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FLYING OVER THE NORTH POLE



Photos Wide World and Wide World Studio, upper picture, © New York Times and St. Louis Globe-Democrat.

IN four days of 1926 two thrilling new chapters in North Pole history were written. On May 9, Commander Richard E Byrd, U. S N. (who has since further distinguished himself by flying across the Atlantic and by expeditions to the South Pole which have added much to our knowledge of Antarctica), with his pilot Floyd G. Bennett, in the Josephine Ford, a large three-engined Fokker airplane, made a skillful and successful flight to the pole from King's Bay, Spitzbergen, and back in 15 hours and 51 minutes. For the first time in history an airplane had circled the pole. On May 11 an expedition led by the renowned Norwegian explorer Roald Amundsen and Lincoln Ellsworth, an American, in the semirigid dirigible Norge, built in Italy, designed and piloted by Colonel Umberto Nobile of the Italian Air Force and manned by a picked crew, took to the air at King's Bay Sailing over the Arctic area, they crossed the pole on May 12 at about 1:30 A.M., Greenwich time, and 71 hours after starting from Spitzbergen they landed near Teller, Alaska. The flags of Norway, Italy and the United States had been dropped and left waving over the pole, and the first radio dispatch from the North Pole had been sent to the New York Times. Both expeditions photographed the polar regions from the air. The inset portraits at the left show the pilots, Nobile and Bennett, the group at the right shows Amundsen, Ellsworth and Byrd, commanders of the two famous flights.

VOLUME XIII

The Book of Knowledge

The Children's Encyclopedia

THAT LEADS TO LOVE OF LEARNING

Editor-in-Chief

E. V. McLOUGHLIN, L.H.D.

Educational Consultant

LEONARD POWER, Ed.D.



With an Introduction by

ALEXANDER J. STODDARD, Ed.D., L.H.D., LL.D.

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The

BOOK OF KNOWLEDGE

The Children's Encyclopedia

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U. S. Farm Security Administration

THE SOUTHERN STATES—PART I

YEARS ago, a painter made a picture supposed to be symbolic of the South. It showed a big tree, a Negro asleep under it and cotton fields stretching away in the background. Most Southern people would object to that picture because it tells too little. It is true that the South has great forests, it has within its borders over nine million Negroes, and it produces about half of the world's cotton; but it is vastly more than all that. This article may tell you some things about the South that you do not know.

When politicians ask, "How will the South vote?" they have only the people in mind. We may say, "The South is a good place for dairying," meaning only the region. But when we say, as we may, "The South is making wonderful progress," we mean the Southern people in the use of their resources. That is the way that will be followed in this article.

If we were asked who are the people of the South, it would be easy to say, "Those who live in the Southern states" if all could agree as to just which states should be named. Some writers include as many as sixteen, others only thirteen. These are the thirteen that are always included: Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, Tennessee and Kentucky. Maryland, West Virginia and Missouri are often included. In this study we shall consider the thirteen named and West Virginia. These include together a little less than 30 per cent of the area of the United States and almost exactly 30 per cent of the population.

The South contains the oldest Spanish settlement in the present United States, St. Augustine, Florida (1565), and the oldest English settlement, Jamestown, Virginia (1607). Four of the states were among the original thirteen: Virginia, which then included Kentucky and West Virginia; North Carolina, which included Tennessee; South Carolina; and Georgia, which claimed some of what we now call Alabama and Mississippi. So a part of the South is old as we count age. The remainder of the South was gained from France, Spain and Mexico after the Revolution.

The people of the older South were chiefly English, though there were Germans, Irish, Scotch, Welsh and French Protestants (Hu-



Virginia State Chamber of Commerce

Blossom time in the beautiful Shenandoah Valley, Virginia, an important apple-growing section.

guenots). When the newer South was added to the United States many people of Spanish, French and Mexican blood came with the land. However, the region soon received large immigration from the older states, and the old stock was soon in the majority. However, French influence is still strong in Louisiana, and Spanish-Mexican in Texas.

The section has received little immigration from across the ocean since the Revolution. Texas has the largest percentage of foreign-born, but this is less than 7 and includes many Mexicans. Eight of the states have less than one per cent foreign-born. Negroes form something more than one-fourth of the population in the section. The percentage runs from less than 7 in West Virginia to a little more than 50 in Mississippi. However, so many Negroes are moving to the North and West that it is probable that the future will show a larger white majority in these states. So you see that most of the Southern people are native-born whites, as the census calls them, and very often several generations of their ancestors lived in the state, or at least in the section where their descendants now live. Generally the Southern people are inspired by a deep love for their section and an almost clannish affection for their relatives and friends.

Southern people are proud of their military heroes and have erected many monuments in their honor. The greatest of these has been partly completed on the side of Stone Mountain, near Atlanta, one of the largest masses of granite in the world. The figures are heroic in size, and the monument as a whole will be most imposing.

Aside from memorials, evidences of the Civil War in the South are few. That war was terribly expensive in terms of both life and property. It interrupted all ordinary business from 1860 to 1865, and for the next fifty years made progress in the South very difficult. Now that the war is long over and the days of reconstruction are past, Southern people are facing present tasks and are studying future possibilities. There is no time to harbor grievances, real or imaginary, when there is so much important work to do. That is the way most people of the New South feel about the Civil War.

Instead of being one region, the South



Department of Conservation and Development, North Carolina

A prosperous farm in the rich plain of North Carolina's coastal country.



Philip Gendreau, New York

Horses grazing in the blue-grass country of Kentucky. Here is some of the most fertile land in the world.

consists of at least four large regions that are quite unlike. Each is made up of smaller sections that differ somewhat. It is important to know something of the natural conditions in each of these regions, for such conditions have much to do with the industries that develop there.

A low, almost level coastal plain stretches from Maryland into Texas. Nowhere is it more than 500 feet above the sea. Its nearness to the sea is one of its most important characteristics. It is narrowest in Maryland, and widest along the Mississippi River, where it extends 1,000 miles from the Gulf of Mexico to the southern tip of Illinois. Two states, Louisiana and Florida, are wholly within this region, which is called, from its location, the Atlantic-Gulf Coastal Plain.

From the Atlantic part of the coastal plain west to the central parts of Tennessee and Kentucky, and south into South Carolina, Georgia and Alabama, is the second region, very different from the first. It is a great mass of wide plateaus, long lines of ridges and mountains, with fertile valleys in between. Mount Mitchell, more than a mile above sea level (6,684 feet), and the highest mountain in the eastern United States, is in this section. Plateaus, fertile valleys and wooded mountains all taken together make



Chattanooga Community Advertising Association

Moccasin Bend, in the Tennessee River, gets its name from its shape, which resembles an Indian moccasin.



Rosella H. Werlin

Children's playground on the beach at Galveston, Texas.

up this region, the Appalachian Highlands. Their main characteristics are elevation and nearness to important markets for their products. Sometimes that part of the region between the coastal plain and the mountains is called the Piedmont Plateau.

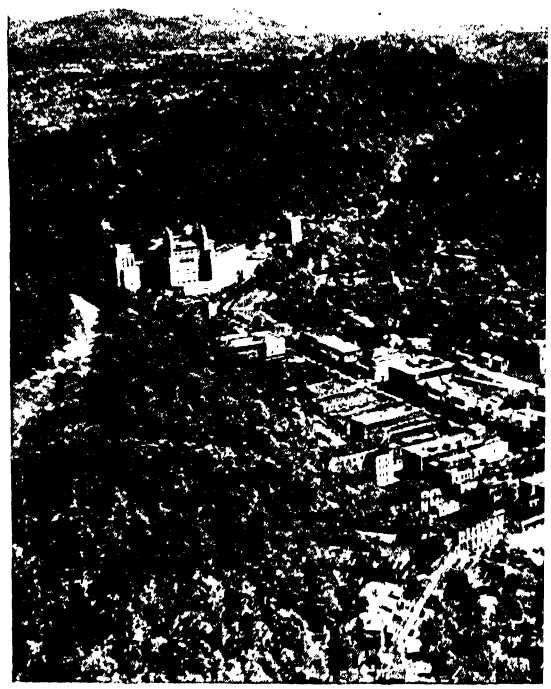
The third region is much like the second, except that it is west of the Mississippi River, and is not a continuous area as is the Appalachian Highlands. It includes the Ozark Plateau region of southern Missouri and northern Arkansas, the Ouachita Mountains of Oklahoma, and the central hilly section of Texas. It is really a part of the great Appalachian region that has folded down under the Mississippi River, reappearing west of it under other names.

The remainder of the South is in some respects the best of all. It, too, consists of several parts somewhat separated from each other. All are interior lowlands—level and fertile, fine for farming. The best-developed are the Blue Grass regions of Kentucky and of Tennessee, the Arkansas Valley and the central basin of Texas. These are parts of the interior lowlands. Along the western border of the interior lowlands is the Great Plains region. This is found in western Oklahoma and western Texas. Later we shall see how great an advantage the South has in these natural regions and the variety of conditions they represent.

The position of the Southern states was favorable for early exploration and settlement. Florida reaches almost into the Tropical Zone; Texas not quite so far. This position in the southern part of the Temperate Zone gives to the South as a whole a long growing season and rather mild winters. Its nearness to the Panama Canal gives easy trade relations with western South America and with China and Japan. The long distance of the Gulf Coast from Europe is a disadvantage, although some products are shipped.

In the South we find fairly good coastlines, temperatures that are seldom very hot or very cold, and rainfall that comes nearly every month of the year, but mainly in the growing season. In such regions one would expect to find the industries of the open country, such as farming, animal industries, lumbering and mining. Of these, agriculture is the most important.

Farming is the main interest for most

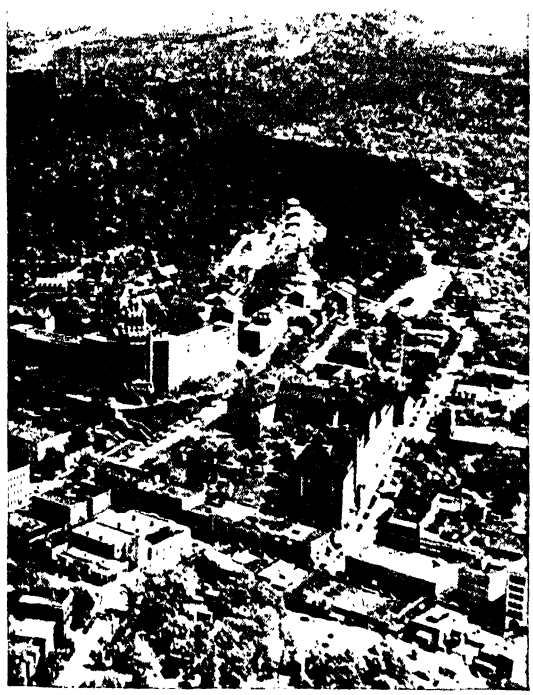


An air view of Hot Springs National Park. This famous

Southern people. The South probably could lead either the Northeastern section, the North Central area or the West in farming or animal industries. That it does not do so at present is partly because it has not been forced to do so. While some other parts of our country are pretty well filled up, there is still an abundance of room in the South, and it is still comparatively easy to make a living. That means that in the South as a whole competition is not very strong, and one can get along very well by using only half his powers.

As population increases, changes will come about. The land will cost more per acre, and it will be made to produce more. Southern people will farm more and more efficiently. Wealth will increase. Better country communities and better cities will be built, with better transportation lines connecting them.

Nature gave the South a favorable climate, good soil, much underground water and a great deal of nearly level land. It is well to consider climate first because that is something that everybody has to take as he finds it. The weather in the South is generally fine to medium, seldom really bad. Frequent changes in the winter months are stimulating to man; rains and freezes are good for the next summer's crops. The summer is a long growing season, usually about seven months from the last frost of spring to the first frost of autumn. The summer temperatures do not run as high in the South as in many sections farther from the sea, but there is, however, little relief from the heat during the summer months. Most of the rain comes in the summer, when the growing crops need it most. Nowhere in the South, except along the far western border in the Great Plains region, is there less than an average of 20 inches of rain a year, and that is enough for ordinary crops. The average is about 40 inches.



health resort is in the Ouachita Mountains in Arkansas.

Of course, a climate that is good for crops is also the kind that crop enemies like. Such pests as the boll-weevil and the San José scale thrive naturally in the warm, moist air. In his efforts to control crop pests the Southern farmer is being forced into the use of the best farming methods, and to that extent the pests are indirectly doing a service to the South.

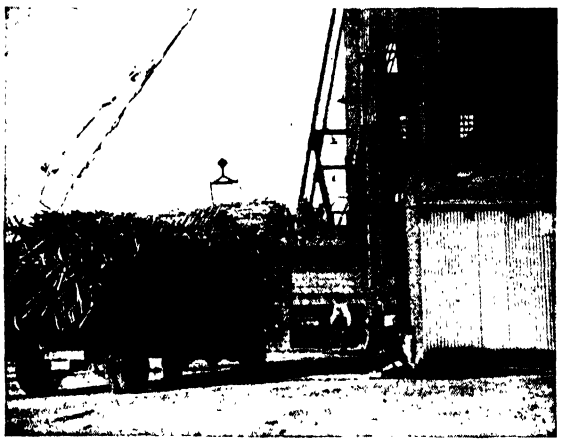
Unlike climate, soil can be controlled by man. If it is too wet, it can be drained. Much land in southeastern Missouri, in Florida, in Louisiana and in other parts of the coastal plain has thus been reclaimed. If it is too poor, as on the sandy parts of the coastal plain, it can be fertilized. Soils of the truck areas and much soil used in cotton-growing is being fertilized. If it washes badly, it can be drained, then plowed along the curves instead of up and down. If the soil does not suit one crop, the farmer can plant another. He can use for truck the sands that warm up early in the spring, and leave the black waxy land for cotton and other crops.

The rich river bottoms never need replenishing by man; the limy soils sometimes need renewing; and the sandy soils must be heavily fertilized to yield good returns. Fortunately, the South, besides possessing large rock-phosphate deposits in Florida, Tennessee and South Carolina, has at Muscle Shoals, Alabama, a great power plant built by the Government with facilities for producing fertilizer directly from the nitrogen of the air. This plant now forms the central unit in the famous Tennessee Valley development project.

Three sections of the South have the highest fertility. They are the Black Belt



A flourishing field of celery near Sarasota, Florida.



Louisiana Tourist Bureau

Unloading sugar-cane at a refinery in Louisiana.



North Carolina's most important products are cotton and cotton manufactures.

of Alabama, the Black Prairie in Texas and the Yazoo Delta region in Mississippi. The first two are on limestone soils, once under the sea; the third is very rich soil, renewed often by silt from the rivers. Other fertile regions are the long limestone valleys of the Appalachian Highlands and the Blue Grass regions of Kentucky and Tennessee. The rest of the South has soils that are well suited to selected crops and when fertilized yield heavily. If irrigation be needed for the crops, such as rice, or in special places, such as the lower Rio Grande Valley, enough water is available.

The four large natural regions of the South include plains, plateaus and mountains, thus giving considerable variety in elevation. Of these three types, the plains are the most extensive. The total width of the plain, one thousand miles from north to south, insures a good deal of variation in temperature; therefore a great many different kinds of products can be raised. Differences in elevation in the South as a whole have the effect of making it seem larger than it is, for on the highlands many cool-summer products, such as apples, can be grown. You will see that it is possible in the South to raise some tropical-zone products, such as bananas; all subtropical-zone products, like cotton, citrus fruits and figs; and practically all temperate-zone products. A list of everything raised in the South for market would be too long to give.

Once the South could have been accused of "carrying all its eggs in one basket," that is, raising cotton or tobacco and neglecting other crops, but that is hardly true to-day. The South grows about two-fifths of the world's cotton, it is true, but less than one-half of her acres are planted to that crop, and the value of cotton and cottonseed





Pictures, Virginia State Chamber of Commerce

A tobacco field near Danville; and sweet sorghum near Appomattox, Virginia. Syrup is made from sweet sorghum.

taken together is less than half of the total crop value. The South is raising many important crops, and much of the total amount of each in the United States comes from the South. For example, over 85 per cent of the tobacco is grown in the South. Besides these products, there are dozens of others. Some regions have become widely known in connection with certain crops. For instance, Georgia and North Carolina are famous for peaches; Florida and the lower Rio Grande Valley, for citrus fruit; Virginia, for apples; and many sections of the south Atlantic and Gulf coasts, for early vegetables. It is plain that the South is not merely the "land of cotton."



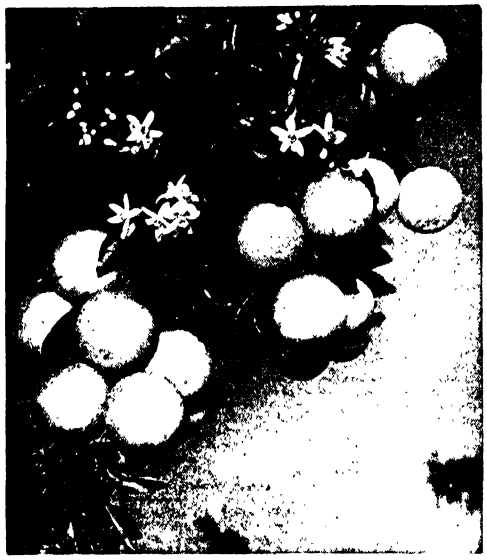
Department of Conservation, North Carolina

Peanuts are raised in several Southern states. This is a field in Bertie County, North Carolina.

Those who know most about agriculture in the South say that cotton should remain an important crop, but not the only one. Although Cuba is our permanent rival in the growing of sugar-cane, the South could increase her sugar-cane acreage. The South should grow all its own corn. The peanut, from which have come more than 150 food products, should be further developed. The delicious pecan could be more extensively cultivated. There should be more fruit farms, truck farms, poultry farms and dairy farms to take the place of the old one-crop farms. As has been well said, "one-crop farming is really not farming so much as it is soil-mining."

Most of these things are becoming established. Some of them are not at all new. Away back in 1894 the South sent many carloads of corn from Southern fields to help Nebraska and the Dakotas when drought caused crop failures there. The farm boys and girls are doing wonderful things. Co-operation in buying and selling are well established in many places. The development of the fertilizer business is important in the section, and better farming is being done.

Beef cattle have long been important in this section, but there are not so many cattle as in the West. Now the dairy cow is traveling southward, and the "dairy dollar" is said to be wiping out poverty in the plains and illiteracy in the mountain sections. Begun as a side line with cotton-growing, on many farms dairying is now bringing in more



Orange blossoms and fruit on the same tree. Florida and Texas produce oranges, lemons and grapefruits.

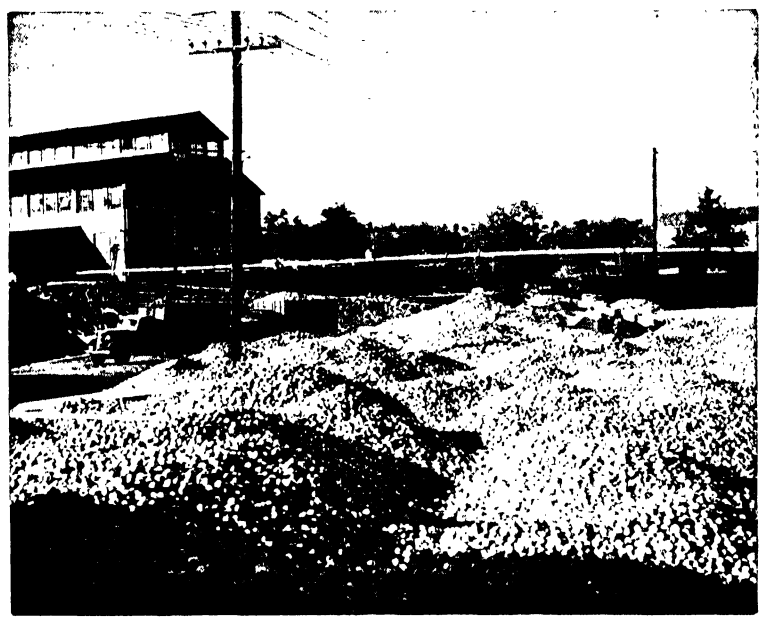
money than the farm crops. The South has about a fourth of all the dairy cattle of the United States, and produces a large part of the butter.

Animal industries are favored in the South because of good all-year grazing with plenty of water, and because expensive housing in winter is not required. Two main problems are before the owners; to keep the cattle tick-free and to protect them against sudden cold snaps in winter. The states impose dipping regulations to kill the ticks, but the housing is left to the farmer or cattleman to take care of. The South has the finest of cattle feed in cottonseed meal and cake and in the meals and fodder from peanuts, velvet beans, soybeans and cowpeas. It has also alfalfa, Kafir corn and other fodders. In time the South will be recognized as a section naturally favorable for dairying on a commercial scale. The development of cities is helping to bring this about.

The South has the largest amount of standing timber to be found anywhere in the United States. It consists mainly of pine and hardwoods. To develop its lumber industry properly is important. We have seen that to grow cotton year after year on the same land takes out the fertility without replacing it. To use the forest resources without replacing them is just as wasteful. Some day we shall be cultivating our forests as we cultivate other important crops.

There is no region more favored than the South for the lumber industries. Natural reforestation takes place more quickly than in the North or West. The workers can get the trees out easily. Mountain lands are available for permanent forest reserves. Water power in the South is available for manufacturing lumber into other products. The manufacture of newsprint from slash pine, which had been considered almost worthless, promises to become an important industry.

Nature gave to the South not only rich soil at the surface, but many valuable minerals underneath. Of the fifty-seven important minerals of the United States the South has all except borax and platinum. Nine minerals found in the South are rarely found



Virginia State Chamber of Commerce

Apples for apple butter and other products at a Winchester, Virginia, factory.

elsewhere in the United States. They are phosphate, sulphur, bauxite, fuller's earth, mica, tin, barite, pyrite and manganese. The world's largest zinc field is in the South. A third of the petroleum produced in the world each year comes from the South. Texas produces the greatest amount.

The coal of the South is important, compared with that of the United States as a whole, the British Isles and all Europe. It is said that there is more coal in the South than in all Europe except Russia. Most of it is bituminous coal of good grade. West Virginia is second only to Pennsylvania in production. Much coking coal needed in the making of steel is found in the Birmingham district. Lignite, a poorer grade, is abundant and may in time prove highly valuable. Coal is used not only as a fuel, but as a source of many valuable by-products. Coal and iron are far more important in the business world to-day than are the so-called precious stones. The South has also much iron ore of good grade. Iron is greatly affected by lime, which has the peculiar property of making the iron separate out from other materials with which it is usually found. This fact helps one to understand why iron deposits are often found where a mountainous region grades into a limestone plain. This iron is found in the southern Appalachians where the lower slopes touch the limestone valleys. The chief centres for iron-and-steel products are Birmingham, Alabama, and Chattanooga, Tennessee. Birmingham has unusual advantages for becoming a centre of the iron-and-steel industries. Found within a few miles of one another are the three essentials in making steel—iron of good quality, limestone to separate it out and coking coal for fuel. The region is not far from the coast with water transportation for the heavy products to all parts of the world. It seems that production is likely to increase greatly.



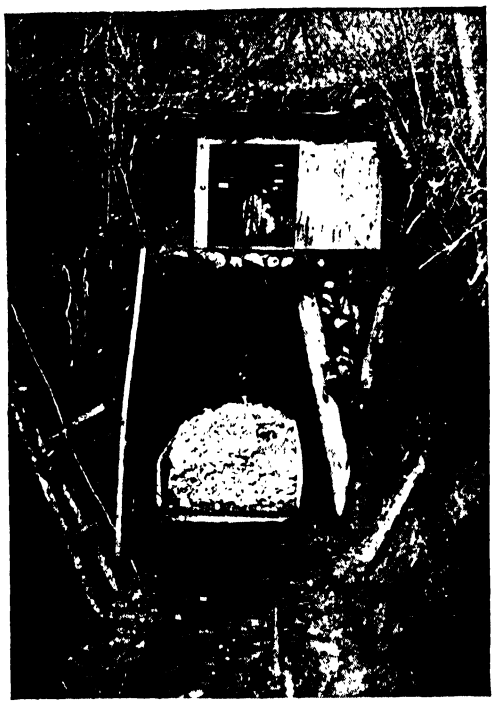
A thriving patch of clover in a Georgia pasture.

Probably next in importance to coal and iron is aluminum. It is a very light, strong, durable metal, important in business, from the making of kitchen utensils to the construction of airplanes. The United States leads in the production of aluminum, and the South mines some of the bauxite from which it is made. The aluminum is obtained by the use of much electric power; then the crude aluminum is manufactured into the many useful articles that trade demands. A town in Arkansas is named Bauxite. Bauxite is obtained also from Georgia, Alabama and Tennessee. The use of aluminum in World War II has been very great.



U.S.D.A. photograph by Forsythe

With each passing year, more and more Southern farms are changing from one-crop (cotton or tobacco) to varied agriculture, including dairying and stock-raising. Here is a fine herd of dairy cattle in Talledega County, Alabama.



Department of Conservation, North Carolina

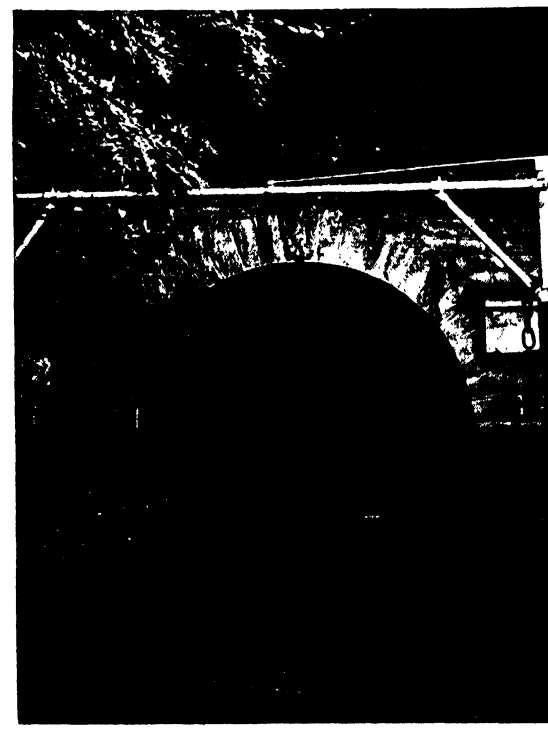
Entrance to a mica mine in North Carolina, the leading state in the production of this mineral.

Magnesium is now a great rival of aluminum in this Light Metals Age. It is one-third lighter than aluminum and can be shaped more easily, making it particularly important in the manufacture of aircraft. While magnesium is extracted from ores, another excellent source is sea water. Only recently, however, have economical methods of using sea water for this purpose been developed. An important plant is located at Freeport, Texas, on the Gulf of Mexico. The quantities obtained thus far are small in comparison with other common metals; but just before the second World War the United States ranked third in world production.

A financial panic struck the island of Sicily when her best customer, the United States, began securing her sulphur from Louisiana and Texas. These two states now supply all the sulphur needed in this country—for matches, sulphuric acid, vulcanizing rubber, and for many other purposes—and besides produce some for export. Sulphur is one of the most important minerals of the South.

Petroleum is a very spectacular material to-day, and one who brings in an oil well may come suddenly into great wealth. Of this mineral the South has one-third of the





Picture at left, State of Tennessee Department of Conservation

A quarry near Knoxville, where some of the famous Tennessee marble is quarried; and the entrance to a mine in

world's known supply. The three states of Oklahoma, Texas and Louisiana produce the greater part. Petroleum is used mainly as a fuel, but it is being used more and more as a lubricant and for its valuable by-products. Often associated with petroleum is natural gas. These products are responsible for much of the wealth that is in the South today, and for much of the high rank in manufacturing. The refining of petroleum is an important manufacturing industry itself, and the refined petroleum supplies power for other types of manufacturing. Texas has valuable helium, the gas that will not burn.

Besides such highly valuable minerals as these, the South has great quantities of building stones, including granite and marble, road-making materials, glass sands, materials for making Portland cement and many other such products. The mineral wealth of the South is already important, but greater developments are expected to come in the future from which the whole region will benefit.

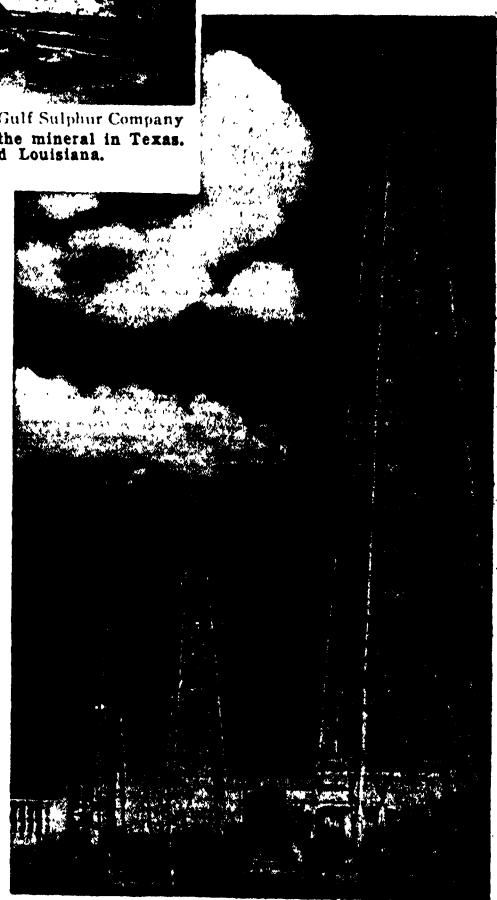
THE NEXT STORY OF THE UNITED STATES IS ON PAGE 4881.



Texas Gulf Sulphur Company

Moving railroad tracks up to a sulphur vat for loading the mineral in Texas. Four-fifths of the world's sulphur comes from Texas and Louisiana.





Oklahoma Chamber of Commerce

the Pocahontas coal-fields, West Virginia. Right, oil derricks march to the door of the capitol in Oklahoma.

SCENES IN FOUR SOUTHERN STATES THAT ATTRACT VISITORS



W. A. Jackson, Charleston, S.C.
Spanish moss hanging from a tree near Charleston, S. C.



Virginia State Chamber
Natural Bridge in Virginia, 215 feet high.



Department of Conservation, North Carolina
Stalactites in Linville Caverns, North Carolina.



Chamber of Commerce, St. Augustine
A corner of an alligator farm near St. Augustine, Florida. The skins of alligators make fine leather.

SCIENCE



Bell Telephone

SOME THINGS ELECTRICITY CAN DO



Westinghouse

LIKE Aladdin's genie, electricity is an obedient servant. It performs many miracles in our everyday life.

The story of Electricity and Magnetism has told us how and why the electromagnet operates. A secret of its great success is that one moment it is a magnet of enormous strength, and the next it is simply a piece of unmagnetized iron.

In addition to being a huge giant of industry, lifting great weights and moving carloads of material, the electromagnet is useful also in smaller form.

Since it responds instantly to a flow of electric current, it is very valuable in instruments and machines that work at high speeds.

Perhaps the best-known device that depends on an electromagnet is the ordinary electric doorbell. When you ring a doorbell, this is what happens:

You press the button, and this joins two electric conductors. They are connected to the bell and to a source of electricity—either a battery or the house current. Before the conductors touch, no current flows because the circuit is incomplete. With the button depressed, however, the conductors touch, the circuit is complete and current flows.

In the bell there is a small electromagnet. The current flows through here and, as you know, sets up a magnetic force.

Near the electromagnet is a strip of soft iron, called the armature, to which is attached the bell hammer. This strip is attracted to the magnet, and the hammer moves with it, striking the gong.

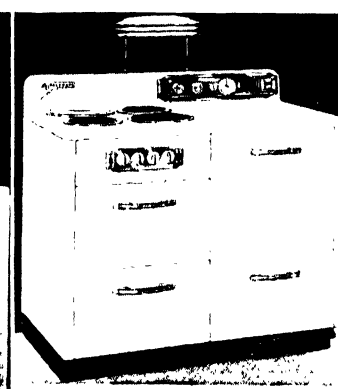
This operation would produce only one ring, however; but there is an added feature that provides the continuous ring with which you are familiar.

When the armature moves toward the electromagnet, it breaks the circuit again by separating two conductors, called points. Thus, just as the hammer hits the bell, the current flow is stopped again. The armature is pulled back to its original position by a mechanical spring. Then, if your hand is still on the button, the same thing starts all over again. So, we have a rapid succession of taps on the gong—the doorbell ring.



Westinghouse

An electric clothes dryer.



Landers, Frary and Clark

Cooking is fun on this electric stove that can be set for any desired degree of heat.



Westinghouse

A roomy electric refrigerator.

TELLING THE TIME IN A HUNDRED ROOMS

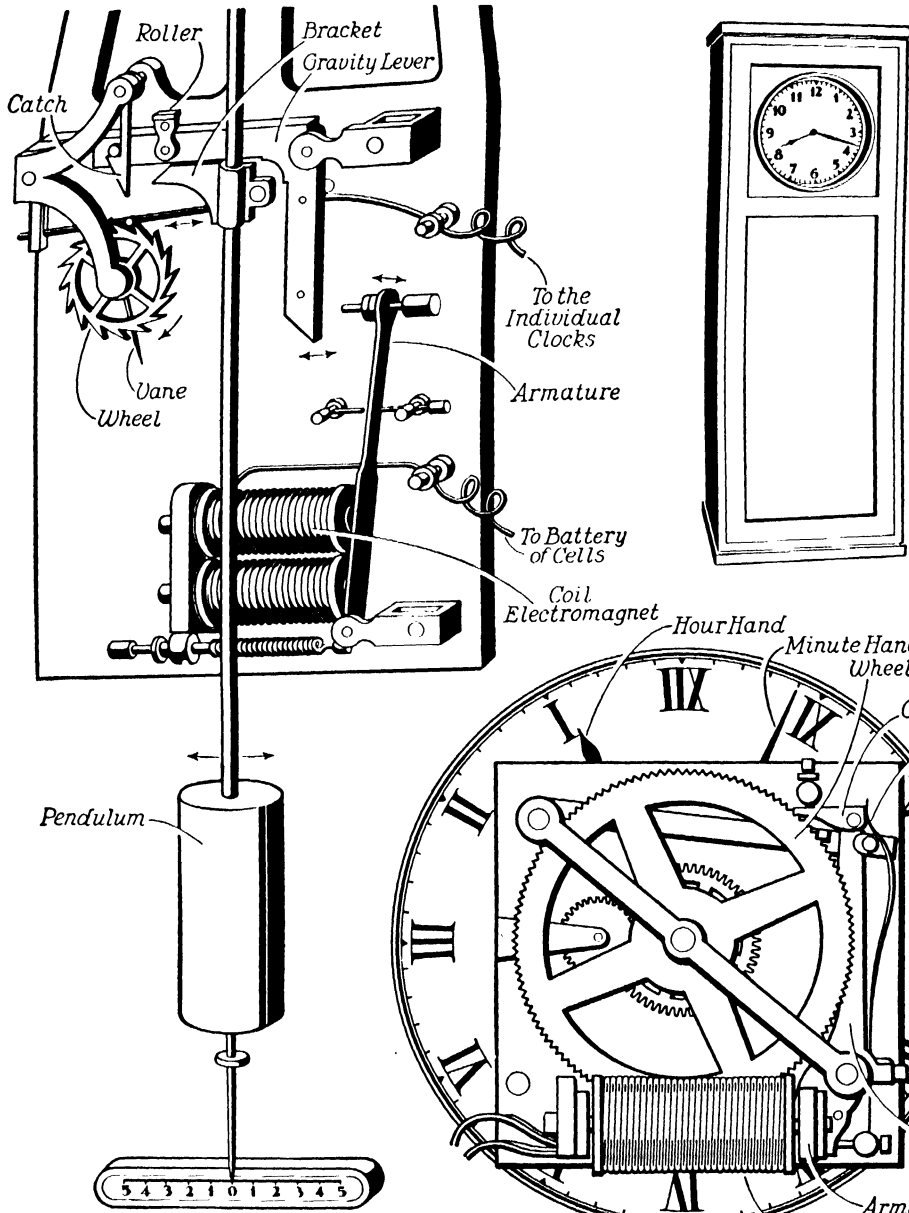


Figure 1.

Figure 2.

By electricity a hundred clocks in a hundred rooms can be so controlled, or synchronized, by a single pendulum, that all show exactly the same time. The diagram shows how this is done. FIGURE 1. The master-clock consists only of a pendulum which pulls round the wheel once every half minute, causing the vane to withdraw the catch and allow the gravity lever to fall. The roller runs down the bracket fixed on the pendulum-rod, pushes the pendulum aside, and forces the upright arm of the gravity lever to touch the point of the screw in the end of the armature. Thus the circuit of the coil electromagnet is closed, and the current from the battery of cells flows through the dials all over the building. FIGURE 2. The clock faces have no pendulums. They are known as impulse dials, and consist of a large wheel actuated by a magnet to work other wheels. The pointers on these dials advance half a minute while the magnet on the master attracts the armature and throws the lever up on its catch again. The magnet behind the dial receives the impulses which attract the nearby armature, moving the lever so that the click picks up another tooth of the wheel. In this way the spring propels the wheel, and the minute-hand attached to it, one half minute. Thus every dial is affected by the master clock.



Westinghouse

This step-saving kitchen has electric stove, clock, mixer, dishwasher, toaster, refrigerator and other helps.

The electromagnet is just as successful in dealing with tiny currents as with powerful ones. Measuring the muscular contractions of the human heart is a job that is performed by one marvelously sensitive electromagnetic instrument. Not only are heart-beats recorded in this way, but even their loudness, their tone and their pitch. These records are of the utmost value in modern medical science.

Inside your home electricity gives you power and light when and where you want it. All you have to do is press a button or touch a switch and electricity obeys your wish. Incandescent lamps or fluorescent lights can illuminate every room in your home in an instant. If you want to hear your favorite radio program, a twist of a knob commands electricity for the task. The telephone and the telegraph depend upon electricity.

In the kitchen, the electric refrigerator freezes water and preserves food. Electricity heats the toaster and the waffle iron. Your mother may beat some eggs with the aid of an electric mixer, and then cook them on a stove that is run completely by electricity. The clock on the shelf has the familiar electric wire running to the outlet in the wall. Upstairs your sister fixes her hair with an electric curling iron. The electric heater warms the bathroom, in order that your little brother may take his bath at a comfortable temperature.



Bakelite Corporation

Light, efficient vacuum cleaner.

Another useful thing which electricity accomplishes is the covering of metals with beautiful, fine deposits of silver, gold, nickel and so on. The process of electroplating is one of the most widely used in the world. It has a very real importance, for it enables us to coat metals which are easily affected by the air with a cheap covering that protects them. Iron easily rusts in the air, and in the course of time it practically crumbles away. But if a piece of iron is well cleaned, connected by a wire to the negative pole of a battery and placed in a bath of water containing a salt of nickel, and the positive pole of the battery is joined to a piece of nickel also immersed in the liquid, ions of nickel will travel along through the liquid in an endless procession. Soon there will be deposited as a coating upon the piece of iron an infinitely thin layer of nickel metal, which, as we know, can be beautifully polished and will not allow the iron to be attacked by rust.

In similar ways the jeweler can plate objects with gold; the silversmith can make table silver out of some cheap white metal and plate it with silver.

Electricity is used in hundreds of industries, and is employed in myriad ways by the engineer and chemist. Nowadays immense quantities of oxygen gas are actually manufactured by electricity, for use in such proces es as welding with the oxygen and acetylene flame.

This power to undo the



Electro-Physical Laboratories, Inc.
The Cardiotron "writes" a record of the heart beat.

bonds of nature and resolve substances into their elements is of great value, for when electricity gives us a metal out of some metallic compound it gives it to us in a marvelously pure state. Copper, for instance, of extraordinary purity is made in this way, and is spoken of in commerce as electrolytic copper. Aluminum is produced in a similar manner.

A chemical industry that is daily becoming of greater importance to the world is the obtaining of nitrates from the air. The nitrogen occurring in such vast quantities in the atmosphere is a thing vital to the growth of plants and crops. Artificial fertilizers must contain nitrogen, and enormous quantities of nitrogen compounds—such as sulfate of ammonia, nitrate of ammonia, and so on—have to be used by farmers, especially in the less temperate countries. Electricity is used to get the nitrogen from the air.

The first great user of electric power for traffic was the trolley car. In the days of the horse car, a third horse was often used to help the usual pair of animals when a hill was reached. The electric car has all the power it wants to climb almost any hill; the driver has only to move a lever and the trolley climbs the steepest grade.

Usually an electric car obtains its current from an overhead wire, with the rails themselves acting as the other conductor. Sometimes, however, you see an electric car with no battery or overhead wire. If you look carefully, you will find a slot running along the ground between the rails. Beneath the ground are two flat conductors, carrying the current. The trolley carries a plow, or projecting shoe, to pick up the current.

The electric transportation field also has overhead railways (elevateds) and underground railways (subways). In the beginning their success was so great that engineers thought of their replacing the steam engine, as they had replaced the horse.

The weight of a train is, of course, much greater than that of one car, and the electric engine for it may have to be a giant. For city and suburban traffic the control mechanism of the motors usually is fitted into one end of a special coach, the rest of the coach being used for passengers. For longer distances and heavier trains, separate locomotives are used.

On electric railroads the power may be supplied by overhead wires or by the special conductor known as the "third rail." It is the rail located at the side of the track itself, running parallel with the train.

Many electric locomotives do not require an outside supply of electricity. They carry their own electric generators, driven by Diesel, gasoline or steam engines.

No one can foresee the outcome of the marvelous work that is now being done in the electrical laboratories of the world. We are only on the fringe of a new world, one among a multitude of worlds of infinite wonder fashioned by the Hand of God. Recent discoveries have been wonderful; those of the next half-century are likely to be even more awe-inspiring.

THE NEXT STORY OF SCIENCE IS ON PAGE 4545.



Fred Eldean photo
Riding to work by trackless trolley in Philadelphia.

POETRY

Springtime of English Poetry

Illustrated by Elizabeth James

May in the Greenwood

WRITTEN IN THE FIFTEENTH CENTURY
BY AN UNKNOWN POET

In somer when the shawes be sheyne,
And leves be large and long,
Hit is full merry in feyre foreste
To here the foulys song.

To se the dere draw to the dale
And leve the hilles hee,
And shadow him in the leves grene
Under the greenwode tree.

Hit befell on Whitsontide
Early in a May mornyng,
The sonne up faire can shyne,
And the briddis mery can syng.

"This is a mery mornyng," said Litulle Johne,
"Be Hym that dyed on tre;
A more mery man that I am one
Lyves not in Christiantè.

"Pluk up thi hert, my dere mayster,"
Litulle Johne can say,
"And thynk hit is a fulle fayre tyme
In a mornynge of May."

Prologue to The Canterbury Tales

By GEOFFREY CHAUCER (1340-1400)

In The Canterbury Tales, Chaucer tells of a group of people who chance to meet at an inn as they start on a journey to the shrine of St. Thomas à Becket at Canterbury. As they travel on their way together, each person entertains the company with a story. In Volume Thirteen you will find some of the stories told by these pilgrims. Here we give the opening verses of the poem. We have modernized some of the spelling. The word *soote* is sweet; *Zephyrus* is the west wind; *fowles* are birds; *seke* is sick.

WHAN that Aprille with his showres soote
The droughte of March hath piercèd to the roote,
And bathèd every vein in such licour
Of which vertu engendred is the flowre;
When Zephyrus eek with his swete breeth
Inspirèd hath in every holt and heath
The tendre croppes, and the younge sun
Hath in the Ram his halfe course y-run,
And small fowles maken melodye
That sleepen all the night with open yë
(So priketh hem nature in hir corages):
Then longen folk to goon on pilgrimages,
And palmers for to seeken straunge strandes,
To fern halwes couthe in sundry landes;
And specially, from every shires ende
Of Engelond, to Caunterbury they wende
The holy blissful martyr for to seeke
That hem hath holpen, when that they were seke.



The Knight

Who Was One of the Pilgrims in CHAUCER'S CANTERBURY TALES

A KNIGHT there was, and that a worthy man
That from the tyme that he first began
To ryden out, he lovèd chivalrye,
Truthe and honour, fredom and curteisye.
Ful worthy was he in his lordes werre,
And thereto hadde he ridden (no man ferre)
As well in Cristendom as hethenesse,
And ever honoured for his worthinesse . . .
At mortal battles had he been fiftene,
And foughten for our faith at Tramissene
In lystes thrice, and ay slayne his foe.
This ilke worthy knight had been also
Somtyme with the lord of Palatye,
Ageyn another hethen in Turkye:
And evermore he hadde a sovereyn prys.
And though that he were worthy, he was wys,
And of his port as meek as is a mayde.
He never yet no vileinye ne sayde
In al his lyfe, unto no manner wight.
He was a verray parfit gentil knight.

The Oxford Student

Who Was One of the Pilgrims in CHAUCER'S CANTERBURY TALES

A CLERK there was of Oxenford also,
That unto logic hadde longe y-go.
As lean was his horse as is a rake,
And he was not right fat, I undertake;
But looked hollow, and ther-to soberly.
Full threadbare was his overest courtepy;
For he had geten him yet no benefyce,
Ne was so worldly for to have offyce.
For him was lever have at his beddes head
Twenty bookes, clad in black or red,
Of Aristotle and his philosophye,
Than robes riche, or fiddles, or gay psaltery.
But all be that he was a philosophre,
Yet had he but litel gold in coffre;
But al that he might of his friendes hente,
On bookes and on learning he it spente,
And busily gan for the soules to preye
Of them that gave him wher-with to scoleye.
Of studie took he most care and most heed.
Noght o word spak he more than was need,
And that was seyd in forme and reverence,
And short and quik, and ful of hy sentence.
Souninge in moral vertu was his speche,
And gladly wolde he lerne, and gladly teche.



Praise of Women

By ROBERT MANNYNG OF BRUNNE
(1288-1338)

The word *nevene* means name; *glew* means gladness; and *hurde* means flock.

No thyng is to man so dere
As wommanys love in gode manere.
A gode womman is mannys blyss,
There here love right and stedfast is.
There is no solace under heavene,
Of all that a man may nevene,
That shuld a man do so muche glew
As a gode womman that loveth trew.
Ne dearer is none in Goddys hurde
Than a chaste womman with lovely worde.

Spring Song of the Birds

By KING JAMES I OF SCOTLAND
(1394-1437)

Worshippe ye that loveris bene this May,
For of your blisse the Kalendis are begonne,
And sing with us, Away, Winter, away!
Cum, Sumer, cum, the swete sesoun and sonne!
Awake for shame! that have your heavens wonne,
And amorously lift up your hedis all,
Thank Love that list you to his merci call!

A Song to the Virgin Mary

WRITTEN ABOUT 1400 BY AN UNKNOWN POET

Of a rose, a lovely rose,
Of a rose is al myn song.

Listenyt, lordynges, both elde and yinge,
How this rose began to sprynge;
Such a rose to myn lykynge
In al this world ne knowe I none.

The Angel came fro heavene tower
To greet Mary with gret honour,
And seyde she should bear the flower
That should break the fiendes bond.

The flower sprong in heye Bedlem,
That is bothe bryht and schene:
The rose is Mary, heavene queen,
Out of here bosum the blosme sprong.

The ferste braunche is ful of myht,
That sprong on Cyrstemesse nyht,
The starre schon over Bedlem bryht
That is bothe brod and long.

The secunde braunche sprang to helle,
The fiendes power doun to felle:
Therein myht non sowle dwelle;
Blyssid be the time the rose sprong!

The thredde braunche is good and swote,
It sprang to heavene, crop and rote,
Therein to dwellyn and ben our bote;
Every day it schewit in prystes hond.

In Honor of the City of London

By William Dunbar
(1465-1520)

London, thou art of townes *A per se.*
Soveraign of cities, seemliest in sight,
Of high renown, riches and royaltie;
Of Lordis, barons, and many a goodly knyght;
Of most delectable lusty ladies bright;
Of famous prelatis, in habitis clericall;
Of merchauntis full of substaunce and of myght:
London, thou art the flower of Cities all.

Gladdith anon, thou lusty Troynovaunt,
Citie that some tyme cleped was New Troy;
In all the erth, imperiall as thou stant,
Pryncesse of townes, of pleasure and of joy,
A richer restith under no Christian roy;
For manly power, with craftis naturall,
Formeth none fairer since the Flood of Noy:
London, thou art the flower of Cities all.

Gemme of all joy, jasper of jocunditie,
Most mighty carbuncle of vertue and valor;
Strong Troy in vigor and in strenuytie;
Of royall cities Rose and Geraflower;
Empress of townes, exalt in honor;
In beautie bearing the crown imperiall;
Sweet paradise precelling in pleasure;
London, thou art the flower of Cities all.

Above all ryvers thy Ryver hath renowne,
Whose beryall stremys, pleasaunt and preclare,
Under thy lusty wallys runneth down,
Where many a swan doth swymme with wyngis fair
Where many a barge doth sail and row with are;
Where many a ship doth rest with top-royall.
O, towne of townes! patrone and not compare,
London, thou art the flower of Cities all.

Upon thy lusty Bridge of pylers white
Been merchauntis full royall to behold;
Upon thy stretis goeth many a seemly knyght
In velvet gownes and in cheynes of gold.
By Julyus Cesar thy Tower founded of old

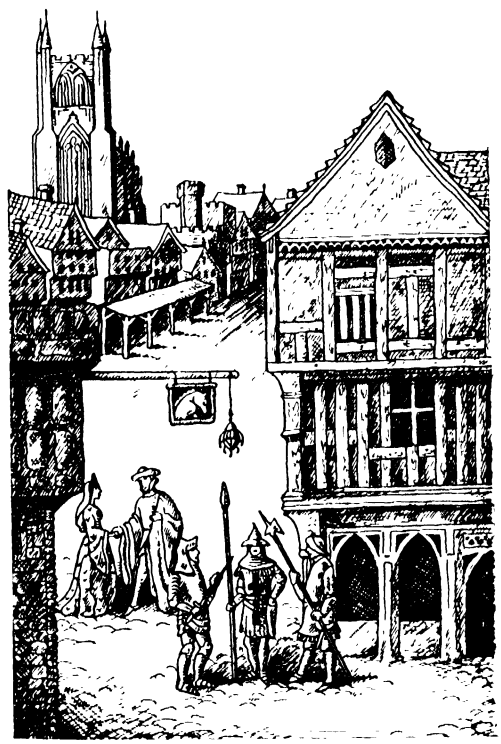


May be the house of Mars victoryall,
Whose artillary with tongue may not be told:
London, thou art the flower of Cities all.

Strong be thy wallis that about thee standis;
Wise be the people that within thee dwellis;
Fresh is thy ryver with his lusty strandis;
Blith be thy churches, well sounding be thy bellis;
Rich be thy merchauntis in substaunce that excellis;

Fair be their wives, right lovesom, white and small;
Clere be thy virgyns, lusty under kellis:
London, thou art the flower of Cities all.

Thy famous Mayor, by pryncely governaunce,
With sword of justice thee ruleth prudently.
No Lord of Parys, Venys, or Floraunce
In dignitye or honor goeth to hym nigh.
He is exampler, lode-star, and guye,
Principall patrone and Rose orygynalle,
Above all Mayors as maister most worthy:
London, thou art the flower of Cities all.



The Old Cloak

A TRADITIONAL BALLAD

This humorous ballad is believed to have been written sometime in the fifteenth century. The word *spill* means die; *flyte* means scold; *grain* was a scarlet cloth; and *misken* means mistake. *Boreas* is the north wind, and *threap* means argue.

THIS winter's weather it waxeth cold,
And frost it freezeth on every hill,
And Boreas blows his blast so bold
That all our cattle are like to spill.
Bell, my wife, she loves no strife;
She said unto me quietly,
"Rise up, and save cow Crumbock's life!
Man, put thine old cloak about thee!"

HE

O Bell my wife, why dost thou flyte?
Thou kens my cloak is very thin:
It is so bare and over worn,
A cricket cannot creep therein.
Then I'll no longer borrow nor lend;
For once I'll new aparell'd be;
Tomorrow I'll to town and spend;
For I'll have a new cloak about me.

SHE

Cow Crumbock is a very good cow:
She has been always true to the pail;
She has helped us to butter and cheese, I trow,
And other things she will not fail.
I would be loth to see her pine.
Good husband, counsel take of me:
It is not for us to go so fine -
Man, take thine old cloak about thee!

HE

My cloak it was a very good cloak,
It hath been always true to the wear;
But now it is not worth a groat:
I have had it four and forty year.
Sometime it was of cloth in grain:
'Tis now but a sieve, as you may see:
It will neither hold out wind nor rain;
And I'll have a new cloak about me.

SHE

It is four and forty years ago
Since the one of us the other did ken;
And we have had, betwixt us two,
Of children either nine or ten:
We have brought them up to women and men:
In the fear of God I trow they be:
And why wilt thou thyself misken?
Man, take thine old cloak about thee!

HE

O Bell my wife, why dost thou flyte?
Now is now, and then was then:
Seek now all the world throughout,
Thou kens not clowns from gentlemen:
They are clad in black, green, yellow and blue,
So far above their own degree.
Once in my life I'll take a view;
For I'll have a new cloak about me.

SHE

King Stephen was a worthy peer;
His breeches cost him but a crown;
He held them sixpence all too dear,
Therefore he called the tailor 'lown.'
He was a king and wore the crown,
And thou'se but of a low degree:
It's pride that puts this country down:
Man, take thine old cloak about thee!

HE

Bell my wife, she loves not strife,
Yet she will lead me, if she can:
And to maintain an easy life
I oft must yield, though I'm good-man.
It's not for a man with a woman to threap,
Unless he first give o'er the plea:
As we began, so will we keep,
And I'll take my old cloak about me.

Whilst it is Prime

By EDMUND SPENSER (1552-1599)

Spenser lived when Shakespeare did, in the reign of Queen Elizabeth. He liked to write in language that was old-fashioned in his day, more like the language of Chaucer's time, and even the characters in his poems, and the adventures they had, were more like those of the medieval romances than they were like those of Spenser's own day. That is why we have put some poems by him in with those of earlier poets.

FRESH Spring, the herald of love's mighty king,
In whose cote-armour richly are displayd
All sorts of flowers the which on earth do spring,
In goodly colours gloriously arrayd—
Goe to my love, where she is carelesse layd,
Yet in her winters bowre not well awake;
Tell her the joyous time wil not be staid,
Unlesse she doe him by the forelock take;
Bid her therefore her selfe soone ready make,
To wayt on Love amongst his lovely crew;
Where every one, that misseth then her make,
Shall be by him amearst with penance dew.
Make hast, therefore, sweet love, whilest it is prime;
For none can call againe the passèd time.

From the Faerie Queene

By EDMUND SPENSER (1552-1599)

This is a poem in six books, each of which tells the adventures of a brave knight sent by Gloriana, the Faerie Queene, to right a wrong and rescue someone in distress. Each of the knights stands for some moral virtue, such as holiness, justice, or friendship, and the dragons, giants and wicked enchanters against whom the knights do battle stand for various evil forces. The verses given below are at the beginning of the first book and describe the Red Cross Knight setting out with the Princess Una to rescue her parents and their kingdom from a dragon.

A GENTLE Knight was pricking on the plaine,
Ycladd in mightie armes and silver shielde,
Wherein old dints of deepe woundes did remaine,
The cruell markes of many a bloody fielde;
Yet armes till that time did he never wield.
His angry steede did chide his foming bitt,
As much disdayning to the curbe to yield:
Full jolly knight he seemd, and faire did sitt,
As one for knightly giusts and fierce encounters fitt.



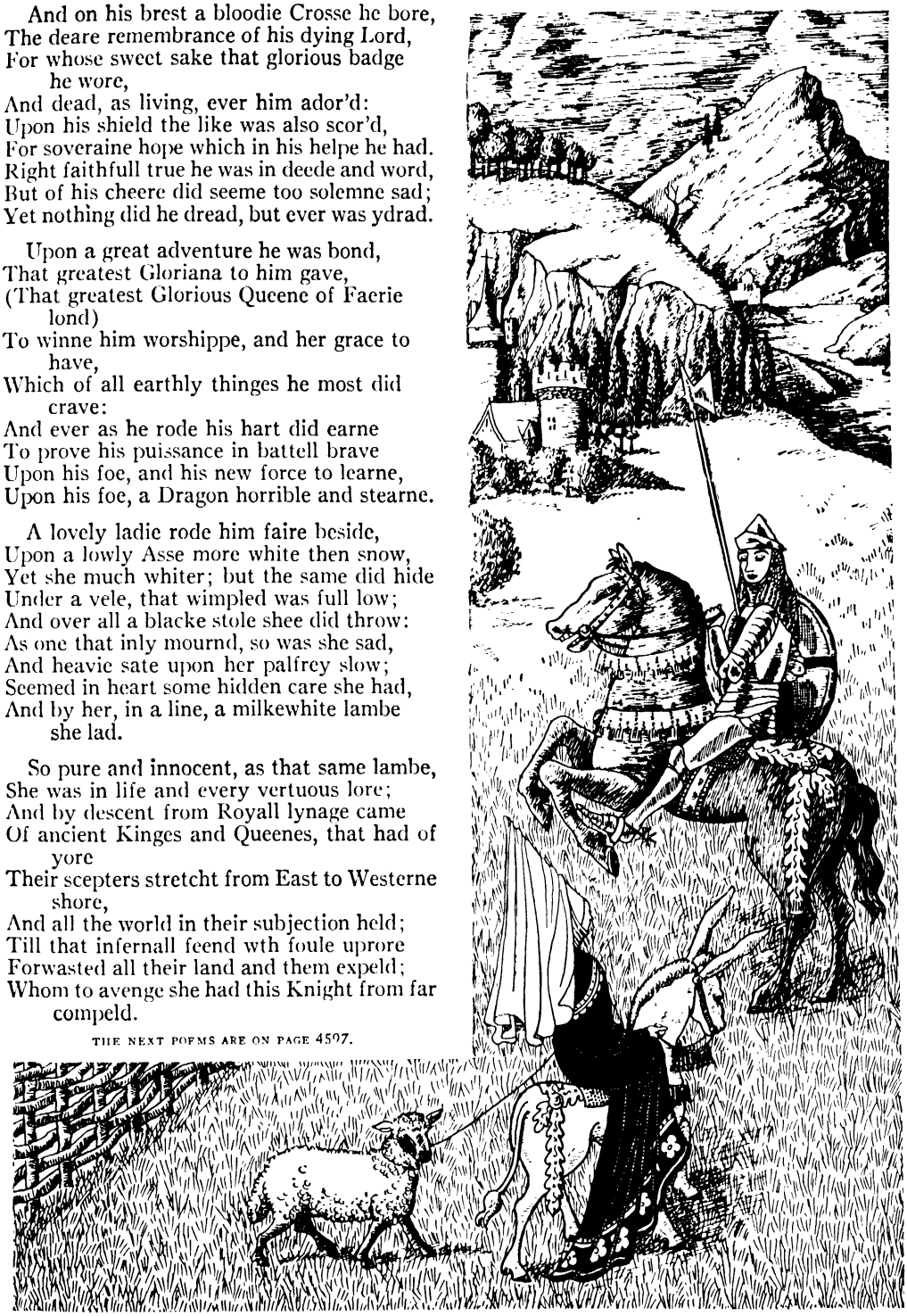
And on his brest a bloodie Crosse he bore,
The deare remembrance of his dying Lord,
For whose sweet sake that glorious badge
he wore,
And dead, as living, ever him ador'd:
Upon his shield the like was also scor'd,
For soveraine hope which in his helpe he had.
Right faithfull true he was in deede and word,
But of his cheere did seeme too solemne sad;
Yet nothing did he dread, but ever was ydrad.

Upon a great adventure he was bond,
That greatest Gloriana to him gave,
(That greatest Glorious Queene of Faerie
lond)
To winne him worshippe, and her grace to
have,
Which of all earthly thinges he most did
crave:
And ever as he rode his hart did earne
To prove his puissance in battell brave
Upon his foe, and his new force to learne,
Upon his foe, a Dragon horrible and stearne.

A lovely ladie rode him faire beside,
Upon a lowly Asse more white then snow,
Yet she much whiter; but the same did hide
Under a vele, that wimpled was full low;
And over all a blacke stole shee did throw:
As one that inly mournd, so was she sad,
And heavie sate upon her palfrey slow;
Seemed in heart some hidden care she had,
And by her, in a line, a milkewhite lambe
she lad.

So pure and innocent, as that same lambe,
She was in life and every vertuous lore;
And by descent from Royall lynage came
Of ancient Kinges and Queenes, that had of
yore
Their scepters stretcht from East to Westerne
shore,
And all the world in their subjection held;
Till that infernall feend wth foule uprore
Forwasted all their land and them expeld;
Whom to avenge she had this Knight from far
compeld.

THE NEXT POEMS ARE ON PAGE 4597.



The Little Princes in the Tower

A True Story from English History

Toward the end of the fifteenth century a little cavalcade set out from Ludlow Castle, England, for London. The center of this party was a handsome boy thirteen years of age. News of his father's death had reached the castle, and as his father was Edward IV, King of England, the little boy set out as soon as possible, with his gentlemen about him, to claim his kingdom.

On the way the party was met by Richard, Duke of Gloucester, a small, misshapen man, with cunning, cruel eyes and a harsh tongue. This Duke of Gloucester was the younger brother of the dead king and an uncle of the handsome boy riding to claim his kingdom. He explained that he was now regent of England, because the new king was only a boy; and accusing the gentlemen who rode with little Edward V of treason, he had them arrested, and himself took charge of the boy king.



The Bettmann Archive

King Edward V (right) and his brother Richard, Duke of York, from the painting by Sir John Millais.

The boy cried bitterly when his friends were taken from him, for he feared his ugly uncle. But the Duke of Gloucester pretended to be kind and told the little King not to fear. He had him taken to the Tower of London, where the boy was to lodge until the affairs of his kingdom were settled. But when the door of the Tower closed upon him, the poor little boy king knew that he was a prisoner.

The Queen, when she heard what the Duke of Gloucester had done, fled in terror with her second son, Richard, to Westminster Abbey. She felt sure that some evil would befall her elder son and determined to save the younger prince.

Now the Duke of Gloucester was ambitious. He was a good soldier and had faithfully served his brother Edward IV. Though he had many enemies, his conduct, until after his brother's death, was as good as that of most men of his time; but he was tempted, and it seems clear that he planned one of the blackest crimes in history.

He wanted to be, not regent, but king of England. Between him and that ambition were the warm young bodies and the fresh young lives of these two pretty children. To slay those fair bodies and send those two innocent souls into eternity became his master passion.

How did he accomplish this end?

He first sent a kind bishop to the Queen in Westminster Abbey, saying that the little King in the Tower longed for his brother to play with him, and begged her that the boy might be sent there. Most reluctantly the poor Queen gave up her second son; and the two little brothers clasped each other in the Tower of London and wondered what would become of them. They were both very much frightened, very lonely and very sorrowful, and they greatly missed their mother.

Then the Duke of Gloucester spread the wicked lie that these young princes were not the sons of the dead king. He hoped that the people would cry out: "Long live King Richard!" but there was no shout for this evil man. He cut off the heads of all those true noblemen who stood by the Queen, and gathered about him a weak party who declared that he was the rightful king. People were actually paid to go about saying that the Duke of Gloucester should be king.

At last, in defiance of the whole nation, the Duke was crowned king of England, while the true boy king remained a prisoner in the Tower. If the nation had risen, as it should have risen, and had cried that Edward V was its king, Richard would have been saved one of the foulest deeds in history. He could not rest. He was the king. He was Richard III. He wore the crown. His word was absolute. His power none could dispute. But the little boys still lived.

He was troubled by the thought of those two poor, miserable children shut up in the Tower and frightened by their own shadows. They poisoned his happiness and kept him jealous and afraid. While they lived he was a robber.

One day he could bear the thought no longer. He sent to the governor of the Tower, telling him that the princes were to be killed. The governor refused to execute this abominable command.

Then the King sent another messenger, bidding the governor deliver up the keys of the Tower for one night. This the governor was obliged to do.

That night two murderers approached the Tower and opened the doors with the keys given them by the King. They made a hole in the stone floor under the staircase, and then, sweating from their labor, ascended the stairs. They reached the door of the room where the young princes slept. The assassins stood for a moment to gain their breath. Then, very quietly, they turned the key in the lock and stole into the room on tip-toe. The only sound was the breathing of the sleepers.

The two prisoners lay on the big bed. Their cheeks were flushed by troubled dreams. Their eyelashes were wet with tears. They had fallen asleep cuddled close together in that companionship of fear which possessed them every day, and still more in the dark hours of the night. Nothing could have been more holy than the sight of those two sleeping defenseless children.

The murderers looked for a moment at the sleeping princes—one of them the rightful king of England—and then turned hastily away lest the sight of that pure and innocent sleep should soften even their hard hearts. Then they laid sudden hold upon the bedclothes and the pillows, wrenched them off, and crammed them over the heads of the startled and awakening children.

As the poor children roused, the murderers pressed the weight of their bodies on the suffocating load, and forced the pillows hard against the mouths of the boys. A little cry; a convulsive struggle of the two poor little bodies; then a long and feeble twitching of the limbs—and the murderers felt, under the clothes, the bodies of their victims lie still forever. The prisoners were set free. The murderers drew away the bedclothes and saw that the princes were dead. They gathered in their arms the little bodies, still warm, and carried them out of the room and down the narrow stairs.

In the hole which they had dug they threw the bodies, and covered them with broken stones and earth, and trod the place flat. Then they went out of the Tower and passed into the peaceful night, with the stars above their heads, and the Thames making music in their ears.

Richard III was king.

The Boy Whom France Forgot

A True Story from French History

In the year 1811, a boy was born in the Palace of the Tuileries, Paris, who seemed destined to rule over a great empire. His father was Napoleon Bonaparte, emperor of the French, a man whose name was a terror to all Europe. His mother was the empress Marie Louise, a daughter of the emperor of Austria. Napoleon had married her as his second wife after he had divorced the empress Josephine. The baby's birth was announced by the roaring salute of many guns; his coming was a great joy to the French na-

tion as well as to his parents. He was given the title King of Rome and his christening was a stately ceremony at the Cathedral of Notre Dame. It seemed as though he had a great future before him, and yet he grew up without a mother's love or a father's care. His short life was pitifully lonely. His early death was a relief to most of the people who thought of his existence at all, and his name is scarcely mentioned in the histories of those times.

But before the Prince was three years old, Napoleon had been defeated by the bitter cold of the Russian winter. All the countries in Europe had combined against him. He had fought and lost the great Battle of the Nations at Leipzig. Even then he might have kept his throne if he had promised to be content with the kingdom of France, but this he refused to do, and everything was taken from him. As the armies of the allies who had



Culver Service

This picture shows the Emperor Napoleon holding the little King of Rome. Beside Napoleon's chair stands his sister, Caroline, Queen of Naples, and seated at the right is the Empress Marie Louise, the baby's mother.

Francis Joseph Charles Bonaparte was born when it seemed to the world that Napoleon was at the height of his power, and everyone thought that the King of Rome was sure to succeed his father on the throne of France. When the little boy was only two and a half years old his education was begun, and he was given lessons almost before his baby lips could repeat the words that were taught him. His father was determined that he should be well prepared for the great place he was to fill among the great rulers of the earth.

defeated the Emperor neared Paris, Marie Louise fled from the city, taking the King of Rome with her, and Napoleon never again saw the son of whom he was so proud and whom he loved so dearly.

The Emperor was sent into exile on the little island of Elba in the Mediterranean. Marie Louise, who did not care for her husband, made no effort to go to him and was quite content to obey her father's command that she should give him up. She agreed, too, to give up the title of empress and was made

Duchess of Parma and two other small Italian states. The title King of Rome was taken from her son, and it was agreed that he was to succeed his mother as Duke of Parma.

This was in 1814. The next year it seemed for a time as if he might be emperor of the French after all. Napoleon escaped from Elba and, gathering a great army as he went, marched through France to Paris and turned out Louis XVIII, the Bourbon king whom the allies had placed on the throne. But the Emperor's second reign lasted so short a time that it is called the Hundred Days. The Battle of Waterloo put an end to it forever. Napoleon was banished for life to the rocky isle of St. Helena. The little boy was given the title Duke of Reichstadt by his grandfather, and it was decided that he should never rule.



Culver Service

This portrait by Sir Thomas Lawrence shows the son of Napoleon in a military cloak like his father's.

By this time Marie Louise had gone to live in her duchy of Parma, but she did not take the duke with her. From this time onward he became a pawn in the game of European politics. Sometimes the great Austrian minister Metternich put forward his claims, at others the malcontents in Italy and in France used his name to stir up trouble. These efforts only made the great powers of Europe the more determined that no son of Napoleon should ever rule, and in November, 1816, Marie Louise was informed that her son could not succeed to the duchy of Parma. As he was not to succeed her, it was thought better that he should be left in Vienna with his grandfather, who undertook his education. He was to be brought up as an Austrian subject, instead of as a French prince, and so all his French attendants were sent away, except his nurse, and she, too, soon went. He was placed in the care of an Austrian gentleman named Count Dietrichstein, who was called his governor. He was still so young that it was hoped he would forget all he had been told about his father. But he never did. Perhaps he had some faint recollection of the man who played with him in the old days in France. He certainly remembered the stories his nurses had told of his famous father, and longed to be like him.

His many tutors found him a difficult pupil, especially at first. He was very obstinate, and as he did not wish to speak German, there were many outbursts of temper to be subdued. Happily, however, he became much attached to Count Dietrichstein, who was very kind to him and treated him with great wisdom. This was all the more fortunate, as his mother married again, after his father's death, and from that time onward he saw little of her.

He admired his soldier-father so much that he was delighted when he learned that his grandfather wished him to become a soldier. It was a great day for him when he got his first uniform, though he was only a corporal, for his tutors thought it better that he should be advanced slowly. He was a clever boy, but lazy, and promotion was held out as a reward for diligence in his studies. No pains were spared to provide him with good teachers.

He was carefully taught his profession, and looked forward to the time when he would command an army, and perhaps lead it to victory. But these hopes were not to be realized, for already his days were numbered. In the spring of 1832 he fell ill, and in July he died. When the news of his death was heard in France it caused but a ripple of interest.

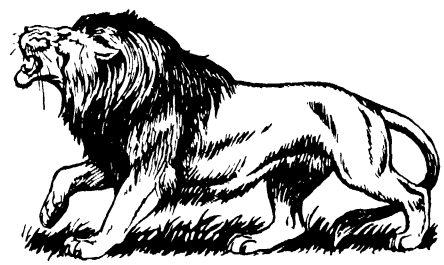
Androcles and the Lion

A LEGEND OF ANCIENT ROME

ANDROCLES was a poor Roman slave who was carried away to northern Africa many hundreds of years ago. His life was very hard and painful, and his master was a cruel man. At last he resolved that he would try to escape to the seacoast and get back to Rome.

He knew that if he were caught he would be put to death; so he waited till the nights were dark and moonless, and then he crept out of his master's house and stole through the town, and got into the open country.

He hastened through the darkness as fast as his legs would carry him. But when the day broke he found that instead of making toward the seacoast he had struck into the great lonely desert. He was tired out, hungry and thirsty; and seeing a cave in the side of some cliffs, he crept into it, lay down and soon fell asleep. Suddenly he was awakened by a terrible roaring. He jumped to his feet. At that instant he saw against the light the form of a huge tawny lion standing at the entrance to the cave. Androcles had been sleeping in its den. He could not escape; the great lion barred the way. Terror-stricken, he waited for the beast to spring upon him and kill him.



But the lion did not move. It moaned and licked one of its paws, from which blood was flowing. Seeing that the animal was in great pain, Androcles forgot his terror and came forward. The lion held up its paw as if it were asking for help.

Androcles then perceived that a great thorn had got into the paw and cut it and made it swell. He drew the thorn out with a quick movement, and then pressed the swelling and stopped the flow of blood.

Relieved of the pain, the grateful lion limped out of the cave, and in a few minutes returned with a dead rabbit, which it laid beside Androcles. When the poor slave had cooked and eaten the rabbit, the lion led him to a place in the cliffs where there was a spring of fresh water gushing from the earth.

For three years the man and the lion lived in the cave. They hunted together and slept together, and the great, shaggy, affectionate creature used to lie down at night at Androcles' feet and slowly wag its huge bushy tail from side to side as a cat does when it lies before the fire and feels happy and comfortable.

But at last Androcles began to weary for the society of his fellow-men. So he left the lion's cave, but he was caught by some soldiers and sent as a fugitive slave to Rome. The ancient Romans were very cruel to runaway slaves and they sentenced Androcles to be killed by wild beasts in the arena on the first public holiday.

A vast multitude of spectators came to see the pitiful sight, and among them was the Emperor of Rome, who sat on a high seat above the arena, surrounded by his senators. Androcles was pushed into the open space, and a lance was thrust into his hand. With this, he was told, he would have to defend himself against a powerful lion which had been kept for days without food to make it savage and fierce. The poor man was given a chance of surviving; but, as he knew, it was a very, very slight one.

He trembled when the hungry lion sprang out of its cage with a terrible roar, and the lance shook in his feeble grasp as the huge beast came bounding up to him. But instead of rushing fiercely at him and bearing him down, it wagged its tail and began to lick his hands. Then Androcles saw that it was his own lion with whom he had lived in the cave, and he patted it and leaned on its head and cried.

All the spectators marveled at the strange scene, and the Emperor sent for Androcles and asked him for an explanation of it. He was so delighted with the wonderful story that he made Androcles a free man and gave him a large sum of money. Thereafter Androcles was free to walk where he would in the streets of Rome, and the faithful lion followed him like a dog wherever he went.

THE NEXT STORIES ARE ON PAGE 4658.





Westinghouse photos

Putting the ultraviolet rays to work. The dairyman is sterilizing milk cans with an ultraviolet lamp. The invisible rays destroy 96% of the bacteria in the cans. The little girl is enjoying an indoor "sunbath."

THE RAYS THAT FILL OUR UNIVERSE

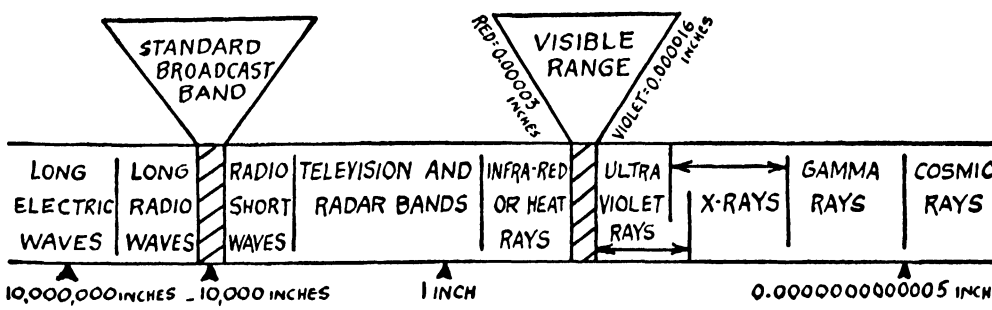
OUR whole universe is filled with rays, shooting past or through one another at enormous speeds. Unlike sound (which needs some medium like air or water through which to move) all these various kinds of radiation can travel through quite empty space, such as the lonely vacuum between the sun and our earth. They make an absorbing study, one which explains many miracles of nature.

In discussing a topic of this sort, which is so closely connected with many other scientific wonders, there is a possibility of mentioning allied subjects which have been treated elsewhere in your book. It is felt, however, that the great interest in rays justifies a separate and more complete explanation.

LIGHT, THE RAYS BY WHICH WE SEE

The rays we know best are the visible rays of light. This light belongs to a great family of waves. In this family there are also light-waves we can not see—infrared waves and ultraviolet waves—as well as X-rays, gamma rays and radio waves.

This is a good place to tell what the difference is between a ray of light and a wave of light. Suppose you dropped a stone into



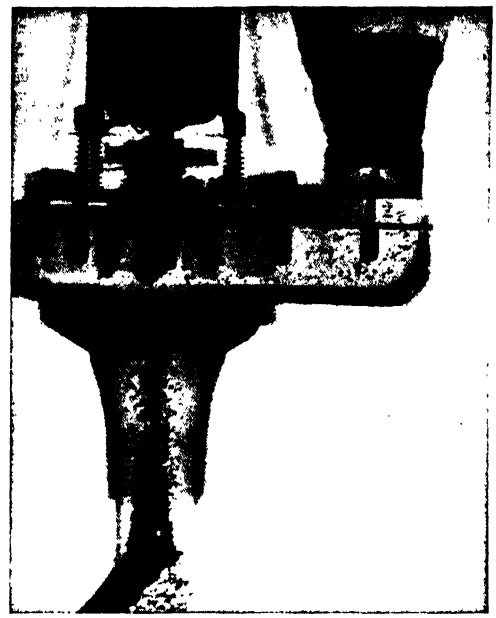
The electromagnetic spectrum above is charted in approximate wave-length values. It includes visible light-rays and standard broadcast waves. The latter vary in range from 7,900 to 21,500 inches, or 550 to 1,500 kilocycles.

THE ALL-SEEING X-RAY



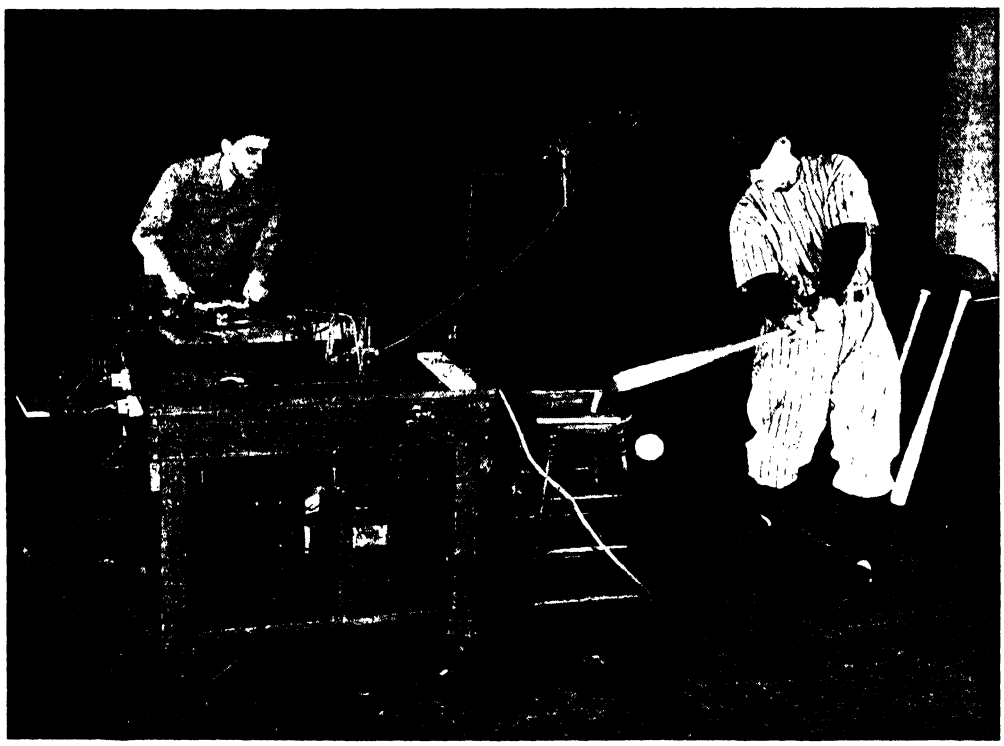
Westinghouse photo

A radiograph of a football kick-off, made with a high-speed X-ray tube. Note how clearly the bones and the nails in the shoe show.



Science Service, Inc.

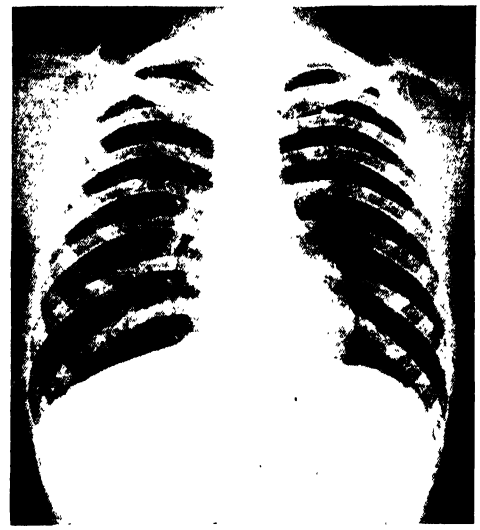
This high-speed X-ray photograph shows what goes on inside a vacuum cleaner as it sucks in particles of dust and dirt.



Westinghouse photo

This is an ordinary photograph of the taking of an extraordinary photograph. A picture has just been made of a ball being hit by a bat, using a new ultra-high-speed X-ray tube which permits a picture to be taken in one millionth part of a second. The ball has been resting on a sensitive plate which is part of the elaborate apparatus for making such photographs. The man in the rear is working the switches that control it.

a still pool of water, and watched the disturbance so created. If the center of the disturbance were to be considered a light bulb, then the ripples or waves of water that go out in all directions from that center might be thought of as waves of light. If, however, you were to draw a straight line from the very center of the disturbance to a point on the shore of the pool, the line would indicate the direction of the wave motion toward that point on shore. This line would be called a ray. Though, strictly speaking, ray refers only to the direction of a light beam, it is a term that is loosely used to designate the narrow beam of light itself.



An X-ray photograph of a normal human chest, showing the ribs, front and rear. This is an example of the use of X rays in medical practice.

Two other terms you will often see in a discussion of light are frequency and wave-length. To explain them, imagine yourself in a boat that lies at anchor. You are looking down at the waves. One after another, in regular intervals, the oncoming waves pass by the bow and travel along the hull toward the stern. The number of wave crests passing by the bow every second is called the frequency of the waves. Small surface ripples might move by at the rate of three every second; their frequency is thus three waves per second. On the other hand, the wave-length is the distance between two successive wave crests. For our ripples this wave-length might be a few inches. It is easy to see that if the waves were spaced farther apart, they would pass by the boat at a lesser rate. That is, frequency goes down as wave-length increases, provided of course that the speed of travel of each wave stays the same. As physicists say, the wave-length is inversely proportional to the frequency.

Now let us get back to light rays; how are they created? When one of the outer electrons of an atom is disturbed in its regular rotation about the nucleus—for instance, by a collision with a "free" electron—then a small bundle of pure energy is hurled away from the atom as the displaced electron jumps back into its own orbit. This bundle, or "quantum", of energy is called a photon. It flies away at tremendous speed —186,000 miles per second. If some special power were given you, so that you could look into an atom and see the disturbed electron being knocked out of its place, and then darting back into place again, you would see a tiny flash of light. Actually, our eyes are not sensitive enough to see a single photon. But suppose the same thing happened in many neighboring atoms at about the same time—then you would really see light being created—many photons shooting out together and forming a spreading light-*wave*. The more violent the atomic disturbances that create the photons, the greater is the energy each represents. The frequency of the resulting light-rays is then higher, the wave-length shorter.

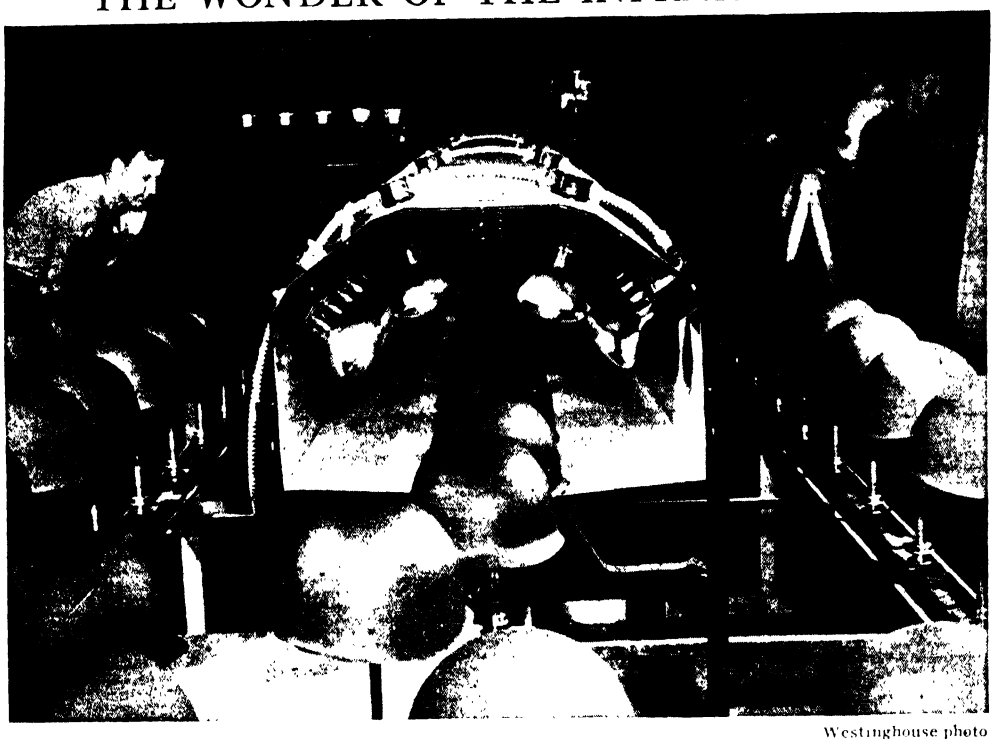
Light-waves with a wave-length of thirty millionths of an inch arouse in our eyes the sensation of red color, whereas rays with half that wave-length seem violet. Between these lie all the other colors of the rainbow—the *visual spectrum of light*. The subject of light is discussed more fully elsewhere in your BOOK OF KNOWLEDGE. The chapter called Light and What Makes It would be a helpful one for you to read.

LIGHT-WAVES TOO LONG AND LIGHT-WAVES TOO SHORT FOR US TO SEE

Our eye fails to notice any rays of longer wave-lengths than that of red, and none shorter than the violet rays; nevertheless, such rays exist. The chart of the whole electromagnetic spectrum shows you that the *infrared rays,* which our skin can feel as *heat* rays, are waves just like light, but with wave-lengths many times longer.

At the other end of the visible light band there is the *ultraviolet* region, with wave-lengths down to one-half a millionth of an inch. To produce those very short, very high-frequency waves, much greater disturbances of the atoms are required than are necessary to cause infrared or visible light. The enor-

THE WONDER OF THE INFRARED RAY



Westinghouse photo

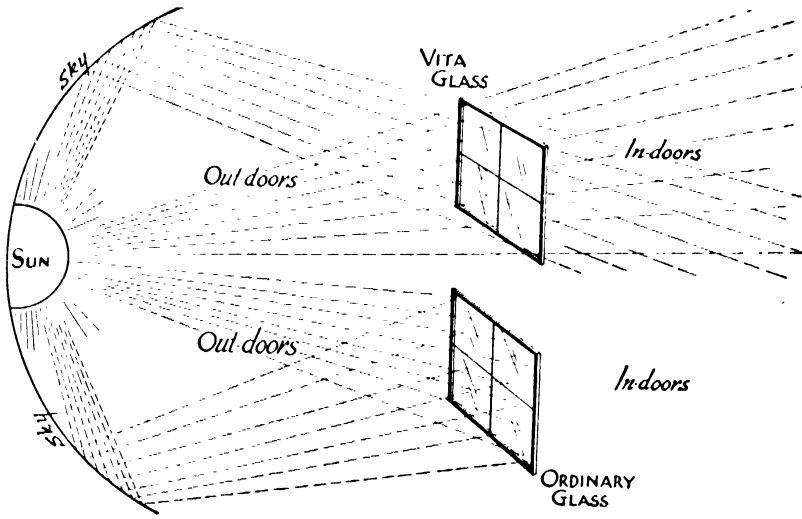
Plastic helmet linings dry in ninety-five seconds under infrared lamps. Oven-drying would take fifteen minutes.





Left: Infrared photography shows the veins under the surface of the skin. Right: An infrared heat lamp.

mous temperatures on the sun, for instance, make possible the creation of such high-frequency, short-wave-length radiation in great amounts. Ultraviolet radiation from the sun is so great that all life on earth would be destroyed by it if the earth's atmosphere did not protect us. Luckily, most of the ultraviolet rays are absorbed by a layer of ozone gas twenty miles above the earth! In the laboratory we can artificially produce such powerful ultraviolet radiation by sending strong electric currents through various substances. A small mercury vapor lamp, for example, can send out very strongly the same healthful ultraviolet rays which are responsible for "sun-burn."



Vitaglass Corporation

Ordinary glass cuts off the health-giving ultraviolet rays, but windows can be made with types of glass such as quartz glass, which permits the rays to pass through them.

ELECTRIC AND RADIO WAVES

Electric and radio waves travel through free space or air with the same speed as infrared, visible and ultraviolet rays, that is, 186,000 miles per second. Like the light-rays, the electric and radio waves are capable of being reflected, refracted, diffracted and polarized. But, as their name implies, these waves are produced by electric currents surging back and forth in man-made electric gadgets. Depending on whether the frequency of these currents is low or high, these waves may have wave-lengths of many yards (radio waves) or down to a fraction of an inch (television and radar).

THE X-RAYS THAT START FROM THE INNER SHELLS OF ATOMS

Let us now turn to the electromagnetic waves with even shorter wave-lengths than ultraviolet light—the X-rays and gamma rays. To create X-rays it does not suffice to disturb the *outer* electrons of atoms; we have to shoot very fast electrons from a special electron source into the *inner* orbit of an atom of some material like copper or tungsten. This will knock out one of those inner electrons; such a catastrophe near the nucleus results in emission of a very powerful photon. The rays formed by these photons may have wave-lengths only $\frac{1}{100}$ the length of ultraviolet waves. But these X-rays have tremendous energy. They can pass through many substances that stop light-rays. They can cause some chemicals to fluoresce, and photographic plates to become exposed. Thus we are able to examine indirectly the inside of many objects. The dentist takes an X-ray picture of your teeth, for example. The rays go through a decayed region more easily than through the healthy enamel; the picture thus shows the condition of the inside of the teeth. Because most X-rays are so powerful, they can destroy tissue material. Doctors can make use of this to "burn out" unhealthy tissue.

THE GAMMA RAYS THAT START FROM THE NUCLEUS OF THE ATOM

Even shorter and more powerful than X-rays are *gamma rays* (γ-rays). To get these we must produce disturbances inside the very nucleus of atoms! In your imagination, watch an atom breaking up, owing either to radioactivity or to bombardment with high-speed particles. It is possible that a neutron in the nucleus may split up into a

proton (positive) and an electron (negative). In such a violent separation into two particles, a large amount of energy is released as photons—and these form the gamma rays. Their wave-length varies, according to the nucleus from which they come. The energy contained in such rays is so great that some gamma rays are able to split nuclei of heavy atoms just as high-speed neutrons do. That is a remarkable thing—for the photon represents "pure" energy, while the neutron is a real particle of matter.

PURE ENERGY FROM COLLIDING UNITS OF ELECTRICITY

Incredible though it may sound, gamma rays are also produced when units of negative electricity (electrons) collide with tiny units of positive electricity (the positron particles). Pair by pair these two kinds of particles completely annihilate each other, and in their stead remains pure energy in the form of photons of the gamma rays. And conversely, if a gamma ray be stopped by a heavy metal it may happen that the photons of the ray break up into pairs of electrons and positrons! Thus in watching the behavior of these rays and particles, we realize that we can not make a very clear distinction between small particles (matter) and photons (energy).

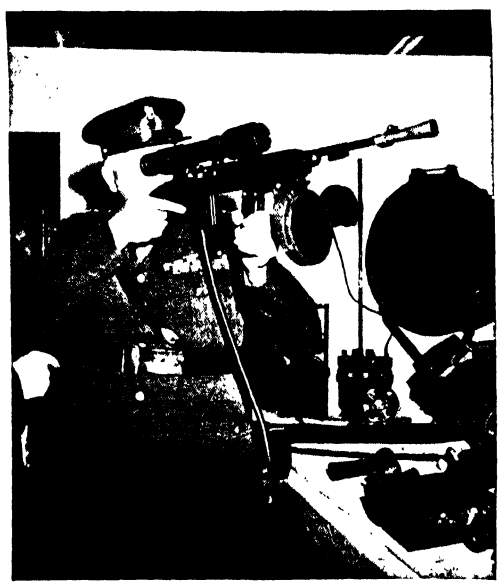
As you know, the nucleus of an atom is ordinarily composed of only two kinds of particles, positively charged protons, and equally heavy but uncharged neutrons. But when atoms disintegrate (break up), various rays can be emitted (sent out) from the nucleus which may consist of particles that must have been produced there during the disintegration. In telling about gamma rays we said that a neutron inside the nucleus might split into an electron and a proton. When this happens to many atoms at the same time, the photons are sent out as gamma rays, and the electrons, too, are emitted at high speed from the nucleus. Such electrons form beta rays (β-rays). Radium, for instance, emits beta rays, which are high-speed electrons, as well as gamma rays. Radium also emits alpha rays (α-rays), which are streams of big and powerful particles, each a combination of two protons and two neutrons. You notice that the structure of an alpha particle is identical with that of a helium atom nucleus.

These alpha particles fly out of the radium nucleus at great speed. Like beta rays or other charged particles, the path of alpha rays can be bent by a powerful magnet. But



Press Association photo

The snooperscope, fitted over a special helmet, was worn by American soldiers during the latter part of the war. It enabled them to see almost as well by night as by day, giving them a tremendous advantage in night operations. The snooperscope converts ordinarily invisible infrared rays into visible light.



Press Association photo

The sniperscope, a rifle-sighting device similar to the snooperscope, enables the soldier to see his target in the dark, without himself being seen. It was used in the Pacific. About thirty per cent of the Japanese casualties at Okinawa were said to be due to it.

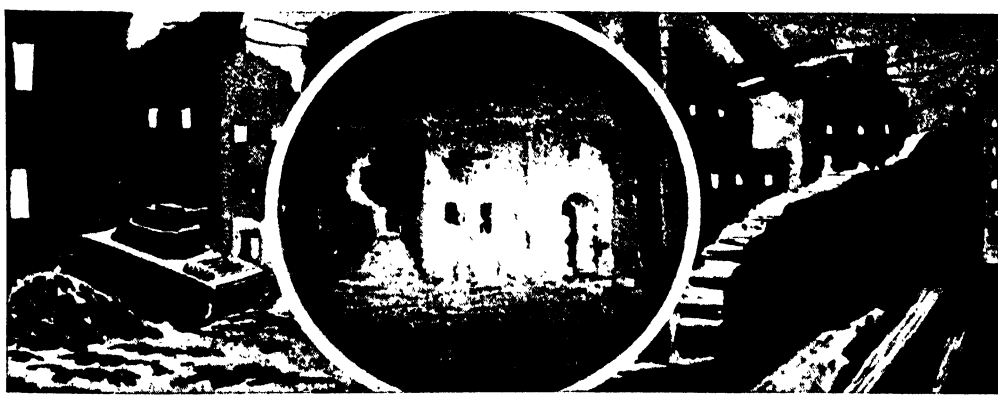
SEEING IN THE DARK BY INFRARED RAYS



These three pictures show the nighttime usefulness of an infrared seeing device known as the sniperscope. Above, we see a street corner of a battle-torn town as it appears in the daytime. The middle picture shows the same scene as it looks after dark with only the unaided eye. The shadows are so black that it would be easy for enemy soldiers to move about, and sneak into position for an attack; the human eye alone could not detect them.

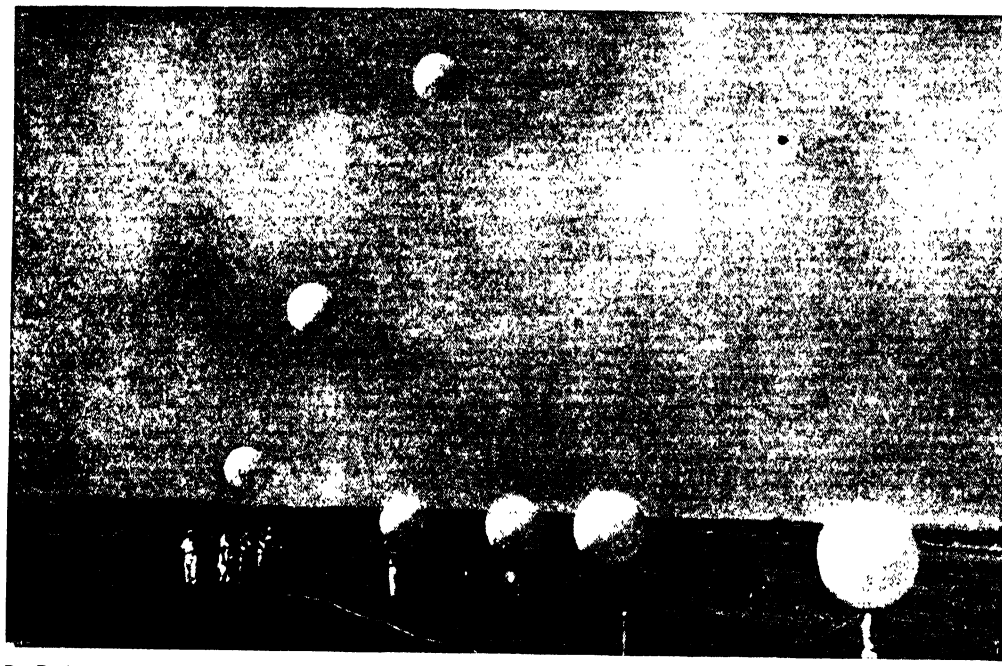


The sniperscope, attached to the soldier's rifle as shown in the picture on page 4550, makes a miraculous change in the scene. It is almost as if a hidden pair of automobile headlights were focused on the building. Look at the picture at the bottom of the page. The vague figures within the white ring show up as ghostly, greenish images. Of course, it is not the same as daylight, but it is clear enough for the soldier to line up his sights.



Press Association photos

The light-source of the sniperscope looks rather like a black spotlight. It gives out infrared light, which shines on the enemy, but which can not be seen by him. After hitting the object, the infrared light bounces back, just as ordinary light is reflected. It is then picked up by the sniperscope, and converted into visible light by the telescope arrangement on the top of the gun. The sniperscope should have many peacetime uses.



Dr. R. A. Millikan, the famous physicist, carrying out an experiment on cosmic rays near Bismarck, North Dakota. Pilot balloons, carrying electronic instruments are sent into the upper atmosphere to measure cosmic radiation.

photons, like those of gamma rays or light, can not be turned from their straight course by magnets. In fact, this experiment with a magnet is usually the test made to see whether a particular ray is made up of charged particles or of pure photons.

OTHER RAYS EMITTED WHEN ATOMS BREAK UP

Besides α-, β- and γ-rays, the other rays that sometimes are emitted when atoms break up are made up of traveling neutrons, protons, positrons or deuterons. Positrons are just like electrons except that they are positively charged. A deuteron is a particle composed of one proton and one neutron. That is, its structure is like that of the nucleus of the "heavy" hydrogen isotope, deuterium.

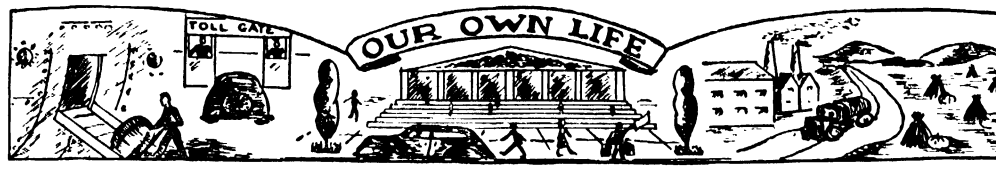
THE MYSTERIOUS COSMIC RAYS

Lastly, let us look at the mysterious type of radiation called *cosmic rays*. It has been known for a long time that our earth is being bombarded from the outer world (the *cosmos*) with rays so powerful that they will go right through many feet of lead. Instruments have recorded them at the bottom of deep lakes, and in mines inside great mountains. We can not escape these rays.

Yet, despite many years of work by some of our greatest physicists, we do not know with certainty whether these rays are particles like β-rays, or photons like γ-rays, or a combination of both. Balloons sent up high with instruments have brought back evidence that the strong magnetic field of the earth bends the rays even at great heights—which seems a particle-like behavior for these cosmic rays. But just how large the particles are, and what their charge, we still can not tell. Also, these rays seem to have some photon rays mixed in with the particles. If there are such cosmic photon rays, they must be of even shorter wave-length than gamma rays. We know that because they have so much greater energy than the gamma rays.

Just how and where these mysterious cosmic rays are created is still an unsolved riddle. Some people say they come from "spots" on the stars, similar to sunspots. Others suggest that cosmic rays are energy given off in the construction of atoms, somewhere in space. But still we do not know. Perhaps the question will be answered by some future young scientist who once received his first stimulation for investigating the mysteries of our world by reading the pages of this book. *By* GERALD J. HOLTON

THE NEXT STORY OF SCIENCE IS ON PAGE 4665.



GOVERNMENT AND TAXES

A NATION is in some ways like a club. Because we belong to this big club we enjoy many advantages. When we join a country club we agree to obey the rules and to pay the dues and we are glad to do so because we hope to get value for our money. By joining together and sharing the expenses we have advantages we could not hope to enjoy by acting singly.

It is much the same with our big national club, the members of which number many millions. Because we belong to a great nation we are protected by laws made for our benefit and carried out by officials especially trained to do the work. We have an army and navy to protect us in war, judges to decide law disputes, inspectors to see that the laws are obeyed, a national money system to enable us to exchange goods, prisons in which to put wrongdoers, good roads for our vehicles, and special men appointed to care for such important things as agriculture, commerce, labor, education and the mails.

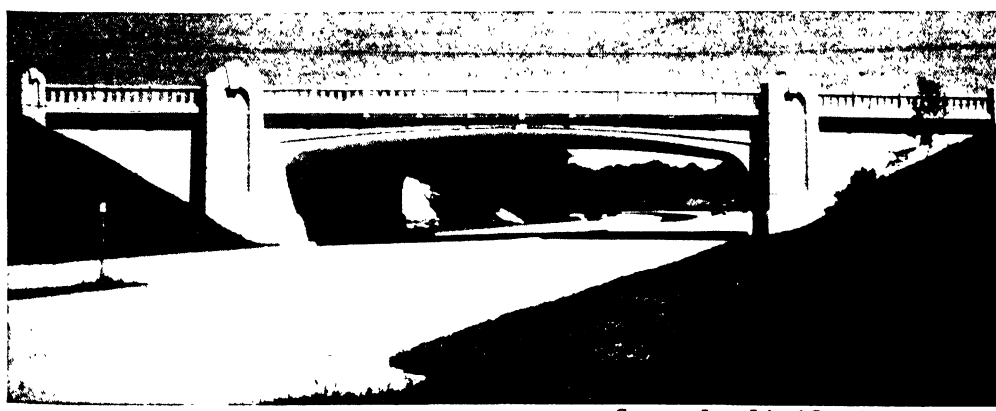
In modern times, too, the government has cared more and more for the training of children and for the protection of those who are not able to look after themselves. So we have established departments to care for education and public welfare, as matters dealing with social questions are often called. These departments look after questions of health, see that we have pure drinking water and pure milk and protect us from fraud when we buy food and drugs.

The number of people employed in all the departments of government is counted by the thousand, and this does not include the many employed in the post office or the teachers in the schools. All these people have to be paid, and they are all paid out of money which we help to find.

Then, too, the government is a great consumer of goods. It is a great builder and must pay for the brick, stone, wood, iron, cement and other things which go into its buildings. It uses great quantities of coal or oil to heat and light the many buildings. It is a great printer, and its bill for paper is enormous. It owns many vehicles of various sorts. It buys furniture for offices, cloth for uniforms, food for animals and hundreds of other things. It must pay for all these things, and they require a great deal of money.

The government cannot get money out of the air. It must either take the money from residents of the country or else must borrow it. When it borrows money it must pay interest until the loan is repaid. So it comes back, after all, to getting money from those who dwell in the country.

The story of a country's finances is not quite so simple as this, as you probably know. We must stop and make a slight exception



Courtesy, Long Island State Park Commission

How some of the money we pay in taxes is spent.

here. In a new country like ours the government has owned a great deal of the land, and, of course, the forests on it and the minerals under it. Much of this land has been sold, but some remains, and in some few cases the government gets what we may call Rents or Royalties from land. However, the amount received from these sources is only a small part of the money the government needs and must have.

How, then, does the government get all of the enormous sums it spends? Does it ask all the citizens to contribute the same amount, or does it ask each to give as much as he thinks proper? It does neither of these things. The government decides what sums each shall pay, and these are called Taxes.

THE NATIONAL CLUB OF WHICH WE ARE ALL MEMBERS

Now we see the essential difference between a club such as a country club and the big club we call a nation. In the case of the private club, we can join or not as we like, and no one can compel us to do so, or to pay the dues unless we wish. In the case of the nation, we are born members of it, and unless we leave the country and become citizens of another country, we are, as it were, compulsory members of the club and are compelled, whether we like it or not, to pay the taxes which are levied against us. In fact, if we are citizens of one country but live in another, both countries are likely to tax us. It is an offense against the law not to pay a tax.

Taxes, then, are sums compulsorily paid by citizens toward meeting the expenses of the government.

Before the first World War, the taxes levied by the nation were large in total amount, but the average sum paid by the citizen was not very large. The expenses of that war were so great that it was necessary for governments to borrow large sums. Conditions after 1929 were such that much more money was borrowed, in the effort to aid victims of the depression. Then came the race among nations to build up great expensive armed forces. Our country entered the race very far behind most of the others, but is now producing materials of war on an enormous scale.

MODERN WARFARE CAUSES VERY HIGH TAXES

Modern warfare is the costliest thing in the world's history. A very big bomber costs more than $3,000,000. A great battleship costs around $70,000,000. In war and defense costs at present, governments spend billions and tens of billions of dollars every year.

Where is the money coming from, to pay these bills? Much of it must come from taxes.

THE TAXES THAT ARE LEVIED WITH EQUAL JUSTICE FOR ALL.

If we think for a moment we shall see that it would not be fair to take the same amount from each person. Some have so little that the tax would be a very heavy burden, while others have a great deal more and could pay this average amount without difficulty. It is because incomes are so unequal that the taxes have been so arranged as to take much from those who are well-to-do and much less from the poor.

One of the best-known of economists, Adam Smith, long ago laid down a famous maxim for tax-makers which ran as follows:

> The subjects of every State ought to contribute towards the support of the Government as nearly as possible in proportion to their prospective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the State.

This maxim, although good, had to be improved on because the ability of a man to pay taxes is not really in proportion to his income. Take the case of two men, one with $2,000 a year and the other with $20,000 a year, and suppose we tax both in proportion to their incomes by levying 10 per cent on each. The man with $2,000 a year would pay $200 and have $1,800 left for himself. The other would pay $2,000 in taxes and would have $18,000 left for himself. The burden of 10 per cent upon one man is therefore much heavier than the burden of 10 per cent on the other. *By taxing in proportion to income we would impose on the poor a heavy burden and on the rich a comparatively small burden.*

THE MILLIONAIRE'S BIG TAX AND THE POOR MAN'S MITE

This consideration led to the development of the maxim of taxation now generally accepted: *Taxes should be levied in such a way as to establish equality of sacrifice between rich and poor.*

This is the principle which is now carried out with more or less success in the taxes we all pay. A millionaire pays very heavy taxes while he lives, and in most countries his heirs have to yield up in tax a large proportion of the value of his estate when he dies. A poor man pays little in direct taxes, or, indeed, he may escape direct taxation alto-

gether. A moderate income pays a moderate tax.

The question of the manner and the degree of justice with which taxes are levied is far more important now than it used to be, because the national expenses have become so great.

THE TAXES ON PEOPLE AND THE TAXES ON THINGS

Taxation has occupied much of the attention of government since civilization began, and hundreds of different taxes have been levied at different places at different times. However, we can divide them in a few classes.

Direct taxes. These are sums which are demanded directly from the person who has to pay them and which cannot be shifted to another. The principal direct taxes are: the Poll Tax, the General Property Tax and the Income Tax, and taxes on the estate of a dead person. These last are called Inheritance Taxes, Death Duties, Succession Duties or some such name. In recent years Sales Taxes have become important. They take many forms, including taxes on admissions to theatres and other places of amusement, taxes on telephone and telegraph services, train and airplane tickets and many other things, as well as on actual articles like clothing, furniture and silverware.

Indirect taxes. These are levied chiefly upon things which are to be sold, so that the people who buy the things pay the tax whether they know it or not. The principal indirect taxes are Customs, or Tariff Taxes and Excise Taxes.

The nation levies both kinds of taxes. Direct taxes bring in more revenue.

THE INCOME TAX IS ARRANGED IN STEPS

The Income Tax is a levy on incomes. It is paid by all those having an annual income of a certain amount. Persons of small means are excused from the tax altogether. When a man is married he pays less than if he were single; and if he has children he pays less still; that is to say, an allowance is made to him for his wife and children. The tax is arranged in steps, so that those having large incomes pay much more on every dollar than those with small incomes. This variation is called *graduating* the tax. It is a fair arrangement.

To obtain more money still from the rich, a second income tax is imposed called the Surtax. It is levied on those with more than a few thousands a year. With income tax and surtax, the income of a rich man is very heavily taxed indeed.

In some countries taxes levied on the value of the estates or possessions left by those who die have brought in large sums. Very tiny estates are entirely excused from the tax. As in the case of the income tax, the duty is graduated so that a little fortune pays not very much and a big fortune pays very heavily.

THE MOST IMPORTANT OF THE INDIRECT TAXES

Now let us come to the indirect taxes. The most important of these, as we have said, are: the Customs, or Tariff Taxes, and the Excise Duties. Let us take the Tariff Taxes first. If you can find a copy of the act now in force you will see that hundreds of articles from foreign countries are taxed. This taxation has a double purpose. We are told that the purposes are to raise revenue and to protect home industries. We know what is meant by raising revenue, but what does protecting home industries mean?

Sometimes we can grow or manufacture an article and think it would be for the welfare of the country if we did. However, for one reason or another a foreign country can produce it more cheaply. This reason may be lower wages, greater experience or larger production. If the foreign goods are allowed to come in free of tax, we cannot grow or manufacture the article at a profit, but if the foreign product pays a tax, we may be able to do so. Therefore many people think it wise to put a tax on the foreign goods, thus raising the price at which they can be sold. We may be able to produce the goods at this higher price, and so wage-earners and manufacturers are more prosperous. This is called a tax for protection. On the other hand, we levy taxes purely for revenue on articles which we cannot produce. A good example is the tax on tea or coffee.

WHAT WE REALLY PAY FOR WHEN WE BUY A POUND OF TEA

When tea is imported it is taxed at the seaport where it is unloaded from the ship. The tea having been bought wholesale and the tax paid to the government, *each pound of the tea is raised in price by the amount of the tax at least.* The wholesale merchant sells it to the store-keeper at a price which includes the tax, and the store-keeper sells it to his customer, of course, at a price which also includes the tax.

Therefore, when we go to the grocery store and buy a pound of tea, *what we really buy is tea and tax,* and there is no one to tell us,

if we do not know it, that part of the price of the tea is not paid for tea at all, but for tax. Every time we buy a pound of tea we pay so much toward the government's expenses.

We can see from this that the tea tax is not graduated in favor of the poor as the income tax is. When a poor woman buys a pound of tea she pays as much tax as when a rich woman buys a pound of tea. This is the great fault of indirect taxation, but governments stick to such hidden taxes, as they are called, because they are effective and because people do not notice that they are being taxed in this way.

TAXES THAT WE NEED NOT PAY UNLESS WE LIKE

Now we come to some other indirect taxes levied by the national government. They are usually called Excise Taxes, from a French word meaning taxes. Such are the taxes on the manufacture of alcohol and tobacco. Alcohol, whether intended for drinking or not, must pay a tax which amounts to millions of dollars every year. The tax on tobacco, however, is larger, and forms a considerable item of revenue. This is a tax which a man pays if he uses tobacco. If he does not, he escapes it. All governments get considerable revenue from this source.

Another tax is the stamps required to be placed on certain documents. This, again, is paid only if we have occasion to need one of the documents. Such taxes have been more common in Europe than in this country.

So far we have dealt principally with the taxes which are levied by the nation. Our other governments in town and country have also to levy taxes to pay their expenses, which are very heavy, tending to increase, and often form a serious handicap to local trade.

SOME THINGS FOR WHICH LOCAL GOVERNMENTS PAY

Education is the concern chiefly of the government of the smaller divisions of the nation, though the national government does pay a small part of the cost. This is one of the heaviest local expenses. Towns must have streets and sewage systems, and must provide magistrates, policemen, firemen and a street-cleaning force. Roads and bridges must be built in the country. Lighting and water systems must be provided either by the public or by private parties. In either case the cost is large. The support of the poor is a local expense, and so is the cost of insane asylums, hospitals and the like. There are dozens of other things for which the governments must pay and all these things cost money.

THE GENERAL PROPERTY TAX BRINGS MUCH REVENUE

Much of this money is raised by the General Property Tax. This is a tax on land, houses and other property. The amount of the tax depends upon the value of the property and not upon the income from it. That is, a man who owns a vacant lot which he is holding for an increase in price must pay a tax on it even though he receives no income from it. In Canada the tax on the estate of a dead person belongs to the Province. In the United States the federal government levies such taxes, and some of the states also impose them. Local governments levy many other kinds of taxes, including sometimes sales taxes.

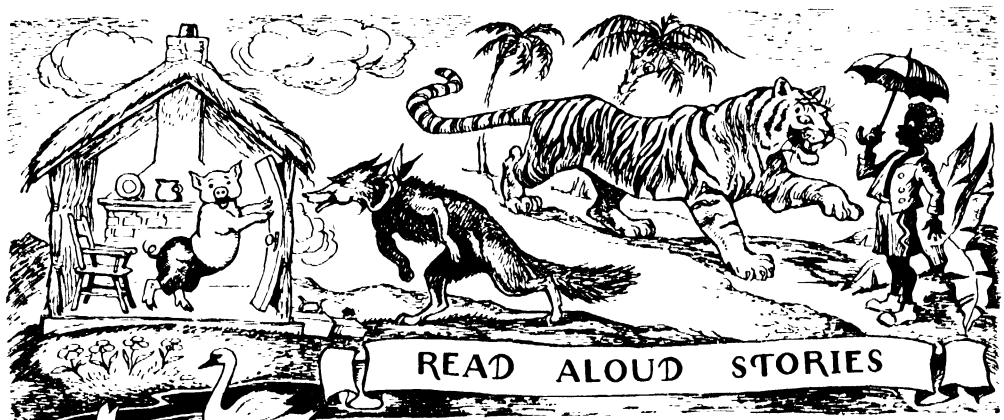
There are dozens of other taxes which we may pay. For example, at times there is a tax on the value of a motor car when we buy it, and then a yearly fee must be paid. This fee varies with the power or weight of a car, and the money is usually devoted to keeping up the roads. Sometimes every gallon of gasoline is taxed for the same purpose. The idea is that if a man can afford to keep a motor car he can afford to pay something extra to the state.

TAXES VARY IN DIFFERENT TIMES AND PLACES

Shooting and fishing licenses belong to the same class, but the money received from them is usually spent for the protection and increase of game and fish. There are other license taxes. Sometimes a license is required to follow a particular trade or profession, or to keep a particular kind of shop. The laws on this subject are not the same everywhere, and if we gave them all, we should have to print many pages of uninteresting tables.

You see that taxes are a very important subject and require much study. The people constantly demand better schools, better fire protection, and public health services, better roads and bridges, and so on. They ask that the local governments undertake new things, but they complain if taxes are high, and say that high taxes hurt business. It is very hard to know what is the right thing to do. Very high taxes do hurt business, and yet without high taxes we cannot have the kind of country we feel we should have. Except during times of emergency, moderation is observed in levying taxes.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 4811



The Angry Little Dwarf

ONCE there was a poor farmer whose lands were all uphill and down. One morning he went out to plow a little hill that had never been planted before. He drove the plow into the ground very cheerfully, for it was a bright spring day, but he had made only a short furrow when a dwarf came rushing up from under the ground.

He was so angry all his hair was standing out on his head like the spines on a porcupine. "How dare you plow the roof of my house?" shouted the angry little fellow.

"Your house?" said the farmer. "I own this land. You are welcome to live here, but I must also get some good out of the land. Let us plant it together."

"Why should I work?" shouted the dwarf.

So then the farmer said he would do all the work himself, but the dwarf insisted on getting his share of the crop.

The farmer agreed. "You live under the ground," he said to the dwarf, "so you may take all of the crop that grows underground. I'll take what grows above the ground."

Good. So the farmer planted corn; and he took the ripe golden ears and left the roots for the dwarf.

The dwarf was so angry, the hair on his head looked like spines on an angry porcupine. Next season he demanded that they make a new bargain; he would take all that grew above the ground and the farmer might have what grew underneath.

Good. So the farmer planted carrots; and he got all the fine yellow roots, and the dwarf got the useless green tops.

So the angry little fellow went and found himself a home under another hill.



The Boy Who Went to the North Wind

This version of an old Norse tale is by Margaret Lima Norgaard



ONCE there was a boy who lived with his mother in an old, old house in the country. One day the mother said to the boy: "Take the bowl and get some meal from the barn, and I will make some pancakes."

The boy went to the barn, filled the bowl with meal, and started back to the house. Just then the North Wind came puffing and blowing, and blew every grain of meal out of the bowl. There was nothing for the boy to do but to go back to the barn and fill his bowl again, which he did. But when he came out, down swooped the North Wind and blew the meal all away. A third time the boy filled his bowl, but a third time the North Wind whirled down and carried off every grain.

At this the boy grew very angry, for there was no meal left in the barn. He went into the house and said to his mother: "Mother, it is not right for the North Wind to take our meal. I am going to find him and tell him to give it back."

So the boy put on his ragged cloak and started in search of the North Wind. He walked all day and all night, and he came at last to the North Wind's house.

"What do you want, Boy?" roared the North Wind in his big, gruff voice.

The boy said: "I've come to ask you to give me back the meal you blew out of my bowl yesterday. My mother and I do not have a thing left to eat."

"I can not give you back your meal," said the North Wind, "for it is scattered from here to there and back again. But since you are in such need I will give you a tablecloth. Only say to it: 'Cloth, Cloth, give me good things to eat!' and it will give you better things than meal cakes."

The boy put the cloth in his ragged cloak and started home. He walked a long time, and when night came on he stopped at a little house in a wood. Now a robber lived in this house, but the boy did not know that. He asked for a bed, and the robber said:

"You may sleep in my house, Boy, but I have nothing to give you to eat."

"Oh, I do not mind that," the boy said.

"Only let me stay here out of the night wind and the cold, and I think I can get food for both of us."

So the boy and the robber went in by the fire, and the boy put his cloth on the table and said: "Cloth, Cloth, give me good things to eat!" And the cloth did. It gave roast chicken, fruit, milk, and a big frosted cake. The boy and the robber ate all they could; then the boy put the cloth in his ragged cloak and went to sleep.

But the robber did not go to sleep. He said to himself: "I must have that cloth." Late in the night he took away the cloth from the boy's cloak and put another in its place that could not even make a crust of bread.

The next day the boy reached home.

"Look, look, Mother!" he cried. "The North Wind gave me this cloth. It will give us all we want to eat."

The mother said: "You say it is so, but I do not know."

The boy put the cloth on the table and said to it: "Cloth, Cloth, give me good things to eat." But not a scrap of food appeared.

"Well," said the boy, "there is something wrong here. I must go to the North Wind again." And he did. He walked and he walked, and he came again to the North Wind's house.

"What do you want now?" roared the North Wind.

"The cloth you gave me is no good at all," said the boy. "Please give me back my meal."

"I told you that your meal is all scattered from here to there and back again," said the North Wind crossly. "But I will give you a goat. Say to it: 'Goat, Goat, make money,' and it will give you all the money you want. Then you can buy more meal and you won't come bothering me again."

So the boy took the goat and started home. That night he came again to the robber's house and he asked: "May I sleep here?"

But the robber, because he had stolen the boy's cloth, did not want to let him in.

"You can not sleep here unless you give me money," he said.

Then the boy said to the goat: "Goat, Goat, make money!" And the goat did.

"Come in, come in!" said the robber. "And go to sleep."

Late in the night, while the boy slept, the robber stole the goat and left another, of no value, in its place. The next day the boy reached home.

"Look, look, Mother!" he cried. "The



North Wind gave me this goat. It will give us all the money we want."

The mother said: "You say it is so, but I do not know."

So the boy said: "Goat, Goat, make money!" But no money did the goat make.

"Well," said the boy, "there is something wrong here. Neither cloth nor goat are of use when I get them home. I must go to the North Wind again." And he did.

The boy walked a long, long time and he came to the North Wind's house.

"So it's you again!" roared the North Wind. "Now what do you want?"

"The goat you gave me is no good at all," said the boy. "Please give me back my meal."

"I've told you and told you," said the North Wind, "that I can not give you back your meal. It is all scattered from here to there and back again. And I certainly wish I had never blown it away. Now I have nothing left to give you but a stick. Say to it: 'Stick, Stick, knock, knock,' and the stick will do what you say. To stop it, you say: 'Stick, Stick, stop, stop.' "

So the boy took the stick and started home. That night he came again to the robber's house and the robber saw him coming up the path with the fine big stick in his hand. "Aha," thought the robber, "I have this simpleton's cloth and his goat. Now I will have his stick." So he went to the door and called: "Come in, come in! You may sleep in my house tonight."

The boy went into the robber's house and went to bed with the stick under his cloak. But he did not go to sleep.

Late in the night the robber came with another stick in his hand that he was going to put in place of the boy's stick. But the boy saw him coming and cried: "Stick, Stick, knock, knock!"

The stick knocked the robber over the back. It knocked him down and when he got up again it went on beating him. The robber jumped over the chairs and he jumped over the bed. He rolled over and over on the floor, but he could not get away from the stick. At last he cried:

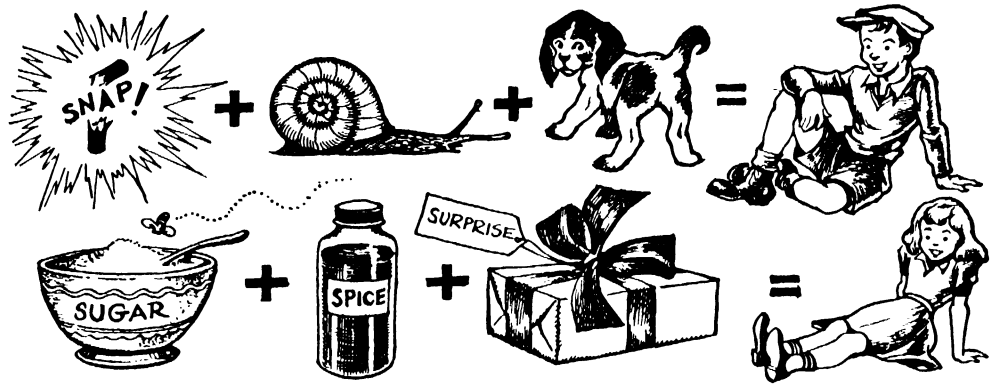
"Boy, Boy, make your stick stop. It will kill me! I will give you back your cloth and your goat. Only make your stick stop!"

So the boy said: "Stick, Stick, stop, stop." And the stick did.

Then the boy took his cloth, his goat and his stick, and went along home to his mother.

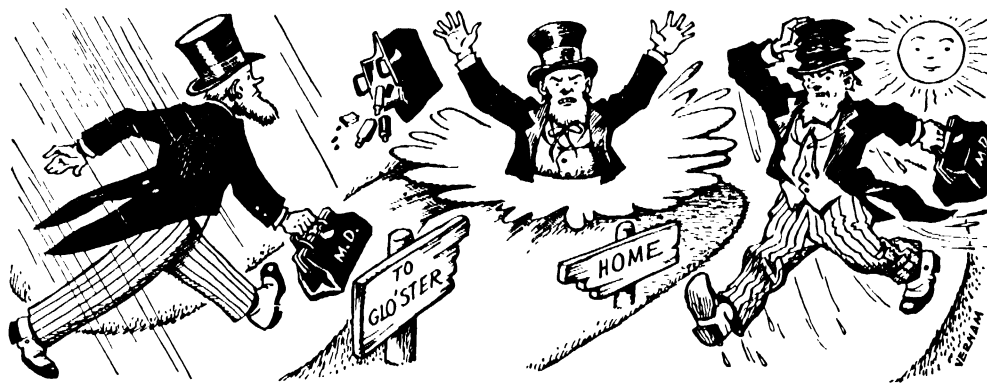
THE NEXT READ ALOUD STORIES ARE ON PAGE 4941.





WHAT are little BOYS made of, made of,
What are little boys made of?
Snaps and snails, and puppy-dogs' tails;
And that's what little boys are made of.

WHAT are little GIRLS made of, made of,
What are little girls made of?
Sugar and spice, and all that's nice;
And that's what little girls are made of.



DOCTOR FOSTER went to Glo'ster,
In a shower of rain:
He stepped in a puddle, up to his middle,
And never went there again.



THERE was a man of our town,
And he was wondrous wise,
He jumped into a bramble bush,
And scratched out both his eyes:
But when he saw his eyes were out,
With all his might and main,
He jumped into another bush,
And scratched 'em in again.



SIMPLE SIMON met a pieman
Going to the fair,



Said SIMPLE SIMON to the pieman:
"Let me taste your ware."



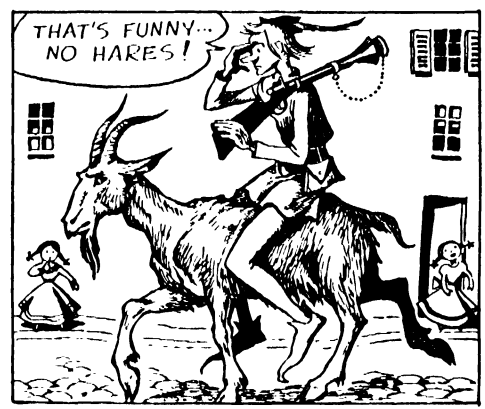
Said the pieman to SIMPLE SIMON:
"Show me first your penny!"



Said SIMPLE SIMON to the pieman:
"Indeed I have not any."



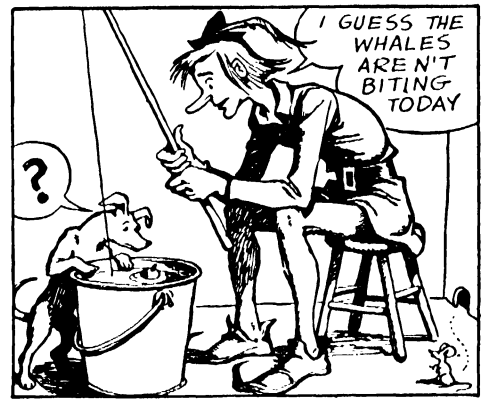
He went to catch a dicky bird,
And thought he would not fail,
Because he had a little salt
To put upon its tail.



Then SIMPLE SIMON went a-hunting
For to catch a hare;
He rode a goat about the street,
But could not find one there.



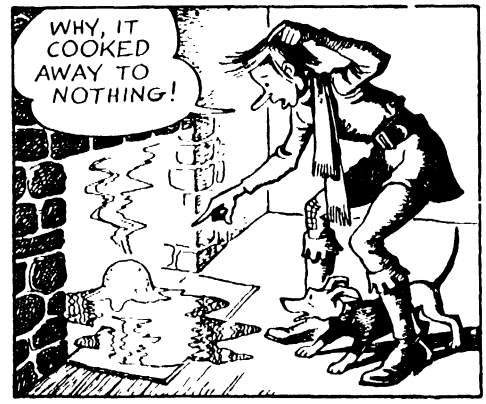
SIMPLE SIMON went a-fishing
For to catch a whale,



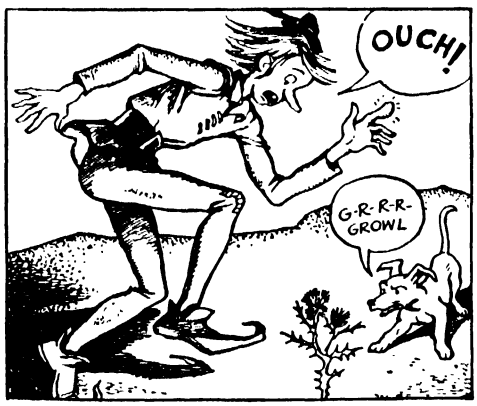
And all the water that he had
Was in his mother's pail.



Once SIMON made a great snowball
And brought it in to roast;



He laid it down upon the fire,
And soon the ball was lost.



SIMPLE SIMON went to look
If plums grew on a thistle;
He pricked his finger very much,
Which made poor SIMON whistle.

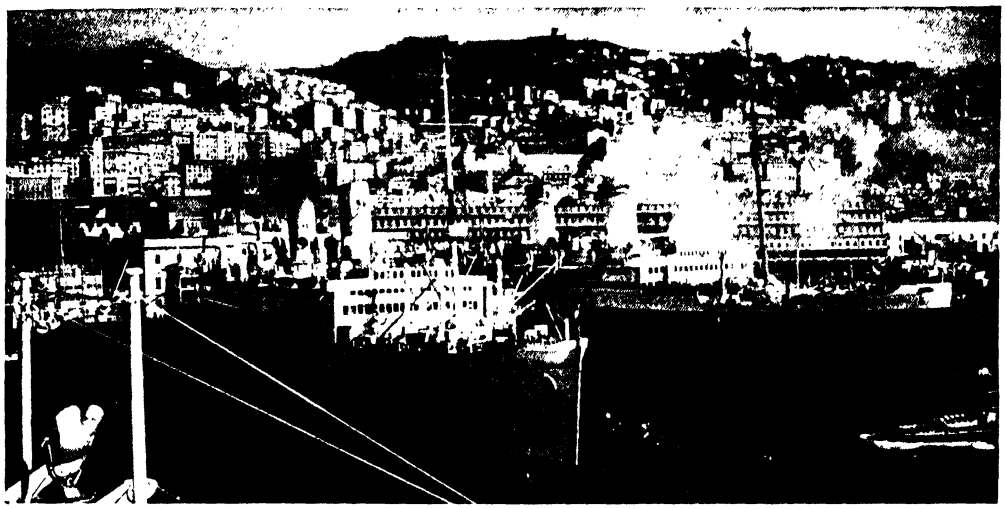


He went for water in a sieve,
But soon it all ran through.
And now poor SIMPLE SIMON
Bids you all adieu.

A FAMOUS PICTURE MADE IN MARBLE



This famous picture of St. Mark is made of marble. It is what we call a mosaic, one of the most wonderful triumphs of the artists. The secret of mosaic is the putting together of thousands of tiny pieces of marble or glass of many colors so as to make pictures or patterns. Some of the noblest pictures in the world are in mosaic; there is a picture in St. Peter's at Rome which took ten men nine years to make in this way. The inside of St. Mark's at Venice, where this picture is, is nearly all mosaic, and contains some of the finest pictures in the world, made in marble of natural colors without any paint. There is a mosaic factory at Rome where men copy pictures for churches, and the colored glass they use is said to have 28,000 different shades.



© Ewing Galloway, New York

Genoa, Italy's most important seaport, has eight and one-half miles of wharves.

ITALY AS IT IS

ON November 11, 1918, World War I came to an end. Italy was one of the victorious Allies; she gained a certain amount of territory as a result of her efforts in the war. The land to the east of the Gulf of Venice, including the naval port of Pola and the commercial port of Trieste, became Italian. Italy made her northern boundary more secure by pushing up through Italian-speaking Tyrol and through a part of German-speaking Tyrol, as far north as the Brenner Pass.

In spite of her territorial gains, however, the country was badly off after the war. Her finances were in a poor condition because of war expenses; her industries had been hard hit. There was much unemployment; the ranks of the idle were swelled by soldiers returning from the front. As a result, there was widespread misery among the Italian people.

A wave of communism had started to spread over certain parts of Europe some time before; there had been communist uprisings in Germany, Finland and Hungary. In Italy the Communists found a fertile field; they drew many new recruits from the ranks of the discontented. Labor trouble now grew more and more serious. There were riots and strikes all over the country; here and there factories were seized by the workers. In a number of places the red flag, the symbol of revolution, took the place of the Italian national flag.

At this time Benito Mussolini (1883-1945) mounted the stage of Italian history. Mussolini, the son of a blacksmith, had been a prominent Socialist. He broke with the socialist movement, however, when World War I broke out in 1914, because the Socialists wanted Italy to remain neutral and Mussolini thought that she ought to fight on the side of the Allies. When Italy went into the war Mussolini joined the Italian army and fought for a time in the trenches. After the war he became convinced that the Communists were to blame for Italy's unfortunate condition and he found others who shared this belief.

In March, 1919, Mussolini organized a *Fascio* (pronounced *fáh-show*) *di Combattimento* or Combat Group, in order to fight the Communists. Soon other *fasci* (plural of *fascio;* pronounced *fáh-shee*) were formed. These groups, the members of which were known as Fascists, became continually stronger. They fought against the Communists, who were strongly organized; they also attacked peaceful workers and others who did not agree with them.

By 1922 the Fascists had the upper hand. Late in October of that year they held a great congress at Naples. Mussolini was hailed as Duce (pronounced *doo' chay*),

which means Leader. He declared that if the government of Italy were not given to him, he would take it by force. At his command 100,000 Fascists began a march on Rome. When the Italian king, Victor Emmanuel III, refused to use force against the Fascists, his prime minister resigned from office.

BENITO MUSSOLINI BECAME PRIME MINISTER AND FORMED A FASCIST GOVERNMENT

The King now asked Mussolini to become prime minister. The fascist leader became prime minister and also took over other cabinet posts. From now on, though Italy was still called a constitutional monarchy, it was really a dictatorship under Mussolini. Victor Emmanuel III became a puppet king, with no real power.

Mussolini proceeded to set up a totalitarian state. In this type of government the individuals who make up the state count for very little; the state is everything (as a matter of fact the word totalitarian is derived from the Latin *totum,* meaning everything). The state regulates labor, industry, education, art—in short, practically every human activity.

In Mussolini's totalitarian state the power was held by him, as prime minister, and by his followers, who were devoted to him. The Fascist Party became the only legal party. Parliament, which had been very powerful up to the triumph of fascism, continued to exist; however, it was shorn of most of its power.

The members of the upper house of Parliament, the Senate, were named, as before, by the King. The members of the Chamber of Deputies, the lower house, were still elected by the people. The voters, however, could not choose between different candidates, but had to vote "Yes" or "No" on a list of candidates prepared by the Fascists. These curious "elections" were continued until 1938, when the Chamber of Deputies was abolished and was replaced by the Chamber of Fasci and Corporations, the members of which were not elected.

HOW THE TRADES ARE ORGANIZED IN UNIONS CALLED SYNDICATES

Mussolini reorganized the economic life of Italy by setting up a system known as the corporative state. In every district the employers and workers in each industry formed separate unions, called syndicates. The members of the arts and professions—artists, writers, doctors, lawyers and so on—formed syndicates of their own. Representatives of these syndicates were combined with members of the Fascist Party to form national corporations. These settled all disputes and also set up business policies, artistic policies and educational policies for the whole nation. As time went on, certain changes were made in the system, but the general idea described above remained in force.

A feature of the fascist government was the introduction of a new warlike spirit in Italy. From the very beginning the Fascists were determined to build up a great military machine in order to revive the brave old days of the Roman Empire. The Italian army and navy were strengthened. Great stocks of weapons and ammunition were piled up. Italians were taught to accept war not as a necessary evil but as the supreme activity of a brave people. The warlike spirit was stirred up by fine parades and patriotic speeches. The Duce addressed great crowds in the Piazza di Venezia (Square of Venice) in Rome. He threatened the "cowardly democracies" of the world with the might of fascist Italy, while his worshipers shouted: "Duce! Duce!"

THE STERN PUNISHMENTS CARRIED OUT UPON ALL WHO OPPOSED THE NEW GOVERNMENT

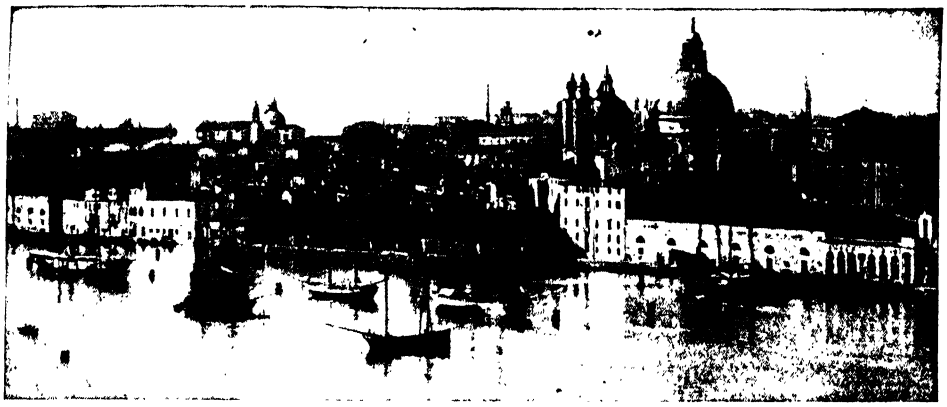
The fascist movement met with considerable opposition at first. This opposition was sternly dealt with; beatings, imprisonment, exile, even death were the lot of those who protested against the government. Open resistance to fascism became increasingly rare. Those who still worked against Mussolini had to carry on their activities secretly and at great risk.

It seemed at first as if the Fascists would be in open conflict with the Catholic Church, for many of the earlier Fascists were opposed to its doctrines. However, Mussolini came to realize that he could never hope to win the Italian people to his program if he was the enemy of the Church. Therefore, he made his peace with the Pope. In fact, he went further than any prime minister before him. He put an end to the quarrel between the Church and the State in Italy, a quarrel brought about by the seizure of Church territory in 1870 (see page 4413).

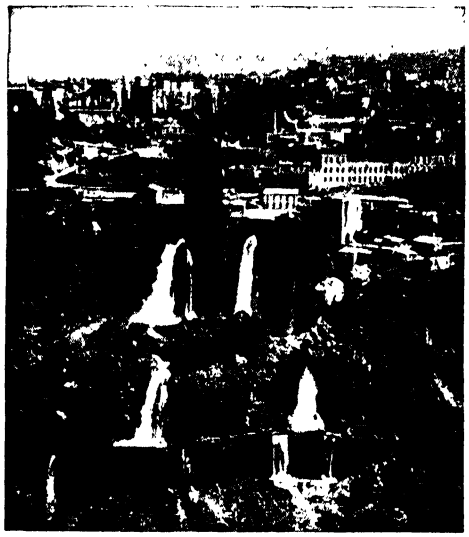
THE TREATY BY WHICH VATICAN CITY WAS MADE A PAPAL STATE

In 1929 Mussolini and Pope Pius XI signed the Lateran Treaty, so called because the signing took place in the Lateran, a Roman palace. By this pact Mussolini consented to give the Pope complete sovereignty over a tiny territory to be known as Vatican

BEAUTIFUL CITIES OF NORTHERN ITALY



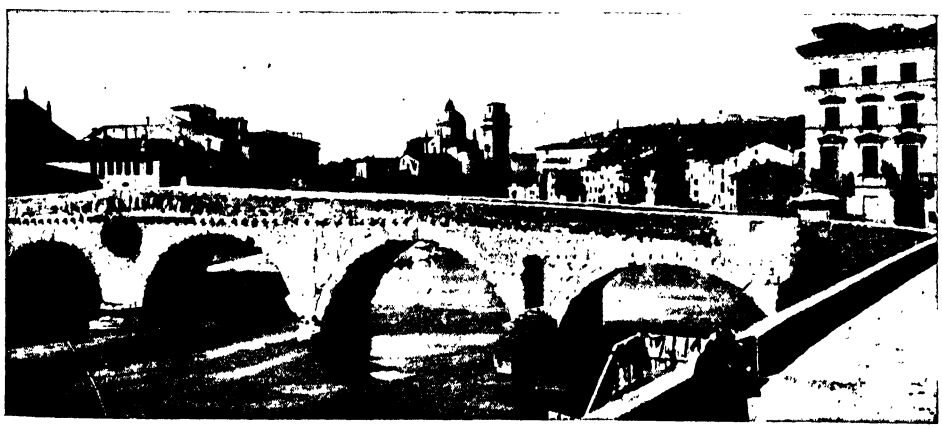
The whole site of Venice is dominated by the main canal, the Grand Canal, which divides the town into two.



The beautiful cascades at Tivoli.



St. Mark's School, Venice, now a hospital.



An old bridge across the Adige at Verona, whose Roman remains surpass those of any other city of northern Italy. There are also many fine specimens of Gothic architecture in Verona.

City (see page 4325). The Church was also paid a large sum as compensation for the territory it had lost in 1870.

With the signing of the Lateran Treaty the last important source of opposition to fascism was removed. Long before this time Mussolini had begun to put into effect his program. He proposed to make Italy great by bringing about prosperity at home and by assuring respect for Italian military power abroad.

MUSSOLINI'S ATTEMPTS TO BRING PROSPERITY TO THE ITALIAN PEOPLE

The first step in the prosperity program was to bring about peace between capital and labor. Strikes and lockouts were forbidden. (An employer engages in a lockout when he stops all work as a protest against the activities of employees.) Both employers and workers were compelled to come to an agreement whenever any dispute arose.

Once industrial peace was assured, Mussolini set to work in earnest. Efficient agricultural methods were introduced, especially in the south of the country. A good deal of land, hitherto useless, was made fertile by means of irrigation or drainage. New hydroelectric enterprises were established. (Hydroelectric refers to electric power made by the power of falling water.) New mineral deposits were discovered; old mining properties were improved. The railroads were run more efficiently. "The trains now run on time": this was one of the proudest boasts of fascism.

Many foreign visitors to Italy in the nineteen-twenties and -thirties were greatly impressed by all these accomplishments. They failed to see the darker side of the fascist record. For one thing, Italians had lost their liberty; there was no freedom of the press, no freedom of speech. Education had become a tool of fascism; the young were taught only what the Fascists decided they ought to be taught. There was industrial peace, indeed, but that was because both employers and workers had become the slaves of the state—or rather, of the Fascists, since the latter were the masters of the state. Furthermore, the financial condition of Italy did not improve much. The great amounts of money spent on the military program caused one financial crisis after another.

In the field of foreign relations there were no very startling developments at first. In 1924, to be sure, Italy acquired the Adriatic port of Fiume, which had been a free city. There were no further territorial gains, however, for some time. Mussolini contented himself for the time being with building up Italian strength.

In 1933 the Nazis set up a totalitarian state in Germany. Mussolini was at first suspicious of their aims; he feared that the Nazis meant to annex Austria. In that case Germany would be a next-door neighbor and a very dangerous neighbor, too, for the new Germany was as militaristic as the new Italy. Hence, when a pro-Nazi revolution broke out in Austria in 1934 and it seemed likely that Germany would intervene, Mussolini sent a strong body of troops to the Austro-Italian frontier. This action represented a warning to Germany to keep out of Austria.

In 1935 Mussolini decided that it was time to begin carrying out his plans for a greater Italy. Ethiopia (formerly called Abyssinia) seemed to be an appropriate victim. It was a country of rich possibilities; a backward country, too, with a poorly equipped army. Besides, the Abyssinians had routed the Italians at Adowa in 1896, and the defeat had never been avenged. Now was a good time to seek vengeance, for Italy was stronger than before. A pretext to attack Ethiopia was soon found; in October, 1935, Italian forces began to pour into Ethiopia.

The League of Nations, of which Ethiopia was a member, protested against the Italian invasion but did not give any military aid to Ethiopia. The troops of that unfortunate country were no match for the modern armies of Italy; by May, 1936, the entire country had been overrun by the Italians. In the following month Ethiopia was combined with the Italian possessions of Eritrea and Italian Somaliland to form the large colony of Italian East Africa.

HOW THE ROME-BERLIN AXIS RECEIVED ITS NAME

Mussolini, angered by the hostility of the League of Nations, now decided to join forces with totalitarian Germany. In October, 1936, the two countries signed a pact of friendship. Hitler and Mussolini hoped to make the affairs of Europe, and of the world, revolve about their countries as the earth revolves about its axis. The Rome-Berlin Axis, as it was called, began to work against the democracies of Europe—particularly England and France. The Axis powers intervened actively in Spain when civil war broke out in that country in July, 1936 (with the result that Spain later became a totalitarian state). They put such pressure on the French and English that these two

THE MAP OF ITALY



The shape of Italy resembles a high-heeled boot. The toe seems to be kicking Sicily over towards Africa. The island of Sardinia belongs to Italy, while Corsica is French, and Malta belongs to Great Britain.

nations allowed Germany to gobble up Czechoslovakia in two bites (the first bite was in September, 1938; the second, in March, 1939).

Mussolini had stood by quietly while Hitler had seized Austria in March, 1938. He had helped Hitler considerably in the Czechoslovakian affair. He now decided that Italy, too, was entitled to some of the spoils. So in April, 1939, the Italians invaded Albania for no good reason except that Italy was strong and Albania was weak. The little country was soon conquered and was annexed to Italy.

In September, 1939, Germany found herself at war with France and England. To the surprise of a good many people, Italy remained neutral at first. Perhaps Germany herself had advised this step, in order that she might obtain needed supplies through Italy, which still continued to trade with the Allies. Perhaps Mussolini was not willing to plunge Italy into war until he could be sure of a swift and easy victory.

ITALY'S ENTRANCE INTO WORLD WAR II ON THE SIDE OF GERMANY

By June, 1940, the Allies appeared to have lost the war. Germany had swallowed up Norway, Denmark, Holland and Belgium. The Allies had suffered terrible defeats in Belgium and France. France lay open to the invader; England's power of resistance seemed gone. Mussolini decided that it was now time for Italy to join in the fighting, since there seemed to be little risk in doing so. On June 10, therefore, he entered the war on the side of Germany.

Though France sued for peace on June 17, the English continued to fight stubbornly. Mussolini decided to carry the war to the British possessions in Africa. His troops invaded British Somaliland in East Africa (August, 1940) and conquered that weakly held colony in two weeks. In September an Italian army under Marshal Rodolfo Graziani invaded Egypt from the Italian possession of Libya, thereby threatening the Suez Canal, which is in Egypt. The Italians penetrated fifty miles within Egyptian territory.

HOW ITALY AND GERMANY COMBINED FORCES TO CONQUER GREECE

In October Mussolini turned his attention to Greece. He made a series of humiliating demands on that small country and when these demands were not met, he attacked Greece, expecting an easy victory. The Greeks more than held their own; they even invaded Albania, which was now an Italian possession. In December, 1940, the Italians also suffered reverses in North Africa. Graziani's army of invasion in Egypt was suddenly attacked by British Empire troops and driven back into Libya. Empire troops now invaded that province and conquered a good part of it.

Greece withstood all Italian attacks in the first months of 1941; for a time Germany did not intervene. At last, however, the Germans stepped in and brave little Greece was soon conquered. The Germans also came to the rescue of the Italians in Libya and the British Empire troops were driven out of most of that province. Other troops of the Empire, however, attacked Italian East Africa and by July, 1941, had occupied practically all of that colony. The Ethiopian ruler, Haile Selassie, was restored to his throne.

ITALY DECLARED WAR ON RUSSIA AND ON THE UNITED STATES OF AMERICA

On June 22, 1941, Germany suddenly attacked Russia and Italy declared war on the Soviet Union on the next day. In December, after Japan's treacherous attack on the American base at Pearl Harbor, Italy declared war on the United States as well.

Late in the following year the tide of war turned against the Axis. British and United States forces joined in a powerful drive in northern Africa. Germans and Italians, after some months of fighting, were driven from Egypt, Libya, Algeria and Tunisia. The next step was a short one—to the small, fortified island of Pantelleria which lies between Tunisia and Sicily. From Pantelleria the Allies crossed to Sicily, and from there to southern Italy and began a slow progress northward. Mussolini had resigned before Pantelleria fell, and the whole fascist government collapsed like a house of cards. On September 8, 1943, Italy surrendered to the Allies. But the fight was not over in northern Italy, for the Germans fought stubbornly there until the war's end.

In April, 1945, Mussolini was captured by Italian anti-fascists, and put to death. By elections held in June 1946, the monarchy was overthrown and a republic established. Italy is now striving to make a success of democratic government.

We have now completed our survey of Italian history from the fall of the Roman Empire up to the present time. Let us turn our attention to the Italy of to-day—Italy,

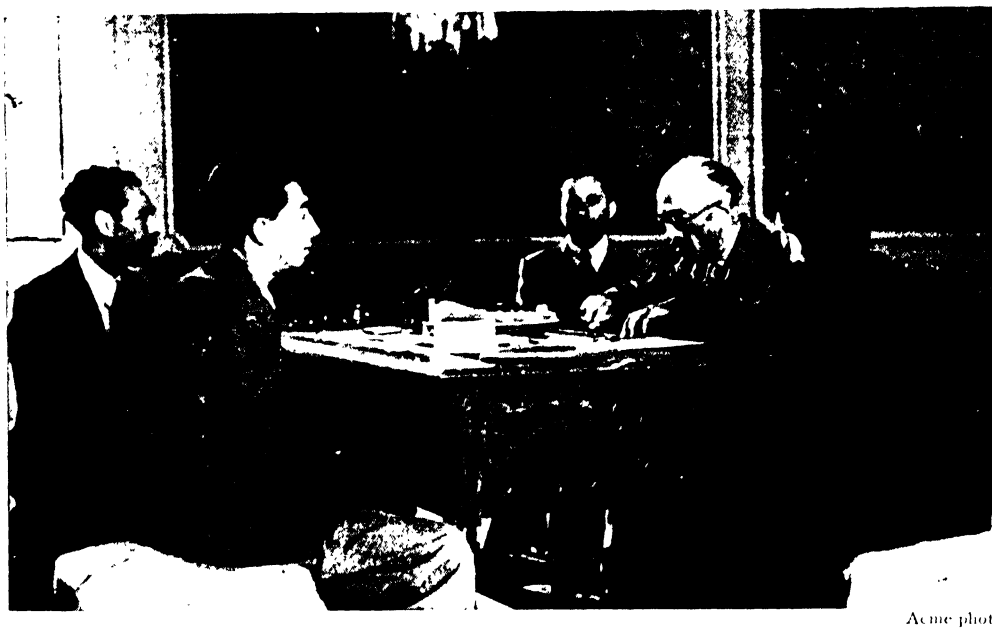
with her fertile farms, her great industries, her historic cities, her hard-working people; a land where the old and the new stand side by side.

Italy is one of the most densely populated countries in the world. According to the latest census figures, about 43,000,000 inhabitants live in an area of 119,764 square miles. This area includes the Italian peninsula, the islands of Sicily and Sardinia and a number of smaller islands.

The large peninsula in which the great majority of the Italian people live is shaped like a boot, with the toe of the boot kicking the island of Sicily, which is just off the mainland The peninsula is guarded on the north by the mighty Alps, which form a great semi-circle along the northern frontier of Italy. Another mountain range, the Appennines, forms the spine of the country. This range extends down the middle of the country to its very tip, and then across the narrow Strait of Messina to Sicily. There are a number of volcanoes in the mountain system of Italy; some of these, including Mount Vesuvius, in the Bay of Naples, and Mount Etna, in Sicily, are still active.

The Po and the Adige in the north and the Tiber and Arno in the centre are the largest Italian rivers. There are many smaller rivers in different parts of the peninsula. The lakes in the north of the country are very beautiful; Lake Garda, Lake Como and Lake Maggiore are perhaps the best known. In the north there is a great plain, watered by the river Po and its tributaries. The centre and south of the country are quite hilly.

The climate varies very much in the different parts of the peninsula. The northern plain is often swept by the cold winds that blow from the Alps. The central regions are generally warmer, though the winters in the Abruzzi region are severe. The heat is often intense in the south, particularly in Sicily and in Apulia, which forms the heel of the Italian boot, described above.



Acme photo.

Townspeople of captured Noto, Sicily, talking things over with the American military governor of the town.

Italy has been famed for the fertility of her soil ever since she first appeared on the pages of history. The amount of land available for farming has been increased in the present century by great irrigation works. Much marsh land has been drained and is now given over to farming—especially the swamp lands of Tuscany, the Pontine Marshes near Rome, the delta of the Po and certain parts of Sicily and Sardinia.

Agriculture has always been important in Italy; even in this modern machine age almost half of the working population is engaged in farming. The farmers of the north generally employ up-to-date agricultural

methods. In the south, however, particularly in Sicily, many of the peasants till the soil with crude plows drawn by oxen. One of the chief aims of the fascist government has been to introduce more modern farming methods in this part of the country.

Among the principal crops of Italy are wheat, barley, oats, rye, corn, rice, beans, potatoes, sugar beets, grapes and olives. Much fruit is grown in the south, where there are many groves of oranges and lemons, and orchards of cherries, apricots, peaches and other fruits. Tobacco, flax and hemp are the chief industrial crops (that is, crops not used for food, but in industry). Dairy farming and cheese making are important in northern Italy.

WEALTH FROM SULPHUR MINES AND FROM THE MARBLE QUARRIES

Italy is not rich in mineral deposits. She does not produce much iron; she is particularly lacking in coal and petroleum. However, the country is one of the world's foremost producers of sulphur; this useful mineral is found chiefly in the volcanic regions of Sicily. Italian marble is famous the world over; the quarries of Carrara are particularly renowned for the fine quality of their marble. Other minerals found in Italy are manganese, mercury, lead, zinc, antimony and bauxite.

THE MOUNTAIN TORRENTS THAT MAKE UP FOR ITALY'S LACK OF COAL

Electricity produced by water power has been used more and more within recent years in Italy in order to make up for the lack of coal. The hundreds of mountain torrents and rivers which tumble down the slopes of the Alps and the Appennines furnish ideal sources of water power. It has been estimated that Italy's water sites, if fully developed, would yield about 9,000,000 horse power. Already half the country's water power has been developed. Hydroelectric plants now supply electricity to many of Italy's industries and to about a quarter of her railroads.

The textile industry is the most important of all in Italy; goods of silk, wool and artificial fibre (including rayon) are turned out in great quantities. Silk culture (the production of silk from the cocoon of the silk worm) is carried on all over Italy; it is particularly important in the departments of Lombardy, Piedmont and Venetia, in the north. Italian laces are famous.

Italy has many large motor car and airplane manufactures; the Fiat automobile works in Turin are among the greatest in the world. The chemical industry has gone ahead, especially since World War I. Among the principal chemicals produced are sulphuric acid, superphosphate and copper phosphate. An important manufacture is macaroni, a favorite Italian food made from wheat. Italy has always ranked high in what may be called the artistic industries—the manufacture of pottery, glass beads, mosaic work and so on.

EDUCATION HAS PROGRESSED SINCE ITALY BECAME A UNITED KINGDOM

In the past, education in Italy was limited chiefly to the upper and middle classes. As recently as 1881, sixty-seven out of every hundred persons in Italy over six years of age could neither read nor write. However, the number of illiterate people (those who cannot read or write) has decreased considerably since Italy became a united kingdom in the last century. According to the latest figures, only twenty-one persons out of a hundred are illiterate.

Elementary education is compulsory for children from the age of six up to the age of fourteen. There are over 4,000 schools that supply secondary education, corresponding more or less to that given in high schools in the United States and Canada. Advanced instruction is given in the twenty-six universities of the country. The oldest of these is Bologna, which was founded in the year 1200; it still ranks high among Italian educational institutions. Other famous universities include those of Genoa, Naples, Padua, Pisa, Rome and Turin.

ROME, THE WONDER-CITY, AND ITS MEMORIALS OF PAST GLORY

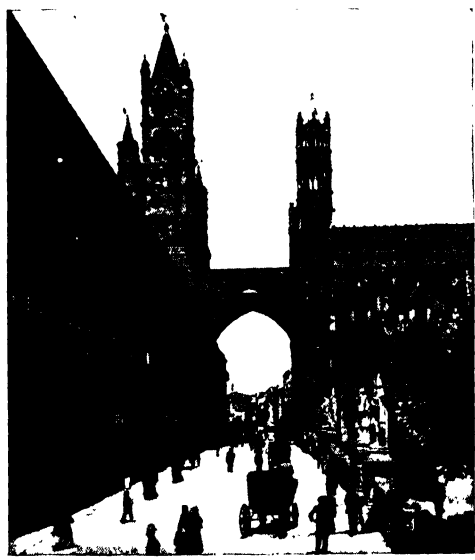
Italy has a considerable number of large cities; there are twenty-four with a population of more than a hundred thousand. The largest of all is the capital, Rome, which has 1,315,000 inhabitants. This famous city, which is about fifteen miles from the mouth of the Tiber River, is rich in memories of past splendor. There is the Forum, which goes back to the early days of the republic; the great Column of Trajan, upon which the campaigns of that emperor have been carved; the Colosseum, where great crowds used to watch chariot races, fights between wild beasts and the terrible duels of the gladiators. There are countless other monuments besides that recall the days when pagan Rome ruled the world.

There are also numerous places in Rome that bear witness to the trials and the tri-

INTERESTING CITIES OF ITALY



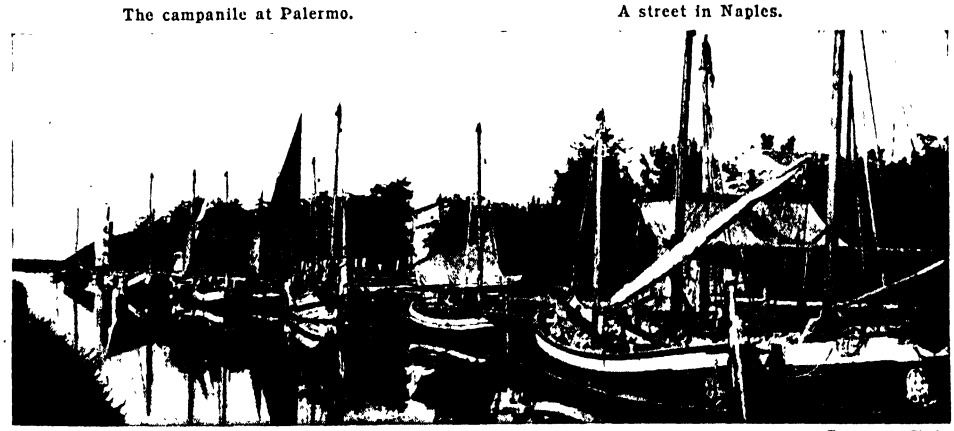
The city of Padua is picturesque, with arcaded streets, and many bridges crossing the various branches of the Bacchiglione. Padua University is one of the most ancient in Europe.



The campanile at Palermo.



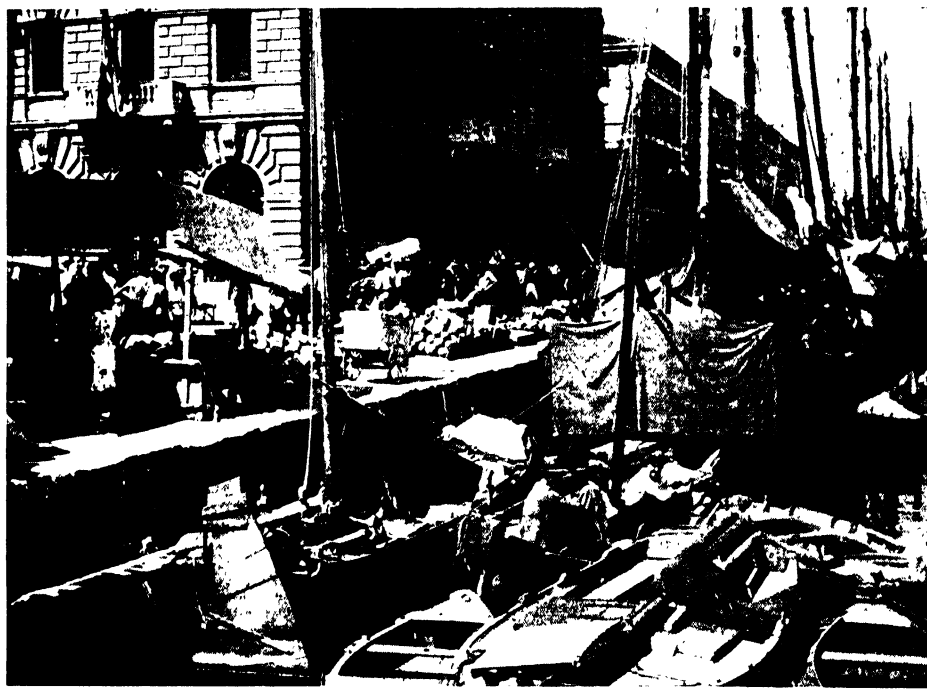
A street in Naples.



Courtesy, Enit

Ravenna is connected with the sea by Corsini Canal; at its mouth is a small harbor, Porto Corsini.

umphs of the Church. The Catacombs, the burial cellars where the early Christians held their secret meetings, extend for many miles underground. The mightiest church in all Christendom, St. Peter's, looks out proudly over the vast Piazza San Pietro (St. Peter's Square). St. Peter's Church stands on the threshold of the Vatican, the residence of the popes, with its beautiful chapels and decorated chambers and its wonderful museums. Rome also has its modern quarters, full of the hustle and bustle of modern life. There are many broad thoroughfares, newly laid out squares and parks and imposing government buildings.



Courtesy, Enit

Trieste, the ancient Roman Tergesteum, is a harbor city on the Gulf of Trieste, at the north end of the Adriatic Sea. Between the two world wars, it was a part of Italy. Now it is a free city.

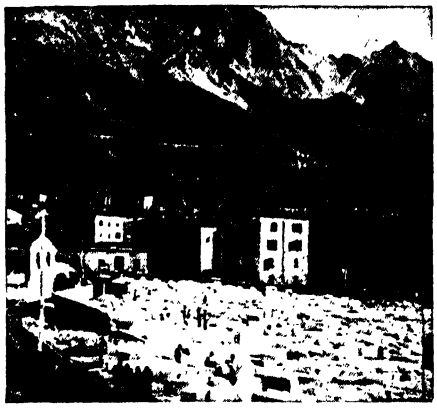
The great port of Genoa (population, 659,000), in northwestern Italy, is one of the most picturesque of Italian cities. It is set upon hills that slope down to the very water's edge; the houses rising from the port seem to stand upon one another. Genoa is famous for its marble palaces, constructed in the days of the Renaissance. The city is not content, however, to live in memories of the past. It is a great centre of commerce. In peacetime thousands of vessels enter its harbor, which is provided with a complicated system of piers and floating docks.

Florence (population, 354,000), which is situated on the Arno River, in the department of Tuscany, is a treasure house of Italian architecture and art. Its cathedral, the foundations of which were laid in 1298, has a magnificent dome, constructed by the great Brunelleschi. The Pitti Palace and the Uffizi Palace house some of the world's finest paintings and statues. Florence has kept fairly aloof from the modern life of Italy. Its chief industry is still the manufacture of art objects, including mosaics, statues, wood carvings and stained glass.

Its neighbor, Pisa (population, 72,000), some forty-nine miles to the west, is famed chiefly for its Piazza del Duomo or Cathedral Square. In this square are a beautiful cathedral, built of dazzling white marble; the Baptistery, a round structure crowned by a great dome; last, but not least, the famous Campanile or Bell Tower, better known as the Leaning Tower of Pisa. It is one of the landmarks of the city.

There is no city in the world quite like Venice (population, 285,000), which has been built upon some 120 islands in a shal-

EVERYDAY SCENES IN SUNNY ITALY

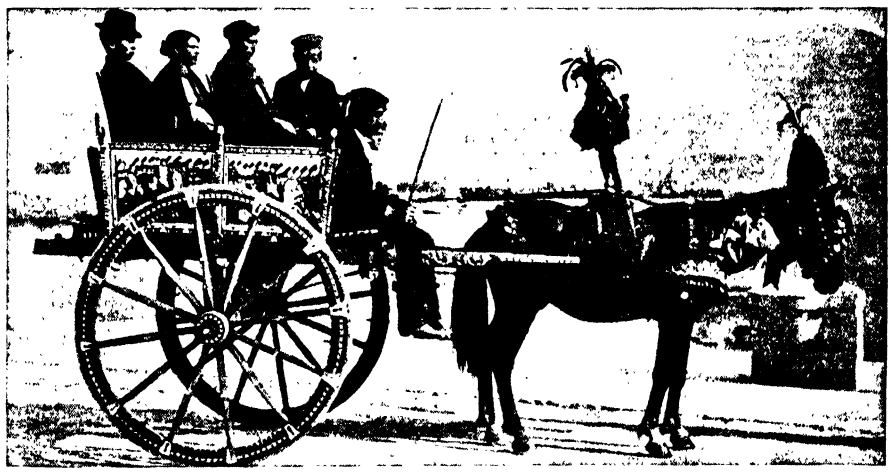


For centuries Carrara has been famed for its wonderful marble, tons of which here await shipment.



© Underwood and Underwood

Cattle drag the marble from quarries to the railway. The world's finest statues are of Carrara marble.



Sicily, the island that lies at the toe of Italy, has had a famous history. Its people now are poor and many are uneducated. They have quaint customs, one of which is to decorate their carts with paintings.



Pisa still retains its ancient walls. Besides its fine cathedral, baptistery and famous leaning tower, it has several notable churches and a fine old university founded in the fourteenth century.

low bay of the Adriatic Sea. Most of these islands are fairly close together and are separated only by narrow canals, over which many bridges have been built. The main part of the city is crossed by the Grand Canal, which is about two miles long and from 100 to 200 feet wide. A great variety of boats are to be found on the waterways of Venice—small steamers, steam launches, rowboats and the picturesque gondolas. Venice is connected with the mainland by a great railroad bridge.

THE CATHEDRAL OF SAINT MARK, ONE OF THE SIGHTS OF VENICE

Venice has many souvenirs of its great past. Foremost of these is the Cathedral of St. Mark, on the east side of the square of the same name. With its wonderful mosaics, its gilded domes and its richly ornamented columns, the Cathedral of St. Mark is quite different from most of the churches of western Europe.

Of late Venice has recovered much of the prosperity that she enjoyed in the Middle Ages. The development of a new port at Marghera on the mainland, opposite Venice, has brought much new commerce to the city. Marghera also supplies the manufacturing space that is lacking in the city itself.

Milan, in Lombardy, is the richest industrial city in Italy and also one of the largest, with a population of 1,219,000. There are great manufactures of textiles, automobiles, chemicals and other materials. The city has a splendid cathedral, built of gleaming marble. The famous Della Scala Opera House in Milan is one of the foremost musical shrines in Europe.

Turin (population, 698,000), formerly the capital of the kingdom of Italy, is in the northern department of Piedmont. It is one of the most modern cities of Italy and one of the most beautiful, with its broad streets and great squares; the snowy Alps, in the distance, form a breath-taking background. Turin has many important manufactures, including iron and steel goods, silks, furniture and paper.

The city of Naples (population, 925,000) has perhaps the most beautiful natural surroundings of any Italian city. It is on the north end of the lovely bay of Naples; it is bounded on one side by the picturesque heights of Posilipo and on the other by lofty Mount Vesuvius.

One of the most densely populated cities in the world, Naples was once one of the unhealthiest. The poorer people were crowded together in filthy slums, where disease flourished. A terrible outbreak of cholera, in 1884, claimed thousands of victims. Since that time conditions in the city have greatly improved. The old buildings have been torn down and replaced by modern structures; new water supply and sewage systems have been built. Naples is one of the greatest seaports of Europe. It is also a great manufacturing centre, with extensive steel and engine works and shipbuilding yards.

The Italian people have always boasted of their descent from the ancient Romans. The Italian type, however, varies a good deal from province to province. Though one generally thinks of Italians as dark complexioned, fair hair and blue eyes are common in Lombardy and other districts of the north, where German tribes settled and intermarried with the native population. In other parts of Italy, numerous invasions by Byzantine Greeks, Arabs, Normans and other peoples have also left their mark. The pure Roman type has been best preserved, perhaps, in Rome and Tuscany— dark hair and dark eyes, with the regular and beautiful features familiar to us in the masterpieces of Italian art.

HOW THE TUSCAN DIALECT CAME TO BE THE OFFICIAL LANGUAGE OF THE ITALIANS

The language of the Italians, like that of the French, the Spanish, the Portuguese and certain other European peoples, comes from Latin, the language of the old Romans. In the early days a number of different dialects were used by people in the different parts of the peninsula and no one of these was outstanding. In the fourteenth century, however, the Tuscan dialect came to the fore. This was because Dante, the Florentine poet, wrote his immortal DIVINE COMEDY in Tuscan. THE DIVINE COMEDY was soon accepted as the greatest work in all Italian literature. Other Italian authors determined to write their works in the same dialect as that of the master, and Tuscan became the literary language of Italy.

This tongue, changed somewhat in the course of the centuries, is to-day the official language of the Italian people; it is taught in all schools. However, such dialects as Piedmontese, Lombard, Venetian, Neapolitan and Sicilian are still used by people in various parts of the country, particularly by those who can not read or write or who have had little schooling.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 4679.



Damon is condemned to death by Dionysius, the ruler of Syracuse, whose cruel deeds he had dared to criticize.

DAMON and PYTHIAS

THE STORY OF A PERFECT FRIENDSHIP

DURING the fourth century before the birth of Christ, Dionysius ruled as the tyrant of Syracuse, a Greek town on the Mediterranean island of Sicily. Tyrant then was another name for king. It did not necessarily mean that a man holding that office was cruel, as we imagine a tyrant to be in our time. Dionysius did have bad as well as good qualities. He ruled over Syracuse with a strong hand and made it one of the most powerful cities. However, he could be extremely wicked and cruel. Anyone unfortunate enough to enrage this tyrant was likely to be imprisoned, sentenced to death and killed. For all his power, Dionysius had no friends. He was a lonely, suspicious man, feared by his subjects, not loved.

At this time in Syracuse there was a school of philosophy and science founded by a Greek named Pythagoras many years before. Those following the teachings of Pythagoras called themselves Pythagoreans. Among the Pythagoreans were two good friends, Damon and Pythias. These men were interested in their country and their fellow-men; they realized that many of the acts of Dionysius were unjust and unwise, and Damon had the courage to speak in public against the cruelty of the Tyrant. When Dionysius heard of it, he flew into a terrible rage. Damon was seized, thrown into prison and sentenced to die.

Damon, a very brave man, did not fear death, but he wished to see his wife and children once more before he died. He begged permission to visit his family and bid them good-bye. Dionysius laughed at his request. "If I allow you this freedom, how do I know that you won't sail away to another country? I give no prisoner of mine a chance to save his life."

"I realize that," Damon answered, "but I have a friend, Pythias, who is willing to stay here in my place, as a hostage, until I return."

Dionysius was astounded. "Do you realize that if you do not return, this Pythias must die in your place? Does he understand the chance he takes?" Seeing that Damon and his friend, Pythias, would willingly accept these terms, Dionysius granted the prisoner six hours of freedom. He then commanded soldiers to stand guard over Pythias until Damon's return.

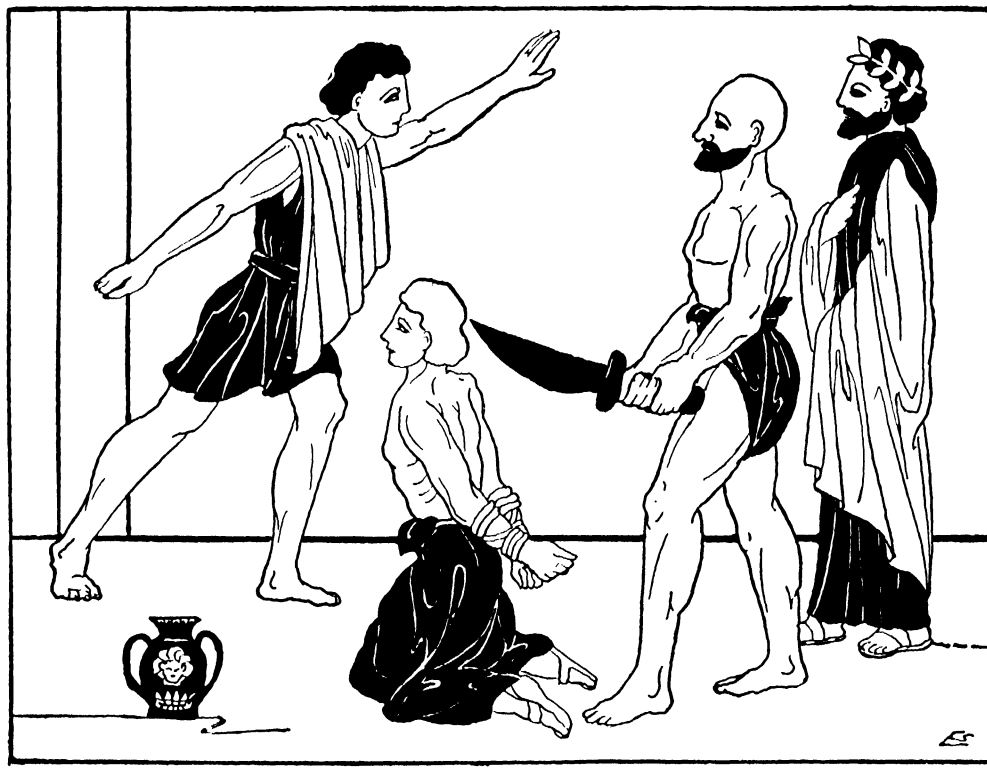
The two friends spoke a few words together. Pythias loved Damon dearly and begged him to flee to a safe country with his wife and children. He knew that this

would mean his own death, but the feeling of friendship between the two was so strong that Pythias felt it an honor to suffer death in Damon's place.

But Damon shook his head. He would not promise to escape, but told Pythias to look for him in four hours. While Pythias waited patiently, four hours passed—five hours passed, and still Damon did not come. A few minutes before the end of the sixth hour, Dionysius descended into the prison to see Pythias die. He mocked at Pythias' trust in his friend as the executioners prepared their instruments of death. With great calm Pythias explained that Damon had probably met with an accident on the road. Dionysius sneered and ordered the executioners to delay no longer.

At this very moment Damon, breathless and mud-stained, dashed into the prison. He embraced his friend and explained that his exhausted horse had dropped dead beneath him. He had had to find another animal on which to continue the journey. Now he was ready to die, grateful because he had been able to bid farewell to his family and return in time to save his friend's life.

Pythias pleaded with the Tyrant to kill him instead of Damon; he pleaded with Damon to let him bear the punishment. Cruel Dionysius was amazed. Never before in his life had he seen such loyalty; never had he imagined that a man would be eager to die that his friend might live. He forgot his wrath. The sight of these two friends filled him with a great warmth and a feeling new to him, compassion. Dionysius had never known a friendship of such sincerity and beauty as this one. Now he saw that the affection of friends was more precious than his power, or his kingdom or his wealth.



Damon returns and halts the execution of Pythias, who was willing to give up his life, out of true friendship.

The proud tyrant walked over to his two subjects and embraced them. In a soft, humble voice he begged them to accept him also as their friend. With a new kindness in his eyes he ordered the executioners away. Damon and Pythias and Dionysius walked out of the darkness of the prison into the light. The names of Damon and Pythias have become a symbol of loyal friendship.

PILGRIM OF MERCY

THIS is the story of a woman who, by a life of self-sacrifice, eased the misery of many thousands of neglected sufferers. Her name was Dorothea Lynde Dix and she lived from 1802 to 1887.

She herself was born to poverty, on a small, ill-kept New England farm; but she hungered for education, and when only twelve years old she made her way to Boston, where her grandmother lived, so that she might go to school. Two years later she was actually teaching a class of small tots in a vacant store. She found, however, that she needed to learn more, so she applied herself to her books with cheerful zeal until 1821, when she opened a school in the dining room of her grandmother's home. The pupils sat crowded around the table, their few books in a neat pile in front of them. Each student had a copybook and a slate, and there was a wet sponge in a dish in the centre of the table. The teacher sat at the side of the room and heard the lessons. Such was the usual school of the time.

Reading, writing and simple arithmetic were taught, as well as conduct, Scripture, handicrafts such as sewing and lace-making, and a little science. To the Dix home every morning came boys and girls of well-to-do parents and Dorothea was happy in teaching them. But she knew that many poor children were virtually without education. Her heart went out to these little ones, and it was not long before she had opened an afternoon school for these poor children in her grandmother's carriage loft.

She soon found that the easiest way to teach a child was to let his own eager questions: Why is the sky blue? Why are raindrops round? and the many other daily questions of bright children point the way to learning. Diligently she searched for the right books that would answer these questions in a way that a child could grasp. But she found nothing that would do, so she made a children's encyclopedia, a sort of book of knowledge, almost a hundred years before the first edition of our own Book of Knowledge came into being.

Later Miss Dix turned her grandmother's home into a boarding school for young ladies, but at the end of five years illness forced her to close it, and to seek, for a time, a gentler climate.

There followed eighteen happy months in England, where kind friends nursed her tenderly back to health. This was the brightest period of her life.

It was darkened by the death of her mother and her grandmother, and she returned to Boston, lonely, eager for employment yet forbidden by the doctors to reenter her chosen field, teaching. Just then, by chance, she learned that in the East Cambridge jail a score or so of women prisoners had refused to attend the Sunday School class arranged for them by a sincere, but very young, divinity student at Harvard. It was thought that a woman might be more successful in bringing a message of hope to these poor creatures, and Miss Dix cheerfully undertook the task, discouraging though it was. On the first Sunday, as she walked through the jail, she was astonished to find insane people there. They had committed no crime, yet they were imprisoned, with no hope of medical treatment or of freedom. Bad as the prisoners' quarters were, the section for the insane was far, far worse. Though it was a bitter cold day, they had no stove or fireplace, no warm blankets or even coats. The food given to the criminals was bad enough; but the miserable creatures whose only crime was mental sickness had but a few crusts of bread.

Miss Dix was told by the jailer that insane people do not feel hunger and cold, as other people do. This stupid belief was widespread at the time, but Miss Dix was too sensible a person to believe such a foolish thing. She begged the jailer to place a stove in the quarters reserved for the insane, but he refused. Forgotten by their friends, neglected by those whose duty it was to care for them, the poor souls were hopelessly suffering through the long days. But there was one who could not forget them. Dorothea Dix took their cause to the local courtroom and pleaded before the judge that some degree of human comfort be granted them, and her prayers were answered. In this one jail, at least, conditions were made easier for the mentally ill.

Here, then, was the work for which this noble woman was fitted. Here was a cause to which she could devote her life, her talents, her boundless energies. Throughout the state, locked up in prisons, poorhouses and in sheds on lonely farms were hundreds of men and women in various stages of mental sickness. They were treated so cruelly that there was no chance of a return to health. Some of them were fastened to the floor with chains, others were kept in small enclosed cribs where they could neither stand nor sit in comfort.

This cruelty was due to ignorance. The world has gone forward in rapid strides in the past hundred years. In 1841, when Dorothea Dix first saw the sad little group of insane women in East Cambridge jail, she was seeing only a sample of what was existing all over the world. Mental illness was not understood. Normal people were terrified of the insane, and their first thought was to lock up the insane person so that he could not harm others.

Insanity was thought to have some strange relation to the moon, and that is how we get the words lunacy, and lunatics, from the Latin word for moon, *luna*. Another odd belief was that mental disease was caused by the intense heat of the "dog days." Treatments were strange; harmful drugs, such as opium, were given; and patients were bled or plunged into cold baths. Strait jackets and iron collars restrained the more violent ones.

A family with an insane member felt disgraced and every effort was made to keep the unfortunate person out of sight, in an asylum or hospital or even, in cases of poverty, in a jail or poorhouse.

There were a few exceptions to this hard rule. In New York State, for instance, no insane person was permitted to be confined in prison, or in the same room with a criminal. An occasional physician, in America and in Europe, was devoting himself to the study of mental disease and its treatment, and some hospitals were being built to house mental patients. The general rule, however, was a cold-hearted display of ignorance, superstition and neglect. In some sections, where there were no hospitals or other provision, the insane were "farmed out" to the lowest bidder. That means that a man would offer to board and care for a patient for a few dollars a week. He made this profitable by giving his unfortunate charge only enough scraps of food to keep body and soul together. Often no blankets were provided, nothing but a few rags for clothing, no furniture except a bed and sometimes not that.

Dorothea Dix resolved, as her first step in relieving the distress of these tragic folk, to make a sort of census of the insane in Massachusetts, and to see for herself the conditions as they really were. It was a sorrowful journey she set forth upon, and it grew at every stage more heartbreaking. She saw human beings, as she wrote in her notebooks, "confined in cages, closets, cellars, stalls, . . . chained, naked, beaten with rods, and lashed into obedience."

She noted down all that she saw. A woman with a weaker will might have given up the task, but Dorothea Dix kept grimly on. She traveled by stage, by boat and in rough wagons, and, whenever possible, by train, although many of the trains of that day made a speed of only fifteen miles an hour, and they stopped and started so jerkily that Miss Dix frequently suffered from headache. For eighteen months she traveled, and saw the dreadful condition of the insane in Massachusetts, and her notebooks carried the whole appalling story. The first step of her sad task was complete.

The second step was to write what she called a memorial of her journeys, and present it to the legislature with a plea for better treatment of the state's charges. Though she was able to recount but a small part of what she had seen, people refused to believe her. Many were scandalized that a woman gently bred should pry into such matters. She was denounced in newspapers, and one township where she had found particularly bad conditions issued a countermemorial, denying all her statements.

Investigation, however, proved her memorial to be entirely truthful and the state of Massachusetts voted to improve conditions at once, by erecting new hospital buildings to care for the insane.

She had been successful first in a township, then in a state. Now she saw her mission clearly. It was to prepare for other states memorials like the first that would secure for the most wretched human beings in the world decent comfort and the chance to get well. She knew her work would be hard, and that her own comfort must be forgotten. Rain or snow must not hold her back. There would be hours of waiting in bleak railroad stations, and nights spent in dreary inns; and above all there would be the constant saddening visits to institutions and homes where the mentally diseased were chained, often covered with vermin.

From state to state she went, exploring, inquiring, keeping records of what she found. In six years she traveled sixty thousand miles, and visited over nine thousand mentally ill or defective persons. She prepared memorials, talked before law-making bodies, won the help of influential men, secured money from the wealthy and awakened the public, through friendly newspaper editorials, to the work that needed to be done.

One by one the memorials were presented, money was voted, hospitals were built and,

most important of all, ignorance and wrong thinking about the care of mental defectives were changed. Kindness began to take the place of brutality and medical science came to the aid of those who needed aid so much.

Dorothea Dix traveled through the middle west and up and down the southern states, on her pilgrimage of mercy. Later, when ill-will developed between the states and northerners were unwelcome in the South, she found every door open to her, just as before. During the Civil War a train on which she was riding, in Pennsylvania, was stopped by a Confederate force. One of the officers recognized Miss Dix and out of consideration for her the train was allowed to proceed.

Canada and Newfoundland were included in her travels, and later many of the European countries, even Turkey and Greece. She learned much, and she labored hard in Europe, though she faced heavy odds for some people considered that she had no right to meddle in foreign concerns. But this warm-hearted woman considered every suffering human being akin to her, no matter what his country or race.

Upon her return to America she continued her travels in behalf of the insane until the outbreak of the Civil War. Then she called for volunteer nurses and offered their services, and her own, to the government. She was given a military commission as superintendent of nurses, and under her able supervision hospitals were organized, volunteer groups of women throughout the north were set to work making bandages, shirts and other supplies, and collecting papers and books for the wounded soldiers.

There were few trained nurses at that time and the women who gladly offered their services had to be taught how to work in a hospital. Dorothea Dix was no longer young, and the strain upon her health was severe, yet she never thought of sparing herself. Louisa M. Alcott, author of Little Women, was for a time a volunteer nurse under Miss Dix's supervision. It is said that during the war Miss Dix wrote to Whittier the story of Barbara Frietchie, from which he made the famous poem on page 1888.

After peace had come, a grateful government asked Miss Dix what she would like to have in recognition of her devoted service. "The flag of my country," she said, and that is what she received. It was until the end of her life her most prized possession.

She was sixty-five years old now, a sprightly little old lady, but active still. For another fifteen years she kept up her labors in behalf of the insane, until, in 1881, she retired to the friendly walls of beautiful Trenton Hospital, in New Jersey, to live out her last days in peace. This was one of the first hospitals built by her endeavors. She died there in 1887.

In her life she brought comfort to thousands of despairing souls. She awakened a nation to a sense of its duty, and pushed forward by at least a generation the march of progress in caring for the mentally ill. The world owes a debt of gratitude to her memory.

THE NEXT STORY OF GOLDEN DEEDS IS ON PAGE 4671.

I EXPECT TO PASS THROUGH THIS WORLD BUT ONCE. ANY GOOD, THEREFORE, THAT I CAN DO, OR ANY KINDNESS THAT I CAN SHOW TO ANY FELLOW CREATURE, LET ME DO IT NOW. LET ME NOT DEFER IT OR NEGLECT IT, FOR I SHALL NOT PASS THIS WAY AGAIN.

"TO ARMS! THROW OFF THE ROMAN YOKE!"



Queen Boadicea urges the Britons on for a last desperate effort. Most of the fighting had been a kind of guerrilla warfare, but at last Britons and Roman soldiers (in the background) lined up for a decisive battle.

PATRIOTS IN MANY LANDS

TO love one's country—its woods and fields and mountains, its story and its people—is a natural feeling. But patriotism means more than this. The true patriot does not love his country blindly. Rather, he sees whatever faults it may have and strives to see them corrected. He is anxious to have his country live up to the highest ideals of all men everywhere. In the company of nations he wants his country's record to be among the fairest. The patriot's watchword is "liberty," because he knows that only a country whose people are free can really grow. In other chapters of THE BOOK OF KNOWLEDGE you will find the stories of the young David who slew Goliath, of the Greeks Miltiades and Themistocles, of King Alfred the Great of England, William Tell, the Swiss, the French Joan of Arc, William Wallace, the Scot, the American Nathan Hale and Thomas Masaryk of Czechoslovakia. Here we shall tell you of some other patriots whose lives are equally thrilling examples of courage and devotion.



The Austrian Emperor sends Andreas Hofer a medal and chain. The gift made Hofer believe that the Emperor would not desert the Tyrol again.

In the second century B.C., Judea (Palestine) was under the rule of Syria. Strongly influenced by the Greeks, the Syrians tried to force Greek ideas and the Greek religion on their Jewish subjects. But the Jews resisted, led by an aged priest, Mattathias. When Mattathias died, his place was taken by his third son, Judas (?-161 B.C.). Judas was given the last name of Maccabaeus, probably meaning "hammer," and all the family have been called the Maccabees ever since.

Judas was strong and resourceful. By surprise raids, night attacks and rapid marches, he and his followers won a series of victories. About 164 B.C., they reached Jerusalem and cleansed and rededicated the Temple, which the Syrians had dishonored. This event is still celebrated by the Jews as the Feast of Dedication, or Hanukkah. A short time later the Jews were granted religious liberty.

However, Judas was now determined that Judea should be governed by its own rulers. He won further victories, but in 161 B.C. he was slain in battle. The last of his four brothers to survive, Simon, finally secured the independence of his country. For about the next hundred years Judea was governed by Jewish kings and did not come fully under the Roman yoke until the time of King Herod.

Queen Boadicea (?-62 A.D.) lived when Britain was a remote part of the Roman Empire. Boadicea and her husband, King Prasutagus, ruled over the Iceni, a tribe of Britons who lived in the eastern part of the island. When Prasutagus died, he left his fortune to be divided between his two daughters and Emperor Nero. Prasutagus had hoped that this bequest to Nero would persuade the Romans to leave his family and his people in peace. But his hopes were not fulfilled.

The Romans proceeded to take over the little kingdom. Boadicea resisted, and for this act the proud Queen was scourged in public and her daughters vilely abused. As soon as she was out of the hands of her captors, she led her people in a surging revolt. Resentment at the Romans burst

into flames elsewhere, and soon half of Britain was up in arms. The Britons fell upon the Roman soldiers savagely. Towns were burned, London was sacked and thousands of people were massacred.

At last the Romans organized and met the Britons in the field. The battle was desperate, but Rome regained the province. Boadicea, rather than submit, drank poison. In the end, Rome saw the wisdom of a more kind treatment of the Britons, and the island became quiet. The memory of the proud Queen has lived on in poetry and sculpture.

Let us now skip a number of centuries. The American and French revolutions of the late 1700's touched off the growing unrest of people in many parts of the Western world. The struggle for liberty flamed up again and again during the next hundred years.



Toussaint l'Ouverture, who freed Haiti. It became the first Negro republic.

An early outbreak occurred in Haiti, then a possession of France. Most of the people were Negroes, some of them slaves. The slaves rebelled in 1791, and were freed two years later. Meanwhile, the revolt produced an extraordinary leader, who is known as Toussaint l'Ouverture (1743-1803). He was a Negro, the son of slaves and himself a slave until he was forty years old. He was born Toussaint Breda; but someone, watching his vigorous fighting, exclaimed, "*Mais cet homme fait ouverture partout.*"—"Why that man makes a gap wherever he goes." So he became Toussaint the gap-maker, or opener of the way.

He raised and disciplined a powerful Negro army, and the French appointed him major general and governor of the island. By 1801 he was in complete control.

However, it seemed to the French Emperor Napoleon that Toussaint was getting too powerful, and in 1802 Napoleon attempted to re-establish slavery in Haiti. Toussaint's answer was a declaration of independence. Then a French army was sent to the island. Toussaint was overcome and retired to his estate. There he was treacherously betrayed, and the French carried him to France, where he died in prison. Two years later, however, the independence of Haiti was made secure.

The Tyrol is a beautiful Alpine region just east of Switzerland. The great Napoleon transferred this section from the rule of Austria to Bavaria, a German state. The Tyrol had been part of Austria for more than 400 years, and the Tyrolese wanted to remain Austrian, for they had been allowed a goodly amount of freedom under Austrian rulers. Resistance to the transfer found a leader in Andreas Hofer (1767-1810), the son of an innkeeper.

In 1809, at a moment when Austria was at war with France, Hofer led an outright rebellion. He inflicted severe defeats on the Bavarians, and captured Innsbruck, the capital of the Tyrol. Then the Austrian Emperor Francis promised Hofer that no peace would be made with Napoleon by which the Tyrol would again be given to Bavaria. But Francis broke this promise twice in the next few months. Hofer led several other revolts, and for two months he ruled the Tyrol in the Austrian Emperor's name. In a final uprising, the French and Bavarian forces proved too strong for the Tyrolese, and Hofer had to hide. However, he was betrayed to Italian troops, who took him to Mantua, where he was shot on February 20, 1810. It is believed that he was executed on direct orders from Napoleon. But Hofer's cause won. By the Treaty of Paris, in 1814, the Tyrol was restored to Austria.

For more than 200 years most of South America, with the exception of Brazil, was a possession of Spain. There had long been discontent with the mother-country's rule, but the effort to break free did not begin in

SOUTH AMERICA'S LIBERATOR, BOLIVAR



Courtesy, Grace Line

In the center of Caracas, capital of Venezuela, stands this fine statue of Simón Bolívar. He is the Father of the Country, and his memory is dearly loved. The principal coin of Venezuela is named after him, a bolivar.



Courtesy, Margaret H. Harrison

The daring and selfless liberator of Chile and Peru, José de San Martín.

earnest until about 1814. The three most remarkable leaders were all educated in Europe and the success of the French Revolution made a great impression on them. Each one came home determined to break the chains which bound South America to Spain.

Simón Bolívar (1783-1830), called the Liberator, was born in Caracas, Venezuela. He first organized a liberation army in Venezuela in 1810; but in the next few years two revolts failed and there was a period of exile for him in the West Indies. A third campaign was successful, and by 1818 Venezuela was free, Bolívar's fame spread and he became enormously popular. Dashing over the Andes he freed Colombia in a tremendous victory in 1819; and that country made him president with almost supreme power. Two years later a final victory in Venezuela made its independence secure.

Bolívar next turned to Ecuador. There he met another great patriot, José de San Martín (1778-1850).

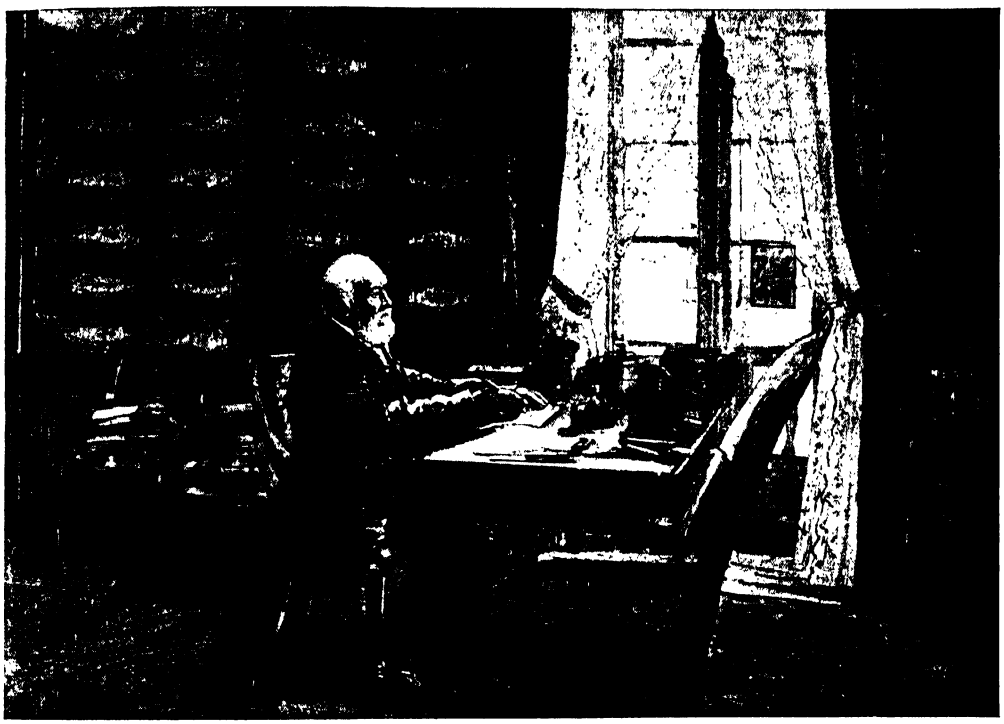
San Martín was born in what is now Argentina. He first acted in the cause of liberty in 1813, when he helped Buenos Aires to defeat the Spaniards. He realized, however, that as long as Chile and Peru remained under Spanish control, his own country would be threatened. So he trained an army in the eastern foothills of the Andes. Then he led them through a perilously high pass, in bitter cold, and fell on the Spaniards in Chile. Its freedom was secured by 1818. San Martín's next step was to move on Peru. It was easily won, and he took Lima, the capital, without a struggle. Peru was declared independent in 1821, and San Martín was given supreme power, with the title "Protector of Peru."

This was the situation when San Martín and Bolívar met. Both men realized that their forces must unite if the Spaniards were to be driven out of the continent completely. The meeting resulted in the resignation of San Martín in 1822, probably because he realized that a single great leader could do more for the cause of liberty than two rival leaders. San Martín retired in exile to Europe.

Peru's independence was firmly established by the end of 1824, and for the next three years Bolívar was president. The southeastern part of Peru was organized into a new republic, Bolivia, named for him. Unhappily, from 1826 on, Bolívar gradually lost his popularity and influence. He resigned as supreme chief of Colombia just before his death in 1830.

Bernardo O'Higgins (1778-1842), known as the Liberator of Chile, was the son of an Irishman (the family name was originally Higgins) who had settled in South America. Bernardo was born in Chile, and joined the group working for freedom there in 1802. A natural leader, by 1813 he was commander-

in-chief of the army. But the Spaniards defeated him the following year; then O'Higgins fled across the Andes and joined San Martín. A charge led by O'Higgins won the decisive battle for the independence of Chile in 1817. He became dictator of Chile and gave the country a progressive, efficient government. But he was overthrown by the aristocratic party in 1823. The rest of his life was spent quietly in Lima, Peru.



The aging Louis Kossuth in his study at Turin, Italy. To the last he continued to write for the cause of freedom, carrying on a vast correspondence with fellow-patriots and lovers of liberty everywhere.

Italy joined the march toward freedom a little later in the nineteenth century. Divided into a number of little kingdoms, the Italian boot had long been prey to the ambitions of stronger European states. Men used to say "Italy is only a geographical expression," meaning that there was no sort of union among the states; and this was true. Two men in particular realized that only by uniting to form one nation would all Italians be free. These men were Giuseppe Mazzini (1805-72) and Giuseppe Garibaldi (1807-82). Mazzini was the mind, and Garibaldi the sword, of the movement.

Mazzini was a brilliant student and could have won success as a writer. But from youth onward his whole life was devoted to the cause of Italian liberty. His first revolutionary activity, in 1830, brought imprisonment for six months. Then he fled to Marseilles, and remained an exile—in France, Switzerland or London—for the next forty years, though there were secret trips to his beloved homeland. He organized a society called Young Italy, whose object was to educate and unite all those who were opposed to the various governments on Italian soil. By his flaming power of expression in speech and writing, he influenced hosts of young men.

For a few months in 1849, a republic was established in Rome. Mazzini was one of its chief officials. The Roman republic was forced to yield to the French, however, and other revolts failed, at Mantua and Milan. Nevertheless the pressure for Italian unity grew until, at last, in 1861, all Italy was united under a king, Victor Emmanuel II. Mazzini had worked for a republic of Italy, and up until his death he remained in touch with revolutionary movements elsewhere in Europe.



A little finch brings cheer to the young Mazzini in prison. Here he worked on the plans that in time were to make Italy a united country, under a king.

Mazzini laid the foundation, thought out the plans. But they might have come to nothing without Garibaldi's enormous energy and fighting ability. Wherever Garibaldi was, there was action. He early joined Mazzini's organization, but because of his part in an unsuccessful outbreak, he was forced to flee. He lived in South America for some years. There he helped Uruguay to win independence from Brazil. Other years of exile were spent in Switzerland and the United States.

He was in Italy in 1849 and won the victory which resulted in the short-lived Rome republic. When it fell, he led a daring retreat through central Italy, pursued and sometimes almost surrounded by the armies of France, Austria, Spain and Naples. In the revolt of 1858 he commanded a group of sturdy Alpine fighters, who liberated Italy as far as the Austrian frontier. The next year Garibaldi was successful in wresting Sicily from the King of Naples. Only a few months later, Italy was proclaimed a single kingdom. On November 7, 1860, Garibaldi accompanied King Victor Emmanuel on his solemn entry into Naples, as king of Italy. The next day Garibaldi, refusing all honors, returned to his island



Gramstorff Bros., Inc.

Garibaldi and Victor Emmanuel II (on white horse) meet, not long before their triumphal entry into Naples.

home of Caprera "with only a little money and a bag of seed beans for the spring planting." His last service to Italy was as a member of Parliament.

Across the Alps, in Hungary, another man was working for the freedom of his country. This was Lajos (Louis) Kossuth (1802-94). He was a lawyer who battled for liberty as a writer and orator of great persuasive power. His influence was widely felt.



From Ewing Galloway

The Irish poet and patriot, Padraic Pearse.

For about one hundred years Hungary had been under the rule of Austrian monarchs. The Hungarians bitterly resented this domination, but they quarreled so much among themselves that they could not unite to resist their foes from outside. True, they had a parliament; but only nobles could be members.

Kossuth's life-work began when certain letters of his, on political subjects, were widely circulated. His influence grew to such an extent that he was arrested and imprisoned for almost four years. This only added fuel to the flames of the resistance movement; and on his release, Kossuth continued to attack Austria and the remnants of the feudal system, which was keeping so many of his people in subjection.

Revolution broke out over much of the continent of Europe in 1848, and Kossuth was recognized as the leader of the entire movement. When the Hungarian revolutionary army won a few victories in the spring of 1849, Kossuth issued a declaration of independence. He was then elected dictator; but he resigned in August in favor of a General Görgei. Russia now stepped in on the side of Austria and made all the efforts of the Hungarians useless. Görgei quickly surrendered; and Kossuth went into exile. Hungary did not win independence until after World War I.

Of all the many Irish patriots, the one of modern times most revered in Eire is Padraic Pearse, or MacPiarais (1879-1916). He was a gentle person, a lawyer, poet and teacher.

As a young law student, Pearse became deeply interested in Gaelic, the ancient Irish language. There was arising at this time a fresh interest in Irish art and literature, and Pearse, with other young men and women, turned back to the old Gaelic writers for inspiration. A Gaelic League was formed, to promote the language and all things Irish. Its influence spread, and Pearse became widely known. He wrote many articles in Gaelic and English for the League's paper.

Pearse believed that both languages should be taught in Irish schools. He opened two schools based on this idea, St. Enda's for boys, and St. Ita's for girls.

POSTPONEMENT OF HOME RULE BRINGS ON A REBELLION IN IRELAND

In 1914 it seemed that Ireland was about to win at last her centuries-long struggle for independence. A Home Rule Bill was passed, in England, giving the Irish the right to their own parliament, so they could make their own laws. But before the bill could be put into effect World War I broke out, and England said the Irish would have to wait for their home rule. This was a terrible disappointment; and Irish patriots determined to get by force what they had failed to get by diplomacy. These patriots declared Ireland's independence.

Pearse was a member of the Irish Volunteers, the revolutionary group in southern Ireland. An uprising was planned, and he was made commander of the Volunteer forces and "President of the Provisional Government" of the "Irish Republic."

Actual fighting broke out on Easter Monday, April 24, 1916. British troops were rushed to Dublin, where the fighting was most severe, and the Volunteers were soon hopelessly outnumbered. They surrendered

on Saturday, April 29. The leaders were seized at once and tried by court-martial. Fifteen of the most prominent were sentenced to death and shot—among them Padraic Pearse and his brother, William. The rebellion had failed, but it helped to pave the way for the independence of Eire in 1921.

Early in the twentieth century, the strong current of revolution circled the globe, to China. For more than 200 years China had been ruled by the Manchus, a Mongolian people from the north. They were despots, but the great masses of Chinese had little thought of rebelling. The ordinary people could neither read nor write and were cut off from Western ideas of liberty.

But China was to be awakened by the son of a poor farmer, Sun Yat-sen (1866-1925). He was born near Canton, South China, and was sent to a mission school, where he learned English. Then he went to the new College of Medicine at Hong Kong, and was its first graduate, in 1894. Involved in a revolutionary plot the next year, which failed, the young doctor fled his homeland. During the next sixteen years, he lived at various times in Hawaii, the United States, England and Japan. A Chinese Revolutionary League was formed in Europe and Japan. By this means Sun raised enormous sums of money which helped him to spread his ideas in China through underground groups. (An underground is a group of men, and sometimes women and even children, who are opposed to the rulers of their country and work in secret, under cover or "under ground," to overthrow the rulers. In some places during World War II, the slang word for underground workers was "radishes.")

To turn the feeling against the Manchus into a movement for a Chinese republic, Sun organized a political party, the Kuomintang (the nationalist people's party), in 1911. Its chief principles were: nationalism, that is, a China for the Chinese to be governed by Chinese; democracy; and socialism, that is, government control over many spheres of everyday life.

At the same time a revolution was planned. It began in Canton at the end of 1911. Though Sun was then in England, he was elected provisional president of the new Chinese Republic. He returned to China in January, 1912, and the next month the last Manchu emperor gave up the throne and China became a republic in fact.

Sun remained in office only a short time. In order to keep North and South China united, he resigned to allow Yüan Shih-k'ai, who had greater influence in the North, to become president of the entire country. Sun was then made director of the national railways; but later he disagreed with Yüan's policy and left the government.

His last years were made sad by the continued struggles between various political groups in China, and he died without seeing his country really united. His memory is honored with a beautiful tomb at Nanking.

As you probably know, Czechoslovakia did not become an independent country until after World War I. It was Thomas



United China Relief Inc.

Sun Yat-sen (seated) with Chiang Kai-shek, then a young man.

Masaryk's life-work to bring this about, and he was given able help by Eduard Beneš (1884-1948).

Beneš was born in Bohemia, a part of Czechoslovakia, then a part of Austria-Hungary. He first met Masaryk at Charles University, in Prague. After Beneš graduated from this university, Masaryk advised him to study in France. Beneš attended the Sorbonne, in Paris, and, later, the School of Political Science, in Dijon, from which he received the degree of Doctor of Philosophy. Meanwhile he was earning his living by writing political articles for magazines published in Prague.

When Beneš returned to Prague in 1909, to become a professor, he was drawn into the movement for Czechoslovak freedom. He wrote books and articles on politics and international history, and helped to form an underground organization. At the beginning of World War I, he remained in Prague and acted as the channel between the underground there and the movement organized by Masaryk in the Allied countries. Arrest seemed certain in September, 1915, however, and Beneš fled.

He continued his work from Paris and helped to convince the Allies that Czechoslovakia deserved freedom. When the war was over, and Czechoslovakia became an independent country, Beneš became foreign minister of the new republic. He was active in the League of Nations, and tried hard, in the years between the two world wars, to prevent Germany from regaining military power.

In 1935, President Masaryk, now an old man, gave up his office, and Beneš became president. Beneš watched the rise of the Nazis with deep concern and warned the League of Nations repeatedly. Then Hitler demanded the Sudentenland, a strip on the western border of Czechoslovakia. By the Munich Pact of 1938, in which Czechoslovakia had no voice, Hitler got the territory without a struggle. He next demanded the resignation of Beneš. Rather than bring his beloved country into further trouble, Beneš sorrowfully went away. He was in England for a while and then became a visiting professor at the University of Chicago.

As you know, Czechoslovakia was not saved by the noble self-sacrifice of Beneš; it was one of the first countries to be overrun by the Nazis in World War II, and its



Czechoslovak Government Information Service

Thomas Masaryk, Father of Czechoslovakia; and Eduard Beneš, who helped to win its freedom in two world wars.

people suffered under German rule for more than five years. After the war Beneš returned to Prague. His one hope was that he might help to bring democracy and prosperity back to the country. This was not to be, for Czechoslovakia soon fell under



French Press & Information Service
General Charles de Gaulle, who led the Free French in resistance to the Nazis, and on to final victory.

the influence of Soviet Russia, and Beneš could not bring himself to co-operate with the new government. He died in 1948, some say of heartbreak.

The fall of France, in June, 1940, stunned the French people. Many could not understand what had happened, but a few brave men refused to accept their country's submission to the Nazis. Chief of these was General Charles de Gaulle (1890-).

A graduate of Saint-Cyr (the French West Point), De Gaulle fought in World War I. He was wounded three times and was taken prisoner by the Germans. After the war he attended the French War College, and served in Syria, Iraq, Iran and Egypt. During these years of a soldier's career, he became known for his belief that the army should be mechanized, put on wheels. He also urged the construction of tanks and the training of men to run them; and he wrote several books on the subject of mechanized warfare. But the French military authorities were deaf to his ideas; though the Germans, far more alert, pounced upon them.

De Gaulle fought against the separate peace with Germany in 1940; and when his efforts proved of no avail, he flew to London. His first act there was to broadcast a message to the French people, telling them that the armistice had been signed while France was still able to fight and that the government of France was no longer independent. Then he formed a French Committee of National Liberation (the Free French). The colonies of Tahiti, New Hebrides, New Caledonia and French Equatorial Africa rallied to the cause; and many French soldiers, sailors and airmen made their way to Allied countries to continue fighting the Nazis.

In France those suspected of being De Gaullist sympathizers or agents were pursued relentlessly by the Nazis. Nevertheless, an underground group was organized, and secret means of communication were set up between it and the Free French outside. The Allies were kept supplied with valuable information by this means.

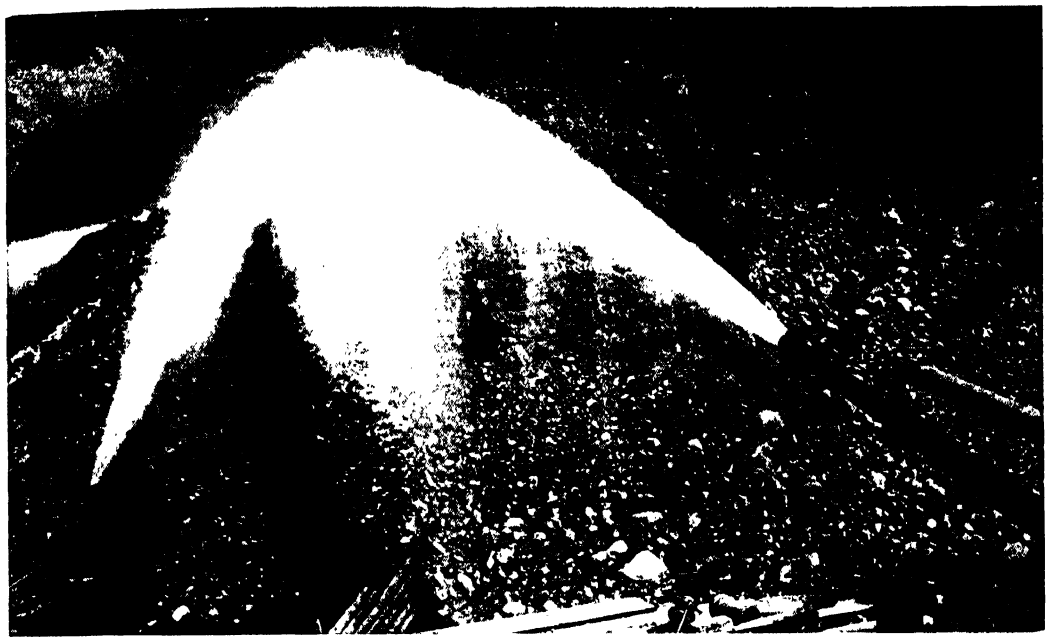
DE GAULLE BECOMES THE HEAD OF A NEW FRENCH REPUBLIC, IN 1944

In 1944 a Provisional Government of the French Republic was formed, with De Gaulle as head. When France was liberated in August, De Gaulle returned to Paris before the firing had ceased between French patriots and collaborationists (those who had worked with the Nazis and wanted them to win). During a triumphal parade, on August 26, from the Arc de Triomphe to Notre Dame Cathedral, he was fired upon twice by hidden collaborationist snipers. But De Gaulle calmly ignored the bullets singing around his head, and continued along the route as had been planned.

In a short time the De Gaulle Government made agreements with the United States and Great Britain for the civil administration of France; and in October the Allies recognized the De Gaulle Government as the official government of France until such time as elections could be held. France became a full-fledged member of the United Nations on January 1, 1945.

During the terrible years when France was ruled from Berlin, De Gaulle heartened his countrymen and kept hope alive in their thoughts. He will always be remembered for his courage and his unwavering efforts to make France free.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 4859.



© Chamber of Commerce, Sacramento

Hydraulic mining near Sacramento, California, has produced nearly a billion dollars in gold.

WHAT BECOMES OF ALL THE GOLD?

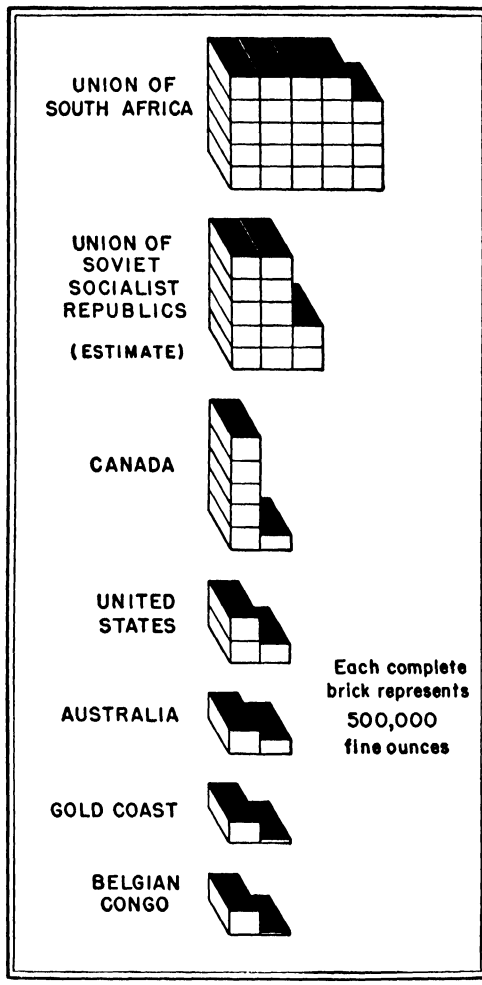
SOME of it wears away, and so is lost, but most of it remains in the world in some form or other. Long before what we call history began, gold was found in river sand. Its presence was detected by the gleaming grains of metal, which were separated from the soil by successive washings. Further search sometimes led to the discovery of nuggets of gold of various sizes. Primitive man used the precious metal to deck his body with ornaments made of beads strung together. Not until a later stage of his development did he learn how to work it into artistic forms and cast it into molds.

Traces of gold decoration have been found even on flint knives of the Stone Age. At the time of the First Dynasty in Egypt, more than five thousands years before the Christian Era, gold jewelry of exquisite fineness and artistic design was produced. Some of this remains to this day as a reminder that our boasted modern civilization, in some ways at least, has had much to learn from the long-buried past.

The total amount of gold produced in ancient times is unknown. That it was enormous may be judged by the estimates, frankly incredible though these are, of the money value of gold collected by David and his successor for the building of the Temple at Jerusalem. These fabulous amounts vary between $4,000,000,000 and $4,500,000,000. Though we can dismiss these figures, there is no doubt that gold was lavishly used. Solomon's yearly revenue in gold has been reckoned at more than $20,000,000.

Conquered nations were usually made to pay tribute in the form of gold, and enormous wealth passed from one owner to another. All the empires of the past amassed vast stocks of the precious metal by conquest. Even after a conqueror had carried off as much as could be found, there usually remained in a vanquished country large amounts hoarded up or buried in the soil to evade detection. Considerable amounts of gold found a safe home in sacred temples until such time as a ruthless unbeliever robbed the shrine of its treasures. Solomon's Temple was stripped in this way by Nebuchadnezzar, king of the Babylonians.

One may assume that though the world's store of gold changes hands with the turn of Fortune's wheel, the actual amount in the



These piles of bricks represent the output of gold by each of the world's chief producers in a recent year. South Africa leads all the rest by far.

world very slowly increases.

The discovery of the Americas and of gold in the continents gave a great impetus to gold production. The world's output from the end of the fifteenth century to the present time has been valued at over $30,000,000,000. In the middle of the nineteenth century, gold was found in large quantities in California and Australia. About 1882 mining was begun in the Transvaal, and the gold output from the Rand became by far the largest in the world. The value of the gold produced from these mines so far is more than $8,000,000,000. At the end of the last century, gold was discovered in the Yukon and in Alaska; and there are important deposits in Ontario. Russia also produces much gold. The world production is worth more than $1,000,000,000 a year.

Some of the world's gold lies at the bottom of the sea, where the vessels carrying it sank in deep waters. Wear and tear must account for some, especially in the case of coins. The bulk of the gold produced is used up in jewelry and so is not really lost. The United States Treasury has stored away in underground vaults at Fort Knox, Kentucky, about 9,000,000 pounds of gold bullion. This is uncoined gold, in bars.

It is probable that there is more gold today than at any previous time in the world's history, yet Stuart Chase, the economist, says: "A modern liner could carry in her hold all the gold dredged and mined in seven thousand years. The present stock is a cube about thirty-six feet square, the size of a large, but not a very large, house."

WHAT IS FOOL'S GOLD?

The search for gold has occupied men's thoughts and endeavors for almost countless centuries. Long before the bright yellow metal was coined, and used as a basis of trade, it was sought for ornament. Gold is the most glamorous color, perhaps because it suggests the sun. A true friend is said to be "pure gold," a generous person has a "heart of gold." A famous orator is "golden voiced." A time of great culture is a Golden Age.

Hidden away in the earth are rich layers of gold; bright pebbles or nuggets lie in river beds, waiting to be found. But Nature has moods of merriment. She has stored away, sometimes near gold veins, or sometimes mixed with bits of the precious metal, a beautiful yellow mineral with high luster, looking so much like gold that when men first come upon it they are likely to be deceived. So often has this happened that the mineral, iron pyrites, is nicknamed fool's gold.

Iron pyrites has, however, a value of its own. It is a combination of iron and sulfur, and often contains traces of copper, cobalt, nickel, gold and other elements, all of which can be extracted from the ore. The sulfur is obtained for manufacturing sulfuric acid, useful in the preparation of fertilizers.

WHAT IS 24-CARAT GOLD?

Pure gold is known, in the jewelry trade, as 24-carat gold. This is too soft a metal for ordinary wear and tear, so a harder metal,

generally copper, is alloyed with gold. If the alloy has 18 parts of gold and 6 parts of another metal, we call it 18-carat gold; if it has 14 parts of gold and 10 of another metal, we call it 14-carat gold, and so on.

FOR WHAT PURPOSE IS GOLDBEATER'S SKIN USED?

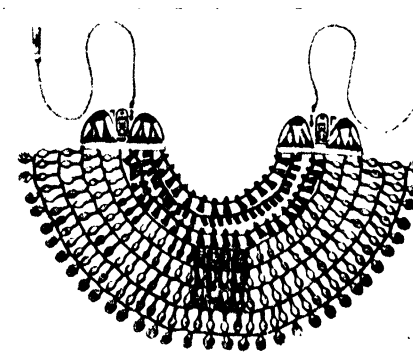
Goldbeater's skin is made from the peritoneum of an ox, a membrane that protects the internal organs and acts as a wall to the abdomen. The chief use, the use that gave goldbeater's skin its name, is in connection with the making of gold leaf. The gold leaf used for gilding is real gold, or sometimes an alloy of gold and another metal, which has been treated to annealing and hammering processes until it is about only 1/290,000 of an inch thick. After several preliminary processes, small, thin squares of gold are placed in a pile and between special paper, and are then hammered. As the gold becomes thinner it spreads out. It is then cut into smaller pieces, piled between sheets of goldbeater's skin and is again hammered. This process is repeated two or three times, goldbeater's skin being the separating material for each successive hammering. The hammering becomes lighter as the leaf becomes thinner, till the desired degree of thinness is reached.

Goldbeating is one of the oldest of the arts, and is thought to have originated among the Eastern nations. Homer wrote about it in his great poems. Examples of gilding have been found on mummy cases taken from the tombs of the ancient Egyptian kings. The gold leaf of the ancients was about three times as thick as the gold leaf of today.

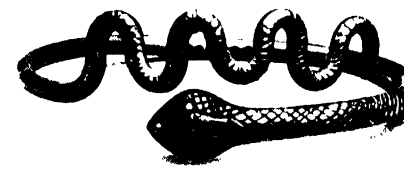


University Museum, Philadelphia

Gold utensils 5,000 years old, from ancient Ur of the Chaldees, the fabulous city of Biblical times.



An exquisite gold collar made 4,000 years ago in Egypt. It is inlaid with carnelian and turquoise.



Photos, Metropolitan Museum of Art

Gold bracelets in the form of serpents were worn by many ladies of fashion in ancient Egypt and Greece.

WHAT IS WHITE GOLD? YELLOW GOLD?

Gold alloyed with silver has a silvery color and luster. If there is more than half gold in the alloy it may be used by jewelers as white gold. Watches, bracelets, necklaces and settings for jewels are a few of the ways in which white gold appears.

Gold alloyed with copper is sometimes called yellow gold, sometimes red gold.

WHAT DOES GOLD-FILLED MEAN? WHAT DOES GOLD-PLATED MEAN?

When a layer of gold is deposited over another substance, usually over another metal, we say the object is gold-plated. The plating may be very thin or rather heavy. When an extra heavy layer of gold is plated over another metal, we say the object is gold-filled. More gold is used.

Agincourt

By MICHAEL DRAYTON (1563-1631)

FAIR stood the wind for France
When we our sails advance,
Nor now to prove our chance
Longer will tarry;
But putting to the main,
At Caux, the mouth of Seine,
With all his martial train
Landed King Harry.

And taking many a fort,
Furnished in warlike sort,
Marcheth towards Agincourt
In happy hour;
Skirmishing day by day
With those that stopped his way,
Where the French general lay
With all his power.

Which, in his height of pride,
King Henry to deride,
His ransom to provide
Unto him sending;
Which he neglects the while
As from a nation vile,
Yet with an angry smile
Their fall portending.

And turning to his men,
Quoth our brave Henry then,
"Though they to one be ten
Be not amazèd:
Yet have we well begun;
Battles so bravely won
Have ever to the sun
By fame been raisèd.

"And for myself (quoth he):
This my full rest shall be:
England ne'er mourn for me
Nor more esteem me:
Victor I will remain
Or on this earth lie slain,
Never shall she sustain
Loss to redeem me.

"Poitiers and Cressy tell,
When most their pride did swell,
Under our swords they fell:
No less our skill is
Than when our grandsire great,
Claiming the regal seat,
By many a warlike feat
Lopped the French lilies."

The Duke of York so dread
The eager vaward led;
With the main Henry sped
Among his henchmen.
Excester had the rear,
A braver man not there;
O Lord, how hot they were
On the false Frenchmen!

They now to fight are gone,
Armor on armor shone,
Drum now to drum did groan,
To hear was wonder;
That with the cries they make
The very earth did shake:
Trumpet to trumpet spake,
Thunder to thunder.



Well it thine age became,
O noble Erpingham,
Which didst the signal aim
To our hid forces!
When from a meadow by,
Like a storm suddenly
The English archery
Stuck the French horses.

With Spanish yew so strong,
Arrows a cloth-yard long
That like to serpents stung,
Piercing the weather;
None from his fellow starts,
But playing manly parts,
And like true English hearts
Stuck close together.

When down their bows they threw,
And forth their bilbos drew,
And on the French they flew,
Not one was tardy;
Arms were from shoulders sent,
Scalps to the teeth were rent,
Down the French peasants went—
Our men were hardy!

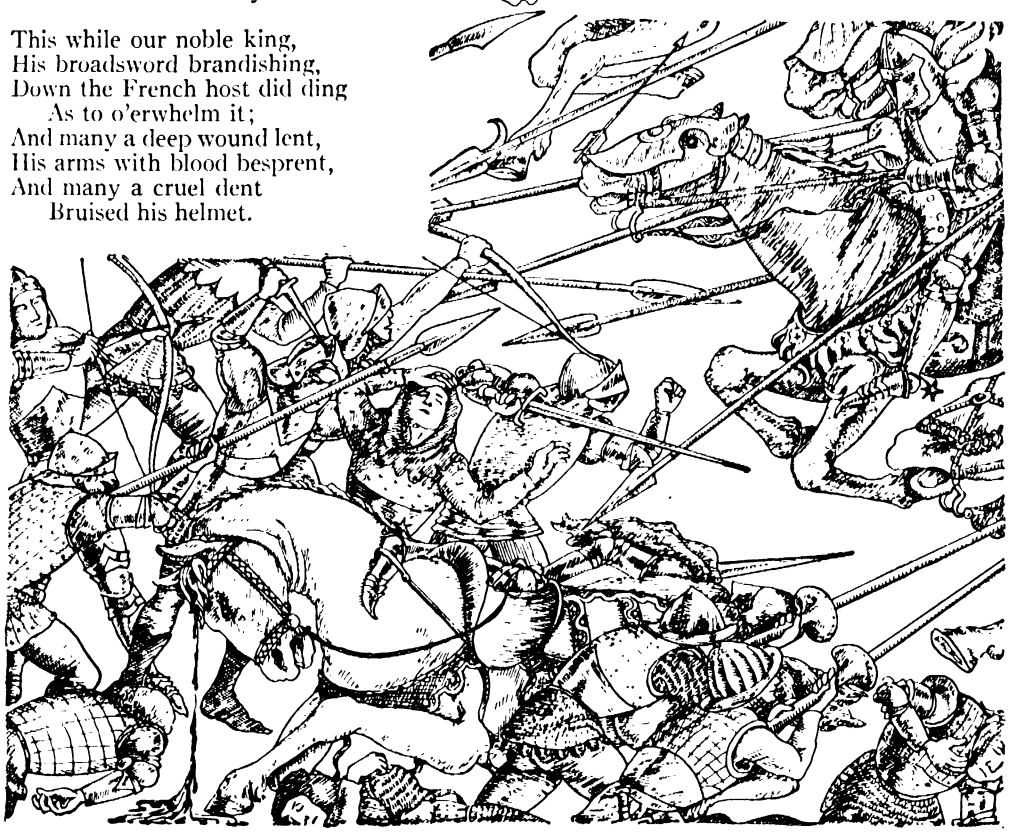
This while our noble king,
His broadsword brandishing,
Down the French host did ding
As to o'erwhelm it;
And many a deep wound lent,
His arms with blood besprent,
And many a cruel dent
Bruised his helmet.



Gloster, that duke so good,
Next of the royal blood,
For famous England stood
With his brave brother;
Clarence, in steel so bright,
Though but a maiden knight,
Yet in that furious fight
Scarce such another.

Warwick in blood did wade,
Oxford the foe invade,
And cruel slaughter made
Still as they ran up;
Suffolk his axe did ply,
Beaumont and Willoughby
Bare them right doughtily,
Ferrers and Stanhope.

Upon Saint Crispin's Day
Fought was this noble fray,
Which fame did not delay
To England to carry.
O when shall English men
With such acts fill a pen?
Or England breed again
Such a King Harry?





A Pastoral

By NICHOLAS BRETON (1545-1626)

IN the merry month of May,
In a morn by break of day
Forth I walked by the wood-side
When as May was in his pride.
There I spied all alone,
Phyllida and Corydon.
Much ado there was, God wot,
He would love and she would not.
She said, "Never man was true."
He said, "None was false to you."
He said he had loved her long.
She said, "Love should have no wrong."
Corydon would kiss her then.
She said maids must kiss no men
Till they did for good and all.
Then she made the shepherd call
All the heavens to witness truth,
Never loved a truer youth.
Thus, with many a pretty oath,
Yea and nay, and faith and troth,
Such as silly shepherds use
When they will not love abuse,
Love which had been long deluded
Was with kisses sweet concluded.
And Phyllida with garlands gay
Was made the lady of the May.



Song of the Basket Maker

From THE PATIENT GRISSILL

By THOMAS DEKKER (1570-1632)

ART thou poor, yet has thou golden slumbers?
O sweet content!
Art thou rich, yet is thy mind perplexed?
O punishment!
Dost thou laugh to see how fools are vexed
To add to golden numbers, golden numbers?
O sweet content! O sweet, O sweet content!
Work apace, apace, apace, apace;
Honest labor bears a lovely face;
Then hey nonny nonny, hey nonny nonny!

Canst drink the waters of the crisped spring?
O sweet content!
Swimm'st thou in wealth, yet sink'st in thine own tears?
O punishment!
Then he that patiently want's burden bears
No burden bears, but is a king, a king!
O sweet content! O sweet, O sweet content!
Work apace, apace, apace, apace;
Honest labor bears a lovely face;
Then hey nonny nonny, hey nonny nonny!

Was This the Face

From DOCTOR FAUSTUS

By CHRISTOPHER MARLOWE (1564-1593)

WAS this the face that launched a thousand ships?
And burnt the topless towers of Ilium?
Sweet Helen, make me immortal with a kiss.
Her lips suck forth my soul: see where it flies!
Come, Helen, come, give me my soul again!
Here will I dwell, for heaven is in these lips,
And all is dross that is not Helena.
I will be Paris, and for love of thee,
Instead of Troy, shall Wertenberg be sacked;
And I will combat with weak Menelaus,
And wear thy colors on my plumèd crest;
Yea, I will wound Achilles in the heel,
And then return to Helen for a kiss.
O, thou art fairer than the evening air
Clad in the beauty of a thousand stars;
Brighter art thou than flaming Jupiter
When he appeared to hapless Semele;
More lovely than the monarch of the sky
In wanton Arathusa's azured arms;
And none but thou shalt be my paramour.

In Praise of a Beggar's Life

One of several poems by a poet whom we only know by his initials, A. W., this jolly song was first published in 1602.

BRIGHT shines the sun; play, beggars, play!
Here's scraps enough to serve today.
What noise of viols is so sweet,
As when our merry clappers ring?
What mirth doth want where beggars meet?
A beggar's life is for a king.
Eat, drink, and play; sleep when we list;
Go where we will, so stocks be missed.
Bright shines the sun; play, beggars, play!
Here's scraps enough to serve today.

The world is ours, and ours alone,
For we alone have world at will;
We purchase not, all is our own;
Both fields and streets we beggars fill.
Nor care to get nor fear to keep
Did ever break a beggar's sleep.
Bright shines the sun; play, beggars, play!
Here's scraps enough to serve today.

A hundred head of black and white
Upon our gowns securely feed;
If any dare his master bite,
He dies therefore, as sure as creed.
Thus beggars lord it as they please;
And none but beggars live at ease.
Bright shines the sun; play, beggars, play!
Here's scraps enough to serve today.

The Shepherd's Wife's Song

From THE MOURNING GARMENT

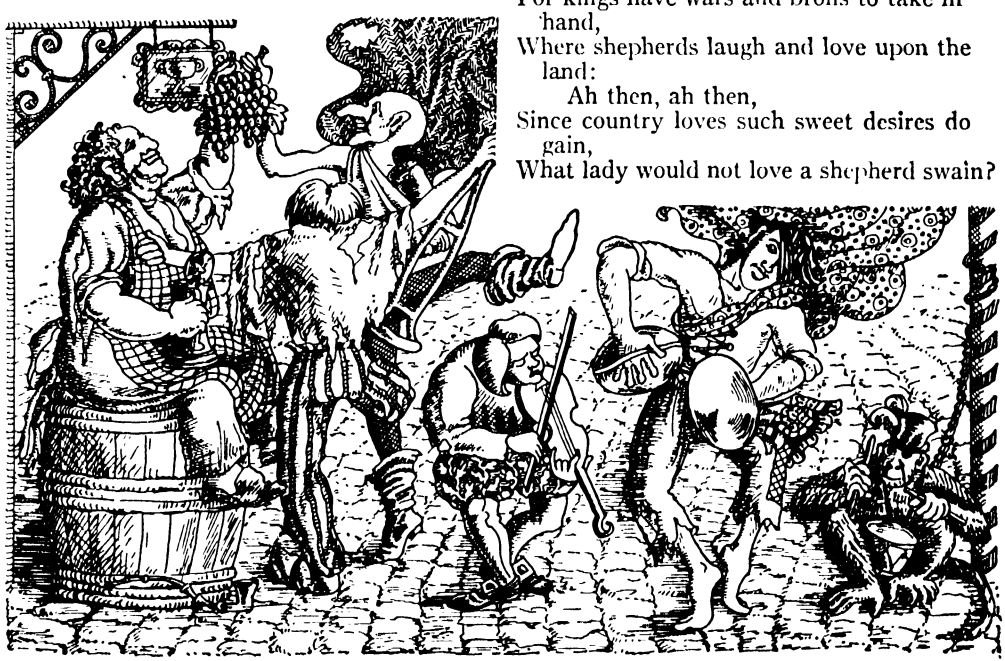
By ROBERT GREENE (1560?-1592)

AH, what is love? It is a pretty thing,
As sweet unto a shepherd as a king,
And sweeter, too:
For kings have cares that wait upon a crown
And cares can make the sweetest love to frown:
Ah then, ah then,
If country loves such sweet desires do gain,
What lady would not love a shepherd swain?

His flocks are folded; he comes home at night
As merry as a king in his delight,
And merrier, too:
For kings bethink them what the state require,
Where shepherds, careless, carol by the fire:

He kisseth first, then sits as blithe to eat
His cream and curds, as doth a king his meat,
And blither, too:
For kings have often fears when they do sup,
Where shepherds dread no poison in their cup:

Thus, with his wife, he spends the year as blithe
As doth the king at every tide or sithe,
And blither, too:
For kings have wars and broils to take in hand,
Where shepherds laugh and love upon the land:
Ah then, ah then,
Since country loves such sweet desires do gain,
What lady would not love a shepherd swain?



The Burning Babe

By ROBERT SOUTHWELL (1561-1595)

As I in hoary winter's night
Stood shivering in the snow,
Surprised I was with sudden heat
Which made my heart to glow;
And lifting up a fearful eye
To view what fire was near,
A pretty babe all burning bright
Did in the air appear;
Who, scorched with excessive heat,
Such floods of tears did shed,
As though His floods should quench His flames,
Which with His tears were bred:
"Alas!" quoth He, "but newly born
In fiery heats I fry,
Yet none approach to warm their hearts
Or feel my fire but I!

"My faultless breast the furnace is;
The fuel, wounding thorns;
Love is the fire, and sighs the smoke;
The ashes, shames and scorns;
The fuel Justice layeth on,
And Mercy blows the coals,
The metal in this furnace wrought
Are men's defilèd souls:
For which, as now on fire I am
To work them to their good,
So will I melt into a bath,
To wash them in my blood."
With this He vanished out of sight
And swiftly shrunk away,
And straight I callèd unto mind
That it was Christmas Day.

There Is a Garden in Her Face

By THOMAS CAMPION (1567-1619)

There is a garden in her face,
Where roses and white lilies grow;
A heavenly paradise is that place,
Wherein all pleasant fruits do flow.
There cherries grow which none may buy
Till "cherry-ripe" themselves do cry.

Those cherries fairly do enclose
Of orient pearls a double row,
Which when her lovely laughter shows,
They look like rosebuds filled with snow.
Yet them nor peer nor prince can buy,
Till "cherry-ripe" themselves do cry.

Her eyes like angels watch them still;
Her brows like bended bows do stand,
Threat'ning with piercing frowns to kill
All that attempt with eye or hand
Those sacred cherries to come nigh,
Till "cherry-ripe" themselves do cry.

The Conclusion

By SIR WALTER RALEIGH (1552-1618)

After Sir Walter Raleigh was beheaded, by order of King James I, these lines were found in his Bible.

Even such is Time, which takes in trust
Our youth, our joys, and all we have,
And pays us but with age and dust,
Who, in the dark and silent grave,
When we have wandered all our ways,
Shuts up the story of our days.
Yet from this earth, and grave, and dust,
The Lord shall raise me up I trust.

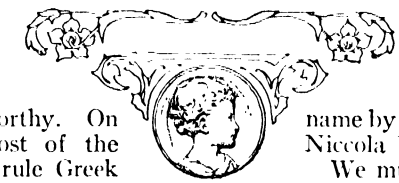
THE NEXT POEMS ARE ON PAGE 5127.





Figures from a panel on the famous Baptistery gates of Florence.

ITALY'S IMMORTALS



THERE are many people who think that since the art of Greece there has been nothing worthy. On the other hand, most of the very modern artists rule Greek sculpture out altogether as being too smooth and soft, too prettily musical.

Between these two extremes of thought lies the accepted faith of the mass of art-lovers. They believe that so far there have been two great movements in the story of the world's sculpture—the Greek and the Italian. After Athens, Florence: the two queen-towns in art's dominion.

Most of the Italian sculptors were Florentine by birth, and the greater part of their work remains in Italy. This is one of the reasons why people come from all parts of the world to visit Florence and Rome. A large number of famous Italian paintings have been carried away into other countries; the sculpture, mercifully, stays at home, and looks much more beautiful there than it would in a museum.

Italian sculpture really began in the middle of the thirteenth century. The first great master was a man called Niccola, who first worked in Apulia, where one of the emperors had encouraged a body of artists to develop a school; and then, among other places, at Pisa. From this town he got the surname by which he is now known, Niccola Pisano.

We must not allow ourselves to think that Niccola was the first of an unbroken procession of Italian sculptors. He is an isolated and unique presence—in a way, a procession in himself. His art was a little Gothic and the rest Roman—what we call now, antique. More than a hundred years had to pass before another great sculptor appeared in Italy, and by that time Roman art seemed to be forgotten.

Niccola was born about the year 1206. His best-known works are two marble pulpits, one in Siena and the other in the Baptistery at Pisa—generally called Niccola's finest production. It is a remarkable piece of sculpture, hexagonal in shape, supported by nine columns. The most striking feature is the relief work, which is carved very deeply, so that the figures are almost separate from the background.

If we saw nothing but these reliefs, we should say the sculpture was the work of a Roman artist, as their whole feeling and treatment is antique. In form alone is the pulpit Gothic. The Virgin Mary seems like a Roman ma-

tron, the figure of Christ like an adapted athlete, and the rest of the forms in the relief bear a likeness to Rome. It is easily explained by the fact that Niccola spent his youth in Apulia studying Roman sculpture and coins.

FROM NICCOLA PISANO TO THE BRONZE DOORS OF GHIBERTI

The pulpit in the ancient Baptistery at Siena is larger and more profusely adorned. Niccola had a very serious fault—he crowded his compositions. For that matter, Niccola did many things wrongly according to the canons of art. His heads are too big, his figures are too uneasy. They all crowd to the front: there is no perspective. But the interest of Niccola lies for us in his art seen from the point of view of his period. Italy had been dead, artistically, so long. He was the first man to do something vital in art.

Niccola's son was a sculptor whose work was naturalistic, under the influence of the art that was being produced in France and Flanders. But Andrea Pisano, who worked under the same influence, had bigger feeling and greater mastery than Giovanni. His finest work is on the bronze door he made for the Baptistery at Florence, which became a model for Ghiberti nearly a century later.

This Andrea, in his turn, was succeeded by Andrea Orcagna, a gifted genius who was painter and architect as well as sculptor.

One of the most famous pieces of bronze relief work in the world is that of the Baptistery doors at Florence. These gates are well known now because of the quality of their decoration; they were for a generation or two a household word in all art communities in the neighborhood of Florence, because the "governors of the Baptistery" arranged a competition among sculptors to find the most worthy. Each competitor was given a quantity of brass, and he was required to make a relief-panel of a certain size, showing the story of Abraham about to sacrifice Isaac.

THE SPLENDID BRONZE PANELS THAT SHOW PERSPECTIVE

Ghiberti's panel was much the best of the various competitors; the next best was Brunelleschi's. For some time, in the history of Italian sculptors, we come across the phrase, "he also competed for the Baptistery doors."

Between the making of Niccola's reliefs at Pisa and the making of Ghiberti's doors Italian art had developed astonishingly. Ghiberti's bronze reliefs are, as reliefs, wonderful, for within the limits of this style of work the sculptor has been able to show perspective. He makes his more distant figures in fainter relief than the rest. And the composition is very fine, with plenty of space and no bulging-out figures crowding to the front. There is a picture of the second of the doors, the most famous, on page 1741; and you can get a better idea of one of the ten panels from the headpiece on page 4603.

Ghiberti lived from 1378 to 1455, and he did an extraordinary amount of work, mostly in bronze. He spent almost thirty years on the Baptistery doors.

A SIMPLE LIFE THAT WAS CROWDED WITH GLORIOUS WORK

This achievement overshadows his other labors, such as the statues of St. John Baptist and St. Matthew in the Church of San Michele; the font of the Baptistery at Siena, where he worked with Donatello and Jacopo della Quercia; and the labor on the Duomo, during which he quarreled with his rival architect-sculptor Brunelleschi. This was a fine, stirring quarrel that roused all Florence. Several of Ghiberti's minor bronzes can be seen in the Bargello, the national museum in the old town.

When we look at the great bronze doors we know without being told that Ghiberti lived in an age of painters. The whole feeling of the panels is pictorial. Perhaps this is why he had such an effect on the later painters of Florence; his work seemed to be an undying inspiration.

Another sculptor, a contemporary of the master of the bronze doors, a man who also influenced painting very much, was Donatello. He lived from 1386 to 1466, and his life was like Ghiberti's in this, that it was crowded with glorious work. Donatello had a very lovable nature, with a genius for friendship, the gift of being easily pleased, and a love of simplicity in his daily life.

There is a pretty story of Donatello and the great man Cosimo Medici. The sculptor had a trick of wearing comfortable, shabby clothes; and Cosimo, seeing him one day more shabby than usual, sent him an outfit—a rich scarlet cloak, a cap and a doublet. Donatello obligingly wore them for one day, and then sent them back and begged to be excused. Cosimo's son gave Donatello a fine country

house; but the servants and all the grandeur troubled his simple soul, and again he begged to be excused and returned to his own dingy abode.

THE LASTING INFLUENCE OF DONATELLO ON THE SCULPTURE OF EUROPE

This man of many faithful friends, this warm, loving-hearted Florentine, was of the texture of granite where his work was concerned. He is the greatest figure we have met so far in the Italian company. The chief note of his work was a strong and healthy realism. His sculpture was like a tonic to the painters of his day; he cured them of the sentimentalism encouraged by the Fra Angelican school. Donatello's influence lasted in Europe for centuries, and the spirit of his work is still alive. His power over succeeding generations was greater than Michelangelo's because his work was more normal, more easily grasped by lesser minds.

Donatello's genius found expression in several kinds of sculpture, from the delicate low reliefs like the St. Cecilia and the little St. John, to the magnificent equestrian monument to the *condottiere* Gattamelata. Compare that statue with the exquisite child's head shown above it on page 4615.

In between these two extremes of style come a great number of statues, monuments and carvings of all sorts. When Donatello was only nineteen he began his public work. To his early years belong the Four Evangelists, Abraham and Isaac, and the famous St. George, which is in the Bargello. This is supposed to be Donatello's finest statue. A little later he carved the marble David, now in the National Museum, where the little bronze David is also treasured.

THE BEAUTIFUL GALLERY OF CHILDREN AGAINST A BACKGROUND OF GOLD

Donatello made a number of wonderful tombs. Among the most famous are the pope's tomb in the Baptistery at Florence; the cardinal's tomb at Naples; and a huge monument for the Medicis in the San Lorenzo chapel. In this work he was helped by Michelozzi, one of his pupils. He seems to have spent years doing nothing but carving magnificent tombs. A little later he made a lovely marble relief on the front of the singing gallery in the cathedral. Here he carved a band of children against a gold background—one of the most charming pieces of fifteenth-century sculpture.

The most famous of Donatello's bronzes, the Judith and Holofernes group, was not his best. The work owed its renown, not to artistic merit, but to the bearing that the subject had on the troubled history of the day.

The unwearying artist went from one kind of sculpture to another, and from one place to another. He found time to do small pieces of work, like mirror-cases and terra-cotta busts, and small decorative panels for the homes of his friends and patrons. He carved some fine statues in wood, like the Magdalen in the Baptistery at Florence and the St. John in a monk's church in Venice. Some of his finest work was done in Padua, including a fine crucifix and several reliefs, most of the subjects being taken from the Gospels.

PUPILS OF DONATELLO WHO HAVE NAMES FAMOUS IN SCULPTURE

The great effect which Donatello's work had on his own and succeeding generations was to make sculptors and painters ashamed of any affectation. He tried to make his work as lifelike and natural as possible, and was the first sculptor of Italy to have such an ideal.

He had a number of pupils always at work in his studio. Those whose names are best known are Nanni di Banco, Desiderio da Settignano, Michelozzo and Verrocchio. The last three are the most important. Verrocchio (1435–88) was both painter and sculptor, and worked in gold, bronze and marble. He made some interesting statues of children and some groups of a religious character. One isolated grand work stands out among his more mediocre attainments—a statue in bronze of Colleoni on horseback at Venice. This has been called the finest equestrian figure in the world. You will see a picture of it on page 4614.

Desiderio (1428–64) was a worthy pupil of the great Donatello, and he founded a kind of minor school of sculpture whose influence was long felt. He and his followers worked chiefly in marble, and were most praiseworthy in their generation for carving little tombs, reliefs, portraits, busts of children, sweet-faced madonnas—the kind of sculpture to be found in every fifteenth-century church of any note in Italy; the kind of sculpture we are inclined to take for granted and pass by because it bears not the superscription of a great name.

The most important of Desiderio's followers were Mino da Fiesole, Antonio Rossellino and Benedetto da Majano. Rossellino made a most lovely relief called the Nativity, which is in a church in Naples; and there also is Da Majano's Nativity.

Siena produced, among many minor sculptors and artists, the fine sculptor called Jacopo della Quercia. He lived from 1371 to 1438; his work was strong and realistic, much thought of by the artists and sculptors of his day.

One of Della Quercia's earliest works was a set of sculptures for the Happy Fountain in the chief place in Siena. The original adornment of the fountain had been a statue of Venus dug up in the neighborhood of Siena, probably a relic of Græco-Roman art. When troubled times came upon the people of Siena it occurred to them that their heathen goddess might have something to do with their disasters. So they took the happy goddess from the Happy Fountain and adroitly buried her in the territory of Florence, their chief enemy. When peaceful days came again the men in power in Siena asked Jacopo della Quercia for a new ornament. The sculptor, taking a lesson from the past, made the Happy Fountain most thoroughly Christian. He sculptured for it a number of beautiful statuettes, including figures to represent the Christian virtues.

JACOPO DELLA FONTE, OVER WHOM TWO CITIES QUARRELED

For the rest of his life, in tribute to the fine work he had put into this sculpture, Jacopo was known as Jacopo della Fonte.

Another early work by him is the lovely tomb of Ilaria del Carretto, now in Lucca Cathedral. Later he made some fine reliefs for the doors of the Church of San Petronio at Bologna. The day came when Jacopo was sorry he had undertaken this commission, for the folk of Siena and Bologna quarreled hard about him. In the end he was threatened by the authorities of his native town with a fine of one hundred gold florins if he did not return at once. Jacopo hastened to return, being, like most artists, too poor to pay such an enormous sum, and was at once threatened with another fine of one hundred golden florins if he should leave Siena without permission and before a certain bronze relief was done for the cathedral.

Those were days, you see, when men cared so much about a piece of sculpture as to quarrel about it.

WHOLE FAMILIES WHO WON FAME IN THE REALMS OF ART

Most of Jacopo's time was spent between Siena and Bologna, making statues, reliefs and monuments. Among those sculptures are a number of reliefs for the inside of the door of the church at Bologna. These are unequal in merit, but in part show the sculptor at his best. The subjects are taken from the Old Testament.

One of the most interesting features of fifteenth-century Florentine art was the existence of whole families who worked together as painters or sculptors. It often happened that one member was worthier of fame than the rest. This was true of the Rossellini, of whom Antonio surpassed his elder brother Bernardo. Another artist family was the Majani, of whom Benedetto was the chief. The most remarkable family in many ways were the Della Robbias. The work begun by the first, Luca della Robbia (1399–1482), was carried on by his nephew and his sons.

The Della Robbia sculpture was of a distinct kind and formed a tradition of its own which lived in Italy a long time. Luca began, like most sculptors, working at small heads and portraits and reliefs. His most important work, before he started making the glazed terra-cotta which we think of as the true Della Robbia craft, was the carving in marble of the organ-gallery front in the cathedral. This was opposite the singing gallery sculptured by Donatello. In these competitive works we can see the essential difference between Donatello and Luca: Donatello chiseled his cherubs in forms of strength and vigor; Della Robbia gave his a harmonious grace which was the keynote of all his work.

Next came some commissions for the Campanile—five reliefs, and two altars, only one of which was finished, and the work on the bronze gates of the sacristy. Then Luca, by a happy inspiration, gave up marble sculpture and devoted himself to that kind of glazed terra-cotta work which made him famous throughout Europe. There are many stories told concerning his invention, and it is difficult to say how much is hearsay and gossip and how much is truth. The fact re-

mains that Luca succeeded in covering his clay models with a kind of enamel that not only gave them color, but protected them from atmospheric injury.

In this painted sculpture Luca's peculiar and harmonious compositions found a perfect medium. His art was never lofty and profound; it was concerned with the day-to-day story of the gospels, angels and madonnas who seem a little nearer to us than the great conceptions of more austere sculptors.

THE BEAUTIFUL TERRA-COTTAS THE DELLA ROBBIAS MADE

A very lovely circular enamel of the Madonna and Child is in the Cluny Museum in Paris. A relief of this same subject, which Luca was never weary of showing, is in the Convent of San Marco in Florence. But this is only one of many specimens of the art of the Della Robbias in their native city. The Florentines took a delight in introducing this colored ornament into the churches and convent chapels. Indeed, Luca was given commissions from all over Europe. Andrea, his nephew, took up the family tradition and carried it on with dignity, although his later works show some loss of strength and a leaning toward sentimentality.

A craft so delightful and lending itself so much to decorative ornament, was sure to find imitators. There were followers of the Della Robbias, but they lacked the gifted touch of the family.

About this time Andrea and Jacopo Sansovino were working. Andrea's best-known work is a very fine tomb in a church in Rome; Jacopo's a fine Bacchus in the Florence Museum.

There is something in the story of Italian sculpture that reminds us of a procession with music. All kinds of figures pass by. There is a sweet, tinkling sound of bells and a flute—that is Luca della Robbia; Youth marches along, with banners flying and drums beating—that is Donatello; ghosts of the past slip by, and dear figures out of Bible story. And always we feel there is something more coming; we look along the swaying lines and see presently the last fine figure, hear the last great music, and we say, "Hail, Michelangelo!"

THE COLOSSAL ACHIEVEMENTS OF THE MASTER ARTIST

There is a quality almost terrible in this master's work. Florence, his native city, and Rome were the scenes of his labors. Echoes of the sculpture and painting he did in those cities sounded all over Italy, and made thoughtful men, patrons of art, pass in review the statuary they had considered greatest in the land.

Michelangelo's sculpture was different from the rest of Italian sculpture in three ways—he saw men as giants; he saw them as solitary, mournful giants weighed down by Fate; and he saw these giants as creatures whose mere bodies could furnish the most magnificent lines Nature has created. All the work of his prime shows this threefold characteristic. His work was, in the literal sense of the word, extraordinary ("beyond the ordinary"), sometimes unnatural. It was as grand and impressive as a ceaseless seventy-miles-an-hour gale; or an organ always sounding the full diapason; or a father who never ceased by night or day lamenting those he had lost.

We know that, most mercifully, life and nature do not exist on this exalted plane. If a March storm makes havoc, we may be sure the day is coming when we shall spy the first violet, and smile.

FIGURES OF THE HUMAN FORM THAT MICHELANGELO FASHIONED IN STONE

One cannot easily imagine Michelangelo as taking notice of the first violet. But he might have seen someone dart and stoop to pick one; and the muscles suddenly set into play thereby would have filled him with a kind of frenzy, a passion for the twisted lovely shapes of the human body at that moment.

He would have gone home in a fever of impatience to make an image in stone that would forever hold that moment's posture. And when he had done so, the figure carved would have become mysteriously sorrowful and fateful; it would have become a symbol of a magnificent huge person, who ought to be lifting the world about, stooping to the ground for a trifle. Whereas, as we know, the man was merely picking the first violet to show his baby girl at home.

As we have already said, Donatello had a better influence on posterity than Michelangelo because he was saner. When a sculptor saw a Donatello statue, something fine and strong and natural in it made him feel a distaste for his own little mannerisms. But when a sculptor saw a Michelangelo statue or painting—and the painting was really statuary in line—he was so lost in admiration of its

unearthly twisted grandeur that he would likely go and get a model to contort himself into a position that he could not hold five minutes without fainting, and then the sculptor would begin to model his figure on the same lines. The result was a weak study in anatomy filled with the most copyable of Michelangelo's mannerisms.

THE WONDERFUL GENIUS WHO STANDS APART FROM ALL OTHER MEN IN ART

And this emotion, this twisted grandeur which the poor imitator struggled so hard to express, was achieved by Michelangelo because he could not help it; he thought that way, felt that way, had just such visions. He abhorred the very idea of imitating anything himself. He simply hewed marble according to his own ideas. We see, now, that he was a great genius, but a bad master. Instead of founding a school he founded a company of imitators of his mannerisms. He stands apart; being unique, he should not be taken by everyday people as a model.

We know that part of Michelangelo's time was given, under protest, to painting wall-pictures at the pope's command, but he insisted that he was a sculptor. His earliest relief dealt with a classical story—the battle of Hercules and the centaurs. When he was only eighteen he hewed a marble Hercules about seven and a half feet high.

A little later he was ordered to Rome, and one of the first things he carved was a Pietà—a figure of Mary with the dead Christ—which is now above the altar in one of the chapels of St. Peter's. A Madonna and Child carved by him is now at Bruges.

THE YOUNG GIANT DAVID, THE MEDICI AND A MIGHTY MOSES

The next great work was the immortal David, at Florence, carved by this genius out of a colossal block of marble with nothing to guide him save a tiny wax model he had made. The David showed what Michelangelo could do; this huge, lanky, undeveloped lad, with the head of a Greek god, filled Florence with amazement and is now one of her chief treasures. You will find pictures of the statue on pages 65 and 68.

The most wonderful and memorable work, after the David, are the tombs for Lorenzo and Giuliano Medici. There is a lofty grandeur in this work. The figure of Lorenzo bears no resemblance to the Medici prince: it is a great being meditating profoundly and is called "Il Penseroso" (the thinker). Both the tombs are ornamented by recumbent figures of Day and Night, and these, again, are images of powerful thought, as you may see on page 1743. Neither of these tombs was entirely finished, and two other Medici tombs which had been ordered were never made.

A magnificent tomb for one of the popes was designed by Michelangelo, but the plan fell through owing to the changeable moods of the patron. Later on the sculptor returned to a less extensive plan, and directed the work. The only sculpture for the tomb which he actually finished is the mighty figure of Moses. It is now in the Church of St. Peter in Vinculis, in Rome. Among the works for this tomb, which he left unfinished, are two figures of slaves, and these alone—twisted, savage forms—would be enough to show his peculiar genius. They are now in the Louvre. It was such works—the Moses, quivering with God's anger, the David, the painting of the Last Judgment in the Sistine Chapel, and the unfinished slaves —which had an almost stupefying effect upon the artists who saw them. Michelangelo, as he found expression in his sculptures and frescoes, was, in himself, one of art's revolutions. He was the last great Florentine, the last great sculptor of Italy. His life lasted from 1475 to 1564, but his art has no period.

THE MEN WITH WHOM CLEVERNESS TOOK THE PLACE OF GENIUS

After him came a number of men in whose work cleverness took the place of genius. There were also a few artists gifted in a smaller way, like Cellini, who was almost a wizard in craftsmanship, and Giovanni da Bologna, a Frenchman by birth who worked in Italy. Giovanni's best figure is the Mercury taking flight, in the Florence Museum.

A hundred years after Michelangelo a sculptor was at work, Bernini, whom the people hailed as another Michelangelo. This judgment shows how far Italy was from her prime. Bernini was born in Naples and made a number of statues, all full of gestures and tricks, and lacking the essential poise of great sculpture. He was the chief artistic influence in Rome in his day, but it was a Rome which had forgotten her greatness.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 4699.

SCULPTURES OF ITALY'S GOLDEN AGE



GIOVANNI DA BOLOGNA'S STATUE OF MERCURY TAKING FLIGHT



A PANEL OF THE PULPIT AT PISA BY GIOVANNI PISANO



A DONATELLO GROUP OF HAPPY CHILDREN



FIGURES FROM THE SINGING GALLERIES OF LUCA DELLA ROBBIA AND DONATELLO



A GROUP OF VIVID CHORISTERS FROM DELLA ROBBIA'S FAMOUS SINGING GALLERY



VIVACIOUS LITTLE FIGURES IN THE PANEL OF DONATELLO'S SINGING GALLERY



A LITTLE CHILD, BY ANDREA DELLA ROBBIA



FETTERED SLAVE, BY MICHELANGELO



A BEAUTIFUL PULPIT, BY GIOVANNI PISANO



THE VISITATION, BY ANDREA DELLA ROBBIA



A COLORED TERRA COTTA, BY GIOVANNI DELLA ROBBIA



MORE DANCING CHERUBS FROM DONATELLO'S SINGING GALLERY



DONATELLO'S
ST. GEORGE



JOHN THE BAPTIST, BY
BENEDETTO DA MAJANO



MICHELANGELO'S HUGE
STATUE OF MOSES



THE MADONNA WITH CHRIST AND ST. JOHN,
BY MICHELANGELO



THE PIETA, MICHELANGELO'S GROUP IN
ST. PETER'S



ÆOLUS, BY GIOVANNI BOLOGNA



DONATELLO'S DAVID



VERROCCHIO'S DAVID



THE FAMOUS COLLEONI STATUE IN VENICE, BY VERROCCHIO



A YOUNG CHILD'S HEAD, BY DONATELLO



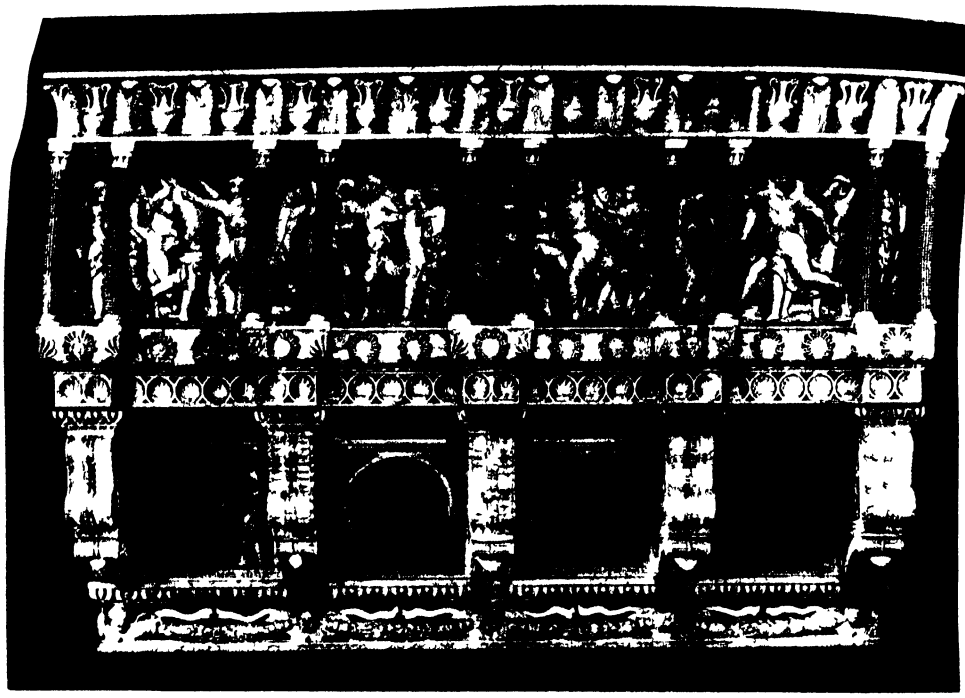
MICHELANGELO'S LORENZO DE MEDICI



AN ANGEL, BY LUCA DELLA ROBBIA



THE GATTAMELATA STATUE AT PADUA, BY DONATELLO



DONATELLO'S SINGING GALLERY IN FLORENCE



LUCA DELLA ROBBIA'S SINGING GALLERY IN FLORENCE

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(c) Ernest Jungmann

A court banquet of about 400 years ago. Note how good manners have changed since that time. The noblemen pictured above keep their hats on, eat with their fingers and toss scraps of food to the dog.

GOOD MANNERS

TO a certain extent good manners are a part of one's character. A worthwhile person might make slips in etiquette and yet not be guilty of really bad manners. The fact remains, however, that a knowledge of the correct thing to do in any circumstances helps all of us to save ourselves and others from embarrassment and unhappiness in daily living.

Much that is merely proper to-day was a matter of life or death in former times, when a man might be run through on the spot for his failure to show respect to his betters. In these days bad manners are fatal in a different way. They are fatal because they stamp us as ignorant or boorish, while good manners show more than knowledge of how to behave. They show kindness, respect for the feelings of others, and, above all, tolerance. It is tolerance which enables us to live in harmony with people who are not like ourselves.

Nothing betrays faulty manners more quickly than the way we act at table. The worst of it is that we are often unconscious of our mistakes. Few people who chew with mouth open, talk with it full and suck up their soup like a powerful pump, do so on purpose. It is more likely that they are careless, as are those who tuck their napkins under their chins, reach far in every direction for what is wanted, sit with faces almost in the food and make a great deal of noise with everything that they put in their mouths. A sound film of their table manners would mortify them.

It is true that the well mannered person at first has much to remember about table manners. After a while, however, all that he is called upon to do becomes so much a matter of habit that it cannot be forgotten.

Women precede men into a dining room, except at formal dinners where they are escorted by an assigned partner. The men seat the women before taking their own places. Napkins are fully unfolded in one direction but only half unfolded in the other; the long part of the napkin is then folded across the lap. Soup is eaten with a large spoon dipped away from the user. In America, a fork is held in the right hand except when it is holding something to be cut. When one has finished eating, he places knife and fork together on his plate, the handles extending over the plate's edge and pointing in his general direction.

To servants passing things, one says nothing when accepting food, "No, thank you," when refusing it. It is polite to take a little of everything offered at a meal, but it is not necessary to eat it. If you drop something on the floor when servants are present, do not dive for it yourself. If it is food, let it go; if an item of the silverware, wait for your chance and ask for a duplicate. Be very free with the words "please" and "thank you" to guests and servants alike.

A GOOD RULE TO FOLLOW

A general rule for what knife, fork or spoon to choose is to pick up the silver at your place in regular order from the outside inward as each course is served. If in doubt, wait for others to lead the way and follow the majority or the hostess, if there is confusion.

Most foods are eaten with a fork or spoon, but there are exceptions in which the fingers may be used. Corn on the cob is held in the hands; asparagus may be eaten with the fingers if the stalks are firm enough, as may nuts, dates, figs and candy. Chicken wings and chop bones are not eaten with the fingers at formal dinners. Steamed clams are eaten with the fingers, having been drawn from the shell by their rubbery necks. Clams and oysters in their shells are eaten with a small fork thrust through the white muscle that holds them to the shell. If a fork or spoon won't do, the fingers may be used in taking things out of your mouth, especially small bones of fish. When you must take something from your mouth, neither flaunt the fact in everyone's face nor choke in an attempt to hide your intention. If you get in serious trouble, excuse yourself and leave the table.

MEETING PEOPLE

Not so long ago it was customary for younger boys to bow when introduced to their elders and for younger girls to curtsy. In these days the bow and the curtsy are seldom seen. Children usually shake hands and say: "How do you do?" as they would if they were grown men and women. One should avoid such expressions as "Pleased to meet you, I'm sure" or "Charmed" or "Delighted, I'm sure." "Good-by" is the one thing to say at leave-taking, and it is customary to shake hands again.

Children and young people can meet one another quite successfully without formal introductions, yet there are times when it is very embarrassing not to know how an introduction is smoothly managed. What one says is simple enough, but there are established customs governing the question as to which person is introduced to which. In presenting people it is enough to say: "Mr. X, may I present Mr. Y?" or, more briefly still, "Mr. X, Mr. Y." By custom, men are always presented to women rather than the other way around, unless the man is very elderly and the woman young, or in a case where the man is an important official or great personage. Young men are presented to older men, young women to older women. A child is always presented to an adult. When making an introduction, by all means avoid saying: "Make you acquainted with" and "Mrs. Jones, meet Mrs. Smith."

Boys and men alike allow the women of the party to precede them into automobiles, street cars, buses and elevators, but go first in getting off in order to be helpful if necessary. In public restaurants, women go first if there is a hostess or headwaiter, in a theatre first, if there is an usher. It is an important principle of good manners in public not to be noisy or conspicuous and not to argue about food or service or the bill in such a way as to cause a disturbance.

PAYING FOR MEALS

When boys and girls are old enough to go out together in public, it is sometimes hard to decide who should be the host and pay for things. A general rule is that one always pays the way of an invited guest. It is quite possible for a girl to invite a boy to be her guest on, let us say, his birthday. Also, young people of to-day frequently share the expenses of an evening's entertainment, because both the girl and boy in question may be earners, and by sharing expenses they can do things that would be beyond their separate means.

There is a limit to these arrangements, however. Young people do not pay each other's way on extended railroad trips, just as a young man never gives presents to young women of his acquaintance that would come more appropriately from their fathers and mothers. Books, flowers, candy and the like are proper presents; dresses, shoes, stockings and valuable jewelry are not.

CONVERSATION

Children can scarcely be too young to learn the basis of good manners in conver-

sation, although the hard part is that the very things they naturally want to do are the things they should not do. Some children interrupt, contradict and show off, and they have a good time doing so. Older people are tempted in much the same way. Only those who have real consideration for others hold themselves in check, remembering how little they like it when somebody else contradicts flatly or makes an exhibition of himself trying to attract attention.

Children often like to talk about themselves and their concerns as long as anyone will listen. Grown people, who are sometimes grown children, are also quite inclined to talk about themselves even though they find fault with other people for doing the same thing. Modesty is generally a feature of well mannered conversation.

Again, nearly everybody likes to argue. Polite people may argue well or badly, depending on their mental training and the amount they know about their subject, but they will always be alike in the manner of their arguing. For them there is never any shouting, never any personal remarks, never any anger. Well mannered argument is quiet, courteous and mindful of the feelings of those involved. Once again, consideration for others is the basis of good manners.

CLOTHES

When children are old enough to choose their own clothes, the question of good manners in clothes becomes important. The color of a girl's dress or the cut of a boy's coat is a matter of taste. But what type of dress a girl wears at a party and what type of coat a boy wears to church is part and parcel of good manners.

The most frequent breach of good manners where clothes are concerned is known as overdressing. This means "dressing-up" too much for an occasion where simpler clothes would have been better manners and probably better common sense. There are many possible examples. For instance, there is the man who wears his dinner coat (Tuxedo) to a simple dinner party at a friend's house. The other boys wear dark suits, and they are right. Or there is the young girl of sixteen who appears at a charade party in full evening dress, sleeveless, low-backed and formal. The other girls wear simple dinner dresses, and they are entirely right.

Over-dressing is not the only kind of bad manners in clothes. One should not go to the city dressed for the country or the other way around. The quality of one's clothes has nothing to do with the matter. The most expensive clothes (or the least expensive, for that matter) may be appropriate or inappropriate according to the occasion.

The safest general rule is to dress as simply as possible and when in doubt as to what should be worn, to dress down rather than up. The other unbreakable rule is appropriateness. Wear the clothes that will be best suited to your surroundings, and you can safely put them out of your mind.

The ability to forget about the impression one's clothes may be making is necessary, because self-consciousness about one's clothes is a cause of bad manners. The right attitude toward clothes may not be easy, but it is certainly desirable. If you possibly can, wear old clothes as if they were new and new clothes as if they were old. In so doing, you may become outstanding but it is safe to say that you will never be conspicuous.

GENERAL RULES

Mention should be made here of certain things so essential to good manners that with most people they are a matter of course. A child cannot learn too early to tip his hat and to take it off altogether in the presence of women and in all private and semi-private buildings. Buildings regarded as semi-private include museums, art galleries and so on. "Please" and "Thank you" cannot be overdone, nor can "I beg your pardon." Staring is bad manners and with staring goes the habit of questioning people too closely when they do not wish to answer.

Things like publicly combing one's hair and cleaning one's nails are very wrong. Careless sneezing and spitting are both poor manners and poor hygiene. Strangers are not to be addressed as "bud" or "lady" or "sister" or "Mack." One says "Excuse me" and asks his question. Young people always stand when older ones enter a room, and men always stand when women enter. The only permissible exceptions are in cases of illness or of physical impossibility.

A few special points may be mentioned. A man accompanied by a woman tips his hat to any man who greets him in passing. There are other circumstances when one may tip one's hat to men. It is a mark of respect that is often accorded to clergymen because of their calling, to prominent officials out of respect for the office they hold and to private individuals who happen to be very distinguished men. When you meet a friend in

company with a total stranger to you, it is more polite to greet them both in a general way than to single out the friend and to ignore his companion. If people make such mistakes as mispronouncing a word, it is far better to repeat their mistake than to point it out by speaking correctly right after them. Even such small matters as these which we have just mentioned illustrate the courtesy and consideration that underlie good manners, as distinguished from mere etiquette.

From evidence found in an old copy-book, gnawed on one edge by rats, we know that George Washington himself was anxious to perfect his manners. When just a lad, not too perfect when it came to spelling and punctuation, he copied out over a hundred rules of good behavior, some of which apply just as well now as they did then. All of them indicate that the motive for good manners has not changed with the years.

Washington was famous in his own day for his great dignity and his right to be considered a gentleman of quality in the sense of which he writes in the copy-book that we mentioned above. In fact so stately and so elegant were his manners that the plain people of the country were a little afraid that he would desire to become their king as well as their president. We know at the present time, of course, that they were entirely deceived by mere appearances.

Given below are some of the more interesting rules for polite behavior which young George included in his list. The reader will note that table manners in the eighteenth century presented many of the snares waiting for us to-day, though some of the rules of that day may no longer be followed. For instance, at the present day we do not cut our bread with a knife at table, but break off a small piece of bread at a time.

GEORGE WASHINGTON'S RULES FOR GOOD CONDUCT

1. EVERY Action done in Company, ought to be with Some Sign of Respect, to those that are present.

4. In the Presence of Others sing not to yourself with a Humming noise, or Drum, with your Fingers or Feet.

5. IF YOU Cough, Sneeze, Sigh, or Yawn, do it not Loud, but Privately; and Speak not in your Yawning, but put your Handkerchief or Hand before your face and turn aside.

6. SLEEP not when others Speak, Sit not when others stand, Speak not when you Should hold your Peace, walk not on when others Stop.

11. SHIFT not yourself in the Sight of others nor Gnaw your nails.

14. TURN not your Back to others especially in Speaking, Jog not the Table or Desk on which Another reads or writes, lean not upon any one.

15. KEEP your Nails clean and Short, also your Hand and Teeth Clean, yet without shewing any great Concern for them.

18. READ no Letters, Books, or Papers, in Company but when there is a Necessity for doing of it you must ask leave: come not near the Books or Writings of Another so as to read them unless desired or give your opinion of them unasked also look not nigh when another is writing a Letter.

29. WHEN you meet with one of Greater Quality than yourself, Stop, and retire especially if it be at a Door or any Straight place to give way for him to Pass.

66. BE not forward but friendly and Courteous; the first to Salute hear and answer & be not Pensive when It's a time to converse.

72. SPEAK not in an unknown Tongue in Company but in your own Language and that as those of Quality do and not as ye Vulgar; Sublime matters treat Seriously.

77. TREAT with men at fit Times about Business & Whisper not in the Company of Others.

91. MAKE no Shew of taking great Delight in your Victuals, Feed not With Greediness: cut your Bread with a Knife, lean not on the Table neither find fault with what you Eat.

94. IF you Soak bread in the Sauce let it be no more than you put in your Mouth at a time and blow not your broth at Table but Stay till Cools of it Self.

95. PUT not your meat to your Mouth with your Knife in your hand neither Spit forth the Stones of any fruit Pye upon a Dish nor cast anything under the table.

96. IT'S unbecoming to Stoop much to ones Meat Keep your Fingers clean & wipe them on a Corner of your Table Napkin.

97. PUT not another bit into your Mouth til the former be Swallowed let not your Morsels be too big for the jowls.

98. DRINK not nor talk with your mouth full neither Gaze about you while . . . Drinking.

99. DRINK not too leisurely nor yet too hastily. Before and after Drinking wipe your Lips breath not then or Ever with too Great a Noise, for its uncivil.

FIRST AID TO THE INJURED: LESSON II

THE BONES AND ARTERIES OF OUR BODY

IF we are going to be successful in rendering first aid to the injured, we should know something about the human body and particularly about the position of the various bones and arteries.

First of all, it is important for us to know how the skeleton is made up; the picture on this page will help us a great deal. We can find the various bones in this picture and then feel where most of these bones are in our own body. The skeleton is really the framework upon which our body is built up, and in it there are more than two hundred bones. These form the supports and levers of our bodies. We ought to learn the names of the more important of them.

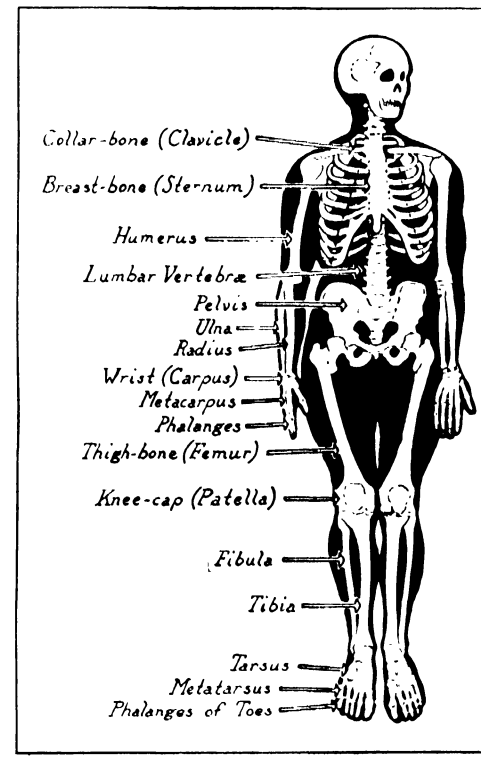
THE HEAD

The head, including the face, is formed of twenty-two bones, all joined together and fixed, with the exception of the lower jaw. The head is made up of a front bone, called the frontal, a back bone, called the occipital (which means simply *back of the head*), two bones forming the crown, two forming the sides and two more the base or floor of the skull. In the face there are fourteen separate bones, including the jaws, but we need not mention these in detail.

THE TRUNK

The second great division of the body is the trunk, which is divided into two parts—the chest or thorax and the lower part or abdomen. Running right down the whole length of the body from the skull to the extreme end of the back, through the thorax and abdomen, is a long column of small bones joined together by cartilage, which is elastic enough to allow the body to turn from side to side and bend forward or backward. This column has twenty-four bones altogether and it is called the vertebral column; another name is vertebræ. These names come from a Latin word which means *to turn*. The vertebral column is also called the spine or backbone; but of course it is not one bone but twenty-four. The bones are hollow rings and right down the middle of the column runs the spinal cord, which is connected with the brain. Some of our nerves run from the brain and some from the spinal cord.

The chest or thorax is like a cage. Part of the spine forms the back; the breast-bone or sternum, which means breast, forms the front; twelve pairs of curved bones, known as the ribs, form the sides. Inside this cage are some of our most important organs—the heart and the lungs. The part of the skeleton in the abdomen is known as the pelvis, which is a Latin word meaning *basin*. It consists of several bones, the best known

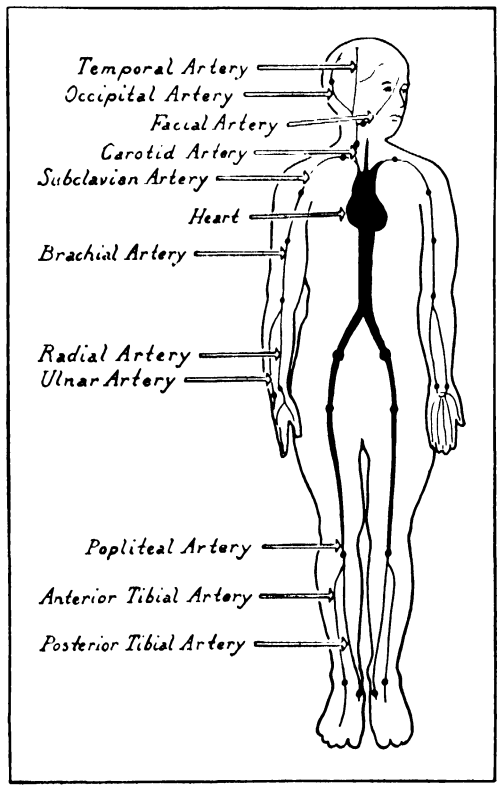


1. The bones of our body.

of which is a large irregular bone that comes from the back right around to the front; the upper part of this is known as the hip-bone. In children this large bone is in three parts, with cartilage between to allow for growing, but in grown-up people it is one hard bone. On each side of this bone is a socket, into which the ball-like head of the leg-bone fits and in which it can turn around when we walk, jump, dance, bend and so on.

The other divisions of the body are known as the extremities, the upper extremities being the arms and the lower the legs. The arms are joined to the trunk on each side

by a shoulder-blade or scapula and by a collar-bone or clavicle. The collar-bone can be felt on either side of the neck like a rod. Its outer end joins the shoulder-blade. The upper bone of the arm is called the humerus, which is the Latin word for *shoulder,* and this reaches from the shoulder to the elbow. It is joined to the two bones of the forearm —the radius or outer bone and the ulna or inner bone.



2. The arteries of our body. The spots show where, in case of injury, we press to stop bleeding.

The bones of the hand are made up of those of the wrist, the palm and the fingers. There are eight little bones, arranged in two rows of four forming the wrist, or carpus. Then there are five bones called the metacarpus; these come between the wrist and the fingers, and they form the knuckles. The finger-bones (there are three in each of the fingers and two in the thumb) are aptly called phalanges. The word phalanges is the plural of the Greek *phalanx,* which means battle-line. The name was probably given because all these little finger-bones when arranged and working in proper order suggested a battle-line.

The bones of the leg correspond to the bones of the arm. There is the large upper or thigh bone, called the femur, which means *thigh* in Latin. This is joined to the two lower bones, the large tibia, or shin bone, outside, and the thinner fibula inside. The leg has what the arm has not—a little plate of bone laid over the joint of the upper and lower bones. This is the kneecap, also called the patella.

The bones of the foot are very much like those of the hand, and indeed the French call the toes the fingers of the feet. In place of the wrist, there is the tarsus or ankle; in place of the metacarpus there is the metatarsus; then there are the phalanges or toe-bones, two in the great toe and three in each of the others.

THE CIRCULATION OF THE BLOOD

We now come to the arteries. The organs that are engaged in that most important work of causing the blood to circulate through our bodies are the heart, the arteries, the capillaries and the veins. The heart is like a large pump, that pumps the pure blood into the arteries; from the arteries the blood is pumped into small vessels called capillaries. The blood, having now become impure passes into the veins and is carried back to the heart, to the side opposite that from which it was pumped out. It is then pumped up into the lungs, where by our breathing, it receives fresh oxygen, giving up its carbonic-acid gas and thus being purified. Passing to the heart it is then pumped through the body once more by way of the arteries and capillaries and so the process continues.

THE ARTERIES

It is essential that we should know the position of the principal arteries of the body, as arterial bleeding is very serious. We can learn from the picture on this page the position of the chief arteries. The picture also shows the places at which pressure is to be applied to stop bleeding. It should always be remembered that the blood coming from an artery is scarlet, while blood coming from a vein is dark red. The blood from an artery comes out in spurts, while vein blood flows out smoothly.

The carotid arteries, right and left, pass up on each side of the windpipe and then divide into branches which supply the brain

and head. The facial artery crosses the lower jaw and sends branches to the chin, lips, cheeks and nose. The temporal artery can be felt in front of the upper part of the ear. The occipital artery is behind the ear, and carries blood to the back of the head (as we have seen, occiput means *back of the head*). So much for the arteries of the head.

The subclavian artery can be felt pulsating if one passes one's finger over the collar-bone at its inner end and presses downward and backward, the shoulder being pressed down with the free hand, so as to bring the artery up nearly to the finger that is feeling for the pulsation. The axillary artery is a continuation of the subclavian, and can be felt if the fingers are pressed into the armpit while the arm is raised well away from the side. The brachial artery is an extension of the axillary artery; it runs down the inner side of the biceps muscle to the front of the joint in the hollow of the elbow. Its course roughly corresponds to the direction taken by the inner seam of the coat. The brachial artery divides at the elbow into the radial and ulnar arteries, which course down the bones after which they are named to the wrist. At the wrist we can always feel the beating of our pulse, which is the blood passing through the radial artery. From the wrist it branches out into the hand and fingers. It forms a curve in the hand, called the palmar arch.

The aorta, which is the largest of all the arteries, is in the thorax. It arches up from the heart and then descends into the abdomen, where it divides, to the right and to the left, into the iliac arteries.

The femoral artery is a continuation of the iliac. It enters the thigh in the middle of the groin, where its throbbing may easily be felt, and passes in a winding line to the back of the knee, where it is called the popliteal artery. There it divides into two branches. One passes down the back of the leg as the posterior tibial artery to the inner side of the ankle, entering the sole of the foot as the plantar arteries. The other branch —the anterior tibial artery—passes forward between the tibia and the fibula, and runs to the instep and the space between the great and fourth toes. At the instep it is called the dorsal artery of the foot. Passing over the tarsus to the sole, it forms, with the plantar arteries, the plantar arch.

In learning the positions of the bones and arteries described in this article, we should practice placing our hands upon the right positions in our own bodies. The pictures in this article will help you to do so.

The next lesson in this series of first-aid suggestions is on page 4849.

THE PUZZLE OF THE TREES IN THE PARK

A WEALTHY gentleman had a fine park in the country. One day he found that a storm that had raged during the previous night had blown down a number of his trees. He telegraphed therefore to a nurseryman to send down 24 young trees that might be planted in place of those that had been destroyed by the destructive storm.

When the trees came, the owner of the park told his gardener that he wanted the 24 trees planted in such a way that there would be 28 rows, each containing 4 trees in a straight line. The gardener thought that the gentleman had undoubtedly made a mistake in the number of rows, so he asked him again just how he wanted the trees to be planted. The gentleman repeated that he wanted 28 rows of 4 trees each. The gardener, thoroughly puzzled by now, repeated that this was impossible with 24 trees.

"You know, sir," said the gardener, "that I have studied arithmetic at school and I certainly learned enough arithmetic to do a simple problem in multiplication like this one. If there are 28 rows of 4 trees each, you must multiply 28 by 4 to give you the total number of trees that will be necessary. This total will be 112."

"No," said the gentleman, "24 trees will quite suffice. Come into my study; I will draw a plan for you, and you will see exactly how I want the trees to stand. When I have drawn the plan for you, you will agree that it is easy, even if one has only 24 trees, to have 28 rows with 4 trees in each row."

The gardener wondered how his employer could be so silly, but he followed the latter into his study. In a moment or two the gentleman had drawn his plan. The gardener studied it carefully and then confessed that the task which at first had seemed impossible was really quite easy. How were the trees planted? The plan showing the 28 rows is given on page 4737.

HOW TO MAKE TILES OF CLAY

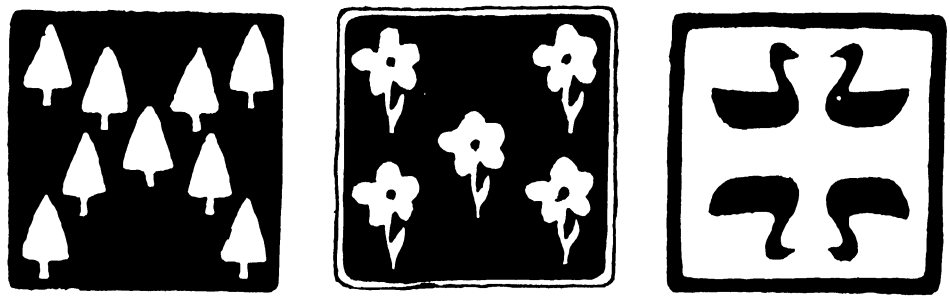
THE first thing to do in making a tile of this sort is to choose the size and shape of the tile. The tiles shown in the illustration were made 6 inches square, and this is a good size. Next, you are to draw a design on paper; it is best to do this before you actually begin to work the clay.

A lump of rather stiff clay is then kneaded and flattened out into a layer about ½ inch thick and a little larger than the proposed size of the tile. The layer of clay is then placed on a level surface and is worked gently to the desired thickness. A knife or clay tool may be used to trim the outer edges to the shape that has been planned. The clay thus shaped is next worked carefully in order to make the surface even before the piece of clay is moistened with a sponge or cloth and put away to dry.

When the clay has dried, you are ready to transfer the design to the surface of the tile. First trace the design on transparent tracing paper. Then put a piece of carbon paper over the surface of the tile, put the tracing paper on top of the carbon paper and trace your design. Bear down lightly on the clay, just enough to make the lines of the design visible on the surface.

If you have not already decided upon the exact colors for the design, you will find it necessary to decide whether you prefer to have a dark pattern with a light background or a light pattern with a dark background. Both types of patterns are shown in the above illustration. The tile can then be colored according to this scheme of dark and light; bright water-colors should be used. When the paint has dried, the surface of the tile is covered with a colorless glaze and then fired (see our article on page 2741).

When it is completed the tile may be set upon a tablecloth and upon it may be placed articles (such as coffee pots or tureens) that are too hot to be put on the tablecloth.



Three designs for square tiles.

THE PROBLEM OF THE TRAVELER'S DINNER

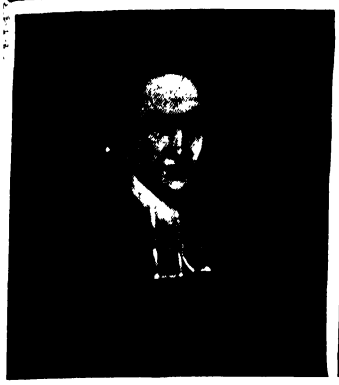
A LONG time ago two Arabs who were traveling to Bagdad stopped at a small village for their midday meal. One of them had 5 loaves of bread with him and the other only 3. Just as they were about to begin eating, a stranger came up and, saying that he had money but no food, asked if he might share their meal. He promised to pay for what he had, and so the two travelers agreed to divide the loaves equally among the three, and they invited the stranger to sit down with them.

After the meal was over and all the food had been eaten, the stranger laid down 8 coins of equal value in payment for the food he had eaten, and, bidding his hosts good-by, went away. The traveler who had 5 loaves took up 5 of the coins as his share, and left 3 for the man who had 3 loaves. But this man insisted that he should have received half the money.

The men began to quarrel bitterly, and as they could not agree they went before a magistrate, so that he could decide who was right. The magistrate listened attentively to the story which the men had to tell. Then, to the astonishment of both, he said: "Let the man who had 5 loaves take 7 of the coins and the man who had 3 take only 1 coin."

Was his decision just? The explanation which he gave will be found on page 4737.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 4731.



Jonathan Edwards.



John Winthrop.



Cotton Mather.

AMERICAN LITERATURE

I. IN COLONIAL TIMES

WHEN we begin to study the literature of the United States we find no primitive literature. Europe had grown up before this nation was founded, and the men who founded it thought and wrote as Europeans of the seventeenth century. The bards and troubadours were gone, and the early leaders had no minstrels to sing their deeds to the music of the harp, or to hand down the story of their heroic adventures by word of mouth. This does not say, however, that American literature has no inheritance from the past, for the early settlers brought with them to their new home the great heritage of English literature as well as the English tongue.

Naturally, then, the early American literature is English in its character. It was not until the coming of a generation whose fathers were born on American soil that we begin to see the growth of anything like independent thought showing itself in writing. And for a long time, almost two centuries, American writers continued to model their works on English patterns.

The first books written in America were A TRUE RELATION OF SUCH OCCURENCES AND ACCIDENTS OF NOTE AS HATH HAPPENED IN VIRGINIA, published in London, in 1608; and A MAP OF THE BAY AND THE RIVERS WITH AN ANNEXED RELATION OF THE COUNTRIES AND NATIONS WHICH INHABIT THEM. Neither of them was intended as a book. They were reports for the Virginia Company, written in the first years of the Virginia colony by Captain John Smith. Yet the Captain contrived to put into his reports so much vigor of expression and beauty of language that in places they come very near to being what we call literature. As time went on, attempts were made in Virginia to write poetry, but it was of little interest. Books of travel and history give us a better idea of life in the colony, and the BURWELL PAPERS, a history of Bacon's Rebellion, THE HISTORY OF THE PRESENT STATE OF VIRGINIA, written by Robert Beverley in 1705, and Colonel William Byrd's HISTORY OF THE DIVIDING LINE BETWEEN VIRGINIA AND NORTH CAROLINA make good reading. These are of much interest to students of history.

The early New England settlers also began at once to write accounts of the new conditions under which they had to live. Governor William Bradford of Plymouth wrote THE HISTORY OF PLYMOUTH PLANTATION, down to the year 1646. Governor John Winthrop of Massachusetts Bay wrote THE HISTORY OF NEW ENGLAND, which is really an account of his own governorship. From these and other histories Nathaniel Hawthorne later drew his tales of Puritan life. The writings of the governors are interesting, but we can scarcely give the name of literature to either of the books or to others that came after them. The most interesting writing of this period is Nathaniel Ward's SIMPLE COBBLER OF AGAWAM, a satire.

There was no such poetry produced in New England in the seventeenth century as



A picture from Captain John Smith's TRUE TRAVELS, printed in 1608.

poets and dramatists were then writing in Old England. Life in New England was too stern and grim; and even if Milton himself had joined one of the bands of Puritan settlers, he might have been so overwhelmed by the terrors and hardships that his imagination would have been blocked. It is hard for us now to imagine the dense forests along the Atlantic coast into which the colonists slashed their way, and which they believed were the haunts of evil spirits. It is almost as hard to make real to ourselves the ever present fear of the bands of Indians that lurked in the pathless woods, or to keep in mind the scarcity of books and pictures and music and everything that makes life gay. Nor can we well understand the hardships endured and hard work done by everyone—men and women, boys and girls alike.

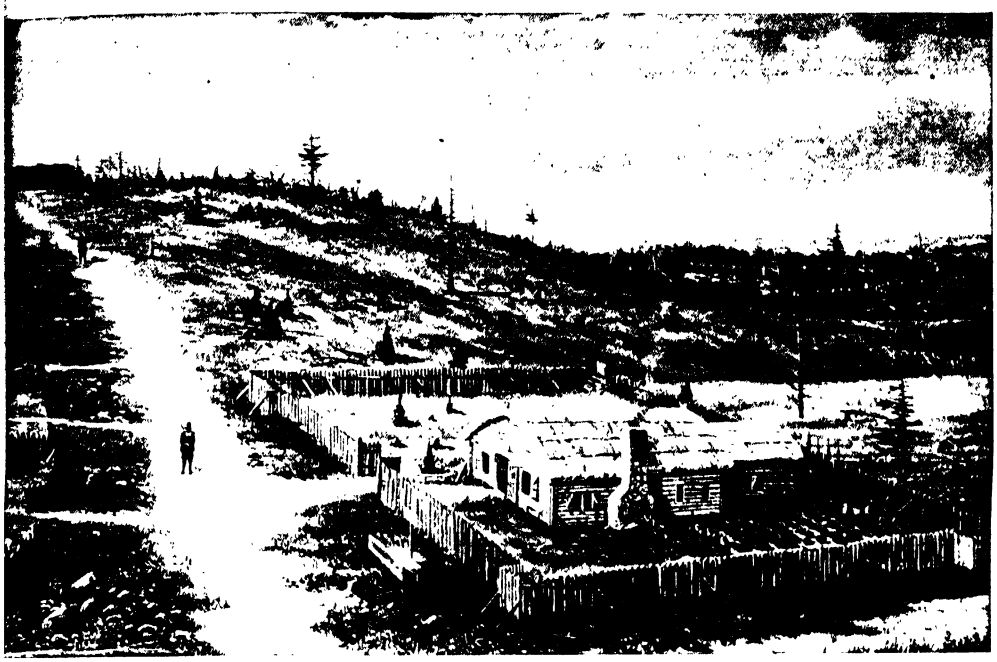
Life was so hard that it would have been a wonder if anything like real literature had been written. Indeed, almost the only men who had leisure to write in the early days were the ministers of the churches, whose duty it was to occupy both time and imagination in composing learned sermons, each one of which consumed two or three hours in the preaching. It was an age of long sermons and great preachers. Sunday was strictly and sternly kept, and everyone, down to the smallest children, had to go to church. The sermons were well remembered, too. They were discussed during the week by the fireside, in the fields and at the blacksmith's shop and even in the tavern. They took the place of books, for the general run of people had no books except their Bibles.

So for anything approaching literature in the first century and a half of New England life we must fall back on sermons by preachers such as Roger Williams, Richard Mather and his son Increase, Thomas Hooker and Thomas Shepard, men of learning who spent their lives in preaching and writing on religious topics. Cotton Mather (1663-1728), the son of Increase, is famous for an ecclesiastical history of New England known as *Magnalia Christi Americana;* and Michael Wigglesworth is noted for a poem called THE DAY OF DOOM, which is really a sermon in verse. It pictures the sinner in torment in the hereafter.

All these preachers were great men of their time, but greatest among them all was Jonathan Edwards, who belongs to the eighteenth century. He was born in 1703 at East Windsor, in Connecticut, where his father was pastor. Jonathan was not only the son of a minister but also the grandson of a minister. When he was thirteen he entered Yale. He graduated at the age of seventeen, then studied for the ministry, and after some time was made assistant to his maternal grandfather at the church in Northampton, Massachusetts.

After his grandfather's death he was

SCENES IN EARLY NEW ENGLAND

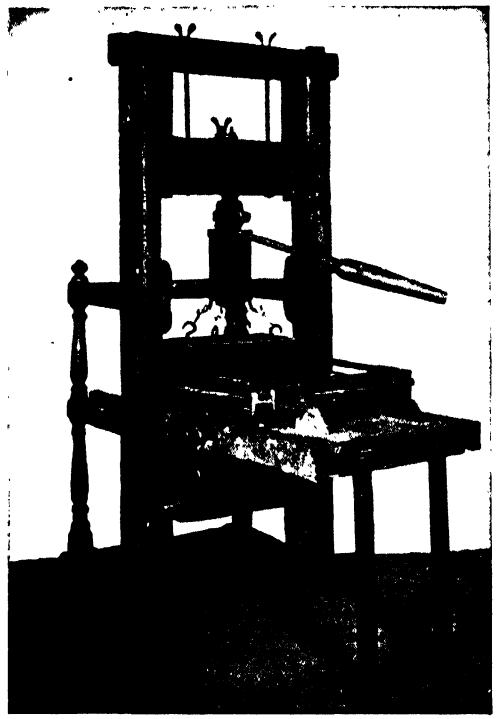


Governor Bradford's house, on Leyden street in Plymouth, where he wrote his history of the colony's early years.



Culver Service

When Roger Williams was persecuted in Massachusetts the kindly Narragansett Indians sheltered and protected him.



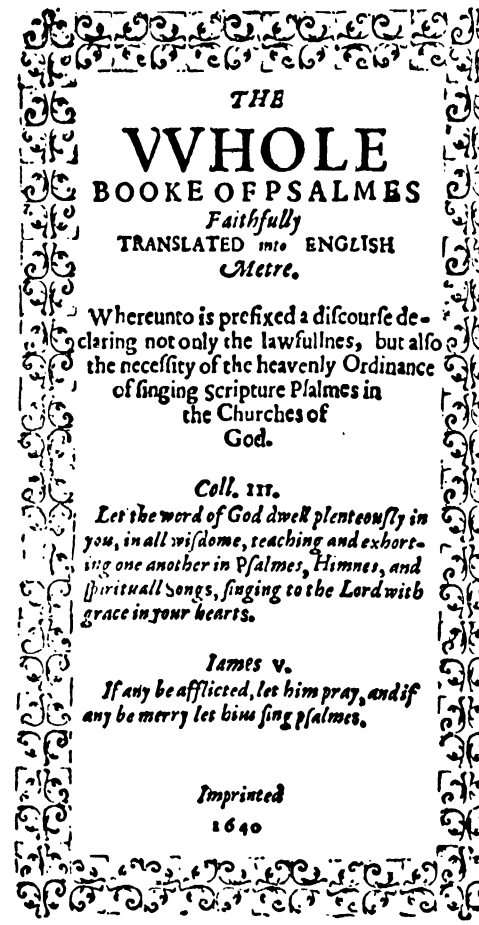
Courtesy, Vermont Historical Society
Stephen Daye had the first press in the colonies.

placed in full charge of the church, which he had already made famous throughout New England by his preaching. His sermons were the cause of a religious revival known as the Great Awakening. Very terrible some of these sermons were, especially one which is called Sinners in the Hands of an Angry God. They had a deep effect on the minds of people at that time. In New England, during this period, religion was a deadly serious matter. People were taught more about the judgment of God than of God's love.

Edwards lived at Northampton from 1727 until 1750. Then his congregation quarreled with him, partly because he objected to the young people's reading and talking about worldly books, such as the new novels which had begun to come over from England. He was compelled to leave the church where he had taught so long. He found a new home at Stockbridge, Massachusetts, where he taught the Indians and a handful of white people. While there he had leisure to write THE FREEDOM OF THE WILL, which is the greatest of his books. This brought him renewed fame, and about the end of 1757 he was chosen president of the new college at Princeton. He died there in the beginning of 1758, almost before he had taken up his new duties.

Jonathan Edwards is still spoken of as the most original of American thinkers, and his books have had a profound influence on students of theology and metaphysics. They are, in the first place, books of philosophy, but they are so well written that they may be classed as literature. If we were to read his sermons alone, we would probably think he was a hard, stern man, but the real Jonathan Edwards was the man who said:

So that, when we are delighted with flowers, meadows and gentle breezes of wind, we may believe that we see only the emanations of the sweet benevolence of Jesus Christ. . . . When we behold the light and brightness of the sun, the golden edges of an evening cloud, or the beauteous bow, we behold the adumbrations of his glory and goodness; and in the blue sky, of his mildness and gentleness.


THE
WHOLE
BOOKE OF PSALMES
Faithfully
TRANSLATED *into* ENGLISH
Metre.

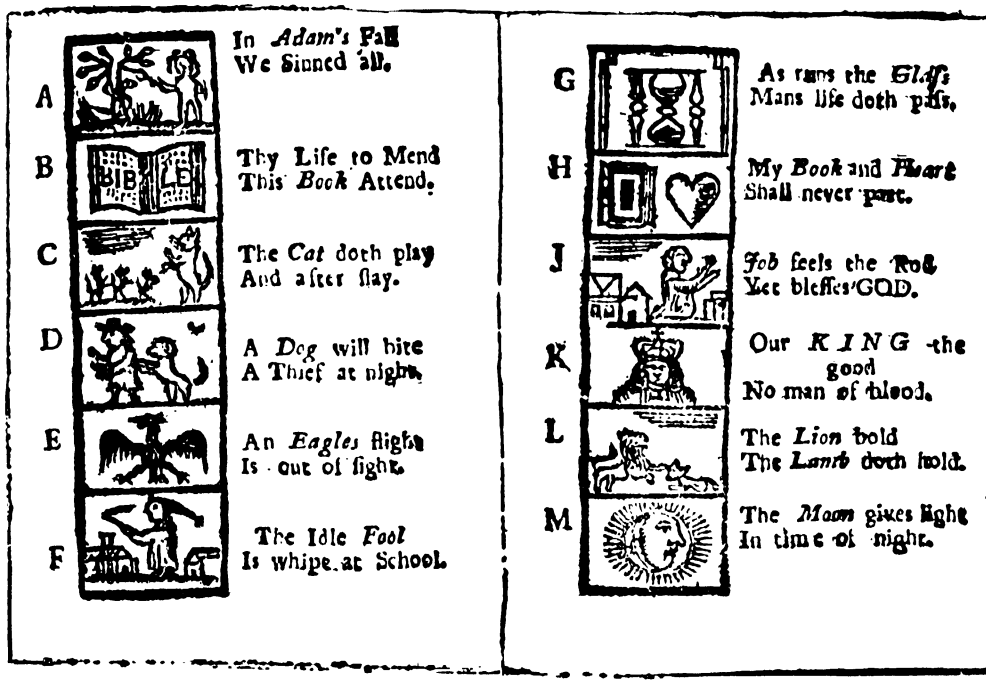
Whereunto is prefixed a diſcourſe declaring not only the lawfullnes, but alſo the neceſſity of the heavenly Ordinance of ſinging Scripture Pſalmes in the Churches of God.

Coll. III.
Let the word of God dwell plenteouſly in you, in all wiſdome, teaching and exhorting one another in Pſalmes, Himnes, and ſpirituall Songs, ſinging to the Lord with grace in your hearts.

Iames V.
If any be afflicted, let him pray, and if any be merry let him ſing pſalmes.

Imprinted
1640

The title page of the BAY PSALM BOOK, the first book to be printed in what is now the United States. It was printed in 1640 by the Daye printing press.

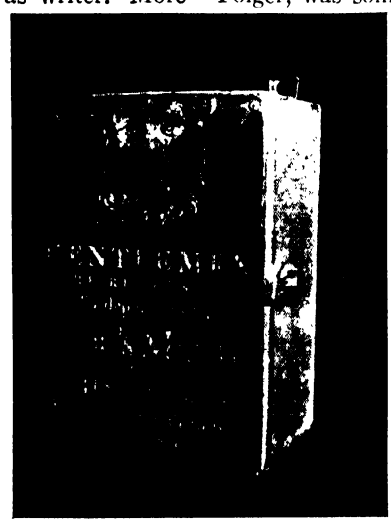


Two pages from the NEW ENGLAND PRIMER, a book from which many generations of New England boys and girls learned their letters. It was compiled and printed in Boston before 1690 by Benjamin Harris, who had come over from England and started a printshop. The crude wood-cuts and sometimes doleful rimes lend it a quaint charm.

The man who wrote that was a poet at heart.

Benjamin Franklin (1706-1790), to whom we come next, was greater as statesman, diplomat and scientist than as writer. More than anyone of his day, he may be compared to some of the many-sided men of the Renaissance, and he probably exerted as much influence on his own times and the times that came after as any other man who lived in his generation. It is as a writer, that we must think of him here; and to understand him as a writer we must go back a little way and glance at the time that came immediately before him.

By the year 1800 more books had begun to come into the colonies. The works of Pope, Addison, Swift, Locke and others were brought over by men who had been educated in England, or were imported by merchants and sold. Young men even began to write in imitation of Addison and Pope. Franklin's own grandfather, Peter Folger, was something of a poet, and when Franklin himself was a boy his father was able to point out mistakes that he made in composition.



Courtesy, Library Company of Philadelphia

The suggestion box in Benjamin Franklin's circulating library in Philadelphia.

Benjamin Franklin lived so long in Philadelphia that we associate him with that city, but he was born in Boston in the year 1706. So, you see, he was only three years younger than Jonathan Edwards. He went to school for two years, and when he was ten years old his father, a candle-maker, took him into his own shop. The boy did not like candle-making, however, and when he was twelve he was apprenticed to his brother James, who set up a printing-press and had begun to publish

a journal. Benjamin liked this much better.

James Franklin had been for some time in London, where he bought his press, and had brought back with him a small library of well-selected books, all of which were devoured by Benjamin, who had already read everything he could get. The printing house, with its bookish atmosphere and the constant talk and criticism that went on among his *there went to work as a printer. He loved Philadelphia, and for the next twenty-five years he lived there, engaged in printing and other pursuits. As he grew in prosperity he* wrote essays and found time for philanthropy, inventions and science.

At this time almanacs were much in demand, especially in the country, where an almanac was often one of the very few books



Courtesy, Franklin Printing Company

Benjamin Franklin started his printshop in 1728. Here the artist, Edward Penfield, shows him hauling paper.

brother's friends, was an excellent school for his eager mind. He soon began to write, with Addison for his model and his father at times for critic; and by the time he was sixteen he felt sufficient confidence in himself to slip an anonymous essay under the door of the printing office. It was accepted and printed, and Benjamin Franklin was soon a regular contributor to the paper.

In 1723, however, the two brothers seem to have quarreled. Benjamin quietly left home, and made his way to Philadelphia and to be found in most every household. In 1733 Franklin under the name of Richard Saunders, began to publish one of these useful books. The calendar was interspersed with witty sayings, proverbs, verses, anecdotes and short stories, each with its moral. The work became so popular that as many as ten thousand copies were sold in one year; and the proverbs, with their short, pithy sentences, became household words. By such sayings as "Remember what Poor Richard says, Many a little makes a mickle," and

"THUMB" PORTRAIT



Photo by Philip P. Wallace

Benjamin Franklin as he looked in his sixtieth year, 1765. The painting from which this picture was made is in Independence Hall in Philadelphia, and was copied from the original portrait, known as the Martin portrait, or sometimes the "thumb" portrait, because of the way in which Franklin has placed his thumb against his chin.

"Beware of little expenses, a small leak will sink a great ship," and hundreds of others like them, he taught thrift and practical common sense for a quarter of a century. Then he gathered the best of them into a preface for the last year, and this discourse, as he called it, has been reprinted hundreds of times in both English and French editions.

Franklin as a writer is best known in our day through POOR RICHARD'S ALMANAC and his autobiography, which is one of the best that has ever been written. But he also wrote a large number of essays full of racy, homely humor that was not English but American, and he has been called the first characteristically American writer. His essays belong chiefly to political literature, which was brought to a high state of excellence toward the close of the colonial period, and besides these he wrote some dainty trifles like THE EPHEMERA, which was well known to school children a generation ago.



Phillis Wheatley (1753?-1784), a slave born in Africa and educated by her owners, was the author of many poems.

He founded in Philadelphia a club called the Junto, for literary and scientific research. The members gathered their books together in the house of Robert Grace in Pewter Platter Alley, now known as Church Street. From this beginning at Franklin's suggestion was established the first circulating library which is still in continuous existence in America.

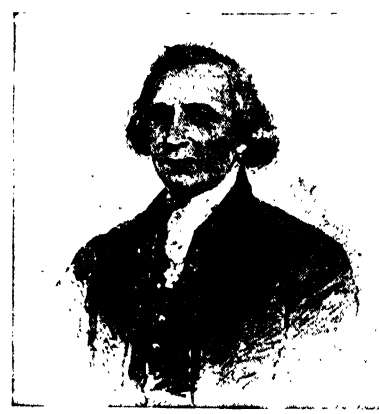
From time to time the library shifted its quarters, and during the occupation of Philadelphia by the British in 1773 Carpenter Hall, its site at the time, was used as a hospital for the British forces. The library, however was not harmed at all, and after the war a new building was erected and occupied until 1880, when the site of the present library was entered upon. When in Philadelphia we can see the first invoice of the library.

Franklin's high esteem for books and printing is plainly reflected in the epitaph he wrote for himself:

The body of B. Franklin, Printer, (like the cover of an old book, its contents torn out and stript of its lettering and gilding) lies here food for worms, but the work shall not be lost, for it will (as he believed) appear once more in a new and more elegant edition, revised and corrected by the Author.

Toward the period of the Revolution the whole tone of literature in the colonies changed to a really astonishing degree. People turned from the discussion of sermons to the discussion of politics. From imitating Addison and Pope, writers turned to composing satires and political pamphlets. It is not easy for us now, perhaps, to realize the stormy days through which the country passed in the years immediately before and after the Revolution. But by reading some of the innumerable pamphlets that were published at the time we can get some idea of the excitement and see the growth of revolutionary feeling.

James Otis and John and Samuel Adams, of Boston, Francis Hopkinson and John Dickinson, of Philadelphia, Philip Freneau and Alexander Hamilton are the most famous of these writers. From the point of view of literature however, of all these by far the most interesting is John Dickinson (1732-1808), who wrote LETTERS FROM A FARMER in Philadelphia and also the greater part of the Declaration of Rights and the Petition to the King.



Culver Service

Philip Freneau, sometimes called the Poet of the Revolution. His poems on nature are considered his best work.

The man, however, who had most influence in stirring the people was Thomas Paine (1737-1809), a fiery Englishman who had come to the country in 1774. He wrote COMMON SENSE and THE CRISIS, a series of sixteen pamphlets, the first of which begins with the famous words: "These are the times that try men's souls. The summer soldier and the winter patriot will, in this crisis, shrink from the service of his country; but he that stands it now, deserves the love

and thanks of man and woman."

It was not a time when men could sit down quietly to think and write for the sake of creating some thing of beauty. We look vainly for great imaginative literature either in this period or in the years that succeeded the Revolution, when the country was in a state of chaos.

The only thing of real note with which we can end the eighteenth century is a collection of papers or essays which were written after the Constitution was signed. These papers are, however, of genuine merit. There was some doubt whether New York would ratify the Constitution, and Alexander Hamilton suggested to James Madison and John Jay that between them they write a series of essays to explain it, so that people could understand it. Eighty-five of the essays were written, and of these Hamilton wrote at least fifty-one and probably several more. The whole collection became known as THE FEDERALIST, and is famous as the first explanation of the Constitution and its meaning. It is still read, and when the Union of South Africa was being formed no book was more frequently quoted.

A little poetry was written, but it is not read now. Francis Hopkinson wrote the BATTLE OF THE KEGS; and Philip Freneau's INDIAN BURYING GROUND is remembered. Thomas Godfrey wrote the first play in verse, called THE PRINCE OF PARTHIA. Joel Barlow's VISION OF COLUMBUS is amusing, though the author did not intend it to be so. A Negro girl, Phillis Wheatley, wrote verses which were much admired.



Culver Service

Joel Barlow, painted by Robert Fulton; and Thomas Paine, by Romney.

THE NEXT STORY OF LITERATURE IS ON PAGE 4707.



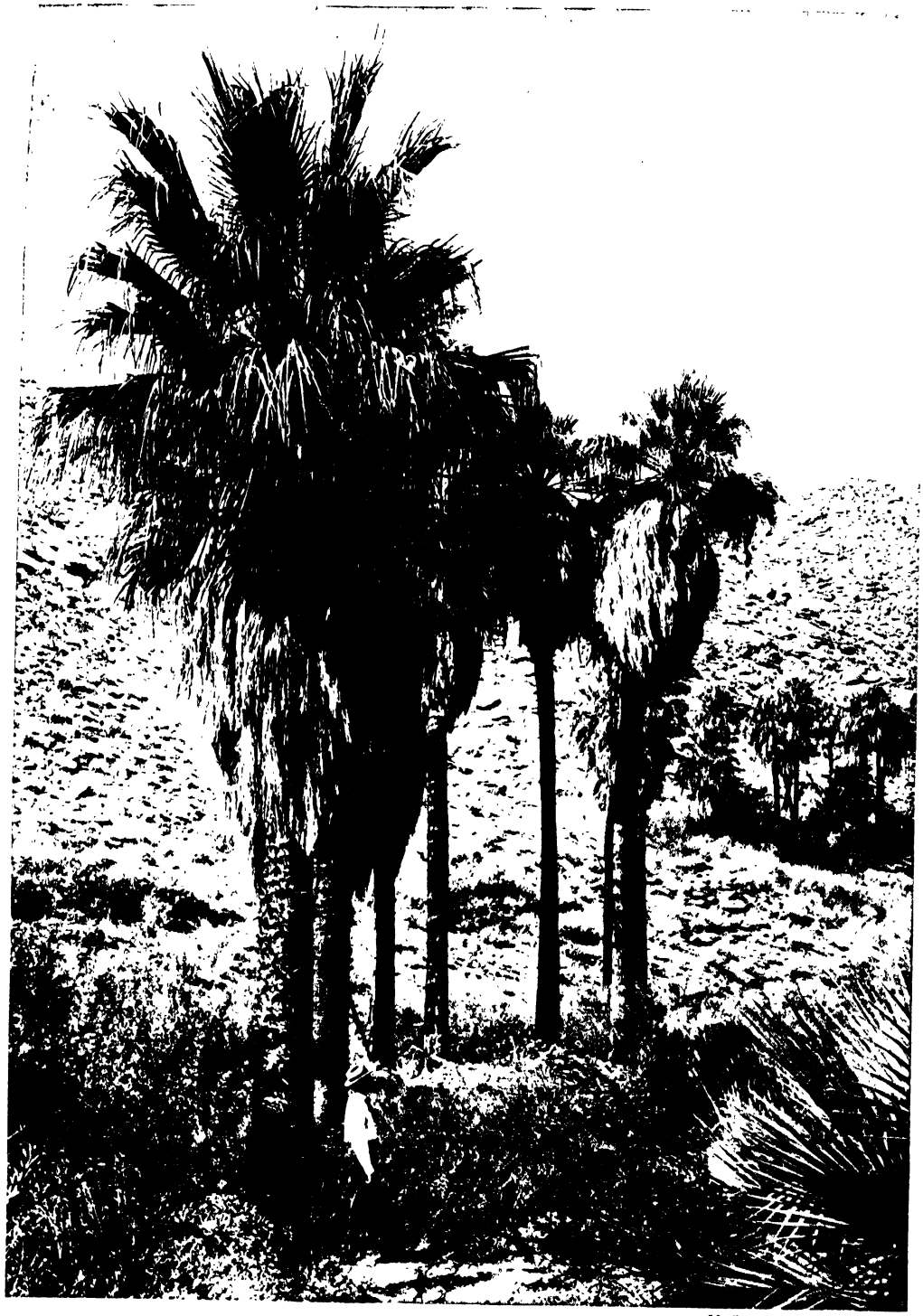
The old schoolhouse in New Rochelle, New York, preserved as a relic in the little park near the house of Thomas Paine.



Both photos by Charles Phelps Cushing

For his services in the Revolution, New York gave Thomas Paine a farm near New Rochelle. The house has been moved to a park in the town.

THE "BEARDED" CALIFORNIA PALM



U. S. Forest Service photo

The dead leaves of this palm remain on it for some years, forming a shaggy mass beneath the living crown.

AMERICAN TREES IN WINTER

HOW many of us can name the trees we see in winter? Perhaps not many, yet if we have ever walked through leafless groves with a forester, we have found that he can recognize the different trees very readily. When the trees are thus crowded together he identifies them partly by shape and partly by the bark—the smooth gray bark of the beech, the deeply furrowed bark of chestnut or walnut, the silvery, or golden, or rich brown coat of the birches, and so on.

Even we can see the difference between the pale, smooth skin-like covering of a beech trunk and the chalky white covering of the "silver-vested" birches that curls back in thin sheets. If we should tear off a strip of this, we should find that it would come away like a ring, leaving a belt of fawn-colored underbark encircling the trunk. How different both of these are from the ragged fibrous bark of the cedar, from which shreds are continually fluttering in the wind, or from the rough, somewhat scaly bark of the white pine, and the furrowed bark of the chestnut which reminds us of latticework.

When we take our winter walks, it is amusing to see how many of the commoner trees we already can tell by sight. The evergreens, of course, are the easiest to know. Nearly every park has plenty of them; we find others growing wild in the fields and woods. Evergreens are conifers. That is, they bear cones, and, as you know from the name, most of them do not lose their leaves in autumn, as maples and elms and oaks do. Included among the conifers are cedars, pines, hemlocks, spruces, firs, sequoias, cypresses and junipers. There is a tendency nowadays to call all evergreens fir trees. In the strictest sense the firs are those evergreens having their needle-like leaves growing from the branchlets singly, instead of in clusters as the pines and larches do. The spruce trees, Douglas fir, silver fir, juniper, cypress and yew are true firs.



Courtesy of the Davey Tree Expert Co.
The grace of the birch is revealed in winter.

The cedar is perhaps the most common evergreen. There are several species known by this name, though they are really junipers, and together they cover this continent from ocean to ocean. We often see young trees, with tightly crowded foliage, and shaped exactly like a paintbrush, standing in rows by fences, velvety green where the sunshine rests upon them, but almost black in the shadows. The fragrant little leaves, like scales, are wrapped around the twigs; and on some trees, bluish berries nestle among them. These bring the pretty, gray-brown cedarbirds, or cedar waxwings, with their wing feathers tipped with color precisely like drops of scarlet sealing-wax. They whisper quietly to each other as we pass through the cedars, then return to their feasting on the resinous berries.

Other birds come to the cedars for shelter, and they carry off streamers of the fibrous red-brown bark to weave into their nests. Long ago, before the time of Columbus, the Indian, too, learned how to weave the bark into ropes and sandals, although it is short and brittle. When the trees grow in groups, the trunks grow straight and tapering like masts, but when in fields or on the tops of sand dunes, where the wind blows them

roughly, the cedar tree becomes broad and low, and often one-sided—a tree that painters love to draw.

Its rosy wood is very fragrant, and campers delight to throw it on a bonfire so as to smell the odorous smoke. This fragrance seems to be disagreeable to moths, however, so that chests for woolen clothing are made from cedar wood. It is also the best material for cigar boxes. It is so soft and easily cut with a penknife that nearly all of our pencils are made from the wood of the odorous cedar.

We have all heard the story of the English yew, and how it was bent into bows that made English archers famous. On the Pacific coast there is another yew which looks very much like that of the Old World. It has the same flattened spray with rigid leaves, and the tapering cedar-like trunk, which reminds one of a group of slender columns pressed closely together and covered with a purplish, shaggy, fibrous bark. Its wood is tough and elastic, and the Indians have always used it for bows and paddles just as the Europeans did. The Canada yew is only a shrub, and there is another small yew in Florida. The foliage and the seeds nestling in the bottom of a scarlet, fleshy cup are poisonous.

THE TALL PINES, WHICH FILL OUR WOODS WITH FRAGRANCE

There are many kinds of pines, most of them valuable, which grow in America. We generally think of them as furnishing tar, pitch and turpentine (called naval stores), or lumber. In fact, this was the reason why the magnificent white pines of New England were considered to be so important that Massachusetts placed a figure of a pine on her colonial shillings. Maine is called the Pine Tree State and has a pine tree in her state coat-of-arms.

But only where the white pine grows in an open space do we see it spreading in the broad pyramid-like form that we think of when we say "shaped like a pine tree." In forests it grows tall and straight, as the lower limbs are killed by shade. It may even reach the height of two hundred feet; and these giant tapering trunks, of firm, compact wood and straight grain, were sought as masts for sailing vessels as well as for many other purposes. Nowadays so many white pines have been cut down that the lumber is rather scarce, and pines with harder wood, or inferior woods, are used in their place.

There are five needles, as the leaves are called, growing together in each little case, or sheath. This is a point to be remembered. The cones are long and slender, with thin, narrow, shingle-like scales that readily open. These scales (in some pines they are thick and stiff and knobbed) in all pine cones serve as little roofs to shelter a pair of winged seeds fitted into hollows at their bases. When the seeds are ripe and the weather is warm and dry, these penthouse roofs are raised, and allow the seeds to fall out and twirl to the ground. But as soon as the weather becomes damp, the scales slowly shut down, and overlap or fit close, to keep the seeds from becoming wet. The scales act also as a protection, or armor, to defend the seeds from being eaten by animals. But they are not proof against the clever red squirrel, nor the attacks of certain birds, called crossbills, that have bills with queer-looking crossed halves, which are just right for tearing apart the pine cones.

The Pacific coast has another pine, quite as large as the white pine, which has a huge cone more than a foot long, but scarcely more than the width of a palm across. The seeds are good to eat. This tree is called sugar pine because it is one of the several trees with sweetish sapwood that used to be scraped off by Indians for a delicacy.

The eastern hemlocks do not seem to have tempted anyone to eat them, unless partridges indulge in the tender sprays. Once hemlocks furnished much of the cheap splintery lumber used in house-building; but like all of our other important trees, they have been reduced in number. The bark of the hemlock is used for tanning leather.

NATURE'S SHELTER FOR SMALL WILD LIFE, THE HEMLOCK

A hemlock tree forms a splendid refuge for little birds as well as for owls and little beasts. Many a ruffed grouse and rabbit has snuggled warm and dry under a low, swinging hemlock branch weighted down by snow. It is easy to tell the hemlocks. The narrow, little leaves are arranged on two sides of a twig, forming a knife-like spray, and their cones are very tiny. The tree, especially when young, is one of the most graceful of our evergreens.

Young hemlocks are likely to perch themselves on rocky ledges where they seldom get a good foothold for their roots; hence they frequently blow over. They seem to be, also, a special mark for lightning: I have seen a little tree in half a second stripped of all its greenery and branches, while the white core, broken at the top, and still glistening







All pictures, U. S. Forest Service

A warm-climate cedar, the deodar.

Eastern red cedar trees.

A Western sugar pine.

with sap, protruded from the wreckage, standing piteously among its feathery, untouched neighbors.

In the South and West not only the cone-bearing trees but other kinds carry their leaves over the winter. California boasts of its great fan-palm, one of the few native palms, which sometimes grows sixty feet high, and which is often used in gardens to give a tropical air. The dead and dried leaves of many years droop in a shaggy mass, like a great fringe, beneath the living crown of green fan-shaped foliage.

South Carolina, on the other hand, prides itself on the palmettos, trees which stand stiff and quaint along her coast, as well as along the coasts of more southern states. Although of no great value as a timber tree, the palmetto has been closely connected with the history of the state. A revolutionary fortification on one of the islands in Charleston's beautiful harbor was built of earth and palmetto logs. These are spongy and elastic, and when the British fleet in 1776 bombarded this fort, the logs received and imbedded the balls without splitting.

The palmetto appears on the state flag of South Carolina—the Palmetto State, and a crooked palmetto rises in the center of the state's present seal.

During the Civil War the tree with a rattlesnake (apparently twenty or thirty feet long) wound about its trunk was figured on the banner and on the seal of the seceding state. Cockades were made of strips of foliage. Oddly enough, none of these pictures shows the proper palmetto foliage, each leaf of which is shaped like an ordinary palm-leaf fan, split at the edges into slender divisions.

Strips of these leaves are woven with rushes into baskets and various trifles. The bases of the young leaf stalks, surrounding the solitary bud at the very tip of the trunk, are filled with long, strong fibers. This bud, containing all the growing parts of the tree, is ruthlessly cut out, killing the palmetto, in order to get the fibers, which are made into brush bristles. The bud itself is sometimes cut out and boiled as a vegetable—whence the name, cabbage palmetto.

Both East and West have evergreen, or live, oaks in their southern parts. The live oak of the southeast is generally draped with quantities of Spanish moss, but that of California displays its dome-shaped head without the hoary veil. The leaves of this oak resemble those of holly, and remain on the tree until the new ones appear. The acorns are long and slender, and were eaten by Indians.

Of all the many trees that shed their leaves in the winter there are several that one can learn to know at a glance. Probably the buttonwood, or plane tree, is the easiest to discover. Look for it along the banks of streams or in damp places, for although it grows elsewhere, the buttonwood likes to



Winter winds swing the seed balls on a sycamore tree.



Both pictures, courtesy of the Davey Tree Expert Co.
The low-swinging hemlock shelters birds.

have plenty of moisture for its roots. In fact, it often grows so close to water courses as to be undermined by them, and then tumbles in, while the great disc of roots rests edgewise on the bank. This tree can be seen afar, for great flakes of its dingy thin bark fall off, leaving curious white patches of inner bark gleaming on trunk and limbs. Countless balls of seed swing gaily from its branches through the winter. Toward spring they are broken up. They are composed of little nuts, each with a tuft of rusty wool, and the birds help to tear them apart. In the Mississippi Valley the buttonwoods (or sycamores, as they are often called) grow to a great size, but are then often decayed within, only a mere shell of their wood and bark surviving. Early settlers utilized these vast hollow trunks, sometimes ten feet across, for smokehouses, grain bins and the like, and even constructed shelters for themselves by cutting great pieces of the thin walls of the cavity.

THE TOUGH WOOD OF THE HORNBEAM, OR IRONWOOD

Not far from the sycamore, we may find the small shapely hornbeam, or ironwood. Both of these names refer to the extremely white and surprisingly hard wood contained in the slender furrowed trunk. It has many uses. So tough is it that home-made brooms could be fabricated out of fine strips of ironwood. A "withe will last almost as long as iron wire, and an oxgad . . . is nearly equal to a leather one."

The flexible branches of the European hornbeam, which closely resembles ours, were woven together to make those curious walled and roofed alleys of old-time gardens. Blue beech it is sometimes called, because of its blue-gray bark smoothly stretched over its hard-looking, irregular trunk and limbs, and from the similarity of its foliage and round head to the beech. Of course it is not a beech at all.

We shall doubtless see some sumacs when we are tramping across barren fields. There is nothing easier to distinguish on account of the cone-shaped masses of berries, each covered with crimson plush, which hold their own bravely during the winter.

In another article we have spoken of the poison sumac with its poisonous, dry white berries hanging like grapes. While all are closely related, it is to be remembered that any sumac with velvety red fruit is safe to handle. In fact, one may taste the red plush berries, but they are very acid and not agree-

ible. Chickadees love them, and continue to visit the spires until they have swallowed all the seeds. In winter we see why the staghorn sumac is so called. Its thick, awkward, extremely brittle branches have a curve upward not unlike a deer's horn.

The shagbark is a tall handsome hickory which farmers often leave standing in their pastures on account of the sweet-flavored nuts it bears. If it is a full-sized tree, it will have a rather small and narrow head with a few crooked branches, bristling with smaller ones, pointing more or less upward. The trunk is generally tall, straight and slender, and it looks as if it had been shingled rather badly. Long narrow strips of its gray bark have become loosened at the sides and lower end and are attached only at the top, whence they hang like flaps or "shag." The hickory is famous not only for its seed-kernels, but for its strong, durable wood, which also makes splendid firewood.

ZIGZAG BRANCHES MARK THE CROWN OF THE SASSAFRAS

In searching for the shagbark, let us not confuse with it the quaint sassafras. Sassafras is also rather tall and straight but has a peculiar crown. The branches look as though they had started to grow to the right, then to the left, then swung back, and so on. The branchlets grow stiffly and crookedly upward, giving an oblong, round-topped outline which curiously reminds one of a many-branched candlestick. The lower bark is deeply furrowed, gray and corky looking, but the upper and smaller branches are smooth and yellowish green.

The sassafras is one of the trees that grows smaller and smaller northward. In Canada it is almost a shrub. But it is extremely difficult to get rid of, for the merest fragment of root will start growing. The aromatic, warm-tasting, orange-skinned roots are the most valuable part of the sassafras. Probably the colonists learned to include them in root beer by discovering that the Indians before them had made a drink out of sassafras.

At one time there were many black walnut trees scattered throughout the timbered lands, especially in the great forests of the United States. They were so common, and the wood was so readily split, that people made fence-rails out of them, saving one or two trees somewhere, perhaps, for the sake of the rich nuts. Then there was a call for black walnut as a material for cabinetwork and furniture. Its rich brown, hard and firm



U. S. Forest Service

The stiff, brush-like palmettos of the deep South.

wood can be readily polished and is light as well. But the demand for it, and the wasteful ways of the early settlers, caused the larger trees to be entirely destroyed, and we seldom see fine specimens unless they have been saved near houses, or in an occasional pasture. Then we shall find that it becomes a noble tree with a broad, rounded head supported by a straight trunk, and widespreading heavy limbs, somewhat awkward in their manner of branching. The lack of delicate spray, and the odd, horn-like arrangement of the stubby branchlets, give the black wal-

nut, when leafless, an unfinished, gaunt look.

The white oak at first glance might be confused with a black walnut, for it also has a splendid dome-like head. But it branches more regularly, is straighter and is subdivided into smaller twigs. Its immense lower limbs stretch far out, level with the ground and not far above it. It is likely to have many faded leaves clinging to the twigs throughout the winter. They are oval in shape, with regularly and deeply indented edges. The bark is rough and pale, and the wood is also light-colored, tough and elastic. One should always be able to tell the white oak either in winter or summer, for it is one of the most valuable of our trees, not only on account of its majestic form, but also for its timber.

A wild-wood tree, that we shall scarcely find growing north of Philadelphia except in cultivation, is the catalpa, or Indian bean, as the settlers in the South called it, having an idea that the slender cylindrical pods looked like snap beans, and being in the habit of calling any native object "Indian" this or that. Certainly no Indian had any interest in the "beans" of the catalpa, for they contain nothing but rows and rows of winged seeds overlapping one another and forming a central rod in the leathery shell. The pods swing from the twigs all over this ungainly tree, with its short trunk and wide-spreading, not to say sprawling, branches.

The catalpas lack that delicate feathering of small twigs that we call spray, but this is the chief feature of the elm, the beech and the birches. The beech's twigs grow smaller and finer as they approach the ends of the branches and are finished by the long, sharp leafbuds; but the birches have the most exquisite spray of all of our trees, except perhaps that of the American elm. In fact, winter is the best time to see the birches, for then the delicate twigs, too fragile, it would seem, to stand the stormy weather, but really so flexible as to bend before it and thus escape danger, stand out clearly against sky and snow. And when spring comes and the yellow-powdered tassels are trembling on the spray, they are tossed and flung about by the elastic branches, thus scattering the powder to be carried on the wings of the wind.

Other trees may be recognized in winter by their sprays. Of course the evergreens can always be studied at this time, but trees which lose their leaves can also be named, such as the pepperidge, with its shelf-like branches closely set with tiny branchlets which bristle in every direction. Then there is the hackberry, with its fine spray rather like that of an elm but dotted with numerous small, round, dried fruits. Birds eat the thin, sweet flesh. The dogwood, too, may be known in a moment by its upturned twigs, topped by gray, squarish buds like buttons. Color in the woods appears when the sprays of willow and maples are painted with pale green and gold and rose tints, which proclaim the coming of spring. Certain shrubby dogwoods also wear the spring's livery, but children know best the black and gold of the willow wands, on which crouch silky pussies under their shell-like tents. The children bring great bunches home.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 4774.



All pictures, courtesy of the Davey Tree Expert Co.

These trees may be told apart in winter by their shape and their bark. Bark hangs down in loose strips on the shagbark, on the left; the hornbeam, in the center, has a smooth bark; and the bark of the sassafras is furrowed.



What Is *the World's* Wheat Championship?

EVERY year many agricultural shows are held in Canada and the United States. Farmers bring their products in competition for prizes. By common consent the International Grain and Hay Show, held in Chicago for many years, is considered to be the most important. Many prizes are offered and growers from any country may enter. The winner is recognized as the champion of the world for the year. Prizes are offered for wheat, oats, barley, rye, as well as for field peas, field beans, soybeans and for hay from various forage plants.

Canadians have won first prizes for some of these every year, and in wheat and oats they lead all other countries. The spring-wheat record is amazing as the championship has been won by Canada every year except four. Herman Trelle, of Wembly, Alberta, has won the wheat championship five times and might have won oftener but for the rule which bars a three-times winner from competition for three years. He has also won the championship for oats three times and for peas five times.

The Junior Grain Clubs have been coming to the front, in Alberta particularly. There are over a hundred of these clubs of young men under the supervision of the Alberta Department of Agriculture. A group of young men forms a club agreeing to follow the instructions of a qualified leader. A small quantity of wheat, or other grain, especially suited to the locality, is furnished to each with expert advice as to treatment. The members are taught how to recognize and judge the desirable qualities in the grain in which they are particularly interested. The members compete with one another for prizes and inter-club competitions are also held. The winners often enter their grain at various agricultural shows where they often win prizes over older men. They have been successful at Chicago in competition with the world.

In 1933 Ian Smith, aged 20, won the oats championship, and in 1934, Jack Allsop, aged 19, won the wheat championship. In 1938, F. Lloyd Rigby, aged 20, won the wheat championship, while his brother, William Justyn Rigby, aged 23, won the championship for oats. A year later, Lloyd Rigby repeated his triumph, while William Skladen, aged 20, won the oats championship. Lloyd Rigby's third wheat award, in 1940, brought the championship to Canada for the twenty-sixth time.

Other members of the clubs won prizes at Chicago in 1939. Twelve of the first eighteen Alberta winners for hard red spring wheat were club members. They also won ten of the thirteen awards to Alberta for oats and four out of seven for barley. They have also won many prizes at other shows.

WHY IS THE MAPLE LEAF CANADA'S EMBLEM?

In the Canadian landscape the maple tree holds a commanding place. During the summer months its massive foliage casts a cool shade over the hillsides and in the valleys. The earliest settlers valued it for its beauty and its utility. It supplied them with wood for their homes and luscious syrup and sugar for their tables. With the first frosts of autumn the maple trees burst into a flame of gorgeous color and far and near the forests were ablaze with a crown of crimson and gold. Little wonder that Canada became known as "The Land of the Maple Leaf."



Other lands had adopted plants or flowers as national symbols. France, which for a century and a half controlled the destiny of Canada, had the fleur-de-lis; England, Canada's mighty mother, the rose; sturdy Scotland, the thistle; and Ireland, the delicate shamrock. For long years the maple leaf was accepted by Canadians as the emblem of the beauty and abundance of their homeland. After World War I it was decided to have a new coat-of-arms for the Dominion and the maple leaf was a part of the design. It was now officially recognized as the emblem of Canada. On the shield of the arms is a three-leaved branch of the maple tree, and above, in the paw of the King's lion, is a red maple leaf, in recognition of Canada's sacrifices in the first World War.

WHAT IS GYPSUM AND WHAT ARE ITS USES?

As gypsum is a mineral which is found all across the United States and the Dominion of Canada, you have perhaps visited the mines where it is quarried or where it is worked underground.

Gypsum is a non-metallic mineral, a compound of lime, sulfuric acid and water, called chemically calcium sulfate, with the chemical formula $CaSO_4$. It is so soft that it can be easily cut with a knife and can even be scratched with a fingernail. In its natural state it is white or yellowish white in color. It is found in beds or sometimes in masses of crystals. In this form it is known as selenite. *A very fine grade, usually white in color though it is sometimes tinted gray, yellow or pink, is called alabaster. This has a soft luster and resembles marble. It is often used in place of marble for decorative purposes. Attractive vases, lamps, book ends and statuettes are made from it. It is sometimes used* in ornamental work on buildings.

Over half the gypsum that Canada produces is exported in the crude state; but in the United States there are many plants where it is prepared for commercial use. It is made into plaster and cement, into fireproof building blocks, and some is used as a valuable fertilizer.

Gypsum plaster was first used near Paris and a very fine quality is still called plaster of Paris. This is chiefly used in making casts, and by dentists for taking impressions of teeth. Wall plaster is essentially the same as plaster of Paris.

In making plaster, gypsum is heated to a high temperature, or calcined. This drives off much of the water which naturally occurs in gypsum. When the ground product is then mixed with water, the water again combines with it to form hard, interlacing crystals. The plaster "sets."

WHO ARE THE DIONNE QUINTUPLETS?

On May 28, 1934, there were born to Mr. and Mrs. Oliva Dionne of Callander, Ontario, five baby girls, who were named Annette, Emilie, Yvonne, Cecile and Marie. While the birth of twins is common and that of triplets fairly so, it is rare for four babies to be born at one time, and still rarer for five. In fact, there have been only thirty cases on record before this, and in none did the children live more than a few days after birth. That the Dionne quintuplets survived is due largely to the skill of the attending physician, Dr. A. R. Dafoe, aided by all the resources of modern medicine. So great was popular interest in the babies that the Province of Ontario appointed guardians to protect them. Annette, Emilie, Yvonne, Cecile and Marie have grown into charming girls, unspoiled by the attentions the world has showered upon them.

WHAT IS ASBESTOS AND FOR WHAT IS IT USED?

Asbestos is a strange mineral that has come into many uses because it is not affected by fire and because it is a poor conductor of heat. It was known to the ancient Greeks, who gave it its name, which means "unburnable." Charlemagne, it is said, had a tablecloth made of asbestos, and his method of cleaning it was to have it thrown into a fire.

Asbestos is found in many countries of the world, but the largest mines are in Canada. In fact, Canada ranks first in the production of asbestos. More than half of the world's supply comes from her mines in Thetford, Quebec.

When asbestos is first brought from the mines, it is a heavy fibrous substance. After it is put through crushing machinery, it becomes light and fluffy and the fibers are separated. These are made into yarn, felt, cloth, board and such things.

Asbestos has many uses and new ones are always being found. You are all familiar with the little mats used on the stove to keep the flame from burning the contents of a pan or kettle. In most places theaters are required by law to have an asbestos curtain as a safeguard against fire. Asbestos is also used for brake linings in automobiles, and for jackets on steam pipes. Asbestos felt is used for floor coverings, roofing and electrical insulation. Asbestos fibers are mixed in cements, paints and plasters to make them fireproof.

THE NEXT WONDER QUESTIONS ARE ON PAGE 4824.



A segment of asbestos rock ore. The fibers are being separated from the rock so that they may be used for weaving.



Both pictures, N. F. B.

Heavy drilling machines are employed in asbestos mining. More than half of the world's asbestos is found in Quebec. Without valuable asbestos there would surely be great loss of property and perhaps life through uncontrolled fires

THE TREASURE IS FOUND AT LAST



Captain Flint had buried the treasure and then had killed one of his men whom he doubted. Ben Gunn, who had been marooned upon the island, later found and removed the treasure. When Long John Silver, the leader of the mutineers, got possession of the map, the gang made for the spot where the treasure had been buried. While discussing what had become of the treasure they were attacked.



Pictures, courtesy, White Studio

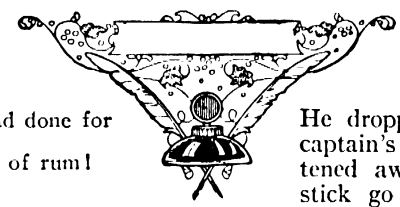
Later Ben Gunn led Jim and the others to the cave to which he had removed the treasure. There were bags and chests which had rotted, and the gold had spilled upon the floor so that one could pick up handfuls of it. It was divided fairly, and then the Hispaniola had a safe voyage to the home port.

A STORY OF SPLENDID ADVENTURE

TREASURE ISLAND is a boy's tale of adventure, written for boys, with a boy for a hero. Many grown-ups as well as boys and girls read and re-read the story. The story grew out of a map which Robert Louis Stevenson drew and colored one day to entertain his little stepson, Lloyd Osbourne. On the map he marked names at random, and then built a story around this chart. The chart of the island is given as the frontispiece of the book, but its whereabouts in the sea is not mentioned. The story was first published in 1881 as The Sea Cook, and appeared in Young Folks, a boys' magazine. In 1883 it came out in book form, and has now been made into a play. The pictures show some scenes from the play. Long John Silver is the villain of the story.

TREASURE ISLAND

FIFTEEN men on the Dead Man's Chest—
Yo-ho-ho, and a bottle of rum!
Drink and the devil had done for the rest—
Yo-ho-ho, and a bottle of rum!



A rugged old seaman, with a sabre-cut on his cheek, sang his favorite song again and again, and the Admiral Benbow Inn, in a little English village, echoed and re-echoed with the chorus. When he was not out upon the cliffs scanning the sea with his brass telescope, he was sitting in the corner of the parlor near the fire. Sometimes he called for his rum. When Jim Hawkins, the innkeeper's son, brought it to him, he sang his old wild sea-songs in his high, quavering voice.

"Jim, my lad," he said one day, taking the boy into his confidence, "keep your weather-eye open for a seafaring man with one leg." Then he told Jim thrilling tales of storms at sea, and of the wild deeds on the Spanish Main. Especially he spoke of Captain Flint, a pirate.

On one occasion Dr. Livesey, the village physician, warned the old seaman to stop drinking rum or he would die. The sudden appearance of a sailor named Black Dog and the fight between them caused the captain to have a stroke. He told the doctor and Jim that old Flint's crew were after his sea-chest. Several days later a blind man turned up and forced Jim to lead him to the captain's room. He dropped something in the captain's hand and then hastened away. They heard his stick go tap-tapping into the distance.

"You have till ten to-night," read the captain. "Ten o'clock!" he shrieked, and sprang to his feet, but then reeled and fell with a heavy thud to the floor. Jim called his mother, but nothing could be done for the captain—Billy Bones was dead.

Jim and his mother rushed to the village for assistance. But no one would venture to the inn, for the name of Captain Flint filled them all with terror. However, they gave Jim a loaded pistol, and offered to go for armed assistance. Alone, the two returned to the inn, and ventured into the parlor, where lay the body of the dead captain. There on the floor near his head was a piece of paper with a black spot, and around his neck hung the key to his treasure-box.

Snatching the key, Jim hurried to the box, opened it, and found on top trinkets, pistols and sticks of tobacco. Underneath was a canvas bag filled with gold, and a bundle tied up in oil-cloth. His mother snatched up the bag and took from it the amount the captain owed her. Jim picked up the oilskin packet and concealed it in his

breast. Frightened by footsteps in the distance, they hastened away from the house.

Breathless with fear, they saw a group of eight men, led by a man with a lantern, dash into the house. They heard them running to and fro, overturning the chairs and tables in their search. Finding that someone had been through the sea-chest, the blind man, Pew, told the others to find the boy Jim Hawkins.

They scattered to search, but at the sound of a pistol-shot, evidently a signal, all the pirates rushed away. Only old Pew was left behind, begging them to save him. As he turned, bewildered, some horsemen bore down upon him. He was struck by the flying hoofs, and moved no more. The riders proved to be revenue officers.

Jim rode to tell Dr. Livesey the news and handed him the oilskin packet. This contained a map and other clues to Flint's treasure, which was buried somewhere on an island far away.

The doctor, Squire Trelawney and Jim studied the map of the island. It showed three crosses, and beside one was written: "Bulk of treasure here." The squire decided to fit out a ship to seek the pirates' treasure. With him he would take the doctor and Jim.

Ready for the voyage to Treasure Island, the treasure ship, the Hispaniola, stood at the dock. Long John Silver, an old one-legged sailor, had offered to provide the crew. In a few days Silver got together a company of the toughest salts imaginable. Jim was wild with delight at the prospect of going to sea—going with a piping boatswain and singing seamen—going forth to seek buried treasures on an unknown island.

Waiting at the tavern for the ship to sail, Jim chanced to see Long John, and decided that he was the one-legged sailor whom he had been told to watch for at the old Benbow. There also he noticed Black Dog, the man with two fingers missing, who had visited the inn. Silver pretended not to know that Black Dog and Pew, the blind man, had been buccaneers. Jim was suspicious, but he was soon lost in admiration of Long John and his parrot, as the sailor told him stories of ships and seamen and taught him nautical phrases. Captain Smollett became suspicious when he found that the crew knew of the treasure-hunt.

Long John Silver, in spite of his crutch, commanded respect from all the sailors. With his parrot, Captain Flint, perched on his shoulder, he would jump along on his crutch as nimbly as any other man could walk. Every man on board worked well, and all was quiet until the last day of the outward voyage. That evening at sundown Jim went to get an apple from a big barrel on the deck. He heard voices talking in excited fashion, and jumped quickly inside the barrel.

So hidden, Jim heard Silver telling the story of his connection with Flint and the other pirates. Silver planned to steal the treasure map and then put the non-pirate party to death.

Just then the voice of the lookout shouted "Land-ho!" There was a great rush of feet across the deck, and the sailors hurried away.

Jim rushed from his hiding-place as all hands came on deck. Captain Smollett was issuing orders to anchor on the south side of the island. He showed Long John a chart, a copy of the original found in Billy Bones's chest, complete in all details, with the single exception of the red crosses and the written notes. Long John's eyes burned as he took the chart, but he was doomed to disappointment. The next morning the Hispaniola was anchored, and orders were given to lower the boats. The crew began to growl over the work. Fearing serious trouble, the captain decided to let the men go ashore. So Silver and thirteen of the crew embarked. With a loud cheer they took to the boats, thinking to get at the treasure before the others could locate it.

Jim foolishly slipped over the side of the ship and concealed himself in the nearest boat. The crews raced for the beach. When the boat Jim was in reached the shore, he jumped out and plunged into the nearest thicket. Silver spied him, and shouted after the lad, but he only hurried on and ducked out of sight.

Some hours afterward Jim heard a bustle among the bulrushes and recognized Silver's voice. He made out that Silver was trying to persuade one of the honest hands to mutiny. Upon his refusal, Silver whipped the crutch out of his armpit and hurled it at the sailor, knocking him down. Then, agile as a monkey, the old pirate jumped at the fallen man and killed him.

Silver picked up his crutch, and blew a whistle which summoned the desperadoes. In mortal fear, Jim dashed out of the thicket and ran in the direction of the boat and away from the murderers. As he sped along he heard a sound, and turning, saw a shaggy dark figure leap behind the trunk of a pine. In terror of this new apparition he pulled out his pistol. The wild figure hesitated, then fell on his knees and held out his clasped hands in supplication. This was Ben Gunn, a former member of Flint's crew, who had been marooned on the island for three years. He offered to tell the secret of the hiding-place of the treasure for a thousand pounds and a passage home.

Meantime the doctor and the squire learned that Jim had gone ashore with the rest. So they hastened to provision a boat and went ashore in quest of information. Leaving one man with a loaded pistol to guard the six sailors on the ship, the others made for the stockade which had been erected by Flint and his party. When they had entered the fort, they saw seven of the mutineers coming toward them. The squire and the doctor fired, and in return ball after ball whistled around them.

"Where do you suppose Jim is?" said the doctor. Just then someone pounded at the door and shouted: "Doctor! Squire! Captain! Let me in! It's Jim!"

Then Jim rushed breathless into the stockade, and was warmly welcomed by the faithful party. He told how he had met Ben Gunn and how he and Ben were interrupted in their talking by the shots. Ben disappeared, and Jim rushed down to the shore, where he saw the ship still at anchor, but flying the black flag of piracy. Then cautiously he had crept to the stockade.

An account of the next appearance of Silver we give in Jim Hawkins' words.

SILVER'S FLAG OF TRUCE

THE rest had long been up, and had already breakfasted and increased the pile of firewood by about half as much again, when I was awakened by a bustle and the sound of voices.

"Flag of truce!" I heard some one say; and then, immediately after, with a cry of surprise, "Silver himself!"

And, at that, up I jumped, and, rubbing my eyes, ran to a loophole in the wall.

Sure enough, there were two men just outside the stockade, one of them waving a white cloth; the other, no less a person than Silver himself, standing placidly by.

It was still quite early, and the coldest morning that I think I ever was abroad in; a chill that pierced into the marrow. The sky was bright and cloudless overhead, and the tops of the trees shone rosily in the sun. But where Silver stood with his lieutenant all was still in shadow, and they waded knee deep in a low white vapor, that had crawled during the night out of the morass. The chill and the vapor taken together told a poor tale of the island. It was plainly a damp, feverish, unhealthy spot.

"Keep indoors, men," said the captain. "Ten to one this is a trick."

Then he hailed the buccaneer.

"Who goes? Stand, or we fire."

"Flag of truce," cried Silver.

The captain was in the porch, keeping himself carefully out of the way of a treacherous shot should any be intended. He turned and spoke to us:

"Doctor's watch on the lookout. Dr. Livesey, take the north side, if you please; Jim, the east; Gray, west. The watch below, all hands to load muskets. Lively, men, and careful."

And then he turned again to the mutineers.

"And what do you want with your flag of truce?" he cried.

This time it was the other man who replied.

"Cap'n Silver, sir, to come on board and make terms," he shouted.

"Cap'n Silver! Don't know him. Who's he?" cried the captain. And we could hear him adding to himself: "Cap'n, is it? My heart, and here's promotion!"

Long John answered for himself.

"Me, sir. These poor lads have chosen me cap'n, after your desertion, sir"—laying a particular emphasis upon the word "desertion." "We're willing to submit, if we can come to terms, and no bones about it. All I ask is your word, Cap'n Smollett, to let me safe and sound out of this here stockade, and one minute to get out o' shot before a gun is fired."

"My man," said Captain Smollett,

"I have not the slightest desire to talk to you. If you wish to talk to me, you can come, that's all. If there's any treachery it'll be on your side, and the Lord help you."

"That's enough, cap'n," shouted Long John cheerily. "A word from you's enough. I know a gentleman and you may lay to that."

We could see the man who carried the flag of truce attempting to hold Silver back. Nor was that wonderful, seeing how cavalier had been the captain's answer. But Silver laughed at him aloud and slapped him on the back, as if the idea of alarm had been absurd. Then he advanced to the stockade, threw over his crutch, got a leg up, and with great vigor and skill succeeded in surmounting the fence and dropping safely to the other side.

I will confess that I was far too much taken up with what was going on to be of the slightest use as sentry; indeed, I had already deserted my eastern loophole and crept up behind the captain, who had now seated himself on the threshold, with his elbows on his knees, his head in his hands, and his eyes fixed on the water, as it bubbled out of the old iron kettle in the sand. He was whistling to himself, "Come, Lasses and Lads."

Silver had terrible hard work getting up the knoll. What with the steepness of the incline, the thick tree stumps and the soft sand, he and his crutch were as helpless as a ship in stays. But he stuck to it like a man in silence, and at last arrived before the captain, whom he saluted in the handsomest style. He was tricked out in his best; an immense blue coat, thick with brass buttons, hung as low as to his knees, and a fine laced hat was set on the back of his head.

"Here you are, my man," said the captain, raising his head. "You had better sit down."

"You ain't a-going to let me inside, cap'n?" complained Long John. "It's a main cold morning to be sure, sir, to sit outside upon the sand."

"Why, Silver," said the captain, "if you had pleased to be an honest man, you might have been sitting in your galley. It's your own doing. You're either my ship's cook—and then you were treated handsome—or Cap'n Silver, a common mutineer and pirate, and then you can go hang!"

"Well, well, cap'n," returned the sea cook, sitting down as he was bidden on the sand, "you'll have to give me a hand up again, that's all. A sweet pretty place you have of it here. Ah, there's Jim! The top of the morning to you, Jim. Doctor, here's my service. Why, there you all are together like a happy family, in a manner of speaking."

"If you have anything to say, my man, better say it," said the captain.

"Right you were, Cap'n Smollett," replied Silver. "Dooty is dooty, to be sure. Well, now, you look here, that was a good lay of yours last night. I don't deny it was a good lay. Some of you pretty handy with a handspike-end. And I'll not deny neither but what some of my people was shook—maybe all was shook; maybe I was shook myself; maybe that's why I'm here for terms. But you mark me, cap'n, it won't do twice, by thunder! We'll have to do sentry-go, and ease off a point or so on the rum. Maybe you think we were all a sheet in the wind's eye. But I'll tell you I was sober; I was on'y dog tired; and if I'd awoke a second sooner I'd a' caught you at the act, I would. He wasn't dead when I got round to him, not he."

"Well?" says Captain Smollett, as cool as can be.

All that Silver said was a riddle to him, but you would never have guessed it from his tone. As for me, I began to have an inkling. Ben Gunn's last words came back to my mind. I began to suppose that he had paid the buccaneers a visit while they all lay drunk together round their fire, and I reckoned up with glee that we had only fourteen enemies to deal with.

"Well, here it is," said Silver. "We want that treasure, and we'll have it—that's our point! You would just as soon save your lives, I reckon; and that's yours. You have a chart, haven't you?"

"That's as may be," replied the captain.

"Oh, well, you have, I know that," returned Long John. "You needn't be so husky with a man; there ain't a particle of service in that, and you may lay to it. What I mean is, we want your chart. Now, I never meant you no harm."

"That won't do with me, my man," interrupted the captain. "We know exactly what you meant to do, and we don't care; for now, you see, you can't do it."

And the captain looked at him calmly, and proceeded to fill a pipe.

"If Abe Gray—" Silver broke out.

"Avast there!" cried Mr. Smollett. "Gray told me nothing, and I asked him nothing; and what's more I would see you and him and this whole island blown clean out of the water into blazes first. So there's my mind for you, my man, on that."

This little whiff of temper seemed to cool Silver down. He had been growing nettled before, but now he pulled himself together.

"Like enough," said he. "I would set no limits to what gentlemen might consider shipshape, or might not, as the case were. And, seein' as how you are about to take a pipe, cap'n, I'll make so free as do likewise."

And he filled a pipe and lighted it; and the two men sat silently smoking for quite a while, now looking each other in the face, now stopping their tobacco, now leaning forward to spit. It was as good as the play to see them.

"Now," resumed Silver, "here it is. You give us the chart to get the treasure by, and drop shooting poor seamen, and stoving of their heads in while asleep. You do that, and we'll offer you a choice. Either you come aboard along of us, once the treasure shipped, and then I'll give you my affydavy, upon my word of honor, to clap you somewhere safe ashore. Or, if that ain't to your fancy, some of my hands being rough, and having old scores, on account of hazing, then you can stay here, you can. We'll divide stores with you, man for man; and I'll give my affydavy, as before, to speak the first ship I sight, and send 'em here to pick you up. Now you'll own that's talking. Handsomer you couldn't look to get, not you. And I hope"—raising his voice—"that all hands in this here blockhouse will overhaul my words, for what is spoke to one is spoke to all."

Captain Smollett rose from his seat, and knocked out the ashes of his pipe in the palm of his left hand.

"Is that all?" he asked.

"Every last word, by thunder!" answered John. "Refuse that, and you've seen the last of me but musket-balls."

"Very good," said the captain. "Now you'll hear me. If you'll come up one by one, unarmed, I'll engage to clap you all in irons, and take you home to a fair trial in England. If you won't, my name is Alexander Smollett, I've flown my sovereign colors, and I'll see you all to Davy Jones. You can't find the treasure. You can't sail the ship—there's not a man among you fit to sail the ship. You can't fight us—Gray, there, got away from five of you. Your ship's in irons, Master Silver; you're on a lee shore, and so you'll find. I stand here and tell you so; and they're the last good words you'll get from me; for, in the name of heaven, I'll put a bullet in your back when next I meet you. Tramp, my lad. Bundle out of this, please, hand over hand, and double quick."

Silver's face was a picture; his eyes started in his head with wrath. He shook the fire out of his pipe.

"Give me a hand-up!" he cried.

"Not I," returned the captain.

"Who'll give me a hand-up?" he roared.

Not a man among us moved. Growling the foulest imprecations, he crawled along the sand till he got hold of the porch and could hoist himself again upon his crutch. Then he spat into the spring.

"There!" he cried, "that's what I think of ye. Before an hour's out, I'll stove in your old blockhouse like a rum puncheon. Laugh, by thunder, laugh! Before an hour's out, ye'll laugh upon the other side. Them that die'll be the lucky ones."

And with a dreadful oath he stumbled off, plowed down the sand, was helped across the stockade, after four or five failures, by the man with the flag of truce, and disappeared in an instant afterward among the trees.

As soon as Silver disappeared, the captain, who had been closely watching him, turned toward the interior of the house, and found not a man of us at his post but Gray. It was the first time we had ever seen him angry.

"Quarters!" he roared. And then, as we all slunk back to our places, "Gray," he said, "I'll put your name in the log; you've stood by your duty like a seaman. Mr. Trelawney, I'm surprised at you, sir. Doctor, I thought you had worn the king's coat! If that was how you served at Fontenoy, sir, you'd have been better in your berth."

The doctor's watch were all back in their loopholes, the rest were busy load-

ing the spare muskets, and every one with a red face, you may be certain, and a flea in his ear, as the saying is.

The captain looked on for awhile in silence. Then he spoke.

"My lads," said he, "I've given Silver a broadside. I pitched it in red-hot on purpose; and before the hour's out, as he said, we shall be boarded. We're outnumbered, I needn't tell you that, but we fight in shelter; and, a minute ago, I should have said we fought with discipline. I've no manner of doubt that we can drub them, if you choose."

Then he went the rounds, and saw, as he said, that all was clear.

On the two short sides of the house, east and west, there were only two loopholes; on the south side where the porch was, two again; and on the north side, five. There was a round score of muskets for the seven of us; the firewood had been built into four piles—tables, you might say—one about the middle of each side, and on each of these tables some ammunition and four loaded muskets were laid ready to the hand of the defenders. In the middle, the cutlasses lay ranged.

"Toss out the fire," said the captain; "the chill is past, and we mustn't have smoke in our eyes."

The iron fire basket was carried bodily out by Mr. Trelawney, and the embers smothered among sand.

"Hawkins hasn't had his breakfast. Hawkins, help yourself, and back to your post to eat it," continued Captain Smollett. "Lively, now, my lad; you'll want it before you've done. Hunter, serve out a round of brandy to all hands."

And while this was going on, the captain completed, in his own mind, the plan of the defense.

"Doctor, you will take the door," he resumed.

"See, and don't expose yourself; keep within, and fire through the porch. Hunter, take the east side, there. Joyce, you stand by the west, my man. Mr. Trelawney, you are the best shot—you and Gray will take this long north side, with the five loopholes; it's there the danger is. If they can get up to it, and fire in upon us through our own ports, things would begin to look dirty. Hawkins, neither you nor I are much account at the shooting; we'll stand by to load and bear a hand."

As the captain had said, the chill was past. As soon as the sun had climbed above our girdle of trees, it fell with all its force upon the clearing, and drank up the vapors at a draught. Soon the sand was baking, and the resin melting in the logs of the blockhouse. Jackets and coats were flung aside; shirts thrown open at the neck, and rolled up to the shoulders; and we stood there, each at his post, in a fever of heat and anxiety.

An hour passed away.

"Hang them!" said the captain. "This is as dull as the doldrums. Gray, whistle for a wind."

And just at that moment came the first news of the attack.

"If you please, sir," said Joyce, "if I see any one am I to fire?"

"I told you so!" cried the captain.

"Thank you, sir," returned Joyce, with the same quiet civility.

Nothing followed for a time; but the remark had set us all on the alert, straining ears and eyes—the musketeers with their pieces balanced in their hands, the captain out in the middle of the blockhouse, with his mouth very tight and a frown on his face.

So some seconds passed, till suddenly Joyce whipped up his musket and fired. The report had scarcely died away ere it was repeated and repeated from without in a scattering volley, shot behind shot, like a string of geese, from every side of the enclosure. Several bullets struck the log-house, but not one entered; and, as the smoke cleared away and vanished, the stockade and the woods around it looked as quiet and empty as before. Not a bough waved, not the gleam of a musket-barrel betrayed the presence of our foes.

"Did you hit your man?" asked the captain.

"No, sir," replied Joyce. "I believe not, sir."

"Next best thing to tell the truth," muttered Captain Smollett. "Load his gun, Hawkins. How many should you say there were on your side, doctor?"

"I know precisely," said Dr. Livesey. "Three shots were fired on this side. I saw the three flashes—two close together—one farther to the west."

"Three!" repeated the captain. "And how many on yours, Mr. Trelawney?"

But this was not so easily answered. There had come many from the north—seven,

by the squire's computation; eight or nine, according to Gray. From the east and west only a single shot had been fired. It was plain, therefore, that the attack would be developed from the north, and that on the other three sides we were only to be annoyed by a show of hostilities. But Captain Smollett made no change in his arrangements. If the mutineers succeeded in crossing the stockade, he argued, they would take possession of any unprotected loophole, and shoot us down like rats in our own stronghold.

Nor had we much time left to us for thought. Suddenly, with a loud huzza, a little cloud of pirates leaped from the woods on the north side, and ran straight on the stockade. At the same moment, the fire was once more opened from the woods, and a rifle-ball sang through the doorway, and knocked the doctor's musket into bits.

The boarders swarmed over the fence like monkeys. Squire and Gray fired again and yet again; three men fell, one forward into the enclosure, two back on the outside. But of these, one was evidently more frightened than hurt, for he was on his feet again in a crack, and instantly disappeared among the trees.

Two had bit the dust, one had fled, four had made good their footing inside our defenses; while from the shelter of the woods seven or eight men, each evidently supplied with several muskets, kept up a hot though useless fire on the log-house.

The four who had boarded made straight before them for the building, shouting as they ran, and the men among the trees shouted back to encourage them. Several shots were fired; but, such was the hurry of the marksmen, that not one appears to have taken effect. In a moment the four pirates had swarmed up the mound and were upon us.

The head of Job Anderson, the boatswain, appeared at the middle loophole.

"At 'em, all hands—all hands!" he roared, in a voice of thunder.

At the same moment another pirate grasped Hunter's musket by the muzzle, wrenched it from his hands, plucked it through the loophole, and, with one stunning blow, laid the poor fellow senseless on the floor. Meanwhile, a third, running unharmed all round the house, appeared suddenly in the doorway and fell with his cutlass on the doctor.

Our position was utterly reversed. A moment since we were firing under cover at an exposed enemy; now it was we who lay uncovered and could not return a blow.

The log-house was full of smoke, to which we owed our comparative safety. Cries and confusion, the flashes and reports of pistol shots and one loud groan rang in my ears.

"Out, lads, out, and fight 'em in the open! Cutlasses!" cried the captain.

I snatched a cutlass from the pile and some one, at the same time snatching another, gave me a cut across the knuckles which I hardly felt. I dashed out of the door into the clear sunlight. Some one was close behind, I knew not whom. Right in front the doctor was pursuing his assailant down the hill, and just as my eyes fell upon him, beat down his guard and sent him sprawling on his back, with a great slash across the face.

"Round the house, lads! round the house!" cried the captain; and even in the hurly-burly I perceived a change in his voice.

Mechanically I obeyed, turned eastward, and with my cutlass raised ran round the corner of the house. Next moment I was face to face with Anderson. He roared aloud, and his hanger went up above his head, flashing in the sunlight. I had not time to be afraid, but as the blow still hung impending leaped in a trice upon one side, and missing my foot in the soft sand, rolled headlong down the slope.

When I had first sallied from the door the other mutineers had been already swarming up the palisade to make an end of us. One man in a red nightcap, with his cutlass in his mouth, had even got upon the top and thrown a leg across. Well, so short had been the interval, that when I found my feet again all was in the same posture, the fellow with the red nightcap still halfway over, another still just showing his head above the top of the stockade. And yet, in this breath of time, the fight was over, and the victory was ours.

Gray, following close behind me, had cut down the big boatswain ere he had time to recover from his lost blow. Another had been shot at a loophole in the very act of firing into the house, and now lay in agony, the pistol still smoking in his hand. A third, as I had seen, the

doctor had disposed of at a blow. Of the four who had scaled the palisade, one only remained unaccounted for, and he, having left his cutlass on the field, was now clambering out again with the fear of death upon him.

"Fire—fire from the house!" cried the doctor. "And you, lads, back into cover."

But his words were unheeded, no shot was fired, and the last boarder made good his escape, and disappeared with the rest into the wood. In three seconds nothing remained of the attacking party but the five who had fallen, four on the inside, and one on the outside of the palisade.

The doctor and Gray and I ran full speed for shelter. The survivors would soon be back where they had left their muskets, and at any moment the fire might recommence.

The house was by this time somewhat cleared of smoke, and we saw at a glance the price we had paid for victory. Hunter lay beside his loophole, stunned; Joyce, by his, shot through the head, never to move again; while right in the center, the squire was supporting the captain, one as pale as the other.

"The captain's wounded," said Mr. Trelawney.

"Have they run?" asked Mr. Smollett.

"All that could, you may be bound," returned the doctor; "but there's five of them will never run again."

"Five!" cried the captain. "Come, that's better. Five against three leaves us four to nine. That's better odds than we had at starting. We were seven to nineteen then, or thought we were, and that's as bad to bear."

There was no return of the mutineers —not so much as another shot out of the woods. They had "got their rations for that day," as the captain put it, and we had the place to ourselves and a quiet time to overhaul the wounded and get dinner. Squire and I cooked outside in spite of the danger, and even outside we could hardly tell what we were at, for horror of the loud groans that reached us from the doctor's patients.

Out of the eight men who had fallen in the action, only three still breathed—that one of the pirates who had been shot at the loophole, Hunter, and Captain Smollett; and of these the first two were as good as dead; the mutineer, indeed, died under the doctor's knife, and Hunter, do what we could, never recovered consciousness in this world. He lingered all day, breathing loudly like the old buccaneer at home in his apoplectic fit; but the bones of his chest had been crushed by the blow and his skull fractured in falling, and some time in the following night, without sign or sound, he went to his Maker.

As for the captain, his wounds were grievous indeed, but not dangerous. No organ was fatally injured. Anderson's ball—for it was Job that shot him first —had broken his shoulder-blade and touched the lung, not badly; the second had only torn and displaced some muscles in the calf. He was sure to recover, the doctor said, but, in the meantime and for weeks to come, he must not walk nor move his arm, nor so much as speak when he could help it.

My own accidental cut across the knuckles was a flea-bite. Dr. Livesey patched it up with plaster and pulled my ears for me into the bargain.

After dinner the squire and the doctor sat by the captain's side awhile in consultation; and when they had talked to their hearts' content, it being then a little past noon, the doctor took up his hat and pistols, girt on a cutlass, put the chart in his pocket, and with a musket over his shoulder, crossed the palisade on the north side, and set off briskly through the trees.

Gray and I were sitting together at the far end of the blockhouse, to be out of earshot of our officers consulting; and Gray took his pipe out of his mouth and fairly forgot to put it back again, so thunderstruck he was at this occurrence.

"Why, in the name of Davy Jones," said he, "is Dr. Livesey mad?"

"Why, no," says I. "He's about the last of this crew for that, I take it."

"Well, shipmate," said Gray, "mad he may not be; but if *he's* not, you mark my words, I am."

"I take it," replied I, "the doctor has his idea; and if I am right, he's going now to see Ben Gunn."

I was right, as appeared later; but, in the meantime, the house being stifling hot, and the little patch of sand inside the palisade ablaze with midday sun, I began to get another thought into my head, which was not by any means so right.

. . . . . .

But we must leave the fascinating words of the book and condense the tale.

While nobody was watching, Jim took a brace of pistols, filled his pockets with biscuits, and made a bolt over the stockade and into the thickets in the direction of the sea, where Ben Gunn said he had left his boat.

As he crept cautiously along the shore, he spied the Hispaniola still at anchor. As it was growing dark, he hastened along, eager to locate Gunn's boat. Finally he found it in a hollow, hidden by the banks and thicket. It was a rude, home-made little coracle, and Jim took a great fancy to it. Impulsively he shouldered it, and groped his way through the swamp under cover of darkness, waded out into the water, and set the coracle on the surface. He paddled toward the Hispaniola, finding her with difficulty in the darkness. When he neared it, he grasped the hawser with one hand, opened his knife with his teeth, and cut one strand after another.

The schooner began to turn upon her heel, spinning slowly across the current. A light rope was trailing overboard across the stern bulwarks. Jim grasped the rope and pulled himself up the rope into the big ship, and dropped upon the deck.

One glance into the cabin showed two drunken figures locked together in a deadly wrestle, each with a hand upon the other's throat. Suddenly the schooner lurched, and the fighters, interrupted in their quarrel, realized their danger. For a time Jim looked around the ship, then he returned to the little coracle.

In the morning he paddled the coracle near the ship and climbed aboard. In an encounter with Hands, the last of the mutineers on the ship, he was victorious. He hauled down the black flag of piracy and brought the ship to the beach on the other side of the island. Elated at his success, he came ashore and started toward the stockade to boast of his achievements. There he was surprised to find the pirates in possession of the fort.

Silver caught the lad but saved him from the knives of the other angry rogues. The one-legged villain's thought was that if he spared Jim's life, the day might come when Jim would save him from hanging.

Thinking that Silver was deserting them, the other buccaneers held a council and handed Silver the black spot. But Silver pacified them and showed them that he possessed the real chart.

Suddenly a voice sounded from the margin of the wood. "Blockhouse ahoy!" it cried. It was the doctor, who stopped in surprise as he entered and saw Jim. Silver announced that Jim must stay with the pirates.

The doctor went away again, and next morning Jim, under order from the buccaneers, followed them on their search for the treasure. After searching in vain for a long time, suddenly they came upon a ghastly human skeleton.

"Shiver my timbers! that's a p'inter," said Silver. "Flint killed his six men, and laid this one down by compass. That's his joke. Take a bearing along the line of them bones."

"Fifteen men on the Dead Man's Chest," a high, trembling voice sounded in the air. The buccaneers in alarm stood rooted to the ground.

"Sounds like Flint, or, by the powers, Ben Gunn!" roared Silver.

It was indeed Ben Gunn, but in the flesh, not in the spirit, as the pirates feared. The old seaman had hidden himself and had played this trick upon his former comrades.

But their courage gradually returned as Silver urged them on. The thought of the money swallowed up their previous terrors, and they continued the hunt. Silver halted in front of a deep excavation, and saw on a board in front of the pit the name of Flint's ship—the Walrus.

Instantly the pirates realized that the treasure had been taken, but they dug frantically in the pit, hoping to find some stray coins. Suddenly musket-shots flashed out of the thicket. Those of the mutineers who were not killed threw down their arms and fled. The doctor and Ben Gunn emerged. The doctor recounted the story that Gunn had found the treasure and had hidden it. Livesey had given Silver the useless chart and the provisions, and had lived with Gunn, sharing his storehouse of food. Gunn led the men to his cave and there on the floor lay great heaps of gold.

For three days they worked to get the coins aboard the ship. Then they sailed for home, reaching Bristol with only five of the original party. "Drink and the devil had done for the rest." Silver was taken along because he had saved Jim's life and because in the last fight he had fought against the mutineers. But he left the ship at a Spanish-American port and was never heard of again.

THE NEXT STORY OF FAMOUS BOOKS IS ON PAGE 4767.



Does an Ostrich Hide Its Head in the Sand?

No; an ostrich does not bury its head in the sand. Early travelers in Africa were responsible for the statement that the ostrich buries its head because it thinks it can not be seen if it can not see others. As a matter of fact these great birds are very wary, and they run away at top speed when they think they are in danger. It is reported, indeed, that if it is accompanied by its chicks, an ostrich sometimes throws itself to the ground in such a way as to give the impression that it is hurt. It does so in order to divert the attention of the hunter from its chicks. Still, even under such circumstances, it does not bury its head in the sand.

BIRDS THAT CAN NOT FLY

IN this article we shall tell you of some giant birds that can not fly; the ostrich, the cassowary, the kiwi, the rhea and the emu. The ostrich now lives in the wild state only in Africa and Asia. Once it had a much wider range, in warm lands. Long, long ago, Asia was the home of many species.

The ostrich of today is startling in size. A fine specimen will measure up to eight feet to the crown of his head, and nearly five feet to the top of the back. His stilt-like legs are to be respected, for the kick of an ostrich can kill a man. The long neck and small head form a very effective periscope. In fact, zebras and antelopes among whom he lives use him as a sort of sentinel, to spy out danger from afar.

Should the menace approach nearer, he can run like the wind. Extraordinary estimates of the ostrich's speed are set down, even as much as sixty miles an hour, for the first great burst. How is it, then, that horsemen are able to run the ostrich down? In broken country it can not be done fairly; the bird can race right away from the fleetest horse under such conditions. But several horsemen acting in concert can hem in an ostrich flock and effect a capture by advancing from several directions.

Yet, for all his speed and powers of endurance, the ostrich likes to keep in a certain neighborhood, and he runs in a great circle, bringing himself back to the point from which he set out. Knowledge of that fact enables the hunter to get within striking distance by covering only a small part of the distance the bird has traveled.

The male ostrich has perhaps half a dozen companions, and these all lay their eggs in one nest, which he sits on throughout the night when danger from jackals and other wandering beasts is to be feared. Usually one of the females sits upon them during the day, but often the eggs are left during daylight to the care of the sun, but not before they have been liberally covered with sand to prevent them from being scorched and addled by too great a heat. Very often more eggs are laid than one bird can cover, and the parent birds are said to break them for food for the young chicks that do hatch. An egg weighs about as much as two dozen hen's eggs.



New York Zoological Society

An ostrich of North Africa, feathered and fleet.

In South Africa, Algeria, Argentina, southern Europe and the United States, ostriches are now farmed like poultry, but it is farming on the heroic scale, for an ostrich farm must have acres of land for each bird. Their value lies in their beautiful feathers. These are clipped from the wings and tail once every seven to nine months, just before the bird is ready to molt.

The ostrich is confined in a V-shaped wooden stall; and his head is covered with a hood; then he is passive and harmless. The feathers are cut through the quill without causing pain. Rough or cruel usage would affect the health of the ostrich and make it unprofitable to its owner, so that the greatest care is exercised in the treatment. The best on the market come from the domesticated birds, from Africa, America, Australia; and even from sunny southern Europe.

Under wild conditions the ostrich eats anything that can be eaten; snakes, lizards, small mammals and birds, insects and great quantities of vegetation. Also in order to aid digestion, it swallows pebbles and even

stones as large as hen's eggs. The species which have gay plumes have but two toes, armed with short, blunt nails. The rest of the family, which have hair-like feathers, useless to commerce, have three toes, and these bear great horny claws.

The rhea is known as the South American ostrich. It numbers three species, and though it takes with delight to water, and swims well, it is entirely a creature of the grassy plains. For long after man appeared in America it had little to fear. Its speed was too great for man, its strength and fierceness made it a terrific foe at close quarters. But three centuries ago the native Indians began to ride horses, and so could attack the rhea by new methods, with the result that rheas now seem born with a fear of horsemen. The naturalist Hudson found that young rheas followed him about as if he were their parent, and when he made a cry imitating their familiar warning of danger, they would scuttle up to him for protection.



An emu hen guards her brood of downy chicks. The nest of these birds is a shallow pit in the ground. Nine to thirteen blue-green eggs may be laid; and when the chicks are hatched, they emerge covered with striped down. Emus flock together in small companies, and are usually found in open country.

Australian News and Information Bureau

THE BIRD THAT ATTACKS A HORSEMAN WITH THE FEROCITY OF A LION

The nesting habits of the rhea are similar to those of the ostrich. Though it has no plumes, its feathers are valuable. The skins also have commercial value; they are made up into rugs which find a ready market.

The Australian regions are rich in cassowaries and emus. Of the cassowaries nine species are known, all readily distinguished from the emu by the horny helmet on the head, covered with a thin membrane.

Animal life in Australasia differs in some respects from other animal life over the rest of the world, and in the strange cassowaries we find ostrich-like birds which do not keep to the open. They are forest-dwellers, powerful and deadly with their great clawed feet when brought to bay, but shy and only too



A great-billed rhea, of the South American pampas. The powerful legs give it tremendous speed and endurance.
New York Zoological Society

anxious to preserve the secret of their existence in the forest and undergrowth.

A fine cassowary measures five feet to the top of the head, but the emu is a still grander creature, ranking second in size only to the ostrich. It is curious that the emu hen, like the kiwi hen, is larger than her mate, whereas the males are the bigger in the other groups of the family. Both sexes are notable as warriors, but the female emu is famous for the strength and lightning-like rapidity with which she delivers her blows.

THE EMU OF AUSTRALIA, WHICH THRIVES ON MAN'S MISFORTUNE

In common with all other wild life in Australia, emus have suffered severely from the arrival of man, and in many districts have been declared practically extinct. But surprising news came from Queensland some years ago. One of the plagues introduced into the island continent is the prickly pear, which advances like a fire over the ground. The emu has profited by this vegetable scourge. A scientific expedition found that wherever the prickly pear is, the emu thrives amazingly. Wherever the pear was thickest the birds were most numerous and in finest condition. Ruin to the human colonist is food and fortune to the emu.

In New Zealand is the kiwi. Here is a bird which has lost so much of its wings that the vestiges remaining can not be seen, but lie hidden beneath the heavy, hair-like feathers of the back.

In size the kiwi is no more than an average hen of the poultry run, yet it lays an enormous egg, upward of five inches long and three inches across. This reminds us of the extinct Aepyornis of Madagascar, whose eggs are said to have measured nine and a half inches by thirteen inches. A dim-sighted creature of the night, the kiwi relies for its living on a long, snipe-like beak which is unique in having the nostrils at the tip like those of a crocodile, not at the base as in the case of all other birds.

Thick-legged and strong like the rest of its family, the little kiwi is skilled and valiant in combat. A friend of the writer, hunting in the New Zealand jungle with two bold dogs, unexpectedly met a kiwi. Instantly it attacked one of the hounds, and a blow from its powerful clawed foot tore a fatal wound in the flesh of the astonished victim.

"Kiwi" is a Maori word; and a more scientific name for the bird is apteryx.

In the article on Sea Birds, in Volume 11, you will read about the penguins. These all live in the southern half of the world, many of them on the ice of Antarctica. They can not fly, but they are superb swimmers and divers. They are perhaps the strangest birds in the world.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 4675.



A Bennett cassowary, shy forest-dweller of the lands "down under."
New York Zoological Society

THE STORY OF PETER PAN

ADAPTED FROM THE PLAY *by* SIR JAMES M. BARRIE

THERE was once upon a time a little girl named Wendy Moira Angela Darling. She lived in a house with her brothers, John Napoleon Darling and Michael Nicholas Darling. This house was an ordinary house of brick and slates, but one thing about it was quite extraordinary. It contained a Newfoundland dog whose name was Nana, and this dog acted as nurse to the three children.

Nana was so clever that she never allowed the children to put on a flannel nightdress before it was aired at the fire; and she knew how to turn on the hot water when it was bath-time; and however the children might cry that they would *not* be bathed, or that they would *not* go to bed, Nana always insisted that they should.

Now, Mrs. Darling loved Nana, and she had a particular reason for keeping this brave and powerful dog as the children's nurse. One night on visiting the nursery she had seen a strange flitting Shape moving quickly to and fro in the dim glow of the night light. At sight of her this Shape rushed to the window. Mrs. Darling darted toward it, and as it sprang into the night she pulled down the window with a bang. The Shape escaped; but something fell on the floor at Mrs. Darling's feet. It was the shadow of this strange, flitting creature. Mrs. Darling put the shadow in a drawer; but she felt very nervous for the safety of the children. She feared that the Shape might come back and do them some dreadful harm. The only comfort she had was



Wendy got needle and thread and stitched the shadow on to Peter Pan.

the presence of Nana in the nursery. The big dog, she thought, would protect her children from all danger. But one night Mr. Darling was rather cross, and he said it was ridiculous to have a dog for a nurse; and he got so cross at last that he said Nana should sleep in a kennel in the yard. Mrs. Darling pleaded, the children cried, Nana barked. Mr. Darling, however, was extremely cross, and Nana was led away to the yard moaning and growling.

That night the window was thrust open, and into the room glided and skipped the mysterious Shape.

"Where is my shadow?" it cried; while Nana barked furiously outside. "I can't be happy without my shadow. Tinker Bell, Tinker Bell, where is my dear little shadow?"



The children soared through the starlit night.

Instantly a spot of light flicked into the room, and sprang round the walls, and over the ceiling, and down the beds, and across the carpet, making a tinkling sound wherever it flitted and whenever it settled for a moment. This was the fairy Tinker Bell, a little female fairy. She told the Shape where the shadow lay, and soon the drawer was open, the shadow pulled forth, and the Shape skipped round the room with delight—singing, dancing, laughing in its joy, while Tinker Bell flashed round the room like a luminous butterfly. But, alas! when the Shape tried to make the shadow stick on, it refused, and so all the delight went and the Shape burst into passionate tears.

Just at this moment Wendy awoke. She was not frightened, and asked the little Shape why it was crying. Then she asked it its name, and the Shape told her that it was Peter Pan. Wendy got needle and thread and stitched the shadow on to Peter Pan, and Peter Pan danced with joy, for wherever he went the shadow followed him on the floor.

Then Peter Pan told Wendy his story. He said that he lived in a place called Never-Never-Land with a lot of little boys who had all been dropped out of their perambulators by careless nurses; and that they lived with fairies and would never grow up, but for always and always would remain happy boys in this enchanting Never-Never-Land.

He told her that when the first baby laughed, the laughter broke into little pieces, and each little piece became a fairy and went dancing about the world. But whenever a child says that it does not believe in fairies, then one of the fairies dies. Peter Pan said it was dreadful for a child to say it did not believe in fairies. There was only one other thing that made them sad, he said, and this was the want of a mother; all the boys in Never-Never-Land wanted to have a mother very much indeed. Wendy asked if there was not a little girl among them who could pretend to be their mother; but Peter Pan shook his head and answered that *girls* never dropped out of their perambulators: they were far too clever. This explanation pleased Wendy, and she at once loved Peter Pan.

"Oh, Wendy," cried Peter, "come and live with us and be our mother!"

The two boys woke up, and Peter Pan said he would teach them all to fly if Wendy would only come and be their mother. All this time Tinker Bell was tinkling angrily and telling Peter Pan to come away at once.

Tinker Bell loved Peter Pan and was jealous of Wendy.

When the children heard that they could learn to fly they were quite excited, and immediately began to spring in the air. But every time, they fell and sprawled on the ground, or bumped flat on the beds.

"You must think beautiful thoughts," cried Peter Pan; and, so saying, soared up gracefully into the air and sailed noiselessly around the room. Then the children tried again.

Soon the children learned, and all began to fly around the room with cries of delight. Then the windows opened wide, and Peter Pan led the way into the night; and while Tinker Bell tinkled loudly and Nana barked warningly the children soared toward the stars. Second to the right, and straight on till morning, was the way to Never-Never-Land.



Hit by the arrow, Wendy had fallen to the ground.

The boys in Never-Never-Land were growing anxious about Peter Pan, who was their captain. He seemed to be a long time away, and they were afraid of wolves and pirates. While they were wondering what had happened to Peter they saw what looked to them like a large white bird in the sky.

As they gazed at it Tinker Bell suddenly shone on the trees, and, tinkling very loudly, told them that Peter Pan wanted them to shoot this bird at once. So they ran and got bows and arrows and shot them into the air. Suddenly down fell—what do you think?—poor Wendy with an arrow in her breast: Jealous little Tinker Bell was responsible for this awful deed.

But she was not killed. Soon she revived, and then with her brothers round her, and Peter Pan holding her hand, she promised all the boys to be their mother. Then they set to and built Wendy a funny little house, with John Napoleon Darling's silk hat for its chimney-pot; and everybody was wonderfully happy, except Tinker Bell, who was more and more jealous of Wendy because Peter Pan loved her so much.

Now, while they were so happy in their house, through the wood came the terrible pirates. The captain of this frightful gang was named Captain James Hook, and a more horrible villain never froze the blood in a child's veins. All his crew feared him and cowered before him. His long black hair was enough to make you shiver; his yellow skin made you go white; his coal-black eyes struck daggers of fear into your hearts; but, far worse than all these, more awful even than his cackling laugh and his way of rolling his "r's" so that they sounded like pistols, was his right hand. His right hand wasn't a hand at all: it was an iron hook. How he came to have that hook is part of the story.

Peter Pan had tripped the terrible pirate into the sea, and a crocodile, a tremendous c-r-r-r-r-roc-odile, had snapped off his hand and part of his wrist. Nor was this all. The crocodile enjoyed the captain's hand and wrist so much that it wanted more, and so it haunted the captain wherever he went, longing to eat another bit of him, and dreaming of the happy day when it would gobble him all up. The captain always knew when his ferocious enemy was near, because on one occasion it had swallowed an alarm clock, and the ticking of this clock could be heard plainly through its skin. But the captain feared, because he knew the clock would one day run down and then the crocodile would be able to steal upon him unawares and finish him. The thought of being a crocodile's favorite dish was not a happy one.

You can imagine how this pirate hated Peter, the cause of all his troubles, and how he longed to slay him.

One day when some friendly Indians were guarding the boys, up came the pirates and made a great slaughter of the poor redskins. The boys did not hear the battle, for they were much interested in something that Wendy was telling them underground.

Wendy, you must know, had become the mother of these boys, and they all did exactly what she told them, and all adored her, because it was so delightful to have a mother after having lived so long without one. After she had seen mermaids and a bird that gave up its nest for Peter Pan to use as a boat, she settled down to be a real, practical mother, giving the boys their medicine, teaching them how to behave nicely, and tucking them all up nice and comfy in their beds. Considering that she was only nine years of age, Wendy made a splendid mother.

Well, on this night, Wendy was telling them a story about her own father and mother—a beautiful story which showed how that mother and father must be weeping for their lost children. As she was finishing, John Napoleon and Michael Nicholas sprang up in their beds, and said:

"Wendy, we must go back!"

"Yes," answered Wendy, "we must go back."

You can imagine how dreadfully sad all the motherless boys were when they heard that Wendy was going home. They cried so much that at last she told them they might come back with her and her brothers, and live in their house, and have Mr. and Mrs. Darling for their father and mother. All the boys accepted this offer with delight except Peter Pan. Peter Pan said he did not want to grow up. He did not want to live in a real house and go to school every day like other boys. He wanted to live always in Never-Never-Land with the fairies and birds and mermaids. In his heart he was terribly sad at losing Wendy, for whom his love was very great indeed; but he refused to go away and grow up like an ordinary boy.

So they all said good-bye to Peter Pan, and one by one went up the narrow tunnel which led from their underground home to the forest and the night. Wendy was the last to go, and before she went she poured out some medicine for Peter and made him promise her that he would take it when he woke up in the morning.

In the meanwhile, however, the pirates had crept up on the Indians, and in the fight which followed, the redskins were defeated. The children listened anxiously to hear the tom-tom which would mean an Indian victory. The pirates, hearing Peter tell the children this, themselves beat the tom-tom to deceive their victims.

So, instead of kind Indians keeping guard, the pirates were there. The boys were seized one by one as they stepped on ground; a rough hand was clasped over their mouths to prevent them from crying out, and they were carried away prisoners to the pirate ship with Wendy.

The pirates made the boys double up with their knees close to their ears, and then tied them so that they could not fly away. Wendy



Peter and the boys had built Wendy a dear little house.

they treated with far more consideration.

But Captain Hook was not satisfied; it was Peter Pan he wanted most of all. Peter had thrown his arm to the crocodile and made his life miserable since; but it was Peter's cockiness which made Hook hate him and long to take him down.

Peter Pan lay asleep in his bed. The rest of the boys were on board the pirate ship. Peter Pan was alone, and asleep. Captain Hook was creeping to the hole above. Now was his chance to slay his enemy.

Noiselessly the pirate chief crept down the hole. He arrived at the door and peeped over the top. Peter Pan was fast asleep. He tried to open the door but failed. Again and again his hook fumbled at the latch but failed. Peter Pan was safe. But no! The terrible captain espied the glass of medicine left by Wendy on a shelf; he reached toward it, and then, taking a bottle of poison from his pocket, poured the contents into the glass.

Peter Pan woke up. He remembered his promise to Wendy and went to drink the poison. At that moment Tinker Bell rushed in, crying: "Don't drink! Don't drink!"

But her warning was useless.

"I have promised Wendy," answered Peter, and walked toward the glass with his hand outstretched.

In vain did Tinker Bell warn him; but just as Peter was about to drink, the little Shining Light popped into the glass and drained all its deadly contents. Then it flickered and paled and drooped toward its bed, dying.

Peter knew there was only one way in which he could possibly save it.

"Do you believe in fairies? Oh, please say you believe in fairies!" he cried to all the world. And back from the world, which was so sorry for poor little Tinker Bell, came the answer: "We believe in fairies."

So Tinker Bell revived and was saved, and she told Peter Pan how the pirates had carried off the lost boys, with Wendy and her brothers, to their ship, and of the danger in which they stood.

Peter immediately started out. He arrived at the ship just as the captain was going to flog his prisoners before making them walk the plank. Peter Pan had an alarm clock in his pocket; he took it out, and at the first sound of that *tick-tick* the captain gave a great cry of horror, thinking that the cr-r-r-rocodile was near.

During the panic Peter stole on board ship and concealed himself in the cabin where the cat-o'-nine-tails was hidden.

The clock ran down. The captain grew brave again. "Go and get the cat-o'-nine-tails!" he ordered.

One of the ruffians went to obey. As he entered the cabin a terrible shriek resounded all over the ship. Another pirate was ordered to go and see what had happened. He, too, uttered a ghastly shriek and did not come out.

The rest of the crew were now in a state of panic. They refused to enter the cabin; one threw himself into the sea.

Suddenly Peter Pan rushed out, sword in hand, and a terrible fight followed. Captain Hook was flung overboard, where the crocodile was waiting for him; and all the rest of the wicked pirates were killed.

Then Wendy and all the boys went home, and Peter and Tinker Bell went with them. When they reached the Darlings' house Peter made Tinker Bell close and bar the window so that Wendy could not fly in to her home and stay with her mother. He saw Mrs. Darling suddenly put her head down and cry. But Peter was stubborn; he would not give in. "I'm fond of her, too. We can't both have her, lady," he said. However, Wendy's mother could not seem to feel happy about it, and so at last, with a great effort, Peter unlocked the window and flew out.

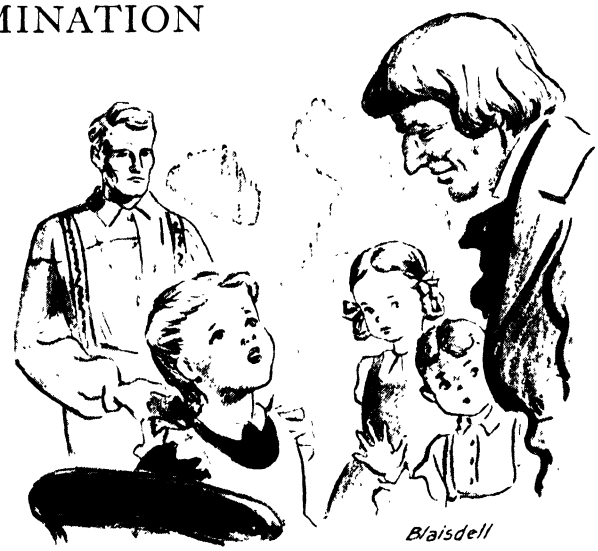
When the children were in, John and Michael were a little bewildered, but gradually recalled the familiar room. They crept into their little beds, to pretend to their mother that they had never been away. Mrs. Darling came into the nursery, and seeing the children, thought she was dreaming. How often she had that dream! But when she had them in her arms she knew they were real. Then she called Mr. Darling to share her joy.

Mr. Darling, we must tell you, had been so repentant for his crossness that he had made Nana live indoors and dine at the table and occupy his own chair; while he himself slept in a kennel outside and ate all his meals out of a dog's trough. Mrs. Darling had always kept the window open, hoping that the children would return, and used to play and sing Home, Sweet Home, thinking that they might hear her and come back.

Peter Pan always refused to grow up, but he longed for little Wendy, so Mrs. Darling allowed her to visit him once a year and keep his house nice and tidy.

THE SCHOOL EXAMINATION

By SELMA LAGERLÖF



Glory Goldie jumped up, eager to answer the question.

WHEN the little girl was six years old Jan went along with her to the Ostanby school one day, to listen to the examinations.

This being the first and only schoolhouse the parish boasted, naturally every one was glad that a long-felt want had been met. In the old days Sexton Blackie had no choice but to go about from farmhouse to farmhouse with his pupils.

Up until the year 1860, when the Ostanby school was built, the sexton had been compelled to change classrooms every other week, and many a time he and his little pupils had sat in a room where the housewife prepared meals and the man of the house worked at a carpenter's bench; where the old folk lay abed all day and the chickens were cooped under the sofa.

But just the same it had gone rather well with the teaching; for Sexton Blackie was a man who could command respect in all weathers. Still it must have been a relief to him to be allowed to work in a room that was to be used only for school purposes; where the walls were not lined with cubby-beds and shelves filled with pots and pans and tools; where there was no obstructing loom in front of the window to shut out the daylight, and where women neighbors could not drop in for a friendly chat over the coffee cups during school hours.

Here the walls were hung with illustrations of Bible stories, with animal pictures and portraits of Swedish kings. Here the children had little desks with low benches, and did not have to sit perched up round a high table, where their noses were hardly on a level with the edge. And here Sexton Blackie had a desk all to himself, with spacious drawers and compartments for his record-book and papers. Now he looked rather more impressive during school hours than in former days, when he had often heard lessons while seated upon the edge of a hearth, with a roaring fire at his back and the children huddled on the floor in front of him. Here he had a fixed place for the blackboard and hooks for maps and charts, so that he did not have to stand them up against doors and sofa backs. He knew, too, where he had his goose quills and could teach the children how to make strokes and curves, so that each one of them would some day be as fine a penman as himself. It was even possible to train the children to rise in a body and march out in line, like soldiers. Indeed, no end of improvements could be introduced now that the schoolhouse was finished.

Glad as was every one of the new school, the parents did not feel altogether at ease in the presence of their children, after they had begun to go there. It was as if the youngsters had come into something new and fine from which their elders were excluded. Of course it was wrong of the parents to think this, when they should have been pleased that the children were granted so many advantages which they themselves had been denied.

The day Jan of Ruffluck visited the school, he and his little Glory Goldie walked hand in hand, as usual, all the way, like good friends and comrades; but as soon as they came in sight of the schoolhouse and Glory Goldie saw the children assembled outside, she dropped her father's hand and crossed to the other side of the road. Then, in a moment, she ran off and joined a group of children.

During the examination Jan sat near the

teacher's lectern, up among the School Commissioners and other fine folk. He had to sit there; otherwise he could not have seen anything of Glory Goldie but the back of her neck, as she sat in the front row, to the right of the lectern, where the smaller children were placed. In the old days Jan would never have gone so far forward; but one who was father to a little girl like Glory Goldie did not have to regard himself as the inferior of anybody. Glory Goldie could not have helped seeing her father from where she sat, yet she never gave him a glance. It was as if he did not exist for her. On the other hand, Glory Goldie's gaze was fixed upon her teacher, who was then examining the older pupils, on the left side of the room. They read from books, pointed out different countries and cities on the map, and did sums on the blackboard, and the teacher had no time to look at the little tots on the right. So it would not have mattered very much if Glory Goldie had sent her father an occasional side glance; but she never so much as turned her head toward him.

However, it was some little comfort to him that all the other children did likewise. They, too, sat the whole time with their clear blue eyes fastened on their teacher. The little imps made believe they understood him when he said something witty or clever; for then they would nudge each other and giggle.

No doubt it was a surprise to the parents to see how well the children conducted themselves throughout the examination. But Sexton Blackie was a remarkable man. He could make them do almost anything.

As for Jan of Ruffluck, he was beginning to feel embarrassed and troubled. He no longer knew whether it was his own little girl who sat there or somebody else's. Of a sudden he left his place among the School Commissioners and moved nearer the door.

At last the teacher was done examining the older pupils. Now came the turn of the little ones, those who had barely learned their letters. They had not acquired any vast store of learning, to be sure, but a few questions had to be put to them, also. Besides, they were to give some account of the Story of the Creation.

First they were asked to tell who it was that created the world. That they knew of course. And then, unhappily, the teacher asked them if they knew of any other name for God.

Now all the little A-B-C-ers were stumped! Their cheeks grew hot and the skin on their foreheads was drawn into puckers, but they could not for the life of them think out the answer to such a profound question.

Among the larger children, over on the right, there was a general waving of hands, and whispering and tittering; but the eight small beginners held their mouths shut tight and not a sound came from them. Glory Goldie was as mum as the rest.

"There is a prayer which we repeat every day," said the teacher. "What do we call God there?"

Now Glory Goldie had it! She knew the teacher wanted them to say they called God *Father*—and raised her hand.

"What do we call God, Glory Goldie?" he asked.

Glory Goldie jumped to her feet, her cheeks aflame, her little yellow pigtail of a braid pointing straight out from her neck.

"We call him Jan," she answered in a high, penetrating voice.

Immediately a laugh went up from all parts of the room. The gentry, the School Board, parents and children all chuckled. Even the schoolmaster appeared to be amused.

Glory Goldie went red as a beet and her eyes filled up. The teacher rapped on the floor with the end of his pointer and shouted "Silence!" Whereupon he said a few words to explain the matter.

"It was *Father* Glory Goldie wanted to say, of course, but said Jan instead because her own father's name is Jan. We can't wonder at the little girl, for I hardly know of another child in the school who has so kind a father as she has. I have seen him stand outside the schoolhouse in rain and bluster, waiting for her, and I've seen him come carrying her to school through blizzards, when the snow was knee-deep in the road. So who can wonder at her saying Jan when she must name the best she knows!"

The teacher patted the little girl on the head. The people all smiled, but at the same time they were touched.

Glory Goldie sat looking down, not knowing what she should do with herself; but Jan Ruffluck felt as happy as a king, for it had suddenly become clear to him that the little girl had been his the whole time.

THE NEXT STORIES ARE ON PAGE 5069.

From The Emperor of Portugallia, by Selma Lagerlöf. By permission of the publishers, Doubleday, Page & Co.

SCIENCE



Philip Gendreau, N. Y.

The STORY *of Your* ELECTRIC-LIGHT BULB

AS the sun goes down and the house begins to get dark in the twilight, your mother often says to you, "Please turn on the light." You go to a little switch on the wall and move a small handle with one finger, or else pull a chain, and instantly the room is flooded with light. It is so easy that you have probably done it ever since you were able to reach the switch, or the chain. Did you ever stop to think about how it works?

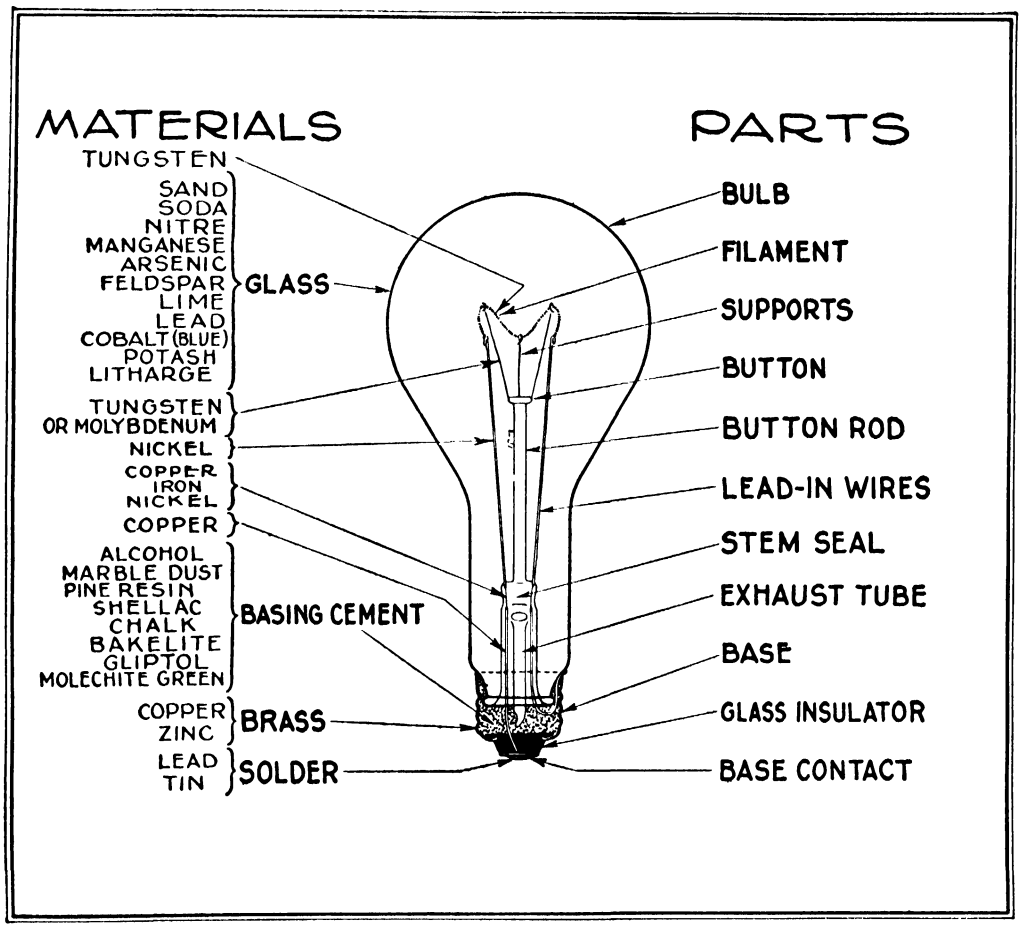
Like all the other wonderful things we shall explain, it is easy when you know how. But it is often not so easy to know how. Although the history of man goes back for thousands of years, electric light has been common for only about fifty years. And how crude were the early ones compared to what we know today! Remember, too, that what we have today may seem terribly old-fashioned by the time you are grown up—because in the laboratories are many men who spend all their time working on better ways of doing things.

Nowadays the glass of the electric lamp is frosted to diffuse the light, that is, to spread it softly and cut down the glare, but if you have an old light globe that is burned out, you can easily open it up and see what is inside. Cover the globe with a bag of cloth—say an old sock—and break it with a sharp blow from a hammer. You use the bag to avoid being cut by any broken glass, of course. Coming out of the brass base of the bulb is a glass stem in which two wires are sealed. One of these is connected to the metal disc at the bottom of the base; the other is connected to the side of the base, the part which screws into the socket. The wires coming out of the glass stem are joined together by a couple of turns of wire. In a

new lamp this joining is complete, but in a burned-out lamp it is broken somewhere, and if you look carefully at the place where it is burned out you will see that the break was caused by the metal having melted there.

That is all there is inside that we can see. Now let us see how it works! Electricity is like a pipe and the electrons that flow are part of the stuff the wire is made of.

Now when the electrons flow from the power-house through the wire, their motion is resisted due to the fact that the electric particles are continually bumping into the atoms of which the wire is made. In much



Courtesy, General Electric Company

The simple little electric-light bulb is not so simple after all. It contains almost thirty different materials.

of two kinds which we call positive and negative, because the kinds are opposite in their behavior. We shall pay attention first only to the negative kind, for it is the more active and moves around more. It consists of many tiny particles, all alike, which are called electrons. Remember this—the electron is the smallest bit of negative electricity that we know. What we call electric current in a wire is simply the flow of these electrons through the wire, like the flow of water in a pipe, except that the wire is not hollow the same way, the motion of a crowd of children trying to run through the woods in the dark would be slowed down by their bumping into trees. They would have a much harder time getting through a dense woods than one where trees are far apart.

In the same way, different metals differ very much in the extent to which they resist the flow of the electrons. The engineer takes account of this in choosing the metals he will use for different purposes. The physicist tells him that silver offers the least resistance,

and copper is next. But silver is a much more expensive metal than copper, and is not very much better. Therefore copper is generally used to carry the electric current from the power-house to your home.

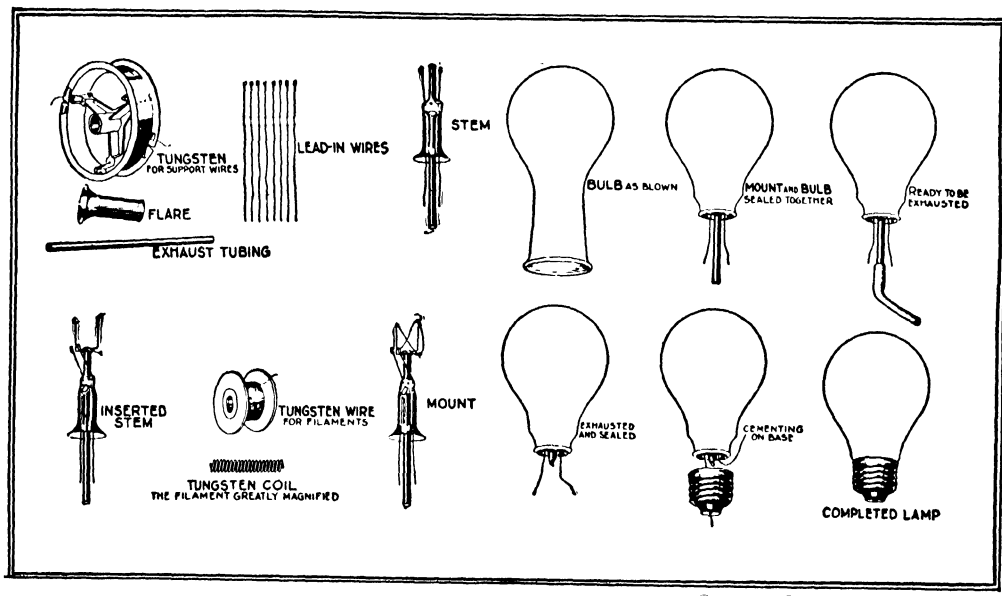
It takes a certain driving force to make the electrons flow through a wire, just as it takes pressure to make water flow through a pipe. The work done by this driving force in pushing the electrons through appears as heat, for the resistance of the wire is a kind of friction. You know that friction makes heat—especially if you have ever burned your hands by sliding down a rope too fast!

So, whenever electric current flows through a wire, heat is generated. We shall see that this is a very useful fact. Not only does it make the little coil of wire get white hot in the lamp, thus making it give off light, but it also heats the coils in your mother's electric iron, and in the electric range or electric roaster. All things in which electric power is used to make heat depend on this friction which occurs when the electrons are forced to flow through a wire. We shall also see that this same heat is a great nuisance at times, and that engineers must provide ways to get rid of it in the coils of motors and in other places where it is not wanted.

Getting back to the lamp, the amount of heat generated in a certain time represents the total amount of electric energy consumed, and this is a product of three factors. It is proportional to the electric pressure drop in the wire; it is proportional to the amount of current flowing in the wire; and it is proportional to the time during which the current flows.

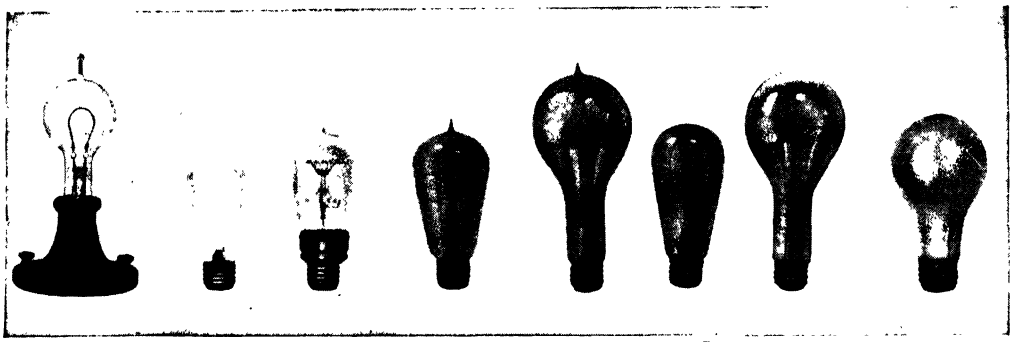
Electric-pressure drop is measured in volts, just as distances are measured in feet or miles. We shall see later just how it is measured. It is enough now to know that in most houses the pressure that is supplied by the power company is 110 volts and that the pressure supplied by an automobile storage battery that is used to operate the starter is 6 volts on most cars. Electric power is transmitted from the power-house at high pressure amounting to many thousands of volts.

Electric current is measured in amperes. It could be measured by telling how many electrons go by in a second, but the electron is so very small that the number going by even in as short a time as a second is an inconveniently large number, so that is not done except by scientists when they are studying exactly how the wires resist the flow of electrons. The product of the pressure drop in volts and the current in amperes gives the power in watts, which is the amount of electric energy being converted into heat in the lamp in a second. On the glass bulb of the lamp, opposite the base, you will find



Courtesy, General Electric Company

The parts of an incandescent light bulb, and how they are put together. Most bulbs are filled with argon gas.



Courtesy, General Electric Company

Incandescent lamps down through the years. At the left is Edison's first lamp. Second, a carbon-filament lamp. Third, a tantalum-filament lamp. Fourth, a drawn-wire-filament lamp with tip. Fifth, a gas-filled lamp with tip. Sixth, a vacuum lamp without tip. Seventh, a gas-filled lamp without tip. Eighth, a modern lamp with inside frosting. Lamps are constantly being improved, so that more and more light costs less and less money.

the power consumption of the lamp given in watts. A common size for use around the house is a 40-watt lamp. In places where less light is needed, people use the 15- or 25-watt lamps, and for a very bright light sizes up to 100 watts are used. We should pay some attention to the sizes of bulbs in various parts of the house. Lights that are too glaring are bad for the eyes; but, on the other hand, we should be sure that reading lamps are not too dim, and that they are properly placed for eye comfort.

A FEW CENTS IS ALL IT COSTS TO LIGHT AN ELECTRIC LAMP FOR A LONG WHILE

You can easily see how cheap it is to operate an electric light. If you ask your father to show you his last month's bill from the electric-power company, you will find out what price is charged for electric energy at your home. (The price is different for different places because of different local costs of producing electric power, just as the cost of other things is different in different parts of the country.) The cost of electric energy will be given as so many cents for a kilowatt-hour. If it is 3 cents, this means that you can use 1,000 watts for an hour, or 1 watt for a thousand hours, for only 3 cents! So to use a 40-watt lamp for 3 hours every evening for a month will use up only $40 \times 3 \times 30$ watt-hours of energy or 3,600 watt-hours, which would cost only 10.8 cents. You can easily calculate the cost if the rate is higher or lower.

In a way, that is all there is to it—an electric lamp is simply an arrangement for making the electric current go through a wire so it will get white-hot and give off light. But we want a lamp that will give as much light as possible, since it is light we want from it and not heat. We want it to last as long as possible. We want to make it as cheaply as possible. Here is where a lot of that educated cleverness we call engineering comes in, to use the facts of science to make the best lamp. Naturally we will need to make various kinds of lamps for many different purposes, ranging from the tiny lamp a doctor needs in examining your sore throat up to the gigantic lamps which flood-light a large building at night or light up the landing field at the airport.

What shall we use for the filament, the part which is made white-hot? Obviously it must be something which will stand a very high temperature without melting or vaporizing (turning into a gas). In the early lamps carbon was used, made in fine strips by charring bamboo splints. But these were very fragile, and they could not be operated at extremely high temperatures without vaporizing. That is why the old carbon filament lamps gave a yellowish light and gave comparatively little light for the amount of electric energy used.

THE GLASS BULB KEEPS THE TUNGSTEN FILAMENT FROM RUSTING IN THE AIR

Nowadays we use tungsten wire for the filament. Of all the many substances which have been tried, tungsten has been found most suitable. It is a very hard metal and is hard to work with. After it was known how good tungsten would be for a lamp filament, engineers had to study hard and make many experiments before they learned how to make fine wires out of tungsten. But that is too long a story to tell here.

Why put the filament inside a glass bulb? Why not just leave it exposed to the air? Thus we could save the cost of making the

bulb and save the part of the light that gets absorbed in the glass on its way out. This sounds like a good idea, but it will not work, because if the filament is exposed to the air it will burn out very quickly. Air contains oxygen, which is the gas that causes coal to burn in a furnace. Also, when iron rusts it is because the oxygen of the air combines with the iron to make rust. All metals rust more or less when exposed to air and do so more rapidly when hot. So we must use a bulb around the filament to protect it from the air so that it will not burn out at once.

What shall we put in the bulb? We must keep air out. Shall we put some other gas in or shall we pump as much gas out as possible, leaving the bulb quite empty? To understand the answers to these questions, we should first know what is going to happen inside the bulb when we turn on the electric current to heat the wire until it glows white.

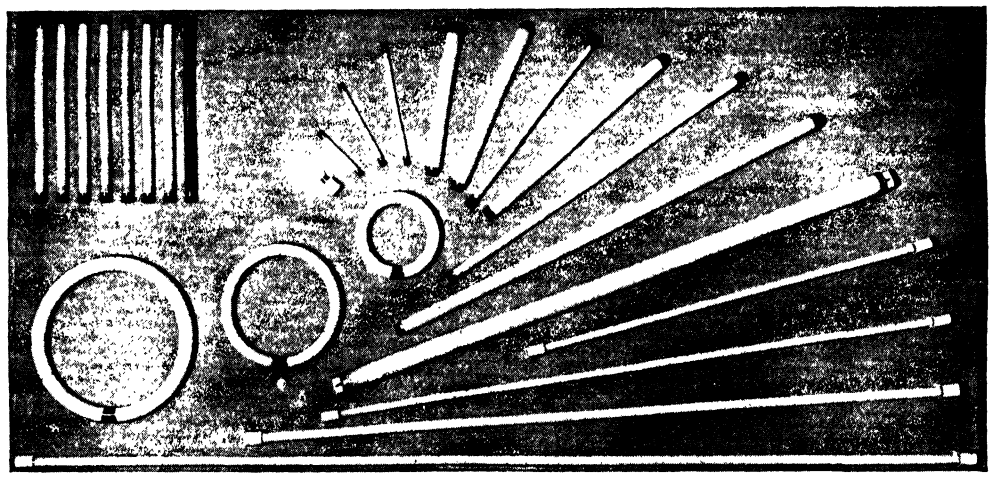
To get as much light as possible, we want the filament to be as hot as possible. Obviously it must not melt. But when anything is very hot it slowly evaporates. A kettle of water will gradually dry up because of evaporation of the water. The same thing happens to the wire in the lamp. Gradually the atoms of the metal filament break free and fly out across the space in the bulb and are deposited on the inner wall of the glass.

This is bad for two reasons. As the atoms of metal leave, the filament gets thinner. At the thinner places there is more resistance to flow of the current. This makes the thin places get still hotter, which makes atoms break free still faster and after a while the filament gets so hot at a thin place that it melts. The lamp is now "burned out" and must be replaced. The other reason why evaporation is bad is that the metal deposited on the glass darkens it. The darkened glass absorbs some of the light, and we get less light from the lamp than when it was new and clean on the inside.

THE LIGHTING ENGINEER MUST BALANCE GOOD AND BAD FACTORS IN DESIGNING LAMPS

You will notice that we are in a situation where we must balance good factors against bad factors—advantages against disadvantages. The hotter we make the filament the more electric power we convert into light. But also, the hotter it is the faster it evaporates, so that the lamp does not last so long. We shall see as we go along that engineering is always concerned with such a balance between good factors and bad factors. We want to make the good factors as good as possible, and the bad factors as weak as we know how, and at all times to strike a proper balance between them.

The engineers could give you a lamp in which the filament gets hotter. Then you would get more light for the same amount of power—but the lamp would not last so long and you would have to buy a new one too often. Or they could give you a lamp with a cooler filament so that the lamp would not burn out even after many years of use—but you would get so much less light that this would cost more money in the extra power consumed. The lamps which you buy have been carefully designed to give the most



Courtesy, General Electric Company

Fluorescent lamps of all colors, sizes and shapes. When certain chemicals are exposed to ultraviolet light, they glow brilliantly, producing a cool, bright light. These chemicals, called phosphors, are used in fluorescent lamps.

light for your money, balancing the cost of power against the cost of replacing burned out lamps with new ones.

But to get back to our question about whether to put gas in the bulb, or to pump it all out and leave a vacuum there! We must keep the oxygen out, for it would burn out the lamp by rusting the filament. But there are other gases which do not have this effect: nitrogen, for example, a gas which makes up four-fifths of ordinary air.

Shall we put any inert gas (inert gas means one which will not attack the filament chemically) in the bulb or shall we leave it empty? Here again we come up against a balance of good and bad factors. If we put some gas in, it will help the heat to get out, by circulating around in the bulb, carrying heat from the hot filament to the bulb. That is bad because we shall need to supply more electric power to keep the filament hot enough to give light. But there is a good factor: when there is gas in the bulb, the filament does not evaporate so rapidly and the lamp lasts longer.

Think of it this way: An atom of tungsten flies away from the filament due to evaporation. If the bulb is empty it goes straight out and lodges on the glass where it sticks. But if there is gas present, the tungsten atom flying away from the filament is likely to bump into a gas molecule—it is likely to be bounced back, so that it falls back on the filament again. It is saved to the filament—thrown for a loss, to use a football term.

That is why a lamp is better if the right amount of gas is put in. We lose power to get the same amount of light, but the gas works for us by keeping the tungsten atoms where they belong so the lamp lasts longer.

Since the useful effect of the gas depends on its ability to bounce back the tungsten atoms, you can see that the best kind of gas to use will be one with the heaviest possible atoms. The tungsten atoms are among the heaviest, and to bounce them back effectively it is better for the gas molecules to be as big and heavy as the tungsten atoms themselves.

Nitrogen was first used in the bulbs, but later a rare gas called argon was found to be better since its atoms are heavier. There are other gases—krypton and xenon—which have still heavier atoms and so could bounce the tungsten back even better—but they are so rare that it would cost more than it is worth to make the lamps a little better by using them. Maybe you can some day discover a way to get these rare gases cheaply and help make better light even cheaper than it is today!

This has been a long story. But now you realize how much hard work and clever thinking has gone into the business of pro- in our factories, hundreds of thousands of lamps are made every day, big lamps and little ones, lamps of many shapes, lamps for a great variety of uses.

THE NEXT STORY OF SCIENCE IS ON PAGE 5033.



Courtesy, Westinghouse Electric Corporation

Over a third of a mile of fluorescent lamps produce "daylight" twenty-four hours a day.



Philip Gendreau, N. Y.

MARTYRS TO SCIENCE

MEN AND WOMEN WHO SUFFERED THAT MANKIND MIGHT LIVE

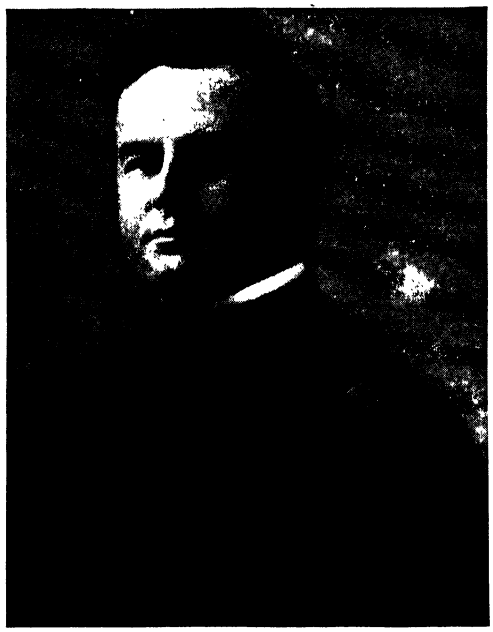
EVER since Pasteur discovered that some microbes are a menace, war against the deadly ones has been waged in laboratories all over the world. In hospitals, in medical foundations like the Rockefeller Institute for Medical Research and in hygienic laboratories like those of the United States Public Health Service and of the Canadian Dominion Health Department, doctors, bacteriologists and laboratory assistants are constantly fighting the microbes of many diseases. Sometimes these microbes rise up against those waging war on them, injuring or even killing them.

Many of their victims are pioneers of knowledge, who, though they realize the dangers attached to exploration in any new field, are not afraid to risk their lives for their chosen work. We read in another part of our book about the moral courage of the men who purposely infected themselves with yellow fever in the effort which finally wiped out this plague. Many others also have exposed themselves to harmful bacteria in attempts to conquer the scourge of dread disease. We could fill our book with stories of their heroism. The few examples which we give are typical of all.

In the Rocky Mountains there is a peculiar disease known as spotted fever. It is carried by the wood tick, an insect which sucks the blood of man or beast. The wood tick becomes a disease carrier after sucking the blood of an infected animal

WARRIORS IN THE FIGHT AGAINST DISEASE





Left, Doctor George W. McCoy, discoverer of the disease known as tularemia. In his research work he suffered from this, as well as dengue and typhoid fever. Right, Thomas B. McClintic, a doctor who died of Rocky Mountain spotted fever, contracted while making studies to determine the means of curing and preventing the disease.



Pictures, courtesy, U. S. Public Health Service

The disease known as undulant, or Malta, fever was described over 2200 years ago by Hippocrates, the father of medicine. It is named after the island of Malta in the Mediterranean, from which it spread over the world. Doctor Edward Francis (above) of the United States Public Health Service performed much experimental work on the disease.

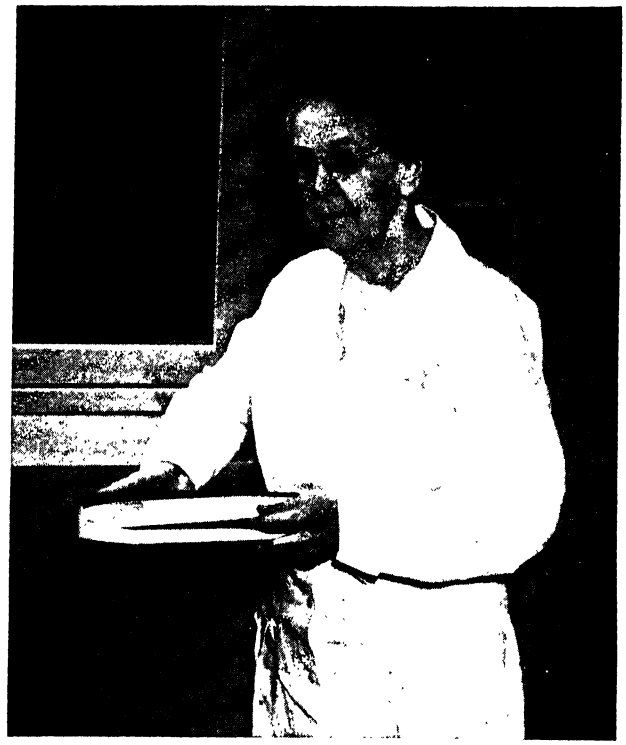
and so gives the disease to its next victim.

Each spring, when the ticks awoke from their winter sleep, spotted fever used to take its toll of lives, but its ravages have been considerably reduced by the painstaking care and work of several brave doctors. One of these, Thomas B. McClintic, limited his research to a certain locality in the Rocky Mountains where the infection was most serious. He decided that the best course was to eliminate the wood tick. Accordingly, all domestic animals were bathed in an arsenic solution which poisoned the insects. Then all wild animals likely to be tick-ridden were killed. At the same time Dr. McClintic intensively studied the disease in his laboratory. In the summer of 1912, while experimenting with serums for curing or preventing it, he became infected with the disease and, after a brief illness, died. But he had succeeded in checking spotted fever temporarily at least, for in that year his was the only case in the region.

It sprang up again, however, despite all the efforts that were directed against it, and ten years later the United States Public Health Service sent Dr. Roscoe Spencer to the infected region. There he established a laboratory and with several of his assistants began to collect wood ticks and to experiment on guinea pigs. At first his experiments failed, and, tragically, some of the insects escaped and overran the laboratory. Two of his assistants, William Gettinger and George Cowan, contracted the disease and died.

But the work went on, and in 1924 Spencer developed a vaccine which protected guinea pigs from the disease. Now the question was, would it also protect man? Without knowing what the results would be, Spencer injected some of this vaccine into his own arm. He continued to work with his deadly ticks with no ill effects and so proved the value of the vaccine. Before long it was being used extensively and successfully for the prevention of Rocky Mountain spotted fever.

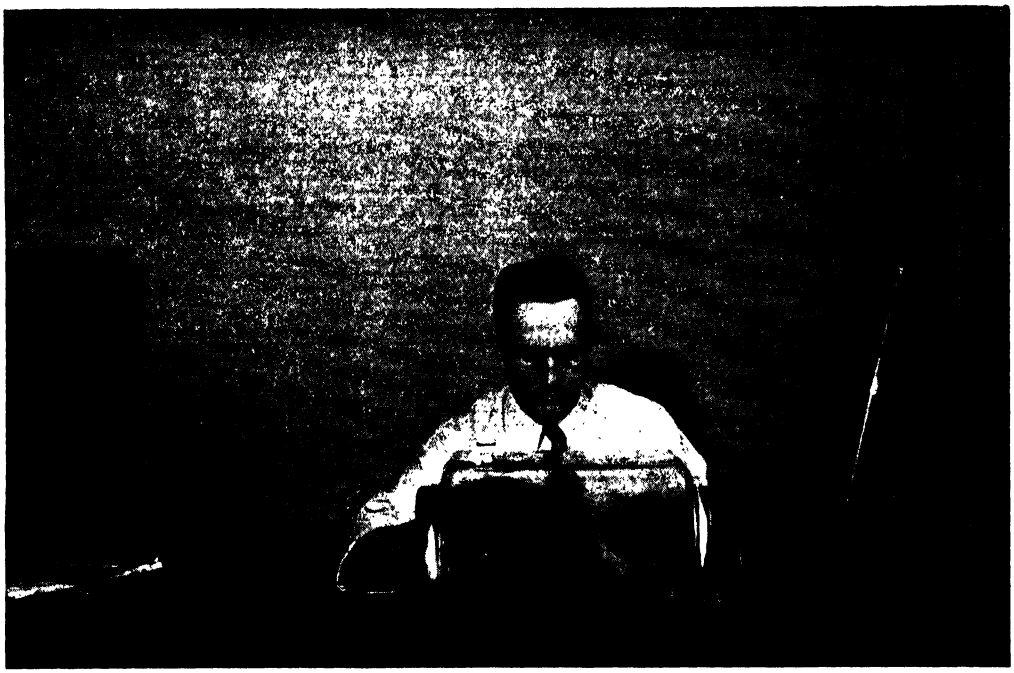
There is another illness which has taken the life of more than one scientist in the battle to wipe it out. This is meningitis, a disease causing inflammation of the membranes of the spinal cord and brain. Important work has been done toward developing a serum to fight it. Not the least worthy is that of a bacteriologist, Anna Pabst, who devoted her medical studies mainly to meningitis. One day, while injecting serum into a laboratory animal, it moved suddenly and some of the serum spurted into the bacteriologist's eye. The eye was immediately washed, but shortly afterward Miss Pabst showed the signs of meningitis. Four days later, on Christmas Night, she died—a heroine of peace engaged in promoting the welfare of humanity.



Courtesy, U. S. Public Health Service

Many scientists, such as bacteriologist Alice Evans (above), are continually experimenting with deadly microbes. They are soldiers in the never-ending war against sickness and disease.

You have perhaps heard of the dread disease called Malta fever. This is also known as undulant fever, because it strikes its victims in waves. Formerly it was believed that goats were the only carriers of the disease, but Alice Evans, a bacteriologist, discovered that cows and pigs also carry it. She found a likeness between the Malta fever germ and the Bang germ which causes a disease in cattle and swine. What is more



Courtesy, U. S. Public Health Service

Working with deadly germs in a tight glass cylinder. Work done by doctors such as this, who expose themselves to sickness and even death, sometimes leads to the discovery of cures and preventive treatments for disease.

important, she suggested that the Bang germ causes Malta fever in human beings. Miss Evans became so engrossed in her research that she neglected her own health until she discovered that she had contracted Malta fever. Forced to give up her work, she suffered for seven years. She was partly rewarded for her good services by being elected president of the American Society of Bacteriologists, but her greatest satisfaction came from the knowledge that her discoveries were of great value to mankind. Now we know that cow's milk which has been heated to 145° Fahrenheit is completely free from the microbes causing Malta fever.

Dr. Edward Francis, of the United States Public Health Service, continued the researches and proved beyond doubt that the Bang germ causes undulant fever. Before he finished his work, however, he himself went through a siege of the disease. This was not his first experience in contracting an illness on which he was working; in 1913 he suffered from dengue, a disease carried by mosquitoes; in 1919 from tularemia, which attacked twenty-four Public Health Service men who worked on it; and in 1930 from parrot fever. Each time he recovered, ready to fight another dangerous disease.

Early in 1930 parrot fever, or psittacosis as it is scientifically called, spread in America. Up to that time very little was known about this strange disease caught from parrots, but now several doctors in the United States Public Health Service began to study it. What happened then shows the tremendous risk run by these men who fight against death. Four doctors, including Francis, two assistants, three attendants and two laborers fell ill with parrot fever. One of the attendants, Harry Bernard Anderson, died.

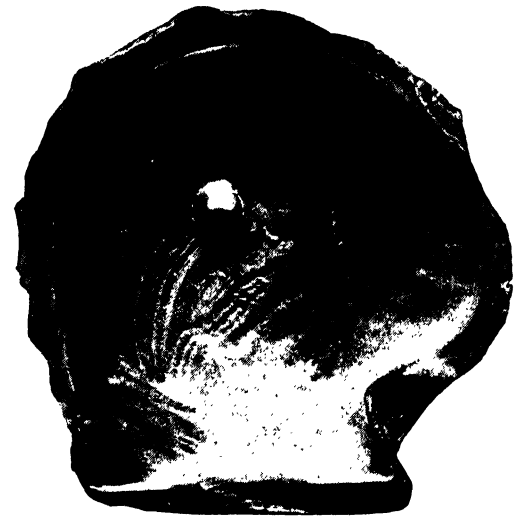
Foremost in the battle was Dr. George W. McCoy, a co-worker of Dr. Francis and director of the National Institute of Health of the United States Public Health Service. McCoy was very nearly a martyr to typhoid fever in 1907 and in the same year contracted dengue. Later he suffered from tularemia. Now he was again exposing himself to a deadly infection; but this time he came through unscathed.

The work done by these doctors formed the basis for further study of the disease and we can not help admiring the courage and selflessness they showed in starting the fight against another of mankind's ills.

THE NEXT STORY OF GOLDEN DEEDS IS ON PAGE 4901.

PEARLS—

TREASURES OF THE OCEAN CAVES



Courtesy, Australian News and Information Bureau

A blister pearl covers a shell-boring parasite.

THE Arabs have a superstition that pearls are dewdrops filled with moonlight, which fall into the sea and are swallowed by the oysters, then turn from liquid to solid form. Certainly these satiny spheres do seem to have the soft gleam of moonlight, but their origin is entirely earthly, and much more wonderful than any legend could devise.

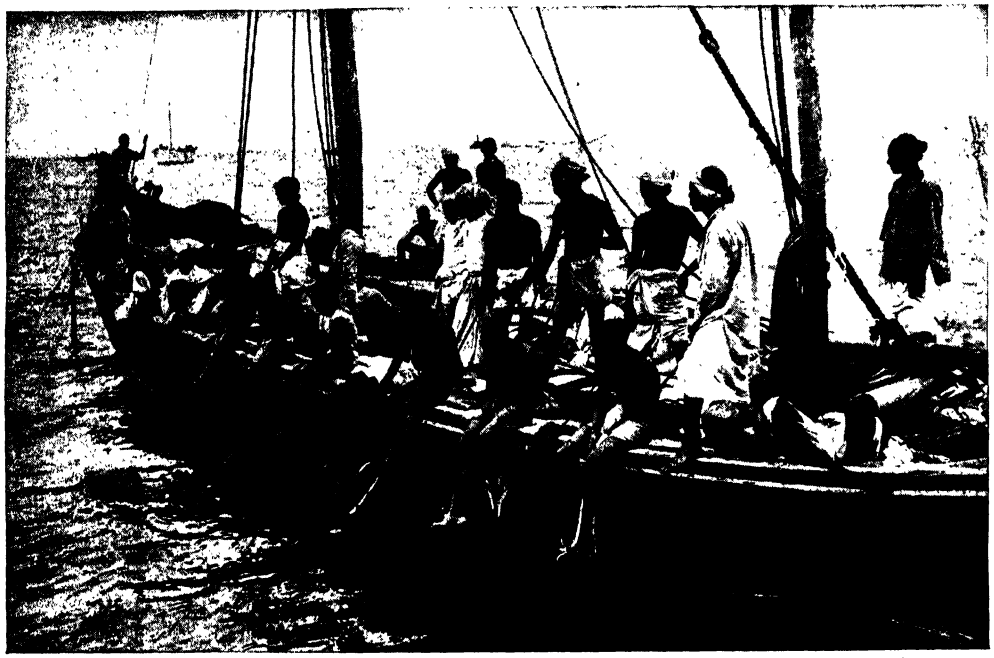
Natural pearls are found inside the shells of certain kinds of molluscs, such as pearl oysters, fresh-water mussels and others. The most valuable pearls come from the pearl oysters that grow in the warm waters of the Persian Gulf, the Red Sea, the northern coast of Australia and the islands of the Pacific. Some are found off the coast of California. Men have to dive down many feet below the surface of the sea (50 to 150 feet) to gather the oysters, and by no means do all of the ones they find contain pearls. Comparatively few of them contain pearls of great value. Let us see why this is so, and how the pearls come to be inside the oyster shell.

You have seen seashells with lovely, glistening linings of pearl. This pearly lining is made of nacre, a substance manufactured by the creatures that live in the shells, from chemicals drawn from the water surrounding them. This pearl shell is what we call mother-of-pearl, and many things are made from it, such as buttons, handles for knives, beautiful inlay-work and other useful and decorative articles.

Sometimes a tiny grain of sand, or perhaps a little parasite, works its way into the shell of a mollusc, and gets caught in the soft mantle, or membrane, that lies between the shell and the creature inside. This irritates the tender membrane, and in order to stop the irritation, the mollusc begins to coat the intruder with thin layers of nacre. Day after day and year after year the shining nacre is deposited on the nucleus, or object in the centre, until the pearl sometimes grows quite large. As the mollusc deposits the nacre, its muscles expand and contract in an effort to get rid of the object entirely. This it can not do, but the movement has the effect of rolling the object around, so that the nacre is smoothed on in even layers and the growing pearl keeps a round shape. This is the way the perfectly round pearls, which are most valued, grow.

Not all pearls are perfectly round; some are irregular in shape, and these are called baroque pearls. The most beautiful baroque pearls are the pear-shaped ones. Others are dome-shaped, like a ball that has been cut in two. This happens when the growing pearl has become attached to the shell. Sometimes a parasite will bore through the shell, and the mollusc will try to protect itself by covering the invader with nacre, creating what is called a blister pearl, round and rather flat, with a hollow in the centre where it covered the parasite. These oddly shaped pearls are often made into beautiful pendants, brooches, rings and other jewels, but they are not so valuable as the round pearls.

You may wonder what the chemical substance is that the mollusc uses to make nacre. It is a form of calcium carbonate called aragonite. Limestone and marble are also made of calcium carbonate, but that is a slightly different kind known as calcite. The ara-



Courtesy, B. Landau, New York

Here we see a pearling boat in the waters near Ceylon, in the Indian Ocean. The divers are resting between trips to the shell beds under the water. The seated men are divers; behind stand other members of the crew.

gonite that makes nacre is mixed with a sort of gummy substance produced by the mollusc itself.

Pearls come in many different colors, but the most valued are rose, cream, white and black. The color of a pearl is the same as that of the nacreous lining of the shell, and this is determined by a number of things,



Courtesy, American Museum of Natural History, New York

This is a part of an undersea group, showing a pearl-diver gathering a cluster of pearl shell.

among them the health of the mollusc, the temperature of the water, and the kinds of minerals and chemicals that the water contains. The lovely shimmering glow of the pearl is caused by the light rays which are broken up by the layers of nacre as the light tries to find its way through. These layers are of different thickness. The thinner they are the greater the lustre of the pearl. The oysters we eat sometimes contain pearls, but they are not the valuable kind.

The finest pearls come from the Persian Gulf, in the waters near the island of Bahrein. Here the season for pearl-diving begins in the middle of May, when the waters grow warm, and lasts until the end of September. On the day when the season is proclaimed open by the ruler of Bahrein, a fleet of several hundred boats, called dhows, gathers in the harbor to set off for the pearling banks—shoals and ledges out in the gulf. The dhows have oars and sails, and the men row them until they reach the open water outside the harbor, singing the ancient song of the pearl-fishers as they row.

When the dhows reach the banks, the diving begins, and it is done in much the same way to-day as in the time of Marco Polo, six hundred years ago. The divers work in pairs; one to dive while the other stays on

guard in the boat and helps him to come up to the surface. Each diver wears a clip like a clothespin to keep the water from getting in his nose. He wears no clothing of any sort, but his fingers and his big toes are encased in leather. This helps him to grip the sea bottom and protects his hands when he wrenches the shells from the rocks to which they are attached. The diver does not really dive, he climbs down a rope to the bottom, carrying a heavy stone to give him weight. When he reaches the bottom he quickly gathers as many shells as he can and puts them in a string bag which is fastened around his neck. A minute and a half is usually all the time that a diver can stay under water. Then he twitches the rope to signal his partner, and is pulled up to the boat. A good diver can go down as many as thirty times in one day.

It is a thrilling moment when a shell is opened. Who knows—a perfect pearl of fabulous value may be found inside! The divers all share this suspense, for their livelihood depends upon the profits from the whole catch. In almost all pearling areas the divers are paid a share in the profits instead of wages. Around Bahrein and in other places this system is said to be very fair and well regulated, but this is not so everywhere.

The pearls are assorted according to size and shape, and sold to the dealers. In the Persian Gulf and the Indian Ocean most of the pearls are sent to India, where the great pearl market is. Here they are washed and polished, and the ones which are to be used in necklaces are drilled by hand, according to a 3,000-year-old method that requires great skill and delicacy. A necklace of real pearls costs thousands, and sometimes hundreds of thousands, of dollars; but it takes years to collect the pearls that go into it. The pearls must be perfect in shape and quality, and exactly the same in size and color. Shorter strands of pearls are usually graduated in size: that is, the pearls at each end, near the clasp, are small, and each succeeding pearl is a little larger; the biggest one being in the exact centre of the string.

Until World War II interrupted it, the pearling industry in the waters off the north coast of Australia flourished. Unfortunately, the Japanese fleets had in recent years nearly crowded out the Australian companies.

In this area the chief object of the pearlers is to get good pearl shell, but pearls are also found and form an important part of the trade. The industry near Australia is con-



From Ewing Galloway

Dealers from India and Ceylon gather during the fishing season to examine the pearls and buy them.

ducted along more modern lines than in the older pearl regions, but pearling is much the same all over the world.

It is believed that the pearl was the first gem to be known to man, and we find it mentioned in the oldest writings. Many legends and stories have been told about the pearl during its long history, and in many countries pearls have been prized above all other gems. Naturally there have been many efforts to imitate the pearl. Most of the artificial pearls are made by coating either the inside or the outside of a glass bead with a pearly substance.

There is, however, another kind of pearl which is not an imitation, yet is not entirely a natural growth. This is called the culture pearl, and the finest of these pearls are very beautiful and costly. As far back as the thirteenth century, the Chinese knew that pearls could be grown by putting a piece of mother-of-pearl or freshwater mussel or some other foreign substance inside the shell of a river mollusc. The mollusc would at once start covering the object, and after a time a pearl would be produced. It was not until 1890 that the Japanese began to do this on a large commercial scale. To-day culture pearls are made around the Persian Gulf and in other places, as well as in Japan.

To put the foreign substance into the shell is like performing a painful surgical operation, and it is not always successful. Indeed, the head of the great Japanese pearl culture industry once estimated that 45 per cent of the molluscs died, and he erected a monument to the molluscs that had given their lives to build up a great industry for Japan. Scientists, working as carefully and skillfully as a great surgeon, and using anesthetics, have been able to develop pearls so perfect that only an expert using scientific instruments could tell that the pearl was not the natural, unassisted product of the pearl oyster.



Culture pearls are made by prying open the shell and inserting a bit of shell, or sometimes a tiny seed pearl, in the pearl-bearing sac. The mollusc at once starts covering the object with pearl nacre.



From seven to fifteen years after the foreign object has been put in the shell the pearl will have become large enough to take out. At the right we see such a pearl being removed from the shell.

Pictures courtesy,
Imperial Pearl Company

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 4759.

POLAND and ITS PEOPLE

IF we look at a map of central Europe, we see a broad plain extending from the Baltic Sea to the Carpathian Mountains. It is the cradle and home of the Polish people. The Poles, like the Russians, Czechs, Yugoslavs and Bulgarians, belong to the Slav branch of the Nordic stock. No one knows when they settled down in Europe. But it seems certain that the Poles of today are descended from people who lived in the Polish plain two thousand or so years ago.

The Romans never tried to conquer Poland. They must have known of it, however. One of the Roman historians mentions a country beyond the Carpathians where there were strange people who played the flute most beautifully but did not know the use of a sword. Most of the Slavs were gentle and peaceful. They tended sheep and cattle, and were clever at bee-keeping and fishing. The women used to spin and weave their own clothing while the men hunted in the big forests.

In some parts, where the old forests were cleared, men used to till the ground, using primitive wooden plows.

Unhappily, those peaceful people had German neighbors who were warlike, and who wanted the rich land of the Slavs. To make it appear right to take over the territory of their neighbors, the Germans, who were Christians, proclaimed a crusade against the pagan Slavs. Whoever rejected Christianity was killed, and his land was taken. The Germans pushed their frontier farther and farther eastward, until their advance was stopped by the Poles.

The danger of a German invasion taught the peaceful shepherds of the Polish plain to use weapons and to organize their country under a single leader. One of these early leaders was Prince Krak, who is said to have founded the city of Cracow. He became a legendary figure in the course of the centuries; among his supposed exploits was the slaying of a terrible dragon which endangered the lives of Krak's subjects.



Ladislas II, who ruled Poland in its Golden Age.

In the ninth century a leader called Piast founded the first Polish dynasty, or ruling family. Piast is said to have been a wheelwright. He was chosen to be leader of the nation because "he was an honest man and a good worker." The descendants of Piast reigned until the last years of the fourteenth century.

Poland adopted Christianity in the reign of Miecislav I, who flourished toward the end of the tenth century. One of the greatest of the Piast kings was Boleslav I, called the Brave, who mounted the throne in 992. He was a renowned conqueror and added Pomerania, Danzig and Bohemia to his realms. He was also a farseeing statesman. He dreamed of a great union of all the Slav nations—a union strong enough to hold in check the Germans, who were at this time spreading toward eastern Europe. Unhappily, this dream never came true, and Poland had to suffer for it, being attacked over and over again.

But the Germans were not the only threat to Polish freedom in those days. In the thirteenth century hordes of Mongolian Tartars swept in from Asia, conquering Russia and then attempting to break through Poland to the west of Europe. But they never succeeded. Poland stood at the gates of Europe like a faithful sentinel, barring the way of the barbaric hordes that might have been a menace to civilization..

The last Piast king to rule over Poland was Casimir the Great, who reigned from

1333 to 1370. It is said that he "found a Poland of wood and left a Poland of brick." He founded the first Polish university in Cracow in 1346, and many of the beautiful buildings in that town were built during his reign. He also allowed the Jews to settle in Poland. From that time on, during all the persecutions of Jews in western Europe, the children of Israel flocked into Poland from England, France, Italy, Spain, Germany and Bohemia.

During this part of her history Poland was comparatively free from religious persecution. Religious tolerance, so unusual at that time, brought to Poland, at the time of the Reformation, Protestant families who, escaping persecution at home, found in this country peace and shelter. Their descendants can still be found in Poland among families bearing such un-Polish names as Morris, Darnley, Brown, Clark and so on.

In 1383, Jadwiga (or Hedviga), a fifteen-year old girl, was elected queen of Poland. In 1386 she married Jagiello (or Yagello), Grand Duke of Lithuania, thus uniting the two countries and bringing Christianity to pagan Lithuania. This land had been invaded again and again by the Germans, who tried to convert it by fire and sword. But the Lithuanians had refused to accept the Christian religion.



Polish Review

The fortress-like medieval Church of St. Andrew, Cracow.

After her wedding Jadwiga went to Lithuania as a missionary, and her smile soon conquered where the sword had failed. Yet this girl-missionary could also, when needed, draw the sword and lead her army against Poland's enemies. She died very young, leaving all her precious jewels and treasures to the University of Cracow.

UNDER THE JAGIELLO KINGS, POLISH LITERATURE AND SCIENCE FLOWERED

Jagiello, who reigned as King Ladislas II, founded a new dynasty. The rule of this Jagiellonic (or Yagello) dynasty, as it is called, marks the golden age of Polish history and literature. Poland became a powerful country; her frontiers stretched from the Baltic to the Black Sea; her princes reigned in Hungary and Bohemia. The University of Cracow, the oldest in central Europe after Prague, became a center of learning; as did the academies of Vilna (Wilno), of Zamosc and Lemberg (Lwow). Polish science in the fifteenth and sixteenth centuries was in no wise inferior to that of the west.

This was the time of Andrew Modrzewski, the noted political writer, and of Nicholas Copernicus, one of the greatest of all astronomers. (His name was Kopernicki in Polish.) Prose and poetry kept pace with science. Kochanowski, the prince of Polish poets, wrote his immortal TRENY, a cycle of poems which describe his great sorrow over the loss of a beloved child. The prose of Rej and Gornicki, the eloquence of Peter Skarga still delight readers.

The Jagiellonic dynasty came to an end in 1572. In the following year Henry of Valois, a French prince, was elected king. From then on any foreigner could become a candidate for the Polish throne, and the Poles had a number of foreign kings in the next two centuries.

Poland now entered upon a very sad period of her history. There were a number of wise and patriotic kings, but they received little or no support from the members of the Polish diet, or congress. The nobles who controlled the diet were unwilling to make even the most necessary contributions to the nation's finances. Sometimes generals had to pay their soldiers from their own pockets; sometimes the soldiers would not

be paid at all and they would mutiny.

There was in particular one extraordinary practice that made a farce of many legislative sessions: that was the famous *liberum veto,* or free veto. Every measure that was introduced into the Polish diet had to be approved by all members. A single deputy could veto the measure by simply saying: "I disapprove." Later, any deputy, by exercising the *liberum veto,* could cause the diet to be dissolved.



Casimir the Great, the king who "found a Poland of wood and left a Poland of brick."

The last great Polish king was John Sobieski (reigned 1674-96). In 1683 all Europe was threatened by the Turks. They reached the outskirts of Vienna, the Austrian capital, and they laid siege to the city. The Austrian Emperor sent messengers to the Polish King asking for help, and Sobieski came to Vienna with his faithful army. The mere sound of his name filled the Turks with terror. They had met him in battle, and they knew the power of his sword.

On September 12, 1683, the Poles and the Turks met in battle before the gates of Vienna. The Turkish hordes were utterly routed, and they had to give up the siege of Vienna. Yet Sobieski never boasted of the victory that had saved Europe. He sent home a message in the words of Julius Caesar (*veni, vidi, vici*: "I came, I saw, I conquered") with a slight change. He wrote: "I came, I saw, God conquered."

After Sobieski's death two German princes reigned in succession. They brought corruption into the country and plunged it into complete chaos. The country was weakened, and it became a prey to its greedy neighbors. In 1772 Russia, Prussia and Austria marched their armies into Poland and occupied several provinces, reducing her area from 304,000 square miles to 216,000 square miles.

The country was almost defenseless, with practically no army and no money. It set to work. An education committee was organized in 1773; it must have been one of the first boards of education in Europe. It covered the land with secondary and primary schools open to all, while a society furnished excellent books for the schools.

Then before long, the country opened a network of roads and developed its industries, in spite of the difficulties created by Prussia. In 1791 a constitution was passed which brought many radical reforms. It granted liberty to every Pole as a free citizen, and free education to every Polish child. Unhappily, all this came too late. Russia, Austria and Prussia renewed their violence. A second partition took place in 1793.

The Poles rose against their oppressors under the leadership of Thaddeus Kosciusko, who had fought for the American colonists in the Revolutionary War. The struggle was in vain. Kosciusko himself was grievously wounded and taken prisoner. The Russians stormed Praga, a suburb of Warsaw; thousands of men, women and children were massacred. Soon afterward Warsaw was forced to surrender. In 1795 the final partition took place, and Poland ceased to exist as an independent state.

But she went on living in the heart of the Poles. To them every Polish home was Poland, every Polish child was Poland. They had to suffer unspeakable agonies. Only Austria granted them a certain amount of freedom. Russia and Prussia persecuted everything that was national. Poles were not allowed to speak their own language in public, to sing national songs, to read their own literature. Polish children were sometimes severely beaten for refusing to say their prayers in German.

Life in Poland was very sad at that time. Russia had a special spy system for her Poles, and none was ever safe from spies, even in his own home. People were stopped in streets by the police, their pockets were turned out, and if anything suspicious was found they were sent to prison. People were sometimes arrested for no reason at all, and kept in jail for months.

Thousands of Poles suffered hunger and cold in the damp, dark Russian prisons; thousands were sent to Siberia to the hard work of the mines. The main highroad to Siberia was called by Poles the Polish Gol-

gotha. (Golgotha is the name of the place where Christ was crucified; it has come to mean a place of torment.) Along this road every year hundreds of Poles were driven, side by side with the worst criminals. The convicts had to walk all the way, in bitter weather.

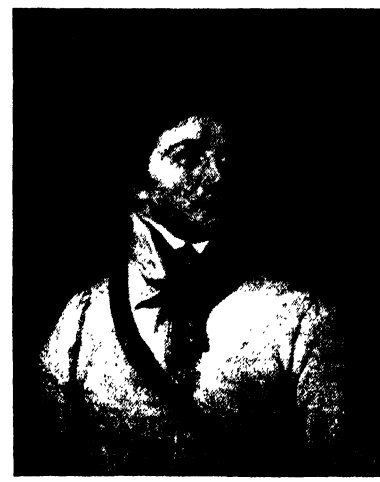
In Siberia most of the convicts were taken down into the mines, where they were chained to the wheelbarrows so that they could not escape. They were kept there for ten, twenty or thirty years, or for life. Sometimes Poles were sent to Siberia as settlers. They were given a certain district where they could live, but were never allowed to go back to their homes in Poland.



John Sobieski, the last great king of Poland, who saved Vienna from the Turks.

The Poles tried many times to free themselves. There was an insurrection in 1831, and others in 1846 and 1863, but they failed, in spite of the tremendous sacrifices the people made. Every insurrection was followed by more and more suffering, yet the soul of the nation remained unbroken. Polish literature and Polish art blossomed in spite of all. The very bitterness of life gave them a touch of something sublime. During the insurrection of 1831, Chopin, Poland's greatest composer, wrote his immortal ETUDE IN C MINOR. When the Tsar heard it played he exclaimed: "This music is dangerous! It is like guns hidden under beautiful roses."

Living at the same time as Chopin were Adam Mickiewicz, Julius Slowacki and Sigmund Krasinski, the three greatest poets of Poland. They were followed by the painters Arthur Grottger and Jan Matejko, among other artists. Toward the end of the nineteenth century there flourished a novelist whose fame spread far beyond the boundaries of his native Poland—Henryk Sienkiewicz. His QUO VADIS? (Whither Goest Thou?) is one of the finest novels of world literature. Another great figure of this time was Ignace Jan Paderewski, the pianist-composer. He was later to become premier of Poland (1919).



Freedom was Kosciusko's watchword. He fought in the American Revolution.

When World War I broke out in 1914, Russia was one of the Allied powers fighting against Germany and Austria. All three countries promised the Poles freedom and independence if they would give their support. But the Poles did not trust them. Nevertheless, they were forced to fight. Poles had to fight against Poles, brothers against brothers. Over and over again whole regiments refused to fight. They threw down their arms and were shot on the spot by the German, Russian or Austrian regiments behind them. Many Polish soldiers escaped to France, Italy or Serbia to join the armies of the Allies. There was a Polish Legion in France fighting under French leadership.

Meanwhile, all through the war, the German, Austrian and Russian armies were fighting on Polish soil, burning towns and villages, and destroying homes. In 1918, after four years of war, the country was a heap of ruins. Thousands of people were aimlessly wandering the roads. Their homes had been burned, the fields laid waste; they had nowhere to live and scarcely anything to eat. Yet others clung to their bit of soil. There were areas where people lived in caves dug in the ground. Terrible epidemics spread all over the country, and the death rate was very high.

But help was at hand. The Treaty of Versailles made Poland a free and independent state in 1919. The three parts were joined again into one, though the new Poland was only about half the size of the Poland of 1772. But no sooner had the country regained her freedom when it was invaded

by Russia. This happened in the summer of 1920.

The Polish army was weak; there were not enough men to fill its ranks. But the women, the old people and the children rallied. There was a regular women's battalion fighting at the front, and many women and girls fought disguised as men. Whoever could carry arms hastened to defend the country. At last Polish heroism, aided by French leadership and Allied ammunition, hurled back the invaders.

Poland settled down to the task of establishing a strong government. The task was difficult indeed. For many years the Poles had had no experience in governing themselves. One-third of the population consisted of non-Poles, who in many cases were opposed to the new government. It was necessary to keep up a large army, which proved to be a great burden. Besides, the country was in ruins and had to be rebuilt.

It soon became evident that, though Poland was a republic with a president elected by all the people, the Poles were not ready for republican government. Much time was wasted in the Parliament in ceaseless quarreling. At last Marshal Jozeph Pilsudski seized the reins of government in 1926. Pilsudski became premier and minister of military affairs. He held the latter post, which gave him control over the army, until his death in 1935.

The Pilsudski Government made many mistakes. The Poles, as we have seen, had suffered under foreign rule for a century and a quarter. Yet when they regained their independence, they sometimes treated the minorities within their borders very unjustly. Even Poles felt the heavy hand of the Government when they tried to protest against the "strong man" government of Pilsudski. But much was done during this period. Shattered towns and villages were rebuilt, and schools and factories sprang up all over the country.

Art and literature revived. The painters Chelminski and Ruszczyc, the poets Staff and Kasprowicz, the novelists Reymont and Zeromski, the composer Karlowicz—these and many others showed that the sense of beauty and the art of expressing it were not dead in Poland.

The Poles were hopeful of the future.



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A modern bridge contrasts oddly with the steep-roofed buildings and Renaissance cathedral of Poznan. This is the old part of the city, which is on the Warta River. It was the residence of Boleslav I, an early king.

Little did they realize that the Nazis, who came to power in Germany in 1933, were to destroy what had been so laboriously built up in Poland since the end of World War I. The Nazis were heartless and ambitious men, who plotted to enslave Europe and, in time,



Courtesy, Paderewski Testimonial Fund, Inc.
The great pianist Ignace Paderewski, who became the second premier of the Poland that came into existence in 1919.

the world. Yet they hid their true purposes well; for a time they found supporters among the British, the French, the Americans and the Poles.

In 1938 the foreign minister was Joseph Beck, who, like Pilsudski, was a "strong man." Beck was anxious to come to an agreement with that other "strong man"—Adolf Hitler, the German leader. In the early part of 1938, therefore, he signed a pact of friendship with Germany. The Poles thought that they would now be able to live at peace with their German neighbors.

They were soon to face a rude awakening. After Germany overran all of Czechoslovakia in March, 1939, the Nazis turned their attention to their friends, the Poles. Following World War I, Poland had been given a strip of territory running through Germany. This territory, which cut off East Prussia from the rest of Germany, was called the Polish Corridor. The German city of Danzig, at the Baltic end of the Corridor, had been made an international free city. Hitler now demanded that Danzig should become German again. He also wanted a strip of land to connect East Prussia with the rest of Germany: that is, a "corridor across the corridor."

The Poles refused to bow to these demands and they were backed up by Great Britain and France. Apparently the Germans did not believe that the British and French would stand by the Poles. At any rate, on September 1, 1939, the nazi war machine launched a full-scale invasion of Poland. Though Great Britain and France declared war on Germany, they sent no aid to Poland. In the *Blitzkrieg*, or lightning war, that followed, German armored columns, infantry and air power proved to be invincible. As the Polish defenses crumbled under the nazi attack, the Russians moved in from the east, meeting no resistance. Soon the Poles had to give up the fight. A fourth partition of Poland now took place: on September 29, 1939, Germany and Russia signed an agreement, dividing the land between them.

THE POLES CONTINUE THE FIGHT UNDERGROUND AND WITH THE ALLIES

The Poles set up a government-in-exile in London and prepared to carry on the fight. They organized an underground movement within Poland itself. They also set up a military force, consisting of Poles who had made their way to the Allied countries. These Poles fought bravely in the war on various fronts; they distinguished themselves particularly in northern Africa and in Italy.

On August 23, 1939, Germany and Russia had signed a ten-year pact, in which each agreed not to take up arms against the other if war broke out in Europe. The Germans violated this agreement as they had violated so many others. They suddenly invaded Russian-held territory in June, 1941, and at first were everywhere successful. The Russians were driven out of Poland, and every part of that unfortunate country now came under the nazi yoke.

The Poles suffered untold misery under their German masters. Thousands upon thousands were forced to work like slaves for the Nazis in the fields and in war factories. Great numbers, too, were sent to concentration camps, where the Germans

CITADEL OF LEARNING AND SOUVENIR OF WAR



An imposing building of the University of Poznan. It is one of the leading centers of learning in Poland.



Both pictures, Polish Review

Warsaw was the first large city to know the horror and destruction of World War II. Great areas of the proud city, with its many historic buildings, were reduced to crumbling piles of mortar. This was once the Blanka Palace.

carried out a terrible program of mass murder. The Polish Jews suffered most of all; they were almost wiped out in the dreadful period of the German occupation.

The liberation of Poland was brought about by the armies of Russia; by the end of January, 1945, they had driven the Germans from the land. In the first Polish areas freed from Germany a number of Poles had refused to accept the authority of the government-in-exile; they had formed a group of their own called the National Council. On December 31, 1944, the members of the group set up a Polish provisional government with headquarters at Lublin. (Warsaw, the capital city, had not yet been freed from the Germans.)

The government-in-exile and the provisional government were bitterly hostile to each other. The Big Three—the United States, Great Britain and Russia—announced in February, 1945, that they would try to bring the two Polish groups together. In June of that year a new Polish Government of National Unity was formed, with Edward B. Osubka-Morawski as premier. It was made up for the most part of members of the former provisional government; but the government-in-exile was also represented in the cabinet. Some members of the government-in-exile, however, did not accept the Government of National Unity, even after it was recognized by the United States and Great Britain in July, 1945.

World War II brought about great changes in Poland's boundaries. In a treaty with Russia, signed in August, 1945, the Poles gave up all claim to a considerable area (69,000 square miles) in the eastern part of the country. This district, east of the Bug River, was inhabited for the most part by Ukrainians and White Russians. To make up for the loss of eastern Poland, the Poles acquired in the west a territory of 39,000 square miles, formerly held by Germany. Poland's western boundary now extends from the Baltic Sea, west of the port of Swinoujscie (Swinemuende), along the Oder and Neisse rivers to the Czechoslovakian frontier in the south.

Poland's area before World War II was 149,274 square miles; it is now only 120,200 square miles. However, in exchange for the largely undeveloped land in the east that was turned over to Russia, Poland acquired a



Both pictures, Polish Review

Every district of Poland has a distinctive holiday costume. The embroidered vest and trousers on this man, probably a shepherd, tell us that he lives in the Tatra Mountains, the western part of the Carpathians.



These smiling girls are shy, but proud of the costumes they have made themselves. The flat bows of striped ribbon are a special feature of the dress of the women of the Baltic coast.



The Poles of the seacoast are a hardy people, who earn their living by fishing. Here the art of old crafts, like spinning, has not been lost.

highly industrialized and richly productive area in the west. Furthermore, she now has 342 miles of seacoast. It is estimated that about 24,000,000 persons are now living on Polish soil. The majority of these are Roman Catholics.

We have already mentioned the great Polish plain. It is lovely in the summer. There are great fields of grain, with no hedges or ditches. All the fields run into one another, so that they form one great mass of gold.

The fields are bordered with forests of pine, birch, oak, beech, elm and elder trees. Especially in the east and north one seems to be surrounded by them.

Looking to the south, one can see from afar a long range of mountains, the Carpathians. They are the glory of the Polish landscape. They have the unspoiled beauty of wild country. In summer their valleys are covered with exquisite alpine flowers. Herds of cattle and sheep graze on their slopes, and the air is filled with the sounds of rushing torrents, tinkling bells and shepherds' songs. In winter the landscape changes. Snow covers the ground four or five feet deep. The junipers and dwarf pines disappear under the snow, and the brooks and streams make their way under white glittering arches.

The rich soil of the Polish plain gives plentiful crops of wheat, rye, barley, oats and sugar-beets. There are extensive forests, which are an important source of national wealth. Poland possesses great mineral wealth, too, with large deposits of coal, iron, lignite, petroleum, natural gas, salt, zinc and other minerals.

Polish industry had made great progress in the period between the two world wars. Large sugar refineries had been built. There were textile factories at Lodz and Zyrardow, near Warsaw. There were ironworks and foundries in Silesia, potteries and glassworks in Lemberg (Lwow), machinery works in Poznan and Warsaw. The German occupation in World War II brought ruin to these industries. After the war, Poland came under the influence of Soviet Russia. It has not been easy for Western observers to learn how far the country has advanced along the road to recovery. It is believed that the Poles have made good use of the industrial plants in the areas taken over from Germany.

Poland had done much to bring education to the people after World War I; but this good work was undone in the period of the German occupation. The Nazis, who boasted of the New Order that they were bringing to Europe, destroyed school buildings and books all over the country; in the Warsaw Public Library, for example, they destroyed 404,000 volumes out of a total of 503,000.



Both pictures, Polish Review

Winter's heavy snows can not pile up on this steep, overhanging roof.

It will be a long and difficult task to make good such losses as these. Much needs to be done, too, to bring education to the people, especially on the technical and university levels of training.

The biggest Polish city is Warsaw, the capital of the country (population, 480,000). This historic town is on the banks of the Vistula. Since the Middle Ages, it has been a center of trade between the East and the West. Its great navigable river connects it with the sea, and it was for centuries used as the chief route for Polish exports.



The beckoning peaks of the Carpathians.

In the days before World War II, Warsaw was one of the most fascinating cities in Europe. Its Old Town was particularly interesting. Most of the houses here had been the homes of rich burghers and merchant-princes. The houses had special names and their special coats-of-arms. There was the House of the Ships, the House of the Lions, the House of the Negro and so on. The doors of many of them showed very fine antique work in wrought iron, bronze and wood. The narrow old streets held under their pavements many a secret passage which made good hiding-places in the times of Russian persecution. Warsaw was terribly damaged in World War II. The Germans bombed it heavily from the air in September, 1939. It was also badly battered in 1944 when the Poles rose against the German occupying forces in a bold but unsuccessful effort to free their capital.

Like Warsaw, Cracow (population, 300,000) suffered heavily in World War II. In the days before the war it boasted of many beautiful buildings: the lovely King's Castle, the cathedral where most of the Polish kings lay buried, the Medieval Cloth Hall and the old university. Cracow was also an important manufacturing center. Today the city is again humming with the sound of busy factories; but many of the finest relics of its past are gone forever.

Gdansk, the former Danzig (population, 118,000), is one of the most important seaports on the Baltic Sea; it is a thriving commercial center. Not far from Gdansk is the seaport and naval base of Gdynia (population, 78,000), built by the Poles after World War I. Another seaport is Szczecin, formerly the German city of Stettin (population, 73,000), at the mouth of the Oder River. The famous old town of Poznan, or Posen (population, 268,000), is an important railway center.



Both pictures, Polish Review

Sheep graze high on the mountain slopes during the summer.

It will take years before Poland recovers from the effects of a war in which she was one of the chief sufferers. However, the Poles are working with great determination to rebuild their land. Some day, perhaps, it will again become, as in the days of John Sobieski, an outstanding member of the European family of nations.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 4797.



From the William H. Coverdale Collection of Canadiana

An old picture of Fort Garry, Manitoba. It was once a center of bitter strife for control of the fur trade.

CANADA AND FUR

WHAT is it that first interested Europeans in Canada? The Northwest Passage, of course, but that was not all by any means. There were two other attractions. Newfoundland's coat-of-arms gives a clue to these. It contains a codfish—and it was cod which introduced the Canadian beaver to Europe. So it was fish and fur that were the great attractions of the wilderness of northern America.

John Cabot opened the route to the cod banks of Newfoundland in 1497, and fishing fleets from France and Portugal were soon regularly following this route. Henry VII's idea of the value of Cabot's discovery may be gathered from an item of his careful bookkeeping: "To Hym that found the new ile—10 pounds." And thus came the name Newfoundland.

The cod fisheries developed rapidly around the shore of "the new-found ile." Contact was readily established with the Indians, and trade soon developed. One fisherman wrote: "The savages offered their best fur for our knives."

Since beaver was the savages' "best fur," the fur trade may have begun with the exchange of a single beaver pelt for a codfisher's knife. That was a dramatic moment of Canadian history.



N. Y. Zoological Soc.

The glossy, durable fur of the beaver was the prize sought by early traders. It was often used as money.

Basques, Bretons and Portuguese came, and sailed away with ever larger supplies of furs. Those hardy and grizzled veterans, the fishermen of the Banks, carried back to Europe marvelous stories about the natives of the great river which, they believed, might lead to China; and they had many a story to tell of the rich fur country.

From these fishermen the merchants of France picked up information about the St. Lawrence area, made petitions to the King for charters and set up in the fur trade. These men and their supporters were seeking fur—fur to trim the "best" clothes of kings, courtiers and merchants and their wives and daughters, fur to line their winter garments; and, above all, beaver for hats.

The motives which were behind Champlain's brilliant exploits as an explorer were furs and the way to Asia. But furs soon became a chief concern. He went as far south as Cape Cod looking for them; he found the Indians had only bows and arrows to trade and had not "anything else better." Finally in the broad valley of the St. Lawrence he found the site for a port and trading post which he called Quebec. Here New France was born, and the first commercial enterprise of its settlers was the trade in

furs which Indians brought down the river in their canoes.

As the fur trade expanded, it soon became a common occurrence for some of the younger men to join the Indians for hunting and trapping. Furs were valuable, and the life in the wild woods was very appealing. The free life of the woods was more satisfying than the hard task of building a new country.

THE DARING "COUREURS DE BOIS" BREAK TRAIL FOR THE GROWING TRADE IN FURS

All these adventurous young men later became known as *coureurs de bois* (wood runners). They made their way deep into the Indian domain. They won the friendship of the red men, and lived the life of the Indian.

Soon after Champlain founded Quebec in 1608, the warlike Five Nations of the Iroquois Confederacy became a menace to French fur trade, because they proved too strong for the Montagnais and Algonkin who sold their furs to the French.

Champlain, in the years that followed, had several battles with the Iroquois. The first one of any importance was on Lake Champlain in 1609. The French with their muskets won the fight, but from that day on the Iroquois tribes were bitter enemies of Frenchmen.

In 1615 Champlain hoped to win a lasting victory over his foes. Encouraged by promises of help from Montagnais, Huron and Algonkin, Champlain went into the wilderness with a small company of his musketeers and Huron guides. They proceeded up the Ottawa and Mattawa rivers to Lake Nipissing, thence down the turbulent French River into Lake Huron and Georgian Bay.

At that point a large party of Huron braves joined them, and together they entered Lake Ontario at the Bay of Quinte, crossed the lake, hid their canoes and marched through the woods on the Onondaga stronghold. The Huron, however, lost their heads in the hot battle which followed, and Champlain and the French failed to achieve a decisive advantage.

After Champlain's day, trouble arose for the French. In the south the Dutch and English pushed up the Hudson River and westward across the Appalachian Mountains. There was a major development in the north. Two great French explorers, Radisson and Groseilliers, sailed to Hudson Bay in English ships.

They wintered in the bay and sailed back to England in the spring in one of their ships, the Nonsuch, loaded with fur—chiefly beaver. In 1670, King Charles II granted a charter to the Governor and Company of Adventurers of England trading into Hudson Bay. So began a great enterprise; and another enormous district was tapped for fur. This territory was called Rupert's Land; it was named for Prince Rupert, cousin of Charles II. In return for their trading rights in the Hudson Bay area, the company agreed to give the King, whenever he should come into their territory, the skins of two elk and two black beaver.

The company built many trading posts on the shores of Hudson Bay, and from these posts (which were really forts in the wilderness) carried on their trade with the Indians. In June, vessels left England laden with merchandise for barter; and in September, the ships started homeward again, laden with furs collected from the various trading posts. Guns and ammunition usually formed a large part of the cargoes sent to northern Canada. The company soon succeeded in drawing to its posts Indians who formerly had traded southward with the French.

SQUEEZED BY THEIR TRADE RIVALS, THE FRENCH TURN TO THE WEST

The French were thus squeezed from the north and from the south, so they pushed toward the west. It was partly in a search for furs that La Salle in 1682 made his remarkable voyage down the Mississippi; it was for furs that La Vérendrye in the 1730's and 1740's pressed out to the plains. After the conquest of New France by the English in 1763, the fur trade from Montreal was taken over by English traders. A number of English companies were established; but soon, as a result of bitter competition, they were merged into one which became known as the North West Company.

The French *coureurs de bois* continued to paddle the canoes of the fur brigades from Montreal. The North West Company engaged more than 2,000 of them to help with the trade. These French Canadians gave valuable assistance, as they knew every path and stream from Labrador to the Rocky Mountains.

Within a few years the trading posts of the North West Company could be seen down the St. Lawrence, up the Ottawa and the Great Lakes, across the prairies to the Rockies and northward by the Athabaska

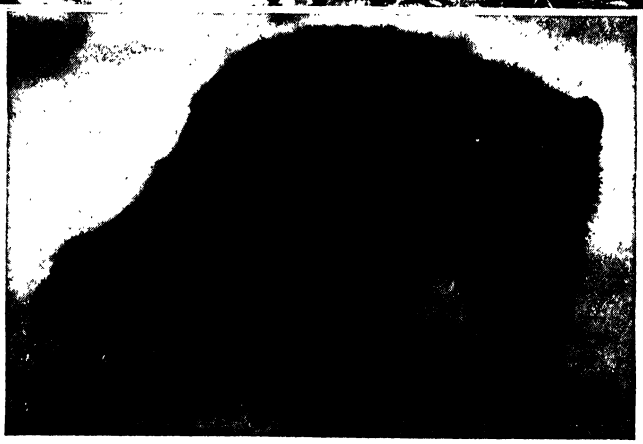
and Mackenzie rivers to the Arctic Circle. Headquarters were at Montreal and the chief trading post was first at Grand Portage, and afterward at Fort William on the north shore of Lake Superior.

Sooner or later the competing companies were bound to clash. Their posts often stood side by side at the junction of rivers or at portages. Although for many years there was occasional violence, an open break was avoided. Then, shortly after 1800, an effort was made by Lord Selkirk to found a settlement at Red River on the Hudson's Bay Company territory. This seemed to the Nor'Westers a dangerous threat to their trade route from the east, and to the supply of buffalo meat on which they depended for their food. They attacked the settlement at Red River, destroyed the crops and carried off some of the settlers. For ten years there was warfare between the two companies. Then, in 1821, it was decided to bring peace by uniting them. The Montreal traders became part of the Hudson's Bay Company, and for another fifty years the rule of the great company remained in the fur-trading areas of the West.



New York Zoological Society

The trapper's enemy, the cunning wolverine. It lives by stealing the animals caught in the traps. Then it destroys the traps themselves. If a wolverine gets on the trail of a trapper, it follows and destroys the man's entire line of traps and deadfalls.



Associated Screen News Ltd.

This trapper is making a deadfall, an old-fashioned kind of trap. Bait is placed beneath the cross log. This log is delicately balanced so that the slightest movement will make it fall. It is heavy enough to kill or disable a small animal.

After the union in 1821, Sir George Simpson, a young Scotsman, was appointed head of the Hudson's Bay Company. He spent much of his time visiting the posts in the West and he brought peace and order. Un-

der his skillful and wise direction, the company became prosperous again, and even the little settlement at Red River took on new life.

THE HUDSON'S BAY COMPANY YIELDS A GREAT PART OF ITS POWER TO THE YOUNG DOMINION

The Hudson's Bay Company held sway for nearly half a century after the union in 1821. But a growing national sentiment took shape in 1867, when four provinces were united into the Dominion of Canada. The fringe of settlement was expanding westward and northward. After long negotiations, and an insurrection at Fort Garry in 1869, arrangements were completed for the Hudson's Bay Company to surrender all its rights in Rupert's Land in return for a million and a half dollars in cash. It was allowed to retain its fur posts and ten acres of land around each one, together with one-twentieth of the land within the fertile belt between the Lake of the Woods and the Rocky Mountains and the North Saskatchewan River and the United States boundary. This transfer was made in 1870, just two centuries after the granting of the charter.

The Hudson's Bay Company remained, however, one of the important trading companies of Canada. Today it has large stores in several Canadian cities, and its trading posts are a familiar sight in the frontier areas of the North and West.

In 1870 the fur trade was thrown open to all, but it was not until 1890 that major competition entered the field. About that time independent traders, or free traders as they are called in the North, set up many small posts. In 1901, Revillon Frères, a wealthy French company, owned many trading posts in the Far North. Later, a few more smaller companies entered the field. However, the bulk of the buying of raw fur from Indians and trappers is still done by the illustrious Hudson's Bay Company, which still reaps benefits from the infusion of North West Company blood in 1821.

The expert hunters and trappers of fine furs are the Indians and the métis (or half-breeds), and from them are secured the greater part of the furs that come from the North.

By the beginning of November the animals have taken their winter coats, and fur is in season, or prime, as it is called. The trapper, who has taken up his residence in some favorite locality, now prepares to lay out his line of traps, which sometimes extends 150 miles in a great circle.

The trapper leads a solitary and dangerous life. To be alone in the trackless forest demands courage and endurance of no ordinary kind. Silently he pursues his way; for he must not frighten the animals off by whistling or singing. The temperature is often below zero, but the fur will be all the finer for that.

As a trapper enters the forest his keen eyes scan every mark upon the snow for telltale tracks. He reads signs left behind by a passing animal as readily and truly as if he had been present and witnessed the whole scene. It matters little whether they are fresh or half blotted out, he rarely makes a mistake in his reading of the language of the tracks. Where he observes the footprints of mink or marten he unstraps his pack and starts to set his traps or to make deadfalls.

Once a week, or fortnight, or month (depending on the length of his line), he gathers the furs caught, repairs the broken traps or deadfalls and resets them.

SLY AND SHREWD, THE THIEVING WOLVERINE IS THE TRAPPER'S WORST ENEMY

The greatest enemy of the fur hunter is the wolverine, or North American glutton. He follows the trapper's footsteps and destroys the animals as they are caught. This curious animal has a long body mounted on short legs of great strength. His large and powerful feet are armed with sharp, curved claws. There is not living a more cunning or crafty animal. During winter months he lives by stealing from the traps of the hunters. He hunts day and night for the trail of man, and when he finds it, follows it unerringly until he arrives at a trap or deadfall. He will destroy the animals caught in the traps, and also the traps. When once a wolverine has established himself on a trap line the hunter's only chance is to change ground. Such serious injury does the wolverine inflict that he has received from the Indians the name of "Evil One."

At Christmas and at the end of March or the beginning of April, the Indian trappers leave their hunting-grounds and make a journey to the trading post with the results of their toil.

Sometimes they are met on the way by independent traders or men from rival companies and are induced to sell their furs. Traders frequently visit the hunting-grounds, carrying with them goods, which they exchange for furs. There are many Indians who never visit the trading posts, but do

all their trading with the traveling traders.

The trader puts a value on each pelt (skin with the fur on it), adds the amounts together and informs the Indian that he will give so much for the skins. The Indian is usually in debt for goods purchased from the trading-post store. He pays the debt, then picks out the articles that he will need for the coming months.

In the old fur trade, money was never used as a medium of exchange in any of the posts, French or English. Everything was measured in terms of skins. (This practice has, in modern times, given way to a system of credit.)

A "skin" is a very old term, and is based upon the standard of the beaver skin, or, as it is called, "made beaver." A "made beaver" is the skin of a full-grown, perfect beaver, killed in season, properly cured and weighing from 16 to 20 ounces. It was the uncoined money of the early fur trade.

The skin did not pass in transaction, but was merely the unit of value, in terms of which furs or goods were measured. Traders had small sticks to represent "made beaver" and these were used as money is used. An Indian would bring his furs. They would be valued as worth so many "made beaver." The Indian would be given a number of sticks equal to the value stated. These he could exchange at once, or the next day or week, or later—providing he didn't lose them —for various goods, each article being rated as worth so many "made beaver," or sticks.

The advance of agricultural settlement, lumbering and mining has driven fur-bearing animals farther and farther afield. The newer, more effective methods of capturing animals has also decreased the numbers of wild fur-bearers. To deal with this loss, the various provincial governments co-operate with the Dominion authorities in conservation methods. Laws provide for closed seasons, licensing of trappers, regulation of trapping methods and collection of royalties on pelts to raise funds for supervision purposes.

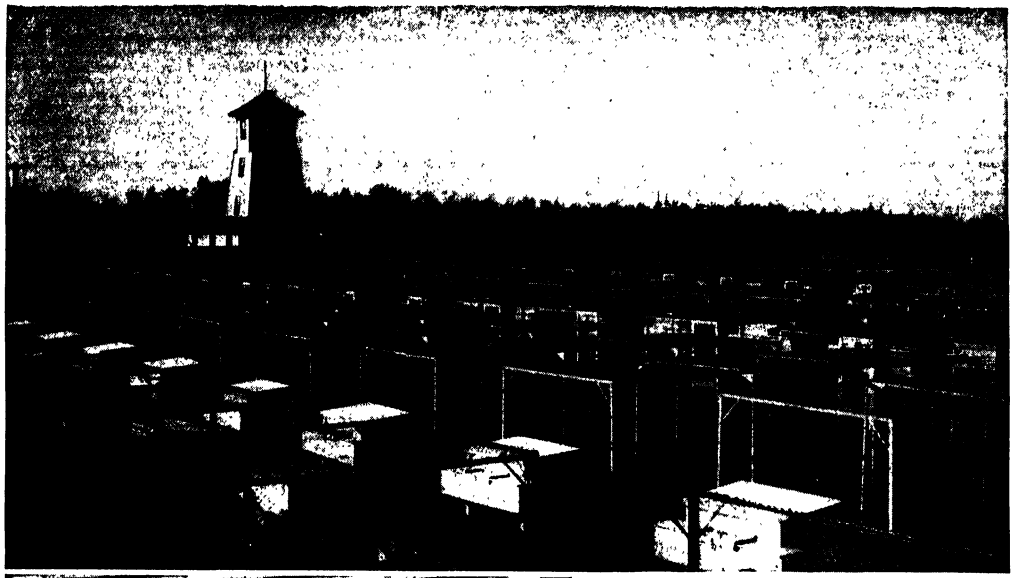
The annual value of raw-fur production in Canada shows no decline, but this is due to the fur-farming industry as much as to conservation and regulation. Fur-farming supplies nearly all of the silver fox and about half of the mink pelts sold annually.

In the early days of the fur trade it was the practice in Canada for trappers to keep

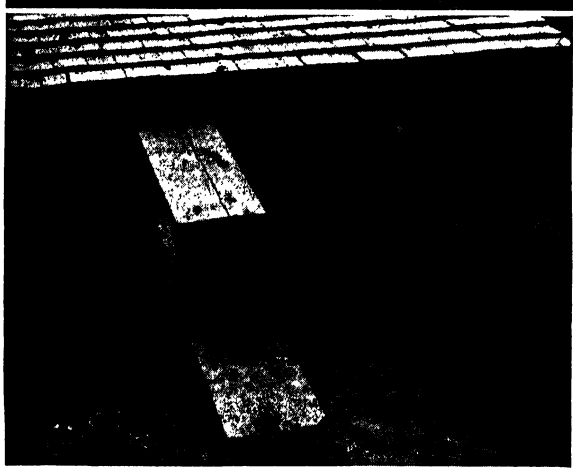


Courtesy, Canadian National Railways

The wilds of northern Quebec are a paradise for trapper and hunter alike. Moose horns and skins adorn this cabin.



Courtesy, Hudson's Bay Company
On this modern fox farm, the animals are under observation at all times from the tower.



Courtesy, Canadian National Railways
Wire netting will keep the fox from burrowing under its kennel.

foxes caught out of season alive until the fur was prime. From this custom has arisen the modern industry of fur-farming. Besides the various kinds of foxes, many other animals including mink, skunk, raccoon, fisher and marten are also successfully "farmed" in Canada. In a recent year there were nearly 11,000 fur farms in operation in the Dominion. During that year, nearly 450,000 animals were born on these farms.

The silver fox is bred in far greater numbers on Canadian fur farms than any other species of fox. The silver fox is the black or rather blackish form of the red fox. The terms silver and black, as applied to foxes, are often used carelessly, though, as a matter of fact, there are five distinct types of this phase—silver, silver-black, black, platinum and white-face.

A silver fox is silvery all over except on the neck, dark below, and white only on the tip of the tail. A silver-black fox is black all over except the hips and forehead, which have silver hairs, and the white tip of the tail. A black fox is black all over except the tip of the tail, which is white. A cross-fox is red on the sides, neck and ears, and silvery on the shoulders and back. Platinums and white-faces are color phases (variations) of the silver fox.

The first attempt at raising silver foxes of which we have authentic record was that of Benjamin Heywood, of Tignish, Prince Edward Island. In about 1872 he obtained several litters from foxes kept in captivity. This attempt was a failure because the necessity for seclusion was not realized, and the young were destroyed by their parents. By 1890 several fox-farming projects had been undertaken, but the industry was not placed on a successful commercial basis until 1895 when Robert Oulton, of Alberton, Prince Edward Island, first made use of the modern method of large wire-netting inclosures. Between 1895 and 1907 several

others took up fox-farming, and from 1907 until 1912 steady progress was made, and the breeders made a good income by the sale of pelts, some of which sold for $1,500 to $2,600 each.

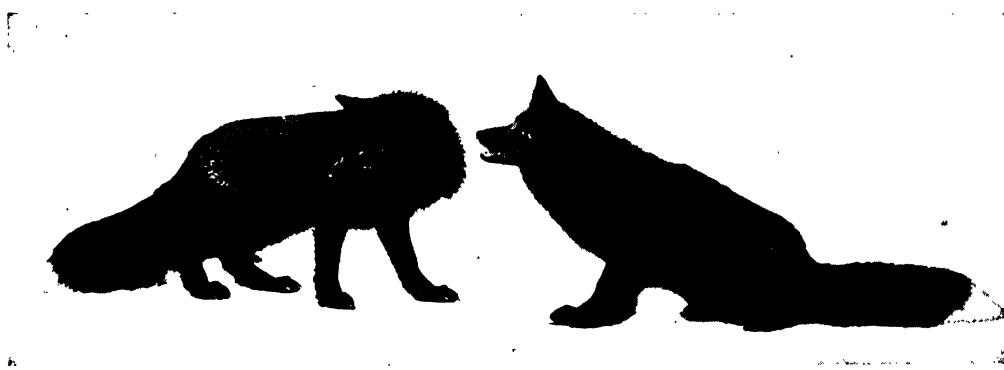
As soon as reports of the success of these breeders became known, general interest was aroused, and a boom in fox-farming began. This boom flourished in Prince Edward Island and in northeastern New Brunswick, and speculation ran high. Companies were formed, and prospectuses were widely circulated, setting forth the huge profits which could be quickly made from fox farms. A large amount of money was soon invested in the industry. As a consequence, the price of animals for breeding soared, until in 1913 a pair of first-class silver foxes cost $25,000. Those who already owned foxes, and understood the methods of breeding and caring for the animals, could sell their stock at the high prices then prevailing, and became wealthy; but the newcomers lost money. Due partly to these losses and partly to the outbreak of the first World War, the boom broke and only well-managed concerns survived.

During the period of the war (1914-1918) most of the companies sold only sufficient of their yield to pay for extensions and to meet current expenses. In 1920 the Department of Agriculture granted a charter to the Canadian Silver Fox Breeders' Association, with headquarters at Summerside, Prince Edward Island. This association recognizes the pedigrees of ranch-bred silver foxes complying with the regulations of the association, and certificates of pedigree are issued by the National Livestock Records at Ottawa.

The silver fox is a "sport" of the common red fox. (A sport is a plant or animal showing new characteristics unlike its ancestors.) The color phases of this species follow Mendel's law of heredity and transmission. (See page 5615.) It has been found that in foxes red is dominant and silver is recessive. Hence, if a red and a silver fox are crossed, the young from this cross will be red in appearance. They will not, however, be really pure red foxes, as they will carry the silver as a recessive character. When two of these red-colored offspring are crossed, their progeny will be red and silver, in the proportion of three red to one silver. The one silver pup will be pure silver, and two such animals when crossed will produce nothing but pure silver progeny. In the early days of the industry, before the application of Mendel's law became apparent, many red foxes carrying recessive silver were destroyed because the silver character was not evident. Now such animals are bred to a pure silver fox, and the result is that one-half the progeny will be pure silver.

The first requirement for success is good breeding stock. The second requirement is that the ranch be properly situated. A good location is in a wooded area, dry and well-drained, where the snow does not pile up in huge drifts in the winter. While the surface soil should be light and porous, it should have a "hard-pan" subsoil, as this prevents the foxes from burrowing deeply and escaping.

One of the chief problems which the fox-breeder has to consider in the building of his ranch is how to keep his foxes in and thieves and sight-seers out. The problem is usually met by surrounding the ranch with a very high board fence having only one gate. The owner's or keeper's house is placed at this gate. Watchdogs help to keep undesirable people away.



Canadian Silver Fox Breeders' Association

In spite of its glossy black coat, sprinkled with white hairs, the silver fox is really a close relative of the red fox. These are silver-black foxes, silvered only on the hips and forehead. The tip of the tail is pure white.

The high fence not only keeps people out, but it retains a fox which may have escaped from its pen. In order to do this more efficiently there is often an overhang of wire netting at the top of the fence and a carpet wire about three feet wide laid on the ground inside the fence, to prevent an escaped fox from burrowing out.

TO RAISE FOXES SUCCESSFULLY, SPECIALLY BUILT PENS AND KENNELS ARE NEEDED

The pens are constructed of wire netting and most fox-farmers prefer pens thirty feet square. It is essential that the pens be large enough for the foxes to run freely and obtain plenty of exercise; otherwise the animals' health would suffer. The wire netting which forms the walls of the pen has usually an overhang about two feet wide. This is necessary because, when they become excited, foxes frequently climb the netting. Some ranchers place a strip of sheet iron three feet wide on the ground, which prevents the fox from climbing high enough to injure itself.

The kennel is usually placed in the center of the pen, and is generally a wooden structure consisting of two compartments placed on skids a foot or so off the ground, so that the foxes can not burrow under it and hide. The inner compartment of the kennel has double walls, with the space between filled with some non-conducting material, such as sawdust, and is provided with a bedding of dry grass or leaves.

The silver fox is at best only a semi-domesticated animal and is easily alarmed, and for this reason one of the most important elements in successful fox-farming is to see that the animals do not become unduly excited, especially in the breeding season. This is why visitors are not encouraged at any time, and are rigidly excluded at the season when the pups are born; at this time all unusual sights, sounds and smells are to be avoided. Even the keeper must move quietly and cautiously about the pens, and should, especially in the breeding season, wear the same clothing from day to day. Many fox farms have a tall tower from the upper chamber of which the keeper can overlook all the pens and thus keep watch on his charges.

Some female foxes are likely to become unduly excited when they have young pups, and carry them about from place to place, thus sometimes causing the death of the family from exposure. In such cases the placing of a live chicken or rabbit in the pen is often successful in attracting the mother's attention long enough to allow her condition of nervous excitement to pass.

Female foxes mate at about ten months. One litter a year is produced, the young being born between the middle of March and the end of May.

Different fox-farmers use different methods of feeding. Horsemeat, butchers' scraps, fresh fish, salt fish, rabbits, ground hogs, chickens, mice, biscuits, bread, vegetables, grass, porridge, berries, apples, milk and eggs are all used. The flesh diet is usually fed raw, though some ranchers parboil (partly cook) it. The amount of meat should not be more than a quarter of a pound a day, and this amount should be reduced if any of it is seen to be buried. Bone and lime water are fed to the young to supply salts for bone formation.

The fox in the wild state is known to be subject to certain diseases and to be infected by certain parasites, both internal and external. Where numbers of the animals are brought together and confined within rather narrow limits, as they are on a ranch, there is far greater danger of the development and spread of disease than when the animals can roam over a considerable area. The chief diseases which have caused trouble among foxes on ranches are distemper and "big head" (a bacterial tooth infection of young foxes); and the internal parasites to which they are most subject are roundworms, hookworms and lungworms. The chief external parasites are a mite, which causes mange, and fleas, which, because of the irritation they produce, spoil the condition of the fox.

Sanitation consists chiefly in keeping everything about the ranch as clean as possible, and in keeping diseased or infected animals far from the others.

The Dominion Department of Agriculture conducts at Summerside, Prince Edward Island, an experimental fur farm for the study of matters affecting the health of fur-bearing animals in captivity, especially the silver fox.

THE FABULOUSLY VALUABLE NEW VARIETIES OF MINK

Whoever heard of white mink? No one, until within the last few years. Now beautiful specimens are carefully guarded in modern compartments at the Assiniboine Fur Ranch in Greater Winnipeg's suburb, Charleswood. In that development Manitoba is promised a new fur industry of great importance.

The Assiniboine Fur Ranch was estab-

lished in 1925 by Morley B. Pirt, with a very small foundation stock of mink. It now has building and equipment to accommodate 2,500 selected mink, with 1,200 breeding pens and 3,000 furring pens, sufficient to take care of from 3,000 to 5,000 animals. The plant is nicely enclosed within a large group of oak trees along the Assiniboine River, providing seclusion and protection for the animals from the hot summer sun.

The present herd of regular breeding stock is the direct result of careful selection of good animals and dropping out of inferior stock. Mink from this ranch have won many cups and awards at fur shows in Canada and the United States.

Wartime regulations placed fur products on the nonessential luxury lists. For that reason Pirt decided to plan for the time when peace would again prevail, and devoted his attention to especially fine and rare types of mink. The ordinary varieties were very soon skillfully weeded out. He studied the occasional appearance of one or two different new specimens—sports, or mutations, as they are also frequently called by the fur breeders.



Manitoba Industrial Topics

Morley B. Pirt, holding one of the rare pure white minks that he has been successful in developing at his fur farm near Winnipeg.

Pirt experimented with these mutations for several years and was well rewarded. Five different new types have been bred successfully in the Assiniboine Fur Ranch, aside from the normal mink. One was the valuable Ingham type of platinum mink, a strain developed in the United States.

The Pirt silver sable mink developed at the Assiniboine ranch has a delicate light blue underfur, dark hair, with silver guard hairs sprinkled from nose to tail tip. Many fur manufacturers have high praise for the rarity and beauty of the silver sable mink.

White mink, with dark rump and tail, is another product. The dark is being worked out gradually through careful breeding. Piebald, or spotted mink, are about 50 per cent pure white, and 50 per cent dark.

But the pure white albino mink developed at the Assiniboine remain the chief attraction, and they are all beauties. The first one was a gift from Nature—a sport that appeared in 1940. Patient experimentation finally proved this type could be reproduced. By 1943 there were seventeen pure white mink kits on the ranch. Their beauty and rarity is recognized by fur-trade experts and ranchers.

At the Assiniboine ranch, great care is paid to the health of the animals. They are given a carefully balanced diet of horsemeat and rabbit meat, with fish and other necessary vitamin-bearing foods. The food is kept in a refrigeration plant and is freshly mixed and ground daily.

The compartments are so arranged that the mink may exercise and feed in the open as Nature intended. Their sleeping or nesting quarters are bedded with cut hay or other dry materials. They appear happy and contented, without any evidence of fear or excitement.

Canada's largest muskrat farm is the Manitoba Government's Fur Rehabilitation Project in the south-central part of the province, on the Fisher River peninsula. An area of 530,000 acres has been set aside for the culture of muskrats. The preserve is 150 miles almost due north of Winnipeg. It is ideally equipped with natural boundaries. On the east and on the north, as well as part of the west, lies Lake Winnipeg, or various large bays opening off Lake Winnipeg. The rest of the western boundary is about forty miles up the length of the Mantagao River. The southerly boundary and a small part of the easterly one lie in wooded and swampy country, and a six-foot skyline has been cut along it so that possible trespassers may be properly warned.

The region is particularly suited for muskrat-farming. The land is generally level or rolling into low hills rising from sixty to seventy feet above Lake Winnipeg. Spruce, birch, balsam and poplar abound. There

are many open marshes, and over eighty small lakes cut up the land.

The early fur traders sent *coureurs de bois* into the area in the days when the Nor'Westers and the Hudson's Bay Company flourished. For more than 100 years it has been known to map-makers; Fisher River is shown on a map of Assiniboia (the Red River Settlement) made in 1811.

THE FISHER RIVER REGION, WHERE ONCE WILD LIFE THRIVED, IS BEING RESTORED

In those times the region teemed with animal life. Even early survey reports listed beaver, otter, muskrat, marten, lynx, fisher, fox, mink, bear, moose, deer, caribou and elk in abundance. Some of these are now rarely seen, others not at all. Heavy trapping and uncertain water conditions made the region poor in wild life.

It was brought back by raising and maintaining the water levels, through several small dams spread along water courses. The work was done with the aid of the Indians in the region, and with the help of the Manitoba Government Air Service.

During the winter of 1940-41 a small engineering party took levels, sounded lakes and streams, made profiles and cross sections of the waterways, examined the quantities of available muskrat food, and planned dam sites. Indians took out several hundred logs for dams and cabins.

During the summer of 1941, three dams were built, of earth and log construction, to hold back the waters of the Thickwood and Little Jackfish creeks. Each dam has flumes and gates. They control the water from twenty-two lakes.

CARE IS TAKEN THAT THE WILD MUSKRATS IN THIS AREA HAVE ENOUGH FOOD

It is necessary to keep an eye on the quantities of muskrat food available. Care must be taken not to encourage a muskrat population which might then have to face starvation. Muskrat foods in the area are bulrush, cattail, arrowleaf and reed grass. They remain plentiful. If, however, there is a threatened shortage, steps may have to be taken to transplant the flowering rush from the East. This is a European aquatic plant (a plant that grows in water), accidentally introduced into Canada when it was used for packing material and thrown into the St. Lawrence River as the articles were unpacked. The seeds grew and the flowering rush has flourished ever since, spreading into creeks and rivers entering the lower St. Lawrence and up the St. Lawrence as far as Lake St. Clair. It is a graceful plant and important as muskrat food. As you know, muskrat fur has fine wearing qualities and is much used for women's coats. When the guard hairs are removed and the soft underfur is dyed glossy black, muskrat is called Hudson seal. It does resemble true seal.



Courtesy, Hudson's Bay Company

Today furs trapped in the remote places of the far north are sped by air to the city markets. Makers of fur garments buy their stocks of pelts in these centers.

The Indians on the six reservations surrounding the Manitoba Project and the white settlers in the adjoining pioneer fringe share equally in both the work of trapping and the returns. This was written in the agreement drawn up between the Dominion and the provincial governments, February, 1941. In that agreement the federal government made arrangements to contribute the money to develop the region, and the provincial government made arrangements to take over the work of development and supervision. The provincial government controls and manages the project and prevents depletion of the stock.

The provincial authorities regulate the trapping, market the pelts and distribute the proceeds to the trappers. Payments are not in a lump sum, but spread over twelve months.

A new era has dawned in the land made historically colorful by the exploits of the Nor'Westers and the Hudson's Bay men.



A Nymph of the Seine, by Jean Goujon.

FRANCE AND HER NEIGHBORS



WE know that in Italy sculpture and painting grew side by side, arose from the same need and impulse—the enriching of churches and public buildings. Flanders rivaled and sometimes outshone Italy in the realm of painting, but she was left far behind in sculpture, for she had no master sculptor who could compare with her painters, the Van Eycks. In Italy there seemed to be for some hundred years an overpowering desire to see glorious solid form as well as glorious color. It might be said that the main strength of European sculpture was concentrated in those generations, and since that time the world has merely shared what force was left.

Here we are speaking of "free" sculpture, of portraiture. Of the lovely carvings that adorn the medieval cathedrals of Europe, and are inseparable from architectural form, we shall be thinking later. By slow degrees the art of the sculptor in France and Flanders grew out of architectural decoration, reliefs, figures on tombs, into portrait sculpture pure and simple. Holland and Spain, each the home of a brilliant school of painting, produced no sculpture worth mentioning, unless Claus Sluter be claimed by the Dutch; more generally he is spoken of as Flemish. In Germany the fifteenth and sixteenth centuries produced some particularly fine woodcarving. It is probable that the artist-workmen of that country loved woodcarving and its possibilities more than any other European people before or since. There is something in wood itself, as a medium, that dictates to the man carving it, especially if he be of the slow, impassive nature of the Teuton. The Italians, working on marble—which seems more impersonal than wood—and moved by a swifter intelligence, were never held in thrall by their own handiwork as the Germans were.

There is some lovely woodcarving in the Cluny Museum, Paris, which shows what was the temper of the German artists, and a fine selection in the Nuremberg Museum. The best known of the very many woodcarvers were J. Syrlin, of Ulm, the pretty old town of painted houses, and Veit Stoss, who worked at Nuremberg. In the Church of St. Laurence, Nuremberg, is some beautiful carving by Stoss, and among other pieces a lovely St. Barbara by Riemenschneider, a sculptor of Wurzburg. Adam Krafft is generally acknowledged as the most powerful stone-carver in Germany at this time; he died at the beginning of the sixteenth century. His work, which

is realistic and convincing, had much effect on the artists of his day.

THE BEAUTIFUL STATUES IN BRONZE THAT PETER VISCHER MADE

There was also a good deal of bronze statuary produced in Germany about the time the stone- and wood-carvers were working. Peter Vischer was probably the best among the sculptors in bronze. His famous statue of King Arthur in a church at Innsbruck, and the tomb of St. Sebald in the church of that name in Nuremberg, are very fair examples of his work.

Looking on Europe as a whole, the most interesting sculpture, next to that of Italy, was produced in France and Flanders. The end of the fourteenth century saw Claus Sluter working in the neighborhood of Dijon. Sluter was a very gifted artist, much of whose work in the monastery of Champmol has been preserved.

One of the most remarkable things in Europe is the carving Sluter did for the Well of Moses, a six-sided base for a Calvary in the courtyard of the monastery. The sculpture has suffered during the passing of the centuries, but the fine spirit that animated it still lives in the six figures of the prophets. Sluter and the sculptors who followed him carved fine tombs of the dukes of Burgundy for the monastery church. A great wealth of beauty and expression was spent on tombs of the kings and nobles of France. In many cases the sculptors, French and Flemish, are unknown. The famous tomb of Philippe Pot is preserved in the Louvre; those of Philippe le Hardi and Jean san Peur are in the Dijon Museum. The art of the "imagier," a class of sculptors peculiar to the art of the period, is very well explained in the work of Claus Sluter and the sculptors of these tombs.

FRENCH SCULPTURE IN THE STYLE OF THE ITALIAN RENAISSANCE

To sixteenth-century France belong a group of sculptors in whose work was the echo of the Italian Renaissance. The chief were Michel Colombe, Jean Goujon, Germain Pilon and Barthelémy Prieur.

Of these Goujon is to be remembered as the most gifted. He had great skill of technique, and developed the elegant and refined style characteristic of his age. Some of his work is in the lovely little Cluny Museum in Paris, some in the Louvre; the most famous is the finely sculptured Fountain of the Innocents in Paris, which is decorated with graceful figures of fountain nymphs.

But before 1520, the year of Goujon's birth, Michel Colombe, a sculptor of Tours, had done distinguished work in the Italian Renaissance manner. He is held in memory for a relief of St. George and the Dragon, now in the Louvre, and for the tomb of Francis II of Brittany, which he designed in partnership with another sculptor, Perréal. At the corner of the tomb are four large allegorical statues of Prudence, Strength, Temperance and Justice. The figures are French in style, though the base keeps to Italian characteristics.

Hundreds of minor sculptors were at work at this time, and many names have been lost. It was a period of free decoration in sculpture wherever possible—in churches, public buildings and private houses. Each generation saw more wonderfully carved tombs for nobles, and everyday people who had not much money found money enough to pay a sculptor for a little image of a saint.

SCULPTURE GROUPS OF SCENES IN THE LIFE OF JESUS

There was a tendency to make groups showing the last hours of Jesus. In almost every church one could be seen. The most famous is in Solesmes Abbey, by Ligier Richier, a sculptor of Touraine. This artist, who made so many sad figures in carving the story of the entombment of Jesus, could also draw children delightfully. There is in the Louvre a little figure of his showing a happy-faced child curling its toes on the ground.

About the beginning of the seventeenth century, in the reign of Henry of Navarre, portrait sculpture became a definite branch of art in France. Before the days of Henry there had been busts of various monarchs, but the example set by him took hold of the French court, and royal portraits in marble, in faint imitation of the busts of Roman emperors, were made by all sculptors. Some were very good, some merely flattering. The equestrian portrait of Henry on the Pont Neuf in Paris is loved for Henry's sake more than for any merit of the sculptor. Simon Guillain, who also carved wonderful tombs, made an excellent full-length portrait statue of Louis XIII. François Girardon was a sculptor of the reign of

EARLY SCULPTURES IN FRANCE



A Prophet, in stone, twelfth century.



Virgin and Child, fourteenth century.



Virgin and Child (detail), in marble, fourteenth century.



A King seated on a throne of Romanesque design, first half of thirteenth century.



The Virgin, the Child and St. John, in alabaster, attributed to Germain Pilon.

Louis XIV. He and the group of which he was leader are best represented at Versailles.

Sculpture during the long reign of Louis XIV was, like the painting, held in subjection to the king's idea. We have read of this already. Pictures and statuary alike grew more Italian in character, and the best work in both was done in portraiture. A great deal of the decorative sculpture of the reign was uninspired, and now seems wearisome.

The best sculptor of the period, Pierre



The Shrine of St. Sebald, by Peter Vischer.



The Well of Moses in the Monastery of Champmol, by Claus Sluter.

Puget, contrived to keep himself aloof from Versailles, where all the art of France was concentrated in making the king's palace and park glorious. Puget lived from 1622 to 1694. Colbert, the great minister of the time, kept the artist in Toulon for a considerable period carving lovely figures on the prows of the royal vessels. One wonderful group of statuary, called the Milo of Crotona, Puget carved for the park of Versailles. It was a powerful throbbing figure, seeming strange among the smooth serenities of Versailles, and made the smiling gods and goddesses which adorned the royal gardens appear still less worthy.

Puget was a worshiper of Michelangelo and of Bernini. His work was rugged and powerful, and reflected the life of a man who lived alone, entirely devoted to a lofty ideal of art. The figures in his groups are never still; they are struggling with some weight, bearing some burden, borne onward or backward by some mighty power. The Louvre has a fine relief of Diogenes and Alexander by Puget, and also a figure called the Gallic Hercules. The doorway of Toulon Town Hall was decorated by Puget; huge sculptured figures on either side bear on their shoulders the weight of the balcony. These Caryatids suffer from exaggeration of Michelangelo's manner.

Most of the important sculptors of France were drawn into the king's service. Girardon, Antoine Coysevox, and his pupils, Nicolas and Guillaume Coustou and Robert le Lorrain were chief among them. But they were not always busy chiseling nymphs for grottoes in Versailles. They found means of achieving a wider distinction. Guillaume Coustou hewed the famous Horses of Marly, in the Place de la Concorde, Paris, and among other fine groups, The Rhone, in Lyons Town Hall, and Maria Leczinska, in the Louvre. Nicolas Coustou carved

the beautiful Dauphin's tomb in Sens Cathedral. In the church of the Sorbonne, Paris, is the tomb of Richelieu by Girardon; in the Louvre is Mazarin's tomb by Coysevox, who also made some of the best portrait statues and busts of the period. That of the great Condé—the general of the seventeenth century—is a very fine piece of work indeed.

The eighteenth century brought a development and a change. The Italian art favored by Louis XIV died out very soon after his death. We know from our reading of earlier chapters how France drew a long breath when the tyrant of art and letters died. A new painting and a new sculpture sprang suddenly up like flowers which had been hiding and waiting for the first spring sunshine. A little of the classic spirit survived; for a time large monuments, pretentious imitations of Italian groups, were made. The spirit of Coysevox and the Coustous lived on in the sculpture of a few men like Jean Baptiste Lemoyne, Etienne Maurice and Falconet. Edmé Bouchardon, another sculptor, was the very opposite of these in his smooth, cold, correct and graceful style of work.



George Washington, by Jean Antoine Houdon.

A little later came two really great sculptors—Jean Baptiste Pigalle (1714–85) and Jean Antoine Houdon (1741–1828). Set amid the lofty achievements of these artists was dainty work by a number of men we might call drawing-room sculptors. The most important was Claude Michel Clodion.

There was a delightful grace in the best of this domestic sculpture. Many of Clodion's groups remind us a little of Fragonard and Watteau. Augustin Pajou was another sculptor who made sensitive, nervous portrait studies in marble. Clodion and Pajou often worked in terra-cotta for the sake of the pliability of the medium. Jean Jacques Caffiéri made a number of portrait busts that have a pleasing distinction.

Lemoyne, the first of this new group, was the master of Falconet, a young artist of gifts who had a tendency to spoil his work, as a writer has said, by insisting on being sublime. He was given a commission to make a colossal equestrian portrait of Peter the Great, and he went to St. Petersburg determined to produce the most wonderful king on horseback ever seen. Perhaps because his natural bent was for carving graceful nymphs, he made the king on horseback a little too wonderful. The fiery charger is rearing just on the edge of a precipice, and Peter the Great looks like a Roman general born out of due time. But it was a spirited piece of work, and is interesting as one of the last of its kind produced by French sculptors.

The sculpture of Pigalle marks another stage, not only in art, but in the thought of the people. He was a nervous, sensitive artist, capable of delicate workmanship, as may be seen in his figure of Mercury attaching wings to his feet. He also made excellent portraits. Probably his best-known work is the tomb of Marshal Saxe in a church in Strassburg. The Rheims statue of Louis XV shows much of his power, independence and individual thought.

He had the courage to throw aside convention when he made this statue group of the French king, for he set at the foot of the pedestal a real French workman and a real French citizen, instead of classical figures to represent labor, or trade.

Close on the heels of Pigalle came Houdon, who threw aside allegorical and classical convention altogether and tried to make his statues full of life and intelligence. He was a realist, one who tried to follow nature, though compared with the realism of to-day, Houdon has the grace and dignity of an age-old art. To his pupils he said: *"Copiez, copiez toujours, et surtout copiez juste"* ("Copy, always copy, and above all copy exactly").

Houdon's chief work was portraiture, but single figures like the Dianas in the Louvre, and The Winter in Montpellier Museum, show how varied was the genius of this man. His busts of Louise Brogniard and the lovely smiling head of his wife (both in the Louvre) reveal the softest of womanly graces. Houdon's Voltaire, in the Théâtre Français, is a portrait of another kind; history and life, thought and cynicism are the forces that lie behind this magnificent statue. The portraits of Diderot, Rousseau and Mirabeau are superb. He came to America in 1785 and made the famous statue of General Washington, now in Richmond, Virginia. This is the only statue of the Father of His Country made from life.

The Revolution caught Houdon up in middle life, so that his work belongs to the two epochs of thought. His bust of Napoleon, in the Dijon Museum, shows how the sculptor had pursued his art untroubled by the upheaval of a great nation.

After the Revolution the feeling about sculpture in France slowly changed. For a time there was little difference, save that the new grandeur of Napoleon replaced the old grandeur of Louis XIV. The work done for him suffered from being too grand, and the artists could not get away from the spell of classic art. When Antoine Chaudet carved his portrait of Napoleon he put a toga on him as if he had been a Cæsar. Canova, the Italian sculptor, did worse: his statue of Napoleon is as undraped as if he were a Greek god. And the satellites of Napoleon, his generals on whom renown was so freely shed, were sculptured in the flowing garments of ancient Rome. So slow was French sculpture in throwing off the leading-strings of her mother Greece and her nurse Italy.



THE BURGHERS OF CALAIS—A SCULPTURE GROUP BY AUGUSTE RODIN

But as a generation or two passed by, France as a republic claimed the glory which had belonged to France as a monarchy. The mass of the people now became of immense importance.

So far the great part of French sculpture had been concerned with religion, mythology, and portraits of kings and of those whom kings delighted to honor. Emperors now faded into the background, and the laurels were given to statesmen,

FROM HOUDON'S DAY TO OURS



Louise Brogniart,
by Houdon.



Peasant Woman, a head
by Dalou.



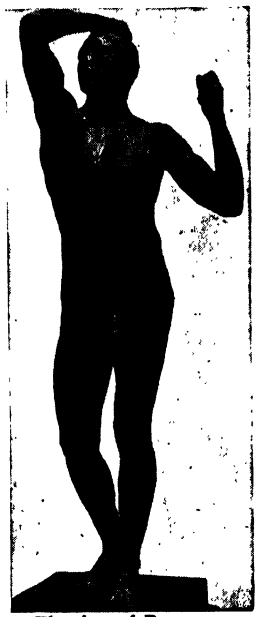
Study for La Danse,
by Carpeaux.



The Creation of Man,
by Rodin.



Theseus and the Centaur Bianor,
by Barye.



The Age of Bronze,
by Rodin.



The wonderful Tomb of Death in Père-Lachaise Cemetery, Paris,
by Paul Albert Bartholomé.

historians, scientists and inventors. The best sculpture was devoted to such portraiture and to the decoration of public buildings.

Three or four names dominate nineteenth-century sculpture in France: Barye, Rude, Carpeaux, Rodin. Behind these came a great company of lesser men who did much that was praiseworthy without being epoch-making. Men like David d'Angers, Jehan du Seigneur, Chaudet, Dubois, Mercié, Pradier, Falguière, Frémiet, Dalou, Bartholomé, Injalbert and Cordonnier—the last of these belonging to our own day as well as to yesterday.

Bartholomé carved, among other things, the grand Monument to the Dead in Père-Lachaise, Paris. Four fine bronzes by Paul Dubois decorate General Lamoricière's tomb in Nantes Cathedral. Dalou made a superb group called The Triumph of the Republic, in the Place de la Nation, Paris, and the monument to Delacroix in the Luxembourg Gardens. Most of these later sculptors of France are represented in the Luxembourg Galleries.

D'Angers, a little earlier, made portrait studies in great numbers and also made sculptures for the pediment of the Pantheon.

Rude, his work similarly divided, has earned an immortality by his superb group called The Marseillaise, on the Arc de Triomphe. Two other very fine works of his are Napoleon Awaking to Immortality, in the Louvre, and the tomb of General Cavaignac, in Montmartre Cemetery, Paris.

THE HAPPY FIGURES THAT DANCE ABOVE THE STREETS OF PARIS

All the work of Rude was marked by that quivering lifelikeness which is the mark of great sculpture. He alone would have glorified a century. Carpeaux carried on in his work something of Rude's spirit. His famous Dancing Group—a decoration of the Opera House in Paris—is a mass of alert and dainty figures who smile and sing as they dance up there, set in marble forever. Carpeaux and Frémiet collaborated in a remarkable work—the Fountain of the Four Quarters of the World, in the Observatory Gardens, Paris.

Among these carvers of the beauty of the human form stands out another, the only great sculptor of animals France has produced—Barye. Barye's work came as a revelation to French artists. Never before had such crouching, springing, powerful forms invaded her statuary. Barye has been called the "Michelangelo of wild beasts." Three of his most famous bronzes are in the Louvre: the Centaur, the Tiger and Crocodile, and the Elephant. Frémiet's work in animals is also very wonderful. There is extraordinary force in his group Orang-outang and Savage, in Borneo.

THE POOR BOY WHO WON FAME AND BROUGHT GLORY TO FRANCE

Auguste Rodin, born in 1840, was a poor boy of Paris who became the glory of France. A poet, a thinker, a dreamer in stone, he was also a strange realist. He has had a tremendous effect on the artists of his generation. His work was a fitting close to the nineteenth century, and stretches out to the twentieth in full kinship with those whose work belongs more properly to to-morrow. Those who look thoughtfully at Rodin's work can see in it a handbook on the advance of sculpture. Rodin translated woods, color, temper, into stone; his predecessors had been content with form and the illusion of actual life. Like most revolutionaries, Rodin was not accepted at first, and his work was severely criticized. His habit of producing what seemed to many unfinished work brought him to great disfavor among those who were unable to see that the unfinished figure sleeping in stone sometimes had a quality that no smooth, carefully finished limbs could have. But when he died, in 1917, he was accepted by Europe as a genius.

Examples of Rodin's work are to be seen now in all parts of the world. They cover a wide range of subject and expression, from busts and figures that are almost too delicate and pretty to such groups as the Six Citizens of Calais, and the massive form of his Thinker.

Of a pupil and co-worker of his, Rodin said: "Impetuosity is the characteristic of the talent of Bourdelle." This Emile-Antoine Bourdelle (1861–1929), of masterly craftsmanship and modeling broad and bold, had something worth while to express. He presented his ideas in a style simple and unconventional, with an effect of austere beauty. Like his master, he was a force making for new life in the field of sculpture.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 4853.



A scene from THE SPY, an exciting adventure story of the Revolutionary War, written by James Fenimore Cooper.

AMERICAN LITERATURE

II. THE GROWING YEARS — 1785-1870

THE years that came immediately after the end of the Revolution brought no real gain to American literature. Many men and women wrote plays, poems, essays and novels, but before the year 1810 only one man really deserves mention. He was Charles Brockden Brown, who was born in January, 1771, in Philadelphia, where he died in February, 1810. He is best known by four novels: ALCUIN, ARTHUR MERVYN, EDGAR HUNTLEY and WIELAND. These were popular in his own time, but are now seldom read. They were known in England, and Sir Walter Scott and Shelley both admired them.

At the beginning of the nineteenth century American literature was a dreary waste of imitative work which showed scarcely a spark of originality. But a new national feeling was making itself felt. Before long someone was sure to find a way to voice it; to express it with ease and smoothness, with something of the national characteristics that were already becoming well marked.

One of these characteristic American traits was a peculiar sense of humor, and it is interesting to note that the first really important book produced in the new nation was a humorous history of New York as a Dutch colony. The supposed author of the book, Diedrich Knickerbocker, was invented by Washington Irving, who is called the founder of American literature. He was born in 1783, in New York, where his father was a merchant. His mother was the daughter of an English clergyman. His own life makes a story as interesting as many of those he wrote.

The greater part of his education was obtained at home, for ill health in his boyhood kept him from school and college. In 1806 he became a lawyer, but soon went into partnership with his brothers, who were merchants. Just at this time the beautiful

young girl to whom he was engaged died, and her death had a great influence upon his whole life.

Still, his sense of humor was not destroyed, and two years later, in 1809, he wrote THE KNICKERBOCKER HISTORY OF NEW YORK. The book is written in a perfectly serious way, and the historical facts are true, but for the most part it is pure fun. It marked Irving as a really original writer, and was the first American book that was looked upon in Europe as literature. When it was written, Irving had no idea of making literature his profession, but nine years later, when his firm failed, he took to his pen as a means of making a livelihood. He began to write charming tales of English life, humorous and gently satirical essays and short stories. At the time of the failure he was in England, where he had gone after the War of 1812 to represent his firm. He stayed in England for twelve years, and during that time he wrote some of his best books. In 1819 he published THE SKETCH BOOK, which included RIP VAN WINKLE, THE SPECTRE BRIDEGROOM and THE LEGEND OF SLEEPY HOLLOW —three legends of the Hudson River and the Catskill Mountains, that were acclaimed by Americans and awoke them to the beauty of their own country.



Washington Irving, who also wrote under the pen name of Diedrich Knickerbocker.

THE SKETCH BOOK was followed by BRACEBRIDGE HALL and TALES OF A TRAVELER. Then came Irving's appointment as secretary to the American minister at Madrid, Spain. It was a golden opportunity of which he made the best use in the study of ancient books and documents, from which he drew the LIFE OF COLUMBUS, a fascinating HISTORY OF THE CONQUEST OF GRANADA and LEGENDS OF THE ALHAMBRA. During part of the time he was in Spain he actually lived in the Alhambra itself, and so caught the spirit of that glamourous building.

From Madrid he was sent to London, where he spent three years at the Legation; and in 1832 he returned to America, and made a long journey through the West. He showed his interest in the vast spaces he traveled over in A TOUR OF THE PRAIRIES and ASTORIA.

In 1842 he was back in Spain as minister to Madrid, and when his term of office there was over, he settled down at Sunnyside, his house at Tarrytown, New York, on the Hudson, where he wrote a delightful biography of George Washington, which is also valuable as a picture of the time in which Washington lived. This book, the last of Irving's works, was completed before his death, which took place in November, 1859.

While Irving wrote with more ease and grace than any other American of his time, he was not a great writer. But he was an original writer; and though he owed much to his study of Addison and Goldsmith, and has been compared to Goldsmith and Lamb, his writing shows him to be distinctly an American.

We might almost describe Washington Irving's great contemporary James Fenimore Cooper as the historian of the primeval forest, for he lived on its borders in his childhood, loved it as a home and has described it as no one else has done; and to this we must add that he was one of the greatest story-writers the world has ever seen. He was born in Burlington, New Jersey, in 1789. When he was about a year old he was taken to Lake Otsego, in New York State, where his father, Judge Cooper, the founder of Cooperstown, owned a vast tract of land. That part of the state was still covered with mile upon mile of forest in which Indians roamed and wild animals abounded. At an early age the boy learned the woodlore and gained the knowledge of the pioneers and the Indians which he used in his romances.

When school days came he was sent to Albany, and at the age of thirteen entered Yale. He preferred roaming through the fields and woods to attending classes, and as a consequence was dismissed from college in his second year. His father then sent him to sea, and after two years before the mast he got a commission as midshipman and served in the navy, chiefly on the Great Lakes, from 1808 until 1811, when he resigned and was married.

All this experience was of the greatest value to Cooper when he began to write.

He had no idea, however, when he left the navy, of writing even one book, much less a whole series; but one day he declared contemptuously that he himself could write a better book than the one he had been reading. His wife dared him to try it, and he wrote a story of English life which is so poor that it is better forgotten. He had failed chiefly because he knew little about England. Then he turned to his own country and wrote one of his best books, THE SPY, a tale of the Revolutionary War, in which the character of the hero, Harvey Birch, is built on the story of a spy in Washington's service. The novel was a great success, and Cooper went on writing books. Some of them are splendid stories of adventure in the forest or on the frontier, or fine sea tales which gain our attention when we begin to read and make us reluctant to lay down the story before we reach the end. They were eagerly read both in America and in England, and were translated into many European languages almost as fast as they were published. Cooper's works are still widely read by young people of other lands. He is nowadays perhaps better known to readers abroad than to those at home.



Photo by Serrano

The patio of the Irving Memorial in Seville, Spain.

His best stories are the LEATHERSTOCKING TALES, namely THE DEERSLAYER, THE LAST OF THE MOHICANS, THE PATHFINDER, THE PIONEERS and THE PRAIRIE; and three of his sea stories: THE PILOT, THE TWO ADMIRALS and THE RED ROVER. The principal character in the LEATHERSTOCKING TALES is Natty Bumppo, a simple, honorable man who meets us in THE DEERSLAYER as a young hunter in the forests of New York State, and dies in THE PRAIRIE as an old, old man among his friends the Pawnees. One of the best characters in THE PILOT is just such another simple man, Tom Coffin, a sailor, whose counterpart is the White Admiral's servant in THE TWO ADMIRALS.



While he was in Spain, Irving spent long hours in monastery libraries searching for the original records of Columbus.

Cooper was the first to write a sea story, and though there have been many written since his time, it will be hard to find anything better than the three we have mentioned. The hero of THE PILOT is John Paul Jones. In the book he is a dark, mysterious stranger to whom the captain pays respect; but the secret of his identity is kept to the end, and his name is not once mentioned.



Bringing in the boar's head, a favorite dish for Christmas dinner in olden times in Merrie England . . . an illustration from OLD CHRISTMAS in Washington Irving's SKETCH BOOK, published in 1876.

Although Cooper's stories are romantic, they are all true to the life of his day, and the men whom he pictures are such men as he might have known. The women in his books do not emerge so clearly, but have something of the lifelessness of paper dolls. His character-drawing is surpassed by his word-pictures; and in his descriptions of the sea, no one excels him.

In 1826 Cooper went abroad with his family and stayed in Europe for about seven years, during which time he wrote THE BRAVO, one of his best-known books. After his return he adopted a scolding attitude. On the one hand, he was irritated by English and European writers, among them Dickens, who were criticizing America; and on the other, by Americans, for the crudeness which brought forth the criticisms. Besides, he had a lawsuit with the people of Cooperstown about some land. Consequently he lost public appreciation, and did not become popular again until after his death, which took place in November, 1851. He wrote some very poor books in his last years, but in spite of his troubles he also wrote two of his best—THE PATHFINDER and THE DEERSLAYER.

While Cooper was writing his great tales of sea and land, other writers were at work in the same fields. The best of these less-known writers was William Gilmore Simms, of South Carolina, who lived from 1806 to 1870, and wrote tales of the Georgia goldfields and of Revolutionary warfare in South Carolina. He wrote too much and paid too little attention to the rules of writing, yet he produced some stirring tales, such as GUY RIVERS, YEMASSEE, THE PARTISAN and EUTAW, all of which were popular in the North. During the Civil war and the troubles which followed it, they were lost to sight and never came into favor again.

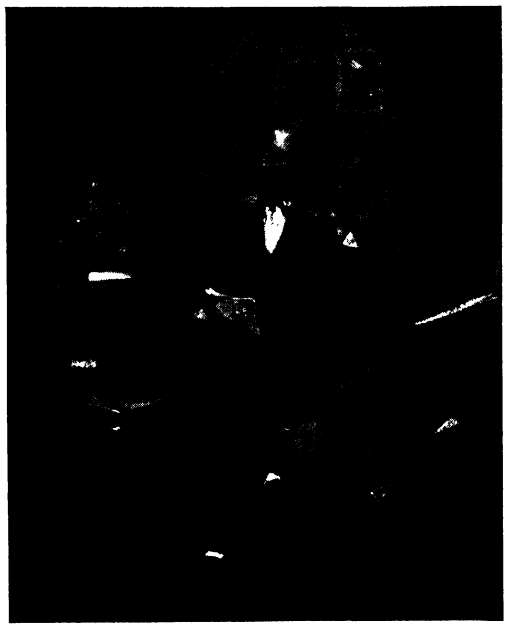
In 1840 Richard Henry Dana, Jr., whose father was editor of THE NORTH AMERICAN REVIEW, wrote TWO YEARS BEFORE THE MAST, a good story of a sailor's life. Good as it is, it is eclipsed by sea romances written by Herman Melville, who lived from 1819 to 1891. In 1841 Melville went on a whaling expedition to the Pacific, and before he got back to Boston had many an adventure. He was a captive among cannibal South Sea Islanders, was in a mutiny and saw service on a United States frigate. When he returned he wove his experiences into romances of the sea. He wrote many books, but the best are TYPEE and MOBY DICK. The latter is one of the best sea stories ever written.

From writers of fiction we must now turn to the poets. During and after the Revolution, Philip Freneau (1752-1832), a New York journalist who wrote many satires, also wrote some charming short poems like THE WILD HONEYSUCKLE, THE INDIAN BURYING GROUND and EUTAW SPRINGS. More important than Freneau were two young men, Fitz-Greene Halleck and Joseph Rodman Drake. Drake, who was born in 1795 and died in 1820, was a physician who wrote only for pleasure, but his CULPRIT FAY, a story in verse about a fairy whose helmet "was plumed of the silk of the thistle down," is a better poem than any that had been written in America before his time; and THE AMERICAN FLAG is full of patriotism. Halleck, who lived from 1790 to 1867, is best

remembered by MARCO BOZZARIS, a heroic ode which is really good. Still, neither Halleck nor Drake could take high rank, and in the early years of the nineteenth century the prospect of finding a national poet seemed rather gloomy.

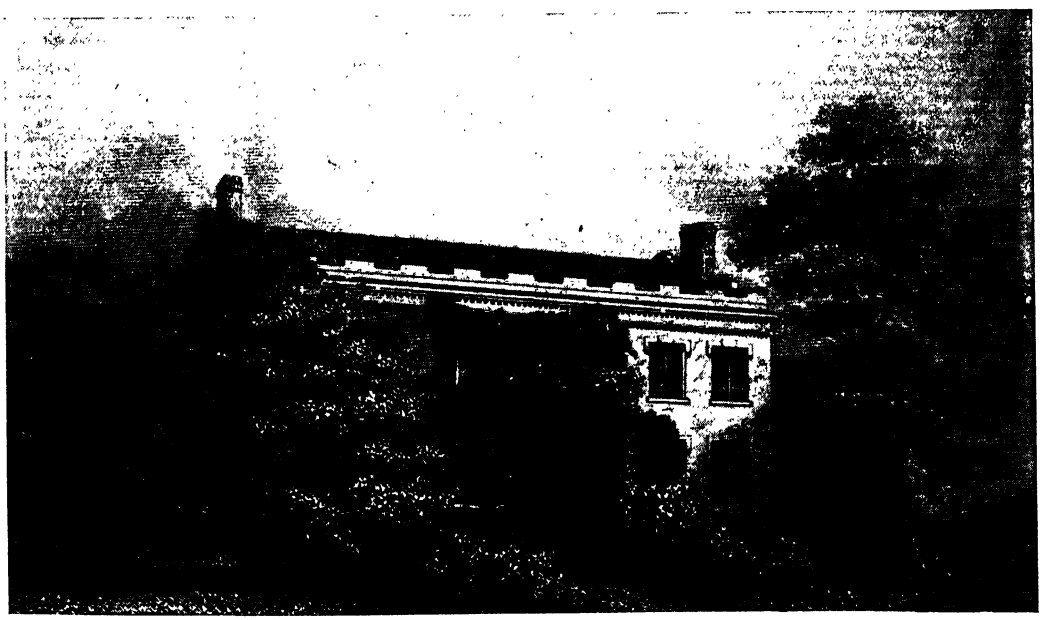
In 1794, at Cummington, Massachusetts, a boy was born, named William Cullen Bryant, who was destined to do for poetry in America what Irving and Cooper were doing for prose. Bryant's father, a country physician, was a lover of poetry, and though money was not plentiful with him, he found enough to buy books for his family. Before Bryant was sixteen he had read Pope's ILIAD, Campbell's poems, Spenser, Southey, Cowper, and Wordsworth's LYRICAL BALLADS. His education was rather unconventional. He had private tutoring and a year at Williams College, and for the rest he wandered through the woods and by the streams. At the age of eleven he had already begun to write verses, and before he was seventeen he had written the greater part of THANATOPSIS, the poem which immediately comes to our mind when his name is spoken, and he never wrote a better one. It was not published, however, until 1817, when his father sent it to THE NORTH AMERICAN REVIEW.

Meantime William had become a lawyer and actually practiced law for some years.



J. Fenimore Cooper wrote his first book on a dare.

But his love for literature was stronger than his liking for law, and having decided to devote himself to literature as a profession, in 1825 he went to New York with his young wife. Life was not easy for them at



The home of J. Fenimore Cooper in Cooperstown, New York, where he wrote some of his best-known stories of the forest, frontier and sea. The town is named for its founder, Judge Cooper, who was the father of the author.

first, but before long he became associated with the New York EVENING POST. He was editor of this paper for fifty years and brought it up to a high standard, which it maintained for long. Through it he gained great influence in the national life, and used this influence unfailingly on the side of right and freedom and justice.

His life was, of course, a busy one, and though he wrote until the end, none of his poems is long; they are not very many in number, and his later ones are not greater than those he wrote in his youth. Like Irving, he did not reach great heights, and while he does not rouse us with a trumpet call, his poetry is unfailingly good. He wrote very noble poems on patriotism, of which he struck the first note in THE AGES, and the last in his old age in OH, MOTHER OF A MIGHTY RACE; but his chief themes were nature, freedom and death.

A GROUP OF WRITERS BROUGHT FAME TO CONCORD, MASSACHUSETTS

While Irving, Cooper and Bryant were writing in New York, an important literary group grew up in the little city of Concord, Massachusetts, around Ralph Waldo Emerson (1803-1882), who, from his wisdom, became known as the Sage of Concord. He is the best known of all American writers of this period except Cooper, and one of the greatest, if not the greatest, among them.

His forefathers had been ministers of the Congregational Church for generations, and his own father was pastor of a Unitarian church in Boston, where he died when Emerson was ten years old. His mother and aunt had a hard struggle to educate him and his three brothers. Ralph entered Harvard at the age of fourteen. After his graduation he taught for a time and then became pastor of a Unitarian church. He married at the age of twenty-nine, but his wife lived only three years, and shortly after her death he left the ministry. Feeling ill and unhappy, he went abroad to see what a change of scene would do for him, and during his absence he made a good friend in Thomas Carlyle.

EMERSON'S TRAVELS AND LECTURES SPREAD THE CULTURE OF NEW ENGLAND TO THE WEST

After his return Emerson went to Concord with his mother to live in the Old Manse. The next year he married again, and as it was necessary for him to undertake some definite occupation, he began to lecture in the lyceums (lecture courses) which were then popular, and which did much to aid



Captain Ahab, the one-legged hero of Melville's MOBY DICK as pictured by Rockwell Kent.

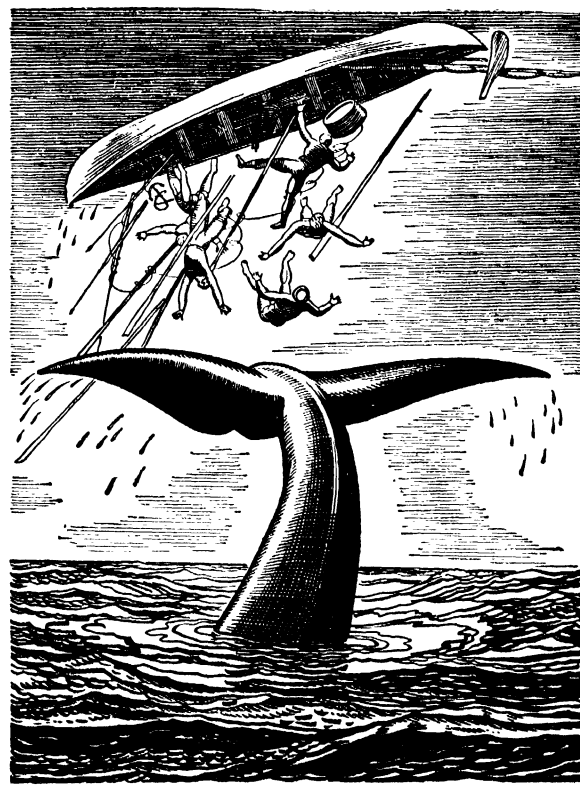
the cause of education. For thirty years he went up and down through New England and the middle and western states lecturing until his ideals pervaded the thought of the day and became part of the life of the nation.

He wrote some noble poems, but it is by his essays that he is known best. The titles of the essays give an idea of the subjects which interested him: MANNERS, FARMING, BOOKS, LIFE AND LETTERS IN NEW ENGLAND, ELOQUENCE, OLD AGE, EXPERIENCE, SELF-RELIANCE, THE OVERSOUL, NATURE, REPRESENTATIVE MEN. His address on The American Scholar has been called the "Declaration of Independence for American literature." His themes were for the most part manners and morals, taught in language of which James Russell Lowell said, "His rich words, every one, are like gold nails in temples to hang trophies on." In all his work we find words of wisdom. Thus in the essay on NATURE, he says:

> For no man can write anything, who does not think that what he writes is for the time the history of the world; or do anything well, who does not esteem his work to be of importance. My work may be of none, but I must not think it of none, or I shall not do it with impunity.

The group of friends by whom Emerson was surrounded, and their followers in New England, came to be called transcendentalists. This difficult word was used to describe the fact that these men and women aspired to great heights of idealism in thought and life. They were all very earnest and very interesting, but the most important in literature were Amos Bronson Alcott, Margaret Fuller and Henry David Thoreau. Nathaniel Hawthorne joined them for a time, but soon left them.

Alcott (1799-1888) is best remembered as the father of Louisa May Alcott, the author of LITTLE WOMEN. In his early life he was not prosperous, for, like many of the transcendentalists, he dreamed too much and had strange theories of life, and if it had not been for the good sense of his wife, the mother who is so well drawn in LITTLE WOMEN, his family must have starved. Later on, after Louisa May Alcott had gained comfort for her family by the sale of her books, her father became more successful, but though his "conversations" and lectures on philosophy were admired in his own time, they are now forgotten except by students of literature.

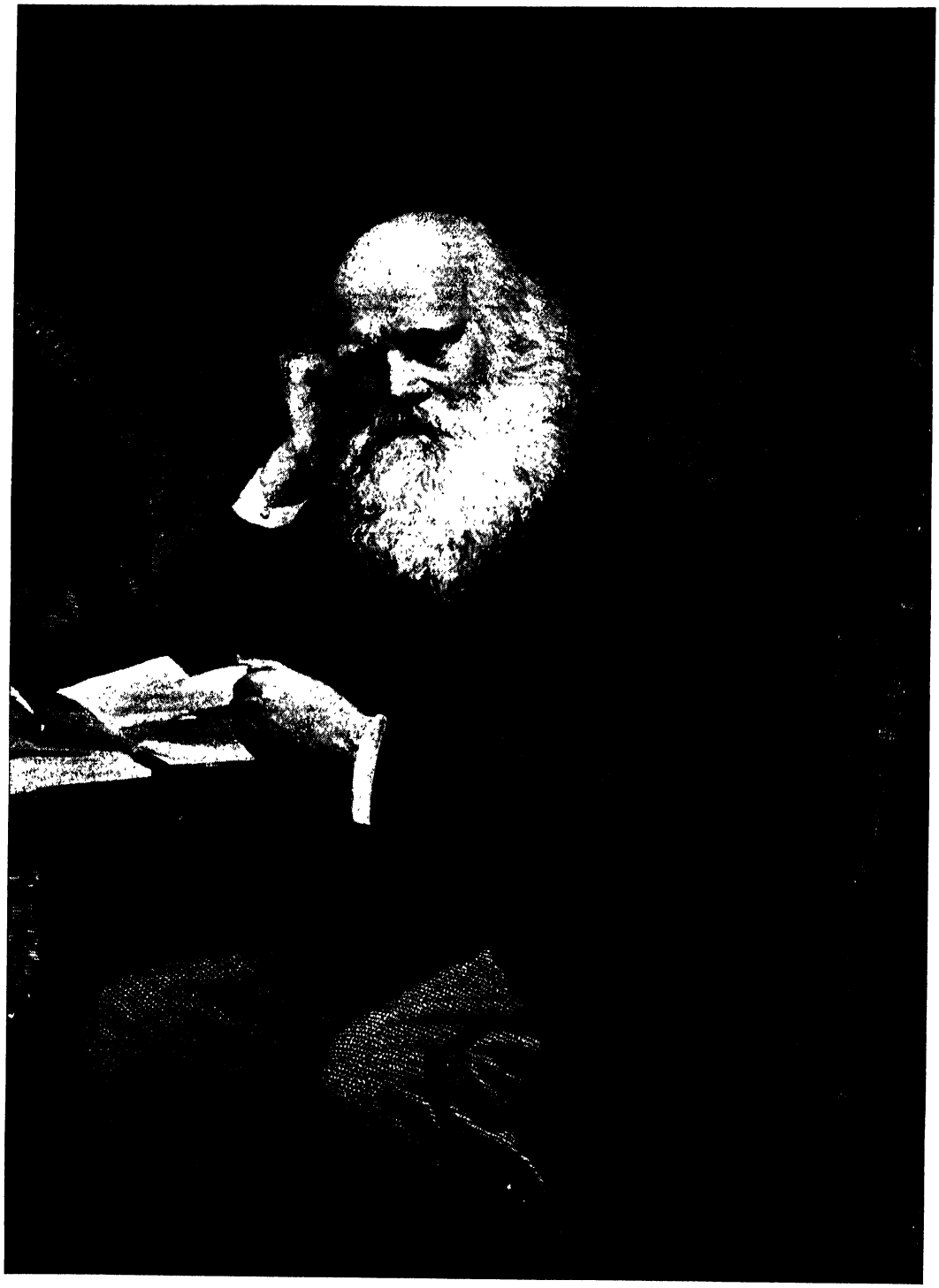


With one flip of his mighty tail, the great whale upsets the harpooners' boat. This exciting moment in Melville's story, MOBY DICK, is drawn by the artist, Rockwell Kent.

Margaret Fuller is of more importance, especially as she was one of the forerunners of the women who brought woman suffrage to pass. She was born in 1810, in Boston, where her father was a judge. She was educated by him in such a fashion that she became quite learned and very critical. For a time she taught in girls' schools and later became editor of THE DIAL, a periodical which was published by the transcendentalists. At the same time she carried on "conversations" in literature with groups of women; we would say today that she gave lectures to women's literary clubs. In 1842, she was made literary critic for the New York TRIBUNE, and though she wrote little besides criticisms, she did a great deal to make the reading public familiar with the best European literature. After a time she went to Europe, and in Italy was married to the Marquis Ossoli in 1847. In 1850 they were coming to America but their ship was wrecked off Fire Island and they were drowned.

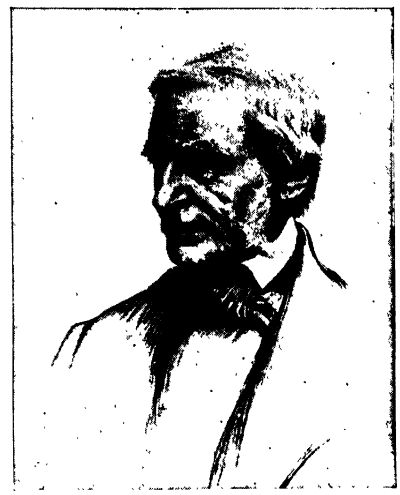
One of the most interesting writers of the time was Henry David Thoreau, who was born in Concord in 1817, and lived there for the greater part of his life. His father, a pencil-maker, was not a well-to-do man, but he succeeded in educating his children. Thoreau was graduated from Harvard in 1837. He first taught for a time, and then learned his father's trade. Later on he became a surveyor, and for a while lived with Emerson's brother William on Staten Island as tutor to William's children. Thoreau had no desire at any time to make money. All he wanted was enough to live on so that he might study Nature, meditate on it, and write, not as a naturalist, but so as to tell others what Nature said to him. In order to do this he built himself a little house in a wood lot belonging to Emerson on the edge of Walden Pond. There he lived all alone for two years and a half, reading, thinking, and making notes of the wild life in the woods. The result was a book of essays to which he gave the name of WALDEN and in which he told

AMERICA'S EARLIEST POPULAR POET



William Cullen Bryant, who was born at the end of the eighteenth century, was the first well-known American poet. One of his best poems, THANATOPSIS, was written before Bryant was seventeen years old. Many others were composed during the poet's fifty years as editor of a leading New York newspaper.

about building his house and about his hermit-like life there and expressed his thoughts on many things. He had already published A WEEK ON THE CONCORD AND MERRIMAC RIVERS, and after his death his books THE MAINE WOODS, CAPE COD and some essays were published. WALDEN is the best of all his works, but all his writing has beauty in it. The mountains, he said, are "washed in air," and he described the bluebird as "carrying the sky on his back"; and, again, he speaks of "the faint, flitting, lisping notes" of the chickadees in winter, "like the tinkling of icicles in the grass."



Ralph Waldo Emerson, the Sage of Concord.

Thoreau died in 1862, at the age of forty-five. During the last fourteen years of his life he lived in his father's house, and made a living by lecturing and by doing a little surveying. But he spent most of his time reading, thinking and writing, or talking with his friend Emerson.

The next man of whom we must speak, because he was at one time associated with the transcendentalists, is Nathaniel Hawthorne, whose ideals were as fine and high as those of any of them. He had not Emerson's hopefulness, and instead of teaching self-reliance and self-development, his thoughts were greatly occupied with the sad effects of wrong on the lives of wrong-doers and those about them. Of course we must look for this meaning in order to find it: on the surface his stories are fascinating tales.

Hawthorne was born in 1804 and was the son of a sea captain who commanded one of the fast sailing ships for which New England was so famous. Unfortunately when the boy was only four years old his father died while away on a long sea voyage. In her sorrow his young mother shut herself away as far as possible from the world. He had two older sisters, however, and his mother's brothers were ready to take his father's place as far as they could, so that his childhood was not unhappy. In 1821 he was sent to Bowdoin College, where he

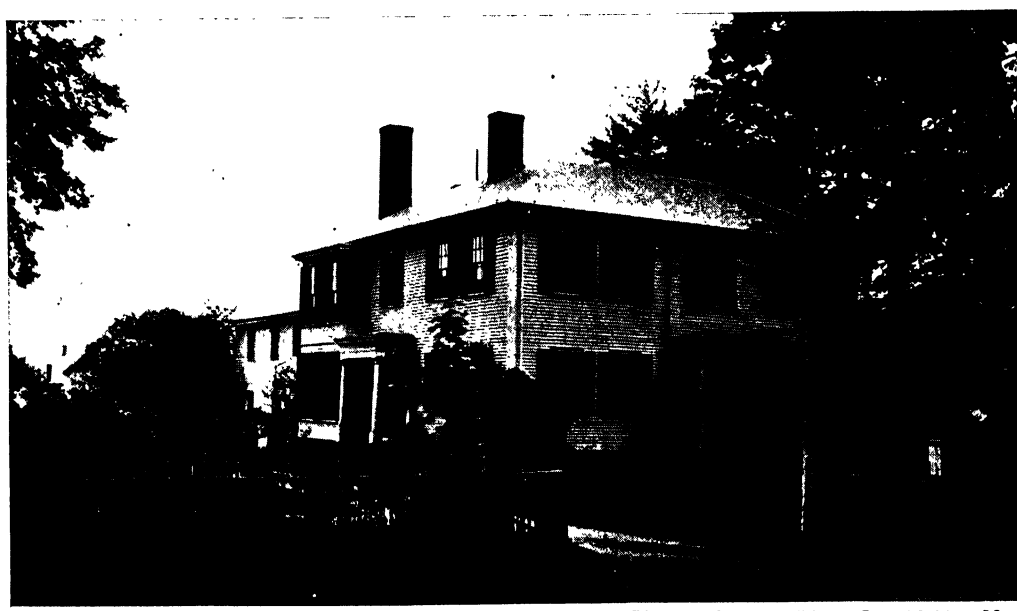
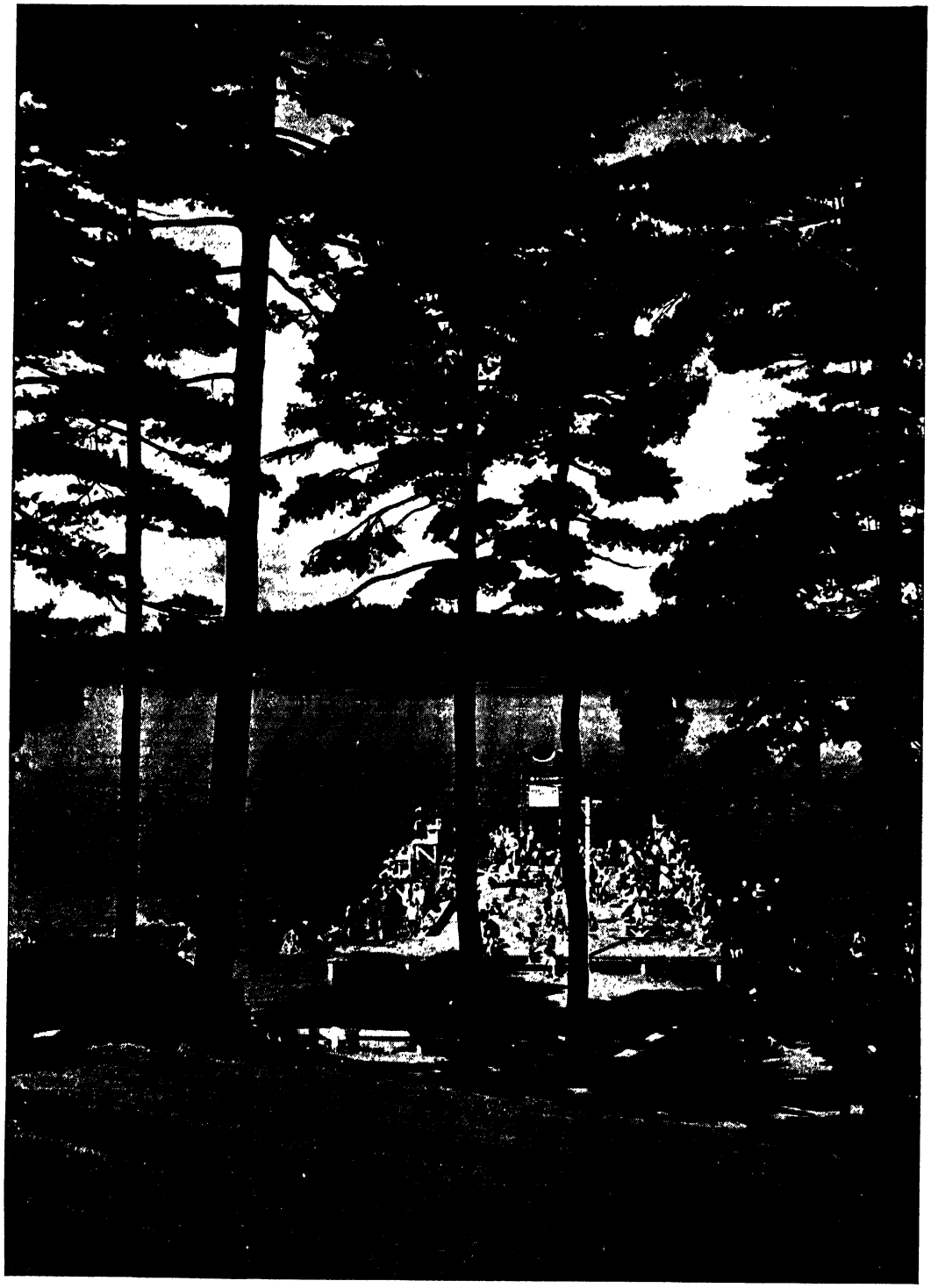


Photo by Gramstorff Bros. Inc., Malden, Mass.

Emerson built this house in 1820 and lived here most of his life. While he was in Europe, Thoreau lived here.

WALDEN POND AS IT LOOKS TODAY



Ewing Galloway

Walden Pond is no longer the lonely, secluded spot where Thoreau lived the life of a hermit meditating on the ways of nature. Nowadays it is part of a state reservation, with playgrounds and a swimming pavilion open to all.

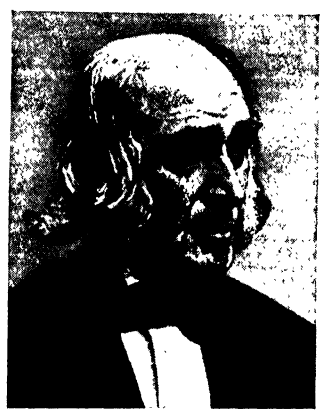
was in the same class as Longfellow; and Franklin Pierce, who later became president of the United States, was his closest friend.

When he left college, instead of preparing for a profession like medicine or the law, he shut himself up in his room and worked there day after day and year after year, writing and rewriting, until at length he was satisfied that he had done something that was good enough to publish.



Henry David Thoreau, who left us a diary of his life as a hermit in the woods.

In 1837 he published TWICE-TOLD TALES, which drew attention to him as a genius. But the stories did not bring in enough for him to live on, and in 1839 he obtained a position in the custom house at Boston. The work was distasteful, but he endured it until his party went out of office. He then went to Brook Farm, where a group of transcendentalists was making the experiment of uniting simple farm life with deep study and high thinking. He does not seem to have fitted in very well with the life there, however, and left even before the experiment proved a failure. In 1842 he married Sophia Peabody, of Boston, and went to live in the Old Manse at Concord, where he spent four happy years, wrote more TWICE-TOLD TALES, and made the old house famous by his MOSSES FROM AN OLD MANSE.



T. F. Healy Collection

Bronson Alcott, best-known today for his clever daughter, Louisa.

In 1846 he was again employed in the customs, this time at Salem, his old home. He lost his position, for some reason, three years later, but when he told his wife of his dismissal she comforted him by exclaiming, "Now you can finish your book!" The book which he later wrote was THE SCARLET LETTER, which some critics consider the best romance that has yet been written in America, although Hawthorne himself preferred THE HOUSE OF THE SEVEN GABLES, which he wrote immediately afterward.

His next book was THE WONDER BOOK, a collection of classical tales that are the delight of children and of many grown-up people. We give you one of these tales on page 3441. Then came THE BLITHEDALE ROMANCE, which is the story of Brook Farm; THE SNOW IMAGE; and TANGLEWOOD TALES. We might have had more of these stories, but in 1853 President Franklin Pierce, his old college friend, appointed Hawthorne consul at Liverpool, England, and during the four years that he was consul he published nothing. After he lost his office, however, he spent some time on the Continent and wrote THE MARBLE FAUN. In 1860 he returned to America to find the country almost on the verge of the Civil War. He lived through the war, but even before his return from England his health had begun to break down, and he died suddenly on May 19, 1864.

We usually think of Puritan times as being harsh and cold and grim, but there was romance in them for all that. Hawthorne found it in the histories and journals written in those grim old times, and wove it into stories like those in GRANDFATHER'S CHAIR, and into THE GENTLE BOY, a story of the persecution of the Quakers.

This period was the golden age of the orator, and some of the speeches of Daniel Webster, Henry Clay, John C. Calhoun, Edward Everett, Rufus Choate, Wendell Phillips, Charles Sumner and others really deserve to be classed as literature. Few of these men, however, had any books published, and the political questions upon which they spoke have long been settled. Few, except students of history, now read their fiery orations. Compared with speeches of the present day they seem rather ponderous and stilted, but some of them deserve

to rank with the greatest orations in history.

At the same time that Hawthorne was writing stories in New England, Edgar Allan Poe, who was in many respects a greater genius, was living, now in the South, now in the North, and writing stories of an entirely different kind from Hawthorne's, and poetry which is filled with sad, haunting music. He was also a master of the art of constructing verse.



Margaret Fuller, who stood out in her day as a learned woman.

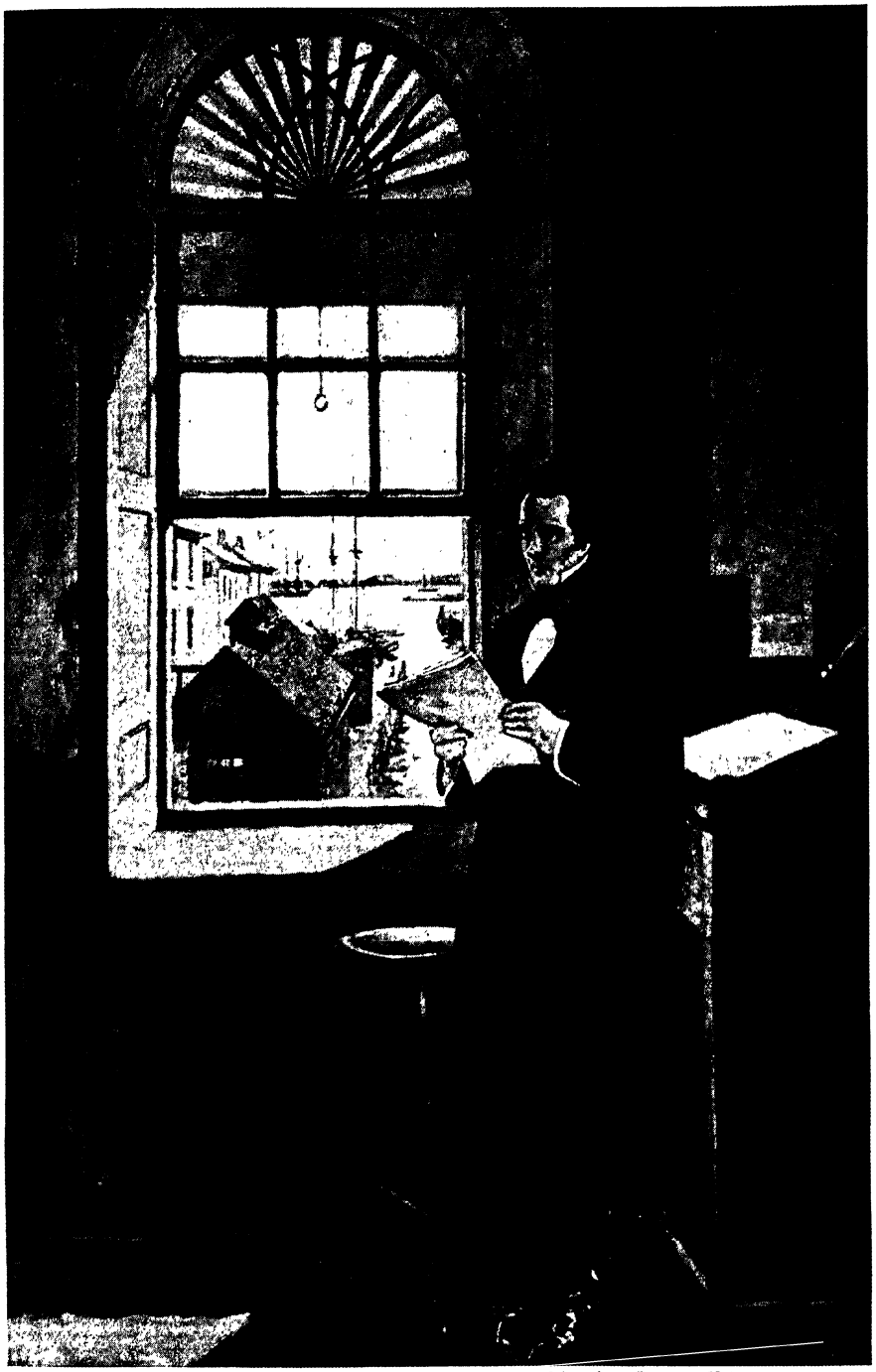
Poe's short life, partly through his own fault, was sad in the extreme. He was born in 1809 in Boston, where his father and mother, who were both on the stage, were playing at one of the theaters. He was not a New Englander, however. His father was from Maryland, and his mother was an Englishwoman. Two years after his birth both parents died in Richmond, Virginia, and their two boys and a baby girl were left to the care of strangers. Edgar was adopted by a wealthy tobacco exporter and his wife who had no children and wanted a boy to bring up as their son. They gave him their name, Allan, and were very kind to him—too kind, for he was a brilliant, wayward boy who needed loving discipline instead of the indulgence that he received. While he was a child his adopted parents took him to England, where he attended school for some years. After his return he went to school in Richmond, where he was prepared to enter the university. In 1826 he was ready for college and entered the University of Virginia. Unfortunately he made the wrong friends there, drank too much wine and lost money at gambling. Angered by Poe's conduct, Mr. Allan would neither let him go back to college for his second year, although Poe stood high in his studies, nor would he give him the money to pay his debts. This disgrace stung Poe to the quick; and when Mr. Allan insisted that he go into the office and learn his business they quarreled. Poe ran away from home and enlisted in the army as a private soldier.



Courtesy, Essex Institute, Salem, Mass.

The House of the Seven Gables in Salem, now a museum, is kept the way it looked when Hawthorne wrote about it.

THE UNHAPPY CUSTOMS CLERK



Reproduced from The Pageant of America. Courtesy, Yale University Press

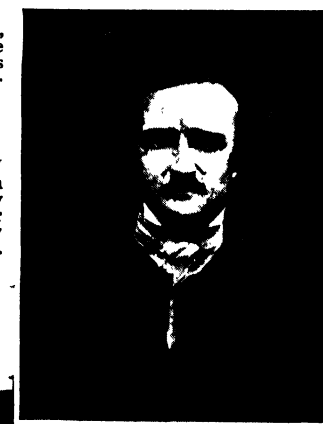
Nathaniel Hawthorne at the customhouse window overlooking the harbor, from the painting by C. W. Jefferys.

This seemed to be a good place for him. He was rapidly promoted. At this time he wrote and published TAMERLANE, a poem which pleased Mr. Allan so much that he forgave him and obtained an appointment to West Point for him. In a few months, however, Poe became restless, unhappy and dissatisfied, and when Mr. Allan refused to consent to his resignation he deliberately neglected his duties, was court-martialed and dismissed. Naturally the disgrace hurt Mr. Allan, who refused to give him any more assistance; and from this time on Edgar was thrown on his own resources.

They were not very great, for a poet had small chance of making a living with his pen alone. However, he went to New York and published a volume of poems which included ISRAFEL. From New York he went to Baltimore, and from Baltimore to Richmond, where he found work as editor of THE SOUTHERN LITERARY MESSENGER, which he made famous by his stories. Again his unhappy fondness for wine got him into trouble, and by the close of 1836 he was dismissed. By this time he was married to his little cousin Virginia Clemm. With her and her mother he went to New York, from there to Philadelphia, and then back to New York, where he fell into dire poverty and his poor little wife died. Three years later, in 1849, he died in a hospital in Baltimore, at the age of forty.

When he died, Poe was famous, both in Europe and in America, for his short stories and poems, and to this day no other American writer has had so much influence on European literature. Unlike the romances of Cooper and Hawthorne, which were founded on fact, Poe's stories originated in his imagination. Though his short stories are masterpieces, his characters are not great. In fact, we need not look for greatness of thought in his work, nor do we find high ideals or love of humanity there.

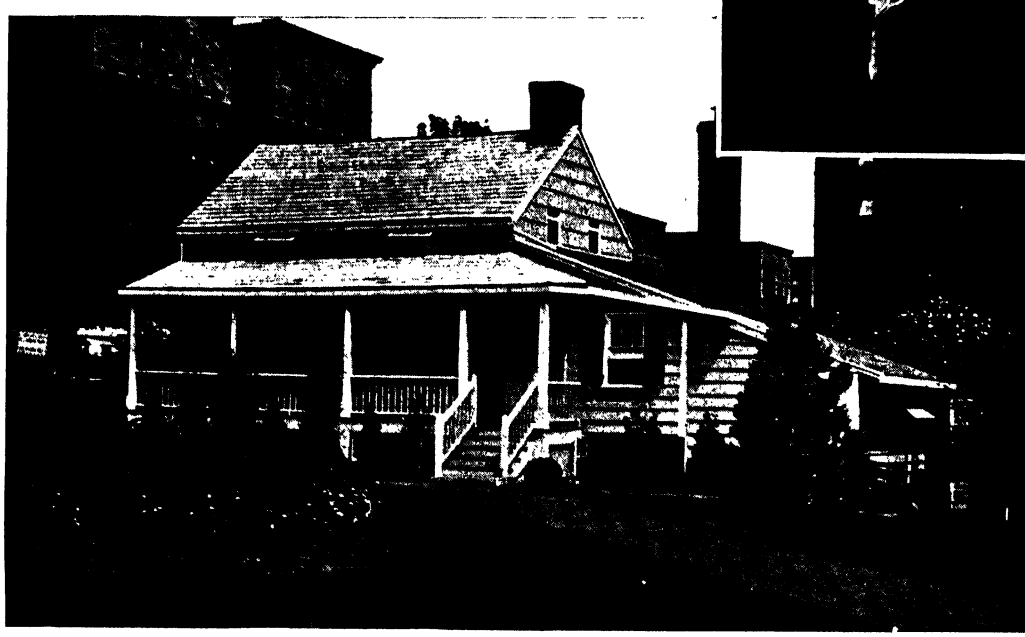
What we do find is marked originality and an appreciation of the music of words such as no other writer has shown. He knew how to create beauty by the repetition of a word, or a syllable, or, it might be, of only a vowel. We find this in THE RAVEN, which made him famous, and more especially in the beautiful melody of THE BELLS. ANNABEL LEE, with its haunting refrain; ULALUME; FOR ANNIE; ISRAFEL; THE RAVEN; and To HELEN are his most beautiful poems. Several of these are in your BOOK OF



Edgar Allan Poe, who wrote some mystery stories that rank as literature.

Ewing Galloway

Poe's cottage, in the Bronx, in New York City, was far out in the country in the poet's day.





T. F. Healy Collection

Longfellow's study in the Craigie House, Cambridge, where George Washington once had his headquarters. Here are many mementos, including the chair made from the spreading chestnut tree under which the village smithy stood.

KNOWLEDGE. Look under Poe's name in the Poetry Index.

Fantastic horror and ghostly fear are the chief emotions on which he plays in his weird, fascinating tales, and he fixes our minds on the morbid and the terrible. His best stories are ELEONORA, THE PIT AND THE PENDULUM, THE MASQUE OF THE RED DEATH, THE BLACK CAT, THE GOLD-BUG, and THE FALL OF THE HOUSE OF USHER.

The first decade of the nineteenth century was a fortunate one for the nation, for in that period were born many of the men who gave the United States an independent and distinctive place in literature. Emerson, as we have seen, was born in 1803, Hawthorne in 1804, Poe in 1809, and we now come to another group of poets—Longfellow and Whittier, who first saw the light in 1807, and Holmes, who was born in 1809.

The first of these men, Henry Wadsworth Longfellow, was a native of Portland, Maine, where his father was a lawyer. He had a happy, sheltered childhood, and at the age of fifteen went to Bowdoin, where he entered the sophomore class and was Hawthorne's classmate. Just at the time he graduated, it was decided to add a professor of modern languages to the faculty at Bowdoin. The professorship was offered to Longfellow. In 1826 he went to Europe to prepare himself by three years of study, which he spent chiefly in France, Italy and Spain. He taught so successfully at Bowdoin that in 1835 he was called to Harvard, and from that time we associate him with Harvard and Cambridge.

Before he settled down at Harvard he spent a year in Germany, and in 1836 took up his new work. His wife had died while they were in Europe, but in 1841 he married again and led a happy home life in the old Craigie Mansion, almost under the shade of the Washington Elm. As years went on he became more and more famous as a poet, and finally gave up teaching altogether in order to devote himself to writing poetry and translating poems from other languages. In 1861, after twenty years of happiness, his wife was accidentally burned to death; but except for this great tragedy his life flowed smoothly on. He was surrounded by friends, loved and admired at home, and in England took place second only to Tennyson. THE CHILDREN'S HOUR shows us how he loved children, and he was loved by them in return. In fact,

PRISCILLA, THE DEMURE PILGRIM MAID



This illustration from Longfellow's THE COURTSHIP OF MILES STANDISH shows Priscilla, the heroine, at her spinning wheel, while possibly John Alden, come to court her for his captain, stands watching through the window.

he was called the Children's Poet, and toward the end of his life children presented him with a great chair made from the wood of the chestnut tree under which the "village smithy" stood. He lived to the age of seventy-five and died in March, 1882, as gently as he had lived.

Longfellow was not a great poet, but for all that we may speak of him as a world-poet, for he is still loved and will probably continue to be loved wherever the English language is spoken. Love was the motive of his life and showed through all his verse. He wrote of the homely, every-day things of life, and turned them into poetry. THE VILLAGE BLACKSMITH, THE PSALM OF LIFE, A GRAY DAY, THE HANGING OF THE CRANE, THE BRIDGE, THE DAY IS DONE, are only a few of the many shorter poems by which we all remember him. Of his long poems, EVANGELINE and HIAWATHA are the most popular, but THE COURTSHIP OF MILES STANDISH is the best.



Culver Service

Longfellow's daughters described in THE CHILDREN'S HOUR; "Grave Alice and laughing Allegra and Edith with golden hair." Allegra's name in real life was Annie.

The life of John Greenleaf Whittier did not run so smoothly as Longfellow's, nor was his lot cast in such pleasant places. He was born in 1807 at East Haverhill, where his father had a farm. Here his family, who belonged to the Society of Friends, had lived for generations. It was a poor farm, and life was not easy. The district school gave the boy part of his early education. How he got the rest you can learn from THE BAREFOOT BOY, a delightful poem in which he enumerates his childhood occupations and pleasures. While Longfellow was studying at Bowdoin, Whittier was following the plow and generally helping his father to work the farm, and at the same time he was earnestly trying to learn to express his thoughts in poetry. His small home library contained the Bible, Shakespeare, Scott's poems and the journals of eighteenth-century Quaker leaders. He must have learned most of these books by heart, and thus laid a foundation for his later work. But it took him many years in later life to study all he missed in his youth, and though his mind was stronger than Longfellow's, he never became so good an artist. When he was about fourteen, Joshua Coffin, a school teacher who stayed in the Whittier household in the course of "boarding round," gave him the poems of Robert Burns. These took hold of his mind and had a strong influence on his poetry.

His family, of course, knew of his efforts, but the shy boy might never have thought of publishing his poems had not his sister Mary sent one of them to THE FREE PRESS of Newburyport. The first knowledge that Whittier had that it had left the house was when he opened a copy of the paper and found it there in print. With this encouragement he sent others, and the editor, William Lloyd Garrison, was so much impressed by them that he paid the boy a visit. After that recognition his father consented to his going for a year to Haverhill Academy. This ended his formal education, but he had long before learned the secret of study, and was now able to go on independently. After he left Haverhill he went to Boston and found employment in a publishing house as editor of a political journal, THE MANUFACTURER. He stayed two years in Boston, then we find him back at Haverhill, and after his father's death he went to Hartford to edit a paper there. His health, however, prevented him from continuing this work, and after a time he bought a house in the village of Amesbury, where he lived until his death in 1892.

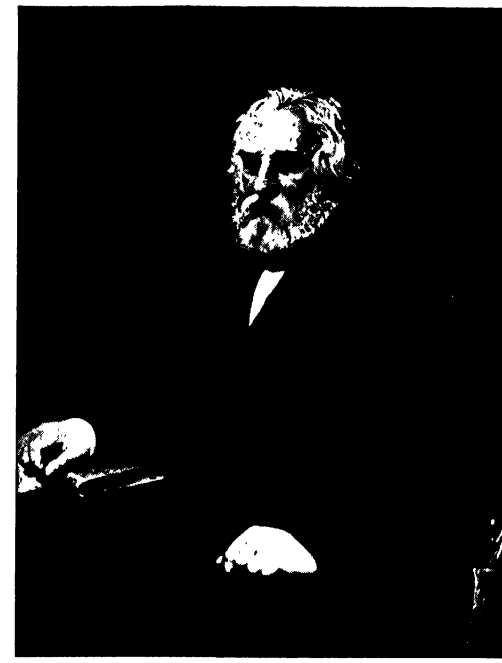
Throughout his life Whittier took part in politics, and in 1835 and 1836 he was a member of the state legislature. Although a "silent, shy, peace-loving man," he was a very active member of the Prohibition party and he had no small part in rousing the North against slavery. Indeed his anti-slavery poems, which make up a large proportion of his work, and into which he put all the strength of his feeling, were one of the forces which made the Civil War inevitable. Among these poems the stirring BARBARA FRIETCHIE and THE WATCHERS are the best. RANDOLPH OF ROANOKE and MASSACHUSETTS are also fine poems, but, like most poetry written with an object, they lose their interest as time goes on. This is not the case, however, with ICHABOD, the

great lyric poem in which, with all the passion in his nature, he mourned Webster's upholding in Congress the measure known as the Compromise of 1850.

MAUD MULLER, SKIPPER IRESON'S RIDE, BARCLAY OF URY, THE BAREFOOT BOY, IN SCHOOLDAYS and SNOWBOUND have endeared Whittier to all lovers of poetry. SNOW-BOUND alone is enough to keep his name alive, for in it he gives a vivid and unforgettable picture of winter life in old New England in the picturesque times that were passing even in his day. This poem and ICHABOD are the two which give him a claim to greatness.

A POET WHO WAS ALSO A DOCTOR AND A WRITER OF MANY HUMOROUS ESSAYS

One of Whittier's last poems was addressed to his old friend, the physician-poet and humorous essayist Oliver Wendell Holmes, who was born at Cambridge in 1809, and lived until 1894. He graduated from Harvard in 1829 and took up the practice of medicine in Boston. In 1847 he was made professor of anatomy and physiology at Harvard, and we can imagine how the play of his humor lightened his lectures and made him a favorite with the students.



Henry Wadsworth Longfellow is the only American represented in Poets' Corner, Westminster Abbey.

HOW A YOUTHFUL POET SAVED THE U.S.S. CONSTITUTION BY MEANS OF A POEM

Meantime he had begun to write essays and poems. In his college days he was class poet. OLD IRONSIDES, which helped to save the famous frigate Constitution from destruction, was written when he was only twenty-one. While he practiced medicine and taught in the university he went on writing verses, and even gave lyceum lectures in verse. Then, in 1857, James Russell Lowell, who had become editor of THE ATLANTIC MONTHLY, refused to accept the appointment unless Dr. Holmes consented to write for it, and thus it came about that the cheery, humorous professor contributed his best essays, with poems interspersed, to the magazine. THE AUTOCRAT OF THE BREAKFAST TABLE is particularly rich in poems. The lovely CHAMBERED NAUTILUS is one of these, and THE DEACON'S MASTERPIECE, which in itself is a masterpiece in humor. THE AUTOCRAT OF THE BREAKFAST TABLE, THE POET AT THE BREAKFAST TABLE and THE PROFESSOR AT THE BREAKFAST TABLE are all good table-talk books. THE AUTOCRAT is the best of these. In addition to these essays Holmes wrote two or three other books in the form of the novel, but they are much too full of medical knowledge to be anything but studies. Of these ELSIE VENNER is most worth reading.

Dr. Holmes outlived every one of the poet friends of whom we have been speaking, and even the youngest of the band, James Russell Lowell, who was not born until 1819 and who died in 1891.

Lowell was in some ways a greater poet than any American who had come before him, and in every way a better writer than all the rest. Like Holmes, he was both satirical and humorous. His satire was more biting than Holmes's, and his poetry was more robust than either Whittier's or Longfellow's, while his English was more polished than that of any of his predecessors or his contemporaries. He had not Poe's originality, but he touches life more closely. Though Poe has had more influence abroad by reason of his originality, Lowell has had much more influence on literature and on culture in America.

He was born in Cambridge, where his father was a clergyman, and lived there for the greater part of his life. He went to Harvard, where he graduated in 1838, and though he was educated for the law, he turned from it to literature as his life-work and began to write poems, book reviews and political articles for various publications. In

1846 he married Maria White, a poet also. Out of the happiness that his marriage brought him great sorrow came, for his wife died in 1853, and of their four children only one survived her.

In 1846 Lowell was practically unknown, but in that year the Mexican War roused his wrath and he gave vent to it in the first set of his famous BIGLOW PAPERS. In these he made Hosea and Ezekiel Biglow, Birdofredum Sawin and the Reverend Homes Wilbur the mouthpieces for the wit and satire with which he lashed the war, the motives that dictated it, and the institution of slavery. The papers, which were partly written in Yankee dialect, appeared in the Boston COURIER and became immensely popular. They were published in book form in 1848.



John Greenleaf Whittier, the Quaker poet, who was for the most part self-taught.

At about the same time Lowell published A FABLE FOR CRITICS, in which by turns he praised and blamed his contemporaries. He wrote THE VISION OF SIR LAUNFAL in the same year. Several of his other best-known poems—A LEGEND OF BRITTANY, THE SHEPHERD OF KING ADMETUS and RHŒCUS—had been written some time earlier. In 1855 he succeeded Longfellow at Harvard, and two years later he remarried. In 1857 he became editor of THE ATLANTIC MONTHLY. Though he resigned in 1861, he kept up his association with the magazine and in it published (1862) his second BIGLOW PAPERS, which were prompted by the Civil War.

Lowell wrote two long poems, THE CATHEDRAL and APPLEDORE, but he is at his best in his four great COMMEMORATION, or MEMORIAL, ODES, in which he gave his passionate patriotism full sway. They formed the bulk of his poetical writings after the Civil War, for as years went on he turned his attention more and more to prose, and gave to the world the delightful essays on literature and politics which have made him better known as an essayist than as a poet.

Like Irving, James Russell Lowell served his country as minister to Spain, and later as minister to England.

The poets of whom we have been reading all called to their assistance a knowledge of the past and a wide acquaintance with the literature of other countries. Now we come to a man whose ways were utterly different, who cared nothing for history and little for the present-day life of countries not his own.

This man, Walter Whitman, was born in 1819 near the old village of Huntington, on Long Island. His father, a small farmer and carpenter, moved to Brooklyn when Walter, or Walt, as he became known, was about six years old, and the boy went to the public schools until the age of eleven, when he left to become an office boy. It would take too long to give the details of his life during the next twenty years. At the age of twelve he began to learn typesetting; then he became a school teacher. After that he tried to edit a weekly newspaper in Huntington, but failed. He went back to New York, where he studied closely the men and women who crowded the streets—the workers of the great city.

By 1846 he had worked himself up to the position of editor on the Brooklyn DAILY EAGLE, which he held for two years and then lost, chiefly because of his political opinions. He turned his freedom to good account, however, by taking a long trip through the country as far south as New Orleans, where he worked for three months, and then home to Brooklyn by way of the Mississippi and the Great Lakes. After his return he edited the Brooklyn FREEMAN for a time, and is believed to have taken to building, and it is certain that he spent a great deal of time in study. He had been writing for some time, and in 1855 he published a small volume of poetry which he called LEAVES OF GRASS, to which a good deal of opposition was raised. Although he called it poetry, it was unlike any poetry that had been written before. He had deliberately departed from the ordinary form; the lines of the poems are not rimed, and they are of unequal lengths. In fact, he transgressed every rule of poetry that had hitherto been made, and gave to Americans a new form, which is now called free verse. There was some crudeness, yet the writing showed great poetic power.

While he was not an Abolitionist, Whit-

man was opposed to slavery, and wrote some of his best poems on the Civil War—chants, he called them—in which he makes us hear the beating of the drums and see the marching of men from far distances. He went down to Washington in the second year of the war to seek his brother who had been wounded, and stayed there to care for the sick and wounded who crowded the hospitals after every battle. This was the greatest work of his life, and from it he drew inspiration for poems which were published as DRUM TAPS and THE WOUND DRESSER, in which he gives an unforgettable picture of military hospitals of those days.

After the death of Lincoln he wrote WHEN LILACS LAST IN THE DOOR-YARD BLOOM'D, and O CAPTAIN, MY CAPTAIN, two poems which alone are enough to prove his greatness. His work in Washington won for him the title of the Good Gray Poet, but it helped to ruin his health, and the later years of his life were spent as an invalid in Camden, New Jersey.

Whitman could write in metre when he chose, as he did in the lyrics O CAPTAIN, MY CAPTAIN and OUT OF THE CRADLE ENDLESSLY ROCKING, but as a rule he used the free verse which he invented, and of which a good example is found in WHEN LILACS LAST IN THE DOOR-YARD BLOOM'D. You can read it on page 5822.



T. F. Healy Collection

Oliver Wendell Holmes, the Autocrat of the Breakfast Table, whose son, Oliver Wendell Holmes, Jr., became a Justice of the United States Supreme Court.



T. F. Healy Collection

The home of Doctor Holmes on Beacon Street, Boston, resembles many of its red brick neighbors, all built about the same time when the Back Bay was filled in.

We have said nothing so far about women writers because, though there were many of them, none of them had so much influence on American literature as the famous men of whom we have been speaking. But there was one woman writer, Mrs. Harriet Beecher Stowe, who by writing one book, UNCLE TOM'S CABIN, had a profound effect on the history of the nation. This book, which was published in 1851, in an Abolition paper, had more influence than any other in bringing the strife between the North and the South to the point of war.

Mrs. Stowe, who was the daughter of Lyman Beecher, a famous Congregationalist minister, was born at Litchfield, Connecticut, in 1811. She lived in Cincinnati, Ohio, for a number of years before and after her marriage, in 1836, to the Reverend Calvin E. Stowe, and there talked to numbers of fugitive slaves, from whom she obtained most of the material for her story.

While these are perhaps the most important figures in the period, there are many others who were popular in their day. Nathaniel P. Willis (1806-67) wrote much in prose and verse, but he is now almost forgotten. The Cary sisters, Alice (1820-75)

and Phœbe (1824-71), wrote some pleasing poetry. A very popular novel was the WIDE, WIDE WORLD, by Susan Warner (1819-85), which was published in 1850. Bayard Taylor (1825-78) wrote both in prose and verse and Thomas Buchanan Read (1822-72) wrote some stirring poems, a few of which are remembered.

During the Civil War, Edward Everett Hale (1822-1909), who was a Unitarian clergyman, wrote A MAN WITHOUT A COUNTRY, a thrilling story that every child should remember. He wrote many other books during his long life.

Edmund Clarence Stedman (1833-1908), who had been a war correspondent, became a broker in New York, but found time to write critical essays and poems that helped make the great city a center for literature.



James Russell Lowell, the first editor of the ATLANTIC MONTHLY.

Most of our attention so far has been given to Northern writers. About the time of the Civil War two Southerners, Paul Hamilton Hayne (1830-86) and Henry Timrod (1829-67), brought Charleston, South Carolina, into prominence as a literary center of the South. In 1861 Timrod wrote his COTTON BOLL, probably his best poem. THE BATTLE OF CHARLESTON HARBOR, which Hayne wrote in 1864, stands above all his other poems.

Humorous books were very popular before the Civil War, and had begun to take an important place in the nation's literature. After the war people liked them even better, for they made them laugh and forget the sadness which the war had brought. Many of these humorous books have been forgotten, but a few of the writers deserve to be remembered.

Benjamin Shillaber (1814-90) created the famous "Mrs. Partington." David Ross Locke (1833-88) pretended to be the Reverend Petroleum V. Nasby, and in that character he wrote a series of letters in which the weaknesses of the Copperheads, as the Peace Democrats were called, were held up to ridicule. Josh Billings was the pen name used by Henry Wheeler Shaw (1818-85), a native of Maine. He wandered to the West in his youth, but after a time went to live in Poughkeepsie, New York, where he became an auctioneer and wrote quaint, whimsical sketches full of practical philosophy.

Artemus Ward, who in real life was Charles Farrar Browne (1834-67), was humorously merciless to insincerity of every kind. He died at Southampton in 1867 on his way home from a lecture tour in England, where he was very popular.

These writers made their fun still more amusing by misspelling words. Other humorists wrote in dialect. For instance, Marietta Holley made good-humored fun of social customs and politics as seen through the eyes of Josiah Allen's Wife, a shrewd, homely country woman from the northern part of New York State. This type of humor is still sometimes heard over the radio.

There is another group of men who deserve to be ranked as makers of literature. They have dealt with facts and not with fancy, but the ability needed to make the dead past live for us is quite as great as that which creates an imaginary scene.

The first of these whom we shall mention is William Hickling Prescott who was born in Boston in 1796, the son of a distinguished lawyer. He graduated from Harvard in 1814



Winslow Homer's silhouette illustrating James Russell Lowell's poem, THE COURTIN'.

when only eighteen years of age. While a student he lost the sight of one eye and injured the other, but he determined, nevertheless, to become an author. His family was wealthy, and so he was able to employ secretaries to read to him and to take his dictation. He studied the literature of many European countries and began to work upon Spanish history in 1826. Twelve years later he published THE HISTORY OF THE REIGN OF FERDINAND AND ISABELLA, which was soon translated into French, Spanish and German.

HOW A NEARLY BLIND HISTORIAN WROTE ABOUT SPANISH EXPLORERS IN AMERICA

This was only a beginning. Six years later THE CONQUEST OF MEXICO appeared. This is probably his best work. Four years later he published THE CONQUEST OF PERU, which added to his fame. Then he began the story of Philip II, the gloomy king of Spain. Two volumes appeared in 1855, but ill health did not allow him to finish. He died in 1859.

Modern students of history have shown us that some of the accounts of explorers that Prescott trusted are not altogether reliable, but his histories remain the most interesting story of Spain in the New World.

George Bancroft, scholar and statesman, was born in Worcester, Massachusetts, in 1800, and graduated from Harvard College before he was seventeen. Then for three years he studied in three different German universities and traveled through Europe.

On his return he began to teach in Harvard, but was not happy there and founded a school of his own in Northampton. In 1834 he published the first volume of his HISTORY OF THE UNITED STATES, which he was not to finish until fifty years later. By this time he was well known and was appointed Collector of the Port of Boston, where he made Nathaniel Hawthorne one of his clerks.

HISTORIAN BANCROFT WAS THE FOUNDER OF THE NAVAL ACADEMY AT ANNAPOLIS

President Polk appointed him Secretary of the Navy in 1845, and while holding this office he founded the Naval Academy at Annapolis. The next year he was appointed minister to England and served until 1849. Weary of public life, he retired, to devote himself to study and writing. But he was not allowed to follow his inclination. In 1867 he was appointed minister to Prussia, and then to the new German empire, where he was very influential. He asked to be allowed to return home in 1874, and lived in Washington until his death, in 1891.

The last volumes of his history, which ends with the inauguration of President Washington, were published in 1874. Besides he wrote many short articles, and many of his orations have been published. His history has been translated into Danish, French, German and Italian.

AN AMERICAN DIPLOMAT WHO FOUND TIME TO WRITE THE HISTORY OF HOLLAND

Another man whose life was divided between literature and diplomacy was John Lothrop Motley, who was born in Dorchester, now a part of Boston, in 1814. He, too, was only seventeen when he graduated from Harvard, and also went to study in Germany, where Bismarck was a fellow-student. He then began the study of law, but did not like it. For a little while he was secretary of the legation in Russian. He determined to devote himself to literature, and published two novels now forgotten. He became interested in Dutch history, and in 1851 went to Europe to gather material. In 1856 he published THE RISE OF THE DUTCH REPUBLIC, which created a sensation and was translated into many languages. Two volumes of HISTORY OF THE UNITED NETHERLANDS appeared in 1860, and two more in 1867. President Lincoln appointed him minister to Australia in 1861. In 1867 he resigned, but two years later was appointed minister to England, a position which he loved. The last years of his life were spent in England, where he published THE LIFE AND DEATH OF JOHN BARNEVELDT, the Dutch patriot. Motley died in 1877.

THE PART PLAYED BY THE FRENCH IN AMERICA'S HISTORY INTERESTED PARKMAN

Prescott began the story of Spain in the New World but never finished it. The story of the rise, decline and fall of the French power was the work of another Bostonian, also a graduate of Harvard—Francis Parkman. The similarity goes farther. Both had weak eyes and had to depend upon others to make their researches for them, but both, fortunately, were able to pay for such service.

Francis Parkman was born in 1823 of old New England stock. Among his ancestors were many clergymen and others prominent in the history of the section. While a student at Harvard from which he graduated with high rank in 1844, he determined to write the story of the French and Indian War. Later the ambition grew into the idea of writing the whole story of the French

WALT WHITMAN, THE FATHER OF FREE VERSE



Metropolitan Museum of Art

In this painting by John W. Alexander, which hangs in New York's Metropolitan Museum of Art, Walt Whitman is shown as a gentle, old man nearing the end of his long and stormy career. Earlier in his life, he stood out from the other poets of his century as a rough and ready man of the common people. He believed intensely in the destiny of America, and of the workingmen who lived in her crowded cities, toiled long hours in her mines and mills, on her ships and railroads, and of the farmers who plowed her plains. All these things he sang about in a new sort of poetry without rhyme, with long rolling lines, uneven in accent, yet with a majestic beat of their own. His fame spread far and wide and brought him many noted visitors in his old age.

exploration and occupation of America.

For a time he lived in a Passionist monastery in Italy in order to gain understanding of the psychology of the devoted monks. This knowledge was later of much value to him in writing of the Jesuit missionaries in New France. Then, in order to understand the Indian before he had been changed by the white man, he made an expedition to the Far West, where he lived for months with the wild Sioux. His experiences on this expedition are told in the book CALIFORNIA AND THE OREGON TRAIL.

Just now his health failed and he was never well afterward. Nevertheless, he had begun, the task was completed with A HALF CENTURY OF CONFLICT.

Parkman's task was difficult in many ways, and not many men could have succeeded. He was not only a great scholar, but he was able to understand the motives of the men, white and red, of whom he wrote, and was at the same time a literary artist. His name is always mentioned with profound respect by historians.

Outside of his main work Parkman was much interested in gardening, and originated several varieties of flowers. In fact, he served for a year or two as professor of horticulture in Harvard, and published THE



This old print shows the waterfront of Brooklyn, Long Island, about 1846, the year that Walt Whitman became editor of the Brooklyn DAILY EAGLE. In the foreground you can plainly see the Fulton ferry mentioned in his poems, as well as the tall-masted schooners and clipper ships that once sailed round the world from this harbor.

began writing THE CONSPIRACY OF PONTIAC in 1848, and finished it three years later. It was fourteen years before he could publish another volume, PIONEERS OF FRANCE IN THE NEW WORLD, which appeared in 1865. The other volumes appeared at shorter intervals, but seven times he visited Europe in search of material.

The order of the succeeding volumes was as follows. THE JESUITS IN NORTH AMERICA was published in 1867, and LA SALLE AND THE DISCOVERY OF THE GREAT WEST appeared in 1869. After five years THE OLD RÉGIME IN CANADA was given to the public, and then in 1877 COUNT FRONTENAC AND NEW FRANCE. It was seven years later before MONTCALM AND WOLFE was published. Finally, in 1892, over forty years after he BOOK OF ROSES. He died in 1893, only a year after his great work had been completed.

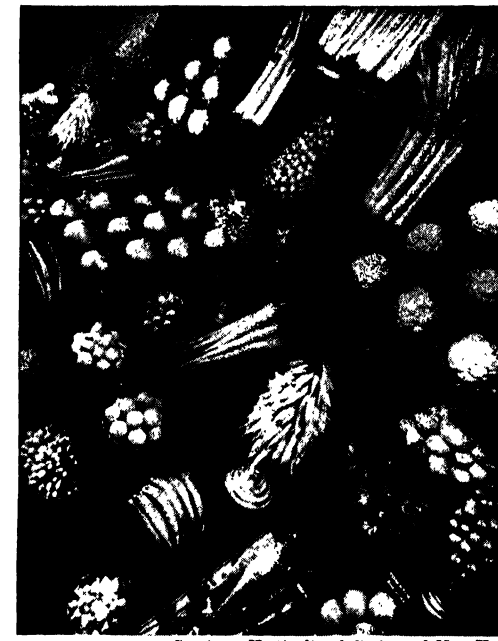
If you want to become an author or an historian when you grow up, remember how most of these writers had to overcome obstacles before they achieved success.

Some of them, like Whittier, were poor farm boys who had little chance at a formal education. But all without exception loved to read by themselves.

Most of them also learned by close observation of other people, either their own neighbors or strangers in foreign lands. Parkman even went so far as to live among the monks and Indians in order to understand them better.

THE NEXT STORY OF LITERATURE IS ON PAGE 4782.

PLANNING THE VEGETABLE GARDEN



Courtesy, Horticultural Society of New York

HAVE you ever eaten vegetables that you grew in your own garden? It is a thrilling experience! The first time your own peas and corn are brought to the table, you feel very proud. Everyone begins to eat, and everyone exclaims: "Delicious!" And you, too, discover that these vegetables are far more delicious than any you have eaten before. It is not your imagination. They taste so good because they were picked in your garden that very morning and cooked before any of their flavor had been lost.

It is not difficult to grow vegetables. It is part of Nature's plan that plants grow and produce fruits. It is our job as gardeners to create ideal growing conditions so that our plants will grow to perfection.

We must dig the soil and see that it is given the necessary food elements to promote healthy growth. We must see that our plants get proper light and air, and the space they need to make full growth. It is part of our skill, however, to see that every plant gets the space it needs, and no more. The serious vegetable gardener strives to get the largest possible yields from his ground.

Do not feel discouraged if you must start with a very small plot of ground. Carrots, beets and radishes, for example, require very little space, and in most vegetables there are varieties which have been developed by seedsmen to produce good crops in a small area.

Dig your ground thoroughly. Break up the lumps of soil, and remove any large stones or rubbish. Dig to a depth of eight inches to one foot, but be careful not to bring to the surface any of the hard lower soil, or subsoil, as it is called.

Do not dig your soil when it is very wet. If you do, the soil may cake when it dries, and you will have a hard time raking it into a fine surface when seeding time arrives. Take a handful of soil and squeeze it in your hand. If it remains in a sticky mass when you open your hand, it is too wet to dig. If the lump of soil gradually falls apart, you will know the ground is in a proper condition for digging.

A few days before you sow the seed, mix some garden fertilizer in with the top two or three inches of soil. Use about ten pounds of fertilizer to every two hundred square feet of soil.

All gardening should begin with a plan. Draw a plan of your proposed vegetable garden, and make it to scale. Then make a list of the vegetables you intend to plant, and fit them into your plan according to the amount of space that should be left between the rows. This information is given in the chart. Make the rows run from north to south, if it is at all possible to do so. Thus one side of your row will get the morning sun, while the other side will enjoy the afternoon sun.

Plan your garden with the thought in mind that you will get as much as possible from your ground. You will find that some crops, such as beets, carrots and peas, may be removed from the soil in ample time to



Camera Guild, Inc., N. Y.

Youthful gardener planting seeds in a home garden, while her two assistants look on.

make a second sowing of some other quick-growing vegetables. Here is a list of the vegetables that may be sown during the summer for late crops. Be sure you select early varieties for this sowing.

Dwarf Beans	Endive
Swiss Chard	Lettuce
Beets	Peas
Carrots	Radishes
Sweet Corn	Spinach

Apply more fertilizer before you make the second sowing, and remember this important rule: Never follow a root crop, such as beets or carrots, with another root crop, but with a leaf crop such as lettuce or endive, or other above-ground crops such as corn or beans. This rule works the other way as well.

You see, every crop takes certain definite food elements from the soil. We know, however, that every crop does not take the same food elements. Thus, by practicing crop rotation, as it is called, we avoid exhausting the soil and we do much to eliminate poor crops and the spread of plant diseases.

The Vegetable Planting Chart, on page 4736, will tell when and how to sow the seed. We now have to consider the care of the growing plants.

You have sown your seed in rows, and every row has been carefully marked. You will soon see lines of little green shoots. A few weeds may come up between rows, and you will find it necessary to do some hoeing. A hoe is not expensive to buy, and you will need one if you are to keep your ground "clean," as gardeners say. Watch for weeds that come up among your seedlings, and remove them by hand. Too much importance cannot be given to the value of keeping your garden clean. Not only does it show smart and capable management, it also means better crops for you. Weeds rob your plants of food and moisture, and they take up valuable garden space. Hoe your soil constantly.

A little work at the beginning will save you much work later on. As in the case of other plants, the longer weeds are permitted to grow, the harder they are to uproot.

As your seedlings continue to grow they will become overcrowded, and they will need

thinning out. The first thinning should be done when the plants are about one inch high and have three or four leaves. If the chart says that the distance between plants in the row should be four inches, do not thin out the plants to that distance immediately. The first time you work along the row, take out the plants which are crowding, one on the other. The plants you leave may be an inch or so apart. In a few days thin out some more plants, and make your final thinning a week or so later. This method calls for a little work, but if you do all your thinning at once, you run the risk of eventually having a number of blank spaces in your row. The seedlings are delicate and more easily destroyed. If a few are lost it makes no difference when the row has not been thinned too severely. When you make the final thinning, the plants you leave will be large enough for you to be reasonably sure they will continue to grow.

Another good reason for thinning in gradual stages is that the plants you take out in the final thinning will be large enough for the table where such vegetables as carrots and onions are concerned, and they will delight you with their fine flavor.

Bush Beans. Do not hoe too deeply, or too near to the plants—the roots stay very close to the surface. There are two types, the green podded, and the yellow podded (or wax beans). Be sure to plant a new stringless variety. The bean is a true American vegetable; so far as we know, it was first used for food by the American Indian.

Bush Lima Beans. The seed will rot if the ground is at all damp and cold. Sow at the end of May. Set the seeds with their eyes down in the furrow. You can plant either the "baby" lima, or the large potato lima. The baby lima produces the earlier crops.

Beets. The seeds you buy look like pieces of cork—actually they are parts of the flower, and each one may contain as many as six seeds. Rake over your ground very carefully before you sow beet seed. If you leave stones and lumps of soil in the ground you will find that many of the beets will grow badly deformed. You will have to be especially careful with the thinning because



Courtesy, New York Plant and Flower Guild

It is important to water newly seeded beds thoroughly. These children are growing gardens at the Rockefeller Institute in New York under the supervision of the New York Plant and Flower Guild.



Courtesy, N. Y. Herald Tribune Garden Department

A public park garden project in Brooklyn, New York.

every "seed" you sow will produce a number of seedlings, one growing on top of the other.

Cabbages. Cabbage plants should be set out in the garden early in the spring, from mid-March to mid-April. Plant them carefully, placing the roots in a downward direction and not curled toward the surface. Plant them two feet apart in rows eighteen inches apart. Apply garden fertilizer before the plants are set out. Water the plants thoroughly.

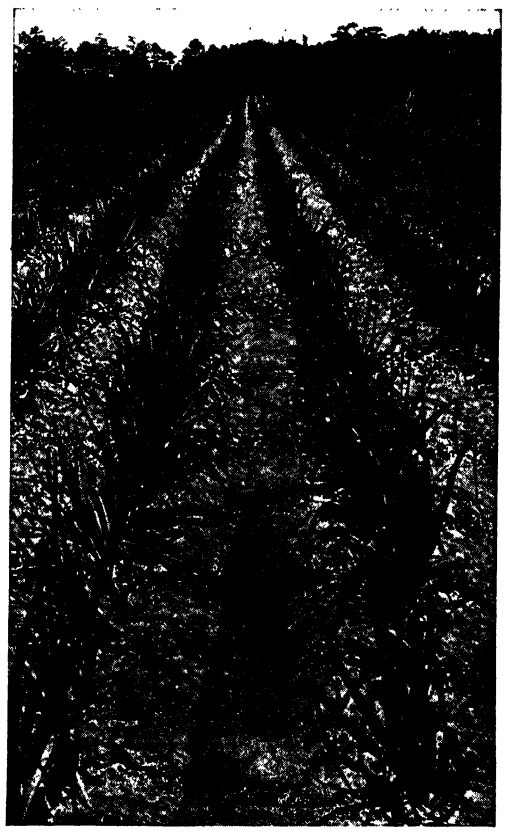
Late cabbage for fall and winter use is obtained from seed sown in the garden in May or June. Sow the seed half an inch deep, in furrows one foot apart. When the plants are about four inches high they may be set out in their permanent quarters, as recommended in the paragraph above.

Carrots. Remove all stones and hard soil lumps from your seedbed if you desire well-shaped roots. If you have room in your garden, make sowings every two or three weeks until mid-August. Tender, fresh young carrots are a great table delicacy, and you should have a steady supply throughout the summer.

Sweet Corn. This most highly prized of garden vegetables may be enjoyed throughout the summer, if sowings are made every two or three weeks. Watch the ears closely and cut them when the kernels are in the "milky" stage, that is, the period in which the kernels are filled with a milky substance. Once the kernels have passed this stage they harden and lose their tenderness. Until you learn to judge the ripeness of the ears, you should prick the kernels with a pin. If a milky substance comes out, you will know the ear is the right size for use, and you will be able to judge the other ears by a comparison of size.

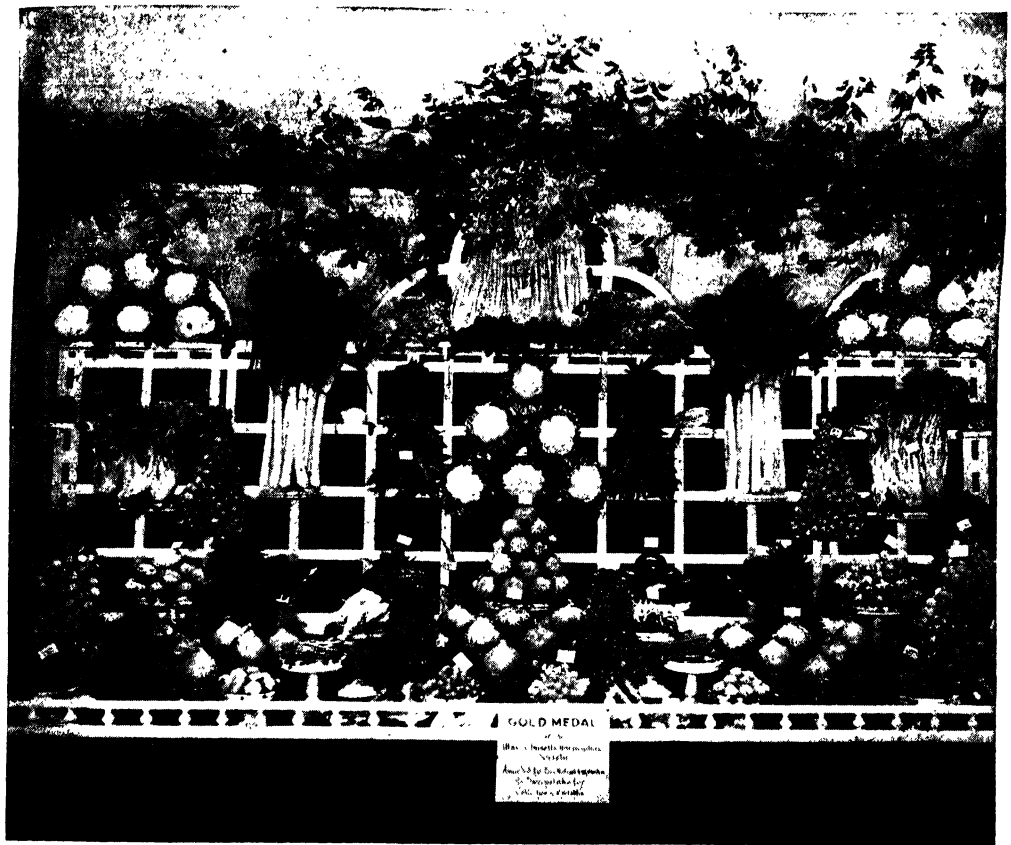
Cucumbers. You will notice that the Vegetable Planting Chart recommends planting in "hills." That is the term for group. In other words, you plant your cucumbers in groups, allowing four feet of space between each group. Allow one pound of garden fertilizer to each hill. Apply it about three days before you sow the seed. Sow eight to ten seeds to each hill, and when the plants have developed four to five leaves, remove all but three plants in each hill.

Lettuce. There are three types of lettuce. The cabbage type is most popular. It heads very much like a cabbage, and is held in high regard for salads because of its crispness and flavor. The Cos type (Romaine or Trianon it is sometimes called) produces long spoon-shaped heads. The leaf type produces masses of leaves which do not form heads. It resists summer heat better than the



Courtesy, U. S. Department of Agriculture

Large or small, vegetable beds should be kept as free of weeds as the field of onions shown here.



Courtesy, Horticultural Society of New York

Prize-winning vegetable display at the fall show of the Horticultural Society of New York.

other types, and for that reason it should always be used for summer sowing.

Muskmelons. This vegetable should be planted in hills as recommended for cucumbers. Do not pick the fruits until they are fully ripened—you will then be able to enjoy the full flavor of the muskmelon. Wait until the fruits become grayish or yellowish in color and pull from the stem easily.

Onions. Weeds are the greatest danger to this crop. Watch for them, and take them out promptly whenever they appear. Thin out the young onion plants gradually—many of them will be large enough to serve as scallions.

Parsley. Do not be in a hurry when you sow parsley seed—it will often take four weeks to come up! Be careful not to let your seedbed dry out. Frequent watering may be necessary in dry weather.

Peas. Fresh garden peas have a flavor that is all their own. They have a sweetness, tenderness and full flavor that will never be found in market vegetables. There are both tall and dwarf sorts. The dwarf sorts grow under two feet in height, and do not require supports. The tall sorts grow from three to five feet, and will need brush or stakes to support them.

Pumpkins. Here is a vegetable that requires plenty of room. Sow in hills as recommended for cucumbers, but make the hills eight feet apart. Plant six seeds to the hill, and allow two or three of the plants to develop. Always harvest the pumpkins with part of the stem attached, and do not let them get frosted.

Radishes. Sow seed every two or three weeks throughout the summer. The plants mature rapidly, and for that reason seed is often sown among such slower maturing vegetables as pumpkin and sweet corn. The radishes are pulled long before the other vegetables cover the ground.

Spinach. The seed may be sown every two weeks from April to early June. Spinach

runs to seed very rapidly during the hot summer. Additional sowings may be made from late August until mid-September.

New Zealand spinach thrives in hot weather, and it may be used as ordinary spinach during the hottest weeks of the year. The plants grow two feet high and they will spread up to four feet in diameter. Sow the seed in April or May in rows three feet apart. Thin out the seedlings until the plants stand eighteen inches apart. The leaves are large enough to use in five to six weeks, and several crops may be taken from the plants during the summer.

Tomatoes. See that your ground is well prepared with garden fertilizer before you set out the plants. You will thus encourage quick, healthy growth in your plants. Water freely. The plants should be tied to stakes if you wish to grow the finest tomatoes. Cut away any growth that keeps sunlight from the tomato plants, as otherwise they will be greatly handicapped.

Turnips. This plant does not thrive during hot weather. Seed should be sown in the early spring and again in the late summer.

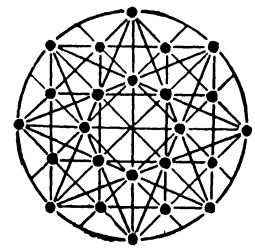
Article prepared by Peter Henderson, of Peter Henderson and Company, Seedsmen.

VEGETABLE PLANTING CHART

Name of plant	Sow or set out plants	Set rows apart	Cover seed	Distance between plants	When ready for use after sowing
Bush Beans (seed)	May–August	2 ft.	2 ins.	4 ins.	6–8 weeks
Bush Lima Beans (seed)	Late May	2 ft.	1 in.	6 ins.	12–15 weeks
Beets (seed)	April–August	1 ft.	1 in.	4 ins.	6–8 weeks
Cabbages (plants)	March–April	2 ft.	.....	18 ins.	13–16 weeks
Carrots (seed)	April–August	1 ft.	½ in.	3 ins.	8–9 weeks
Sweet Corn (seed)	May–July	3 ft.	1 in.	8 ins.	8–9 weeks
Cucumbers (seed)	May–July	4 ft.	½ in.	4 ft. (hills)	8–10 weeks
Lettuce (seed)	April–August	1½ ft.	¼ in.	1 ft.	6–9 weeks
Muskmelons (seed)	Mid-May	4 ft.	¾ in.	4 ft. (hills)	11–14 weeks
Onions (seed)	April–May	1 ft.	½ in.	3 ins.	16–20 weeks
Parsley (seed)	April–May	1 ft.	½ in.	2 ins.	12–14 weeks
Peas (seed)	April–August	2 ft.	2 ins.	2 ins.	8–9 weeks
Pumpkins (seed)	Mid-May	8 ft.	1 in.	8 ft. (hills)	13–15 weeks
Radishes (seed)	April–September	1 ft.	½ in.	1 in.	4–5 weeks
Spinach (seed)	April–September	1 ft.	½ in.	4 ins.	8–9 weeks
Tomatoes (plants)	Early May	3 ft.	.....	3 ft.	13–15 weeks
Turnips (seed)	April–August	1½ ft.	½ in.	4 ins.	8–10 weeks

THE ANSWER TO THE PUZZLE OF THE TREES

You will recall that the gardener, in the puzzle on page 4623, was required to plant 24 trees in such a way as to make 28 rows, with 4 trees in each row; each row of trees was to be perfectly straight. The diagram shows us how this apparently impossible task can be quite readily accomplished.



Of course, the rows of trees, as indicated in the diagram, are not parallel to each other, but that condition was not required. It would have been impossible to plant the trees in that way. There are, however, 28 rows, each containing 4 trees in a straight line; that is what was called for.

THE PROBLEM OF THE TRAVELER'S DINNER

Here is the solution of the problem on page 4624. The first Arab had 5 loaves and the other had 3, making 8 loaves in all. When the third traveler came up and joined the others, the 8 loaves were equally divided between the three of them. Suppose each loaf were to be divided into 3 equal parts. There would be, of course, 24 parts. As the Arabs divided equally between the three of them, each would receive the equivalent of 8 of these parts.

Now one traveler originally had 5 loaves, or 15 parts, and, as he ate only 8 parts, he must have given 7 to the foodless traveler. The other man had originally 3 loaves or 9 parts, and as he ate 8 parts, he gave only a single part to the third Arab. Therefore, as can readily be seen, the decision of the magistrate was quite fair. The 7 coins should go to the Arab who gave 7 parts and the single coin should go to the man who gave a single part.

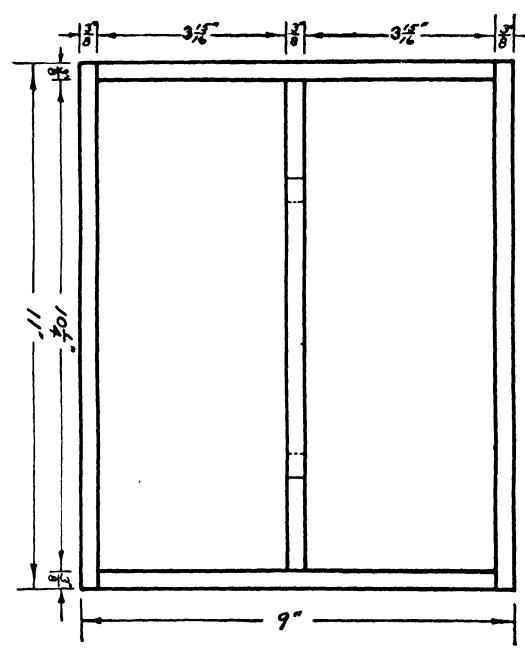
A CONVENIENT BOX FOR KNIVES AND FORKS

THIS easily made knife-and-fork box will be greatly appreciated by your mother. The box has two compartments, one for knives and the other for forks; the partition between the two compartments serves as a handle by means of which the box may be carried from place to place, as desired.

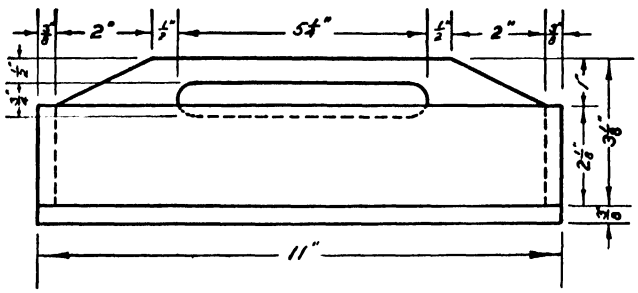
Any thin soft wood which is available may be used to construct this useful box. You will find that ¾-inch poplar will be especially suitable for the purpose. The stock for the simple box construction is shaped into six parts as follows:

2 pieces, ⅜″ x 2⅛″ x 11″ for the sides.
2 pieces, ⅜″ x 2⅛″ x 8¼″ for the ends.
1 piece, ⅜″ x 3⅛″ x 10¼″ for the partition.
1 piece, ⅜″ x 9″ x 11″ for the bottom.

The part that is to be used for the partition must be specially prepared. The upper corners of the partition, which extends above the box for the handle, are cut at an angle, as shown in figure 2. As indicated, the angle is made by measuring down one inch and horizontally two



1. Working diagram of the box.



2. Plan of the partition.

inches from each corner. A hole is then made to complete the handle. This is first laid out ½ inch from the top and is made ¾ of an inch wide and 5¼ inches long (see figure 2). To make the hole for the handle, you must bore a series of holes and then chisel out the wood between the holes.

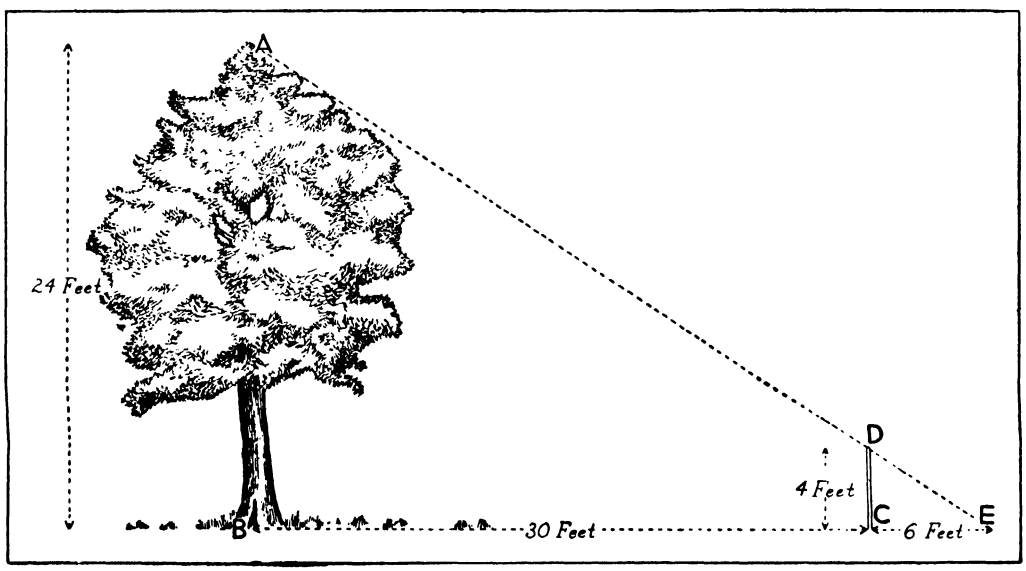
All the parts are now ready to be sandpapered, in order to remove rough edges and surfaces. After the sandpapering has been completed, the box is assembled and fastened together with 1-inch brads. It will be found most satisfactory to place the parts in position first in order to be sure that each fits properly before the nailing is begun. First of all, nail the sides to the ends and then nail the bottom to the frame. The partition is to be fastened in place last of all.

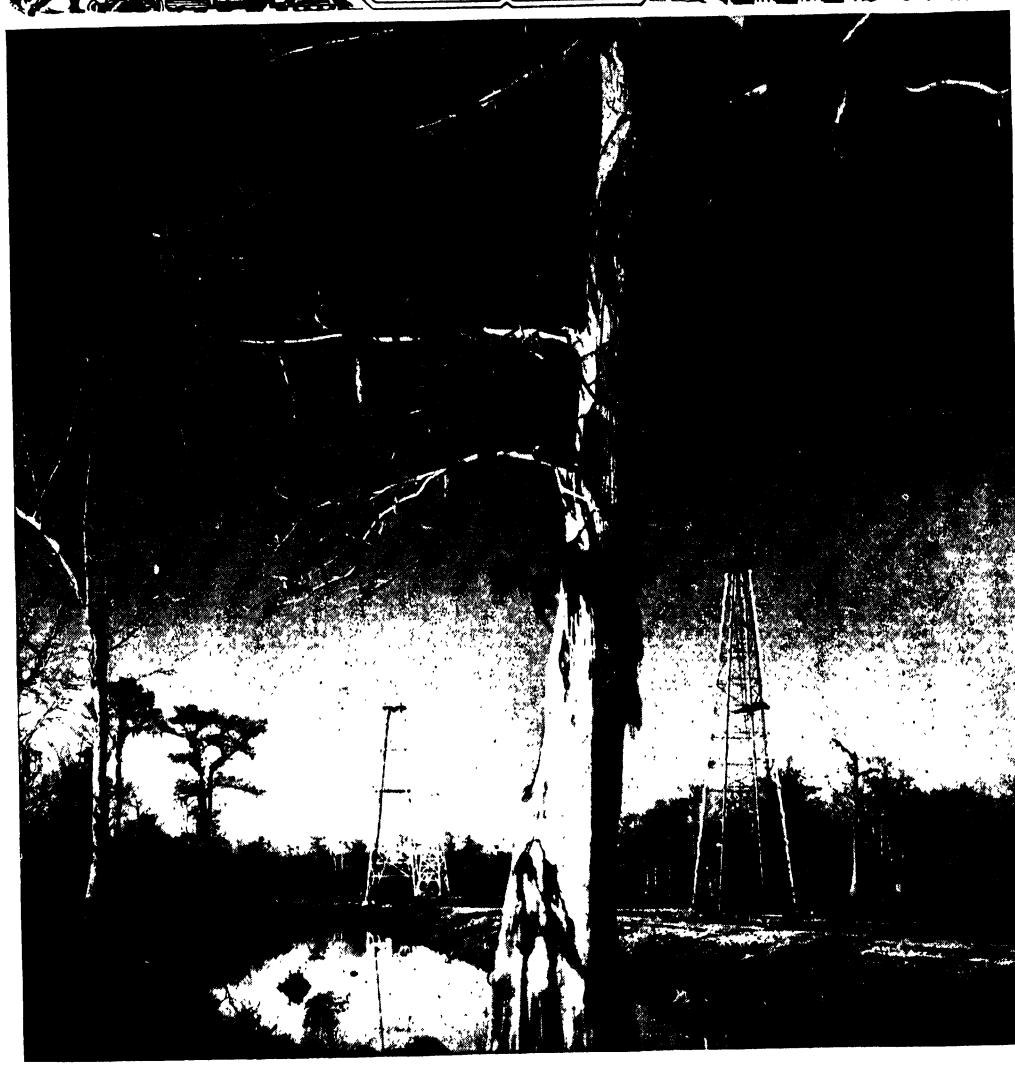
MEASURING THE HEIGHT OF A TREE

HERE is a simple way of measuring the height of a tree. Suppose we wish to find out the height of AB in the picture. We first measure a distance of, say, 30 feet from it in a straight line. Then we stand a stick or branch, 4 feet long, in the ground at the spot. We next go away from the tree, in the same straight line, until we come to E, where, as we look up from the ground, the top of the stick just covers the highest part of the tree that we wish to measure. We now have the two triangles CDE and ABE, as shown in the illustration. We now have a problem in simple proportion. Side CD of the triangle CDE is to side CE as side AB of the triangle ABE is to side BE. From this we work out the height of the tree. In the present case we know that the stick is 4 feet high and that BE is 36 feet. Suppose CE is 6 feet. Then 6 is to 4 as 36 is to AB. We multiply 36 by 4, making 144, and divide by 6, giving 24 feet as the height of AB.

You will find this method of measuring the height of a tree fairly accurate.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 4845.





PETROLEUM—THE MINERAL OIL

OIL is one of the most valuable things known to us. It exists in many different forms. It is composed mainly of hydrogen and carbon, and for short, therefore, we call it a hydrocarbon.

The term "oil" is applied to a number of substances having the same oily characteristic. Oils, for example, occur in plants and in animals as well as in the earth. Oils from all three sources are important in our lives today. In other parts of our book we have spoken of the many uses of animal and vegetable oils. All of our domestic animals which we use for food produce oil, or fat, which is oil in solid form. Animal fats were the first oils known. In recent years the supply of vegetable oils has been greatly increased. The olive, the coconut and the humble cottonseed are the

chief sources, though we get oil from many other plants and trees. There are hundreds of uses for these oils.

Here, however, we are not talking about the many vegetable and animal oils, but about the strange oil which in many places oozes out of the ground, and is known as mineral oil. Enormous quantities of this kind of oil are obtained by drilling deep holes in the earth. This oil from the earth is called petroleum, a word made up of the latin words for rock (*petra*) and oil (*oleum*). Mineral oil became prominent at the end of the nineteenth century. Its importance is still growing, and everywhere in the world search is being made for fresh supplies. Fortunately it is found in many places. Although the quantity existing must be very great, its true extent can only be estimated, for most of it lies far underground.

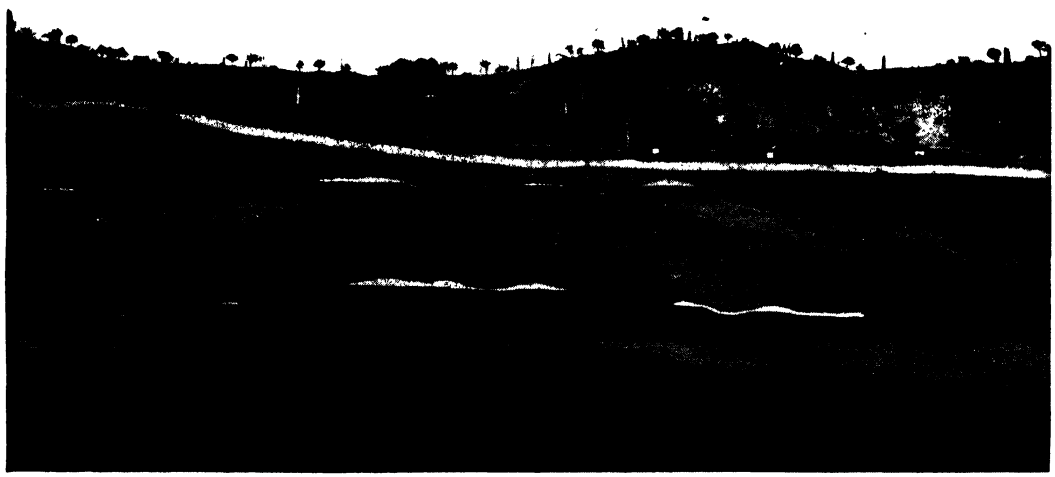


Reading a magnetometer, used to find oil-bearing layers of rock.

There is eager competition among the nations seeking to control the great oil-fields. World War II was to some extent a struggle for some of the rich oil reserves. At the beginning of the war the great oil-owning nations were the United States, Great Britain, Russia and the Netherlands. Germany was poor in oil; therefore Germany planned to capture the oil of Rumania and of Russia, as well as the new fields in Iran and Iraq. In the same way Japan went after the rich oil-fields of the Netherlands East Indies and of British-controlled Burma. Nations go to extreme ends, even to war, to control oil supplies, because oil is so important both in peace and in war as a fuel and lubricant for motor cars and trucks, airplanes, ships and tanks, and for countless other uses.

As petroleum shows up in numerous places by oozing from the surface, the ancient peoples of many parts of the world knew it and used it. In the OLD TESTAMENT we find petroleum referred to as "slime." In GENESIS we find the Vale of Siddim described as full of slime pits. The ancient Greek historian Herodotus refers to the oil pits near Babylon, and to the oil spring on the island of Zante in the Adriatic Sea. The island still yields oil, two thousand years after Herodotus wrote about it. Pliny tells us of the mineral oil of Sicily. Ancient Chinese and Japanese writers make many references to the subject.

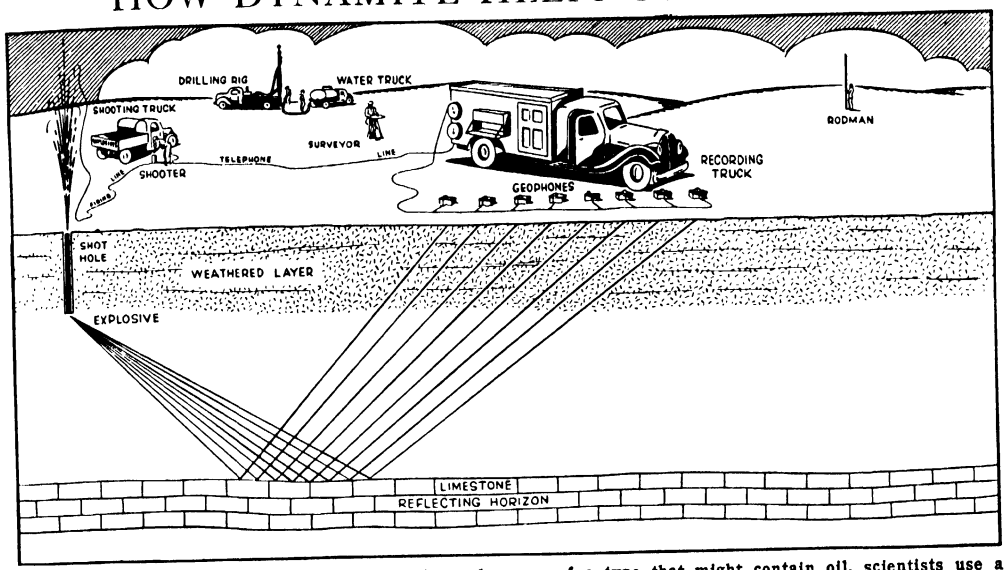
Marco Polo, the great Venetian traveler, tells us of the oil of Baku on the Caspian Sea,



Courtesy, U. S. National Museum

This diagram shows gas, oil and water in an oil-field. The oil floats on the water and the gas collects above the oil. Note that after the oil in the top basin is used up, driving the well deeper may tap greater stores.

HOW DYNAMITE HELPS US FIND OIL



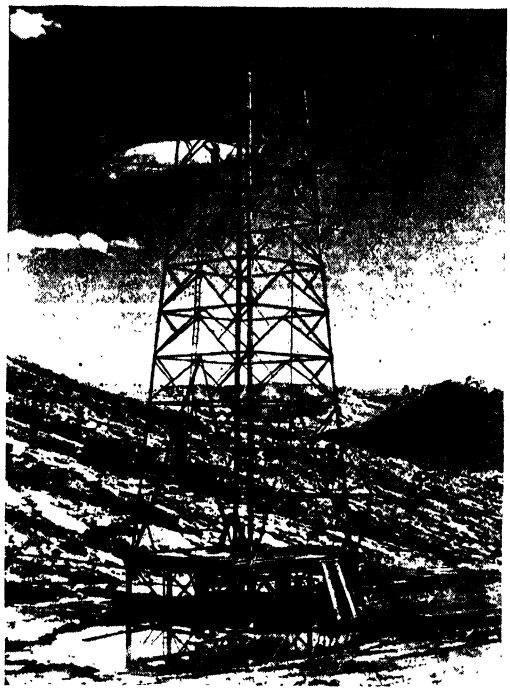
To learn whether the layers of rock at any given place are of a type that might contain oil, scientists use a seismograph, an instrument used to record earthquakes. First a hole is drilled in the ground. A charge of dynamite is put in the hole and set off. The explosion produces a sound-wave which travels in all directions. It changes its speed as it strikes different layers—sand, limestone and so on. The vibrations it sets up are reflected toward the surface and are caught by geophones on the ground. In the recording truck, instruments amplify (make louder) the vibrations and take a picture of them. By studying the picture and calculating the time it takes for the sound-waves to be reflected from the various layers, we can tell just what the layers are.



Inspecting a reflection seismograph record, like that described above. You will note that the vibrations are recorded in the form of wavy lines. The study of a record of this kind is completed in the computing offices.



Setting off a charge of dynamite in order to obtain a reflection seismograph record. The shooter, who is shown in the foreground, "fires the shot" by closing a switch.



Building a derrick at Elk Basin, Wyoming.

where there are now great oil wells. He wrote, in his vivid fashion, of "a fountain from which oil springs in great abundance, inasmuch as a hundred shiploads might be taken from it at one time," and added that "this oil is not good to use with food, but it is good to burn." He also pointed out that petroleum was then used to cure camels of the mange.

Oil often occurs with natural gas which may burst into flames. This led to the ancient worship of mysterious fires. The Fire Worshipers at Baku in the old days erected temples, and pilgrims came from far and near to visit the "Everlasting Fires." Thereabouts, too, petroleum gas was not only worshiped, but was also used to light dwellings and to cook food.

Mineral oil is a rather thick fluid which varies a good deal in color and in composition. Sometimes it is yellow, sometimes green, sometimes almost black. Usually it has a very unpleasant smell. In composition it varies as much as in color, and in this respect it reminds us of coal. Like coal, too, it is found at very different depths in the earth. In some places it is only 50 or 100 feet deep, while in others we have to drill down for 2,000, 5,000 or even 15,000 feet.

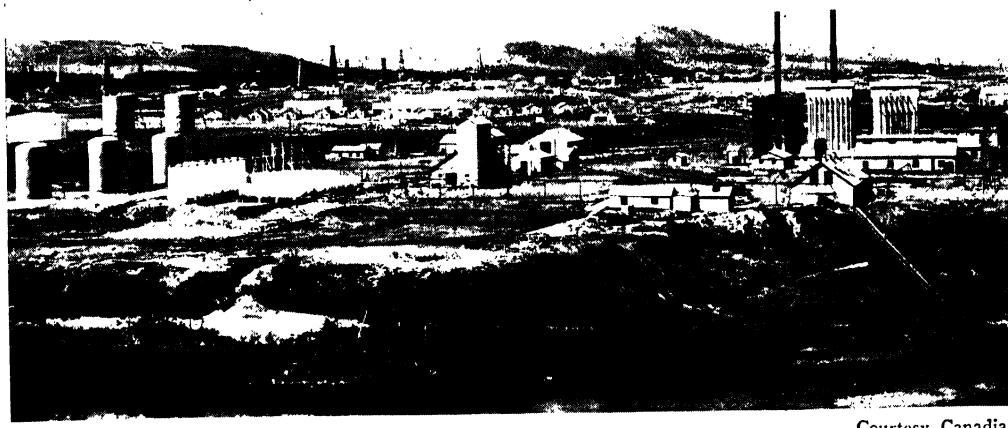
The early explorers of what is now the United States found petroleum oozing out of the ground or floating on the surface of the water in many places. They found that the Indians rubbed their bodies with it and said that it made them active and quick. When the country became settled, the whites also began to use it in a small way. Sometimes they laid blankets on the ground where the oil appeared and then wrung the oil out of the cloth. Sometimes they skimmed it off the surface of the water. The quantity they gained was small. It was then sold by peddlers at a high price, as Seneca Oil, Indian Oil or some such name. It was rubbed on the body as a cure for rheumatism, or taken as a medicine. Most people used a pint a year.

The men boring wells to get salt water in western Virginia in 1806 found much petroleum along with the brine. This caused a great deal of trouble there and at other places, but for many years no one seems to have



A power-driven rotating table used in drilling for oil. The middle section, in which the pipe fits, is called a Kelly.

THREE CENTERS OF OIL PRODUCTION



Courtesy, Canadian National Railways

The Turner oil-fields, in the Canadian province of Alberta. Alberta has the world's greatest oil reserves.

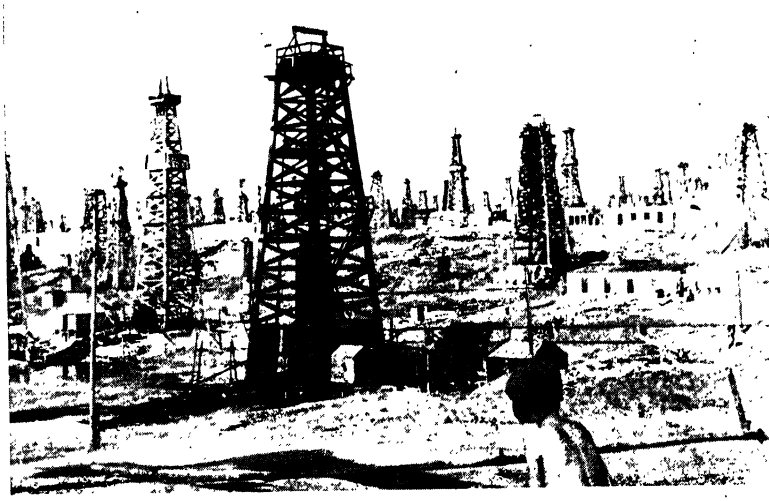
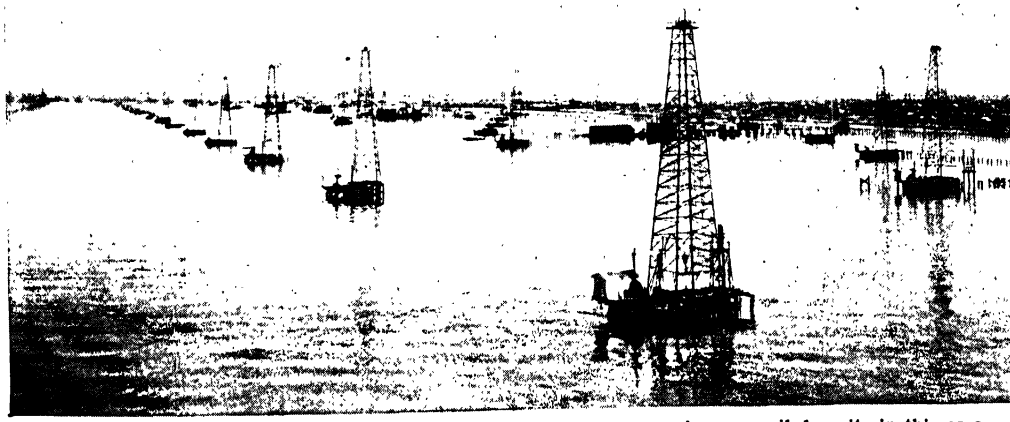


Photo from European

The marvelously rich oil fields of Baku, Russia, on the Caspian Sea. Baku was threatened by invading Nazi forces in World War II.



Oil derricks along the shore of Lake Maracaibo, in Venezuela. There are immense oil deposits in this area.

thought of using petroleum except as a liniment or as a medicine.

In 1846 Dr. Abraham Gesner, of Nova Scotia, obtained an oil from coal which he afterward called "kerosene," from the Greek word meaning "wax," and a company was organized to manufacture it. The company was successful, and other oilworks were established. The demand grew and Professor Benjamin Silliman, the younger, of Yale College, was employed to find out whether there was any likeness between coal-oil and petroleum. He conducted his experiments on Oil Creek in Pennsylvania and reported that petroleum furnished excellent oil for burning.

KIER AND YOUNG, TWO PIONEERS IN MARKETING THE OIL THAT BURNS

Samuel M. Kier had sold some oil for burning in 1848 under the name "carbon oil." It sold for $1.50 a gallon. In 1850 James Young got, from shale, oil which would burn.

It was not long before the public began to demand more and more of this rock oil. From this came the first historic drilled oil well. It appears that many of the salt wells in the vicinity of Titusville, Pennsylvania, also yielded small quantities of petroleum as a by-product. On occasions the presence of the dark, evil-smelling liquid led to the abandonment of salt wells. One of the salt manufacturers of the region sold this petroleum for medicinal purposes. He advertised it by distributing imitations of an American greenback (paper money) carrying a picture showing the derricks used in boring and pumping the brine wells.

A BUSINESS MAN OF CONNECTICUT SUGGESTS DRILLING TO OBTAIN PETROLEUM

The story goes that one day in the summer of 1857, George H. Bissell, a Connecticut business man, saw in a drugstore window one of these bottles of rock oil and the illustrations of the salt-well derricks. Bissell and a group of friends owned a tract of land near Titusville. They sent a sample of petroleum from the tract to Professor Silliman, at Yale. He reported that the petroleum could be used for lighting and that other valuable products could be secured from it. Suddenly, as Bissell looked at the pictures on the imitation greenbacks, he thought of drilling for oil on the Titusville property just as salt wells were developed by boring and pumping. Though Bissell gave up his interest in the property, his idea was adopted. The group engaged a man named Edwin L. Drake to drill for oil. Drake thus became the founder of the modern oil industry.

Drake at the time was a railroad conductor, temporarily retired because of ill health. He was sent to Pennsylvania to take charge of the Titusville development for the group's Pennsylvania Rock Oil Company and Seneca Oil Company. It took him a year to find a suitable driller but finally, in the spring of 1859, he engaged William A. Smith, a man with long experience in the drilling of brine wells. Smith's two sons joined him.

EDWIN L. DRAKE DRILLS FOR OIL AT TITUSVILLE, IN PENNSYLVANIA

By great good fortune Drake selected a likely site for the first well. The spot chosen was close to an old "oil spring." The well was started. Rock was struck at a depth of 36 feet and Drake's troubles began. Slow progress followed as the crude equipment bored through the rock at the rate of only 3 feet a day. The people roundabout began to call the hole "Drake's Folly." But the drilling continued, month after month. The work was well into the fourth month on August 27, 1859. It was a sultry Saturday afternoon. Smith and his son, Sam, drew out an iron bit from the well hole and started to measure the depth. Previously it had been 69½ feet. To their amazement, within a few feet of the top of the hole bubbled a black, oily fluid. Quickly Smith and the youth seized a tin pitcher pump, inserted it in the well and began to pump. They raised several barrels of the oil. Then at sunset Smith, with a sample of the rock oil, climbed on a mule and hurried into Titusville, a mile away, to spread the news of the discovery.

This first simple well, drilled with makeshift machinery—a steam engine for power and a hemp rope attached to a drill with a crude wooden windlass—was the forerunner of the modern oil industry.

THE OLD METHODS OF REFINING OIL ARE APPLIED TO THE OIL FROM THE DRAKE WELL

Drake's discovery would not have been so valuable had not methods of refining rock oil already been developed. For years there had been a demand for something to light homes and offices that would be better than candles and whale-oil lamps. Scientists had been working on the problem for a long time. The best illuminating oil was "coal-oil," produced by refining coal. There were fifty-three companies in the United States actively producing such oil from shale and coal when the Drake well was brought in. The processes used by these companies for refining crude petroleum to produce kerosene were adapted immediately for refining the black oil which the



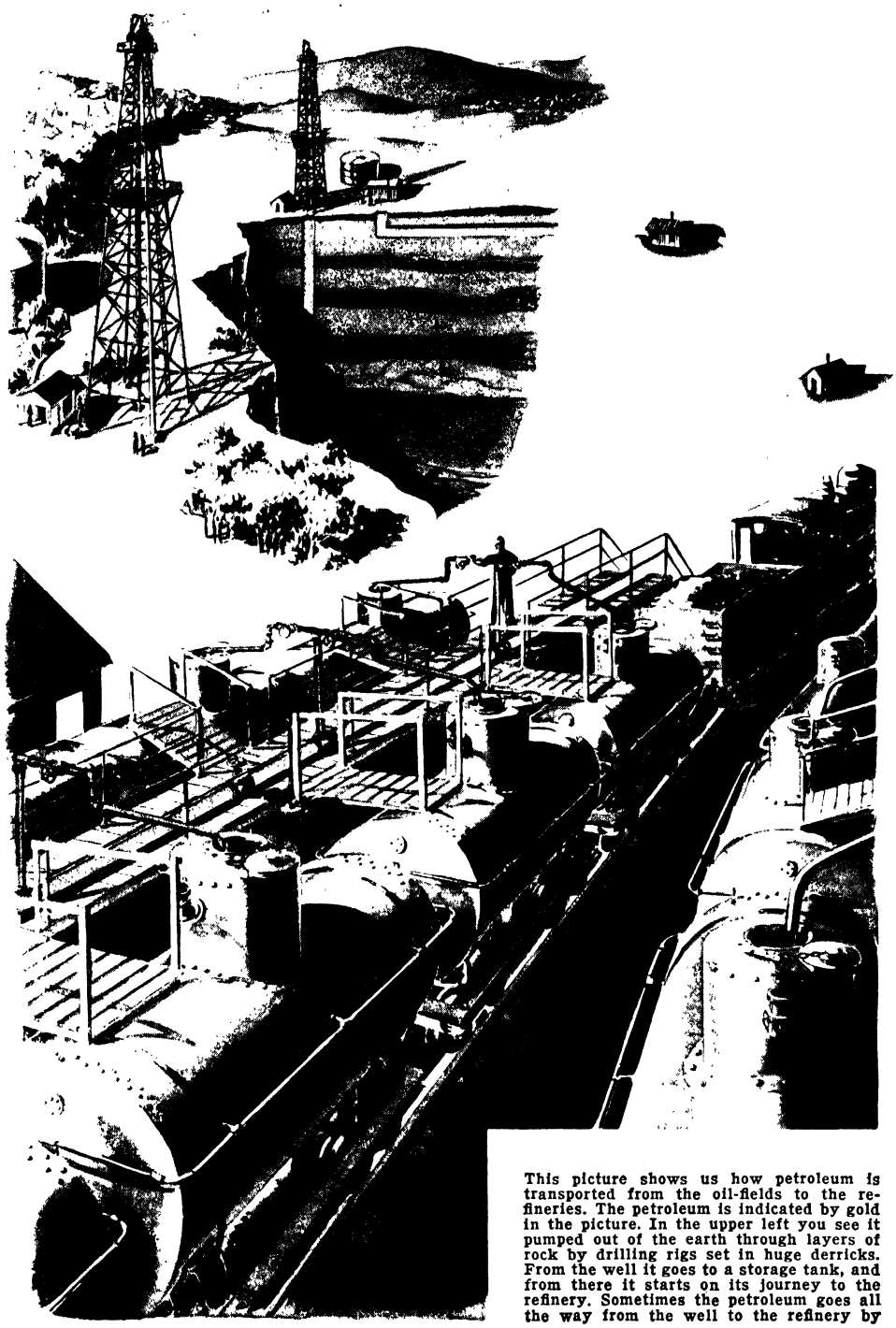
This map shows the possible oil resources of the world. We give in dark gold the present producing areas. The sections in lighter gold are those where geologists expect to find new oil resources.

Drake well yielded. A great new source of kerosene for illuminating purposes thus was provided. For years thereafter, until the coming of gas and electricity, it was considered the ideal source of artificial light.

The great economic value of the Drake oil discovery was indicated by the wild boom which followed in the section. Cities sprang up overnight. The most famous was Pithole City, a few miles from Titusville. Within three months after the first well was brought in, the little community had 10,000 people. It grew to 20,000, some said 30,000, and at times, including travelers passing through, may have sheltered 50,000. Hundreds of wells were drilled; many produced oil.

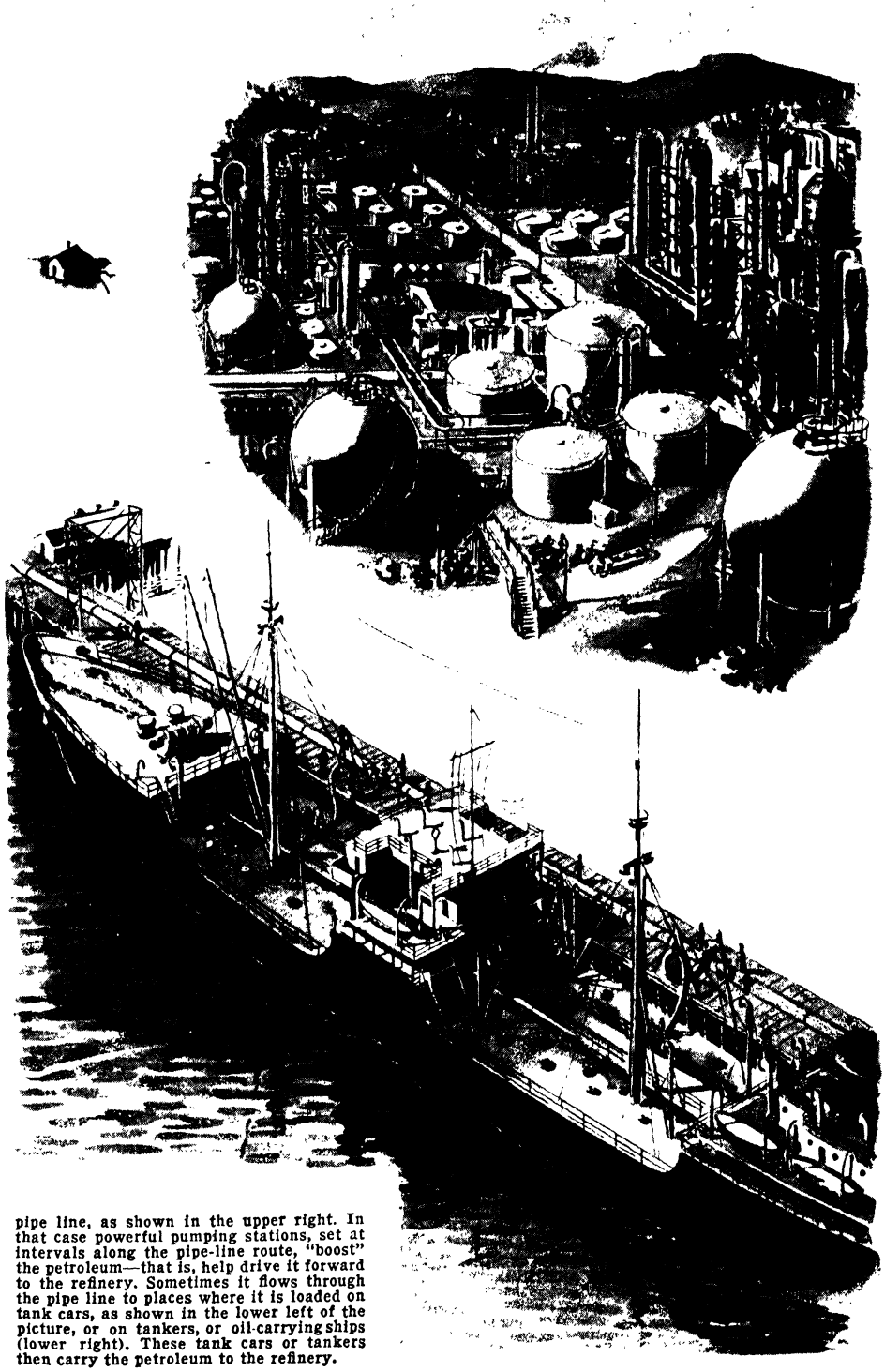
How is it that petroleum has come to be stored up for us in the earth? Where did the

FROM OIL-FIELD TO REFINERY

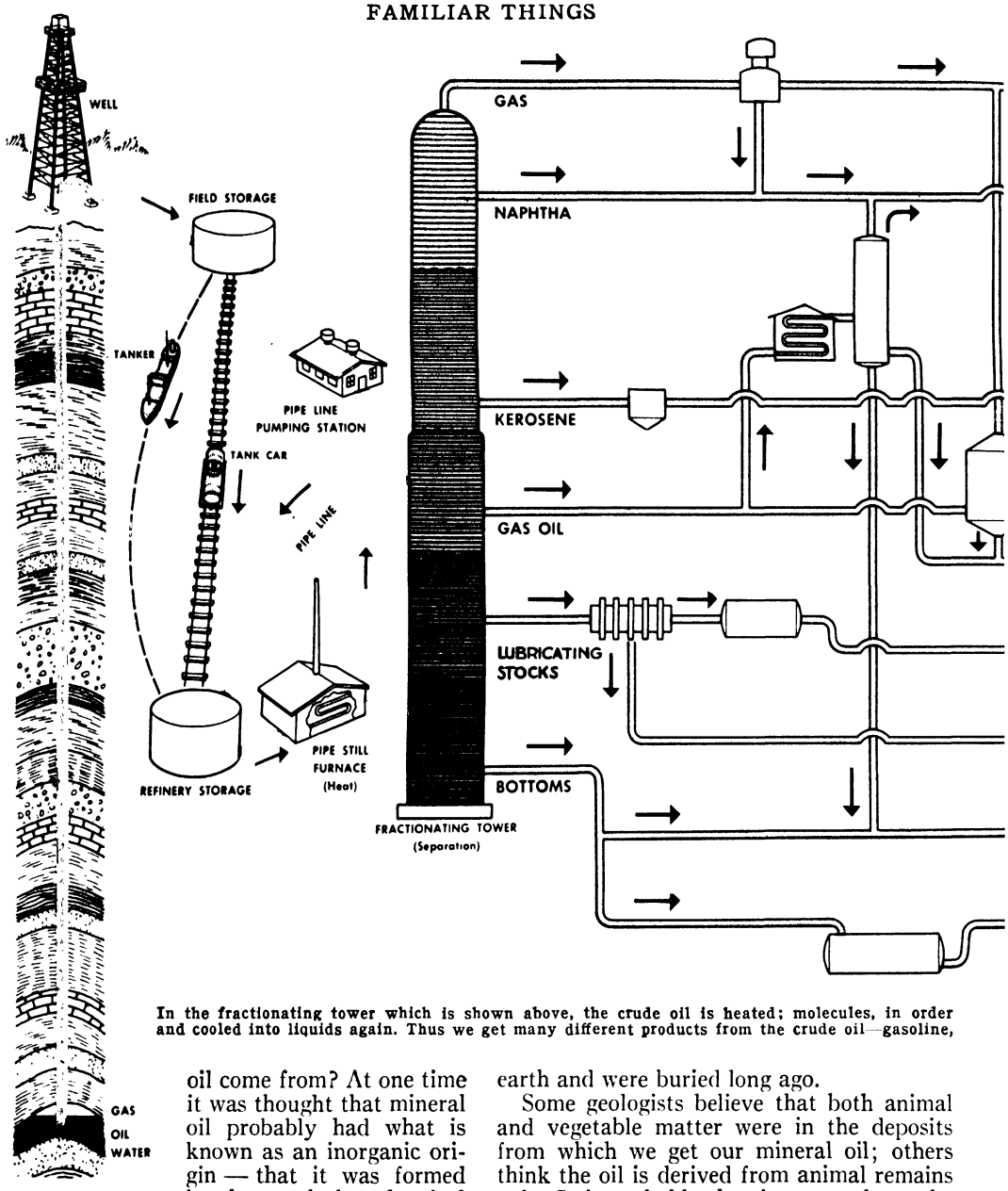


This picture shows us how petroleum is transported from the oil-fields to the refineries. The petroleum is indicated by gold in the picture. In the upper left you see it pumped out of the earth through layers of rock by drilling rigs set in huge derricks. From the well it goes to a storage tank, and from there it starts on its journey to the refinery. Sometimes the petroleum goes all the way from the well to the refinery by

BY PIPE, TANK CAR AND TANKER



pipe line, as shown in the upper right. In that case powerful pumping stations, set at intervals along the pipe-line route, "boost" the petroleum—that is, help drive it forward to the refinery. Sometimes it flows through the pipe line to places where it is loaded on tank cars, as shown in the lower left of the picture, or on tankers, or oil-carrying ships (lower right). These tank cars or tankers then carry the petroleum to the refinery.

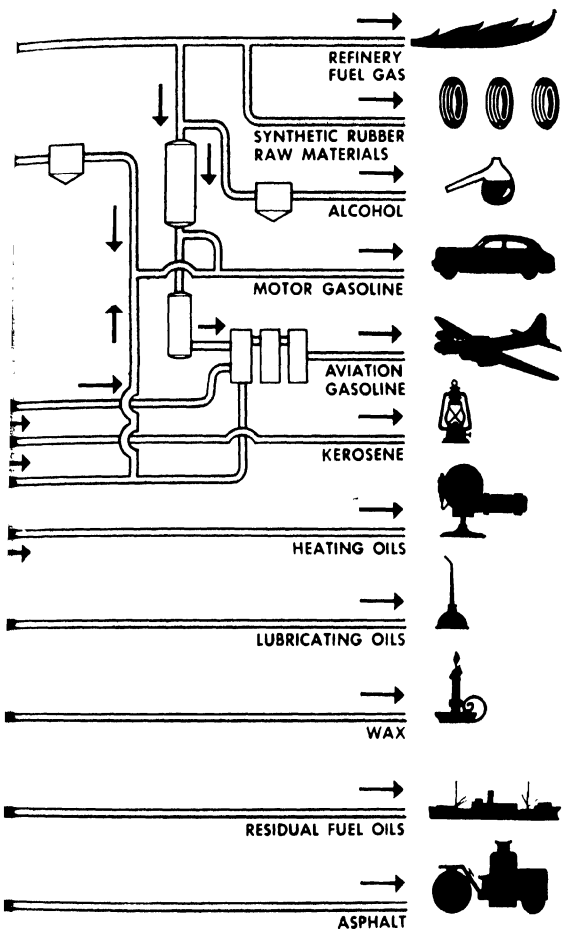


In the fractionating tower which is shown above, the crude oil is heated; molecules, in order and cooled into liquids again. Thus we get many different products from the crude oil—gasoline,

oil come from? At one time it was thought that mineral oil probably had what is known as an inorganic origin — that it was formed in the earth by chemical means, and not from the bodies of ancient plants or animals which had become buried in the earth. It would be pleasant to think the inorganic theory true. Then we might hope it would still be going on, so that the supply of natural oil in the earth would continue until the end of time. However, it is now generally accepted by scientists that we owe petroleum to the oily or fatty parts of things that once lived on earth and were buried long ago.

Some geologists believe that both animal and vegetable matter were in the deposits from which we get our mineral oil; others think the oil is derived from animal remains only. It is probable that in some places the mineral oil was mainly of animal origin, and in others mainly vegetable. As in the case of coal, there was a great variation in the conditions of production. Different oil-fields have different origins.

One of the great authorities on oil has given a sketch of the days when oil was formed. He asks us to picture an ancient forest of the Carboniferous Period, when the earth had cooled down and become solid and



of their lightness, float upward as gases, are drawn off kerosene, lubricating oils, wax, asphalt and so on.

able to support life. The surface of the land had become covered with dense forests, growing on hot, marshy soils. The rich, luxuriant coat of vegetation which covered the earth from pole to pole was "sad and silent," with no flowers to enliven its foliage, and no refreshing fruit on its branches. The sky was somber and veiled with heavy and brooding clouds.

There was scarcely light enough to make visible the dark tree trunks. It was a shadowy and oppressive scene. It would have been a realm of indescribable horror had there been human beings to observe it, but neither man nor any other vertebrate animal had as yet appeared on the land. The seas, however, contained abundant fish and shelled molluscs; and there were insects of enormous size on the land.

Later, during the Tertiary Period, the formation of the world's store of mineral oil was being completed. Then the earth, still luxuriant, had reached a higher stage of development and had become the home of many forms of animal life, including creatures of great size and curious shape, such as the ichthyosaurus, whose remains we now see in the large museums.

So the great animal and vegetable deposits accumulated. In one way or another, which is not well understood, these deposits were sometimes changed into coal and sometimes into oil and natural gas. Coal seems to be chiefly of vegetable origin, while oil often comes from an animal and vegetable mixture. Now let us see how the oil is stored.

The oil in the earth is stored in layers of porous rock, such as limestone or sandstone. When, as often happens, such layers (strata is the correct word) are roofed over with harder rock we get an ideal oil-field.

A "GUSHER" IS FORMED BY ESCAPING GASES FORCING THE OIL UP TO THE SURFACE

Imagine the strata sloping away in opposite directions, like the roof of a house. Gas is trapped with the oil or dissolved in it. The oil is thus under pressure, and if the oil rocks are drilled the escaping gas forces the oil with it up to the surface of the earth. Formerly this created what oil men called a "gusher." The valuable liquid gushed from the well like a fountain. But that was a wasteful process and was abandoned as soon as the engineers found ways to control the pressure. In some wells there is water under the oil, which pushes it up. From some fields the oil has to be pumped, if the gas pressure has been exhausted.

No one knows how much petroleum there is in the world. Every year adds to the number of known fields, but few things are more widely misunderstood than the estimates of the world's crude-oil reserves. Deposits are buried deep beneath the surface, with few or no surface signs to reveal their presence. For that reason, the effort and cost involved in their discovery are very great. At present, however, it is believed that at least fifteen years' supply is easily available. This does not mean, however, that the world's oil resources will be exhausted in that time. There is every prospect that new pools will be discovered and that improvement of recovery and refining methods will make it possible to

insure a supply for a long time to come. New oil-fields must be found if the present rate of consumption is to be maintained.

The United States, so far the greatest oil-producing country, produces two-thirds of the world's output each year. The whole world produces more than two billion barrels of oil yearly. Outside of the United States, the other great producers are Russia, Venezuela, Iran, the former Netherlands East Indies, Mexico, Rumania, Iraq, Colombia, Argentina, Trinidad, Peru, British India and Burma. Canada produces a substantial quantity and has prospects of much more. Most of Canada's oil comes from Alberta, but some is found in Ontario, New Brunswick and the Northwest Territory.

The world's greatest oil reserves are found in the Athabaskan oil-sand deposits along the Athabaska River in northern Alberta, Canada. One official estimate gives the amount of oil in the Athabaskan sands as one hundred billion barrels, while another official estimate more than doubles this figure. Since the oil in the Athabaskan oil-sands is neither fluid enough nor under sufficient pressure to flow into wells, the usual drilling methods can not be used.

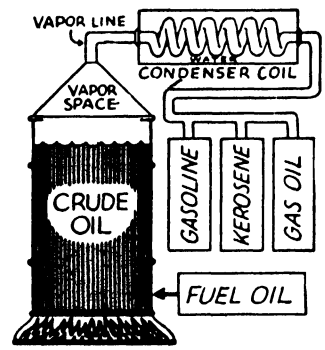
In 1941 a small plant was opened at Alasand, Alberta, to extract the oil from the oil-sands (frequently, though incorrectly, called tar sands). At this plant mining methods are used to dig up the oil-sands which are then washed with hot water to remove the crude oil.

For years Pennsylvania furnished most of the oil used in the world. Today oil is produced in twenty-three states and will eventually come from others. The leading states are Texas, California, Oklahoma, Illinois, Louisiana and Kansas. Others are New Mexico, Michigan, Wyoming, Arkansas, Montana, Kentucky, New York, West Virginia, Ohio, Indiana, Colorado, Mississippi, Nebraska, Missouri, Tennessee, Utah and Pennsylvania.

Although the United States produces about two-thirds of all the world's oil it does not follow that it possesses two-thirds of all the world's stock. We do not yet know whether any other great fields like those of Texas, California, Oklahoma or Illinois will ever be found. Some may be. The United States has developed and used its resources quickly; so much so that scientists have become anxious about how long the oil resources will last.

Petroleum can not be replaced, once it is gone. Until recently, when the wells of an oil pool went dry the pool was believed to be exhausted. As a result, much discussion of the careless waste of natural resources has been heard. This is probably true to some extent, but the waste was due, not so much to carelessness and greed, as to the imperfect knowledge of the best methods of oil recovery. In fact, with the better understanding which we have today, it is now possible to reopen fields once believed exhausted and to recover as much oil as the fields once yielded by restoring the pressure which lifts the oil to the surface. This is done either by pumping natural gas from other fields into the field which once was exhausted, or by using water to restore the pressure.

Much oil was also wasted through competition. An oil-field is usually held in small

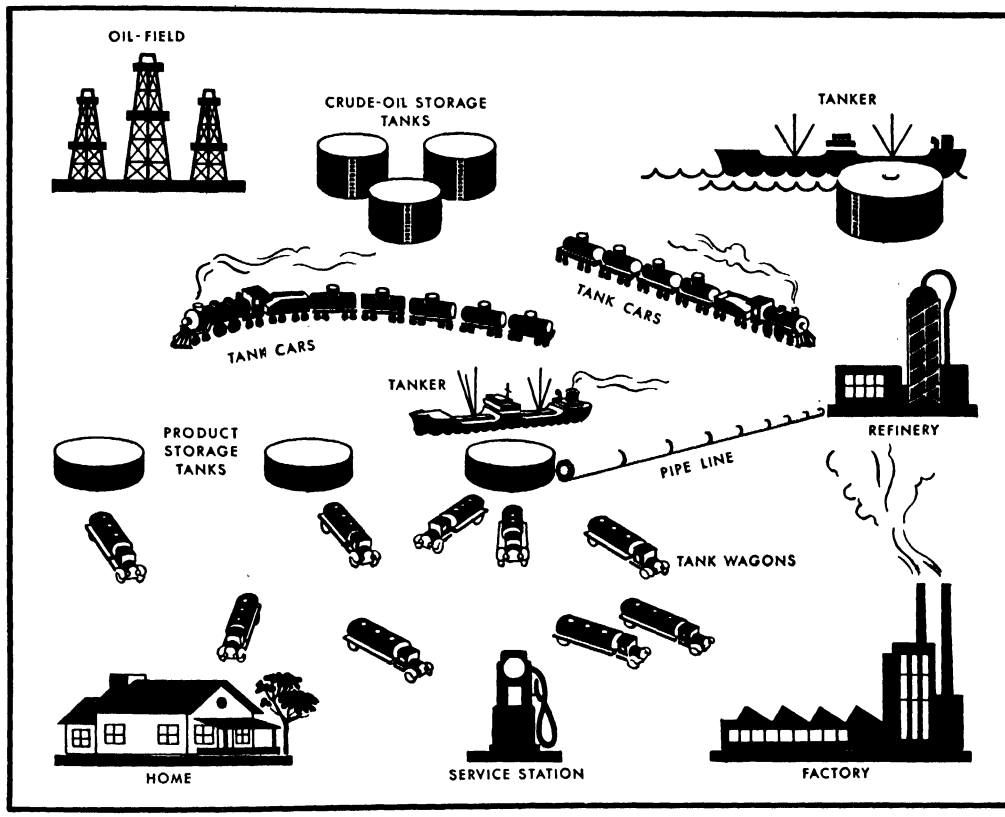


A SIMPLE FORM OF THE FLOW CHART SHOWN ON PAGES 4748-49.

APPROXIMATE YIELD OF PRODUCTS FROM 100 GALLONS OF CRUDE OIL

Gasoline	37 *Gal.*
Fuel Oil	39 "
Miscellaneous: coke, asphalt, paraffin wax, road oil, etc.	17 "
Kerosene	4.5 "
Lubricants	2.5 "
Total	100 *Gal.*

parcels by many owners. Yet the oil of a pool can be tapped from many parts of the field. In consequence, a great deal of hasty and unnecessary drilling often was done by landowners who wanted to gain their fair share of the oil wealth below ground before it was drained off by a near-by landowner. This has now been stopped. The government now carefully regulates the spacing of wells. In this way the pressure in a pool is conserved so that most of the oil can be withdrawn. Fields are beginning to be operated under a control which permits the greatest amount of the oil to be captured.



This picture shows how petroleum is brought to the refinery by pipe line, tank car and tanker; how the refined oil and gasoline are brought to huge storage tanks; how they finally reach homes, service stations and factories.

In the early days of the oil industry, before men fully understood the most economical recovery methods, much oil was lost in gushers when a rich pool was tapped. This does not happen now. Oil wells are brought in with the pressure under control.

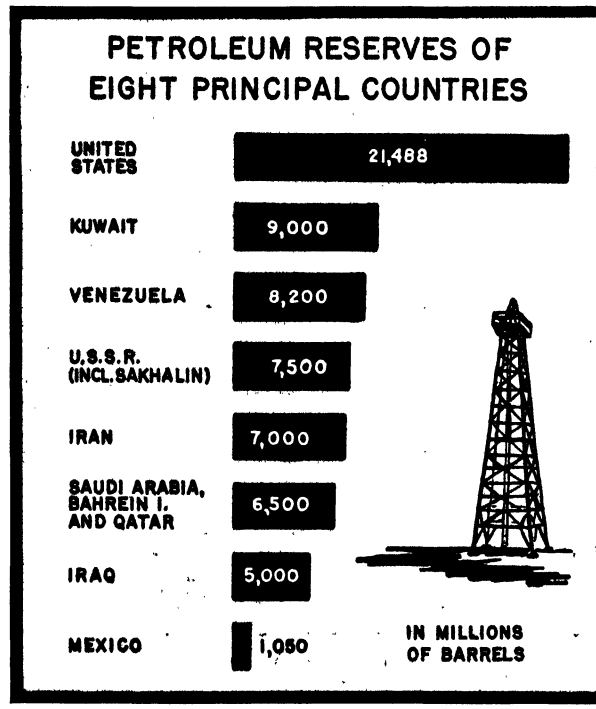
Oil conservation will help to postpone the time when petroleum and its products, because of scarcity, will be much more expensive than they are today. For this reason it is important that new oil-fields should be carefully preserved and their development carried out scientifically. The world can not afford to waste its resources and it will need in the future far more oil than it is likely to possess.

Scientists once held very gloomy views as to how long our vital treasures of oil would last. Dr. Svante Arrhenius, of Sweden, predicted at one time that the world's consumption of oil was increasing so fast that the supply would be used up by 1940. Today, however, we have far more reserves staked out for future development than we had when he made his prediction. It certainly is true that our stock of oil some day will be exhausted, but that day is likely to be much farther away than we know now. New oil-fields continue to be found, and a considerable portion of the earth has not yet been thoroughly explored for oil. Many generations will probably come and go before the evil day comes upon the world.

As a fuel for engines on land or sea, oil has many advantages. Oil is easily handled and can be moved through pipe lines. Because it is a liquid, oil can be easily stored and drawn off from storage containers. That, of course, means a great saving in time and labor, and also in cost to the consumer.

The cleanliness of oil is much in its favor, and this is especially the case in ships. The oil tanks can be easily filled through a pipe. The officers and crews of ships which burn oil have good reason to bless the use of petroleum at sea.

Then, too, oil takes up less room in the vessel than other fuels, and this means that cargo can be carried in the space which is saved. Enough to make the round trip can be carried in a space large enough to carry other fuels only one way. Therefore, an oil-burning ship is more profitable to run.



Note that about half of the world's known reserves of petroleum are in countries of the Middle East or quite close by.

This is the case even in a steamship which uses oil to boil water and produce steam. Even more is it true with the motor ships which have internal-combustion engines, something like those of a motor car. Motor ships, of course, need no boilers, so that even more space is saved for cargo or passengers. We can see why the number of oil-burning ships grows larger.

Oil, too, is more certain in its use; that is, with oil we can easily maintain an even temperature. It is not difficult to install a suitable apparatus to convert a furnace to burn oil. However, results are more successful when oil is burned in furnaces designed for this purpose.

On the other hand, oil is sometimes more expensive to use than other fuels, such as coal. In ships, the space saved more than pays for this, but on land it may sometimes be economical to use coal, in spite of the advantages of oil. However, more oil-burning furnaces are installed every year in normal times.

Some people imagine that oil can supplant coal for general use. It is a great pity that this is not really the case because oil is so convenient to use. The truth is that the known coal and oil deposits are both limited. As there is far more coal than oil, enormous deposits of coal may remain long after the oil is exhausted. Therefore, natural oil does not doom coal. The world as a whole has enough coal to last for centuries, even if consumption greatly increases.

Crude petroleum is a composite of many kinds of hydrocarbon molecules and from it can be derived, through various processes, not only motor fuel, lubricants and fuel oils, but a vast array of other substances.

The most important product is gasoline, which has come into almost universal use as a result of the development of the internal-combustion engine. That is the kind of engine used in motor cars, motor trucks, most airplanes and motor boats.

Gasoline consists of a very volatile, that is, easily evaporated, liquid. When mixed with air in the right proportions, it forms a powerful and useful explosive. In the internal-combustion engine, for example, in an automobile, a small amount (charge) of air and gasoline is admitted above the piston in the cylinder; the charge is fired by an electric spark and the explosion moves the piston. (Diesel engines are internal-combustion engines which run on oils heavier than gasoline. The charge is fired by the heat of compression.)

There are many kinds of gasoline. In gen-

eral use there are two grades of motor gasoline, standard and premium, and several grades of aviation gasoline, depending upon the uses to which it is put.

Gasoline engines sometimes "knock" when they are called on to do unusually heavy work. You may have heard engine-knock while riding uphill in an automobile. Knock occurs when the gasoline burns so quickly that its energy is delivered to the piston as a sudden blow, which is the knock we hear. This rapid burning resulting in knock is wasteful. If the gasoline can be made to burn less rapidly so that its energy is delivered as a steady push against the piston, more useful work will be done by the engine and no knock will be heard.

TESTS THAT DETERMINE THE OCTANE RATING OR OCTANE NUMBER OF VARIOUS GASOLINES

The knock that may be expected from different gasolines is tested in specially designed engines. After these tests each gasoline is given a number which is called its octane rating or octane number. The lower the octane number, the more readily does the gasoline knock. Since knock is a sign of wasted energy, the higher the octane rating the more efficient is the gasoline.

It is now a common practice to add to gasoline a small amount of tetraethyl lead, a chemical which controls the burning of gasoline so that knock is reduced.

In addition to the gasoline which is obtained, a barrel of crude oil also yields kerosene, furnace oil, fuel oil and gas oil, medicinal oils, lubricating oils, wax, coke and asphalt.

KEROSENE LAMPS AND STOVES ARE STILL IN USE IN THOUSANDS OF HOMES

There are different kinds of kerosene. Most of it is used as a fuel and for lighting. In this age of electricity it is easy to forget that even today thousands of homes are still lighted only by kerosene lamps and many housewives cook their food on kerosene stoves. Kerosene also is used as a heating fuel in many homes. The old-fashioned kerosene lamp gave light from a burning wick. Many new lamps have been developed which provide much better light with the same fuel. Kerosene is refined so that it does not take fire too easily and can be used with comparative safety. However, remember always to be careful in handling kerosene lamps and stoves. Accidents still happen, although they can be avoided.

Large quantities of furnace oil are used today to heat homes and other buildings, while other oils are used to furnish power for steamships and for conversion into gas fuels.

The Indians first learned the healing uses of crude oil and its products. They rubbed petroleum into their skins to ward off rheumatism. Now medicinal oils, such as mineral oil and petroleum jelly, have come into wide use. Petroleum also enters this field in the form of solvents (dissolving agents), creams and ointments. Moreover, alcohols are obtained by chemical treatment of some of the products of refining. These alcohols enter the hospital and the home and are also used as solvents in the making of lacquers, soaps and essential oils.

Another valuable by-product of petroleum is paraffin wax. This has scores of uses, in making candles, packing fruits and eggs and preserving fruits and vegetables. It is used for coating the insides of tanks in which acids are kept, since paraffin withstands acids well. It renders paper and cardboard waterproof, and is a good electrical insulator. Matches are coated with paraffin to make them catch fire easily when the spark is struck.

LUBRICATING OIL, WHICH HELPS THE WORLD'S MACHINES TO RUN SMOOTHLY

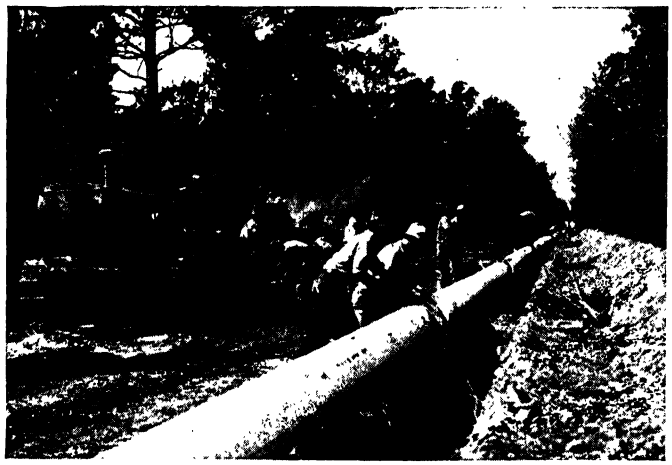
The most important of all the oil derivatives of crude petroleum, however, is lubricating oil. Its use is highly important because oil is necessary to prevent friction wherever a wheel turns. The general use of machinery was made possible largely because of lubricating oils, and enormous quantities of these oils are consumed today. Crude oil is not a suitable lubricant, but must be carefully processed, purified and otherwise treated before it is ready to make industry's wheels run smoothly.

Beyond the use of oil products in the fields of lighting, heating and lubricating, modern chemists have developed many by-products. Hundreds of substances have been made from crude oil and chemists believe they will find many more. One type of synthetic rubber is made from petroleum. See Synthetic Rubber, and also By-Products, in the Index.

The wonderful modern dry cleaning of clothes is done with naphtha, another product obtained from petroleum. And when Dr. Gorgas fought the deadly mosquito in making the Panama Canal, he used oil to coat the surface of the stagnant waters in which the mosquitoes bred, and so destroyed them.

THE WONDERFUL DISTILLING PROCESS BY WHICH WE GET PETROLEUM PRODUCTS

The manufacture of all these petroleum products illustrates the marvels of modern industrial chemistry. In its simplest form the production of the principal product, gaso-



In this picture we see a road gang preparing to place a pipe line in its trench. Pipe lines for oil run across deserts, over mountains and under rivers. In an average day about 10,000 feet of pipe can be laid.

line, consists of heating the crude-oil mixture to the point where it gives off vapors just as boiling water gives off steam. The lightest hydrocarbon molecules vaporize first, and when the vapor is passed through cooled pipes it condenses to form gasoline. As the temperature of the crude oil is raised by stages the other, heavier, hydrocarbon molecules are vaporized in the order of their volatility (lightness), and are condensed by cooling to form other products—kerosene, gas oil, lubricating oil and fuel oil. This is called straight-run refining, or fractional distillation.

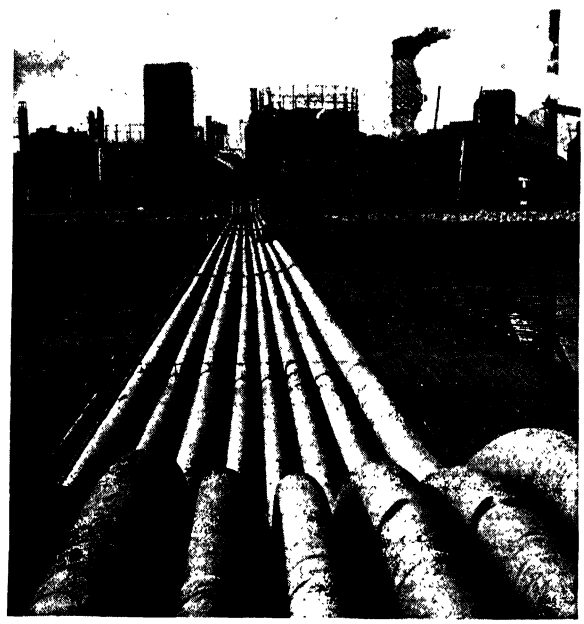
About 1915, with the demand for motor fuel rapidly increasing, petroleum refiners began to use a new process—"cracking." Cracking is a good name for the process. After the straight-run refining, the heavier products—gas oil and fuel oil—are put under high pressure and very great heat is applied until the heavy molecules split, or crack, into lighter ones. Gasoline and other products are then separated out of the cracked oil by a process similar to straight-run refining. Cracking has practically doubled the amount of gasoline obtainable from a forty-two-gallon barrel of crude oil. Today a barrel of crude oil yields nearly a half-barrel of gasoline.

During the cracking process, gases are generated which formerly were wasted or used as fuel in the refinery. Now these gases can be turned into gasoline by polymerization.

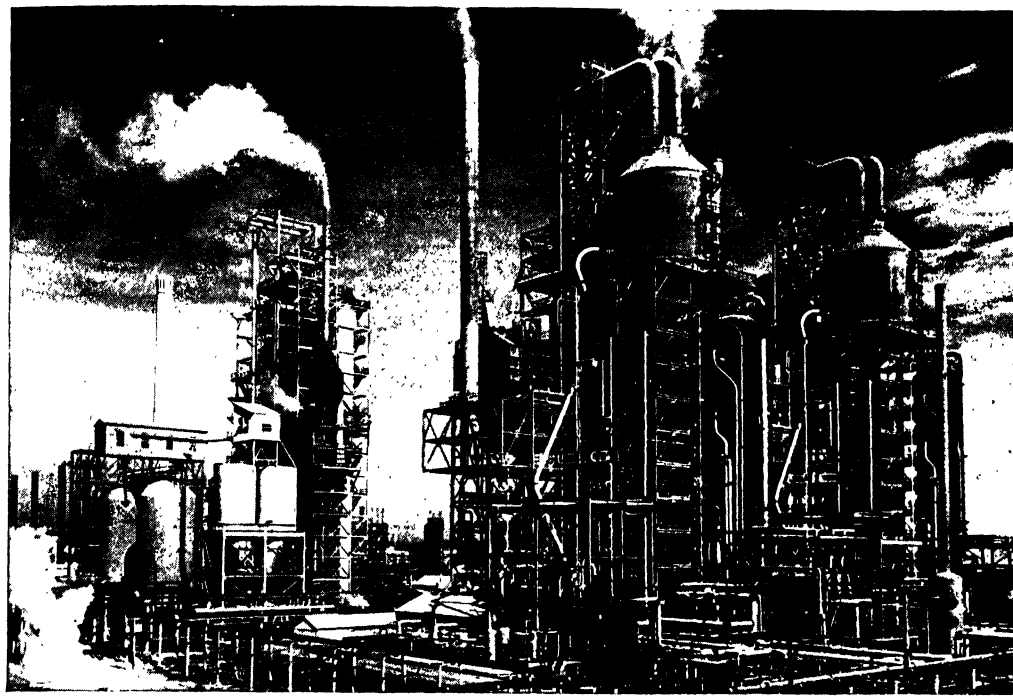
This is almost the reverse of cracking. Instead of splitting heavy molecules into lighter ones, polymerization takes the light gas molecules and synthesizes them (welds them together). This creates the more complex molecules of gasoline. In this way more gasoline can be obtained from a barrel of crude oil.

To keep the world's factory wheels turning, its homes and other buildings heated, its motor vehicles and trains moving and its ships plowing the seas, two billion barrels of crude oil must be produced and consumed every year.

To offset this drain upon the world's oil reserves and to increase the available supply, a search for new sources of oil is constantly carried on in many areas over the globe. The principles of seismology (study of earthquakes), geology (study of the earth's crust), paleontology (study of the earth's formation in past eras), cartography (map-making), chemistry and even bacteriology (study of



These pipe lines lead from the water front to a refinery.



The oil-cracking apparatus of a modern refinery. We discuss the process of cracking heavy oil in the article.

germs) are employed by the oil explorers in their efforts to locate new reservoirs of oil.

The oil seismograph is modeled upon the seismograph used to record the location and intensity of earthquakes. It is probably science's most valuable contribution to the oil explorers. Seismographs have been used in the search for oil for many years and have aided in the discovery of some of the world's greatest oil-fields.



This photograph shows the immense control board in the interior of an up-to-date cracking plant.

In one of the methods used today, a charge of dynamite is placed in a hole drilled to a depth of from forty to one hundred feet. When the charge is fired a sound-wave starts down through the earth. It does not travel smoothly, but changes velocity as it strikes different layers—sand, limestone, hard rock, and so on. From these layers echoes are reflected back to the seismograph recording instruments on the surface.

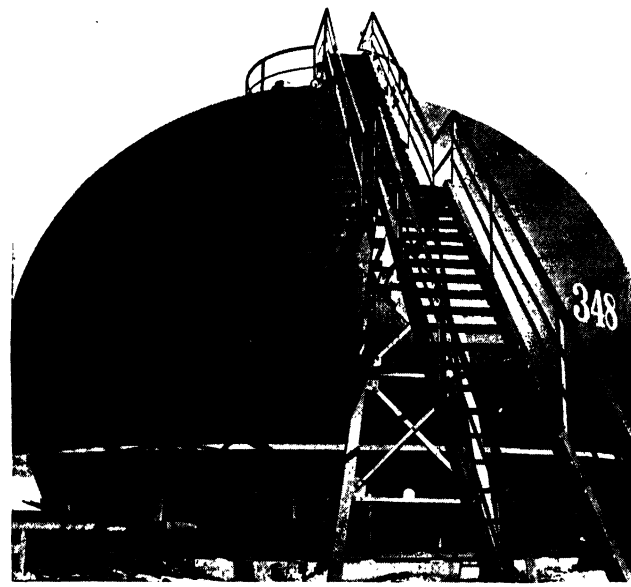
Study of these records, including the time taken for the sound-waves to reach the various layers and be reflected back again, makes it possible to tell what the layers are. Charts are made and from a study of the charts it is possible to tell where a well should be drilled through the dome of hard rock that forms a trap for the oil.

In normal years more than 25,000 new wells are drilled in the United States to meet the demand for oil. The number is probably not so great for the rest of the world.

The first oil wells, as we have said, were drilled with equipment used to drill water and salt wells. The equipment consisted of a cutting tool hung at the end of a cable. The tool

was lifted and dropped and lifted and dropped again and again. Each time it fell it cut its way deeper into the earth, but could never go very far down. The modern rotary drilling rig, however, makes it possible to tap oil pools lying nearly three miles deep in the earth's crust. Petroleum engineers now consider the possibility of reaching oil 20,000 to 25,000 feet down—four to nearly five miles below the surface of the earth.

The essential features of a rotary rig are: (1) the derrick which supports the rigging used to run the drill pipe in and out of the hole; (2) a power-driven rotating table, with a hole in its center, mounted on the derrick floor; (3) the Kelly, a square or octagonal length of pipe which passes through the hole in the table and rises above it; the drill pipe is screwed to the lower end of the Kelly; (4) the drill pipe, consisting of joined lengths of steel pipe; (5) the bit which cuts its way through the earth, sand and rock.



Storage tank for isopentane, a substance derived from petroleum.

The Kelly, gripped by the rotating table, turns with the table, and as it turns rotates the drill pipe and the bit. As the bit cuts its way through the formations, the Kelly, free to rise and fall, gradually sinks down through the hole in the table. When the top of the Kelly is nearly level with the table, the drill pipe is hauled up until the topmost joint shows above the level of the table. The joint is unscrewed and an additional length of pipe is inserted. Then the pipe is again lowered into the hole and the drilling goes on. Each time the Kelly is "buried" the procedure is repeated. The drill pipe grows longer and longer as the hole gets deeper. To drill a deep well may cost $150,000 or more.

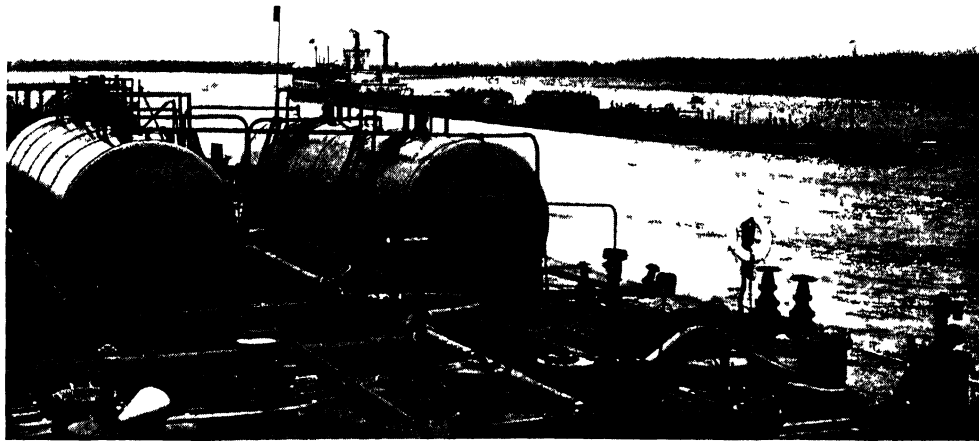
Once oil has been brought to the surface it must be transported to refineries to be processed and then distributed to market. Pipe lines, tankers (ships), tank cars (railroad cars), and tank trucks are the vehicles used for this purpose.

The oil tanker is the most important single carrier used by the oil industry to haul crude oil to the refineries and crude products to market. Its importance lies in the low cost of water transportation. The first ship to carry a cargo of oil on the high seas sailed for England from Philadelphia in 1861. The vessel was the 224-ton brig, the Elizabeth Watts, and she carried her cargo in barrels. It was not until 1869 that the first oil ship fitted with iron tanks appeared. The name of this pioneer tanker was the Charles, a sailing vessel of 774 tons, with 59 tanks. Before this the oil had either been shipped in barrels or the entire hold of the vessel in the trade had been used as a single tank. The first steam tanker appeared in 1878. This form of transportation has progressed a long way since then.

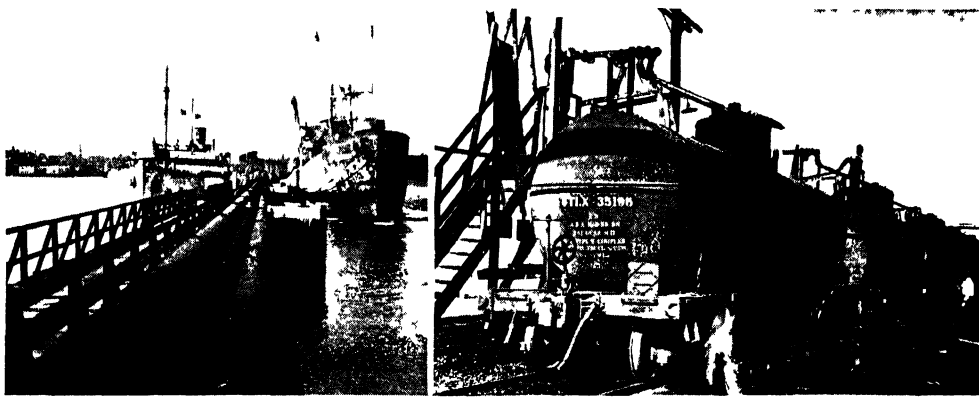
Before World War II, approximately 75 per cent of all the oil produced in the United States was moved by water carriers at some stage of its passage from the well to the consumer. Practically all shipments to points along the Atlantic and Pacific coasts were made entirely by water. From the receiving points on the two coasts, oil barges and river tank ships carried petroleum products over 30,000 to 45,000 miles of waterways to inland destinations. During a single month, tankers have unloaded as much as 45,000,000 barrels of crude oil, gasoline and other petroleum products at United States ports.

Tankers constitute about one-fifth of Amer-

HOW OIL PRODUCTS ARE SHIPPED



Aboard a river towing steamer of the Standard Oil Company of New Jersey It is passing a sister craft.



Left tankers emptying their crude oil cargo at the pipe line docks Right loading tank cars at a refinery.



General view of a bulk storage plant. From here gasoline and other oil products are shipped to the consumer.

ican merchant-marine tonnage and carry about one-third of all water-borne tonnage in American world trade. The United States tanker fleet, taking into consideration only tankers of 1,000 gross tons and over, is larger —both in number of ships and gross tonnage —than that of any other nation.

In the early days of the industry, one trouble which developed was the high cost of carrying the oil from the wells to the refineries and thence to market. The roads were bad, and the teamsters charged high prices. The oil had to be packed in barrels for hauling and barrels were expensive. Few could be carried on a wagon and not many on a freight car. So wooden tanks were built on the cars. Later, iron tanks like boilers replaced the wooden tanks. Every navigable river also had a fleet of flatboats with such tanks which helped carry the oil to market.

Only a year or two after the oil wells were opened a man thought of the plan of running the oil to market in a pipe. The teamsters, angry at the prospect of losing their oil-hauling business, destroyed the first pipes and sometimes there were riots. But the new device saved so much time and money and carried oil in such large quantities that others were built. Today the pipe lines carry an important share of the crude oil and oil products moved to the various markets of the world.

AMERICA'S OIL-PIPE LINES FORM AN IMMENSE TRANSPORTATION SYSTEM

A map of the oil-pipe lines in the United States shows an enormous network of steel, forming one of the most important but least known of our modern transportation systems. Thousands of people pass over these pipes every day without a thought of the millions of gallons of oil flowing beneath them.

There are more than 350,000 active oil wells in the United States; there is not one of these that does not have an outlet for its production through a pipe line. Fifty-three thousand miles of pipe line gather the day's supply from the wells and carry it to gathering stations. From the gathering stations the oil flows through 58,000 miles of trunk line to more than 400 refineries in twenty-eight states and to shipping points. Forty-five hundred miles of pipe line carry refined products from refineries to distribution points.

The pipe-line builders have run their lines across swamps and deserts, over mountains, under rivers and even along the bed of the ocean. The obstacles presented by nature frequently tax the ingenuity and skill of the engineers. In an average day about 10,000 feet of pipe can be laid. On easy stretches 25,000 feet and even more can be laid in just about the same time.

During the early days of the petroleum industry railroad tank cars were used widely to carry petroleum and its products to market. As the industry grew other forms of transportation had to be found to keep costs down. The pipe line and the tanker gradually took over most of the work of carrying the oil. After the outbreak of World War II many tankers were sunk by submarines and mines. The railroad tank cars once more had to carry great quantities of crude oil from the fields to the refineries.

Pipe lines, small tankers and tank barges are used whenever possible to carry petroleum products from the refineries to large distribution stations. From these, tank trucks usually carry gasoline, lubricating oils and furnace oils on the last lap of the trip from the oil well to the consumer. Many thousands of trucks are in use.

We have said that the world's coal is greater in quantity than the world's oil. When all the natural oil has been consumed, oil for motors may possibly be distilled from coal. In some countries gasoline was made from coal, for a time, because of their shortage of petroleum. The process is known as hydrogenation. The product is much more expensive and not so good as natural gasoline made from crude oil. Benzol, a valuable motor fuel, is distilled from the by-products of coke-making. This means that when our supply of petroleum is used up it will be possible to provide an artificial petroleum from coal.

There is another source of oil. In some parts of the world there are deposits of bituminous shale. Shale is clay which is on the way toward becoming rock, and bituminous shale is that which contains bitumen (asphalt). This contains oil which may be extracted by distilling the shale. From thirty to fifty gallons of crude oil may be obtained from a ton of shale, and the oil may be separated into naphtha, kerosene and so on, just as the oil from wells is separated.

There is also the possibility of using alcohol for power. The right type of engine has not yet been invented, but it is almost certain to come. So, even if the oil wells yield less and oil becomes dearer, we shall probably be able to get the power to run our motor cars and other engines, though it may cost more than at present.

Photographs and charts not otherwise credited were supplied by the Standard Oil Co. of N. J.

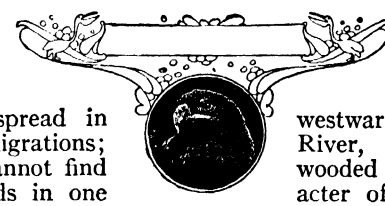
THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 4865.

LAND BIRDS OF NORTH AMERICA

THE same birds are not found in every part of a large continent or even of a large country. In fact, a man who knows birds, if put down in a strange land, could guess the general region by the birds he would see and the season of the year. There is some overlapping. Some birds have a very wide range, but the ornithologists have divided the continent of North America into several "provinces," or zones. It is of the many attractive birds of the Northern province that we shall first speak. Then we shall give you some chapters on the birds of the other provinces. This Northern province is the territory north of a line drawn from Boston, through Buffalo, Cleveland, Chicago and along the upper Missouri River. The birds of the Far West differ somewhat.

BIRDS OF NORTH AMERICA

LAND BIRDS OF THE NORTHERN PROVINCE: PART I



THE birds of North America, like those of all other continents, are not uniformly spread in their residence, or migrations; that is to say, you cannot find the same list of birds in one part of a continent that you do in another, except in the case of a very few kinds.

This is owing to several causes, the chief of which is climate and its effect on bird-food. It is evident that birds that are accustomed to get their food altogether from the ocean cannot live inland; and that those subsisting on fish, frogs and aquatic animals and plants will not be present on the dry interior plains and prairies, or among mountains, where lakes, large rivers and marshes do not exist. On the other hand, the seed-eating sparrows of the plains, the thrushes, finches, woodpeckers and others that depend on insects which feed on plants, have no reason to go to the seashore.

In addition to this, the birds (and other animals) of the Pacific side of the continent are different, on the whole, from those of the Atlantic slope and of the Mississippi Valley. The snowy ranges of the Sierra Nevada and the Rocky Mountains are too high for most of the Pacific birds to cross; and the wide, dry, treeless plains prevent a large number of birds of the eastern half of the country from ranging much westward of the Mississippi River, although the more wooded and well-watered character of northwestern Canada enables eastern birds to extend their range much farther west there than in the United States. Such things as these influence the range of birds.

But there is another sort of distribution. Some birds are accustomed to go even to the Arctic regions to spend the summer and rear their young. Others are able, or choose, to go only as far north as southern Canada or northern United States. These are seen in the southern half of the United States only when passing through it to and from their winter home in the tropics.

Some remain in this Northern region all the year round because they find water and food that suit them. In winter various Arctic birds come south into southern Canada or into the northern part of the United States.

If you will draw a curved line on a map from Boston through Buffalo, Cleveland, Chicago, and northwestward to and along the upper Missouri River, you will define about the southern boundary of this Northern province. It is the birds of this region

which we shall describe in this chapter and the next, leaving the birds of the Southern province for another story.

WHY ARE BIRDS DIFFERENT IN DIFFERENT SECTIONS?

The only explanation of these variations in geographical distribution is that the variety of climate and food makes conditions in one region suitable for certain kinds of birds and not suitable for others; and each species inhabits that district, or "zone," where it thrives best.

In the Northern region we have many birds. More than two dozen are permanent residents, and a dozen or more are winter visitants. The great majority of our birds are summer residents only.



Cooper's Hawk is one of the small hawks which fly over the poultry yards, pounce down on the chickens and carry them off. It is sometimes called the Chicken Hawk.

They arrive from southern United States, the West Indies, and Central and South America in spring and early summer, and leave us for those warm regions when cold nights foretell the approach of winter.

THE RUFFED GROUSE, THE DRUMMER OF THE WOODS

Among permanent residents one of the most common is the Ruffed Grouse, often incorrectly called Partridge and Pheasant. (We have no true partridges or pheasants native to North America.) It, and other related species, are game birds which are protected by the game laws. It is a bird about seventeen inches long, with upper parts chiefly brown, but variegated with black, gray and white; large tufts of broad glossy black feathers on the neck; under parts chiefly white, tinged with buff and barred with blackish or grayish brown. The tail feathers vary from gray to brown and are irregularly barred and mottled with black, with a broad dark band near the end. When the tail is spread it presents a beautiful fan-like appearance.

Of all the characteristics of this superb game bird, its habit of drumming is the most remarkable. The sound is produced by the male bird's beating the air with his wings as he stands firmly braced on some favorite low perch. It is the call to his mate, who approaches the old rendezvous, shy but responsive. The same perch may be used by the old male year after year. On the ground at the base of a stump or tree, or beneath some brush, the nest is made. It may contain from eight to fourteen pale yellowish brown eggs about one and one-half inches long and an inch broad. The young can run about as soon as they are hatched, and when one week old they can fly well. During the summer and autumn the grouse eats insects, berries and seeds, and in the winter, leaves and buds. To keep itself warm during cold nights in winter, it burrows into a snowdrift and there passes the night. Sportsmen delight in hunting the ruffed grouse, and its flesh is much prized at the table.

OTHER MEMBERS OF THE GROUSE FAMILY

The Canada Grouse, or Spruce Partridge, is a common inhabitant of coniferous forests. It has more feathers on the legs, but the toes are bare. The throat is black, and is separated from the black breast by a broken circular band of black and white. The tail is black, tipped with brown. Its eggs are larger than those of the ruffed grouse, and are more or less speckled or spotted with deep brown. This bird is sometimes called the Wood Partridge.

The Quail, or Bobwhite, belongs to the same family. It is only about ten inches long. The male in winter has upper parts varying from reddish brown to chestnut; a black band on the upper breast; the throat and a broad line from the bill over the eye white; the lower breast and belly white, barred with black; and an ashy gray tail. On the ground in grassy fields the female lays from ten to eighteen white eggs about one inch broad. It is found only in the warmer sections of eastern Canada, but is common farther south and has been introduced in the Far West.

SOME FEATHERED RAIDERS OF THE AIR

Hawks are birds of prey. They often make raids upon the poultry yard, and always prefer feathered game to any other. The Sharp-shinned Hawk and Cooper's Hawk are those which often attack poultry. They are both small, but possess great boldness and dexterity. The former is about a foot long; with upper parts slaty gray; primaries barred with blackish; white throat streaked with black; under parts barred with white and buff; and an ashy gray, nearly square tail with blackish crossbars and whitish tip. Cooper's Hawk is very similar, but larger, and with the crown blackish.

They build nests in trees, fifteen to fifty feet above the ground, and lay from three to six bluish white eggs about two inches long. Because of its larger size, Cooper's hawk is more destructive to poultry. Both are fearless, daring, aggressive; and watching their prey from a lookout, then flying swiftly and low, they make a sudden dash at the frightened animal and grasp it in their talons. They are very often called Hen Hawks and Chicken Hawks.

The latter names are applied also to the Red-tailed Hawk and the Red-shouldered Hawk. Both like chickens. The former is about twenty inches long; with upper parts brownish; upper breast heavily streaked with grayish brown; the upper belly streaked, spotted or barred with black, forming a kind of broken band across the belly; the lower belly generally white; and the tail rich brown, with a narrow black band near its end and a white tip.

The Red-shouldered Hawk is about the same size; with conspicuous reddish brown "shoulder" patches, and a blackish tail with four or five white crossbars and a white tip. Both are common species, but give little trouble to the farmer, though unjustly blamed for the sins of their bird-killing relatives. They live chiefly on mice, moles, frogs and insects. The hawks already described are permanent residents in most parts of the province.

THE MANY HAWKS WHICH ARE FOUND IN THIS REGION

The American Goshawk is a bird of Northern regions, wintering as far south as Virginia. It is one of the most daring of all the hawks, and will dart down suddenly and carry off a chicken which may be only a few feet from a person. It is nearly two feet long; with upper parts bluish slate color; a blackish head; and the breast and belly barred pale slate and white, with sharp black streaks. It nests in trees and lays from two to five white eggs faintly marked with pale brown. This hawk is so large and powerful that it is quite capable of killing and carrying off a full-grown hen.

The Marsh Hawk is often seen gracefully skimming over the low meadows, or occasionally hanging poised over one spot for a second or two and then dropping down into the long grass. This drop may mean the death of a mouse or a frog. It seldom attacks a domestic fowl, but destroys an enormous number of field-mice each year. The male has gray or ashy upper parts; a silvery gray tail irregularly barred with black; and lower breast and belly white, with bars or spots of rufous. It lays from four to six dull white eggs on the ground in marshes.

The most unsuspicious of all hawks is the Broad-winged Hawk, which is chiefly distinguished from other species by the three "notched" primaries and its smaller size. It breeds throughout Eastern North America. During early summer it may be seen for hours sitting on the dead top of some high tree. It feeds chiefly on mice, reptiles and insects.

The American Rough-legged Hawk, a large species characterized by feathered tarsi and heavily marked under parts, breeds in Canada and winters in the United States. It is somewhat nocturnal in its habits, and may be seen in the fading twilight watching from some low perch or beating with measured, noiseless flight over its hunting-ground. Its flight is seldom rapid and often appears labored.

The Pigeon Hawk has slaty blue upper parts; a rusty collar on the neck; three or four distinct grayish white bars on the tail; and under parts of cream-buff or yellow streaked with black, except on the throat. It nests in trees or on cliffs, and lives chiefly on small birds.

The American Sparrow Hawk is less than a foot long; with a brownish back more or less barred with black; a slaty blue head; under parts chiefly cream-buff; and belly and sides spotted with black. It breeds as far north as Hudson Bay and winters in the southern states. Its call is a high, quickly repeated *killy-killy-killy-*

killy; and, as the name suggests, it lives on small birds, mammals and insects.

THE FISHERMAN THAT SELDOM MISSES

The Fish Hawk, or American Osprey, is a common species. It has upper parts, head and nape brownish, varied with white, and white under parts. This species lives in colonies or in pairs along our coasts, and returns year after year to the same nesting-ground. Its note is a high, rapidly repeated, plaintive whistle. It is



The Screech Owl frequently lives in a hollow limb of an old apple tree, where it can hide through the day from the small birds that might attack it.

a good fisher. Winging its way slowly over the water, it keeps a close watch for fish. When one is observed, it hovers for a moment; then descends with rapid speed and directness, strikes the water with great force, making a loud splash, frequently disappears for a moment, then rises with its prey grasped in its powerful talons, and flies to a favorite perch.

The Golden Eagle is of rare occurrence east of the Mississippi, but the Bald Eagle breeds throughout North America. The head, neck and tail are white, and the rest of the plumage is brownish. It lives chiefly near water and subsists principally on fish. The nest is found in tall trees and contains two or three dull white eggs nearly three inches long.

NIGHT BIRDS THAT PREY ON SMALL BIRDS AND ANIMALS

Owls are found in all parts of the world, and about twenty species inhabit North America. They are chiefly woodland birds, while some make their home in towers or outbuildings. Owls are birds of prey, and birds of the night, living chiefly on small mammals. They have weird, human voices, and are usually regarded with superstitious fear. Their eggs are uniformly white and unmarked. Only a few common species will be described.

The Long-eared Owl has conspicuous ear-tufts an inch or more in length; upper parts brownish mottled with white; a tail with six or eight crossbars; and sides and belly irregularly barred with brown. It spends the day in the shade of evergreens. Like other owls, its flight is slow and wavering, but, in common with them, it is buoyant and devoid of any appearance of heaviness.

The Barred Owl, or Hoot Owl, has no ear-tufts. The upper parts are grayish brown; the under parts white; the breast barred; and the sides and belly broadly streaked with brown. The deep-toned, questioning voice, the absence of "horns," and the dark brown, nearly black eyes combine to make barred owls appear strangely human. Their usual call is a sonorous *whoo-whoo-whoo,* uttered during the first part of the night and again before sunrise, or, on moonlight nights, throughout the night.

The Saw-whet Owl is only about eight inches long. Its upper parts are cinnamon-brown; the back spotted with white; the tail with three or four imperfect white bars; the under parts white, heavily streaked with cinnamon-brown; and the legs and feet feathered and buffy white. It nests in a hole in a tree. During the day it frequents dark woods and sleeps so soundly that often it may be captured.

The Screech Owl is known by its small size and ear-tufts when seen; and when night comes, by its tremulous, wailing whistle—a weird, melancholy call welcomed by few. It frequently makes its home near dwellings and may nest in them. Its favorite retreat is an old apple orchard, where the hollow limbs offer it refuge by day from smaller birds which may attack it. There are still superstitious persons who believe that the call of this bird foretells misfortune to the house it visits.

THE GREAT OWLS OF THE WILDER REGIONS

The Great Horned Owl is nearly two feet long and has conspicuous ear-tufts nearly two inches long. The upper parts are mottled with varying shades of buff and black; there is a white patch on the throat; and the under parts are a yellow-buff, barred with black. The legs and feet are feathered, and the eyes are yellow. The great horned owl is common in wilder, less settled, wooded regions, and is very fond of rabbits. Its call is a loud, piercing, blood-curdling scream.

The Snowy Owl is a bird of cold, Northern regions, but it may wander southward in winter. It is large, without ear-tufts, and is white, with bars of grayish brown. The legs and feet are heavily feathered, and the eyes are yellow. Its flight is firm, smooth and noiseless. It is diurnal in its habits, and is most active during the early morning and again before dusk.

The Hawk Owl is also diurnal in its habits, and its flight is swift and hawk-like. It breeds in Northern regions and comes south in winter. The size is medium; the upper parts grayish brown; the head and neck spotted with white; the under parts barred with brown and white; and the tail long and rounded.

WOODPECKERS THAT DESTROY THE ENEMIES OF OUR TREES

Woodpeckers of several species are common in the North. As a rule, they are solitary, and they are the best climbers among all birds. Two toes of each foot are directed forward and two backward, except in one group, and this structure of the feet, together with the pointed, stiffened tail feathers, assists them in clinging to upright surfaces. The bill is stout and chisel-like, and is used to cut away wood and reach grubs, which are drawn out of their hiding-places by the long tongue with its horny tip. Woodpeckers nest in dead trees and lay white eggs.

A most common species is the Hairy Woodpecker, which is about ten inches long; with black upper parts; white under parts; wings spotted with white; a white stripe above, and another below, the eye. The adult male has a scarlet patch on the back of the neck.

The Downy Woodpecker is very similar in color and markings, except that in the latter the outer tail feathers are white, barred with black, and in the former they are white without bars. The Downy is shorter, and the feathers more downy and fluffy. It is the smallest and the best known of all our woodpeckers. He visits the orchard and shade trees, and tells of his presence by the *tap, tap, tap,* on the trees as he patiently digs out grubs and larvæ. The valuable work done by these birds for the protection of our trees should commend them to every nurseryman. The toughest cocoon ever spun by a caterpillar is no protection against the sharp beaks of these birds. The food of both birds consists almost entirely of insects, with the seeds of the hemlock or the berries of the sumac for dessert.

The most beautiful bird of the family is the Red-headed Woodpecker; with the head, neck and upper breast deep red; the lower breast and belly white; and the upper parts and the tail black, except the white hump and white patches on the wings. The Downy and the Hairy are winter residents, but the Red-headed generally migrates southward in the autumn. These red-heads are noisy, active birds; and their brilliant plumage and loud, rolling call make them conspicuous. In early spring they feed on insects, which they catch on the wing; but after the small fruits ripen, their tastes change, and they visit the strawberry and raspberry patches.

A WOODPECKER WHICH HAS FORTY NAMES

The Golden-winged Woodpecker has more colors and more names than any other bird. A few of its forty names are Flicker, High-hole and Yellow-hammer; and these names are the reflections of its habits, notes and colors. The top of the head is a sky-gray; across the neck is a bright scarlet band; the upper parts are brownish gray, barred with black; the sides of the head, throat and upper breast are yellowish brown; a broad black stripe on either side of the throat runs backward from the base of the bill; a broad black crescent spans the breast; the under parts are white, tinged with yellow, and the tail is black above, and yellow, tipped with black, below. The Flicker is a bird of character, and does not always follow the habits of the family. It does less woodpecking than any other of its class, and is really a ground-feeder, living chiefly on ants and other ground insects. For the most part it winters in the South.

The Yellow-bellied Sapsucker is another woodpecker. The adult male has a

crimson crown and chin; black and white wing coverts and back; wings black, with a large white bar; black tail; breast black, edged with yellowish; and the under parts dull yellowish; and white sides, streaked with black. It is a small woodpecker, which prefers sap to insects. In spring, when the sap is rising, it bores small holes in the bark of various trees and sucks the sap which flows from the holes. Apart from this habit, which may render young trees somewhat unsightly, the bird has an excellent record. It devours great numbers of ants, beetles and moths, which it obtains from rotten wood. It is a summer resident only.



The friendly little Chickadees live with us through the snowy weather. They are friends of the gardener, for they live on the eggs and larvæ of insects which destroy fruit trees and shrubs.

THE PILEATED WOODPECKER, "COCK OF THE WOODS"

The Pileated Woodpecker, known as the "Cock of the Woods," is about seventeen inches long and is the largest of our woodpeckers. The male has a scarlet crown and crest, and a red mark extending back from the bill. The upper and under parts are brownish black, and a broad white stripe extends from the bill backward, on either side, to the wings. This bird is common only in the wilder parts of the country. Its flight is rather slow, and when under way, the markings of the wings show plainly. The Arctic Three-toed and the American Three-toed, as the names suggest, have only three toes on each foot, two in front and one behind. They are restless, active birds of Northern regions. The males of both have an orange spot on the crown. The Arctic is a little larger and is seldom found far down in the United States.

The Nuthatches are closely related to the woodpeckers. We have two species in the North, the White-breasted and the Red-breasted. They are resident species frequently seen around cultivated lands in the winter. They are active insect-destroyers, picking their food from bark, twigs and leaves, and are of great value to the fruit-grower because of the immense quantities of insect eggs and larvæ which they destroy. Their call is a nasal *yank-yank* and a repeated *ya-ya,* all in the same tone. The White-breasted Nuthatch is about six inches long, with a bluish black crown, slate upper parts, white under parts, and a short tail. The Red-breasted has the top of the head and a wide stripe through the eye shining black; a white line over the eye; the upper parts bluish gray; the throat white; and the under part reddish brown. Few birds are more easily identified.

THE FRIENDLY CHICKADEES THAT HELP TO SAVE OUR FLOWERS

Chickadees are permanent residents and are also insect-eating birds. They closely inspect the bark of trees for insect eggs and larvæ.

"Were it not for me,"
Said a chickadee,
"Not a single flower on earth would be;
For under the ground they soundly sleep,
And never venture an upward peep,
Till they hear from me,
Chickadee-dee-dee."

The Black-capped Chickadee is a small, fluffy bird; with top of head, nape and throat shining black; the sides of the head and neck white; the back ashy; the breast white, with belly and sides washed with cream-buff. It builds a nest of moss, grass and feathers in old stumps, and lays from five to eight small white eggs, spotted and speckled at the larger end with brown. The Hudsonian Chickadee has a dull, dark brownish gray crown. No bird speaks its name so plainly as a chickadee, and no bird has more friends, because he is sociable with all. In an unconcerned way he hops from limb to limb, whistling softly the while, picking an insect egg from this crevice in the bark and a larva from another, all the time performing acrobatic feats. After satisfying his ap-

CHARACTERISTIC NESTS OF AMERICAN BIRDS



1. Yellow Warbler (type of hempen nest in small tree). 2. Wild Cliff Swallow; Eaves Swallow (nests made of mud). 3. Typical Hawk's, Owl's or Crow's nest (in a forest tree). 4. Redstart's nest (showing a Cowbird's intruded egg). 5. Red-eyed Vireo (hammock-like suspended nest). 6. Nest and eggs of Blue Jay. 7. Nest-hole of a Tree Swallow. 8. Nest-hole originally dug by a Woodpecker, now the home of a Wren. 9. Phœbe Flycatcher (on a beam in a stable). 10. Mourning Dove. 11. Fish Hawk, or Osprey. 12. Grouse. 13. Grebe. 14. Tern.

petite, he looks at the onlooker with his sparkling black eyes, speaks to him in liquid gurgles, and then flies away to the woods.

THE LITTLE BROWN CREEPER SEARCHES FOR BUGS

The Brown Creeper is another small bird which, like the chickadee, searches for insects, eggs and larvæ which are hidden in crevices of bark. He starts at the bottom of the trunk and winds his way upward in a nearsighted manner. Having reached the top of his spiral staircase, he suddenly drops to the base of another tree and resumes his task. The upper parts are mixed brown and white; the rump pale brown; the tail grayish brown, with feathers stiffened and pointed; and the under parts white. It builds its nest in the loose bark of a tree and lays from five to eight spotted and speckled eggs. All of the true creepers except this industrious foe of insects are birds of the Old World. The so-called Black-and-white Creeper is really a warbler, but the habits are similar.

GOOD AND BAD HABITS OF CROWS AND BLACKBIRDS

A Crow can speak for himself, and is well known to most boys and girls. He is about twenty inches long and is black all over. The farmer is well acquainted with his corn-pulling habit, and even the "scare-crow" does not frighten him. He is a vegetarian to the extent of two-thirds of his diet, and one-half of this vegetable matter consists of grain, chiefly Indian corn. Sometimes he is guilty of destroying the eggs and young of small birds. On the other hand, he does much good by destroying injurious insects, mice and other rodents, and is valuable occasionally as a scavenger. He seems to rejoice in being an outlaw.

When caught young, the crow is easily tamed, though it is likely to be a mischievous pet. It learns to distinguish different members of the family and has been known to show signs of recognition after long absence. It often steals objects and hides them. Sometimes servants have been accused of stealing jewelry when the real culprit was this noisy pet. It often imitates the sounds it hears and some have been known to speak quite a number of words. The Fish Crow is very much like the common crow but is smaller. It is chiefly a bird of the Southern province.

Blackbirds are closely related to crows, but are much smaller. Both walk, while most birds hop. The Bronze Grackle, or Crow Blackbird, breeds as far north as Labrador, and winters in the lower Mississippi Valley. It is about twelve inches long, and the general color is bronze, with metallic purplish reflection on neck, throat, wings and tail. The name Crow Blackbird is also applied to the Purple Grackle, which does not often go north of Massachusetts. The chief difference is that the purplish reflections are arranged in bars. The female is duller.

The Rusty Blackbird is smaller. The plumage of the male is a glossy bluish black. The female is slate color in spring, and rusty brown in fall and winter. The Red-winged Blackbird is distinguished by the patch of red and cream on the shoulders in the male. The female is smaller, grayish brown, and heavily streaked with brown or black. A near relative, the European Starling, has become naturalized, and in some sections has become a great nuisance.

Blackbirds are not liked by the farmer. Little can be said in their favor, except that at times they eat a large number of cutworms. They are early migrants, arriving in March and resorting at once to their nesting-places in swamps or woods. Early in the season they live on insects, but as soon as grain is sown they visit the sown fields and help themselves liberally, varying their diet by robbing the nests of smaller birds.

THE RAVEN, THE BIRD OF SUPERSTITION AND GLOOM

Ravens and crows are near relatives. The Northern Raven is practically the same as the raven of the Old World. In America it is a bird of the North, though occasionally found south of New England. It is about twice the size of a crow, and its plumage shows a bluish metallic lustre.

It eats everything, including carrion. It robs the nests of birds, swallowing the eggs or the young birds with equal relish. It attacks young or sick animals, but will also eat insects, fruit or grain. When hatched, the young are more white than black, and at first are fed on food partly digested and disgorged by the mother bird. The parent birds look after them until they are almost full grown. Like the crow, a young raven is easily tamed and may learn to say a number of words.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 4829.

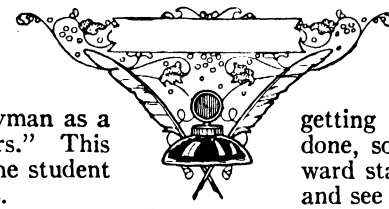
CHAUCER'S CANTERBURY TALES

THE most famous of the writings of Geoffrey Chaucer, the first great English poet, is the work known as The Canterbury Tales. Its plan is simple. We are to imagine a company of "pilgrims"—which did not mean religious people, but good and bad alike—setting out from the Tabard Inn, at Southwark, in April, 1387. Some were on horse and some on foot, but all were journeying to visit the shrine of St. Thomas à Becket, at Canterbury. The landlord of the inn proposed that each pilgrim, to pass the time, tell a story on the way to Canterbury, and another on the way back. As there were thirty-three people in the company, including Chaucer himself, that would mean sixty-six tales. But the poet wrote only twenty-four. Though the book is incomplete, it is longer than the Iliad. Seven of the stories have been chosen for retelling here. Our language has changed so much that syllables have to be pronounced which are not sounded now. These are marked with accents.

THE PATIENCE OF GRISELDA

THE TALE TOLD BY THE CLERK

IN Chaucer's time a "clerk" meant a student or any learned man. We still speak of a clergyman as a "Clerk in Holy Orders." This is the story told by the student to his fellow-pilgrims.



A gifted but pleasure-loving nobleman named Walter, lord of the noble country of Saluces, in Italy, was asked by his subjects to marry, so that an heir might be left to them when he had gone. Near his palace was a little village which the marquis passed through when he went hunting.

Among the poor folk of this village dwelt a man called Janicula who had a daughter, "the fairest under the sun." This humble maiden, whose name was Griselda, was as virtuous and dutiful and hard-working as she was beautiful. Often, when on his way to the chase, had the marquis's eye rested on Griselda. Bearing in mind his people's wish, he determined that if he did marry she should be his wife. He had fixed a day for his wedding, as his people had desired. The day came and still none knew who was to be the bride.

All preparations were made for the ceremony. Costly dresses were made, gems prepared for his lady that was to be, and a gallant company were invited to the feast. Then a brave procession, headed by the marquis, set out from the palace to escort the bride. The marquis led the way to the little village. Here Griselda was busily engaged getting her household tasks done, so that she might afterward stand at her father's door and see the wedding procession. As she was setting out to draw water at the well, the marquis stopped the procession at her rude dwelling. Calling her by name, at which she almost swooned, he asked for her father. Griselda answered that he was within, and then brought him forward. After conferring with her father the marquis asked Griselda if she would marry him, giving him all obedience. Griselda pleaded her unworthiness of so much honor, but replied that if it were her lord's will, she would marry him and obey him in all things. Then the marquis, taking her hand, led her forth from the hut and said to his people: "This is my wife. Honor and love her as you love me."

Griselda was straightway dressed in royal robes. Looking more lovely than ever, she was set on a beautiful horse, on which she rode to the castle, where the marriage was celebrated with much feasting.

Walter and she then lived for a time in great happiness, Griselda winning all hearts until she was known afar. Then was Walter moved to try her obedience sorely. When a little daughter was born to them, he told her that

his people were displeased, and that she was the cause of the trouble. Obedient to her husband's wish, Griselda gave up her child, thinking she would never see it any more. So, when a son was born, him also she gave up. Then the marquis chided her with her lowly origin, though her conduct was such that one born and reared to fill a great position might have been proud of it. He said that she must return to her father to make way for another whom he was to marry. In this, as in all other things, was Griselda submissive.

The people, who loved her, were angry at the marquis's cruelty. The new bride came in state with her brother from Bologna, and the people saw that she was fairer and younger than Griselda. They, with the fickle hearts of the crowd, thought that the marquis had done well.

Yet was Griselda to be further tried. The marquis sent for her to greet the new arrivals, because she alone knew how such ceremony should be carried out. So, in her humble attire, Griselda went back to the castle to obey her cruel lord's behest. And all the guests wondered who this humble and beautiful lady was that knew such honor and such reverence. At last, when the feast was spread, the marquis called for Griselda, and, as if in jest, asked her how she liked his new wife.

"Right well, my lord," quoth she; "for in good fay,
A fairer saw I never none than she.
I pray to God give her prosperity;
And so hope I, that He will to you send
Pleasaunce enough unto your life's end.
One thing warn I you, and beseech also,
Hurté not ever with no tormenting
This tender maiden, as ye have done me;
For she is fostered in her nourishing,
More tenderly, and to my supposing
She could not adversity endure
As could a pooré fostered créature."

And when Walter saw her patience under this great trial, his heart was at length touched.

"'Tis enough, Griselda!" he cried. "Be no more afraid. Now know I, dear wife, your steadfastness." He took her in his arms and sought to comfort her, so overcome was she at what he said. He told her that it was her own daughter whom she had just received as his new bride, and that the boy was her son. He had sent the two to Bologna, where they had been fittingly cared for and brought up secretly. Griselda was then dressed in the royal robes. There was great rejoicing, and the rest of her life was full of happiness. Says the poet:

Full many a year in high prosperity
Lived these two in concord and in rest.
And richly his daughter married he
Unto a lord, one of the worthiest
Of all Italy; and then in peace and rest
His wife's father in his court he keepeth,
Till that the soul out of his body creepeth.
His son succeedeth in his heritage,
In rest and peace after his father's day;
And fortunate was eke in marriage,
Though he put not his wife in such a say.
This world is not so strong, no, by my fay,
As it hath been, in oldé timés yore,
And hearken what this author saith therefore.
This story is said, not for that wivés should
Follow Griselda in her humility,
For this could not be borne, no, tho' they would;
But for that every wight in his degree
Shouldé be constant in adversity
As was Griselda.

THE FOX REPAID IN HIS OWN COIN

THE TALE TOLD BY THE PRIEST

THERE was once a poor widow, in the little yard attached to whose dwelling was a very fine cock, called Chanticleer. One morning this bird awoke with terror and told his mate, Pertelot, of a horrible dream that he had had, of a beast like a hound that threatened him. Dame Pertelot laughed her Chanticleer's fears to scorn. It was, said she, the result of indigestion, for which she suggested that he should take certain medicines.

While Chanticleer was enumerating stories of dreams that had come true, he looked upon Dame Pertelot's face, and, taking courage, begged that they should talk of cheerful things. By this time daylight had come, and, descending from his perch, Chanticleer strutted around like a lion, chuckling whenever he found a corn.

But one day, as he was proudly walking about the yard, crowing at the sun, he spied a fox that had crept in the night before and hidden in a bed of herbs. Then Chanticleer, reminded of his dream, would have fled, but the fox, addressing him, said:

"Gentle sir, alas! why would ye go? Be not afraid of me. I am your friend. I only came to hear you sing, for, truly to you as sweet a voice is given as any angel hath that is in heaven. Your father and your mother both have been in my house. I never heard anyone except you sing so well as your father did. Let us hear now if you can imitate your father."

Chanticleer, much flattered by the remarks of the sly fox, stood high upon his toes, stretched his neck, made his eyes to close, and began to crow right loudly. Then Dan Russell, the fox, jumping up, seized him by the throat, and fled with him toward the wood.

Such an alarm was then raised by Dame Pertelot and the other hens that the widow and her daughters ran out of their dwelling. Seeing how matters stood, they called the neighbors, who joined in the chase. Jack Straw and all his company never made such a to-do as was caused by the chase after the fox and Chanticleer.

As he was lying helpless in fear on the fox's back the cock thought of a plan. "Dear sir," said he to his captor, "if I were you I would turn on yon proud fellows and tell them that, now that you are near the wood, the cock shall here abide. And you will surely eat him, when you choose, whatever they may do."

"In faith," declared the fox, "it shall be done."

But as he spoke the cock slipped from his mouth and quickly flew high up on a tree out of reach. The fox cried that he was sorry for frightening the cock. He did it, he said, with no base intent. If Chanticleer would only come down again he would tell him why he had acted as he had done.

But Chanticleer replied that he had been deceived once and would not be deceived again. And so the fox was paid in his own coin—flattery.

THE STRANGE ADVENTURES OF A PRINCESS

THE TALE TOLD BY THE LAWYER

CONSTANCE, the daughter of the Emperor of Rome, was of such goodness and beauty that, when travelers returned from that city, they could not sing her praises too highly. The Sultan of Syria heard of her from his merchants. He was so affected by their reports that he sent word to her father offering to become Christian, with all his nobles, if he might have her hand in marriage.

The marriage took place. But the sultan's mother, who was secretly opposed to the union, invited the bride and bridegroom, and all the Christian knights who accompanied them from Rome, to a great feast. Then she caused them to be treacherously murdered, all save Constance. Her she sent adrift to sea in a rudderless boat, with all the rich wedding gifts and a store of food and raiment.

In this frail bark Constance was driven far, and finally cast on the shores of Northumberland. Here she was found by the constable of a castle which stood near. He and his wife Hermyngyld befriended her and became Christians.

A young knight of Northumberland, being refused by Constance, sought to bring her to a shameful death. He killed Hermyngyld secretly and accused Constance of the crime. She was tried before King Alla of Northumberland, whose gentle heart was touched with pity by her tears. A miracle occurred which was thought to prove her innocence. So the false knight was put to death, and she became King Alla's wife.

But Alla had a mother who was bitterly opposed to this marriage, and in her son's absence had Constance once more sent adrift with her baby boy. When King Alla discovered this, he killed his wicked mother with his own hand, and gave himself up to grief and lamentation. Meanwhile, Constance and the little Maurice were rescued from a heathen land on which they had been cast. Eventually they were taken to Rome, where they were befriended by a senator and his wife.

All this time Constance kept her pitiful story to herself, but her goodness caused her to be beloved by all.

Then King Alla, smitten with repentance for the death of his mother, journeyed on a pilgrimage to Rome. He was received by the very senator who had befriended Constance. Being invited to a feast by Alla, the senator took young Maurice with him.

Attracted by the child's face, Alla

asked as to the boy's history. Musing on all that the senator could tell him, and full of thoughts of the wife he mourned as one that was dead, Alla afterward went as a guest to the senator's house. Here Alla and Constance met and recognized each other immediately. Constance, who thought it was by Alla's orders she had been cast adrift, sank down in a swoon. Then the truth became known to her concerning the treachery of King Alla's mother. Husband and wife being reconciled, Constance made herself known to her father, the emperor. So at last all were come to happiness.

Alla shortly after took his wife back to England. But only a little while in joy and pleasure lived Alla and his Constance before Alla died.

Constance then returned to Rome, where Maurice was made emperor in course of years. The remainder of his mother's days were passed in acts of virtue and charity.

THE MEN WHO WENT TO KILL DEATH

THE TALE TOLD BY THE PARDONER

IN those days there were men who were permitted to grant to others, in the name of the pope, "pardons" for their sins. Such a pardon was known as a "papal indulgence." The men who dealt in them were called "pardoners." Here is the story told by the pardoner whom Chaucer includes among his pilgrim group:

In Flanders lived a company of young revelers who practiced all forms of folly and wickedness. Three of these ne'er-do-wells were one day seated in a tavern drinking, when a bell was heard tolling for a man who was dead. One thereupon called to his servant to go find out for them the name of the dead man. The boy replied that he had no need to go out to learn who it was that was dead.

"It was told me," said he, "two hours before you came here. The dead man was an old comrade of yours. He was slain suddenly at night, as he sat on his bench drinking, by a silent thief called Death, who hath killed a thousand by pestilence in this country."

The lad's story was confirmed by the tavern-keeper, who added that Death had slain men, women and children in a large village about a mile away, where he might perhaps be found.

At this one of the roisterers suggested that they join together, in order to seek out Death and slay him. And the three set out toward the village. On their way they met an old man, whom they treated roughly, though he besought their mercy.

"Nay, old churl," said they, "tell us where this same Death is, that killeth all our friends, or thou shalt suffer."

"Now, sirs," replied the old man, "if you are so eager to find Death, turn up this crooked way. You will find him in yonder grove beneath an oak tree, where I left him."

On learning this the three young men ran in the direction indicated, and coming to the tree, found a great store of golden florins piled up. No longer did they think of their quest of Death, but forthwith sat down by the precious hoard.

"Fortune," said the youngest of the three, "has given us this treasure that we may live in mirth and jollity. It must be carried home to my house or to yours by night. If men saw us with it in the daytime, we should be hanged for carrying what is our own."

He proposed that they should draw lots to decide which of them should go to the town for food and wine, while the other two kept watch over the treasure. The lot fell on the speaker.

When he had departed, one of the others said to his companion that it would be much better if the gold were divided between only two of them. "Two of us are stronger than one," said he, "and when our companion returns, do you engage him, as it were, in a playful wrestling bout. I will strike him with my dagger, and if you dispatch him with yours, then all this gold shall be ours to gratify all our wishes and enable us to play at dice as much as we like." The second villain agreed to this dastardly plan.

But wicked thoughts entered the mind of the youngest also as he went toward the town. Scheming how he could gain the gold for himself, he bethought him of the apothecary's. There, on the pretext that he wanted to kill rats, he bought some powerful poison. Next he borrowed three bottles, into two of which he poured the poison. Filling the bottles

with wine he returned to his companions. When the other villains had killed him, as they had planned to do, they said, "Let us sit down and drink and make merry before we bury him." And one, taking up a bottle—it was one containing poison—drank from it and passed it to his companion, who also drank.

So, both dying of the poison, the words of the old man who had told them that they would find Death under the oak tree were proved to be true.

THE ROMANCE OF THE LADY EMELYE

THE TALE TOLD BY THE KNIGHT

ONCE upon a time, in ancient Greece, there lived a great duke named Theseus. No greater conqueror than he lived under the sun. He defeated the Amazons of Scythia and married their queen Hippolyta. Her fair young sister Emelye he took captive. On his way back to Athens he was met by weeping women, who besought his help because the tyrant Creon had massacred their husbands and captured the throne of Thebes. Sending Hippolyta and Emelye to Athens, Theseus turned aside, and with his army marched on Thebes. There he slew Creon by his own hand and routed the tyrant's forces.

After the battle there were found, wounded and lying near where the fight had been fiercest, two handsome and richly dressed young men named Palamon and Arcite, cousins of the royal house of Thebes. Now, because of a vow he had made against Creon's house, Theseus ordered these young men to be kept in prison at Athens for life. When they had recovered from their wounds, Palamon and Arcite were therefore thrown into a dungeon in a strong tower near Theseus' palace.

It also happened that the narrow window of their dungeon overlooked the royal garden. Here one bright May morning the Lady Emelye,

> Far fairer to be seen
> Than is the lily on her stalké green,
> And fresher than the May with flowers new,

came forth to walk and gather flowers.

> Her yellow hair was braided in a tress,
> Behind her back a yardé long, I guess.
> And as an angel heavenly she sang.

Palamon himself awoke with the sun, heard the sweet song, and peering through his prison bars upon the fair scene beneath, was stricken to the heart with love for the fair Emelye. His cry of pain aroused Arcite.

"Cousin mine," exclaimed Arcite in alarm, "what aileth thee? Why criest thou? Take in all patience our imprisonment, for the stars ordained it when we were born."

"Cousin," replied Palamon, "you are wrong. It was not our imprisonment that caused me to cry out. The fairness of the lady that I see yonder in the garden is the cause of my woe. I know not if she be woman or goddess in human form."

Then went Arcite to the narrow window, and when he, too, saw Emelye walking in the sunlight, his despair was even greater than Palamon's.

"If," he cried, "I cannot see her day by day, I shall be nought but a dead man." Then, for the first time in their lives, there sprang up a feeling of enmity between the cousins.

This continued till one day a duke who knew Arcite, and who was an old and valued friend of Theseus, came to Athens. Hearing of Arcite's captivity, he begged Theseus to set the young Theban free. The request was granted on the condition that Arcite never again set foot on Athenian soil. For two years Palamon, still in prison, and his cousin, now at freedom, bewailed the cruel fate that divided them from the beautiful Emelye.

At last Arcite could bear his pain no longer and returned to Athens as a poor laborer. In this guise he obtained a humble post in the household of the duke. Then, one night, Palamon was enabled to drug his jailer and escape to a little wood near by, where he met Arcite. The two fell to quarreling afresh over the object of their mutual affection. At length Arcite said he would bring food and weapons, so that on the morrow they could fight for the lady Emelye.

They were engaged in this conflict when they were surprised by Theseus and his retinue. Theseus, learning from Palamon who they were, condemned both to death. But on the intercession of the ladies of the company he ordained that the two rivals should go away for fifty

weeks. At the end of such period each should return with fifty knights, to attend a great tournament, the victor in which should have the fair Emelye's hand.

The time passed, and when the hour of the tournament arrived, it was decreed by Theseus that life should not be wasted. Should either of the leaders be taken prisoner or slain, the tourney would cease. Palamon was struck down by the Indian king Emetreus in Arcite's company, and taken prisoner. But as Arcite was riding proudly to the spot where Emelye was sitting, his horse stumbled, and he was fatally injured by the fall. While lying at the point of death in the palace of Theseus, Arcite sent for Emelye and Palamon. To Emelye he said:

"Nought may the woful spirit in mine heart
Declare a point of all my sorrow's smart
To you, my lady, that I love most;
But I bequeath the service of my ghost
To you aboven every creature,
Since that my life may now no longer dure.
Farewell, my sweet! Farewell, mine Emelye!
And softly take me in your armés tweye (two),
For love of God, and hark to what I say.
I have here with my cousin Palamon
Had strife and rancour many a day i-gon
(gone by),
For love of you, and eke (also) for jealousy."

But, he went on to say:

"In this world right now I knowé none
So worthy to be loved as Palamon,
That serveth you, and will do all his life.
And if that ye shall ever be a wife,
Forget not Palamon, that gentle man."

And so a brave man died. Emelye and Palamon were stricken with bitter grief, and Arcite's death was mourned by all Athens. Even Theseus bowed his head in sorrow. None could comfort him save his aged father, Egeus, "that knew this world's changes," and said:

"This world is but a throughfare full of woe,
And we be pilgrims, passing to and fro;
Death is an end of every worldly sore."

Theseus cut down the wood where the cousins had fought, and gave to Arcite a befitting funeral. Then it came to pass, when time had brought healing to the hearts of all concerned, that Theseus sent for Palamon and Emelye. That of two sorrows might be made a perfect joy, the duke ordered that these two should take one another as husband and wife.

So, with great rejoicing, the marriage was celebrated. Emelye loved Palamon so tenderly, and Palamon served Emelye so nobly—

That never was there word between them two
Of jealousy, nor of none other woe.

THE KNIGHT AND THE UGLY OLD WOMAN

THE TALE TOLD BY THE WIFE OF BATH

A KNIGHT of King Arthur's court by an unworthy deed had earned the penalty of death. But, the Queen and her ladies gaining the King's grace, the knight was handed over to the Queen. She promised him his life if, within a year and a day, he could tell her what it was that women most desired.

Time passed sorrowfully for the knight. No satisfying answer could he discover of anyone. The day on which he was once again to appear before the Queen drew near. As he was returning from his quest he met an ugly old hag who, addressing him, inquired what it was that he sought.

"Promise me," said the old woman, when he had told her his story, "that thou wilt do the next thing that I require of thee, if it be in thy power, and I will tell thee the answer."

The knight gave her his word, and together they journeyed to the Queen's court. Here, as instructed by the old woman, the knight declared that the thing most desired by women was power. This was the answer, and he was adjudged to have saved his life. Then up rose the old woman, and telling the Queen of his promise, asked his hand in marriage.

"Take all my goods and let me go rather!" exclaimed the knight. But he was kept to his bond. When his newly wedded wife upbraided him for his treatment of her, he taunted her with her lowly birth, as well as her ugliness and poverty. To this she replied in words that have been often repeated:

"Look who that is most virtuous alway,
Open and secret, and most intendeth aye
To do the gentle deedés that he can,
And take him for the greatest gentleman.
Christ will we claim of Him our gentleness,
Not of our elders for their old richesse.
For tho' they give us all their heritage,
For which we claim to be of high peerage,
Yet may they not bequeathé, for no thing,

To none of us their virtuous living.
That made them gentlemanly called be."

When the knight had repented of his unknightly mood, his wife asked him to choose which she should be—old, ugly and devoted to him, or young and fair, but vain and fickle. In reply the knight put himself in his wife's "wise governance."

"Then," said she, "I have the mastery, and I will be to you both fair and true."

As she spoke a magical change occurred: she became young and beautiful. The knight looked up and saw to his rapture that her words had indeed come true.

And thus they live, un-to hir (their) lyves ende,
In parfit joye.

THE CUNNING ALCHEMIST

THE TALE TOLD BY THE CANON'S YEOMAN

ALCHEMY was the chemistry of the Middle Ages and the forerunner of modern chemical science, but with it was mixed a good deal of superstition, and the great desire of alchemists was to find a way of making gold and silver from less valuable metals. Many believed that it could be done, and spent their lives in poverty, trying to devise a formula, or discover the "philosopher's stone" which would work the magic change and make them rich. Others pretended that they knew the secret, and the canon's yeoman, or servant, tells a story about such a man.

This unscrupulous alchemist was a clever, smooth-spoken fellow, and he lived by deceiving others; he had "bitrayed folkes many tyme." In London there dwelt a priest, a pleasant, generous man who was fairly well-to-do, although not rich. The alchemist came to him one day and borrowed a little money, promising to return it within three days. He did so promptly, to impress the priest with his apparent honesty, and then he said that out of gratitude for the loan he would teach his benefactor something of alchemy.

The priest was interested, and sent his servant to buy quicksilver, which they melted in a little crucible set in a bed of hot coals. The alchemist threw a mysterious powder into the crucible, and then, while the priest was not looking, took a piece of charcoal which he had previously hollowed out, filled with silver filings and stopped with wax. This he placed on the fire so that, when the wax melted, the silver dropped into the crucible. Then they made a mold and poured the liquid into it to harden, and the priest thought the powder had changed his quicksilver to silver. Again they tried the experiment, and this time the alchemist played his trick by means of a hollow stick which held the silver filings and with which he stirred the fire. The priest was so busy working the bellows that he did not see the melting silver drip from the end of the stick into the crucible. A third test was made with copper, and when the molten metal had been cast in the mold and thrown into water to cool, the alchemist cleverly substituted a bar of silver which he had concealed in his long sleeve, and which was shaped just like the mold.

They took the three little bars to a goldsmith, who assayed them with "fyr and hamer," and found them genuine. The priest was overjoyed and wanted to buy the formula for making the marvelous powder.

"What shal this receit coste? Telleth now!"

The alchemist answered that it was very valuable—

"I warne yow wel; for, save I and a frere (friar),
In Engelond ther can no man it make."

"No fors (no matter)," quod he, "now, sir, for goddes sake,
What shal I paye? telleth me, I preye."

"Y-wis (truly)," quod he, "it is ful dere, I seye;
Sir, at o word, if that thee list it have (if you want it),
Ye shul paye fourty pound, so god me save!
And, nere the freendship that ye dide er this
To me, ye sholde pay more, y-wis."

Forty pounds would equal several thousand dollars in our money to-day, and as the excited priest did not have that much ready money he had to borrow from his friends, thinking that once he had the formula he could easily repay them. But no matter how many times he tried the experiment for himself it would not work, for the powder was worthless. So instead of being a rich man, he found himself in debt for his trouble, and he never saw the alchemist again.

THE NEXT STORY OF FAMOUS BOOKS IS ON PAGE 5152.

SOME BEAUTIFUL FLOWERING SHRUBS



FLOWERING LOCUST

The common locust has such handsome foilage, and such quantities of fragrant white blossoms, that it has been planted extensively in European parks.



FLOWERING RHODODENDRONS

Rhododendrons, both native and foreign, are frequently planted in cool and shady places for their evergreen foliage and splendid heads of flowers.



FLOWERING DOGWOOD

Dogwood trees grown in the open are like small apple trees. The foliage takes on brilliant scarlet lines in fall, and the close clusters of berries are redder. The flowers are white or pink.



MOUNTAIN LAUREL

Mountain laurel is one of the handsomest of American evergreen shrubs, and is often transplanted to parks and gardens. Its flowers, which shade from white to a beautiful pink, generally bloom in June.



Courtesy, Chamber of Commerce, Salem, Oregon

Hydrangea is a showy and beautiful shrub, much used in parks and around public buildings.

STRIKING NORTH AMERICAN SHRUBS

ONE usually thinks of a shrub as quite tall, rather like a small tree, or at least like a bush, yet some shrubs creep along the ground and others climb high into the trees. To put it as plainly as possible, a shrub is a woody plant that does not die down to the ground each winter, but keeps its sideshoots from year to year, breaking into bloom each season from buds on these shoots.

Trees, especially when growing in a grove or forest, soon lose their sidebranches at the base of the trunk as they grow taller, and shoot up into tall shafts crowned by most of the branches growing in a head. Upright shrubs, on the contrary, retain their lower branches more frequently and become "bushy" in appearance.

The flowering shrubs in spring seem to light up the garden with sudden glory. Hydrangeas, dogwoods, azaleas and spireas are favorites. So is the Philadelphus, or mock orange, which most people call syringa. That name, in fact, was given to the philadelphus by botanists, and then taken away, and given to the lilacs.

The Lilac family is large. There are hardy ones that like crisp climates, and tender ones that grow best farther south. There are fragrant species and some with no odor, white lilacs, pale lavendar, deep bluish purple and reddish purple and red lilacs; single and double blossoms. No one who has ever been in New England in May can forget the thousands of lilac bushes in bloom.

Among the shrubs that creep is one that grows in many parts of eastern North America but is particularly dear to the people of Massachusetts. It is the Trailing Arbutus. It grows during the summer, shooting out long branches that trail along the ground, taking root here and there. Its leaves are oval or almost round in outline, leathery, rigid and evergreen. By autumn, the clustered buds at the end of the hairy twigs are almost ready to open. But they do not do so. Cold weather sets in, dead leaves drift over the plants, and, singularly protected by them, the arbutus waits until the spring sun warms it; then the flowers have but little growing to do, and soon open, among the first flowers of the season. Without doubt they were the first pretty flowers the Pilgrims found. Mayflowers they are called sometimes, or maypinks.

The flowers themselves are salver-shaped, waxen, and pink or white. They have a delicious "woodsy" fragrance that reminds one of sweet birch or of wintergreen, the spicy little evergreen shrub that is so close a relative of the arbutus. With the laurel, the azalea and the bearberry, they both belong to a large family—that of the heaths —which contains a great many odorous white or rosy-flowered shrubs.



L. W. Brownell

Azalea flowers of different varieties resemble one another very much. The pinxter flower (above) blooms before the leaves are fully expanded.

The lovely pink azalea of early spring is also called wild honeysuckle, and not without some reason, for its coronets of delicately cut, long-tubed flowers, poised on slender, brittle stems, do suggest honeysuckles, except for their color. The resemblance is aided by the quintet of very long stamens and two pistils, which are thrust out far beyond the petals. This character would lead one to suppose that wind carried the pollen from flower to flower. But the pollen grains are so coated with a viscid substance that strings of them may be drawn from the anther cells by the slightest touch of the finger. So probably insects are the messengers desired. The rich fragrance would also seem to be an attraction for insects. There is a white azalea, which blooms in midsummer in swamps, that is still more fragrant.

The mountain laurel, or kalmia, however, though very closely related to the azalea, is scentless. But so brilliant is the display of bloom on this evergreen shrub, which sometimes grows ten feet or more high, that no odor seems necessary even at night. It bears great flat-topped masses of flowers ranging in hue from white to deep pink, set off, like an old-fashioned bouquet, by a salver of stiff shining lance-shaped leaves, very dark green. Each flower is like a saucer which has a five-sided, rather than circular, rim. At each angle, and in each space between the angles, is a small pocket which projects on the outside like a little knob. Look at a newly opened flower. You will see that each one of the ten pockets has the tip of one of the ten stamens safely stowed away within it. Its filament springs in an arch from the center of the blossom. Run your pencil over the tops of the arches. You will probably jump with surprise, for every stamen has jerked its tip out of its pocket and is now standing stiffly erect. Now, if your pencil had been a bumblebee, he would have been well thumped by the unspringing stamens, and well dusted by the pollen jerked out of the open mouths of the pair of quaint jugs that form the anthers. He would have flown away disgusted, and lighted on another flower, whose trap had been previously sprung, perhaps, and would have rubbed off some powder on to the ready stigma.

Masses of laurel leaves are stripped from the bushes and used for holiday decoration, as they endure transportation well. One should be careful about throwing them, when discarded, within reach of young browsing animals, for this foliage contains a poison more deadly than strychnine, and many animals have been killed by eating it. Honey made from laurel bloom is also said to poison those who eat it. The narrow-leafed laurel, which is much smaller, with darker, smaller flowers, is known as sheep laurel or lambkill, showing that its dangerous qualities are suspected.

There is a group of relatives of these gorgeous shrubs that are very plain in appearance, crowded with little drooping white or rose-flushed, bell-shaped flowers, that in one case, at least, fairly tinkle when the bush is gently shaken. Some whortleberries are called bilberries in Europe; but in America we lump several kinds under the name blueberry or huckleberry, having a vague intention of calling those that are blue, with a waxen bloom like a grape, by the first name, and the shining black fruit by the other. Where these berries grow at all, they usually grow in great patches, and many women and children in the country earn money each year by picking and selling the little berries. These are so crowded on the branches that they may be plucked in handfuls.

The bears know how good they are; and the Indians put them into their porridge and into the corn cakes they cooked by the camp-

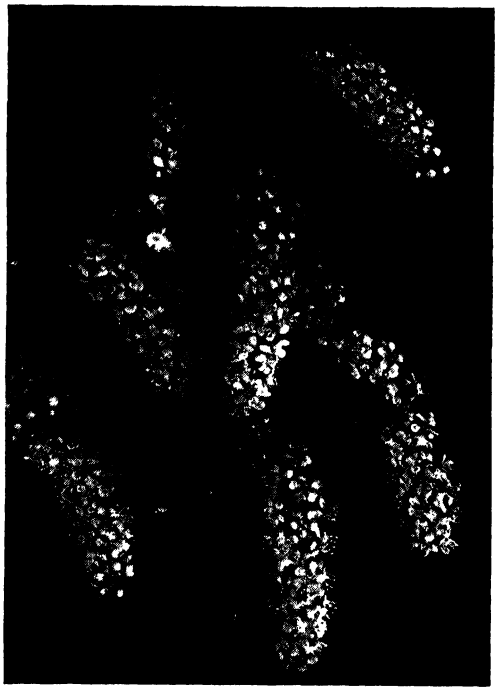
fire, and even into their dried meat cakes, which they called pemmican. In certain districts large tracts are burned over very early in spring every two or three years. This kills small trees and weeds among the low blueberry bushes, which grow very quickly and bear their best crop the year after they are burned over. The cultivation of this delicious berry is increasing.

THE SEED OF THE WILD RED CHERRY CONTAINS A POISON ACID

The Indians probably could not get much comfort out of the wild red cherries, for the flesh is very thin and very sour, but birds gorge themselves upon the plentiful scarlet fruit, and at least one little animal, the gray chipmunk, nibbles away at them wherever it can reach the clusters of fruit. When in flower, this slender little tree of our rocky woods is wreathed in a veil of tiny, star-like, snow-like blossoms. It would be well to regard this cherry with some suspicion, for the leaves of the more common black cherry, with racemes of fragrant flowers and of shining black fruit, are very dangerous to cattle (when partly wilted, especially), and it is probable that the other species would be equally so. Cherry seeds contain a wonderfully active and prompt poison, prussic acid, which may be set free in the stomach. It gives the pits the taste and odor of bitter almonds.

Blooming under the wild red cherry are the straggling bushes of the chokecherry, from which hang long clusters of luscious-looking scarlet berries which will pucker the mouth and throat most amazingly.

We are all familiar with the great maples, so often planted as shade trees, such as the scarlet, the sugar and the Norwegian kinds; but there is a delicate little maple that we rarely see unless we travel on the mountains or in the northern forests. It is uncommon, even then, outside of the woods themselves. It seems to be happy only in thickets of low trees covering rocky hillsides. In the north woods the hunters know it as moosewood, for those great deer, the moose, feed upon its large red-scaled buds. The other name of striped maple is quite apt, for its smooth dark green bark is lined up and down with delicate tracings of a white pigment that can be scraped off with the nail. Its great soft triple-pointed leaves are arranged in a fine spray, and from the twigs spring delicate pendent clusters of pale yellow bells, like fragments of necklaces; and, late in summer, follow strings of pale brown winged fruits



The lovely blossoms of the wild cherry tree.



Pictures, L. W. Brownell

Birds are very fond of the small, sour wild cherries.

that turn to gold when the rays of the setting sun strike through them.

In the same woods as well as those farther south, and very widely distributed, are the dogwood trees, the name being borrowed from a small European tree closely related to it, from whose bark a healing wash for dogs used to be extracted. In May they become snowy banks of bloom, but each apparent blossom is only a cloak for real flowers. In the center of the large white petals—as those who are not botanists very naturally call them—which form the cloak are grouped the real flowers, each quite complete in itself—a pale, somewhat slender floweret, four-parted at the margin. The snowy, striking, heart-shaped leaves we called petals are really "bracts" (a form of leaf that infolds, or closely attends a flower) which cover the flowers in the little square buds. They are at first green, but gradually become white as they unfold and expand. They serve to attract insects by making the tiny flowers very conspicuous, and also provide a platform upon which flying creatures may alight, so that they may search easily for, and suck up, the nectar from the very bottom of the yellow flower vases.



Berries of the poison sumac, found growing in swamps.

If we wish to see how the dogwood flowers would look without their brilliant bracts we may search in thickets or in woods for other varieties, mostly low shrubs. Some of them are quite common along roadsides, while others, and especially the round-leaved dogwood, prefer shady and rocky woodlands. The latter has a flat-topped cluster of starry flowers a little larger than those of the flowering dogwood, and quite white, but it has no brilliant bracts.

Along roadsides we may find the barberry, a tall bush, very straggling in its growth and crowded by a host of suckers. It came from the Old World, but has made itself at home here. It throws out long, slender and brittle branches, studded with tufts of small, obovate or spatulate leaves; but as soon as we pick a spray we discover that it is very fully armed with sharp spines that point in every direction. They are leaves that have been transformed entirely into spines like those of the cactuses. In autumn the ordinary foliage falls off, but the spiny leaves remain, ready to keep browsing animals away from the tender, growing twigs.

Racemes of pretty yellow flowers droop from the tiny barberry shoots in spring. Nectar is produced in saffron-colored swellings on the petals and on the filaments of the interior circle of stamens; for the six pollen-bearers stand in two whorls, slanting outward and lying in the concave faces of the similarly placed petals. The bases of these stamens are very sensitive, and when a bee flies upward to the drooping flower—that, like a roof, protects its stamens from rain—and plunges her feet or proboscis therein, seeking honey, she sets off a trap, as it were. The stamens fly upward at the slightest touch, toward the stigma, and tap the bee smartly on the head, snapping open the little trap doors at the top of the anther, and powdering the visitor thoroughly with pollen. The later racemes of oval scarlet berries droop from the bending branches during almost the whole winter. They are very acid—too tart to interest many birds. But they make delicious preserves, with a very distinct flavor.

The tulip tree grows best in damp soil, but the locust thrives best in dry and sandy land. It has a somewhat tropical look. Its leaves are divided into many rounded leaflets. Its spray, seen against the sunset light, looks like delicate seaweed, and the tree itself, when uninjured, suggests instantly the gray-tinted ones seen in the landscapes of the older French painters, or of Corot. However, the flowering locust is rarely seen in fine condition, for its branches are extremely brittle and are usually injured by borers,

and some are likely to crash down in every storm. In June it is a glory of bloom. Great clusters of racemes of pea-like flowers droop from every branch, white, with golden hearts —an American rival of the Japanese wistaria with the added virtue of very great fragrance.

But one must approach the tree with caution, for it is defended by vicious thorns, while stray thorns are scattered here and there on the main trunk, even near the ground, where we do not expect them. Brittle as the branches are, the wood, when properly seasoned, withstands decay admirably, especially when in contact with the soil, and is greatly sought for fence-posts.

Even more tropical in appearance than the locust is the stag-horn sumac with its crooked branches covered with thick, soft hair, not unlike the velvet of a young deer's horn. Its closely set pyramidal masses of acid fruits are also wrapped in crimson plush, as well they may be, for they crown the awkward brittle stems until spring, or as long as the birds will let them stay. Although sour and dry and velvety and difficult to swallow, they offer a sort of hard, unnourishing food to many a bird hard pressed by hunger in the winter season. Chickadees fairly haunt them, and cheerily peck the pyramids to pieces.

LIKE ITS RELATIVE, POISON IVY, POISON SUMAC IS DANGEROUS TO TOUCH

While we are prowling about the margins of swamps looking for the pin oak, we must take care not to run into, or handle, the poison sumac, or swamp elder, as it is sometimes called. It is most dangerous in early summer, for then the flowers are opening, and even the flying pollen seems to be quite able to cause that itching inflammation of the skin which tortures some people so greatly, whether caused by the poison ivy of the fence-posts, or by its relative the poison sumac of the swamps. This is a shapely shrub or small tree, which often grows among alders and elders. Its rather long and bare, slender limbs bear at the top a great cluster of leaves composed of from seven to thirteen pointed leaflets. These stand up from the mid-rib in a way that is quite unlike the attitude of the leaflets in other trees. They are very glossy, of an odd shade of dark green above, and have red stems, while the mid-rib from which they spring is also red. This is a point to be remembered. The little green flowers fall loosely in long spray-like panicles from the axils of these leaves.

In the fall the leaves very early change to unusually brilliant shades of orange and vermilion, and when they have fallen to the mud, grape-like clusters of white berries still grace the tops of the branches, tempting birds to eat them, and occasionally tempting young folks with an eye for winter decoration to pick them. Sad, then, are the results, for root and branch, winter and summer, the poison sumac is poisonous to the touch.

W. H. Gibson has given us a catchy little jingle about the sumacs which may help us to remember the important differences between the poisonous and harmless sumacs.

Berries red,
Have no dread!
Berries white,
Poisonous sight!
Leaves three,
Quickly flee.

One should be cautious, moreover, in going to the leeward of a fire in which the poison shrubs are burning, and should never chew bits of wood without first examining them; the smoke from the fire or the chewed-up splinter of bark may result seriously even for persons who are not usually affected.

Although not quite so virulent as the swamp or poison sumac, the poison ivy, its close relative, is quite as dangerous. It is much more common, springing up in many an old field and woodland clearing, and climbing upon roadside fences, where it thrusts out its short branches into the faces of the passers-by. It climbs by means of rootlets protruding from the bark, and each leaf is made up of three leaflets of an irregular lobed, ovate outline. The number of leaflets is to be remembered, for the poison ivy is frequently confused with the innocent five-leaved Virginia creeper or the ampelopsis. The dark green leaflets of the poison ivy are thin, and do not have the warning red stalks of the poison sumac; but they have the same high gloss, and that takes on the same brilliant coloring in the autumn. The spreading of the poison ivy is due largely to the birds, which devour the berries eagerly, pallid, hard-shelled and unappetizing as they look to us. Some of the seeds passing through the bodies of the birds fall uninjured and proceed to sprout.

THE BRILLIANT, ORANGE-COLORED BERRIES OF THE BITTERSWEET

A much more gaudy climbing shrub is the bittersweet, that sometimes shares the fence-posts with the poison ivy. During the summer one hardly notices the pale vine, as it climbs by twisting its supple branches around

trees and other supports. One will sometimes find small trees in a grove, with a swollen portion around which a welt or groove winds spirally. This is a sign that some vine, and usually a bittersweet, has inwrapped the growing sapling so firmly that it has nearly strangled it, and forced it to grow in an unusual manner where the vine pinches, just as one's finger swells about a tightly tied string. Shade, or the upgrowing of the tree, generally kills the vine, and leaves the sapling free, but sometimes fragments of bittersweet are imbedded in the bark. In fall the orange-colored berries of the bittersweet split into four portions that bend backward and leave exposed a fleshy scarlet sphere called an aril, that covers the seeds. Scarlet and yellow placed together make each hue more brilliant, painters say, and doubtless these gaudy berries catch the eye of the birds and are carried afield by them, as are those of the poison ivy.



The bittersweet has vivid scarlet and orange berries.

Near the end of this very short list of shrubs I put the dangerous thorn apple, for it really is not a shrub at all, since each year the stalks are laid low by frost. However, it looks much like a great widely branching true shrub. Its unshapely, lobed, dark green leaves, rank in odor and arranged in clusters separated by long spaces of bare stem; the toughness of its branches; and above all its morning-glory-like flowers that bloom at night, and round spiked fruit, make it easily recognized. An interloper from the tropics, it thrives very well on our dust heaps and roadsides and grows rankly, forming thickets on the vacant lots of cities. There are two common sorts, one bearing exquisitely white flowers; the other, blossoms with violet corollas, and having purple stems and shades in its foliage.

The thorn apples, or daturas, are sometimes called Jimson weed, a shortened form of Jamestown weed. They are so called because soldiers eating its young sprouts near Jamestown, Virginia, in colonial times became delirious and acted as if half mad. This was because, while not poisonous to the touch, the thorn apples are poisonous when eaten. Large amounts throw the victim into a fatal stupor, but in slighter quantities induce delirium. Luckily, the fruit is not very tempting. The green, fleshy, ball-like capsules soon become dry and brown, and are thickly beset by long but not very sharp prickles. It soon splits open downward from



L. W. Brownell

The common barberry bush was brought from Europe.

the top, usually into four pieces, and the thin little black seeds can be plainly seen. These are the most dangerous parts of the plant, and children should be warned not to nibble them.

It is the shrubs that form the thickets which border the outskirts of the woods. They flourish in a continuous fringe by the banks of many country streams, arching over the currents and reaching out on the sunny side into rounded masses of foliage. Standing upon a hilltop, one can trace the winding course of streams whose waters can not be seen at all by the green cushiony line of bushes that marks their course. Such thickets are the favorite resort of small birds, which find among their recesses plenty of the insects or of the small fruits upon which they feed. They feel safe among the close twigs where they can not easily be seen by hawks or other enemies. Few small birds spend much of their time in the tall trees, but seek the thickets of shrubs.



L. W. Brownell

One variety of thorn apple bears a white flower. The seeds that slip from its fruit are poisonous.

Here, too, insects, snails and such small creatures live in the shaded soil and decaying leaves. These attract the toads, wood frogs and turtles; and after them go snakes and various of the smaller mammals, wandering rabbits, woodchucks, raccoons, foxes and so on.

Although the Himalayas appear to be the home of most species of rhododendrons, America possesses several of these lovely flowering shrubs. The most beautiful ones live chiefly on mountains, occasionally creeping down into cool shadowy glens of the lowlands. They arrive at their greatest size, that of small trees, in the southeastern mountains. They bear great clusters of pink or white spotted flowers, jutting out from massy foliage of dark, shining evergreen leaves.

Another evergreen shrub of the South is the climbing smilax, closely resembling its relatives the cat briers of the North. The twining stems, set with stiff leaves, are frequently sent north for Christmas decoration, along with the prickly foliage and scarlet berries of holly.

The black alder of swamps, which loses its foliage, but is strikingly adorned with close-crowded vermilion berries, belongs to the holly family, like the gay winterberry, the inkberry and the inconspicuous cassine, or yaupon. The leaves of the last named are dried and used as a tea in some places. They were formerly used by Indians for brewing the sickening "black drink" with which they ceremonially dosed and purified themselves. The leaves of the New Jersey tea, a widely branching little shrub, every twig tipped with bunches of tiny white flowers, were said to have served in an infusion, for a beverage; but the use of Labrador tea, woolly and astringent, appears to be more frequent in subarctic regions.

The West has a shrub, the mahonia, "which looks like a holly, fruits like a grape, and is a barberry." It is frequently seen in modern shrubberies, but although evergreen in its own home, will lose its foliage in the North if not protected, thus unduly exposing its blue fruit. In the warmer parts of California are found also the manzanitas, very conspicuous among other shrubs of the chaparral on account of their smooth red branches, pale foliage and large dark red berries.

The witch hazel, that sprawls in young forests, has flowers like rosettes of tiny golden ribbons. Both bark and leaves contain a great deal of tannin. An extract of the bark is much used to bathe tender skins and sore muscles. Not so long ago many people believed that a forked twig of this shrub properly held in the hands was able to point out where a supply of water could be found near the surface of the ground.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 4870.



Ewing Galloway

"The Old Swimmin' Hole" beloved by James Whitcomb Riley, now part of Riley Memorial Park, Greenfield, Ind.

AMERICAN LITERATURE

III. 1870-1900 — ROMANTIC YEARS

THE Civil War marked the end of one era and the beginning of another in the life and literature of the United States. For more than five years the whole nation had been absorbed in the struggle to preserve the Union. When it was all over a period of tremendous growth began; in population, in industry and trade, and in agriculture. The age of exploration of the West was over, the pioneer days were passing, and what had been raw frontier towns, in the vast area between the Mississippi River and the Pacific Ocean, were becoming rich, busy cities.

Literature, like a mirror, reflects the world about it, and the restless, changeful years after the Civil War brought forth a strange mixture of romantic and realistic fiction. There were many historical novels, filled with color and romance and showing nothing of the drabness or ugliness of the periods they portrayed. There were some novels, like those of Henry James and William Dean Howells, which were careful, critical studies of the manners of the age in which they were written. There were a few writers, like Stephen Crane and Frank Norris, who wrote with brutal realism about the ugly evil side of the life about them. These three types of writing, the romantic, the moderately realistic and the grim, characterized the short story as well as the novel as we shall see later on in this chapter.

Of the more distinguished novelists of the period, four are of special interest: Mark Twain (1835-1910), William Dean Howells (1837-1920), Henry James (1843-1916) and F. Marion Crawford (1854-1909). These four men and the kind of books each wrote give a remarkable example of the variety and contrast of the literature of their time.

Mark Twain's real name was Samuel Langhorne Clemens, but he will probably always be known by his pen name. Born in Missouri and brought up on the shores of the Mississippi River, for a time young

Clemens served as a pilot on a Mississippi steamboat. When he began to write articles and books he took his pen name from the calls of the pilots as they measure the depth of the stream: "Mark one! Mark twain!" and so on. HUCKLEBERRY FINN and LIFE ON THE MISSISSIPPI, his two greatest works, are filled with Mark Twain's memories of the characters and events along the course of the great inland waterway when river travel was at its height. TOM SAWYER, one of the most famous of all stories of boyhood, was based upon Mark Twain's own adventures as a boy in Hannibal, Missouri. You will find one of Tom Sawyer's adventures told in another part of your BOOK OF KNOWLEDGE.

After a few years of steamboating, young Clemens, who had been trained as a printer, began a career as a newspaper man which took him all over the United States and to many other parts of the world. The travel sketches and stories that he wrote made him famous as a humorist. INNOCENTS ABROAD, based on a tour of the Mediterranean, Palestine and Egypt, and ROUGHING IT, the story of a trip to the Nevada silver mines and to the Hawaiian Islands, amused and delighted thousands of readers. Today these books no longer seem very entertaining. The humor, which is crude, seems to consist largely of sneering comment. Aside from a few of his short stories, the books by which Mark Twain will always be remembered are TOM SAWYER, HUCKLEBERRY FINN, LIFE ON THE MISSISSIPPI, A CONNECTICUT YANKEE AT KING ARTHUR'S COURT, THE PRINCE AND THE PAUPER and PERSONAL RECOLLECTIONS OF JOAN OF ARC.

THREE OF MARK TWAIN'S BOOKS ARE BASED ON HIS OWN BOYHOOD EXPERIENCES

Of these books, the first three are entirely American in their background, characters and happenings. They are truly realistic for they are drawn from the author's own knowledge and experience, but they have a freshness and vividness that comes from his love for the scenes where his childhood was spent.

The last-named three books have European historical backgrounds. THE CONNECTICUT YANKEE gives a realistic and most unromantic view of the legendary Age of Chivalry. Parts of the story are extremely funny and other parts are tragic. In THE PRINCE AND THE PAUPER we follow the contrasting adventures of the little King Edward VI of England and a poor boy with whom he changes places for a short time. The life of Joan of Arc is what we today call fictionalized biography. It is supposed to be told by a faithful friend who had followed the brave Maid all through her brief career. Mark Twain had a passionate and reverent admiration for Joan of Arc, and this book is wonderfully sympathetic and moving.

WILLIAM DEAN HOWELLS, A MIDDLE-WESTERNER, "ADOPTED" BOSTON

Like Mark Twain, William Dean Howells came from the Middle West. He was born in Ohio and began his career as a printer and reporter on a Columbus newspaper. In 1860 he wrote a biography of Abraham Lincoln to be used in the election campaign. This had an important effect upon Howell's career in two ways. With the money he received for the book he was able to go to Boston, then the literary capital of the United States. He came to know Hawthorne, Lowell, Emerson and others of the great New England writers and to love the Bostonian way of life. Then, when Lincoln was elected president, he appointed Howells United States Consul at Venice, Italy, and the author spent several years there. When he returned to the United States he settled down to the writing of novels and essays in his beloved Boston. He was for many years editor of THE ATLANTIC MONTHLY, and possessed a great deal of influence in the American literary world of the late nineteenth century.

Howells had a tremendous capacity for writing. For many years he wrote at least one novel a year, in addition to essays, magazine articles and even verse. He wrote about the lives and problems of the Americans of his own time, and while his novels were truthful, they were never sensational. He has been called a "selective realist," because, while he wrote of things truthfully, he often avoided entirely those parts of the truth which he felt were too unpleasant to dwell on.

Perhaps the most enduring of his novels are A MODERN INSTANCE, the story of an unfortunate marriage; THE RISE OF SILAS LAPHAM, which shows a man of character and integrity meeting the problems which are brought by good fortune and by bad fortune; and A HAZARD OF NEW FORTUNES. This novel gives an interesting view of New York in the 1880's. It was a time when many men with sudden, and often ill-gotten, fortunes had come to the city to live. There were sharp contrasts of poverty and wealth, and a great deal of social unrest. The char-

CREATOR OF HOMESPUN HUMOR



Underwood & Underwood, N. Y.

Mark Twain's real name was Samuel Langhorne Clemens. He took his picturesque pen name from one of the calls used by the Mississippi steamboat pilots as they made their soundings—"By the mark, twain!"

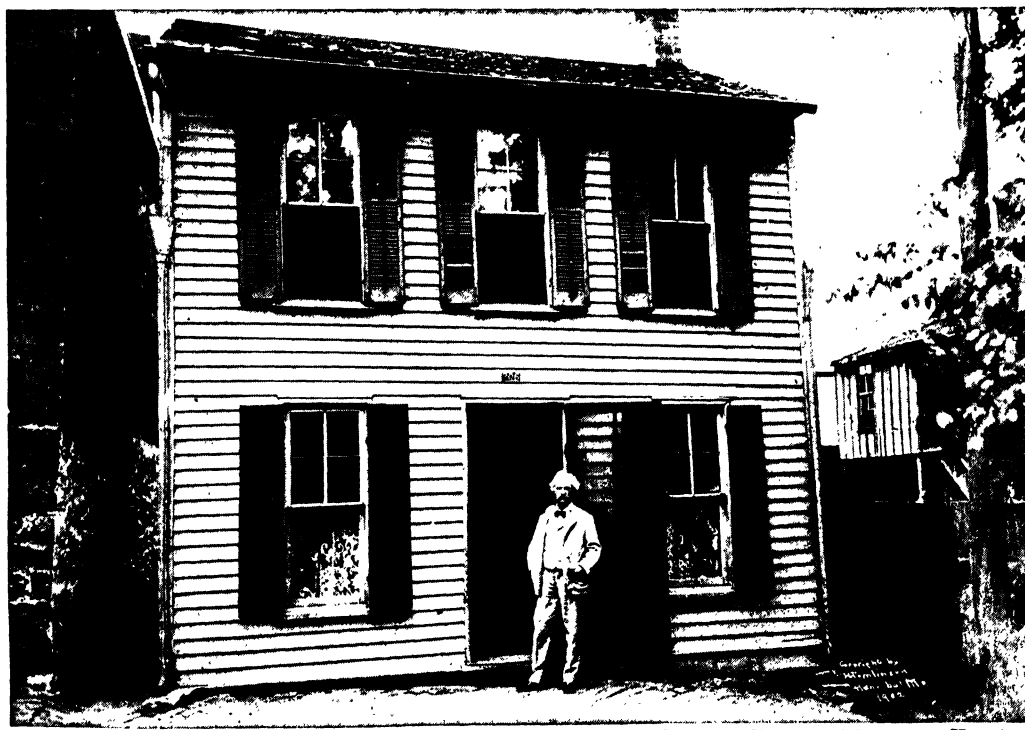
acters in this novel are drawn from many different walks of life, so that the reader gets a varied and vivid picture of a dramatic age.

Howells and Mark Twain, who, by the way, came to be great friends, both came from the heart of America to make their permanent homes in the East. The other two distinguished writers whom we mentioned, Henry James and F. Marion Crawford, were Americans who chose to spend the greater part of their lives in Europe.

Henry James was born in New York City and attended Harvard University, but the greater part of his education was acquired within his own family. His father, the elder Henry James, was a philosopher and theologian who was acquainted with many learned and famous people on both sides of the Atlantic Ocean. The older son, our Henry's brother William, became a famous philosopher. The James family spent a great deal of time in London, Paris, Geneva and other European centers of culture, and the young Henry grew to feel more at home in the Old World than in his native land. From 1876 until his death in 1916 he made his home in England, and after the outbreak of the first World War became a naturalized British subject.

Henry James wrote a tremendous number of novels, novelettes and essays. His books did not have a wide popular appeal, but he was, and is still, considered one of the great masters of the art of novel-writing. James wrote about a small section of humanity, people of wealth and leisure. The scenes of most of his stories are laid in London, Paris or Italy, and his chief characters are usually Americans, coming from their young, free world into the world of the European aristocracy, bound in a thousand ways by centuries of custom and habits of thought. James analyzed the moods and emotions and actions of his characters with delicacy and skill, and he did it in a style of writing that was elaborate, yet precise.

Francis Marion Crawford was born in Italy of American parents. His father was the famous sculptor, Thomas Crawford, and he was a nephew of Julia Ward Howe, who wrote THE BATTLE HYMN OF THE REPUBLIC. Although he received some of his education in the United States, and he always considered it his home, most of his life was spent abroad, and his best novels were



Courtesy, Chamber of Commerce, Hannibal

This picture was taken in 1902, when Mark Twain went back to his boyhood home in Hannibal, Missouri, on a visit.



T. F. Healy Collection
William Dean Howells when he was about sixty.

written about Italy. He wrote about the old Italian nobility and his stories are smooth-flowing, vivid and full of romance and drama. Many of them show the strong strain of religious mysticism that was in him. Among his best novels are SARACINESCA, SANT' ILARIO and DON ORSINO, but the one which is probably best known to modern readers is THE WHITE SISTER. These were all stories of Italy, but he wrote also a very famous novel about India called MR. ISAACS. As a young man he had spent two years in India, studying Sanskrit and editing a newspaper in Allahabad. Crawford's books have highly developed plots, but his characters are so lifelike and the settings so vivid that the books would be absorbing to read even if there were not quite so much story to them.

Howells and James were, each in his own special way, moderately realistic writers; Crawford was romantic and mystical; Mark Twain's writing ran the whole scale, from a rather harsh bitter realism to romantic sentimentality. All of Mark Twain's moods were, however, made sharper and brighter by the gift of laughter that almost never failed him. There were, as we have said, other writers who looked at the world about them and saw only its poverty and cruelty and injustice. They thought that other people should be made to see these things and so they wrote about them.

STEPHEN CRANE'S "RED BADGE OF COURAGE" ONE OF THE GREAT BOOKS OF THIS PERIOD

Two of the most outstanding of these grimly realistic writers were Frank Norris (1870-1902) and Stephen Crane (1871-1900). Both men died young, and we can not know how far their later work might have developed. Both wrote with great power. When he was only twenty-one, Crane wrote MAGGIE, the sordid and tragic story of a poor family in the slums of New York. His best-known work, however, is THE RED BADGE OF COURAGE. This is a story of the American Civil War and it tells of the state of mind of a raw recruit who is under fire for the first time. Since the first World War we have had many books dealing with the terror and discomfort and misery of war, but none has been more vivid and realistic than THE RED BADGE OF COURAGE. The most amazing thing about the story is that the author himself knew nothing about war except from books or from hearsay. It takes both intelligence and imagination to enable one person to put himself in another person's place.

Frank Norris, in MCTEAGUE, showed the degenerating effect of greed and miserliness on human character. In THE OCTOPUS and THE PIT he gives a realistic and fascinating picture of the business which had grown up to sell and buy and transport the huge American wheat crop. These novels were to have been part of a trilogy called The Epic of Wheat, but Norris died before the third book was written.

Other realistic works of fiction which must be mentioned were THE STORY OF A COUNTRY TOWN by the famous Kansas newspaper man, Edgar Watson Howe (1853-1937), a story of the darker side of life on the prairie frontier; the short stories of Hamlin Garland (1860-1940), of farm life in the Middle West; and many short stories by Ambrose Bierce (1842-1914). Bierce was a newspaper man who served in the Civil War and lived in London, and also in San Francisco. His death is shrouded in mystery, but it is generally believed that he died in Mexico in 1914. There were many other writers of realistic fiction in the years before the turn of the century, and we shall tell of some of them when we tell you about the development of the short story.

It is said that where the dark waters of the muddy Missouri River flow into the

upper Mississippi you can see the two different streams, one dark and one clear, flowing side by side for many miles down the combined river that we call the Mississippi. So it was with the fiction of the last thirty years of the nineteenth century. Grim realism flowed side by side with cheerful romanticism, and the two streams did not really become completely merged until well into the twentieth century. The stream of romance contained a great many historical novels. The people of the United States, having conquered and settled their own land, and preserved its unity in a bloody war, turned to the past, both of their own country and of the lands that many of them had come from. But they wanted to read about the colorful and romantic part of the past: the things that were as different as possible from the busy, workaday world in which they lived. Many writers rose up to fulfill this need, and their books became very popular. As literature, some of the books were better than others, but all are important to us because they show what the people at that time liked to read.

SOME OTHER ROMANTIC NOVELS WHICH YOUR GRANDPARENTS LOVED

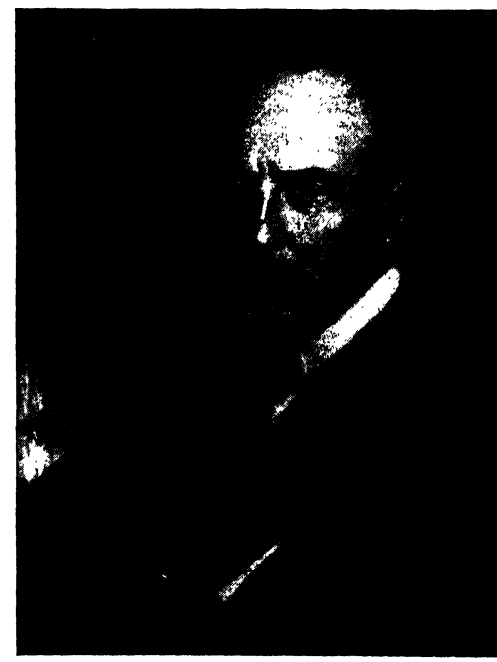
One of the most famous of these historical novels was BEN HUR, by Lew Wallace (1827-1905), a general in the Union Army during the Civil War. BEN HUR is a story of the time when Christ was upon the earth. It is thrilling and romantic; and its religious theme had, and still has, a strong appeal. Very likely you have read it or have seen it in the movies. It has been played on the stage and the screen many times. There were other religious novels which were popular, but few equaled the fame of BEN HUR. Wallace wrote two other novels, THE FAIR GOD: A STORY OF THE CONQUEST OF MEXICO, and THE PRINCE OF INDIA: OR, WHY CONSTANTINOPLE FELL.

Charles Major (1856-1913), a native of Indiana, liked to write about the picturesque days of French and English history. His most famous story is WHEN KNIGHTHOOD WAS IN FLOWER. This book tells how the younger sister of King Henry VIII fell in love with and was finally able to marry a young nobleman of England, in spite of the quite different plans that had been made for her by the King and his advisers.

Mary Johnston (1870-1936), a Virginian, wrote many romances of her native state, but the one that is still most popular is a story of the early settlement of Virginia, TO HAVE AND TO HOLD. It follows the fortunes of a young lady of the Court who fled to Virginia from England to escape marriage with a man whom she did not like. In Virginia she has many adventures, including pirates, Indians, shipwreck; and, of course, the book has a happy ending.

The American War of Independence inspired a number of historical romances. Among the best of these is JANICE MEREDITH, by Paul Leicester Ford (1865-1902). Ford, who was a Philadelphian, was really an accomplished writer on historical and antiquarian subjects and he wrote very little fiction. However, JANICE MEREDITH is a novel of extraordinary charm. The characters are human and convincing, and there is the most natural and likeable portrait of George Washington that has yet been written. Beginning in New Jersey, the action follows Washington's little army to the grand climax at Yorktown. There are also fascinating scenes laid in Philadelphia and New York when the British held those cities.

RICHARD CARVEL, by Winston Churchill (the American novelist, not the British statesman), takes its hero to the high seas with John Paul Jones, and shows us a delightful glimpse of high political and social life in England at a time when many Englishmen sympathized with the colonies.



C. Pirie MacDonald

F. Marion Crawford, who wrote novels about Italy.

BEGINNING OF A GREAT ADVENTURE



Gramstorff Bros. Inc., Malden, Mass.

An illustration from one of Henry James's most delightful novels, Daisy Miller. It shows Daisy, the heroine, setting forth from New York harbor on her first trip across the Atlantic. Like other works by the same author, this one deals with the misunderstandings common between American travelers and their European hosts.

S. Weir Mitchell (1829-1914), a Philadelphia physician who was also a novelist, wrote THE RED CITY and HUGH WYNNE: FREE QUAKER, both about Philadelphia during the Revolution, and both delightful and satisfying books to read. Maurice Thompson (1844-1901), in ALICE OF OLD VINCENNES told the thrilling story of General George Rogers Clark's conquest of what are now Indiana, Ohio and Illinois. A few years after the time about which we are telling, Winston Churchill also wrote a fascinating novel about Clark's expedition, called THE CROSSING.

In addition to the interest in historical fiction, there was a tremendous interest in what is called regional, or local-color, fiction. This is a story or novel which brings out the characteristics peculiar to one particular section of the country, such as the mountains of Tennessee, or the villages of upstate New York, or the mining camps of California or the townships of New England. Many novels were written about such special localities, and a great many more short stories were written about them during the last years of the nineteenth century. Let us look first at some of the novels.



Henry James, whose novels lost favor for a while, but are once more gaining popularity.

In 1898 a novel called DAVID HARUM was published. It was written by Edward Noyes Westcott (1846-1898), and it started a whole school of rural and small-town fiction. The principal character, David Harum, is a good natured, apparently lazy, small-town character, a clever horse-trader and a shrewd counselor who can solve practically any problem that his friends and fellow-townsmen bring to him. In this story the author brings out the local customs and speech of a little village in New York State in the 1890's. The book was enormously popular and is still read and quoted.

Entirely different, but quite as interesting, are RED ROCK, a story of plantation life in Virginia by Thomas Nelson Page (1853-1922), and COLONEL CARTER OF CARTERSVILLE, another story of Virginia characters by Francis Hopkinson Smith (1838-1915). Americans were becoming interested in the life and speech and customs of the different parts of the vast land they lived in, and the writers of fiction were happy to fill the demand.

The short story had been growing in quality and in popularity for many years, and in the period after the Civil War there were a great many excellent magazines to print this kind of fiction. THE ATLANTIC MONTHLY, published in Boston, HARPER'S, THE CENTURY and SCRIBNER'S, in New York, and many other magazines, were eager for good stories, well written. Many American writers of short stories and novels first appeared in these periodicals, and the regional story had its greatest development in their pages. Some of these writers followed the current of realism, showing the drab, unpleasant aspects of the life they wrote about. Others stressed the humor and romance and charm of their chosen localities.

Among those who wrote about New England, two women, Sarah Orne Jewett (1849-1909) and Mary E. Wilkins Freeman (1862-1930), were outstanding. Sarah Orne Jewett wrote about the abandoned farms and decaying seaports of Maine; places that were busy and flourishing in the days of the clipper ships but which the steamships passed by. Miss Jewett's stories are serene and clear-cut, like delicate etchings. Some of the best are contained in the books called DEEPHAVEN and THE COUNTRY OF THE POINTED FIRS.

Mary E. Wilkins Freeman was a native of Massachusetts, and most of her short stories and novels are about people in the little villages of that state. Her characters lead drab, frustrated lives and the author tells their stories without trying to brighten or soften the truth as it appears to her. A NEW ENGLAND NUN and A HUMBLE ROMANCE are typical of her best work.

Thomas Nelson Page and F. Hopkinson Smith wrote many charming short stories of life in Virginia. Like most stories of the South written in the years after the Civil War, they were rather sentimental and ideal-



T. F. Healy Collection

S. Weir Mitchell, a doctor whose hobby was writing.

ized, for they dealt with a life that had passed away. Joel Chandler Harris (1848-1908) of Atlanta, Georgia, collected the songs and folk tales of the old plantation Negroes and wove them into the UNCLE REMUS stories. The adventures of Brer Rabbit and the tarbaby, Brer Fox and Brer Tarrypin have become famous wherever the English language is spoken.

Farther south George W. Cable (1844-1925) wrote novels and short stories about the people of French descent in New Orleans. THE GRANDISSIMES, his best-known novel, and the stories published under the title OLD CREOLE DAYS, have a richness of color, a mingling of laughter and tragedy, that is unlike anything else in the American literature of the period.

Three women writers who wrote about the people of the Appalachian Mountains were Mary Noailles Murfree (1850-1922), Alice French (1850-1934) and Constance Fenimore Woolson (1848-94). Miss Murfree wrote under the pen name, Charles Egbert Craddock, and it is said that the editors who had been publishing her stories were perfectly astonished when she visited them and they found she was really a woman. She lived among the Tennessee mountaineers and knew them thoroughly, and she had a gift for setting down their speech and their way of life. Alice French, whose pen name was Octave Thanet, wrote chiefly about the people of Arkansas; and Miss Woolson wrote about the people of the Great Lakes region and Florida, as well as the mountaineers.

One of the most delightful books about life in the frontier settlements is THE HOOSIER SCHOOLMASTER, a story of Indiana by Edward Eggleston (1837-1902). This story of the young man who went to teach in a tiny rural school has humor and excitement and romance, but the dialect and the characters are truly realistic. In your BOOK OF KNOWLEDGE you may read the amusing and exciting story of the spelling bee from Eggleston's book.

James Lane Allen (1849-1925) was a Kentuckian who wrote charming stories about his native state. The best of his stories are those in FLUTE AND VIOLIN, and the novel, A KENTUCKY CARDINAL. Allen was a naturalist and his stories are filled with the lore of birds and flowers; but there is also a curious sadness that seems to pervade even the brightest of them.

One of the most celebrated of the American fiction-writers of the last half of the nineteenth century was Francis Bret Harte (1839-1902), better known as Bret Harte. Although he was born and brought up in New York, it is with California and the Old West of the Gold Rush that we associate him. He was a humorist, a poet and storyteller; and his best works are such stories as THE LUCK OF ROARING CAMP, THE OUT-



Joel Chandler Harris, collector of Negro folk tales.



Gramstorff Bros Inc , Malden
Mary E. Wilkins Freeman wrote novels of New England.

CASTS OF POKER FLAT and M'LISS. All of them are highly colored with humor, pathos and drama.

Frank R. Stockton (1834-1902) and H. C. Bunner (1855-96) wrote short stories and novels that were quite out of the ordinary. Stockton's most popular novel, THE CASTING AWAY OF MRS. LECKS AND MRS. ALESHINE, is a humorous tale of two jolly widows who are shipwrecked in the Pacific and cast up on an island. One of his short stories, THE LADY OR THE TIGER? caused arguments and debates all over the country. It has a puzzle ending which is left for each reader to solve in his own way. The very best of his stories, however, were the dozen or so fairy tales that he wrote. H. C. Bunner wrote witty, sparkling stories of great originality, as well as brilliant light verse. Some of his best stories are in the collections, SHORT SIXES and STORIES TO BE READ WHILE THE CANDLE BURNS.

A fiction-writer, who was also a famous war correspondent for the newspapers, was Richard Harding Davis (1864-1916). He was himself a romantic figure and he wrote romantic stories. Many of his short stories have backgrounds and characters suggested by his experiences as a correspondent. His most celebrated novel, SOLDIERS OF FORTUNE, takes place in a Central American country during a revolution. Davis reached fame during the Spanish-American War period, and so did another and quite different writer, Finley Peter Dunne (1867-1936). Finley Peter Dunne, better known as Mr. Dooley, was a satirist and humorist, and one of the greatest that America has ever produced. The work that made him famous was a series of sketches in Irish-American dialect, in which events of the day are discussed by "Mr. Dooley" and his friend "Hennessey." Behind all of the wit and fun in these sketches was a keen mind, liberal in thought and penetrating in judgment.

The last decades of the nineteenth century did not produce any new poets to compare with Whitman, Longfellow or Poe. Perhaps the greatest was Sidney Lanier (1842-81) of Georgia. Lanier was an accomplished musician and to him poetry was simply a branch of music. Sometimes his poetry suffers from too much color and too intricate rhythms but much of it is very beautiful. THE MARSHES OF GLYNN is his finest long poem, though THE SONG OF THE CHATTAHOOCHEE is more widely known

Two other Southern poets, both, like Lanier, veterans of the Civil War, were Abram Ryan (1838-86) and John Banister Tabb (1845-1909). Both of these men became Catholic priests, and Father Ryan was a chaplain with the Confederate Army. He has been called "the poet of the Lost Cause," and his IN MEMORIAM, THE CONQUERED



Sidney Lanier, a Southern poet and musician. His poetry was greatly influenced by the music he loved.



T. F. Healy Collection

THE HEATHEN CHINEE of Bret Harte, Ah Sin by name.

BANNER and THE SWORD OF ROBERT E. LEE have long been loved in the South. Father Tabb wrote lyric poetry of delicacy and beauty, though there is an impersonal quality even about his nature poems. Some of his religious poems have a true mystical strain.

Thomas Bailey Aldrich (1836-1907) and Richard Watson Gilder (1844-1909) were both famous editors and talented poets. Aldrich was also one of the leading writers of short stories, and the author of THE STORY OF A BAD BOY, a novel based on memories of his own childhood. Gilder's sonnets in his collection entitled THE NEW DAY are exquisite in beauty and feeling. Aldrich wrote graceful verses in which perfection of form is balanced by a kind of wistful gaiety of feeling. His verse has been compared to that of his favorite Latin poet, Horace.

Celia Thaxter (1835-94) spent her childhood on the islands off the coast of New Hampshire, where her father was a lighthouse-keeper. She wrote many poems filled with the moods of the sea and the lonely northern islands. One of them, THE SANDPIPER, is well known and loved by children today: you will find it in one of the poetry chapters of your BOOK OF KNOWLEDGE.

Richard Hovey (1864-1900) is best known for the celebrated SONGS OF VAGABONDIA that he wrote with Bliss Carman, the famous Canadian poet. These are romantic, gay poems filled with the love of nature and the lure of the open road. Hovey also wrote a series of long poems about Lancelot and Guinevere at King Arthur's court. He died before he was able to complete the series.

In the year 1890, several years after their author's death, there was published the first volume of the poems of Emily Dickinson (1830-86). These and the volumes which were published later revealed to the world the work of one of America's finest poets. Emily Dickinson lived all her life in Amherst, Massachusetts, and for the last half of her life scarcely went outside her own garden gate. All of that time, however, she was writing hundreds of verses, simple in form but fresh in thought and strong in feeling. Many of them are today looked upon as masterpieces.

Joaquin Miller (1839?-1913), whose real name was Cincinnatus Heine Miller, was a quite different sort of poet. He was a picturesque character who grew up in the West and was one of the first American poets to sing of the West. His SONGS OF THE SIERRAS brought him fame, but it is probable that his short poem, COLUMBUS, will live longer than most of his other work. (You will find this poem in your BOOK OF KNOWLEDGE.)

EUGENE FIELD AND JAMES WHITCOMB RILEY, POETS OF CHILDHOOD

Eugene Field (1850-95) was a newspaper columnist, a humorist and a poet. Boys and girls everywhere know his WYNKEN, BLYNKEN AND NOD, LITTLE BOY BLUE and other poems that he wrote for children and for those who love children. Field was a product of the Middle West, at the time when that section of the United States was producing an extraordinary number of talented writers of all types. Another poet of the Middle West who wrote for children, and grown people too, was James Whitcomb Riley (1849-1916). It is safe to say that no verses have ever become more popular with Americans and Canadians than those of Riley. He wrote about the homely things of farm and small-town life, quite often in the dialect of the Indiana countryside. LITTLE ORPHANT ANNIE, THE OLD SWIMMIN' HOLE and WHEN THE FROST IS ON THE PUNKIN have become almost a part of American folklore.



T. F. Healy Collection

Thomas Bailey Aldrich; May Alcott, Louisa's artistic sister; and James Whitcomb Riley, painted by Sargent.

We must tell you something about the writers of history during this period. There were not so many of them as there had been earlier in the century, in the time of Parkman and Bancroft and Prescott. Among the most important was John Fiske (1842-1901). Fiske did not open up any new fields of thought about the past, but he took the ideas of the three great nineteenth-century English thinkers, Darwin, Huxley and Spencer, and explained and interpreted them with brilliance and clarity. Although other historians do not always consider his work thorough and reliable, it is never dull or dry. He did much to spread the new philosophical and historical ideas of the nineteenth century in the United States.

James Ford Rhodes (1848-1927) was one of most distinguished writers of American history. He was born in Cleveland, Ohio, and though he was never graduated from any college, his historical writing earned him the honorary doctorates of ten universities, both in America and abroad. Rhodes began his career as a business man, but even as a child he had wanted to write, and he devoted a great deal of his time to study, especially the study of American history. Finally, in 1877, he began preparations for the writing of a history of the United States. The actual writing was begun in 1887 and the first volume appeared two years later. There were nine volumes in all, the last one being published in 1928. The history covers the period from the Compromise of 1850 to the end of the Theodore Roosevelt Administration in 1912. For this great achievement Rhodes was awarded the Pulitzer Prize in 1918.

Edward Eggleston, about whose story, THE HOOSIER SCHOOLMASTER, we have already told, also wrote historical works. He believed that history books should tell of the lives of the people, rather than dwell entirely upon political movements, dates and statistics, and that is the way he wrote his HISTORY OF THE UNITED STATES AND ITS PEOPLE, THE TRANSIT OF CIVILIZATION FROM ENGLAND TO AMERICA and several other works. He planned vast historical works, but his health was poor and he was never able to carry out all of his plans.



Harper & Bros.

Emily Dickinson, unknown in her own day.

One of the most brilliant thinkers ever produced in America was Henry Adams (1838-1918), the great-grandson of President John Adams and the grandson of Pres-

ident John Quincy Adams. The Adams family has been one of the most distinguished in America, and in each generation has produced writers, statesmen and diplomats of outstanding ability. Henry Adams was frail from his childhood, and his health and temperament probably had much to do with the rather gloomy view that he took of the world during his adult life. He was a spectator of life rather than an active player. He traveled to many parts of the world, he knew intimately many of the great and famous of the world, and he himself regarded his life as being one long education.

The most famous of his books, which was published after his death, was entitled THE EDUCATION OF HENRY ADAMS. Another equally admired work is MONT-SAINT-MICHEL AND CHARTRES. In this he used the famous abbey and cathedral, which are considered the most glorious examples of the spirit of the Middle Ages expressed in architecture, to illustrate his philosophical theories. Henry Adams was for several years assistant professor of history at Harvard, and he wrote a number of historical essays and biographies, but these two books are the ones by which he will be remembered.

Two strange and interesting books which excised a great deal of influence in the last part of the nineteenth century were LOOKING BACKWARD, a novel by Edward Bellamy (1850-98), and PROGRESS AND POVERTY, a book on economic reform by Henry George (1839-97). Both were written for a definite purpose. First we shall tell about the novel, LOOKING BACKWARD. It tells of a man who is put to sleep in the year 1887 and awakens in the year 2000, to find that great and wonderful changes have taken place in the world: there is no more war, no more poverty, no more crime. The rest of the story is taken up with the explanation of how this ideal state of affairs has come about. It has done so through a form of socialism and co-operative living which is told about in detail.

Bellamy believed that the theories outlined in his book could be made to work in actual practice, and he spent the rest of his life preaching his beliefs. Many other people believed that he was right, and clubs were formed in different parts of the country to try and spread these ideas. Since that time other theories of social and economic reform have arisen, but there are still some people who are followers of Bellamy.

Henry George's PROGRESS AND POVERTY is not a novel. It is a brilliantly and persuasively written book which preaches the idea that certain reforms, especially concerning the ownership of land, would do away with most of the evils of our world, including poverty, crime and economic injustice. The chief reform that George urged is called the Single Tax. He believed that all land should belong to the government, and that the people who used the land should pay a tax or rent based on the profit gained by its use. No other taxes were to be paid by anyone.



International News

A monument to Eugene Field in Chicago, celebrating his beloved lullabies.

Both of these books are interesting to read, for both were written with charm and brilliance. Henry George wrote a number of other works in support of his theories, and he has had many followers. As recently as 1946 there were schools where his theories were taught, and groups of people who wished to see them put into practice.

You will notice if you look at the birth and death dates of the authors we have told you about, that many of them were living until well after the first World War. Some of them, indeed, did much of their best work after the opening of the present century. This century, however, saw the rise of many new writers whom we will tell about later.

THE NEXT STORY OF LITERATURE IS ON PAGE 4814.

SOME OTHER LATE NINETEENTH CENTURY WRITERS

Louisa May Alcott (1832-88)
Fiction
LITTLE WOMEN
AN OLD-FASHIONED GIRL
LITTLE MEN
EIGHT COUSINS
ROSE IN BLOOM

John Burroughs (1837-1921)
Essays
WAKE-ROBIN
BIRDS AND POETS
FAR AND NEAR
THE WAYS OF NATURE

Will Carleton (1845-1912)
Verse
FARM BALLADS
CITY BALLADS
RHYMES OF OUR PLANET

Charles Edward Carryl (1841-1920)
Fiction
DAVY AND THE GOBLIN
THE ADMIRAL'S CARAVAN

Kate Chopin (1851-1904)
Fiction
AT FAULT
BAYOU FOLK
A NIGHT IN ACADIE
THE AWAKENING

John Esten Cooke (1830-86)
Fiction
STORIES OF THE OLD DOMINION
MY LADY POCAHONTAS

Rose Terry Cooke (1837-92)
Fiction
SOMEBODY'S NEIGHBORS
ROOT-BOUND AND OTHER SKETCHES

Mary Mapes Dodge (1831-1905)
Fiction
HANS BRINKER: OR THE SILVER SKATES
DONALD AND DOROTHY

Paul Laurence Dunbar (1872-1906)
Verse
OAK AND IVY
MAJORS AND MINORS
LYRICS OF LOWLY LIFE

Mary Baker Eddy (1821-1910)
Religious Works
SCIENCE AND HEALTH
THE SCIENCE OF MAN

Edgar Fawcett (1847-1904)
Fiction
PURPLE AND FINE LINEN
THE ADVENTURES OF A WIDOW

Francis Miles Finch (1827-1907)
Verse
THE BLUE AND THE GRAY AND OTHER VERSES

Harold Frederic (1856-98)
Fiction
THE DAMNATION OF THERON WARE
THE COPPERHEAD

Lafcadio Hearn (1850-1904)
Fiction
CHITA: A STORY OF LAST ISLAND
SOME CHINESE GHOSTS

Thomas Wentworth Higginson (1823-1911)
Essayist and historian
ATLANTIC ESSAYS
CARLYLE'S LAUGH AND OTHER SURPRISES
A READER'S HISTORY OF AMERICAN LITERATURE

Josiah Gilbert Holland (1819-81)
Verse
GARNERED SHEAVES
THE PURITAN'S GUEST AND OTHER POEMS

Marietta Holley (1836-1926)
Humorous Essays
MY OPINIONS AND BETSY BOBBET'S: BY "JOSIAH ALLEN'S WIFE"
ROUND THE WORLD WITH JOSIAH ALLEN'S WIFE
MISS JONES'S QUILTING

Helen Hunt Jackson (1830-85)
Fiction
RAMONA

Joseph Kirkland (1830-94)
Fiction
ZURY: THE MEANEST MAN IN SPRING COUNTY
THE CAPTAIN OF COMPANY K

Emma Lazarus (1849-87)
Verse
ADMETUS AND OTHER POEMS
SONGS OF A SEMITE
BY THE WATERS OF BABYLON

Charles Godfrey Leland (1824-1903)
Verse
HANS BREITMANN'S BALLADS
MOTHER PITCHER'S POEMS

Alfred Thayer Mahan (1840-1914)
Naval history
THE INFLUENCE OF SEA POWER UPON HISTORY

Brander Matthews (1852-1929)
Essays
VIGNETS OF MANHATTAN
OUTLINES IN LOCAL COLOR
GATEWAYS TO LITERATURE
ESSAYS ON ENGLISH

Donald Grant Mitchell (1822-1908); pen name, "Ik Marvel"
Essays
REVERIES OF A BACHELOR
DREAM LIFE

John Ames Mitchell (1845-1918)
Fiction
A Romance of the Moon
Amos Judd
The Last American
Edgar Wilson Nye (1850-96)
Humorous essays
Bill Nye and Boomerang
Forty Liars and Other Lies
Thinks and Remarks by Bill Nye
John Boyle O'Reilly (1844-90)
Verse
Songs from Southern Seas
Songs, Legends and Ballads
George Wilbur Peck (1840-1916)
Humorous fiction
Peck's Bad Boy and His Pa
Peck's Bad Boy With the Circus
Peck's Bad Boy With the Cowboys
Sunbeams: Humor, Sarcasm and Sense
Harry Thurston Peck (1856-1914)
Verse and Essays
Greystone and Porphyry (verse)
Thomas Sergeant Perry (1845-1928)
Non-fiction
The Life and Letters of Francis Lieber
The Evolution of a Snob
Sarah Morgan Piatt (1836-1919)
Verse
An Irish Wild-Flower
An Enchanted Castle and Other Poems
Child's World Ballads
Harriet Waters Preston (1836-1911)
Fiction
Aspindale
Is That All?
A Year in Eden
Howard Pyle (1853-1911)
Fiction
The Merry Adventures of Robin Hood
Otto of the Silver Hand
Men of Iron
Howard Pyle's Book of Pirates
John Clark Ridpath (1840-1900)
History
History of the United States
Universal History
Frederick Remington (1861-1909)
Stories of the West
Pony Tracks
Crooked Trails
Sundown Leflare
Edward Payson Roe (1838-88)
Fiction
Barriers Burned Away
Driven Back to Eden
Found Yet Lost
John Godfrey Saxe (1816-87)
Humorous verse
Clever Stories of Many Nations Rendered into Rhyme
Fables and Legends of Many Countries Rendered into Rhyme
Leisure-Day Rhymes
Frank Dempster Sherman (1860-1916)
Verse
Madrigals and Catches
New Waggings of Old Tales
Lyrics for a Lute
Edward Roland Sill (1841-87)
Verse and Essays
The Venus of Milo and Other Poems
Hermione and Other Poems
Edmund Clarence Stedman (1833-1908)
Verse
The Blameless Prince and Other Poems
Lyrics and Idylls
Mary Virginia Terhune (1830-1922); pen name, "Marion Harland"
Fiction and cookery
Alone
The Carringtons of High Hill
The National Cook Book
Edith M. Thomas (1854-1925)
Verse
A New Year's Masque and Other Poems
The Inverted Torch
The Flower from the Ashes
Theodore Tilton (1835-1907)
Verse
The King's Ring and Other Poems
Elizabeth Stuart Phelps Ward (1844-1911)
Fiction
The Gates Ajar
Burglars in Paradise
Men, Women and Ghosts
Charles Dudley Warner (1829-1900)
Essays and fiction
My Summer in a Garden
The Gilded Age (written with Mark Twain)
A Little Journey in the World
Ella Wheeler Wilcox (1850-1919)
Verse
Drops of Water
Poems of Pleasure
World Voices
William Winter (1836-1917)
Essays
Gray Days and Gold
Old Friends
Sarah Chauncy Woolsey (1835-1905); pen name, "Susan Coolidge"
Fiction
What Katy Did
What Katy Did Next



A city on the Dardanelles, the strait that separates Europe from Asia.

THE OLD AND THE NEW TURKEY

IN order to understand the history of the Turkish Empire which had its greatest period in the fifteenth, sixteenth and seventeenth centuries, let us go back several hundred years before that to the time when the Mohammedan religion came into existence.

At that period, about the sixth century, a young man belonging to an Arab tribe was growing up in a poor and adventurous way. He was a reformer, for he taught the Arabs to give up idolatry and to form themselves into one nation. His new religion taught that there is but one God, that both the Jewish and Christian religions had come from God, but that he, Mohammed, was sent to teach a more perfect faith.

It is almost impossible for us to realize the force and fury with which the followers of Mohammed, catching the fire of his enthusiasm, set forth to conquer the world by the sword. They did not fear death; they rather wanted to be killed if only they had slain an "unbeliever" first, for they firmly believed they would then be sure of happiness after death in the world to come.

It was this fierce fanatical spirit in the Mohammedans which caused them to be greatly dreaded. Province after province fell to them, and although the magnificent walls of Constantinople saved that city for several centuries, nearly all the time the Christian Byzantine emperors, who ruled Constantinople, were engaged in fighting the followers of the Prophet, as Mohammedans are often called.

We remember from the story of Rome that the great Roman Empire in the year 395 A.D. fell into two parts. Rome became the capital of the Western Empire and Constantinople (now Istanbul) of the Eastern Empire. The Byzantine Empire became the more important; Latin ceased to be the common tongue and the Greek language and literature were more widely cultivated.

Among the enemies of the rich and powerful Byzantine Empire was a Turki tribe, known as the Seljuk Turks, who had come westward from Central Asia and settled in Asia Minor. Having become Mohammedans, they took up the cause with fanatical zeal and were successful in gaining Palestine and a large portion of Asia Minor. In the story of the Crusades we will tell you how cruel these Seljuk Turks were to Christians in the Holy Land. Bitterness increased and in a series of Crusades, from the eleventh to the thirteenth centuries, the Christians attempted to win back Jerusalem from the infidels. But, far from being able to rescue the land sacred to the Christians from Mohammedan power, the Christian people of Western Europe were busy quarreling with one another which made the way easy for their formidable enemy.

Unhappily, differences arose between the Churches of the East and the West, and so



Legend says that, being blind and poor, Belisarius, a great Byzantine general, wandered about with a guide, and the youth being killed by a snake, Belisarius carried the body, not realizing he was dead.

it came to pass that, as Christianity spread over Europe, the people joined either the Western Church, with the Pope as its head, or the Eastern or Greek Church, ruled by the Patriarch of Constantinople.

We have seen that the English, French and Germans were converted by missionaries from Rome; but the Slavonic peoples had most to do with the Eastern Empire, and so took their Christianity from the Greek Church. Chief among these peoples were the Bulgars, who settled between the Danube and the Balkans and the Serbs who settled west of them in Serbia (now a part of Yugoslavia). Many were the struggles between the Eastern emperors and these settlers, who eventually became Christians within the Greek Church, but still with dividing jealousies.

In the meantime, the Seljuks had been gradually pushing back the boundaries of the Byzantine Empire, but they had been helped in a military way by another nomadic tribe who had come from beyond Persia and were looking about for a place to settle. In exchange for their help, the Seljuks allowed them a small section of land in Asia Minor not far from the present capital, Ankara. The new tribe, taking the name Ottoman Turks from their leader, Othman, prospered and became so powerful that in less than a hundred years they had taken the Seljuk lands and had joined in the contest between Mohammedanism and Christianity with an intense vigor. Nearer and nearer they edged towards Constantinople, which by this time was more like a city-state than the heart of a great empire and the seat of Christianity in the East. By the middle of the fourteenth century the Ottoman Turks had secured a firm foothold in Asia Minor on the shore of the Bosporus opposite to Constantinople. From this point they were able to cross into Europe.



The emperor whom Belisarius served was Justinian the Great, who married a dancer named Theodora. Theodora was beautiful, but although wise and courageous, she was also arrogant and cruel.

The story of how the Turkish crown prince with eighty men crossed into Europe on rafts is most thrilling. At the narrowest part of the Dardanelles, no wider than a good-sized river, they succeeded in planting a fort, the foothold of the Ottoman Turks in Europe. Before many years had passed, towns, villages and valleys fell to the conquerors—even Adrianople, the second city of the Byzantine empire, fell. Several causes helped. The rulers of the old empire were weak and foolish; the Balkan Christians were fiercely destroying one another; and the other peoples around, the Venetians, Genoese, Hungarians, Poles and Austrians, were too disunited, or too busy with their own affairs, to join forces against the invaders at their gates.

Sigismund of Hungary headed a force when the Turks burst through the Balkans; but they were too strong for him. Later the brave Hungarian, John Hunyadi, with the Poles, defeated the Turks, but was afterward in his turn defeated by them at the Battle of Kossovo, in 1448. Still, he carried the fight on, and in 1456 hurled the Turks back from an attack on Belgrade. To Hunyadi is due the credit for saving Western civilization from being overthrown at this time by Mohammedanism.

The Turks had determined to have Constantinople for their capital, so for years they were increasing their ships and their army. One way they had devised of strengthening the army was to make the conquered peoples give up the finest of their boys. These boys were brought up as Mohammedans, and drilled to fight against their own countries. They were the famous Janissaries, or new soldiers, who helped so largely to destroy the Eastern Empire, and gained so much power over the sultans.



In the capture of Constantinople by the Turks in 1453, about 600,000 people were made slaves and dispersed throughout the Turkish Empire. But the fall of the city had a greater meaning than its military one. This conquest, by driving scholars into Italy helped the great revival of learning known as the Renaissance.

In 1453, three years before their defeat at Belgrade, they won one of the greatest victories of world history—the coveted city of Constantinople. As it happened, the sultan bore the name of Mohammed II, while the emperor bore the illustrious name, Constantine Palaeologus. The ruins of the walls of Constantine's city (many of them built by his great namesake) show how strong were the defenses when the last emperor stood bravely in the breach against Mohammed II. He knew the end was near, and at midnight had taken the Sacrament in the beautiful Church of St. Sophia. Then after a short rest in his palace, he sadly mounted his horse and rode away amid the sobs of the crowd, to the post of danger.

Before long the besiegers made their entrance over his dead body. The streets were deserted, for the people had gathered in St.



Pointing up Istanbul's skyline, from the Golden Horn, are the slender minarets of Mohammedan mosques.

Sophia in frantic prayer, expecting a miracle to save them. Alas! a piteous wailing went up as they were dragged out to be killed or were sent into slavery, and then only a few hours after the celebration of Constantine's last act of worship, the loud voice of the Mohammedan crier rang out through the huge building: "God is great, and Mohammed is his prophet." It was on May 29, 1453, that the great church of Christianity passed into the hands of its enemies.

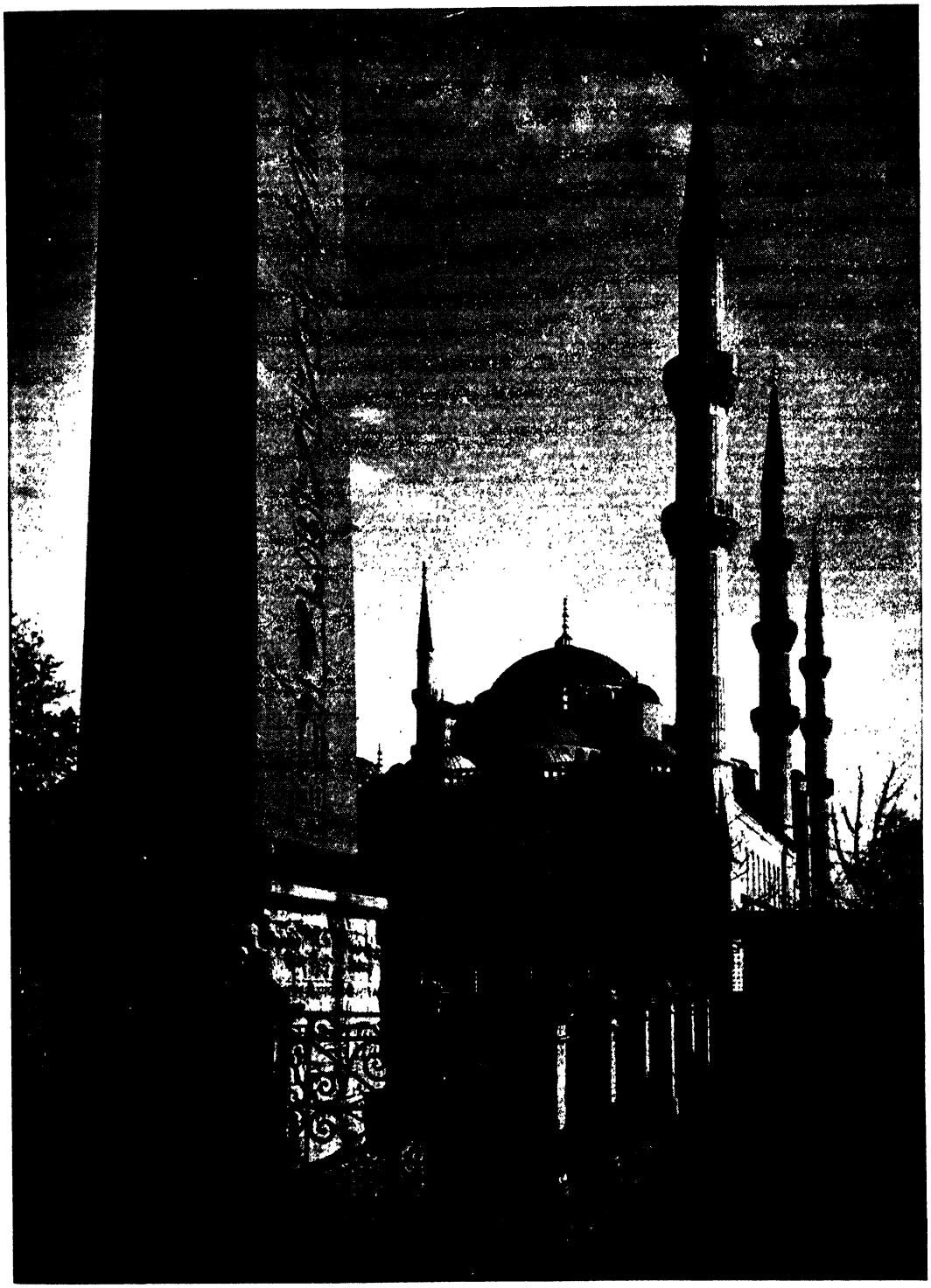
St. Sophia still stands in its grandeur, and many of its beautiful mosaics tell of its Christian past, though for more than four centuries it was used as a Mohammedan mosque.

This conquest by the Turks of the old Greek Empire, and particularly the fall of Constantinople caused the flight of many students and learned men, toward the West, chiefly to Italy. In Florence, Lorenzo the Magnificent gathered round him men who were interested in the old Greek manuscripts and in the wonderful old Greek art. The knowledge of these writings, and of this art, had been shut up so long in the East that when the study of them was revived it was called the New Learning and the New Birth of Art—or the Renaissance, as we say. Many scholars from all over Europe journeyed to Italy in those days, and returned to their own countries to fire others with enthusiasm for the study of Greek and its wonderful literature.

Some time before this the Ottoman Turks had taken as their military and religious symbol the Crescent, just as the Cross was the symbol of the Christians. During the years that followed the taking of Constantinople, the Crescent on the Ottoman banner shone triumphantly over an immense and powerful empire from the Danube to the Euphrates, from the Caspian Sea to the Straits of Gibraltar. The discipline and unity of purpose of the Mohammedans prevailed against the jealousies and quarrels of the Christian kingdoms. Deeds of daring and heroic resistance were not wanting, and there were terrible revolts and massacres; but so bitter were the jealousies between Christian rulers, so intense the rivalry between the East and West branches of the Church, that not only was there no united front against the followers of Mohammed, but on several occasions Christians sought alliance with them against their fellow Christians.

Among the Turkish rulers—who came to be sultans—were many strong and clever men. One of the greatest was Mohammed II, who had ridden over Constantine's body and up the nave of St. Sophia on that eventful day in May, 1453. He ruled for thirty

TURKISH MOSQUE AND EGYPTIAN OBELISK



The mosque of Sultan Ahmed, the only one of Istanbul's temples with six minarets. From one of the balconies on the minarets, muezzins, or criers, call the faithful Mohammedans to prayer. The obelisk is Egyptian.

years, and conquered Serbia, Bosnia and Greece.

Suleiman the Magnificent lived at the same time as Henry VIII of England. An old German song shows the terror which this "Grand Turk" cast over the Holy Roman Empire. It says: "The furious Turk has lately brought great forces into Hungary; from Hungary he has quickly entered Austria in the light of day; Bavaria is his for the taking; thence he presses onward and may soon come to the Rhine, for which cause we have no peace or rest."

It was said of Suleiman that while he ruled, sword and pen were never dry, so continual was the fighting, and so great was the number of writers in his day. It was he who swore he would take no rest till the prayer of the Prophet rang out from the tower of St. Stephen's Church in Vienna. But his quarter of a million Turks were obliged to retire from the gallant city, and so the spread of the Turkish power in the valley of the Danube was checked for a while.

A few years after Suleiman's death, at the great naval battle of Lepanto (1571), a limit was set to Turkish power in the Mediterranean also, and on the sea generally. After this came a succession of weak and cruel rulers, and under them there were wars with the Persians, mutinies of the Janissaries (who had become a very rich and strong body), and other disasters. Ottoman power rose again for a time under the able rule of a family named Kiuprili, many of whom acted as prime ministers, or chief viziers. It was under one of these men that the Turks determined to try their fortune again at Vienna. Enormous preparations were made, and finally the vast hosts advanced, spreading terror and desolation in their way. Then they encamped before Vienna. The peasants had crowded the city from the country round. There was but a small garrison, the old walls were out of repair, and the Turks, the best engineers and artillerymen in Europe, soon undermined them and drove off the emperor's soldiers. This was in 1683.

At last, after two terrible months, when it seemed only a question of days before the Turkish general would gain the glory of receiving the submission of the city, a troop of Poles and Austrians was seen hastening down the vine-clad slopes, shouting at the top of their voices, "Sobieski forever!"

John Sobieski, the gallant king of Poland, had come to the aid of Austria. In three days the siege of Vienna was raised. The departing Turks left an immense treasure behind.

At this time the Turks were masters of the whole of the Balkan Peninsula; but from

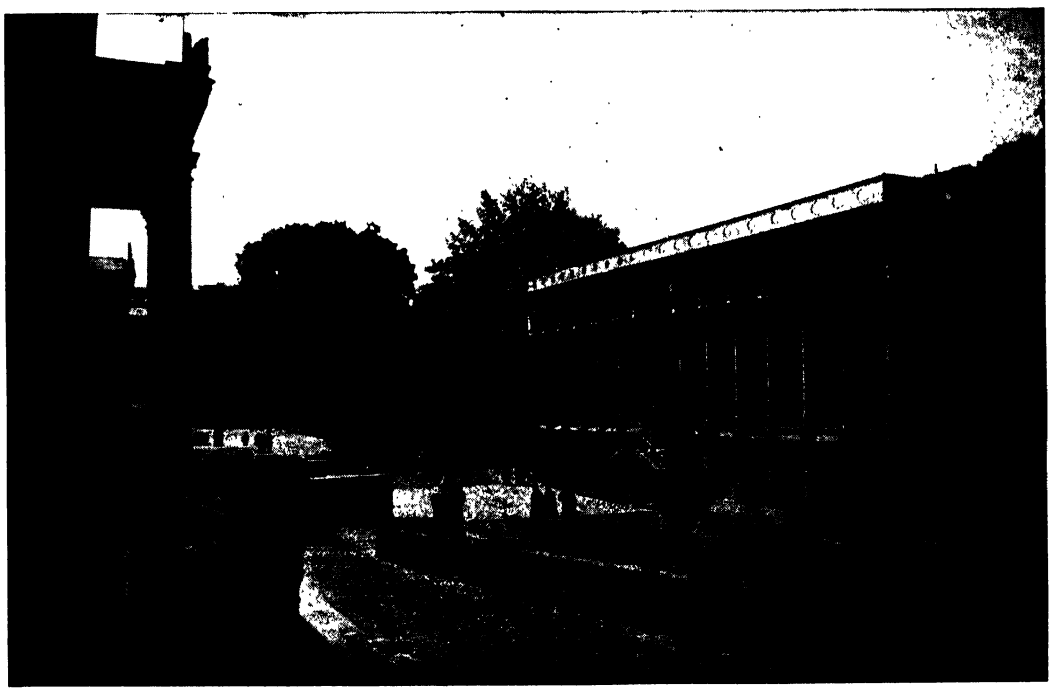


Faithful worshipers, though in modern dress, wash their hands and feet before entering the mosque to pray. Here is a woman—and an unveiled one!—preparing to go in, with the men. Times have changed in Istanbul.

TWO MUSEUMS IN ISTANBUL



The beautiful Byzantine cathedral of St. Sophia was a Christian church until 1453. The conqueror Mohammed II converted it into a mosque, and so it served for almost five centuries. It is now a museum.



Another interesting storehouse of the past is the Archeological Museum in Istanbul. There are two buildings. In one you will find priceless Chinese porcelains, in the other, relics of Greek, Byzantine and Roman life.



Turkey and her neighbors. To the north (across the Black Sea) is her most powerful neighbor, Soviet Russia.

that September day in 1683, thanks to John Sobieski and his gallant Poles, the tide of Turkish power in Europe began to ebb. No more did the sultans threaten and terrify the whole of the Christian world, although they continued to have some success and for many years kept in bondage and misery all the nations of the Balkan peninsula.

The Turks were driven out of Hungary; many towns and islands in the Mediterranean were taken from them; Greece passed for a time to the Venetians before entering on its long, final struggle for freedom against the Turks. The Russians, now growing into a power in Europe, captured Azov, on the Black Sea, and by degrees its northern shore passed into their hands. Russian ships on the Black Sea meant power to threaten Constantinople.

With the growth of Russia's power came the right to interfere in the provinces north of the Danube, particularly Moldavia and Wallachia, which were dependent on Turkey. This country's frontier fell back to the river Dniester, then to the Pruth, and for many years Moldavia and Wallachia were alternately under Russia and Turkey.

The growth of Russia had a great effect in restoring to power the Greek Church. As the church of a chief power in Europe it bound that power in close sympathy with its poorer brethren of the smaller and despised nationalities, and gave many chances of encouraging their revolts.

The Western nations, in love with liberty, also gave their sympathies to the oppressed Balkan peoples, and often gave help that was better than sympathy. The story of the two hundred years before 1914 was a story of the striving of nation after nation to gain freedom from its Mohammedan rulers.

At the beginning of that period Turkey held all the Balkan peninsula, Hungary to the summits of the Carpathians, all that is now Rumania, part of the Russian Ukraine, the Crimea, the northern slopes of the Caucasian range, part of Georgia, all Asia Minor, nearly all of Armenia, part of Kurdistan, Mesopotamia, Palestine, Arabia, Egypt, Tripoli, Tunis and Algiers, with Albania, Bosnia, Herzegovina, Dalmatia and part of Croatia.

At the start of the first World War, two centuries later, she had lost Algiers and Tunis to France; Rumania, Serbia, Greece and Bulgaria were independent; Egypt was only under a sovereignty that had no meaning; Bosnia and Herzegovina had passed to Austria, and only Macedonia and Thrace in Europe, and Asiatic Turkey, with Palestine

ANKARA, THE MODERN CAPITAL

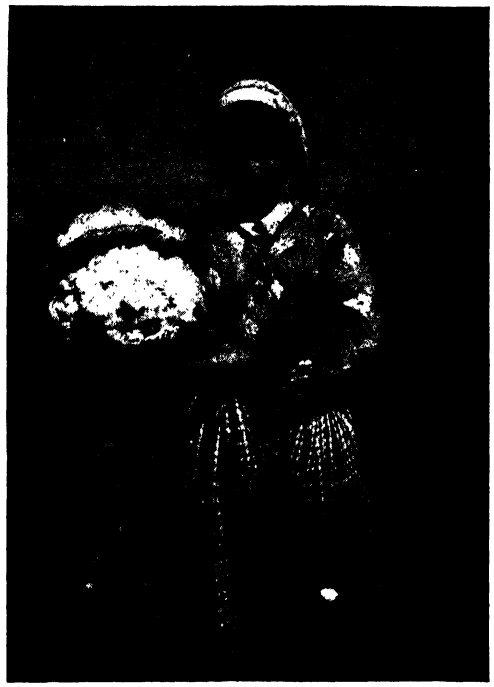


A view in the residential section of Ankara, showing spacious parks and beautiful apartment houses.



Pictures, courtesy, Commercial Attache, Turkish Embassy, New York

This statue, showing a fine feeling of serenity and the strength, is dedicated to the new national state.



A cotton picker in Anatolia, Asiatic Turkey.

and Mesopotamia, remained Turkish; while Russia had annexed a part of Armenia and all lands once Turkish in the Circassian district.

When Germany's ambition turned the Kaiser's thoughts to the East he saw in Turkey a possible helper. The officers of the Turkish army who studied the arts of war in Germany were impressed by the military power of that nation, which appeared to them irresistible. Accordingly, when the first World War broke out, these men linked Turkey to the fate of Germany.

But the help given by Turkey to Germany was only indirect, for Great Britain struck at her along three lines of advance, and all Turkey's strength was needed to ward off the British movement from India through Mesopotamia, from Egypt through Palestine and an attempt to reach Constantinople from the Mediterranean through the Dardanelles and over the Gallipoli Peninsula. Although the British were repulsed in their Gallipoli attack, they were successful in the other campaigns and in October, 1918, Turkey surrendered unconditionally.

After World War I, Turkey lost Mesopotamia, which became the independent Arab kingdom of Iraq, until 1930 under the guardianship of Great Britain. Its king was Feisal who died in 1933. Turkey also lost the Arab kingdoms of Hejaz and Nejd, now united as Saudi Arabia under Ibn Saud. Palestine was entrusted to Great Britain, the Emirship of Transjordania under Abdullah, brother of Feisal, becoming a semi-independent part of it. Syria and Lebanon went to France as mandates from the League of Nations, and the part of Thrace west of the Maritza River was ceded to Greece.

The losses were considerably greater at first, for in Asia Minor, Smyrna and the district around were given to Greece. But that country, with an ambition beyond her strength, advanced eastward until Greece occupied Asia Minor beyond the highland borders of Anatolia. This vigorously aroused the patriotism of the Turks, who became imbued with the desire to regain their empire. Under an able leader, Mustapha Kemal Pasha, the new Turkish army (calling themselves Nationalists) advanced upon the Greeks, and in September, 1922, completely routed them.

The peace which followed this rout of the Greeks found the Allies disunited, and so gave Turkey Constantinople, and re-established the Turks in Eastern Thrace with renewed possession of Adrianople. The Sultan was dethroned, and retired from Turkey; and a Republic was established with Mustapha Kemal Pasha (1881-1938) as president.

MUSTAPHA KEMAL PASHA MAKES TURKEY A MODERN COUNTRY

Kemal, for some time, had been thinking about the differences between the progressive western countries and his own, and he saw that much of the backwardness of the East was due to the Mohammedan religion. As head of the army that had just won back some of Turkey's lost territories, he was able to make many drastic changes that were directly opposed to the teachings of the Koran, the Mohammedan Bible. When we remember the frenzied zeal with which Mohammedans had for centuries fought, it seems impossible that a single man, even a dictator, could in a few short years overthrow some of its most cherished rules. The Koran had established all laws and most rules for conduct in everyday living, including rules about dress. Life in a strict Mohammedan country is far different from ours.

In the old Turkey, boys and girls did not grow up together as they do here, but at a very early age were separated and the girls remained in special quarters called a harem which was provided for the women of the household. Here they spent their days until

TWO TURKISH CITIES OF ASIA MINOR



A pottery market in Bursa, the old Broussa.



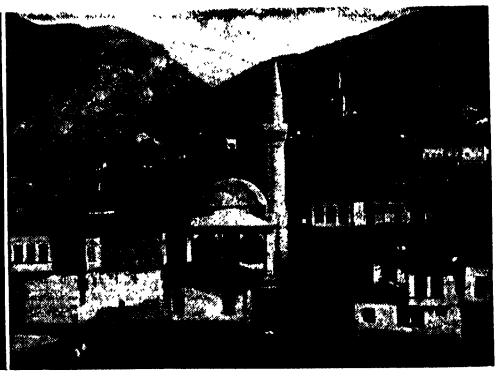
The harbor at Izmir, formerly Smyrna.



The ancient aqueducts of Paradise in Izmir.



A camel caravan, Izmir.



Bursa, in the shadow of Mount Olympus.

an early marriage when they went to live in the harem of their husband who, if he could afford it, had more than one wife. Little attention was given to their education. Boys were sent to school but often the lessons consisted merely in learning passages from the Koran.

Women never appeared outside the home without covering their faces with a veil, and this was one of the first of the customs that Kemal wished to change. Not only did he tell them to remove the veil but he encouraged them to wear Western clothes, instead of the voluminous baggy trousers of Eastern ladies, and to go into positions in offices and factories. They were also given the right to vote and to hold office. Education for girls was provided, including schools where girls and boys attend classes together.

One of the laws of the Koran forbade the use of statues and pictures in which human beings or animals are represented, so that art as Western countries know it did not grow in the East. In the new Turkey, schools for teaching art were established, and monuments and other sculptured pieces were placed in parks and in public buildings.

It is impossible to tell you here of all the changes that Kemal brought about. A most important one was the use of the Latin alphabet instead of the Arabic. That meant the change of names of famous old towns, rivers and mountains. On the other hand, Constantinople was officially given the Turkish name, Istanbul, but it was no longer the capital. In 1934, by act of Parliament, Kemal himself received the family name of Atatürk (chief Turk), by which he is often referred to now.

As for a capital, the new Turkish republic selected Ankara, a dingy village in the center of the country. Ankara has now become a modern city of over 122,720 inhabitants, with broad streets, fine parks, beautiful government buildings and apartments. It can be reached by railway which terminates in an impressive new station. There is also daily air service.

Istanbul's position as a link between the eastern and western parts of the Old World



These men in their turbans, baggy trousers and brilliant sashes, are dressed up for a festival. Turkish men nowadays wear European dress. The turban and fez were more convenient than modern hats to wear in the mosque, where a man never takes off his hat; and where the worshiper bows until his forehead touches the floor.

A VILLAGE SCENE, WITH MINARET



Pictures on pages 4797, 4800, 4801, 4803, 4805, 4806, 4808, 4809, 4810 courtesy, Commercial Attaché, Turkish Embassy, N. Y.
This narrow street in a poor Turkish village shows the typical mud-washed homes with overhanging balconies.



Turkish girls in a cigar factory. Until Kemal Ataturk became dictator, girls in factories were unheard-of; they kept to the seclusion of their homes, and when they ventured out even for a few moments, their faces were veiled.

of history and its command of the passage between the Black Sea and the Mediterranean will always give it high importance. It has a population today of about 800,000 and the many new buildings proclaim its part in the new and revitalized Turkey. Adrianople (now called Edirne) with a population of about 46,000, the center of a very fertile district, was more important in the days when Turkey governed the Balkan Peninsula.

The Turkish Republic in Asia Minor is a solid block of country chiefly mountainous, and the natural home of the Turkish people. The boundary between Soviet Russia and the new republic, as recognized by the Lausanne Treaty in 1923, restored to Turkey the province of Turkish Armenia, but the frontier to the southward, bordering the rich oil district of Mosul, was in dispute until settled by the League of Nations in 1927. Although Mosul is now under the control of Mesopotamia, Turkey shares in the oil profits.

Turkey is an agricultural country. Its chief exports are dried fruits (particularly raisins), tobacco, barley, cotton, mohair, wool and olive oil. Cotton and tobacco are expected to show a marked increase in production as modern agricultural methods are used to a greater extent. The country has valuable unworked minerals, including copper, silver and lead. Petroleum is found here and there.

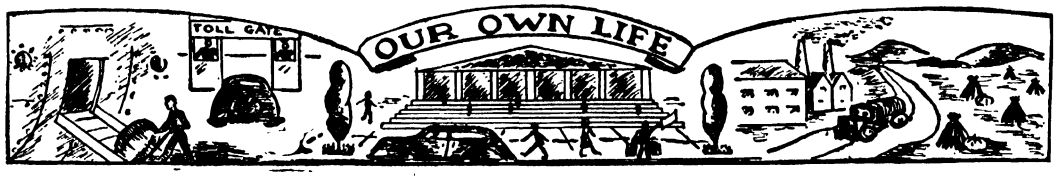
The government of the new Turkey is based on a democratic constitution with a single House of Assembly representing the people. Only one party is recognized, and a form of socialism exists with communications, industries, mines and utilities under the control of the state.

When the second World War broke out in 1939, Turkey chose to remain neutral. However, in February, 1945, less than three months before Germany surrendered, Turkey declared war on her.

A matter in which Turkey is deeply interested is the waterway between the Mediterranean and Black seas, consisting of the narrow Dardanelles Strait, the Sea of Marmora, and the narrow Bosporus Strait. These bodies connect Turkey's Asiatic and European sections. However, they are important to Russia, also, as her outlet from the Black Sea. Turkey once fortified the straits; but after World War I she was forced to remove all fortifications. In 1936 she was permitted to fortify the straits again. After the second World War Russia asked for bases along the straits, to protect Russian interests.

The chief towns are: Izmir (Smyrna), which is next in size to Istanbul, with a population of 184,000; Bursa (Brusa or Broussa), the capital before the Turks entered Europe; Balikesir (Karasi), lying about seventy-five miles southwest of Bursa; Seyham (Adana) and Konya. Trabzon (Trebizond) is the chief Black Sea port.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 4905.



THE LAW—THE POWER SUPREME

THE word law comes from an old Anglo-Saxon word meaning "that which is fixed." We use it sometimes to describe those unchanging forces of nature from which we can not escape, but which we may learn in time to control and use intelligently.

The law we are here concerned with is a body of rules imposed by the will of the nation on every person in the nation. Unlike natural law, it is changeable, and does actually change as men grow more enlightened. The laws of men are made to fit the times men live in, but they do not always provide for changing conditions.

Thus the law says that we must do certain things, as, for example, to register births and deaths or to pay taxes to help defray the expenses of government. The law also says we must *not* do certain things, as, for example, to steal the property of another.



Culver Service

Moses bringing the Ten Commandments from Mount Sinai. These laws are the basis of the moral code of our civilization.

The law not only deals with things which must be done and things which must not be done—it concerns itself with the business and social relations of the people. For example, it protects contracts or agreements made between persons, and provides a remedy when an agreement is broken; it awards compensation when a workman is killed or injured while at work, to provide for his family.

Our laws are partly written and partly unwritten. Written law is statute law, or, in other words, it consists of the acts of the lawmaking bodies. A good deal of English law, which the first colonists brought across the seas with them, rests on custom, or what has been done before, and is called common law. When a matter is settled under common law it is said to rest on precedent; that is to say, on what has gone before. Common law is very largely the carrying on of custom by general agreement. Many parts of the common law, indeed, are rooted in the customs of the old Anglo-Saxons. Many customs have become laws based on precedent.

An enormous mass of doctrine has often to be considered in the decision of a legal point. One lawyer will argue before the judge that the case is similar to that of Jones *versus* Brown (Jones against Brown), heard in 1846, as modified by the case of Black *versus* White, heard in 1946. His opponent will reply that the true precedent is the case of Towler *versus* Tyerman, heard in 1862, as modified by the further decision of the judges in Derry *versus* Ray in 1885. It is a complicated thing, the common law,

and it is preserved by respect for precedent. It is a body of doctrine administered by judges who follow faithfully in each other's footsteps in preserving the principles laid down in olden times. Even with regard to statute law, the written law, the judges find much to do in filling in the framework of an act.

THE WORDING OF A LAW SHOULD LEAVE NO DOUBT OF ITS PURPOSE

Words may be used which have not been closely thought out, or are badly expressed or are capable of different interpretations. In such cases the judge decides what the act means, and each decision of a judge becomes a precedent guiding other judges as to the meaning of the act. Sometimes in this way a judge's decision so changes the real purpose in making the law that a new law has to be passed to make the original act effective. The very greatest care is obviously necessary in drawing up a bill which is to become the law of the land.

It has been increasingly recognized that the unwritten common law has many inconveniences, and from time to time parts of it have been written, or codified, to make things simpler and plainer. Until quite recent years the laws relating to the buying and selling of goods were largely unwritten. Some people think all law should be summarized in a written code, as was done by the Romans long ago, and for the French in the famous Code Napoléon, which has been copied in other countries.

In the early days of Rome the Senate made the famous code of laws known as the Twelve Tables, which were engraved and set up in the Forum. This was a written code of justice based largely on existing customs and legislation. The Romans were great lawgivers, and not the least part of their work for civilization was the respect for law which they created. A thousand years after the Twelve Tables the emperor Justinian appointed ten learned lawyers to write a new code, to simplify the mass of laws and customs which had grown up and become unwieldy and obscure. In the year 529 the first edition of the Justinian Code was completed. It was revised and improved in 534, and was a powerful aid to civilization. It contained much that we could hardly approve today, but, as a great lawyer has written, it has exercised the most beneficent influence on moral and political science, and has introduced "more just and liberal ideas concerning the nature of civil government,



The Bettmann Archive

The Emperor Augustus tells the Gauls, in Lyons, the laws under which they will be governed by the Romans.

and the administration of justice, in all the nations of modern Europe, which rose on the ruins of the Roman Empire."

Even when the barbarians overthrew Rome they respected Roman law. It is not too much to say that Rome gave law to the Western World. No finer words on the subject of law have ever been written than the definition of justice by Ulpian, the great Roman lawyer, over 1,700 years ago, when he defined justice as "the constant and perpetual wish to render everyone his due."

The common law, then, is a growth which began with our Anglo-Saxon ancestors, which rests largely on precedent and has been partly embodied in written acts. Much of its old severity has been shorn away, partly through changes effected by the modifying decisions of judges and partly by statute. As an example we may notice that under the old common law a debtor could be thrown into prison and kept there till his debt was paid—a cruel and stupid law which was not abolished until the last century.

During the Middle Ages the imperfection and inequality of the common law in its application to the practical affairs of life led to the formation of the Courts of Chan-

cery. The king, appealed to by sufferers under the common law, would refer them to his Lord Chancellor. Thus the petitioners for justice came to be heard in the Chancellor's Court, which came to be called the Court of Chancery. This court, striving to do justice outside the rules of common law, gradually established rules of equity. The common-law judges long looked with hostility on the Court of Chancery, and unfortunate suitors were sometimes sent backward and forward between common law and equity, until justice became a mockery.

THE DIFFERENCE BETWEEN THE CHIEF DIVISIONS OF LAW—CIVIL AND CRIMINAL

There are several divisions of the law, but the two of which you hear most are the civil law and the criminal law. The first regulates the rights of persons and property, and the second has to do with crime and punishment. Let us see what this means.

The lawmaking body declares that certain acts are against the welfare of the whole people. By this act they become crimes. Some are not very serious, and the punishment may be only a small fine, or, if the offense is a little more serious, a fine and imprisonment for a short period. For more serious crimes, as burglary or killing a man, the punishment is very much heavier. In the criminal court a representative of the state presents the charge and calls witnesses and asks for conviction and punishment. The accused has the right to be heard in his own defense and to call witnesses in his favor. He has also the right to be represented by a professional lawyer.

On the other hand, suppose two men can not agree about the correct boundary between their land, or suppose one has been injured by a machine or an animal belonging to another. The people as a whole have not been injured. No crime has been committed. The dispute is between citizens, and is therefore called a civil case. The state takes no part except to set up a court which will decide what is the correct boundary, or whether the owner of the machine or animal ought to pay damages to the other, and how much. When the matter has been decided, the state steps in and requires that the decision be respected.

But how are such cases decided? First judges, or justices, as they are sometimes called, are selected who decide what is the law in the matter. These justices are not all of the same rank. Some have the right to deal with unimportant cases only. Others deal with more important cases, or with those which have been appealed from the lower courts. These justices should be of high character and possess sound knowledge of the law.

In trying criminal cases, and in many civil cases, the judges are aided by an ancient institution called the jury. The jury consists of a body of men and women, usually twelve, who are chosen and sworn to make a truthful decision upon the facts of the matter put before them.

The jury system is exceedingly important, yet no one seems to know exactly how it arose, though it appears to have had its origin in customs introduced into England by the Normans. All important criminal trials are jury cases, and juries are also asked to decide many civil cases. Coroners, too, usually make their inquiry with the help of a jury.

The verdict of a jury in criminal cases must be unanimous. This not infrequently leads to failure to arrive at a verdict at all, and a fresh trial before a new jury must take place. This custom seems to have originated in the old idea that before a citizen could be condemned as guilty "twelve good men and true must be agreed that he is guilty."

VERDICTS ARE INFLUENCED BY THE JUDGE'S SUMMING-UP OF EVIDENCE IN A CASE

It is the jury which decides questions of fact, but in practice the judge has much to do with the verdict. The judge decides what evidence is admissible, and the last words spoken to the jury are in his summing-up of the evidence. The manner and matter of the judge's utterance, therefore, necessarily weigh very heavily with the jurors.

We should not make the mistake of considering the law merely as bearing on disputes between private persons. Such disputes are inevitable, and the processes of law often have to be used to settle them. The main part of the law, however, is concerned with making rules which govern the citizen in his relations with his fellow-citizens.

It is not actually necessary in "going to law" to engage someone to represent you in court, and now and then we see a citizen conducting his own case. But it is a risky experiment, because of the great difficulty and complication of the subject. Very poor people have the privilege of taking proceedings into the courts without paying fees and with voluntary legal help.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 5243.

AMERICAN LITERATURE

IV. TWENTIETH CENTURY (1900-1920)—PART I

IN our last story of American literature we told about the leading authors of the final thirty years of the nineteenth century and of some of the books they wrote. As the new century got under way, younger men and women writers became known to the reading public, but many of the older writers continued to grow in reputation. Mark Twain, although he never again wrote anything so fine as his HUCKLEBERRY FINN, and LIFE ON THE MISSISSIPPI, was a world celebrity and America's most beloved author until his death in 1910. William Dean Howells, called "the Dean of American Letters," exercised great influence, both as a novelist and as a critic. Richard Harding Davis lived to do some of his most brilliant reporting as a correspondent during the early part of the first World War. Hamlin Garland's A SON OF THE MIDDLE BORDER, often called the greatest regional work in American literature, was published in 1917. Winston Churchill, whose romances of American history had been so popular at the turn of the century, turned to the writing of what were called "problem novels"; stories dealing with the social problems of his time. These novels, including THE INSIDE OF THE CUP and A FAR COUNTRY, were highly thought of by both critics and public.

The new writers who came to the front in the twentieth century included many who looked searchingly and critically at the age they lived in. Some of them did not at all like what they saw and used their writings, both fiction and non-fiction, to point out conditions that needed correction. Upton Beale Sinclair (1878-) was one of these. In 1906 he published a novel called THE JUNGLE which described the frightful and heart-breaking conditions among the recent immigrants living and working in the Chicago stockyards district. This book created a tremendous sensation, and led to great reforms in the packing industry, but the lives of the people themselves did not become easier for many years. Sinclair himself said that this book had been aimed at people's hearts but had hit their stomachs instead.

Upton Sinclair, a native of Baltimore, has lived for many years in California. He has always been a reformer and a socialist of a highly individual kind. He has run for various public offices with the idea of bringing about wonderful, but sometimes rather startling, reforms. During the 1940's he has published a series of novels centering about a character named Lanny Budd. These books form a running account of all the world political events of recent years, with Lanny playing a useful part and being present at practically every important meeting of the great political leaders during World War II. Indeed, in one of the books, PRESIDENTIAL AGENT, he goes on special missions for Presi-



Keystone View Company

O. Henry, whose short stories set a fashion in writing and in reading. Willa Cather, who gave us some of the most fascinating characters in the story-book world. Right, Theodore Dreiser, writer of powerful but grim novels.



Characters from Booth Tarkington's PENROD AND SAM putting on a show. Illustration by Gordon Grant.

dent Franklin D. Roosevelt. It is said that Sinclair's books are more widely read in other countries than those of any other American author.

In the last chapter we told about Frank Norris and Stephen Crane and the writers of grim, sordid stories. Both Norris and Crane died at about the turn of the century, but the realistic novel of the type they wrote has come to form an important branch of American fiction. Perhaps the most widely known of these realistic novelists during the early twentieth century was Theodore Dreiser (1871-1945). Most of Dreiser's chief characters, especially in his early novels, are strong but not especially admirable people. His books are slow-moving, heavy and formless, but they have great power. In THE FINANCIER and THE TITAN, he wrote about wicked and grasping business men. SISTER CARRIE and JENNIE GERHARDT, which some critics consider his best works, are bitter and grim. AN AMERICAN TRAGEDY, a two-volume novel published in 1926, was based on a real-life case of murder brought about by the sordid circumstances of the main character's life.

Dreiser seems to have been an unhappy, sensitive sort of man, and there is little of grace or light in his books. Curiously enough, it was he who wrote the words to the famous song of his native state, Indiana, ON THE BANKS OF THE WABASH. The music was written by his brother Paul, who had changed his last name to Dresser.

BOOTH TARKINGTON, AUTHOR OF GENTLE, WISE STORIES

Out of the Middle West and the state of Indiana came another famous novelist, Booth Tarkington (1869-1946). Tarkington is about as different from Dreiser as a man well could be. His novels and stories usually deal with the comfortable middle classes that make up a great deal of the population of the United States. He is a little bit sentimental in his viewpoint of these people, yet underneath the sentiment you feel that he is laughing at them in a kindly way. Someone has said that all of Tarkington's characters are grown-up versions of his famous boys, in PENROD AND SAM, and in SEVENTEEN.

Booth Tarkington's first published book, MONSIEUR BEAUCAIRE, was a charming story of a French prince who pretended to be a barber and then fell in love with a beautiful but snobbish English lady. The story is light and fanciful, with a delicate note of sadness about it. Later on he wrote other stories of pure romance, several of them having historical backgrounds. His most serious and highly thought of books are ALICE ADAMS, which won a Pulitzer Prize, and a series of three novels, THE TURMOIL, THE MAGNIFICENT AMBERSONS and THE MIDLANDERS. These three show the effect of industrial growth on a quiet, pleasant little city. The city is his native Indianapolis. His early novels, THE GENTLEMAN FROM INDIANA and THE CONQUEST OF CANAAN give an interesting picture of local politics in Indiana at the turn of the century.

Another Middle-Western writer who did not like the spread of industrial civilization was Sherwood Anderson (1876-1941). He was, however, quite different in his attitude and in his subject matter from Tarkington. While Tarkington, in his trilogy about Indianapolis, seems to feel a gentle regret that the smoky factories have destroyed so much that was serene and beautiful, Anderson plunges right into the midst of the smoke and grime and writes about the lives of the

twisted, unhappy people he sees there. WINESBURG, OHIO, a collection of twenty-three sketches of citizens of a most depressing town, is his most famous work. His stories have very little plot, most of the action taking place in the minds of the characters.

Anderson himself lived a wandering, turbulent life, but he spent his last years as owner and editor of two newspapers, one Democratic and one Republican, in Marion, Virginia. This unusual and rather difficult job he seemed to enjoy to the full.



Keystone View Company

Jack London's life was as exciting as his stories.

Three of the most distinguished novelists of this period were women: Edith Wharton (1862-1937), Ellen Glasgow (1874-1945) and Willa Cather (1875-1947). All of them were born on the eastern seaboard, Miss Glasgow and Miss Cather in Virginia, and Mrs. Wharton in New York. Miss Cather, however, grew up in Nebraska and her earlier novels were written about the western farmlands. The other two authors stayed in the East.

Most of Mrs. Wharton's novels and short stories were written about the people of wealth and leisure who made up New York society. It was a narrow world, like the world that Henry James wrote about, but, like Henry James, Mrs. Wharton was able to give her characters individuality and life. She saw quite clearly the effects, both good and bad, that wealth may have on human character, and she put it all down with skill and grace. Her most celebrated books are THE HOUSE OF MIRTH, in which she shows that wealth and poverty can be equally deadly in their influence on a weak nature; ETHAN FROME, a grim tragedy of three people in a New England village; and THE AGE OF INNOCENCE, a story of New York society in the '70's and '80's, when society was still a small, compact group of families who had lived in New York for generations. This novel won its author a Pulitzer Prize. Mrs. Wharton's short stories are in some ways even finer than her novels. They are written in a way that reminds one of the sharp, clean lines of an etching. They, as well as the longer works, show humor and keenness of perception.

EDITH WHARTON WROTE ABOUT THE SOCIETY SHE KNEW

Edith Wharton was born and brought up in the sheltered society that she describes in THE AGE OF INNOCENCE. The fact that she actually developed her talent for writing shows what an unusual person she was, for her own family and friends thought it a very odd thing for a young woman of their class to want to be a writer. For many years before her death she lived in France, but she always wrote about her own people.

Ellen Glasgow belonged to an old Virginia family and received most of her education from the books in her father's library. Although she learned her alphabet out of the romances of Sir Walter Scott, she was neither romantic nor sentimental in the novels that she wrote later on. Most of her stories are about Virginia people of all classes and conditions, and she writes about them with understanding and humor. Many people write about the South as if it were different from all other parts of the world. Some of them make its people seem too perfect to be alive, and others can find nothing at all to praise. Miss Glasgow was one of the first novelists to write about Southerners simply as people, with the qualities and peculiarities that individuals anywhere are likely to have.

One of her most interesting books is BARREN GROUND, the story of Dorinda Oakley, the daughter of a "poor white" farmer, who struggles to make something of her father's farm and ends up as a successful and wealthy woman. THE ROMANTIC COMEDIANS is a

delightful picture of human relationships in a settled community where individuals are expected to act according to a certain pattern. LIFE AND GABRIELLA, THE SHELTERED LIFE and VEIN OF IRON are among the finest of her other works.

Willa Cather, as we mentioned farther back, went from Virginia to Nebraska to live when she was still a child. Her earlier and, some people think, her best novels were about the people who farm the western prairies. One of these, MY ANTONIA, is a warm, human story of a Bohemian immigrant girl and her courageous struggles in a new world. A LOST LADY is about the last days of the western pioneer railroad builders. The heroine of this book is one of the most enchanting women in American fiction. O! PIONEERS, the title of which comes from a poem by Walt Whitman, and THE SONG OF THE LARK are others of this group of stories about the West. Of her later novels, the finest are DEATH COMES FOR THE ARCHBISHOP, a wonderfully moving story of two French missionary priests who carry the faith into remote parts of New Mexico and Colorado; and SHADOWS ON THE ROCK, a story of old Quebec. To many people DEATH COMES FOR THE ARCHBISHOP is her best work. It recreates a period in American history, it is filled with fascinating characters and events. It also shows us human beings living lives of unselfishness and sincerely trying to be kind and wise in their dealings with other human beings. There has been far too little of this in modern American literature, perhaps because it is much easier to detect and analyze weakness of character than strength.

TWO WRITERS WHO WERE POPULAR IN THE 1920's

Two writers who were especially remarkable for elaborateness of style and a sort of romantic disillusionment, were Joseph Hergesheimer (1880-) and James Branch Cabell (1879-). Aside from these characteristics the two men have little in common, for Hergesheimer has written chiefly of restless, sensitive modern people—even in his historical novels his men and women seem modern—while Cabell's best-known novels are laid in a kind of legendary dream world of his own invention.

Joseph Hergesheimer is a Philadelphian of Scottish and German ancestry, but he has none of the mysticism that is often found in both peoples. His modern novels, such as CYTHEREA, THE PARTY DRESS and LINDA CONDON, are about shallow people intensely absorbed in their own often trivial concerns. Perhaps his finest stories are those which have earlier American backgrounds. THE THREE BLACK PENNIES tells of three generations of a family of Pennsylvania ironmasters. Penny is the name of the family. Every few generations there is a member who seems to have inherited the temperament and the black hair and eyes of a Welsh ancestor, and these "black Pennies" are different from most of their relatives. JAVA HEAD, another fascinating story, takes us back to old Salem in the days of the clipper ships and the China trade. One of the men of a family of merchant sea captains brings home a bride from China, a lady of noble birth, and the strange combination of two entirely different types of civilization makes an absorbing story. BALISAND is a novel about an aristocratic and very conservative Virginian in the days just after the American Revolution. THE LIMESTONE TREE tells the story of several generations of a family that came to America in the eighteenth century and later on moved west to settle in Kentucky.

THE CURIOUS WORKS OF JAMES BRANCH CABELL

James Branch Cabell is, like Ellen Glasgow, a member of an old Virginia family. In some of his earlier novels, such as THE RIVET IN GRANDFATHER'S NECK, he deals with people and affairs in his own age and country. The books which have occupied most of his writing career have, however, been laid in the Kingdom of Poictesme; in an age and place that seems to take in the legendary places and people of the tales of King Arthur, with the addition of mythological characters from ancient Greece, Scandinavia and the Celtic lands. The chief novels in this series are FIGURES OF EARTH, JURGEN, THE HIGH PLACE and THE SILVER STALLION. In another novel, THE CREAM OF THE JEST, he combines his mythical dream world with the twentieth century by having his principal character escape into another world in his dreams.

During the years of which we are telling, there were a number of writers of immense popularity who wrote with varying degrees of realism but whose work is not considered the highest form of American literature. Of these, Jack London (1876-1916) was the most rugged and realistic in his approach to his material. Jack London's own life and adventures were more thrilling and tragic than anything he wrote, and he used his

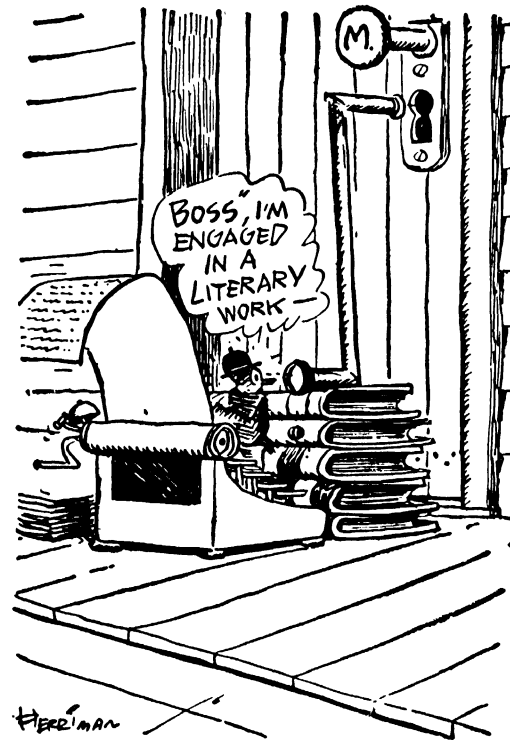
own experiences as material for some of his books. His most famous story is THE SEA WOLF, the tale of a brutal, dominating captain of a schooner, and his conflict with a cultivated and much finer man over a beautiful girl who has been rescued from a shipwreck. Perhaps London's finest book is THE CALL OF THE WILD, the story of a man and a dog in Alaska and the Yukon during the days of the gold rush. It is one of the best dog stories ever written, and also gives a thrilling picture of a rough and wild period.

THE "ROMANTIC SERMONS" OF HAROLD BELL WRIGHT

One of the most popular novelists of the past half century was Harold Bell Wright (1872-1944). His stories are still read by people who do not read the novels of any other writer, as well as by the general novel-reading public. All of his books have a strong moral and religious tone, and are rather like sermons told in a romantic and entertaining form. THE SHEPHERD OF THE HILLS is a story of the Ozark Mountains, and THE WINNING OF BARBARA WORTH is a story of the West. The plot of this story is intensely romantic and full of mystery and suspense, and the ending is most satisfactory.

Two famous and popular women novelists are Kathleen Norris (1880-) and Mary Roberts Rinehart (1876-). Kathleen Norris was the sister-in-law of Frank Norris, who wrote with brutal realism of the harsher features of American life; and her husband, Charles G. Norris (1881-1945), wrote thoughtful novels on serious economic and social subjects. Mrs. Norris, however, writes straightforward romances about average American families and their ups and downs and sorrows and joys. All of her books have love stories, and they almost always turn out happily after a good deal of doubt and uncertainty. Some of her best novels are MOTHER, THE STORY OF JULIA PAGE, BARBERRY BUSH and CERTAIN PEOPLE OF IMPORTANCE. Tears and laughter are closely mingled in the stories of Kathleen Norris.

Mrs. Rinehart is most famous for her mystery detective stories, such as THE CIRCULAR STAIRCASE, THE WINDOW AT THE WHITE CAT, THE DOOR and THE YELLOW ROOM. She has, however, written a number of straight romantic novels, of which the best known is entitled K, from the initial and nickname of the hero. This is a romantic story of peculiar charm, possibly because the background of the story was also the background of Mrs. Rinehart's own



From "Archy's Life of Mehitabel" by Don Marquis, illustrated by George Herriman, by permission of Doubleday and Company, Inc.

Don Marquis invented two characters who have become famous, archy a cockroach with literary leanings, and archy's friend mehitabel, a cat.

youth. The hero is a surgeon, the heroine a young girl who studies nursing. Mrs. Rinehart herself studied nursing and she married a surgeon. This skillful author has also given the world a delightful group of characters in her Tish stories. These are a group of short stories which originally appeared in a popular magazine, which tell of the cheerfully ludicrous adventures of three elderly spinsters, Tish, Aggie and Lizzie, and their nephew, Charlie Sands, an engaging young man who lives a life of fear and delight over what his aunts are going to do next.

This brings us to a subject that is of tremendous importance in any account of the literature of the early twentieth century, the popular magazine. In the nineteenth century many magazines were established, and some of them printed fiction, both serial novels and short stories. Most of these, however, were first of all magazines of a high literary type, with a limited circulation. THE ATLANTIC MONTHLY, HARPER'S, CENTURY and SCRIBNER'S, to name a few, printed the work of the period's most famous writers.

Indeed, they made the fame of many of our writers by printing their works. Magazines of this type continued to flourish until after the first World War—THE ATLANTIC MONTHLY is still a force in the realm of high-class fiction—but with the new century magazines of another type began to dominate the field.

With the increase of advertising, and the big sums of money which it brought in, came the day of the weekly and monthly magazines with enormous circulations. Some of these were purely fiction magazines, and even the ones which also printed non-fiction needed a great many short stories and serials and were able to pay their authors well. In the years before World War I such magazines as MCCLURE'S, MUNSEY'S, COSMOPOLITAN, THE SATURDAY EVENING POST, COLLIER'S, and the women's magazines such as GOOD HOUSEKEEPING, THE LADIES' HOME JOURNAL, DELINEATOR and WOMAN'S HOME COMPANION, to name a few, brought the popular romantic novel, the mystery serial and the short story to a high point of craftsmanship and entertainment value. The short story, indeed, became established as a kind of literary staple, like a good brand of soap, and, in truth, it sometimes seemed as if the general run of short stories were almost as much alike as cakes of soap. There were Western stories, detective stories, business romances and various other brands, all of them written smoothly and entertainingly but few of them, it must be said, having any great literary value.

It would be impossible to name all of the writers of magazine fiction who became popular during those years, and we shall not try to do so. We must mention, however, that many of the leading novelists that we have told about also wrote short stories of originality and distinction, among them Edith Wharton, Willa Cather, Joseph Hergesheimer and Booth Tarkington.

There is one short-story writer of the early years of our century about whom we must tell you, because his stories are interesting and entertaining and because the kind of stories he wrote and the way he wrote them greatly influenced hundreds of other writers who came after him. This was William Sydney Porter (1862-1910), who is known all over the world by his pen name,



Keystone View Company

Don Marquis was a newspaper columnist whose wit and good-nature delighted millions of readers.



Amy Lowell is best known for her emotional poem, PATTERNS.

O. Henry. Born in North Carolina, he lived for years in Texas, Louisiana, Mexico, Honduras and New York City. While his chief occupation was that of a writer and newspaper man, he also worked at different times as a clerk in a drugstore, as a bank teller and at loading banana boats. He served a term in prison for taking money from a bank, but it turned out later that he had not really been guilty. It was in prison, however, that he began to write the stories which were to make him famous and successful.

O. Henry wrote about simple, ordinary people of every walk of life. Tramps, policemen, shopgirls, cowboys, decayed Southern gentility, men who sold fake cure-alls in medicine shows, small-time gamblers and Central American revolutionaries. He wrote in an easy conversational style, often in a colorful and expressive slang, and most of his stories ended with an unexpected twist, a trick that came to be known as an "O. Henry ending" and was much imitated by other writers, who could not always do it so well.

O. Henry wrote one novel which was really a group of short stories more or less skillfully mixed up and tied together into one long story. This is called CABBAGES AND KINGS. Altogether he wrote more than 600 pieces of fiction in a little more than ten years. None of them is great literature, many have been forgotten, but a few, especially those about New York, or Bagdad-on-the-subway, as he called it, are still vividly remembered. You will find some of the New York stories in the book called THE FOUR MILLION. Other collections which are especially entertaining are ROLLING STONES, HEARTS OF THE WEST and WHIRLIGIGS. Since 1918 a yearly prize called the O. Henry Memorial Award has been given for the best short stories published during the year.

We have already told in the last chapter on American literature about Finley Peter Dunne and his Mr. Dooley sketches. Another famous humorous writer of the time was George Ade (1866-1944). Mr. Ade wrote several plays and a number of humorous short stories, but he is best remembered for the FABLES IN SLANG which delighted a whole generation of readers. Because slang quickly becomes outdated, these stories have lost some of their interest for modern readers, but the kindly humor and philosophy of the author is still as fresh and likeable as ever.

Other humorous writers who had genuine distinction were Don Marquis (1878-1937), Ring Lardner (1885-1933) and Franklin Pierce Adams (1881-). All three of these men were newspaper men during the greater part of their careers. Don Marquis began his newspaper career with the Atlanta CONSTITUTION when Joel Chandler Harris (Uncle Remus) was its editor. Later he conducted a famous column in the New York SUN. He wrote graceful verse, some of it gay and some of it sad and bitter, for underneath his gaiety and wit Marquis was a far from happy man. In his column he wrote amusing sketches about a number of characters whom he had created. The most famous of these are The Old Soak, archy the cockroach and mehitabel the cat. He also put these characters into books; THE OLD SOAK'S HISTORY OF THE WORLD and ARCHY AND MEHITABEL. Archy was supposed to be a cockroach in a newspaper office. He had literary leanings and when he came out at night, after every-



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Carl Sandburg. Many of his poems are in the great American tradition of Walt Whitman: powerful, original, unhampered by poetry rules of the past.

one had gone home, he would write unrimed free verse on the typewriter, jumping from key to key. His friend mehitabel, an alley cat, was a cat of strong character and decided opinions, who loved to dance and sing in the moonlight. Archie and mehitabel did a great deal of talking about life and its problems.

Ring Lardner began as a sports writer, but his real distinction came from his short stories. Some of these were about baseball players, prize-fighters, writers and actors, but whatever type of person he was writing about, his stories were biting, savage satires. They were humorous, but the humor was mixed with disgust for his characters. His best short stories have been published in a book called ROUND UP.



Brown Bros.

Edna St. Vincent Millay, at the time she wrote her lovely poem RENASCENCE.

Franklin Pierce Adams is best known by his initials, F.P.A. He, like Don Marquis, was for years one of the most famous of newspaper columnists. He is a brilliant writer of light verse, much of which has been published in book form. Radio listeners in many parts of the world know him best as one of the "experts" on the Information Please radio program, answering questions and making amusing quips.

One of the most striking literary occurrences of the early part of the twentieth century was the sudden flowering of a whole new group of poets. This renaissance, or rebirth, of American poetry began about 1912, and one of the factors that helped to keep the new poetry alive and growing were the poetry magazines which sprang up at about this time. The most influential of these, POETRY: A MAGAZINE OF VERSE, was started in Chicago by Harriet Monroe. Miss Monroe was herself a poet, but she was far greater as a poetry editor, and she printed in her magazine some of the finest work of most of the young poets who have since become famous.

For some years before the time we are speaking of, American poetry had been rather conventional and imitative of the great poets of the middle nineteenth century. Many of the new poets of the twentieth century sought to introduce new forms of verse, new ways of expressing their thoughts and new subject matter. Free verse, that is, verse without metre or rime, came to be accepted as a genuine poetic form, though not all of the new poets adopted it completely.

Among those who wrote a great deal in free verse were a group who called themselves Imagists. They took their inspiration from some of the French poets of the turn of the century, but they developed certain rules and beliefs of their own. Among these poets were Ezra Pound (1885-), Amy Lowell (1874-1925), H.D. (Hilda Doolittle, 1886-) and others. Ezra Pound was a native of Idaho, but he has spent most of his later life abroad. As a poet, Pound's earlier work had merit and influenced many later poets, including T.S. Eliot, of whom we shall tell in a later chapter. Amy Lowell belonged to the famous New England family that produced James Russell Lowell. She was a strong, individualistic character. Although her own poetry is intricate in form and rich in color, her greatest contribution to American poetry was the fighting spirit with which she worked to gain acceptance for the new poetry. Some of her loveliest verse is to be found in A DOME OF MANY-COLORED GLASS and SWORD BLADES AND POPPY SEED. Hilda Doolittle has lived abroad since 1911. Her verse, for all its brilliance and beauty, has a cool, austere quality that leaves the reader unmoved. Her collected poems have been published in one volume.

Among the new poets who saw poetic material in modern everyday people and things were Edgar Lee Masters (1868-) and Carl Sandburg (1878-). Masters was a Middle-Western lawyer who deserted the law for literature. His great work is THE SPOON RIVER ANTHOLOGY, a collection of poems in free verse. These poems are sketches of the lives of certain persons in the imaginary town of Spoon River, as if told to the poet by the persons themselves as he looks at their gravestones in the cemetery. Sorrow,

tragedy, scandal, courage and nobility are all present in the apparently drab lives of these people.

Carl Sandburg is often called the Chicago poet because his first outstanding poems celebrated the strength and power of the young giant of Western cities. The titles of his books of verse tell something of their nature: CHICAGO, SMOKE AND STEEL, THE CORNHUSKERS and GOOD MORNING, AMERICA. He likes to sing and shout the story of the smoky cities, the great prairies and the age of steel. Sandburg has also written a life of Abraham Lincoln which has now reached six volumes, and a group of delightful stories for children called RUTABAGA STORIES.

New England fields and villages form the tranquil background for many of the finest poems of Robert Frost (1875-) and Edwin Arlington Robinson (1869-1935), but the life that flows through their poems is anything but tranquil. Robert Frost's earlier books of verse, A BOY'S WILL, NORTH OF BOSTON, WEST-RUNNING BROOK and MOUNTAIN INTERVAL, shed a magic light on the stone-filled fields and the snowy woods of Vermont and New Hampshire. They give us unforgettable glimpses of the people who live on the lonely farms or tramp the roads.

Edwin Arlington Robinson wrote beautiful and haunting narrative poems, such as TRISTRAM, about the legendary characters of King Arthur's time, but his finest poems are the short verses about the men and women who lived in the imaginary Tillbury Town. Like Edgar Lee Masters, Robinson tells of the lives of his characters in a series of brief, brilliant pictures, giving glimpses of the hidden sorrows and weaknesses that helped to shape them. Some of the most moving of these poems are RICHARD COREY, FLAMMONDE, MINIVER CHEEVY and MR. FLOOD'S PARTY.

The war years of 1917-19 brought the forerunners of the crop of writers who were to become known as the post-war generation. Edna St. Vincent Millay (1892-) was one of these younger poets, though her work has always been too individual and too fine for her to be considered simply as one of a group. Her first important poem, RENASCENCE, created a sensation by its freshness and beauty. This was followed by many short lyrics and some of the most exquisite sonnets in the English language. Miss Millay has the gift of selecting the precise word for her purpose, and she has also what many fine poets lack, a keen humor that gives a curious little twist even to her most sentimental verses.

We can not begin to tell about all of the poets who gave richness to the literature of America in the early twentieth century, but we have selected some of those whose achievement and influence were exceptional. In the next chapter on twentieth-century literature you will read about many poets and other writers, many of whom came into prominence in the years immediately after the end of World War I

PART TWO OF THIS CHAPTER IS ON PAGE 5007.

OTHER AMERICAN WRITERS OF THIS PERIOD

Eleanor Hallowell Abbott (1872-)
Fiction
MOLLY MAKE-BELIEVE
THE WHITE LINEN NURSE

Conrad Aiken (1889-)
Poetry
EARTH TRIUMPHANT
THE HOUSE OF DUST
PRIAPUS AND THE POOL
THE CHARNAL ROSE

Gertrude Atherton (1857-1948)
Fiction
THE CONQUEROR
THE TOWER OF IVORY
BLACK OXEN

Irving Bacheller (1859-)
Fiction
EBEN HOLDEN
KEEPING UP WITH LIZZIE
THE LIGHT IN THE CLEARING

Temple Bailey (188?-)
Fiction
CONTRARY MARY
THE DIM LANTERN
THE BLUE CLOAK

Rex Beach (1877-)
Fiction
THE SPOILERS
THE SILVER HORDE
THE BARRIER

Ellis Parker Butler (1869-1937)
Humorous fiction
PIGS IS PIGS
THE JACK-KNIFE MAN

Henry Seidel Canby (1878-)
Criticism
THE SHORT STORY IN ENGLISH
DEFINITIONS
AMERICAN ESTIMATES
BETTER WRITING

OTHER AMERICAN WRITERS OF THIS PERIOD (*continued*)

Irvin S. Cobb (1876-1944)
Humor
COBB'S ANATOMY
SPEAKING OF OPERATIONS—
JUDGE PRIEST (fiction)
EXIT LAUGHING (autobiography)

Margaret Deland (1857-1945)
Fiction
OLD CHESTER TALES
THE IRON WOMAN
THE VEHEMENT FLAME

Dorothy Canfield Fisher (1879-)
Fiction
HILLSBORO PEOPLE
THE BENT TWIG
THE DEEPENING STREAM

John Fox, Jr. (1862-1919)
Fiction
THE HEART OF THE HILLS
THE LITTLE SHEPHERD OF KINGDOM COME
THE TRAIL OF THE LONESOME PINE

Louise Imogen Guiney (1861-1920)
Poetry
THE WHITE SAIL
THE MARTYR'S IDYL

Henry Sydnor Harrison (1880-1930)
Fiction
QUEED
V. V.'S EYES

Oliver Herford (1863-1935)
Light verse
THE BASHFUL EARTHQUAKE
RUBAIYAT OF A PERSIAN KITTEN
THE JINGLE-JUNGLE BOOK

Fannie Hurst (1889-)
Fiction
HUMORESQUE
STARDUST
LUMMOX
A PRESIDENT IS BORN
BACK STREET
ANITRA'S DANCE

Owen Johnson (1878-)
THE TENNESSEE SHAD
STOVER AT YALE
THE SALAMANDER

Vaughan Kester (1869-1911)
Fiction
THE MANAGER OF THE B. & A.
THE PRODIGAL JUDGE

Basil King (1859-1928)
Fiction
THE INNER SHRINE
THE STREET CALLED STRAIGHT

Helen Reimensnyder Martin (1868-1939)
Fiction
TILLIE: A MENNONITE MAID
BARNABETTA

William Lyon Phelps (1865-1943)
Criticism
ESSAYS ON MODERN NOVELISTS
SOME MAKERS OF AMERICAN LITERATURE

David Graham Phillips (1867-1911)
Fiction
OLD WIVES FOR NEW
SUSAN LENOX
THE FORTUNE HUNTER

Melville Davisson Post (1871-1930)
Fiction
THE STRANGE SCHEMES OF RANDOLPH MASON
THE CORRECTOR OF DESTINIES

Lizzette Woodworth Reese (1856-1935)
Poetry
A WAYSIDE LUTE
WILD CHERRY

Eugene Manlove Rhodes (1869-1934)
Fiction
GOOD MEN AND TRUE
THE TRUSTY KNAVES

Logan Pearsall Smith (1865-1946)
Essays
THE ENGLISH LANGUAGE
ALL TRIVIA

Wilbur Daniel Steele (1886-)
Fiction
LAND'S END
THE MAN WHO SAW THROUGH HEAVEN

Bert Leston Taylor (1866-1921)
Light verse
LINE-O-TYPE LYRICS
MOTLEY MEASURES

Sara Teasdale (1884-1933)
Poetry
LOVE SONGS
FLAME AND SHADOW

Henry Van Dyck (1852-1933)
Poetry, Fiction
COLLECTED POEMS
WINDLESS CABINS (fiction)





How Do Fireworks Get Their Colors?

THE science of fireworks is a very real one, demanding a good deal of chemical knowledge. The name chemists give to the making of fireworks is "pyrotechnics," from a Greek word for the art of making fire. Miniature fireworks are often made and used by chemists, for it is by the color of their flames that some of the elements can most easily be known. The chemist burns a bit of the substance he is analyzing and tells by the color of the flame whether it is one of those elements.

The color of a flame is due to the element itself. It is a wonderful secret of nature, and has its origin in the lightning-like vibrations in the atoms. These vibrations set up waves that we recognize as blue or red or yellow or other light. Thus barium salts give a green flame, strontium salts a red flame. It does not matter whether we use strontium chloride or strontium sulfate: it is the strontium that gives the characteristic crimson color to the flame.

There are, of course, many colors that can be introduced into fireworks. Sodium salts give golden effects, lithium salts red colors, copper salts blue flames and so on. Some of these compounds require greater heat than others to make them burn brilliantly, and here again the science of the firework-maker must come in so that the heat of the firework flame is hot enough to get the proper effect at the right time. The pretty little stars made by the dinner-table fireworks in party snappers are caused by tiny filings of iron, which burn with a fierce but rapid flash, giving the appearance of a star.

Some fireworks have a practical service. Colored lights have long been used by ships at sea for certain signals. Star shells and signal lights are also used for night operations by troops on land.

WHY DOES GRASS TURN YELLOW AFTER BEING MADE INTO HAY?

The grass we cut for hay consists of the leaves and green stems of certain plants. The green coloring matter is chlorophyl, a chemical substance that aids the plant to manufacture its own plant substance from carbon dioxide. Chlorophyl is a very complicated compound, easily broken up and changed. When grass is cut, it dies. The delicate chlorophyl soon breaks up, and its atoms form other, simpler, compounds, some of which are yellow. Usually there is so much more of the yellow compound that is left that only the yellow color shows in the cut hay.

HAVE THINGS ANY COLOR AT NIGHT?

No. What is a colored thing? An orange is orange-colored when light containing orange waves is thrown upon it. The skin of the orange absorbs all other waves from the light and throws back the orange waves. If you throw no light on it, the orange can not throw any light back to you.

A picture on the wall is painted in various colors: blue sky, green grass, red barns. When white light (containing all color waves) falls on the picture, the red paint on the barns absorbs all but the red light, and throws the red back; the blue paint in the sky throws back the blue part of the light, and absorbs the rest, and so on with the other paints in the picture. If you go into the room at night you do not see the colors of the picture until you turn on the electric light. Things do not have color in the dark, because darkness is the absence of light, and color is a kind of light.

WHY DO WHITE THINGS GO YELLOW WITH AGE?

Not all white things go yellow with age, but articles made from plant fibers generally do so: cotton and linen fabrics; also wool and silk, which have an animal origin. The reason probably is this: After a time the fibers, made of cells that once were living, begin slowly to break down. As they weaken, oxygen and carbon dioxide from the atmosphere join with them to form new compounds, some of which have a yellowish color. We call this process oxidation.

Ultraviolet radiation also probably plays a part in the yellowing. Perhaps you have noticed that your father's straw hat grows yellow after he has worn it for a summer. Here the sun's radiant energy is mostly to blame. The ultraviolet rays cause chemical changes in the straw, as they cause changes in your skin when you sunbathe to get a coat of tan.

Precious white fabrics can be protected from ultraviolet radiation if you wrap them in heavy blue paper. But even so, in time, they will go yellow from oxidation, because the atmosphere is everywhere, and because we do not know how to keep the dead cells of the fibers from breaking down.

You may see a fine old piece of lace or silk or linen with brown spots here and there. These are probably due to fungus. No way of clearing these spots has yet been discovered.

Cotton fabrics and some others may be rinsed in bluing water to offset the yellowish look. A very thin film of blue clings to the fabric. When white light falls on the fabric, some of its yellow waves are absorbed by the bluing and so the light that is reflected has a bluish tint. This offsets the tendency of the old fabric to absorb blue light-waves and reflect yellow.

WHY DO SOME COLORS CHANGE IN ARTIFICIAL LIGHT?

What we call the color of an object is the reflection, as we said above, of some of the light that falls upon it. Whether in artificial light or in daylight, the object itself is the same, but its color may change if these two kinds of light are not the same.

Let us suppose an object is able to reflect only a certain pure shade of blue, and that this blue is found equally in electric light and in daylight. Then the color of the object will be the same in both cases. But in many respects electric light and daylight are different. Our eyes tell us at once that there is more yellow in ordinary electric light than in daylight, but that is only one of many differences. The color of an object may be a mixture, because it sends back to the eye two kinds of light together. Then, if one of these kinds of light is not present in electric light, or is only very weak in it, we shall see the object entirely or mainly by the other of the two colors that went to make up its daylight color.

All this depends, of course, on the fact that daylight, electric light and, indeed, practically all the kinds of light we ever use to see by, are made up of a mixture of light of many colors; and the particular mixture varies in different cases. Even sunlight is by no means the same mixture of colors at all hours of the day.



By Burton Holmes from Ewing Galloway

A rainbow in the mist over the gorge of the Zambezi River, forever foaming below Victoria Falls.

HOW DOES THE SUN MAKE A RAINBOW?

A rainbow always appears in the sky opposite to the sun, so that the person looking at it must have his back to the sun. The rainbow is due to a bending and reflection of the sun's rays when they are shining on raindrops in the sky. The white light of the sun is composed of rays of all the colors of the rainbow mixed together, but when this white light passes through a drop of rain the rays composing it are bent to different degrees, and so forced apart. When they reach the back of the raindrop, these separated rays—

violet, indigo, blue, green, yellow, orange, red —are reflected back to the eye.

That is the principle of a rainbow. If we make a hollow ball of thin glass and fill it with water, so as to have a sort of giant water drop, we can see the different colored rays reflected from the concave back of the ball as the drops of water reflect them back in the rainbow.

WHERE DO PAINTERS GET THEIR COLORS?

The painter's original color chart might well have been the rainbow, and while we can not make colors more beautiful than those we see in the sky, we can imitate them with pigments. A pigment, taking its name from the Latin *pingere,* to paint, is a coloring material. Many pigments are found in nature. Yellow ochre, for example, is a clay dug from the earth. Cobalt blue comes from a mine in the form of ore. Plants and trees supply us with a variety of natural pigments. On the other hand, coal tar is an example of artificial coloring material from which the great group of aniline dyes is developed.

Yellow ochre is one of the simplest pigments to obtain, yet neither the house painter nor the artist could use it in its raw state. Were we to spread yellow ochre on the side of a house, the first good rain would wash it off. But if we mix it with linseed oil, we get oil paint, which will hold. If we combine it with glycerin and gum arabic, we have a water-color paint; if we mix it with chalk or wax we obtain pastels and crayons. In all cases the pigment is the same, while the mixing materials differ in accordance with the use intended for them. Today colors come ready-made, but once the painter had to mix them himself.

WHY DOES RED IRRITATE A BULL?

It is very difficult to be quite sure of the truth of this question, and we ought to be sure of the fact before we try to explain it. No one has made experiments to prove that red really irritates the bull more than any other bright color. Still, it is probable that red, perhaps just because it is usually the brightest of colors, does irritate a bull; though if the red color were on something that did not move, it might have less effect. Study of human beings seems to suggest that colors differ in their effect on the nervous system. While such colors as green and violet are soothing, yellow and red are excit-

An expert bullfighter controls a bull by tantalizing flourishes of the cape, in vivid red or pink.

Black Star





Cleanliness Bureau

Such a pretty blue cake of soap, but the lather is all white on our hands. Where did the color go?

ing. The cloaks of bullfighters are often bright pink, not really red, and the rest of their costume in almost any vivid color.

WHY DO WE GET WHITE LATHER FROM COLORED SOAP?

We see a cake of soap because it reflects light. You know that white light is composed of many colors. When illuminated by white light, a cake of colored soap *selects* the color or colors that it reflects. The other colors are absorbed. The amount of light absorbed depends to some extent on the thickness of a material.

Soap lather is composed of bubbles of air surrounded by thin films of soap and water. These bubbles reflect, absorb and transmit light differently from the solid cake of soap. The cake absorbed much light, transmitted little or none, and reflected some. The soapy bubbles are so thin as to be quite transparent.

When white light strikes bubbles made from colored soap, some of the white light is reflected at the surface of the first bubble struck. You know that when white light passes from one material to another, some reflection usually occurs at the surface between the two materials. The bubble also reflects the color of the original cake of soap and absorbs the other colors partly, but the bubble is so thin that most of the light passes right through. Whenever this light reaches a surface separating the soap-and-water film from air, reflection of the light again takes place.

There are so many bubbles that the numerous reflections eventually send back much of the light originally thrown upon the lather. The bubbles are so thin that they do not absorb much of the color. Thus the total amount of light reflected back appears to be white.

WHY DO LOBSTERS TURN RED IN BOILING?

The red color of a boiled lobster is due to a chemical change that occurs in the greenish brown coloring matter of the shell when it is heated. It is curious that red coloring matter, such as the hemoglobin of our blood, turns brown when it is heated, but the brown of a lobster's shell turns red.

THE NEXT WONDER QUESTIONS ARE ON PAGE 4947

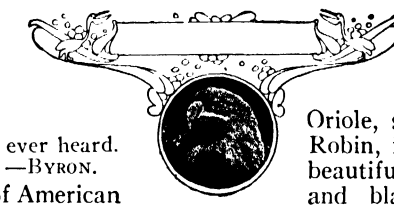
WHAT THIS STORY TELLS US

IN this story we read about some more of the feathered inhabitants of our fields and woods. Nearly all the birds spoken of here are song birds, and each one does its little best to help in the chorus of joyous song that fills our woods and gardens with sweet sounds throughout the spring and early summer. We also find that nearly every one of them destroys thousands of insects which would harm our crops. Even those which eat berries and fruit do more good than harm. The birds are so well described that we may easily learn to distinguish the birds and their songs and have the pleasure of knowing the names and the habits of the birds that nest in our orchard trees, down in the "bush," or in the fence corner of the meadow by the lane.

BIRDS OF NORTH AMERICA

LAND BIRDS OF THE NORTHERN PROVINCE: PART II

A LIGHT broke in
upon my soul—
It was the carol of a
bird;
It ceased—and then it
came again,
The sweetest song ear ever heard.
—BYRON.



In our first story of American birds we spoke chiefly of those birds which remain in the North the year round, though we did mention a few migratory birds. Most of the following are with us only in the summer. They include our best singers and our most brightly colored birds.

The Meadow-larks are not larks at all, but are relatives of the blackbirds, though they differ markedly in habits. In walking through grassy fields, meadows or marshes we sometimes flush rather large brownish birds which, alternately flapping and sailing, fly away. The white outer tail feathers show plainly whether the bird is flying or nervously flirting its tail after it has alighted on a tree or fence. The upper parts are dark in color; a line from the bill over the eye is yellow; a black crescent spans the breast; the throat, breast and upper belly are bright yellow; and the sides and lower belly are whitish, spotted or streaked with black. On the ground it builds its nest, and lays from four to six white eggs about one inch long, and spotted and speckled with brown. The song of the meadow-lark is a clear, plaintive whistle.

The Baltimore Oriole, sometimes called Golden Robin, is loved by all. In its beautiful plumage of orange and black it reminds us of stories of the gorgeous plumage of tropical birds, and seems out of place among the more soberly clad inhabitants of Northern climes. The head, neck, throat and upper back are black; and the breast, belly and lower back are a rich reddish orange. It breeds in Eastern North America, and winters in Central America. The nest of the Baltimore oriole is most interesting. It is made of grasses, plant fibres, hair, strings and bark firmly interwoven, and is hung between two twigs from near the extremity of a limb from twenty to forty feet high. The construction work is done by the female, who, though not so brightly plumaged, is a more highly skilled weaver than the male. The young birds cry ceaselessly for food—a monotonous *dee—dee—dee—dee*, until one of the parents arrives and stops their mouths. This bird is one of the greatest destroyers of hairy caterpillars. The tussock, gipsy, browntail, tent and forest caterpillars and the fall webworm are all greedily devoured by this species. For variety, curculios, wasps, bugs, plant-lice, scale

insects and flies are eaten, while cultivated fruit is occasionally eaten as a relish.

The Orchard Oriole is not so brightly colored. The head, neck and upper parts are black; the breast, belly and lower back are chestnut. This bird dresses quietly, but with excellent taste; his nest is of choicest materials; and the song, which no words can describe, is a finished effort.

THE GENTLE CUCKOOS WITH THEIR MOURNFUL SONG

Cuckoos are not very common in this region. The Yellow-billed Cuckoo occasionally breeds in Canada. It is a long, slim, dove-like bird; with upper parts brownish gray, with a greenish gloss; under parts dull whitish; outer tail feathers black tipped with white; and the lower mandible yellow. It is distinguished from the more common Northern species, the Black-billed Cuckoo, by its yellow lower mandible, reddish wing feathers, and black, white-tipped tail feathers, which marks are absent in the latter. The two species are alike in habits. They are insect-eating birds, and are particularly fond of tent-caterpillar larvæ. Cuckoos are of quiet and retiring habits, and on account of their mournful notes are often regarded with awe by the superstitious. Their short rounded wings and long broad tails give them a silent, gliding flight. The nests are flat, shabby platforms of twigs placed on the lower branches of trees. The eggs are greenish blue and over one inch long. Only the European cuckoos lay their eggs in the nests of other birds. Our cuckoos arrive in May or June, and leave in September for Central or South America.

A FEATHERED FISHERMAN AND HIS NEST IN THE BANK

The Belted Kingfisher is found about ponds, lakes and rivers, looking for small fish, which he catches by diving. The upper parts are bluish gray; the tail feathers have numerous spots and broken bands of white; the throat, a spot before the eye, and the breast and belly are white; a band across the breast and the sides is bluish gray, sometimes tinged with rufous. The nest is built at the end of a two- or three-foot tunnel in a sand bank, where five or more glossy white eggs are laid upon the sand. Silently the kingfisher perches on some limb overhanging the water, ever watching for a fish, his only food. Just as you reach the danger line he drops from his perch, and with a loud, rattling call flies on ahead.

In size and colors the Blue Jay resembles the kingfisher, but his habits are quite different. Nearly three-fourths of the food of the blue jay is vegetable matter, seeds, nuts and fruits. One of his many faults is that of eating the eggs and young of other birds. The head of the blue jay is crested; the upper parts are grayish blue, marked with black and white; a black band passes across the neck, back of the head and across the breast; the tail is blue, with feathers barred with black and tipped with white. He is a mimic and a ventriloquist, and delights in teasing other birds. The nest is built in the crotch of a tree. The four to six pale olive-green eggs, thickly marked with brown, are an inch long.

The Canada Jay, named Whisky-Jack and Moose-bird by lumbermen, is common in Northern woods. The forepart of the head is white; the back of the head and nape sooty black; the back gray; the wings and tail gray; the throat and sides of the neck white; and the under parts ashy gray. Because of his puffy gray feathers, and general colors, he resembles a big chickadee. The Canada jay is not so shy as most birds, and soon becomes a pet about lumber camps, where he feeds on the food thrown out to him. Lumbermen claim that he is very fond of whisky, and they delight in making him "drunk." These jays nest early in March, while deep snow still covers the ground and frost reigns supreme in the woods. Neither species is migratory.

TWO BIRDS OF THE NIGHT

The Whip-poor-will is an interesting bird, often heard in the calm of the evening repeating his name, but not often seen. His colors resemble those of the bark of a tree—black, brown and buff, with touches of white. There is a narrow white band across the breast, and the end half of the three outer tail feathers is white. This bird breeds in Eastern North America, and winters in Florida or Central America. Two dull white eggs, with delicate, obscure lilac markings and a few brownish spots, are laid on the ground among leaves. It is a bird of the night, captures and devours numbers of the large-bodied moths that fly in the woods, and is also fond of mosquitoes.

Whip-poor-wills are often confounded

with the Nighthawk, but are easily distinguished by the long bristles from the base of the bill, the black chin and the rounded tail. In the male nighthawk the throat is white, and there is a white band across the tail. The forked tail and the white band across the wing readily distinguish it at a distance. The female lays two mottled gray-and-white eggs on the ground among rocks in pastures. The nighthawk passes the day perched lengthwise on a limb; but soon after sunset he mounts high in the air, flies erratically about, at irregular intervals utters a loud nasal *peent,* and follows it by two or three unusually quick, flitting wing-beats. He is coursing for insects, his principal food. He winters in South America. This bird is sometimes called the Bull Bat, and occasionally the Goatsucker.

THE EXQUISITE RUBY-THROATED HUMMING-BIRD

The Ruby-throated Humming-bird is a near relative of the birds we have just described. Though there are four hundred species of humming-birds, all American, this is the only one of the family with courage to leave warm, sunny, Southern regions and visit Northern countries. It is the smallest bird we have, less than four inches long; with upper parts bright, shining green; under parts dusky, washed with green; and throat beautiful metallic ruby-red.

The ruby-throat needs no song. Its beauty gives it distinction, and its wings make music. It seems ever on the wing, now hovering over a bright blossom for a moment and thrusting its long bill into the flower for honey or for insects, then flying away so swiftly that its wings are lost in hazy circles. The nest is of down, covered externally with lichens, and firmly wound with almost invisible plant fibres. The tiny nest, not much over one inch broad, is placed on a limb high above the ground. In it are laid two tiny white eggs about the size of a pea. Humming-birds are curious and fearless. They will probe a flower held in one's hand, or fly into houses and feed upon sugar placed on a table. Their food consists largely of minute insects.

Voyager on golden air,
Type of all that's fleet and fair,
Incarnate gem,
Live diadem,
Bird-beam of the summer day,—
Whither on your sunny way?

THE KINGBIRD—THE ACTIVE TYRANT OF THE WOODS

The Kingbird, a member of the Fly-catcher Family, is every inch a king. Concealed under the feathers on the head is his crown of orange-red. He dearly loves a fight; and his scientific name, *Tyrannus tyrannus,* recalls the lives of kings of other days. The upper parts are grayish slate color; the tail black, tipped with white; and the under parts white. The nest of grasses and moss, firmly compacted, is placed high up at the end of a branch. The eggs, from three to five in number, are one inch long and are white, spotted with umber, in color. The kingbird has no love for crows, blackbirds, hawks and jays in particular; and should any of these approach his nest, they are reminded that other birds have rights which they must respect. He captures a vast number of mature insects, and thus renders a great service to the farmer.

Phœbes also are flycatchers and have all the food traits of the family. They are not too aggressive, and do no injury in any way. They nest in and about dwellings and under bridges. If unmolested, they will return year after year to the same nest. The colors of the upper parts are grayish brown, with an olive-green cast; the crown is greenish brown; the outer tail feathers whitish; and the under parts white, washed with yellow, and tinged with brownish gray on the sides. The bill is black. The phœbe is a devoted parent, and is seldom found far from home. There is something familiar, trustful and home-like in his ways. Perched on a bridge-rail or barnyard gate, he contentedly sings his humble, monotonous *pewit phœbe, pewit phœbe.* It is also called Pewee.

SOME OF THE OTHER FEATHERED INSECT-EATERS

The Wood Pewee is a near relative of the phœbe, and, like it, has gentle, pensive ways, voiced by his sad, sweet call. All day long he repeats his name—*pee-a-wee;* and these clear, sympathetic notes come from the canopy of green overhead during the peace and stillness of the hot midday hour, when summer heat has silenced more vigorous birds. The upper parts are very dark; the wings and tail greenish brown; and the under parts whitish, washed with gray on the sides. He winters in Central America, and breeds throughout North America, building a

nest of grasses and moss high up in a tree. One writer says: "I have seen one wood pewee catch and feed to its young forty-one insects in forty-five minutes."

Several other members of the Flycatcher Family are found in this territory. Of these, the Least Flycatcher, or Chebec, is the smallest and the most common. Its small size, the comparative absence of yellow on the under parts, and the generally horn-colored or brown lower mandible are the chief distinguishing characteristics. He salutes you with a business-like *chebec, chebec,* as he sallies after insects about lawns and orchards, which he prefers to the forest. The nest, built in a tree, contains from three to five white eggs.

The Crested Flycatcher is much larger, and has a sulphur-yellow belly, and a throat and breast of pearl-gray. His note is a loud whistle which pierces far through the clearing, as, full of life and vigor, in bright spring days he flies about in green tree-tops, chattering to himself or calling loudly as he goes. He often lines his nest with a cast-off skin of a snake.

Only one species of the Lark Family, the Horned Lark, is found in North America, but there are several varieties or subspecies. It comes from the North instead of from the South. These hardy birds visit us in flocks, and may be seen running over the snow or barren ground when few birds are about. They take wing with a sharp, whistled note. The forehead, a line over the eye, the ear region, and the throat are sulphur-yellow; the upper parts are grayish brown; a black patch crosses the breast; the under parts are whitish; and on each side of the head there rises a tuft of elongated feathers resembling a horn. It is from this tuft that the bird takes its name.

THE GROSBEAKS WHICH NEST IN THE FAR NORTH

The Pine Grosbeak is another winter visitor from colder Northern regions. The male is slaty gray, more or less strongly washed with rose-red. In the female olive-yellow takes the place of the rose-red in the male. Because of a general resemblance to the American robin, it is often called the Winter Robin. Its tail is forked, and the beak short and thick. It is very fond of the red berries of sumac and mountain-ash trees, which provide it with a nourishing diet.

The Evening Grosbeak, which has a black crown, wings and tail, and a yellow forehead, rump and belly, is a hardy and distinguished inhabitant of Far Northern regions, which comes south to Manitoba and Ontario in winter-time, and occasionally is seen in the United States. It builds its nest in the North. The Rose-breasted Grosbeak and the Cardinal Grosbeak both nest in the region, but neither is common. They belong to the South.

The Purple Finch is much smaller. The male has the entire body suffused with rose-red; but the female bears a decided resemblance to a sparrow, except for the rounded bill, the tufts of feathers over the nostrils, and the forked tail. The purple finch is a garden bird, very fond of fruit, blossoms and buds. Its full song is a sweet-toned, carelessly flowing warble which bursts forth as if from a happy heart, particularly when he wishes to attract the attention and win the love of a demure female. It nests in conifers and lays from four to six blue eggs, which are spotted with brown about the larger end.

SOME BIRDS THAT LOVE THE SNOW

The little Red Poll, with his bright red crown, grayish brown back and pinkish breast, is one best known as a winter visitor. It comes from the North in flocks in search of food. It is affectionate and confiding, easily tamed, and makes an interesting pet.

The Snow Buntings, or Snowflakes, come south, when the chill season comes on in icy regions, in great flocks, and forage about barnyards and bare fields. They must find enough to eat, because they are always very fat and in good health and spirits. The whole head, neck, rump and under parts are white, with some black on the wings and tail. As long as the snow lasts the Snowflakes stay; but when warm, sunny days in spring arrive they betake themselves to Far Northern regions, and there build their nests and bring up their little families.

Another bird of the North is the Pine Siskin, which comes south in winter, sometimes venturing almost to the Gulf of Mexico. The upper parts are streaked with black and buff; the wings and tail are greenish brown, with yellow markings, which serve to distinguish it.

THE AMERICAN GOLDFINCH, OFTEN CALLED THE THISTLEBIRD

Few birds are held in such high esteem as the American Goldfinch, or Thistle-

SOME OF OUR COMMON BIRDS



The wood thrush is larger than the other thrushes and has a bright coat. He has a sweet song.



The catbird, one of the friendliest of birds, makes its nest in hedges and thickets. His song is varied.



The purple finch, a garden bird, charms us with a sweet warble.



The blue jay has a crested head, and blue-and-white dress with black bars.



The female of the red-winged blackbird wears a brown dress.



The meadow-lark, a rather large bird, lives in grassy fields, meadows and marshes, where its whistle is often heard.



The orchard oriole wears a sober dress of black and chestnut.

bird, a summer resident wintering in the United States and the warmer parts of Canada. The adult male is bright yellow, with black cap, wings and tail. The female is olive-green all over. As they bound through the air in undulating paths their joyous nature is expressed by the canary-like song which speaks of the wilds of nature and of a happy life. They are seed-eating birds, and may often be seen swinging from the ripened heads of a dandelion or a thistle as they eat the tufted seeds.

The nest of grass and moss, thickly lined with down, is placed in a bush or tree, and contains from three to six pale bluish white eggs not much over one-half inch long. When the young birds are placed in a cage, hung from the tree at first, and moved toward the house a few feet each day, the parent birds will feed them until they are old enough to eat the food given canaries. They do well in captivity, the male in spring putting on his coat of yellow and black, and singing his joyous song. The writer kept one for eleven years. It died evidently of old age.

THE MANY FINCHES AND SPARROWS IN OUR FIELDS

The Finches and the Sparrows constitute the largest family of North American birds, represented by many species. The sparrows, commonly called "gray birds," are common about roadsides and the farm during the summer months. In general, they build on, or near, the ground, and are brown in coloring. Their food consists chiefly of insects during the summer and of seeds in autumn. Since the young are fed on insects, and as there are two or three broods each season, this means a vast number of insects taken from crops. When the breeding season is over, sparrows gather into flocks, and may be found in large numbers in weed patches left about the farm. As winter comes on, they leave for the South. Many species take high rank as songsters.

Though there are many American sparrows, an importation, the European House Sparrow, better known as the English Sparrow, is the most common. This bird needs no description, as it is familiar to every one of you. It is a dirty, noisy, quarrelsome bird, and all agree that it was a great mistake to bring it to America.

The Chipping Sparrow is the smallest—so small that sometimes it hangs itself accidentally with a horsehair used in lining its nest. The top of the head is reddish brown; the under parts nearly white; and the bill black. It is the humblest, most unassuming member of the family, making its nest in the vines about our porches, and feeding on the crumbs about our doorstep. Its song is a monotonous *chippy*, often repeated. The Winter Chippy, or Tree Sparrow, is larger, and, in addition to the size, is distinguished by an indistinct black spot on the centre of the breast. They come in flocks from the North when fields are beginning to look brown and dreary, and feed on the seeds of weeds and grasses. In spring they begin to sing a low, sweet, canary-like song.

SOME OF THE SPARROWS WHICH SING

The Song Sparrow, already referred to, is one of the best singers of early spring, and tells us that the winter is past. He strikes three or four strong notes, and then runs down the scale.

A joyful flourish lilted clear—
Four notes—then fails the frolic song,
And memories of a vanished year
The wistful cadences prolong;

A vanished year—O, heart too sore—
I cannot sing, thus ends the lay:
Long silence, then awakes once more
His song ecstatic of the May.

The crown is brownish, and the breast is marked with wedge-shaped marks of black and brown which tend to form a larger blotch at the centre. Its vivacious song may be heard by night as well as by day, and in all weathers; and though not a sociable species, it is one of the best-known of all sparrows. It nests on the ground or in bushes, and lays four or five white or bluish white eggs with brown markings.

The Vesper Sparrow much resembles the song sparrow, but is distinguished by two outer white tail feathers which show when it flies. It is a spring migrant, wintering on the Atlantic coast and breeding in Canada. As you walk along a country road the vesper sparrow will run rapidly ahead of you, wait for you to catch up, then run ahead again. His song is clear, loud and ringing.

The Savanna Sparrow has no distinctive marks except pale yellow marks over, or before, the eye and on the bend of the wing. It is a common bird by roadsides and in fields, and chips vigorously at every passer-by as it bobs up and down on fence

posts. Its song is a weak musical trill, most audible toward sunset. Swamp Sparrows are distinguished by their unstreaked breasts and different song—a simple, sweet, monotonous *tweet-tweet-tweet,* repeated many times. They are rarely seen beyond the confines of a wet meadow or grassy marsh.

In early spring the Fox Sparrow, which is foxy red all over, and larger than the other species, is seen about damp thickets and roadside shrubbery foraging among the dead leaves. Its song is not surpassed by that of any of the sparrows. One may be sauntering along wooded fields enjoying the balmy air of evening and be halted by a beautiful new song. It is a solo at first—an emotional outburst rising full-toned and clear, and passing all too quickly to a closing cadence which seems to linger in the silent evening air. Then, of a sudden, the solo is succeeded by a chorus. From every side, and from a hundred throats, comes the same sweet melody—the song of the fox sparrow.

OLD TOM PEABODY, THE WHITE-THROATED SPARROW

The White-throated Sparrow, or "Old Tom Peabody," is the national song bird of Canada. Some say that he says *peabody, peabody,* but Canadians hear his song differently and declare that he plainly says: *I love dear Canada, Canada, Canada.*

Shy bird of the silver arrows of song
That cleave our northern air so clear,
Thy notes prolong, prolong,
I listen, I hear—
"I—love—dear—Canada—Canada—
Canada."

Shy bird of the silver arrows of song,
Shy poet of Canada dear,
Thy notes prolong, prolong,
We listen, we hear—
"I—love—dear—Canada—Canada—
Canada."

The centre of the crown has a white stripe, bordered on each side by much wider black stripes; and a white stripe passes from the eye backward along the side of the head. The throat is marked by a square white patch. There is little in their modest appearance to tell one, as they feed on the ground near their haunts, of their vocal powers; but suddenly a clear, sweet, plaintive song arrests one's attention, and we may hear the patriotic words of Canada's national song bird.

We must not leave the Sparrow Family without referring to a common bird, slate color above, white below, flesh-color bill, and white outer tail feathers. It is the Junco, a welcome bird of early spring days, even though dressed in sober colors, and with a song seldom heard. The *tsip* of the Junco is known to all, but few have heard his low, sweet song, which is as unpretentious and cheery as the bird itself. It does not migrate to any great distance.

THE FLAME WHICH LIGHTS UP OUR WOODS

The bird of paradise in the Northern regions is the Scarlet Tanager. The male is bright scarlet, with black wings and tail. The female is more soberly clad, olive above and greenish yellow underneath. It nests as far north as Canada, but is not common anywhere. Its color is so vivid that it is an easy mark for anyone with a gun. Its song is a loud, cheery carol, suggesting the song of the robin. These beautiful birds are found in open woods, parks or orchards. They live on seeds, berries and insects. It winters from Mexico to South America.

SWALLOWS OF THE BARN, THE BANK AND THE WOOD

The swallows are denizens of the air. It is their domain, and it contains their food. In structure they are especially adapted for their life, having long wings, small feet and short, broad, deeply cleft bills fitted for catching insects. They are highly insectivorous, and are, therefore, of great benefit to man.

The Barn Swallow has upper parts of dark blue; forehead, throat and upper breast chestnut; lower breast and belly buff; and a deeply forked tail, showing white markings when spread. It builds a nest of mud and grass, lined with grasses and feathers, and fastens it on the rafter or beam of a barn or other building. The eggs are white, with numerous brownish spots. Barn swallows rank first among a family of birds famous for their power of flight. In search for insects they skim low over the fields, turn quickly to right or left, up or down, and pursue their marvelous course with ease and grace.

The Bank Swallow has brownish gray upper parts, a white throat, and a brownish gray band on the breast. It builds a nest of grasses and feathers in a hole in a sand bank two or three feet from the entrance. It may be generally known from other swallows by the small size, absence of metallic coloring, and the nesting hab-

its. The Cliff, or Eave, Swallow has a whitish forehead; steel-blue crown and back; chestnut throat and sides of head; brownish gray breast; and greenish brown tail feathers of nearly equal length. Its nest is of mud, pocket-shaped, with an opening at one side above, and fastened beneath a cliff or the eaves of a barn. The birds will return year after year to their rows of mud tenements.

The Tree Swallow has upper parts of steel-green or steel-blue; under parts of white; and the tail slightly notched. They build nests of grasses and feathers in the hollow of a tree, or they may accept as substitutes for the tree the boxes erected by man.

THE PURPLE MARTIN DEMANDS A HOUSE FOR HIMSELF

The best-known of the swallows is the Purple Martin, which occupies houses or boxes erected for its occupation, if the English sparrow has not already taken possession of these before the martin arrives in late spring. The male is shining blue-black, with wings and tail duller. Martins not only drive away hawks, but they eat many injurious insects—beetles, in particular, for which they have a great fondness. They arrive in the spring just as the insects are beginning to become active. Every one eaten then means many fewer later in the year. Intelligent fruit-growers realize their value.

The Chimney Swift closely resembles the swallows in its habits, except that it never alights on the ground, even to obtain the materials for its curiously constructed nest placed on the inside wall of a chimney. The birds are smoke-colored; and spines on the end of each tail feather enable them to hang to the upright walls of the soot-lined chimney. The nest is made of twigs glued to each other and to the side of the chimney by the bird's saliva. The white eggs, from three to five in number, are long and narrow. Throughout the day numbers of swifts are scouring the air for their fare of insects; but as night approaches they return to the chimney, where there is a continuous and not unmusical twittering day and night.

THE CEDAR WAXWING, THE MOST POLITE OF BIRDS

The most polite and the best groomed of all birds is the Cedar Waxwing, often called Cedar-bird or Cherry-bird. The forehead, chin, and a line through the eye are velvety black; the head and the upper parts are a rich grayish brown, with small red sealing-wax tips on some of the wing feathers; the belly is yellowish; and the tail has a yellow band at its end. The nest is placed in a fruit or shade tree, and the eggs are bluish gray, spotted with umber. The cedar waxwing is a common summer resident. Though very beautiful, it undoubtedly consumes a large number of cherries and currants and a few raspberries. On the other hand, it destroys many insects. It is particularly fond of the elm-beetle, which has done so much harm to our beautiful trees. They are very tame, and allow anyone to almost touch them while they are feeding. The note is an insignificant hiss. Their beauty and their gentle, refined ways make them seem superior creatures of the air which we must respect. The Bohemian, or Northern, Waxwing is rather rare. It has whitish bars across its wings.

THE BLOODTHIRSTY SHRIKES, WHICH EAT OTHER BIRDS

The Northern Shrike, or Butcher-bird, is a hawk-like, bloodthirsty bird which preys on small birds and impales them on a thorn, a fence barb, or a forked twig—hence the name butcher-bird. The male is ten inches long, with gray, black and white the prevailing colors. They are unable, because of the structure of their feet, to hold their prey while they eat it, so they impale it upon thorns or barbs and tear it to pieces with their hooked bills. They also feed on mice and noxious insects. The song consists of various whistles. They place their rude, bulky nests of twigs and weeds in thorny trees or shrubs and lay from four to six grayish white, spotted eggs over an inch long.

The Loggerhead Shrike has black upper parts and white under parts, and his habits are in general like those of the northern shrike. His notes are harsh and unmusical.

THE VIREOS, OR GREENLETS, AND THEIR HABITS

The vireos are small insect-eating birds confined to the Americas. They are slow in their movements, and lovers of trees, where they secure their food from crevices in the bark or from the under-side of leaves. With us the most common species is the Red-eyed Vireo, which has a slaty gray crown, bordered on either side by black; a white line over the eye; under parts pure white; and upper parts olive-green. The conspicuous white line over

FOUR OF OUR FEATHERED FRIENDS



The nuthatch is a shy woodland dweller during the summer, but the approach of winter sends him forth into the open fields in search of food.



The crossbill is so named because the points of the upper and lower halves of its bill are curved, and overlap. It loves pine forests, and northern regions.



The killdeer are swift in flight, and run fast on their long legs. They are nervous birds. Their noisy call "Killdeer, Killdeer" gives them their name.



Pictures by Bruce Horsfall, from National Audubon Society

The flicker, or golden-winged woodpecker, carves out a nest in the trunk of a dead tree. Flickers help the farmer by eating insects and grubs.

the eye, with its black border, and the bird's red eye distinguish it from its relatives. It is a summer resident, wintering in South America. All through the spring and summer months the warble is heard from woodland and roadside, often becoming monotonous. It is delivered in parts, with intermissions of a few seconds between, from morning until night. He is called the Preacher, because he explains his subject in a few words, and then makes a pause for his hearers to reflect upon it. Translated, his sermon is: *You see it—you know it—do you hear me?—do you believe it?*

The Warbling Vireo is olive-green above, with no black border on the crown. The under parts are white, slightly washed with yellow. It breeds as far north as Hudson Bay, and winters in the tropics. Its song is a firm, rich, continuous warble. The Yellow-throated Vireo has bright olive-green upper parts; a white belly; and eye-ring and throat and breast bright yellow. He is a dweller in tree-tops, and his tune is deeper, richer and more deliberate than that of the red-eyed. He calls: *See me; I'm here; where are you?*

Several other vireos are more or less common. The Blue-headed, or Solitary, Vireo is, however, rather rare, and so is the Philadelphia Vireo. It is grayish olive above and greenish yellow below. Its song is very much like that of the Red-eyed. The White-eyed is one of the best singers of the group, but is also becoming rare in the region.

TWO SWEET SINGERS—CATBIRD AND BROWN THRASHER

From the coverts of the thicket comes a wondrous burst of song;
Tripping gaily, pressing, crowding, flood the liquid notes along!
'Tis the catbird, dear old Orpheus, with a heart as full of joy
As our quaint old Quaker poet, or his whistling bare-foot boy.

The Catbird is one of the most intelligent of birds. As the copses come into leafage in May, catbirds and thrashers fill the air with their delightful songs. We close our eyes and give our ears full enjoyment. The catbird, so-called because he can "mew" like a cat, is inclined to be friendly to man, and where he is well treated and his confidence won, will show himself delightfully familiar, coming around the veranda, answering one's talk, and singing for our entertainment. He is a charming singer. The song seems to be made up as he goes along. It is an indescribable medley interspersed with various mews and calls.

His general color is dark gray, with a black cap, and chestnut under the tail coverts; and he is nine inches long. The nest is found in hedges or thickets, and is made of twigs, rootlets and grass, lined with fine black roots. The four eggs are plain greenish blue. In general, catbirds are lively, playful, full of pranks and quaint performances, and should be encouraged about our homes.

The Brown Thrasher calls from his lookout: *Shuck it, shuck it; sow it, sow it; plow it, plow it; hoe it, hoe it.* His song is a bright, cheerful carol, often long continued, but always clear and sweet. Above he is bright reddish brown; below, white with black spots; and the length is about one foot. He is an inhabitant of shrubbery and borders of woods, where he passes much time on the ground scratching among the fallen leaves. He is active, shy and suspicious, and does not like to be watched. The brown thrasher is a finished musician with rich tones and exact execution. Morning and evening, mounted on the upper branches of a tree, he pours forth his song in a way that makes it appeal to the heart and to the mind.

THE FRIENDLY WRENS AND THE HAPPY KINGLETS

The wrens were formerly classed with the thrashers, but are diminutive in size. The House Wrens are common in the southern part of the United States, but also breed in southern Canada. They are brownish above, with tail and wings barred, dull gray below, and barred on the flanks with brown. They are bold, sociable, confiding little birds, building their nests in bird-boxes erected for them. They feed wholly on insects, and are therefore beneficial. The song is loud and clear, and bubbles with enthusiasm.

The Winter Wren breeds in northern Canada or in the mountains of the United States, and winters southward. It is bright cinnamon above, paler below, with sides, wings and tail heavily barred with black. This is the shortest and most stoutly built of wrens, and looks very pert with its stubby tail erect over the back. They nest in brush heaps, tin cans, or in hollow stumps. The nest is lined with feathers, and the little eggs are white, sparingly speckled with reddish brown. The Marsh Wrens are shy, suspicious little

birds which are seldom seen near the habitations of man. They love low ground. Both the Short-billed and the Long-billed occasionally go as far north as Canada.

The kinglets are very attractive birds. Though very small, they are active, hardy little birds, and always seem to be happy. The Golden-crowned Kinglet has the centre of the crown bright reddish orange, bordered by yellow and black, with upper parts olive-green and under parts whitish. It builds a tiny hanging nest of mosses, bark and feathers high up in a tree, and lays nine or ten tiny eggs. Its song consists of a few chips or chirps and trills, but is surprisingly strong for such a tiny bird. The Ruby-crowned Kinglet has a partly concealed crest of bright red. The kinglets are usually seen flitting about evergreens. They breed in Canada, and winter in Mexico and Central America.

THE THRUSHES, THE GIFTED MUSICIANS OF THE WOODLAND

The thrushes are conceded first rank among song birds by all true lovers of music. Wilson's Thrush, or Veery, has the entire upper parts a uniform reddish brown. Below it is dirty white, with a few faint marks on the breast. It is found in swamps and in dry woods. The nest is on the ground and made of strips of bark and leaves. The eggs are greenish blue. These birds are shy and retiring, and live near the ground. All the wondrous mysteries of the woods find a voice in their song. It is a weird, ringing monotone of blended alto and soprano notes. It has neither break nor pause, nor does it seem to come from any one place. In fact, the bird is a ventriloquist, and has led many a bird-lover a weary tramp in searching for him on different trees while he has not moved from his perch. The song is like the syllables *vee-r-r-hu* repeated eight or nine times around a series of intertwining circles.

The Wood Thrush is distinguished from other thrushes by its larger size, its brighter cinnamon colors above, and the numerous large round black spots on its under parts. His song is very clear and flute-like, containing many notes of the scale; and as it rings through the woods like a hymn of praise, it invites one to yield to the ennobling influences of nature.

The Hermit Thrush has a reddish brown tail much brighter than the back and head, and a breast quite heavily spotted with black. When migrating it does not sing; but in its summer home in the woods, where it finds seclusion, it pours forth a song which in purity and sweetness of tone, and in exquisite modulation, touches the very highest chords of bird music. The Olive-backed Thrush, Bicknell's Thrush and other species are summer residents up into Canada, and are quite similar to those described.

THE AMERICAN ROBIN, BEST KNOWN OF THE THRUSHES

The best-known and most-loved of all the thrushes is the American Robin, which is abundant about farms and dwellings over Eastern North America. His loud, cheery carol, *cheerily-cheerup, cheerily-cheerup,* repeated many times, is welcomed in the early spring, and tells us that the winter is past.

The robin is about ten inches long, much larger than the little robin redbreast of England, which is not a thrush. The male has a black head, a reddish brown breast, and drab upper parts. The female has duller colors. The nest is of coarse grasses and rootlets, with an inner wall of mud and lining of fine grasses, and may be found in shade trees or on a veranda beam. She lays from three to five greenish blue eggs about one inch long. The young are fed on larvæ, chiefly cutworms, and in this way robins do a good work. It is true they may help themselves to cherries and strawberries from the farmer's garden, but otherwise they do little damage, and none would wish to miss their cheery songs.

> The Robin in the cherry tree
> Is blithe as any bird can be;
> And bubbling from his silver throat
> His wordless songs of rapture float—
> O happy, happy May.

Few birds are more friendly toward man. They seem to feel that no one could possibly wish to hurt them. Unfortunately this confidence is often misplaced. Thousands are shot or trapped while migrating, but as they raise more than one brood every year, they are still comparatively plentiful.

Though robins seem to go south in winter, it is not uncommon to find them winter residents in New England or southern Canada. It is believed that these are the birds which breed in the Far North, and grow tired after they have traveled several hundred miles southward. Meanwhile those which breed in New England have gone farther south, and those which

were hatched in the southern states go to the tropics.

The Bluebird is another thrush which makes itself at home in our orchards and gardens, and occupies the cozy birdhouse in the apple tree. "The robin, the forerunner of the spring, the bluebird with his jocund caroling." Twenty years ago the bluebird was one of the most abundant of our summer residents, but now it is not common. Just why, we cannot say. It may be it goes to more northern unsettled districts, where it can still find "snake" fences and stumps in the pastures. It is cobalt-blue above, cinnamon-red below, with a white belly. Its disposition is typical of all that is sweet and amiable.

It is an expert catcher of insects, and a pair will destroy thousands in a season. They raise two, and even three, broods, and the appetites of the youngsters are enormous. It pays a farmer to prepare boxes in which they may nest and start housekeeping without delay. Pairs have been known to use the same nesting-place for several years in succession.

THE WOOD WARBLERS FOUND ONLY IN AMERICA

We close this review of birds of the Northern province with a reference to the wood warblers, which are found only in America; and of the one hundred species known, about thirty go as far north as Canada. With few exceptions they are inhabitants of the woods, but may be found in the trees of lawns and orchards. They are among the last of the spring arrivals, and the first to leave in autumn on their way to Central and South America. Like the flycatchers, their food is chiefly insects. Some look for these on leaves or bark, while some capture a large part of their food on the wing. All are small. Many are among our brightest-colored and most interesting birds. None of them is remarkable as a songster. All through the summer they are actively engaged in exterminating the hosts of our smaller insect enemies, and many thousands of broods of caterpillars are destroyed by them before they are large enough to do mischief.

The Redstart is perhaps the most brilliantly colored of all the warblers, resembling the Baltimore oriole, except in size. The Blackburnian Warbler is black, white and chestnut. The Yellow-breasted Chat is an excellent mimic, and there are a dozen others we might name.

TWO OF THE MORE INTERESTING WOOD WARBLERS

The Yellow Warbler, or Summer Yellowbird, is the most familiar of all because of its canary-like plumage and because it nests in the trees and shrubbery about the home. The upper parts are bright greenish yellow; the under parts are bright yellow, streaked with brown. The female is uniformly yellowish olive-green. Its nest of fine grasses and fibres is lined with down. The tiny eggs are bluish white, thickly marked with brown. Its bright colors, and its pleasing, though simple, song—a happy *wee-chee, chee, chee, cher-wee*—add to the attractions of the rural home.

This bird seems to suffer more than others from the attentions of the cowbird. Sometimes when this warbler finds the unwelcome eggs of the cowbird in its nest it has been seen to build another nest on top of the old.

One of the commonest and the most interesting of the woodland warblers is the Ovenbird. The crown is orange-brown, bordered by black; the upper parts olive-green; the under parts white; with the sides of the throat, breast and sides streaked with black. Flying up from the ground, he cautiously hops from branch to branch, walks carefully along a limb, and then suddenly "bursts forth into a wild outpouring of intricate and melodious song" which vibrates through the woods, as in rising tones it seems to say *teacher, teacher, teacher, teacher.*

THE MANY WATER BIRDS SEEN IN THE NORTH

You have noticed that we have spoken only of land birds in this story. This is not because water birds are not both numerous and important in the Northern province. In fact, they are probably more common in this section than elsewhere. One reason we have not mentioned them is that they are generally so large that they attract attention, and therefore are better known than many of the smaller land birds. We have not neglected them, however. In Volume Eleven you will find three chapters on the water birds of the world, and in those chapters you will find mention of the swans, geese, ducks, herons, cranes, gulls and other birds which love the water. Among our colored plates in other volumes you will also find them pictured.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 5026.

SOME INTERESTING AMERICAN BIRDS



RUFFED GROUSE



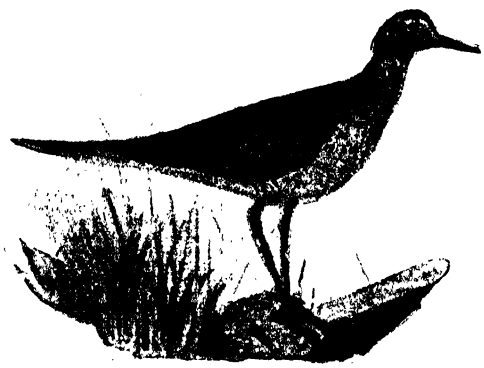
BLUE JAY



YELLOW-BELLIED SAPSUCKER



QUAIL, OR BOBWHITE



UPLAND PLOVER



ROSE-BREASTED GROSBEAK

Here are some common birds of the fields and woods. The ruffed grouse and the quail are game birds. The jay is noisy and quarrelsome. You can hear the sapsucker tapping on the trees. The rose-breasted grosbeak is rather shy, but may often be heard singing at night.

SOME COMMON BIRDS OF FARM AND WOOD



YELLOW-BILLED CUCKOO



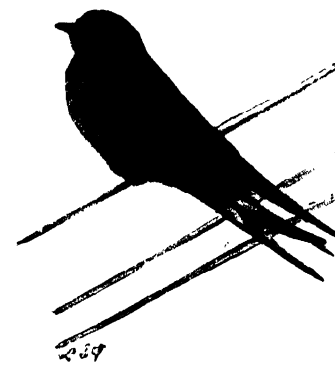
LOGGERHEAD SHRIKE



BLUEBIRD



ROBIN



BARN SWALLOW

These birds are found in the United States and Canada. In fact, many birds of Canada and the United States are the same, though Arctic birds do not venture down into the United States, and some tropical birds do not visit Canada. The robin, the bluebird and the barn swallow are common. The cuckoo winters in the South, and the cruel shrikes are the dread of the smaller birds.

WELL-KNOWN BIRDS OF NIGHT AND DAY



KINGBIRD



NIGHTHAWK



CHIPPING SPARROW



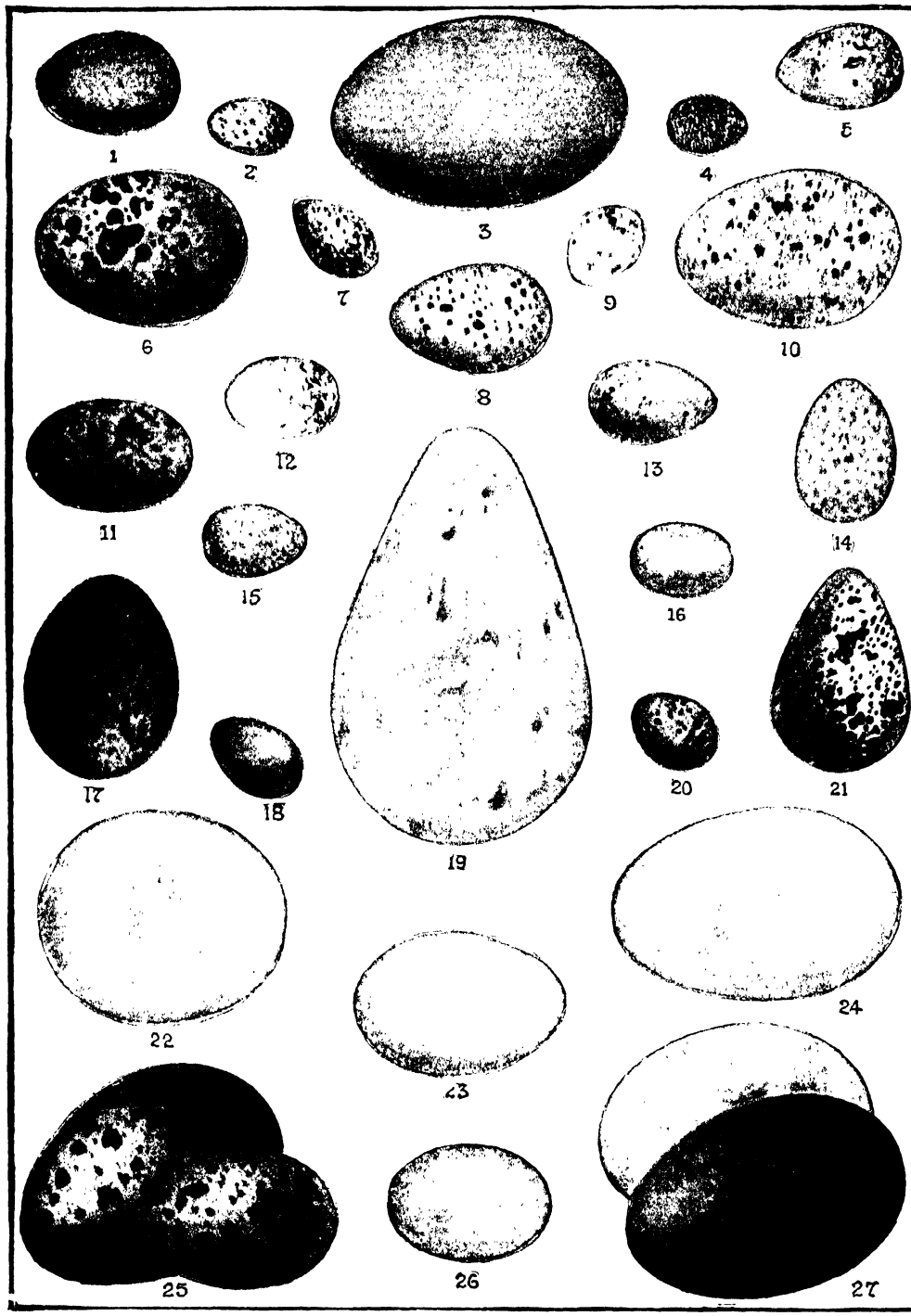
BROWN THRASHER



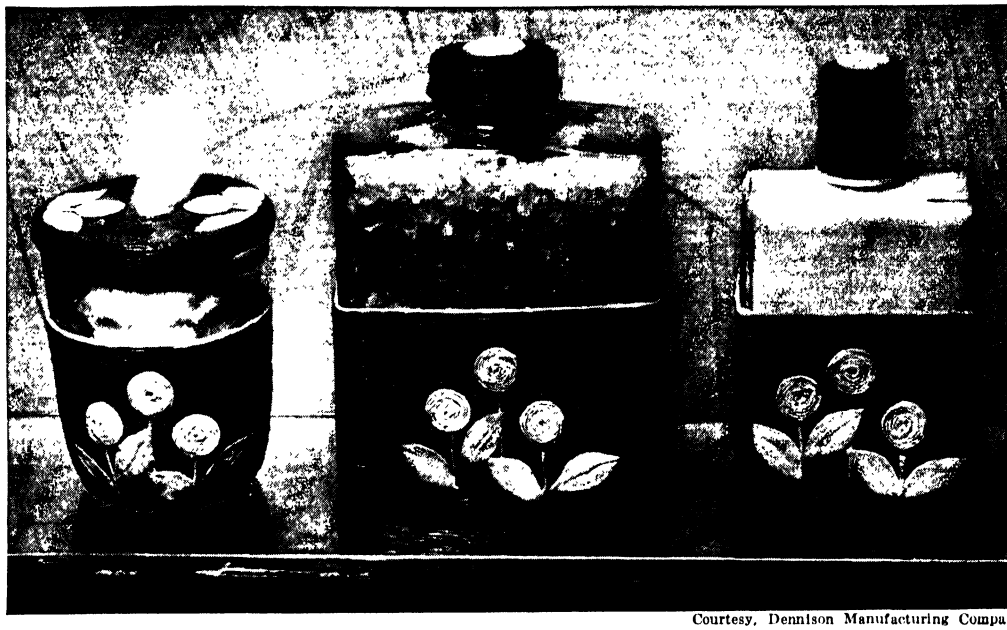
SONG SPARROW

Some sparrows are sweet singers, destroy many injurious seeds and insects, and have beautiful manners. They are not like the rude English sparrow, which has become a nuisance. The chipping sparrow and the song sparrow range over the greater part of North America. There are many other kinds of sparrows. The brown thrasher is a delightful songster, while the kingbird is a sturdy fighter for his rights. The nighthawk eats many insects.

CHARACTERISTIC EGGS OF AMERICAN BIRDS



1. Jays. 2. Titmouses. 3. Egrets and Herons. 4. Wrens. 5. Orioles and Blackbirds. 6. Grouse or Partridges. 7. Swallows. 8. Woodcock. 9. Pewee Flycatchers. 10. Gallinules, Coots and Mudhens. 11. Whip-poor-will; Nighthawks. 12. Towhee Finch. 13. Vireos. 14. Brown Thrasher. 15. Cowbird. 16. Bluebird. 17. Crows, Ravens, etc. 18. Thrush. 19. Guillemots and Auks. 20. Sparrows. 21. Plovers. 22. Owls. 23. Grebes. 24. Scaup-duck. 25. Gulls and Terns. 26. Cuckoos. 27 Hawks and Falcons.



Courtesy, Dennison Manufacturing Company

These three ornamental receptacles, trimmed with crepe paper, were originally discarded bottles.

DECORATIVE BOTTLES

OLD and discarded bottles may be decorated easily and inexpensively with crepe paper so that they will be not only useful but also ornamental additions to a medicine chest or a cupboard.

First cut strips of vermilion crepe paper across the grain 5/8 of an inch wide. Stretch and pull each of these strips through the hole of a large coat button.

Stand the bottle that is to be decorated in the centre of a square of wax paper. Draw the paper up and around the sides of the bottle, holding in place at the top with an elastic band. Turn the bottle upside down. Starting at the very centre of the bottom of the bottle, paste the pulled crepe paper around in a circle if the bottle is round, in an oblong if the bottom is oblong or in a square if it is square. Continue row after row, pasting and tightly twisting the crepe paper as you work. When the bottom is complete, work up the sides of the bottle until the jacket (as the covering that you have just put on the bottle is called) is as deep as you wish. Finish with one row of white pulled crepe paper (see picture). Paste the end in place and cut the surplus wax paper flush with the top end of the jacket.

Before covering the metal or bakelite tops of the bottles, give them a coat of clear white shellac. Otherwise the paste will not stick to them. Begin pasting a crepe paper strand at the centre of the bottle top and work as before.

For the flowers of the design, as shown in the above picture, cut circles out of thin white paper. Brush paste over one side and, starting at the centre, wind the white pulled crepe paper around like a wheel to the outer rim of the circle. Twist the crepe tightly as you wind.

The leaves are cut out of plain white crepe paper (the shape is shown above); use either two or three thicknesses pasted together with a double layer of thin white paper to form the back. The stems are merely twisted strands of white crepe paper. Arrange the circles and leaves to form a pleasing design, as in the illustration, and paste in place on the jacket of the bottle. After the jacket is complete, give it several coats of white shellac to make it waterproof.

Instead of the vermilion and white color scheme suggested above, you may use any other color pattern you desire. Some fascinating effects may be produced.

A GAME YOU CANNOT LOSE

THE greatest tennis players, golf players, chess players and checkers players sometimes lose games. Here, however, is a game that you cannot lose, provided that your opponent plays first.

This is the game; it is played by two people. Place 21 matches in a pile on the table. Tell your opponent that he is to take one, two or three matches from the pile. It is now your turn; you also take one, two or three matches from the pile. Your opponent and you then continue to draw from the pile in turn, each time taking one, two or three matches. The player taking the last match loses the game. And you can be absolutely certain that your opponent will take the last match!

Here is the secret of your success. As we have seen, your opponent plays first. Watch the number of matches that he takes. When it is your turn, take from the pile of matches the difference between the number 4 and the number of matches that your opponent takes. For example, if he takes three matches, you are to take four minus three—that is, one match. If he takes two matches, you are to take two; if he takes one match, you are to take three.

After a time, your opponent will probably insist that you play first. Unless he has found out your system, you should still have no trouble in winning. Simply keep count of the total number of matches taken from the pile. If at any time you can take enough matches to make the total number of matches that have been taken from the pile divisible by four, without leaving any over, you are sure to win. You simply continue to play as though your opponent had taken the first turn. That is, you simply observe how many matches your opponent takes from the heap and you take the difference between the number 4 and the number taken by your opponent.

SOLUTIONS TO THE RIDDLES ON PAGE 4266

Here are the answers to the six riddles that were given on page 4266.

1. Dust. 2. The figure 8. 3. David. 4. River. 5. Glass. 6. Shadow

HOW TO FIND A PERSON'S AGE

HERE is a mystifying arithmetical trick that will enable you to tell the age of a person between the ages of 10 and 99. He is to co-operate with you by working out some arithmetical problems on a piece of paper; you are *not* to look at this paper.

First he writes down the day and month of his birth in figures. For example, if he were born on April 15, he would put down 154. The 15 would stand for the 15th day of the month and the 4 would indicate that April is the 4th month of the year. He now multiplies the figures representing the day and month of his birth by 2, adds 5, multiplies by 50, adds his age at his last birthday and finally adds 365 to the result. He tells you what this total is. You simply subtract 615 from this total and you will be able to tell him his age and the date of his birth.

Let us suppose that your friend was born on April 15 and that he is 15 years old. He would set down 154, as we have seen, as the day and month of his birth expressed in figures. He would multiply 154 by 2, making 308; add 5, making 313; multiply this by 50, making 15,650; add his age, 15, making 15,665; and, finally, add 365, making 16,030. This is the total that he would give you. Subtracting 615 from this total, you would have 15,415. The first two figures will stand for the day of the month, the 15th; the 4 will be the fourth month and the remaining figures will indicate his age, 15.

You may ask: "How will one know that the 1 with which the numeral 15, 415 begins does not stand for the 1st day of the month?" You will note that, if this is so, the month would have to be 5 (that is May), as of course it could not be 54; that would leave 415 as the age! In every case, no matter what the figure is, you will be able to determine which figures refer to the day of the month, which to the month and which to your friend's age.

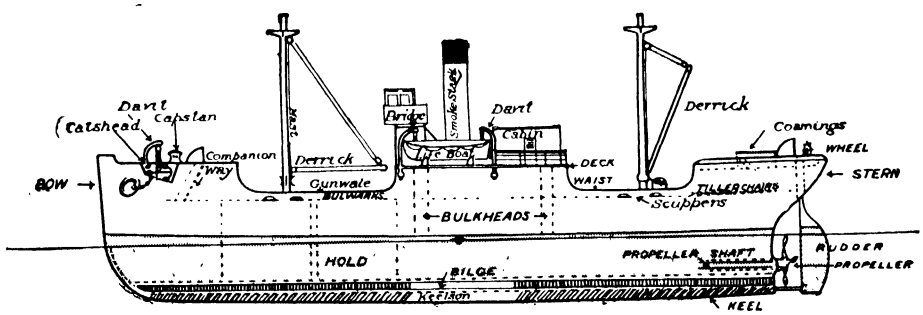
Even if your friend remembers the arithmetical operations he was required to do, he still will not know the secret of the trick, as you alone know the last operation.

HOW TO UNDERSTAND A SHIP

IN this article we shall tell you about some of the more important parts of a ship. We shall also explain some of the more frequently used nautical terms (that is phrases which have to do with seamen, navigation and ships—the word *nauta* means sailor in Latin).

On page 340 we showed how sailors made their knots; on page 3253 we described the methods by which they splice ropes. The different sailing ships, masts and sails were discussed on page 4084. Hence none of these matters will be dealt with in the present article.

As most of us know, the body of a ship, without the masts, rigging, sails, and so on, is called the *hull.* The *keel* is the lengthwise beam that goes along the bottom of the ship, in the middle of the hull. In steamers and battleships this part is of metal. Its purpose is to give strength and steadiness to the ship. Sailors often talk of a ship floating on an *even keel.* This phrase means that the ship's decks are quite horizontal.



1. In this diagram of a small steamer we see the names of the principal parts of a ship.

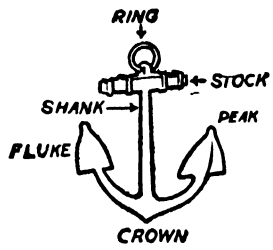
The word *beam* sometimes refers to timbers or metal supports set across a ship from one side to another of the hull, so as to give the ship stiffness. The term is also used to refer to the width of a ship. Thus, when we speak of a ship with a 40-foot beam, we mean that the ship's width at its broadest part is exactly 40 feet.

The *deck* of a ship is the floor-like platform of a vessel. On ships of large size there is always a kind of gutter around the edge of the deck. The water that falls on the deck runs into this gutter and there are holes in the side of the ship by means of which this water is discharged into the sea. The word *scuppers* is applied to the gutter and the holes in the ship's side.

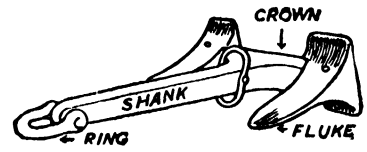
The *bulwarks* of a ship are the raised sides above the upper deck; they have a rail on top. The *topsides* (this word is sometimes used in the singular form, *topside*) are the portion of the outer surface of a vessel that is above the water line. The *gunwale* or *gunnel* is the uppermost planking covering the timbers of a ship right below the bulwarks. The gunwale is sometimes described as the part of the ship where the topsides and the deck meet.

The *hold* is the part of the hull where goods are stored during a voyage. The opening in the ship's deck leading to the hold is called the *hatchway;* the lid which covers this opening is called the *hatch.* The hatch was originally a grating of wood or metal, but it is now generally solid. The *coamings* are raised pieces of wood or metal which are built up around the hatchway, above the deck, in order to prevent the water on the deck from running into the hold. The *bilge* of a ship is the very lowest part at the bottom of a ship, under the hold. The water that finds its way into the bilge is called *bilge-water;* it is pumped out at regular intervals.

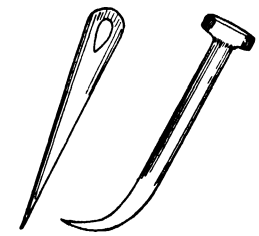
The *bridge* is a platform raised above the rail and extending across the deck of the larger vessels; here the captain or pilot or helmsman stands when he steers the ship. The *helm* is the steering apparatus. It consists of the *rudder,* the *tiller* (sometimes *tiller-ropes* or *tiller-chains* replace the tiller) and the *wheel.* The rudder is the flat, vertical blade at the back of a ship by which the ship is steered. It is sometimes called



2. A common anchor.



3. A stockless anchor.



4. Marline-spikes.

the helm; this is not very exact, however, as the rudder is only a part of the helm. In the smaller boats there is a long piece of wood at the top of the rudder, extending in the same direction as the rudder. This long piece, known as the tiller, forms a handle by which the boat is steered. In some ships tiller-ropes or tiller-chains connect the rudder with the steering-wheel. The latter is a large vertical wheel, the movement of which turns the rudder from one side to the other and thus steers the ship. Sometimes the rudder-chains are moved by separate engines.

The *cabins* of a ship are the rooms where the passengers or crew have their quarters. The word companion is used in a curious way on board ship. The *companion* is the window-frame or skylight through which light is admitted from the deck into a cabin or to the lower deck. The *companion-way* is the name of the stairs leading from the deck into a cabin. The *companion-ladder* is the ladder by which the ship's officers reach their cabins from the deck.

The *forecastle* of a ship is the forward part of the upper deck. Generally the name refers to the place where sailors on merchant ships have their quarters. At the other end of the ship is the *poop,* a deck built at the *stern,* or rear of the boat. A *poop-cabin,* naturally, is the cabin directly beneath the poop. The *quarter-deck* is a part of the upper deck reserved as a promenade for the officers and sometimes for cabin passengers. The quarter-deck is between the poop and the main mast. The *main-deck* is the middle section of the upper deck of a freighter or passenger ship. The *galley* of a ship is the cook's quarters; the name is also applied to the cooking apparatus. The *steerage,* in some ocean-going passenger vessels is the part of the ship occupied by those who travel at the lowest rates. The steerage is generally below the main deck, somewhat forward.

In loading and unloading a ship the *derrick* is used. This is a hoisting apparatus; it consists of a swinging spar attached to a mast and worked by ropes, as we see in figure 1. The derrick hoists packages to and from the hold. Another hoisting device is used to lower and raise the ship's boats. These are suspended from metal posts, called *davits.* In some ships the davits are turned around when the boats are to be lowered into the sea; in others, a sliding device on the davits lowers the boats.

To *moor* a ship is to fasten it by ropes or chains to its pier, or to let out the anchor, so that the ship remains in one place. In the latter case we say that the ship *is at anchor* or that it *rides at anchor.* The *moorings* of a ship are the various chains, ropes and so on used to make a ship fast to its pier or anchorage.

The *anchor* of a ship is an instrument of iron or other heavy material used for holding ships; it is let out by means of a rope or chain and rests on the sea bottom. The common form of anchor, as shown in figure 2, consists of a central shaft, known as the *shank,* and two curved arms which terminate in the pointed *flukes.* The cross-piece at the part of the shank opposite the flukes is called the *stock.* The part of the shank above the stock is the *head;* upon this is the *ring* or *shackle,* to which the rope or chain is attached. Most large modern vessels use some form of the stockless anchor shown in figure 3. The anchors and the chains or ropes attached to them are called *ground-tackle.* The anchor is *weighed* (raised) or *cast* (lowered) by means of a capstan or winch set on the deck. When the anchor is hoisted up, it is secured to the *cathead,* a projecting piece of timber or of metal near the bow of the vessel. When the anchor fails to hold on

the sea bottom, the ship is said to drag its *anchor.*

When we say that a ship *draws* 12 feet of water or that it has a *draft* of 12 feet, we mean that when the ship is in the water, the depth of water from the surface to the bottom of the keel does not exceed 12 feet. When the ship is loaded with cargo we speak of the *load-water draft* of the ship and when there is no cargo in the hold we refer to the ship's *light-water draft.* The *load line* is a line on a ship's side near the surface of the water. When the load line sinks beneath the surface of the water, it shows that the vessel is too heavily loaded.

Starboard means the right side of a ship; *port* or *larboard* refers to the left side: right and left, that is, as one stands on the ship looking toward the bow. *Fore* and *aft* refer respectively to the front part and the back part of the ship.

A word frequently found in books about the sea is *marline-spike.* A *marline* is a small rope used for winding around thicker ropes; it consists of two strands loosely twisted together. The marline-spike (see figure 4) is a spike or pointed iron used in *marling* or separating the strands of a marline. In the naval warfare of other days, when hand-to-hand fighting with the foe above decks was not uncommon, marline-spikes sometimes served as weapons. These tapering, sharp-pointed irons could be used in close-range fighting with deadly effect.

FIRST AID TO THE INJURED: LESSON III

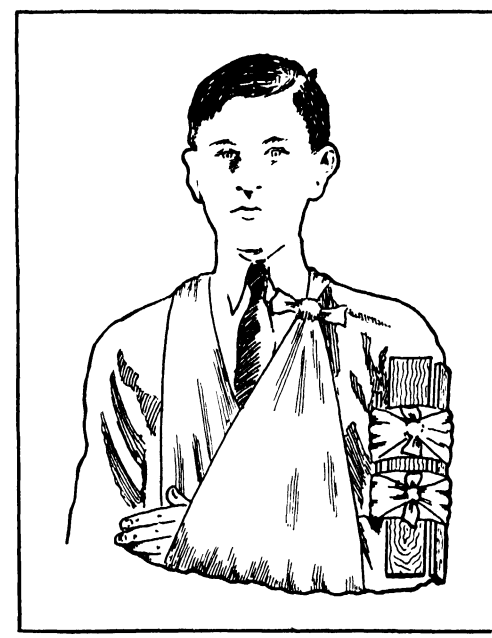
FRACTURES, DISLOCATIONS AND SPRAINS

A FORM of accident in which first aid is necessary is that in which some bone of the body is broken. The breaking of a bone is called a fracture. In a simple fracture the bone is broken once and there is little or no injury to the soft parts of the body near the bone. It is a clean break. In a compound fracture, there is a wound leading from the outside of the body to the bone, thus exposing it to infection. Sometimes the wound is caused by the sharp end of the broken bone sticking through the flesh; sometimes it is inflicted by the implement that broke the bone, as in the case of a bullet.

In a complicated fracture there is not only a broken bone but also an injury to one of the organs of the body. In a multiple fracture, the bone is broken in more than one place; of course this sort of fracture may also be and often is compound. An impacted fracture is one in which the two ends of broken bone are forced into one another. A greenstick fracture takes place when a young child meets with an accident that would result in a broken bone to an older person. The child's bone, being soft, acts very much like a green branch because, instead of breaking right across, it only bends and cracks.

Only a doctor should use some of the methods employed to find out whether or not a bone has been fractured. There are various simple tests, however, that may be applied without risk to the patient, and one or the other of these tests will generally indicate when a fracture has occurred.

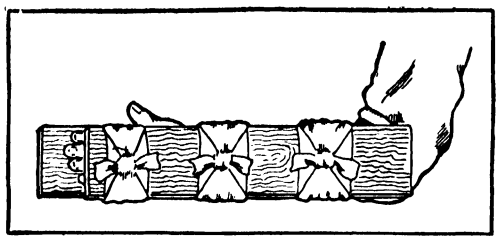
First of all, there is usually pain at the place where the bone is broken. Again, there is what doctors call inability—that is, loss of power in the limb below the place where the bone is broken. The part where the frac-



1. How splints, bandages and sling are applied in the case of a fractured humerus.

ture occurs will usually be swollen. When the broken bone is quite near the skin, by drawing the hand gently along the surface of the place we can often feel and locate the break. If the fracture is a compound one, the bone is often seen. If you suspect that a bone has been broken but are not quite sure, it is best to treat the injury as a fracture.

In treating fractures it is surprising to see how many things can be utilized as splints and bandages. We have mentioned, on page 4377, some of the things that may be used for this purpose. The chief thing to remember in the case of a splint is that the article used should be long enough and firm enough to keep the parts of the limb above and below the fracture perfectly free from the slightest movement. Splints of all kinds



2. Splints and bandages for a broken forearm.

should be well padded. They are tied to the broken limb with bandages or the various substitutes for bandages. The bandages holding the splint in position should be placed twice around the limb and splint, if possible, before tying. Knots should be fixed over a splint, not over the injured limb.

When tying splints in position, the bandages above the fracture should be put on first. Bandages should be tied firmly, but not so tightly as to interfere with the circulation of the blood. Of course, if there is bleeding from the wound, this must be attended to before the splints are put on. We shall learn how to stop bleeding in a later lesson. After a fracture has been attended to, the patient must be covered with coats or other garments to keep him warm.

We shall now consider the treatment of some of the commoner cases of fracture. When the humerus (the bone of the upper arm) is fractured, we set three or four splints around the arm, the outer splints reaching to the elbow; we then secure the splints by means of bandages, as shown in figure 1. The lower arm is carried in a sling in such a manner that the hand is raised a little higher than the elbow.

When there is a fracture of one or both bones of the forearm, the arm is to be bent at a right angle at the elbow, with the thumb pointing up. One splint is put in position along the back of the forearm and hand and is to extend to the fingertips. The other splint is to be set along the front of the forearm and hand. The splints, which must be well padded, are attached to the arm by means of three bandages, one above and one below the fracture and one around the hand (figure 2). The forearm is to be supported in an arm-sling, the hand being kept slightly higher than the elbow.

When a bone of the hand is fractured, apply a padded splint to the front of the hand from beyond the fingertips to above the wrist, apply bandages around the palm and around the wrist and support in a sling. A broken finger should be straightened out and bound to a very light splint reaching from the wrist to the fingertips.

Fractures of the elbow-joint are very serious. About the only thing that we can do, while waiting for the doctor, is to try to rest the patient's arm on a pillow or other soft object in as comfortable a position as possible.

If the patient's thighbone is fractured, we first place him upon his back. We then hold the ankle and foot on the injured side and very gently pull the foot down until it is quite level with the other foot. Then, while the foot is held in position, we apply to the outside of the injured limb a long splint reaching the entire length from the foot to the armpit; a shorter splint is placed inside. The whole is then bandaged carefully together as in figure 3. The inner splint is sometimes dispensed with, in this case the two legs are tied together, the sound leg supporting the injured one.

When the kneecap or kneepan is fractured, the patient should lie on his back with his shoulders and head raised up. The leg should be straightened and the foot raised and rested on a cushion, a heap of clothing or anything of that kind that is available. A long, flat splint is placed at the back of the leg. This splint is tied just above and below the injured kneecap, at the thigh and just above the feet. It is important to keep the foot raised off the ground until the doctor arrives.

Generally speaking, the treatment for a fracture of either or both of the lower leg-bones is the same as in the case of a fractured thighbone. In this case, however, the splints are kept in position by bandages tied

right above and right below the fracture, just above the knee, around both ankles and around both knees.

For a fractured foot, remove the shoe by slitting the back seam and undoing the laces. Then apply a padded splint to the sole of the foot from toe to heel and bandage as shown in figure 4.

For a broken ankle a broad bandage is used. The centre is placed under the heel and the ends are brought over the instep and crossed. One end is passed around the ankle and the other around the foot at the instep. Again the ends are crossed and brought around the sole of the foot and up again over the instep, where a knot is tied. The patient is not allowed to move the ankle or joint.

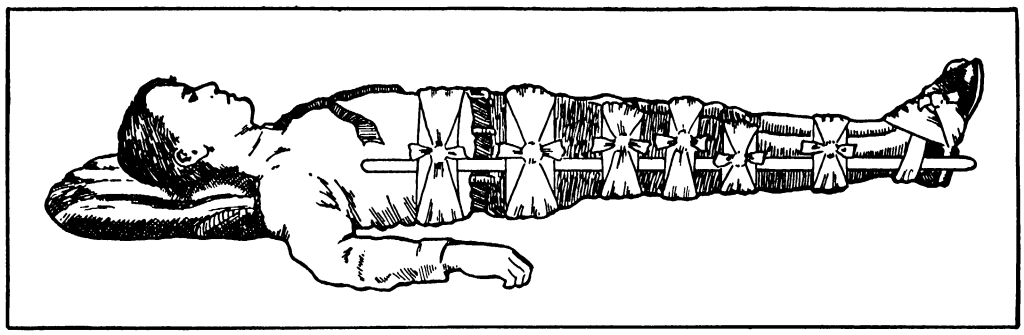
A fracture of the skull is a very serious matter. The signs of a fracture of the base of the skull are unconsciousness and the issue of blood from the ears or from the nose. When the upper part of the skull is fractured there is frequently considerable swelling and, sometimes, a wound allowing the bone to be seen. There is very little we can do in a case of this kind except to send for the doctor. The patient should be kept warm, any flow of blood should be stopped and all tight clothing should be gently loosened.

When the lower jaw is fractured, there is great pain, the patient's mouth remains open, he is unable to speak or move the jaw, the teeth are uneven and there is bleeding from the gums. In such a case, with the palm of the hand raise the lower jaw into position, using the rows of teeth as a guide. Then close the jaws and apply a bandage, so as to keep the two rows of teeth against each other. The simplest method of bandaging is to use two handkerchiefs, as shown in figure 5.

A fall on one's hand or arm sometimes breaks the collarbone. The result is that the arm cannot be raised above the shoulder and the head leans toward the injured side. In this case it is best to put the patient on his back with a blanket under him and no pillow at his head and to wait until the doctor comes. If it is necessary for the patient to be moved, the shoulders should be braced by means of a bandage tied as shown in figure 6.

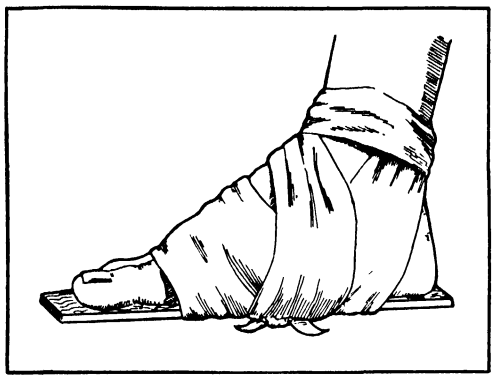
One of the most serious of fractures is that of the spine. This condition is particularly dangerous because the spinal cord is often involved. Most of the symptoms are the result of injury to that structure. If the injured person cannot move his legs, his back may be broken; if he cannot move his fingers, his neck may be broken. If fracture of the spine is suspected, the patient should be rolled over most gently on his back; the resting place should first be cushioned with any soft materials available, such as pillows, rolled up clothes, straw, hay or leaves. Thereafter he should not be moved at all while waiting for the doctor to come.

When the ribs are fractured, the patient is unable to breathe deeply without great pain. A series of strips of adhesive tape should be set in position on the side of the chest where the break is. These strips, which should be about two inches wide, should be placed parallel to the ribs. They should extend from the sound side of the spinal column to a little distance beyond the sound side of the breastbone. They should begin at the lowest part of the chest and should go upward; each strip should overlap the one below it by about one inch. When the breastbone is broken, all tight clothing must be loosened and the patient must be kept warm and quiet, in as comfortable a position as possible, until the doctor arrives.



3. How a long stick is used as a splint in treating a broken thighbone. Note the arrangement of bandages.

Compound fractures are generally treated much like simple fractures. Before the splints are applied, the wound should be cleaned with water that has been boiled, and allowed to cool; a teaspoonful of salt should be added to a pint of the water. The exposed bone and the surrounding area should be



4. Splint and bandages applied to broken foot.

painted with tincture of iodine and a sterile dressing should be applied. Be sure that you do not move the protruding bone from its position, either while applying the dressing or when putting the splint in position. The greatest care should be taken not to bring the splint in contact with the bone.

Even when no bones are broken a person may suffer a dislocation—that is, two or more bones may get out of place. Dislocations of the lower jaw, the shoulder, elbow and fingers are by no means uncommon. There is great pain near the joint, with loss of power in the limb and frequently swelling of the joint, which sometimes becomes fixed. Only a doctor should attempt to replace the bones. We can help the patient, however, by supporting the limb on pillows or coats or similar objects, by gently applying cold-water dressings to the injured joint and by following these with hot-water dressings.

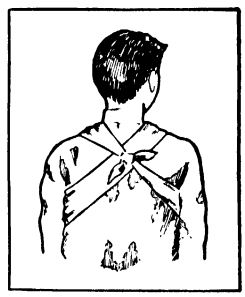
Another quite common injury is a sprain. This is frequently caused by a sudden jerk or wrench, which causes the ligaments around a joint to become stretched or sometimes even torn. There is much pain at the joint with swelling and discoloration.

The ankle is the joint most frequently sprained. If the injury occurs out of doors, a bandage should be fastened in place over the shoe. Place the bandage under the foot, bring the ends over the instep and then bind round and round the ankle, fixing it firmly. When shelter has been reached, the outside bandage, shoe and stocking are removed and cold-water dressings are applied to the joint. If the cold water does not give relief, hot-water dressings may be used. This treatment is for a sprained ankle; sprains of the other joints may be treated in the same way as dislocations, as described above.

Before closing this lesson, there is one important matter to which we should like to call your attention. When there is a fracture of the neck, the spine, the thighbone, the leg, the foot and, in general, when the patient cannot walk without assistance, you should make no effort to move the patient until the broken part has been placed in splints or securely bandaged. It would seem to be a simple matter to remove such a patient from the road to the sidewalk or from the playing field to the sideline. Such movement, however, before the broken part has been placed in splints would be extremely painful to the patient and might have the most serious consequences. A broken bone usually has sharp edges; a sudden jerk or pull may cause the bone to be thrust through the flesh, and thus the fracture will become compound (see our definition of compound fracture on page 4849). In the case of a simple fracture there is no chance of germs getting into the break. If the fracture is compound, however, there is very grave danger that the wound will become infected. Infection might have the most serious consequences.



5. Bandaging broken jaw with handkerchiefs.



6. Bracing shoulders when collarbone is broken.

Another thing that one must always bear in mind is that first aid in the case of fractures should be administered only when a doctor is not readily available. If you know that a doctor can arrive at the scene in a short time, it is best to let the patient lie quietly until he arrives. But if the patient must be moved, you should prepare the necessary splints and bandages.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 4997.



Evelyn,
By Sir W. Goscombe John.

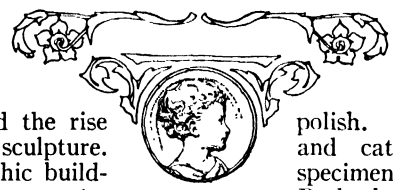


The Potter,
By F. W. Pomeroy.



Sylvia,
By C. L. Hartwell.

BRITAIN, AND LATER EUROPE



MANY centuries elapsed between the sculpture of the Gothic cathedrals of England and the rise of a school of free sculpture. The story of the Gothic buildings you will find on page 5963. Of the carving done in those early days a great part was wrought into the actual building; the sculpture was done after the stones were built into the walls. In any of the Gothic cathedrals, such as Peterborough, Lincoln, Salisbury, Exeter, Wells, we can see beautiful sculpture which was part of the architect's thought. And the Gothic law dominated architecture so completely—the law that sculpture must follow the lines of the scheme of the building—that free sculpture was of a very slow growth indeed.

It first took the form of heads of angels and saints—of which, after all the changes of time, there are thousands left "to joy us," as the old writers would say. There are also a great number of single figures, like the lovely pillared Madonna of the Chapter House in York, and those on Henry V's chantry in Westminster Abbey.

This Gothic sculpture passed through various phases. There was the time when Purbeck marble, a hard tinted shell-limestone quarried in Dorset, was in great demand. A peculiar quality in this stone gave an unusual texture to the carvings, and it also admitted of a polish. A number of churches and cathedrals still treasure specimens of the work of the Purbeck marble men. There is a great deal in the Temple Church and in Westminster Abbey.

Then, somewhere about the year 1300, the fashion of Purbeck marble died out, and sculptors began to work in wood, bronze and alabaster, as well as stone. The carver in alabaster took the place of the worker in marble, and his work marked the buildings of several generations. We can go from place to place and pick it out. There is a delightful little Annunciation in alabaster in the British Museum; the head of Edward II, in Gloucester Cathedral, is in this medium; and a lovely tomb in Southwell Cathedral. Of the wooden figures very finely carved a good number remain. The best is generally considered that of Archbishop Peckham at Canterbury. Some fine bronze belonging to this period is in Westminster Abbey.

After Gothic sculpture in England came to a close, generations passed empty of gifts, and then years of destruction swept over the land. The Puritans took pride in destroying all the "images" they saw. After the

country had passed through its phase of admiration of foreign artists, like Holbein and Van Dyck, there came a group of men of varied artistry. There was Grinling Gibbons, sculptor and decorator, a most interesting figure, whose work, still existing here and there in England, recalls the spirit of the Renaissance.

His bronze statue of James II in St. James's Park is said to be one of the finest in Europe. The work of Grinling Gibbons can be seen in St. Paul's, Chatsworth, Petworth, Burghley, and at Trinity College, Oxford. After him came Thomas Banks, Joseph Nollekens, John Bacon and John Flaxman, eighteenth-century sculptors of no great merit save that they represent a period. Their work was imitative of the classic style. Flaxman had a passion for Greek sculpture, but his art is cold because behind its classicism there is nothing of the warmth and fullness of the Greek ideal. One of his best groups is the Mansfield Monument in Westminster Abbey. The simplicity that he loved is the chief merit of a number of illustrations he made for books like Church's stories of Homer, their style imitative of Greek vase-decoration.

The first Englishman whose work is powerful, and is not to be grouped in a period and valued for the sake of the period, is Alfred Stevens. He is the greatest sculptor of the nineteenth century in England, and although his work in point of time belongs to yesterday, he is one of the greatest decorators and sculptors of modern times. Stevens lived from 1818 to 1875, and in him the English school of sculpture may be said to have had its beginning. He worked in Thorwaldsen's studio in Rome, and at first seemed not to be quite sure whether he would become sculptor, painter or architect. His earliest work in England was domestic decoration, and no one thought anything of him. Then it happened that he was given the commission for the monument to the Duke of Wellington, in marble and bronze, in St. Paul's Cathedral. This is one of the finest things in England.

THE DESIGNS OF ALFRED STEVENS THAT WERE NEVER CARRIED OUT

A great deal of Stevens' power to-day lies, if one might put it this way, in the spirit of the work he was never able to carry out. His sketch for a memorial for the Great Exhibition of 1851, which was most unhappily rejected in favor of a third-rate production, is now in South Kensington. The Tate Gallery possesses several of his sketches and cartoons. All this artist's creations should be a handbook for the art student—his designs for the decoration of the dome of St. Paul's, the British Museum Reading Room, and his wonderful sculpture designs for Dorchester House.

Two other sculptors of a certain distinction belong to Stevens' generation: John Henry Foley, the Irishman, and G. F. Watts, of whose work as a painter you have read on page 2236. Watts's bronze group of Physical Energy, built for the tomb of Cecil Rhodes and represented by a copy in Kensington Gardens, is an interesting work. His equestrian group of Hugh Lupus, Earl of Chester, at Eaton Hall, shows the same powerful spring and looseness. There is a bronze cast of his well-known Clytie in the Tate Gallery. Foley's best work—his statues of Burke, Goldsmith and Grattan—is in Dublin.

THE MAN AT THE HEAD OF ENGLISH SCULPTURE IN THIS CENTURY

The school of English sculpture, so ably started by Alfred Stevens, has maintained a high standard of excellence during the first half of the present century. It is essentially an English school, and one of its great exponents was Sir Alfred Gilbert, whose work is world-famous.

There is something of the eternal creator in him. He flings his energies joyously and with abandon into whatever may be his work. There is a lilt, a rhythm, a color in his statuary that make us feel that if he had not been a sculptor he would have been a musician. Alfred Gilbert was exposed to the influences of Florence, Rome and Paris, but they lightly touched his art rather than dominated it.

The first work to attract the attention of the art public to this artist's work was the group of the Mother and Child. Soon after came the bronze statue of Icarus. This is a very beautiful work, fine in conception and feeling and finely carried out. There is strength as well as grace in the figure, and the wings have a magical decorative quality that subtly repeats the lines of the body. Gilbert made some excellent busts and statues—of Watts, Baron Huddleston, J. S. Clayton and others—and a number of fine memorials which give evidence of genius.

OLD AND NEW IN BRITISH SCULPTURE



A Gothic Angel, in wood, about 1400 A.D.



The Virgin, St. Anne and St. Joachim, in alabaster, 1400-1450.



An Apostle, in colored alabaster, 1450-1500.



The Sluggard, by Frederick, Lord Leighton.



Peace, in bronze, by Edward Onslow Ford.



Perseus Arming, by Alfred Gilbert.

THE CREATIONS IN BRONZE THAT HAVE MADE THE FAME OF ALFRED GILBERT

The Fawcett Memorial in Westminster Abbey, the Howard Statue at Bedford, the Shaftesbury Memorial Fountain in Piccadilly Circus, and the Queen Victoria Monument at Winchester, and that of the Duke of Clarence at Windsor are the chief of his productions of this kind. In future times Gilbert will probably be best remembered for his Icarus, among the single figures, and among the memorials for that of the Duke of Clarence. The Queen Victoria Monument at Winchester is also a memorable piece of work; it would show to anyone that this sculptor was primarily a worker in bronze because of the dainty shapes and fantastic decorations that would be impossible in any other medium than metal. He died in 1934.

A group of some nine or ten men—Onslow Ford, Sir Hamo Thornycroft, Alfred Drury, Sir George Frampton, Lord Leighton, Thomas Brock, Goscombe John, W. R. Colton, Bertram Mackennal and John Swan—form the main strength of the British school of sculpture. The work of some is past, of others in its maturity. There are a great many other sculptors of the past and present generation, but they have perhaps not merited a name and place among the foremost.

Sir Hamo Thornycroft had what might be called—thinking of the struggles of some artists—an easy start, for both his father and his mother were sculptors. There is a poise, a serenity in his work which sets it apart. It has all been sound and good, and some of it excellent. The Artemis and the Teucer, the memorial to Bishop Creighton in St. Paul's, the Mower and the Sower, two figures of workmen, indicate a sculptor of unusual gifts. The Teucer, which is in the Tate Gallery, deserves to be set among the best sculpture of Europe. In Homer's Iliad we have his story—the bowman who tried nine times to slay Hector. The sculptor shows the man standing, having just let fly his ninth arrow and watching it speed.

Onslow Ford's best work was in portrait sculpture, such as the statue of Irving as Hamlet in the Guildhall Gallery, the Huxley Statue in the Natural History Museum, the memorial to Shelley at Oxford, the Gordon Monument at Woolwich, and the Dr. Jowett Memorial. Portraiture has always been one of the best aspects of British sculpture, and the men of the later school, from Leighton and Brock down to Mackennal and Colton, have worthily upheld the tradition.

Sculpture keeps our lives from being too workaday. It is a good thing to see, in public places, groups like Alfred Drury's work on the War Office, Goscombe John's Elf and The Glamour of the Rose; W. R. Colton's Image Finder; Albert Toft's Spirit of Contemplation.

EUROPE'S DEBT TO TWO SCULPTORS OF ENGLAND AND FRANCE

Amid this group of artists stands out one who was born to shape animals—John Swan. Animal sculpture is a powerful element in any art, for in it the sculptor achieves something which the shaper of human figures may strive for in vain—the expression of something truly elemental. A finely hewed group of animals, tense or springing, is the nearest we shall get to making statuary that expresses hunger and wind and rain, and spring and thunder. For all these elements lie within the animal form, and are forbidden or controlled in human beings, who are the children of civilization. In animal sculpture we not only see new shapes, but hear new sounds, new rhythms which vibrate back into our own consciousness. Europe owes a great debt to Barye in France and John Swan in England; Harry Bates, perhaps, may count too. His Hounds in Leash, for instance, is very fine.

Sculptors who have included animals in their groups have often been content to make them fierce and heroic—first a piece of marble and then an animal. John Swan seemed to build up his groups out of actual rippling muscle and bone. Those who have tried to draw animals like panthers and tigers know how difficult it is to suggest that beneath the sleek skin, which seems to efface all muscles, the flesh is folding and passing on the bones. The Leopard and Tortoise, The Puma and Mackaw, Fata Morgana, and Orpheus Charming the Beasts, are among Swan's best works.

If we take a sweeping view over the sculpture of Europe from the opening of the nineteenth century until the present hour, we shall notice a change in manner and feeling so astonishing as to leave us almost gasping.

About 1800 a revival of classic influence was at its height, with the Italian sculptor Antonio Canova (1757–1822) taking the lead in producing work that

MONUMENTAL SCULPTURES IN LONDON



A winged figure of Peace borne in a chariot—the famous Quadriga at Hyde Park Corner, by Adrian Jones.



A model for a bronze group for Australia House, London, by Sir Bertram Mackennal.

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aimed at bringing back the spirit of Phidias and the other sculptors of the Golden Age of Greece. Canova's statues have a smooth, cold grace and polished beauty, but they fall far short of the strength and power of the great examples he had chosen to follow. They have more of Bernini than of the Greek. Nevertheless, his influence reached far and lasted for a long time.

THE CLASSIC INFLUENCE IN EUROPE FOLLOWED BY NATURALISM

We have seen that in England Flaxman was the chief representative of this movement for the revival of classic simplicity in thought and style. Denmark produced another leader, Bertel Thorwaldsen, who soon took a position beside Canova. The Danish sculptor, whose birthday really fell in the year 1770, said of himself: "I was born on the eighth of March, 1797; before then I did not exist." By that he meant that his real experience of life and art began when he first went to Rome. His subjects were taken chiefly from classical story, both mythical and historical, and his results had more of the true classical feeling than did Canova's.

In Germany the movement found expression through the chisel of Johann Heinrich von Dannecker, a friend of the poet Schiller. He studied in Rome under Canova, but he balanced between classic severity and a tendency to naturalism. In his portrait busts he found especial interest in the characteristic traits of individuals. His subjects for imaginative work were at first pagan, later Christian.

The time came when taste changed, having had enough of the cold prettiness of nymphs and cupids, goddesses and heroes. Everyday human beings with their cares and toils and emotions took the place of academic figures in the attention of the sculptor. Naturalism was set up; the academic standards were pushed aside.

We read in the preceding art chapter how Rodin, the French sculptor, turned his back on convention and represented actual humanity, whether of ancient times or his own day, as he saw and felt it. Both he and Constantin Meunier, of Belgium, may be considered more nearly related to Donatello than to any other sculptor of the past. Meunier has preserved in his statues and statuettes the life of the laboring man—the miner, the glassblower, the sower, the hammerer and others—as Millet in his paintings recorded the life of the peasant.

SOME OF THE TENDENCIES OF MODERN SCULPTURE

We are too near to the most modern thought to judge it fairly. In general its intention is to use the human form in a decorative manner and to express through it certain feelings or impressions. For inspiration it would have us go all the way back to the primitive expression of the archaic Greek period. But only a very great genius can be simple enough to use such forms without showing self-consciousness or affectation.

Of the extreme modernists we shall name but two—Ivan Mestrovic, of Yugoslavia, whose great marble figures show power and thought; and Jacob Epstein, born in New York of Russian-Polish parents, who works in England and who goes to great lengths in his rebellion against all softness and prettiness. When any of his statues or memorials is made public for the first time, a storm of criticism and protest is very sure to break forth.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 4933.



The memorial to Margaret Macdonald in Lincoln's Inn Fields, London, by Richard R. Goulden.



St. Boniface cutting down the oak tree which the heathens of Germany adored as divine.

SOME FAMOUS MONKS

SERVANTS OF GOD IN MANY LANDS

IN the early centuries of Christianity, many holy men retired from the world and went to live out their lives in monasteries. A monastery is a dwelling place for men living secluded lives under religious vows. The men who dwell in monasteries are called monks. The most common vows which Christian monks take are those of poverty, chastity and obedience. Most monks take other vows as well, and by these special vows become members of certain groups. Such a group or society of monks is called an Order. Often a number of monasteries in different parts of the world belong to the same order. Members of some orders are teachers of the young, some are devoted to good works of various kinds, some to contemplation and prayer. In the most correct meaning, monks are only those who devote their lives to prayer and contemplation. However, in this article we shall use the term monk in its wider sense, and include members of teaching orders and others.

A monk whose name deserves to live forever is Telemachus, the Asiatic. Leaving the quiet seclusion of his cell, he went to Rome. In the arena there he protested against the bloodthirsty combats of the gladiators. The people were furious and stoned him to death. But his mission was accomplished. From that time—it was in A.D. 404—the fearful fights of men and beasts in the Colosseum were seen no more.

One of the most famous churchmen of the Middle Ages was Jerome, who lived from about 340 to 420. He was a great scholar and reader. You almost never see a picture of him without a book at his hand. He thought that his love for worldly books, especially for the old pagan writings, was a deadly sin. Fiercely he fought in his own soul to overcome the sin. For four long years he lived in the desert as a hermit.

Called to Rome to help settle a dispute, he prolonged his stay in the holy city, preaching the gospels. It is said that he won the hearts of many who heard him, and when he set out on a journey to the Holy Land, numbers of men and women followed him. They built convents and a monastery which became his home. There, in Bethlehem, Jerome settled down to translate the Old Testament from Hebrew into Latin. Jewish rabbis came to him by night to help him in his work. Jerome was made a saint of the Church.

It was a monk from England who, in the eighth century, carried Christianity to Germany. His name was Winfrid, and he was born probably at Kirton or Crediton, in Devonshire, the son of a West Saxon chieftain. As a boy he was sent to a monastery

SAVONAROLA'S FAMOUS BONFIRE OF VANITIES IN FLORENCE



The power of Savonarola grew until it became greater than that of the rulers of Florence, and wooden galleries were set up in San Marco to hold the crowds that thronged the cathedral to hear him preach. Under his influence, the people resolved to burn their frivolous treasures which took their minds from spiritual things. There were two great bonfires. This picture by F. W. Topham shows one of them in the square. For a while pleasure-loving Florence became, under his spell, a city of stern piety.

school in Exeter, and became an excellent scholar and a noted preacher. After some years he went to Rome. From there, under a new name, "Boniface," he was sent by the pope as a missionary to the Germans.

We get a quaint picture of the scene which took place between Boniface and the heathens of Germany to decide between God and Woden. Boniface undertook to chop down an oak tree which they worshipped. The heathen, thinking he would surely be struck down by their wrathful god, stood by to watch his destruction. The oak fell with a crash. Boniface did not. Whereupon the heathen embraced Christianity, and out of the oak Boniface built a chapel to St. Peter.

But alas for poor Boniface! He was not to end his days in peace. After having converted thousands to Christianity, set up monasteries, built churches, and, it is said, anointed Pepin king of France in the name of the Pope, Boniface was attacked by a body of pagans. The poor old man, frail and delicate, fell before the clubs of savage robbers, and won the glorious crown of martyrdom. His life was one of the most useful, hazardous and courageous ever lived by man. Boniface died in 755.

THE GENTLE MONK WHO STARTED A GREAT CRUSADE

One of the most attractive monks in history is St. Bernard of Clairvaux, so simple was he, so full of faith, so quiet of soul, so touched by the Spirit of Jesus. He was the son of a French knight, and as a boy drew others to the religious life. He became a Cistercian monk, and set himself to kill all sense of enjoyment, all desire for pleasure, in his own soul.

We hear him saying of book-learning: "You will find something far greater in the woods than in books. Stones and trees will teach what masters do not know. . . . Do not the mountains drop sweetness, the hills run with milk and honey, and the valleys stand thick with corn?" Yet he was one of the most learned men of his time.

He lived the most hard and desolate life, preaching repentance with a rare eloquence. When he was fifty-five, and worn to a shadow, he was bidden to bestir Europe for a second crusade. Pale and shrunken, he made a tour of France and Germany, preaching with a success so great that in some districts more than three-fourths of the men followed the Crusade.

Behind this old man came a young monk stirring people up to massacre the Jews. Bernard turned back, reproached the monk as "a child of the devil," and sent him to his monastery. "Had not the tender mercy of the Lord sent priest Bernard, none of us would have survived," said a Jew. That such a tender and beautiful life of fervid piety should have been lived in the twelfth century is a glory of Christianity. St. Bernard was born in 1091 and died in 1153.

PETER ABELARD, A FAMOUS SCHOLAR OF THE TWELFTH CENTURY

One story of St. Bernard brings us in contact with another and far different monk of that period, Peter Abelard. Possessed of a brain that used logic as a boy uses a top, Abelard gave himself up to disputing the most ridiculous things in the world. He passed for a scholar of immense learning. His fame spread. He became a peacock of philosophy, a dandy of theology. He went from town to town airing his knowledge and refuting other teachers. At the height of his fame he fell in love with a young girl, a pupil. He married this Héloïse secretly, lest he should be stopped from advancement in the Church. Then his enemies, stirred up by his pride, came about him, and he had on some occasions to flee for his life. He was accused of heresy. Bernard was chosen to debate with him.

We are told that, hearing the eloquence of Bernard, Abelard refused to argue and appealed to Rome. Rome condemned him. Sick of the world, Abelard entered a monastery. His wife went into a convent. He died a broken-hearted man, having spent his last years in writing rather cold and formal letters of religious instruction to his wife. Abelard lived from 1079 to 1142.

ST. DOMINIC, WHO FOUNDED A GREAT PREACHING ORDER

One of the most striking figures in the Church was a Spanish priest known as St. Dominic. Dominic founded an order of friars who wore black gowns and were called "black friars." He began life with a beautiful and earnest devotion to Christ. As a boy he prayed often. At the university he sold his clothes in a time of famine to feed the poor. Another time he offered to go as a slave to Morocco in place of a poor woman's brother who had been captured by the Moors. He was ordained a priest, and soon became known for the rigor of his life and the eloquence of his preaching.

So far, Dominic was simply an earnest son of the Church. But a day came when

he went on a mission. No sooner had he left Spain, where the people feared and obeyed the priests, than he found himself among people of a very different character. Shocked by their disobedience, their heresies and the manner of their life, Dominic set himself to reform or punish them.

Meeting a magnificent cavalcade from Rome on the same mission, he exclaimed: "How can you expect success with all this rich display! These men cannot be touched by words without corresponding deeds. Throw aside your splendor, and go forth as the disciples of old, barefoot, without purse or scrip, to proclaim the truth!"

Dominic practiced what he preached. He became a barefooted, black-robed mendicant (begging) friar—a black friar—and set out to win these disobedient people. But, alas, success did not attend his efforts! He had to say at last: "I have spoken to you with tenderness, with prayers, with tears. But, according to the proverb of my country, where the benediction has no effect, the rod may have much. Behold how we rouse up against you princes and prelates, nations and kingdoms, and many shall perish by the sword!"

Some historians have claimed for him the terrible responsibility of having organized the Inquisition. That was the organization which tried and condemned men, women and children in the name of God. But Dominic's connection with it is doubtful. Dominic was born about 1170 and died in 1221.

ROGER BACON, A THIRTEENTH CENTURY PIONEER OF SCIENCE

A great scholar-monk was the Englishman, Roger Bacon—"the miracle of the age he lived in." He was said to know everything. He marks for us an interesting place in human history. For many centuries learning in Europe seemed to be almost dead. But toward the end of the twelfth century a new desire for knowledge awoke. By the thirteenth century men, no longer content with what had come down from the ancients, had begun a search into the unknown. As yet, most of the learned men were in the Church, and thus it was that one of the greatest of the pioneers of science in all Europe was a Franciscan friar—Roger Bacon. This friar studied chemistry and astronomy; but soon his knowledge gave offense and he was imprisoned in his friary in Paris. After some time he was released, at the request of the pope, and was allowed to return to England. But he was again put in prison and kept there for about fourteen years. Roger Bacon is said to have invented gunpowder, and to have foretold the invention of automobiles and airplanes. He lived from 1214 to 1294.

THE PIOUS MONK WHOSE GOLDEN WORDS STILL COMFORT MEN

Early in the fifteenth century Europe was in a state of great confusion. England was fighting France. The Turks were attacking Hungary. At that time there lived in a poor monastery in Germany, earning bread for himself and his brother monks by copying religious books, a little man whose name was Thomas à Kempis. To-day that name is known in practically every land under the sun.

The little monk was a deeply religious, profoundly pious man, who lived a useful and contemplative life. The noise of cannon and the shouts of kings reached his ears like the sounds of children at play. This quiet and simple man, besides copying other people's books, wrote some of his own. One of them, The Imitation of Christ, he gave to the world without his name.

But so sweet, so true, so natural, so golden is this book that it has been translated into more languages than any other book in the world, except, of course, the Bible.

Little did Thomas à Kempis imagine, while he wrote, that his words would be the most loved literature of Europe for centuries. He had been reared in a poor cottage, the son of over-worked peasants. His name of Thomas Hammerken had been changed at school to "Thomas from Kempen," Kempen being the name of the little town where his peasant mother had nursed him. The monk sent the name of that humble German town around the whole earth by just writing down, again and again, that he loved God and desired immortal life! Thomas à Kempis lived from 1379 to 1471.

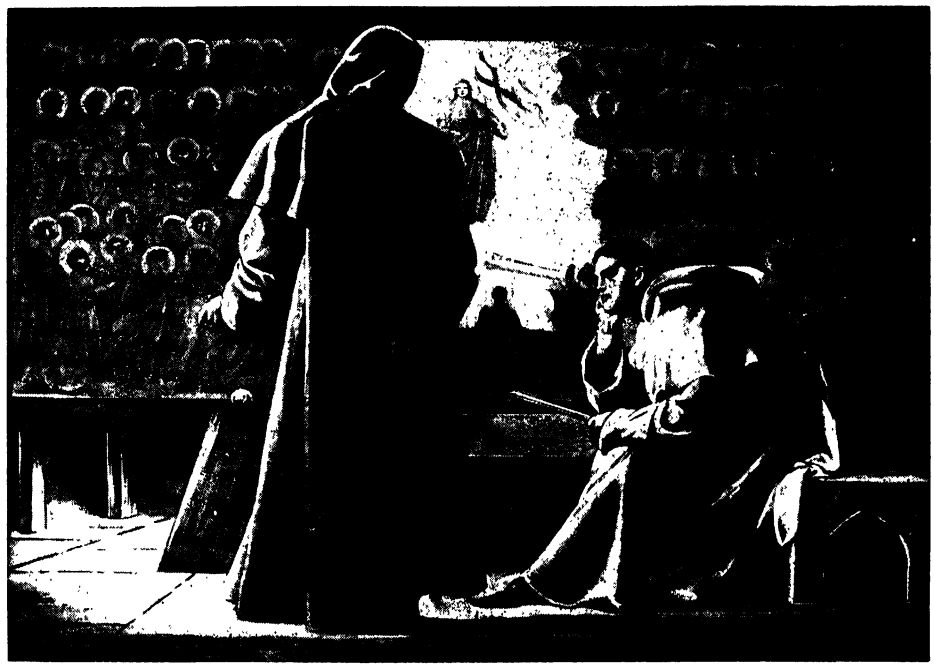
THE ANGELIC PAINTER OF FLORENCE

A very famous monk, one of the men who helped to make Florence beautiful, is the painter known to all the world as Fra Angelico. (See page 698.) His name as a monk was Giovanni, the Italian name for John. He was born at Fiesole, the little hamlet on the hill above Florence. And he was called Fra Angelico, the "angelic friar," because of his paintings of angels.

Fra Angelico was born in 1387. When he was twenty years of age he entered the monastery at Fiesole, to devote his life en-

tirely to religion and painting. He painted nothing but religious subjects, and preached beautiful sermons with his brush. His first paintings were probably done at the city of Cortona, where a number of his pictures are still to be found. In 1418 he was recalled to Fiesole and labored there until 1436. Then he went down the hill into Florence, permitted him to remain a humble friar. In 1445, and again in 1455, Angelico worked in the Vatican. He died in Rome in 1455, and there he was buried.

Fra Angelico tried to lead others to share his joy in religion by the most beautiful paintings of heavenly beings, and by presenting, with all his tender genius, the stories



One of the best-known painters of Italy was the monk Fra Giovanni da Fiesole, often called Fra Angelico (the Angelic Brother). He lived from 1387 to 1455. He painted to inspire in men feelings of reverence and devotion, and his pictures of saints and angels, painted in clear, gem-like colors, breathe an innocence and faith that was far removed from the turbulent world outside the cloister. He painted as from an inner vision.

to reside in what was then the Dominican convent of St. Mark but is now a national museum.

Here he executed some of the most famous of his paintings, which are still to be seen. Some remain where he painted them; others have been removed to places more secure. Most of them have been left just as his brush finished them. A specimen of Fra Angelico's work at Fiesole is in the Metropolitan Museum in New York. It is a picture of the Crucifixion. After he had been at Florence nine years, Fra Angelico was summoned by the pope to Rome. The pope had heard of the painter's saintly life, as well as of his work as an artist, and is said to have wished to make him archbishop of Florence.

The painter was as modest as he was good and skillful. He prayed the pope not to make him accept the dignity, and the pope of the Bible. He painted the sorrows of Jesus as well as his triumphs. These were sad days in the life of Fra Angelico, and he wept bitterly as he painted the Crucifixion.

SAVONAROLA, WHO MOVED A GREAT CITY TO REPENTANCE

Savonarola is one of the picturesque figures of the Middle Ages. In the midst of that gorgeous, wicked and careless period we see the shrunken figure and the gaunt face of a little hooded man. His glowing black eyes, flashing anger, glanced like lightning on the crowd from under the shadow of his cowl. He was terrible to sinners. Rulers feared him. Wicked people maligned him. The populace was tossed as a sea by the tempest of his preaching. He came from his monastery to chastise the world. The world accepted the challenge. Savonarola

was raised high in honor, then tried, tortured, hanged and burned. His ashes were thrown into the river.

His courage was magnificent. His hatred of vice and luxury was most honest. The wickedness of court life hurt his noble soul to the quick. If ever a man felt the sharp contrast between the simplicity of Jesus and the self-indulgence of the day, it was this fiery prophet of Florence.

As he passed to the gallows—in sight of the beautiful cathedral where crowds had flocked to hear his preaching—a bishop said: "I separate thee from the Church militant and the Church triumphant."

"Not from the Church triumphant," replied the monk, with quiet confidence; "that is beyond your power."

Protestants have claimed him for a martyr. But he appears to have adored the Sacrament before his death, and to have confessed himself a true son of the Roman Church. Savonarola was born in 1452 and died in 1498.

The famous portrait by a fellow-monk, Fra Bartolomeo, gives us a fine study of the man. It was painted from life, and the original still hangs in Savonarola's cell in the monastery of San Marco in Florence.

THE SOLDIER OF SPAIN WHO BECAME A SOLDIER OF GOD

In 1491 there was born in a Spanish castle a boy destined to become one of the most famous men that ever threw off the world to put on monk's attire. This was Inigo Lopez de Recalde, known to history by his monk's name and his Roman sainthood as St. Ignatius de Loyola. He was a nobleman, and grew up on his father's estate without learning of any kind. He became a page in the court of Ferdinand and Isabella, and later became a soldier. He was severely wounded in the right leg at the siege of Pamplona. While he lay in his father's castle recovering from his wound, certain books of religion, given him to while away his time, gained a hold on his soul.

When he rose from the sick bed it was to journey to a church, where he hung up his soldier's arms and vowed to live a religious life. He went to a hospital and worked in menial offices to learn humility. Then he journeyed to Jerusalem and came back inspired with the idea of founding a new religious society. He put himself to learn at school, sitting in a class with mere boys. While learning he began to influence men. Directly he stated his simple views, however, the hand of authority seized upon him and he had to flee. From city to city he went, begging his way. At last in Paris he found freedom and there he lived as a poor student. At the university his persuasive powers drew certain young men to his side; and at the age of forty-six he was ordained and set out on his preaching mission.

His burning zeal had drawn around him a remarkable group of men. Six of them met with him in 1534 in the Church of Montmartre and bound themselves to chastity, poverty and obedience to their superiors. From such small beginnings, made with difficulty and against great discouragement, one of the greatest religious orders sprang.

In appearance Loyola was a striking figure. His face was thin and bore signs of the hardships he had forced himself to undergo. His olive complexion increased this effect. He had the high forehead, and brilliant eyes of the active student. He was naturally enthusiastic and impulsive, but his great self-control kept those characteristics within reasonable bounds. He loved to overcome difficulties, and in his early days always had a desire to surpass everyone else. But in his later days he came to believe that the greatest duty of man was obedience.

THE FAMOUS TEACHING ORDER THAT LOYOLA FOUNDED

The great accomplishment of Loyola lies in his creation of the Society of Jesus, sometimes incorrectly called the Jesuits—a society spread all over the world, working in many languages to one and the same end. For a man who was not ordained until he was nearly fifty, this is a most remarkable achievement. Loyola is not responsible for the political power which his society soon acquired. His influence was purely spiritual.

He drew men to him by the force of his holiness. It is narrated of him that while in Paris he sought to gain the affection of a young student named Xavier, who withstood all advances.

One day Xavier, having done well in the class for philosophy, was strutting about in great pride. Ignatius came to his ear and whispered, "What shall it profit a man if he gain the whole world and lose his own soul?" Xavier was converted, and became the famous St. Francis Xavier. Such was the real power of Ignatius—a personal influence on the side of holiness. Ignatius de Loyola died in Rome in 1556.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 5199.

THE MAGIC OF PAINT

WHAT IT IS AND WHAT IT DOES



Courtesy, Lead Industries Association

A good painter knows how to lay paint at the corners.

IN the very early stages of civilization, paints were no more than natural deposits of colored earth found in many parts of the world, and mixed with a liquid. They possessed color because the soil contained various kinds of materials. Even to-day, these colored earths, or pigments, are still used in paint making.

White and red earths were known to the ancients, yellow was mined in Greece, and charred plants were used for black. These seem to be the first four pigments used. Then came green from the copper mines. The purple of Tyre (probably secured from molluscs) was famous over much of the ancient world. This pigment was so expensive that its use was limited to wealthy chieftains, so that even now we speak of "royal" purple. Other ancient pigments were white lead, vermilion from cinnabar, and indigo from a plant. Many of these same pigments are still used, but now many more pigments and combinations of pigments are available, so that we have paint in black, white, and every color and in a wide range of tones and tints in each color.

Some of the colored earths get their names from the sections of the world in which they originated. Sienna (warm brown), for example, is named after a geographical section of Italy. Turkey umber (brown) first came from Turkey. The names Berlin blue, Prussian blue, Naples yellow, Italian pink and Persian red tell of their own origins. Bone black comes from the animal kingdom, and gets its name because it is made by charring and grinding up the bones of animals.

However, color is only one part of the story of paint, although probably more interesting to us because it stimulates our senses more. More important, perhaps, is the protection which paint provides for surfaces that are exposed to destructive influences like air, moisture, or sea water. Let us see how paint is made in a modern factory.

As we near the factory, we see tall chimneys belching smoke. Then railroad sidings come into view, where freight cars and tank cars are being unloaded of their raw materials, many of which came thousands of miles across land and sea. At another corner of the building, huge trailer trucks and freight cars are being loaded with finished cans of paint.

As we enter the plant, we come first to the manager's office, where direct telephone and telegraph wires bring in the news of the quantities and kinds of paint his factory must prepare for shipment that day.

Next we come to the chemists' laboratory, where men are busy over scales and miniature grinding mills, preparing the formulas for the various kinds of paint, and telling the men in the manufacturing plant exactly what quantities of each raw material they must use.

Some paints are selected on account of their color, of course, but generally other characteristics are necessary as well, such as hardness, if it is to be used on floors; resistance to water, if for ships; reflection of light, if for interiors of houses, schools or factories where light for seeing is important, and so on. Interiors painted in light tints will throw back, or reflect, more light than darker shades. This factor is important in defense manufacturing plants to-day, where

walls, ceilings, and even the machines themselves are painted in light colors to make it easier for the workers to see what they are doing. This reduces the number of accidents that would cause delays in production and loss of time by skilled craftsmen.

Experiments show that barnacles attach themselves principally to darker areas of ships. If a ship's bottom is covered with barnacles, its speed is slowed and it uses more fuel to overcome the extra drag. The ship would normally have to be taken to a dry-dock, where the barnacles could be scraped off. You can readily see that this is a time-consuming and costly process. Paint makers are coming to the rescue with the development of light-colored paints that will withstand the action of sea water and be of great aid in ridding ships of these sea hitchhikers.

Paints are therefore manufactured of ingredients best adapted to solve each specific problem, and many are made especially to resist the action of some particular destructive force.

Here is a sketch of one of many units in a modern paint-making plant. Materials used in paint manufacture are very heavy. That is why the manufacturing process is begun on the upper story of the plant, so that when the materials have completed one process, the force of gravity carries them to the floor below, where they undergo further processing, and so on down.

Starting at the top, we have the heavy mixing machines. Here workmen empty bags of pigment into a mixer, together with the correct proportion of oil, and these ingredients are thoroughly mixed together to form a stiff paste. This is sent down a chute into the rolling mills below.

In the rolling mill, the thick paste is thoroughly combined with the oil, and is ground

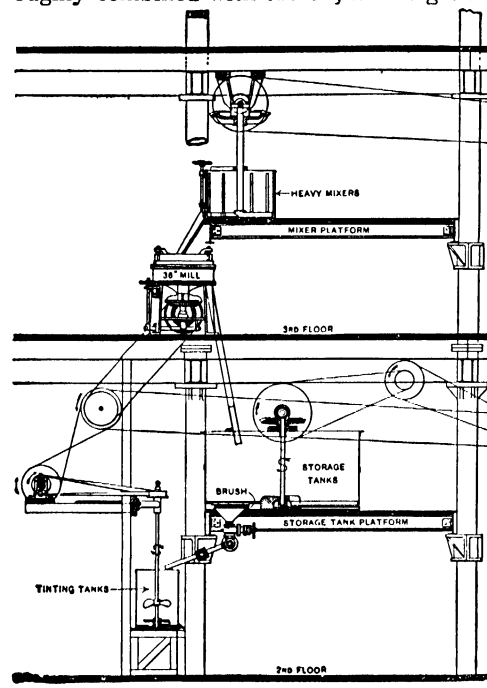


Diagram of a paint-mixing plant. Ingredients are poured in at the top floor, and the mixing proceeds step by step down to the storage tanks.

to the required fineness. The grinding is accomplished by passing the mixture between rows of rollers that are traveling at different speeds, causing a shearing action.

From the rolling mill, the fine paste is sent down another chute to storage tanks, where thinners (which bring the paste to a more liquid condition for brushing or spraying) and driers are added to produce ready-mixed paint. In most cases, this is white paint. When colored paint is desired, the white paint is then dropped into a tinting tank, where stronger-colored paints are mixed with the white paint to make all the lovely and delicate tints we have in our homes.

We now have finished the making of the paint. It is stored in large 500-gallon tanks. In order to make it possible to ship it to the painter in a convenient form, it must be packaged in smaller cans that will keep it airtight and free from dust and dirt. The tanks are emptied into a filling machine, which pours exactly the proper quantity into cans of various sizes. These are then sealed,



Courtesy, Lead Industries Association

A miner loading a cart with lead ore, many hundreds of feet below the earth's surface. From this material, white lead pigment is made. Colored paints are made by adding various tints to the white lead paint.



Chemists in their laboratory working over formulas for different kinds of paint to suit different purposes. This is work requiring much knowledge and skill, for the same type of paint will not suit all conditions.

and another machine puts on the printed labels describing the paint, and how best to use it.

The cans, filled and labeled, are then moved on small hydraulic lifts to the shipping department. When next you see them, they are on the shelf of your local paint or hardware dealer.

Now let us take a look at the part paint plays in protecting and beautifying our towns and cities.

The air we breathe is necessary for our very life, but, strange to say, it has many destructive agents that are working against us, all the time. Oxygen in the air, for instance, easily combines with iron to form oxide of iron, or rust, and were it not for paint, many huge structures built on iron girders would soon crumble.

Light, heat and moisture—three other factors necessary for life—are active in causing the destruction of the fibres of wood, and it is mainly for protection from these destructive influences that outside surfaces are painted.

Man builds homes to keep himself comfortably warm and dry. Brick and stone, two materials that we use to build our houses, are so porous that the pores can be detected with the naked eye. Under a powerful microscope, their surfaces appear as a huge sponge. It is through these openings that moisture, the greatest enemy of them all, does its destructive work. Paint, when it is properly mixed and applied, closes up these pores and so helps to keep out moisture and other destroying elements.

The substances which come from mines and forests and fields, the paint pigments, cannot do this work alone. That is why they are ground with a fine oil, called the vehicle, so that they can be fine enough to fill the pores, or holes, in the various materials. Linseed oil is one of these vehicles. It has the peculiar property of being able to absorb some of the oxygen from the air, and then to harden into a waterproof, rubber-like gum which can expand and contract in accordance with any changes in the length of the material on which it is applied. On iron surfaces, for example, it swells up tightly into every nook on the side of the microscopic pores, so that it not only fills the holes, but anchors the paint film firmly to the iron surface.

Everyone admires the trim, spic-and-span appearance of a freshly painted ship. But a vessel is not painted for reasons of beauty only. The coat of paint is a gleaming suit of armor, warding off rust. On most ships the paint is frequently renewed; even at sea, painting is constantly being done.

In time of war, paint is an important material. Great quantities are needed to protect war machines; and through the art of camouflage, it disguises or hides ships,



Pictures, courtesy, M. J. Merkin Paint Co.

A rolling mill, which thoroughly mixes the paste with oil and grinds it smooth and fine between rollers which turn around at different, but carefully regulated, speeds. Linseed oil, made from flax seeds, is often used.



Courtesy, CBS

Paint has many important properties, besides covering objects with a coat of color. It protects wood and many metallic surfaces from decay. Experiments are being made on a paint to retard fire. This painter is at work on Columbia Broadcasting System's new 410-foot tower on Little Pea Island in Long Island Sound.

tanks, mobile units and gun emplacements from enemy eyes.

By why go so far afield? Without paint, our own homes would not be the bright and cheerful places they are. Outside, paint beautifies and protects. Inside, it permits us to transplant the brilliant hues of the spectrum to make our everyday lives more colorful.

Paint contributes to our general health by keeping surfaces smooth, so that they may be easily cleaned, and by making possible the right reflection of light for better vision. Some colors make a room lighter, others make it darker. A hundred-watt bulb might be bright enough to read by in a room with white or cream walls, while the same bulb in a room with red or blue walls might produce eyestrain.

An idea of the relation of color to light may be gained from these facts: A white wall reflects as much as eighty per cent of the light in a room; when the wall is tinted with ivory, the reflecting value drops to seventy-eight per cent. Add a little tan and its reflecting value is lowered to sixty-four per cent. Bright sage green reflects forty-eight per cent, sky blue, thirty-five per cent and dark blue-gray only seventeen per cent.

Sometime you may want to paint something you have made, or perhaps refinish mother's kitchen set in gay bright enamels. Since the care with which you apply the paint is as important as the quality of the paint itself, you will want to bear these things in mind.

The surfaces to be painted must be clean and dry, and free from dirt and grease. If the article is dirty, give it a good washing with soap and water—but be sure it is thoroughly dry before you start to paint.

If the article has been painted before, you must be sure to scrape off loose and scaly

paint. Use fine sandpaper to rub down the rough spots and secure a smooth, even finish.

When painting outside, do not paint in damp, foggy or extremely cold weather, as it will prevent the paint from drying and adhering properly to the surface.

On opening the can, stir the contents thoroughly from the bottom up to insure a uniform mixture.

Use a good brush and spread the paint evenly. Thin coats, well brushed out, wear better than heavy coats. The paint on a house is about 1/200 of an inch thick.

Over a previously painted surface, one coat of the same color usually covers with a solid finish. On new wood or worn surfaces, two or three coats are usually required. If you are changing a dark surface to a much lighter one, several coats may be needed.

Be sure that each coat of paint is quite dry before attempting to put on the next.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 5053.



Courtesy, Lead Industries Association

A coat of paint on a house is only 1/200 of an inch thick. Yet it gives beauty and protection.

PLANT RELATIONS AND PLANT STRANGERS



Few who have not studied plants would think that the common white clover, or Dutch clover, seen here, belongs to the same family of plants as the pea.



European furze, so unlike both clover and pea, belongs to the same family. Nearly seven thousand different plants belong to the pea family.



The European daisy represents the largest of all the families of plants. There are ten thousand different plants belonging to this composite family, which includes the thistles, chicory and dandelion.



This is wild cabbage, which grows on cliffs in Europe. It represents the cabbage family, to which belong mustard, horseradish, various cresses, woad, that gave the blue dye to the Britons.



There appears to be little likeness between these flowers, and yet they belong to the same family as the rose. On the left is Alpine lady's mantle, in the middle wild cherry, and on the right stone bramble.

THE FAMILIES OF PLANTS



ONE of the chief troubles that confront us when we seek to learn to know the flowers is the very great number of distinct kinds that grow even in our own country. North of Mexico there are perhaps five thousand different wild flowers, shrubs and trees; but if we extend our study all over the world, we shall find that there are over one hundred thousand. When we find a flower in the woods or fields and want to know its name, how is it possible to pick it out of a list of five thousand? It is not an easy matter at first, but many men, called botanists, have, by their labors, made the task much less difficult than it seems to us.

They discovered first that many plants which differ widely in size and habit, in the shape of their leaves and in the color of their flowers agree in the arrangement of the parts of their flowers and the structure of their fruit.

These resemblances they regard as family likenesses, and by means of them they are able to arrange all these thousands of plants into small groups. Now, instead of hunting blindly through the descriptions of all the flowers, we have only to find by its structure to which family it belongs, and then to search through that family for the one that is most like the flower we have found.

In the story of Animal Life we learn that animals fall into similar groups. If, in walking through the streets, we meet with a fox terrier, an Irish terrier, a poodle, a mastiff or a staghound, we know the type of structure so well that we could tell anyone that they are all dogs. And if we go to a zoo, and see a wolf there, we know at once that it belongs to the same family. So, too, with our knowledge of cats—tabbies, black, white Persians, and so on. When we see a lion or a tiger we know that it is a cat of some kind—that is, one of the Cat Family. The same rule applies to all living things, whether animals or plants, and the discovery of these family relationships has simplified matters.

One of the first things we ought to do is to get a general idea of the chief characters that mark these families. We may, perhaps, know that our two thousand wild flowers are divided up into nearly a hundred families, and it will be a pleasant pastime to pick out

the flowers of different families in our walks.

Every boy and girl knows the beautiful wild rose, or dog-rose, that covers many hedges with its pink or white flowers in June. Each flower consists of a green ball about the size of a pea, from the top of which spread five ragged green leaves. Above these are the widely spread, broad petals of a delicate pink or white tint, which are also five in number. Spreading over the narrow ends of these petals is a ring of green pins with yellow heads, and right in the centre of this ring is a cluster of hairy threads of a greenish color.

The green ball is called the *receptacle,* and inside it are the *carpels* which contain the seed-eggs. After the flower has fallen to pieces the receptacle will grow into the red egg-shaped "hip" that makes a fine show on the hedgerows in the autumn. The ragged green leaves are the *sepals,* the five forming the calyx. The five petals, as a whole, are spoken of as the *corolla.* The yellow-headed pins are the *stamens,* and the hairy threads are the *pistils.*

THE ROSE FAMILY HAS SEVERAL BRANCHES

Now, if we were to take a flower from an apple tree, a plum tree, a cherry tree, a may tree, a blackthorn, a bramble, a mountain-ash, a strawberry, and a meadow-sweet, we should find that in spite of small differences they are all constructed on the same plan. Between the plants that bear these flowers there is little resemblance. Some are trees, some shrubs, some lowly herbs; but because their flowers are of the same type they are all included in the great Rose Family.

There are several branches of the family, known by differences in their fruit. The apple, pear, mountain-ash, and white-beam have several tough-skinned seeds, which we call pips, in a horny core, composed of five carpels, or seed-vessels, which is surrounded by firm juicy flesh. The cherry, plum and blackthorn have only one large seed in a bony stone, covered with sweet juicy pulp. In the strawberry the receptacle itself becomes pulpy and bears the seeds upon its surface; the bramble and raspberry wrap each seed in a separate globe of juice. Some of the Rose Family, like the cinquefoil, silverweed and agrimony, have yellow flowers, and some of them are passed by as buttercups, because of their color; but if they are compared with buttercups they will be found to be quite unlike them. Here, then, among these well-known plants, flowers and herbs we may get a good idea of what is meant by a plant family.

THE POPPY FAMILY IS NOT DIFFICULT TO KNOW

The Poppy Family is a small one, and its members may easily be detected. Its flowers are always of regular shape, and have only two sepals and four petals. The sepals drop off when the crumpled petals burst out and smooth themselves. The slender stamens are very many, but they all drop with the petals as soon as the seed-eggs in the big pistil are fertilized. In the true poppies the pistil is a rounded or club-shaped knob with a sloping roof, on which the lines running from the centre to the edges are the stigmas. In the greater celandine and the horned poppy the pistil is more slender, and lengthens greatly after the petals have been shed. In the horned poppy, which we may meet with at the seashore, it grows into a curved seed-vessel a foot long. The seed-vessel of the true poppies we all know as a poppy-head.

THE BUTTERCUP FAMILY DO NOT ALL LOOK ALIKE

The Buttercup Family includes not only plants with an open cup-shaped flower, such as everybody knows a buttercup to be, but also such strange shapes as those of the larkspur and the columbine. They have five sepals, five petals, many stamens and many pistils, as a rule. Each pistil ends in a little point.

THE CROSS-BEARER FAMILY IS NUMEROUS BUT UNMISTAKABLE

The cabbage, cress, stock, mustard, radish, turnip and a host of field and wayside weeds make up the large family of Cross-bearers—so called because their four sepals and four petals are always placed crosswise. If we look at a flower of stock or wallflower we shall see what is meant; then we shall always be able to tell one of this numerous family when we meet with it.

There are only six stamens—sometimes fewer—of which two are smaller than the others, and there is only one pistil, which grows into a long slender pod, which usually splits down the sides to set free the one or two rows of seeds.

Over sixty of the wild flowers found in this country belong to this family. With few exceptions, they are not very showy, and therefore are called weeds.

THE VIOLET FAMILY IS TERMED IRREGULAR

The Violet Family is quite easily recognized, since its flowers are what are termed irregular, because its petals are not all of the same size or shape. There are five sepals, five petals, five stamens and one pistil. The violet and the pansy are well known, so we can easily follow the description. One of the petals is larger than the others; this is really the upper petal, but, owing to the fact that the flower-stem always curves over, it appears to be the lowest petal. This petal is continued behind as a spur, or hollow tail, and in it the nectar is produced for the attraction of insects. Two of the five stamens have tails also, which extend back into this spur, and all of them end in flat points, which fit closely around the bent pistil. The stigma is simply a hollow ball.

THE PINK FAMILY IS WELL REPRESENTED IN GARDENS

A larger family is that of the Pinks, which will be familiar to us through the pinks, carnations and sweet-william of the garden. But we have many wild flowers also that belong to this family, among them campion, catchfly, corncockle, stitchwort and chickweed. They all have their leaves in pairs, and often the lower ends of a pair are joined together around the stem. The flowers are always regular, the sepals and petals four or five in number, the stamens twice the number of the petals, and the pistil ending in two to five stigmas. In the pinks and campions the sepals are all joined together to form a stiff tubular calyx; in the chickweed and stitchworts they are separate. The seed-vessel is either long and cylindrical, splitting at the top into several teeth, or short and round.

THE ST. JOHN'S-WORT FAMILY GENERALLY HAS YELLOW FLOWERS

We probably know the large yellow-flowered rose of Sharon that is often grown in gardens, though it is wild in some places. It is a member of the St. John's-wort Family, of which we have a dozen varieties among our wild flowers. They are mostly very upright-growing plants with slender stems and smooth oval opposite leaves. The flowers are yellow, with five sepals, five petals, a great number of stamens arranged in separate bundles, and a pistil that ends in three or five stigmas. Some of the plants, if we hold them up to the light, will be seen to have clear little dots on the leaves, as though they had been pierced through with pins; and some have raised black dots and lines along the edges of the leaves, sepals or petals. The marsh St. John's-wort, which grows in wet places, has trailing stems and rounder soft hairy leaves.

THE GERANIUM FAMILY HAS SMALL FLOWERS WHEN WILD

The Geranium Family, though it includes the large and showy geraniums of the garden and greenhouse, is, so far as our wild plants are concerned, a family with small flowers as a rule. But they are all very pretty, not only in their flowers, but also in their leaves. With the exception of the yellow balsam, or touch-me-not, they all have quite regular flowers. The herb-robert, which grows commonly on wet rocks, and the wood-sorrel, which is abundant in spring in old woods, are among the best known of this family. There are five sepals, five petals, usually ten stamens, and the pistil ends in a stout style which branches at the top into five stigmas. The plants with regular flowers have five streaks upon their petals pointing the way to the glands where the nectar is poured out. All of them have peculiar seed-vessels, so contrived that, when ripe, the seeds are shot off to a great distance from the mother plant.

THE PEA FAMILY HAS PECULIAR IRREGULAR FLOWERS

The Pea Family is a very large one, and includes furze, broom, the vetches, medicks and clovers. Most of them have the leaves divided into three or more leaflets, and the flowers are always irregular and of peculiar form. The five sepals are joined together. Of the five petals, one—known as the standard—is very much larger than the others, two others are known as wings, and the two smallest form the keel.

The last two often have their edges joined together, and between them will be found the ten stamens and the long curved pistil, whose thickened portion—the *ovary*—grows into the long pod we know so well in the case of the green pea.

These pods are not always as straight as they are in the pea, the bean and the furze. In the clovers it is short; in some of the medicks it is shaped like a reaping-hook; in others coiled on itself like a snail-shell. In this family are included all the clovers and vetches, rest-harrow and beans.

THE SAXIFRAGE FAMILY GENERALLY HAS SMALL FLOWERS

Another large family, of which several members are well known to us, is the Saxifrage Family. They have small flowers, as a rule, but these are always very pretty. The four or five sepals are joined together, forming a tube-shaped calyx, from which the five petals emerge. There are from five to ten stamens and an ovary with from two to four stigmas.

The saxifrages proper are neat little plants, mostly growing on mountainsides, of which the London pride of our gardens is the best known. This is a wild plant in the west of Ireland.

In the golden saxifrages, which grow along streams and in marshes, the flowers are small and have no petals; but the sepals and leaves adjoining, being bright yellow, make the plants conspicuous.

The grass of Parnassus has a single large white flower. Between its five stamens are five broad scales fringed with knobbed hairs. The currant and gooseberry belong to this family. In the copses of the North we may find red and black currants, and the gooseberry.

THE PARSLEY FAMILY WE SHALL ALWAYS KNOW

One of the largest of our plant families is the Parsley Family; and in almost every case when we meet with one of these plants we may know at once to which family it belongs. The flowers are very small, but they are many and are arranged on slender stalks that radiate from the top of a thicker stalk.

If the wind blew our umbrella inside out and we stripped off the covering, the framework would look just like the flowering stem of one of this family—the stick being the stout stem and the ribs the slender flower-stalks.

In most cases we need a magnifying glass to make out the structure of the flowers clearly. There is a very simple calyx, sometimes having fine teeth along its rim to show that it is composed of five united sepals. There are five very tiny heart-shaped petals of white or yellow—bluish in sea-holly—five curved stamens, and a quaint pistil with two stigmas. Some of the plants, such as hemlock and cowbane, are very poisonous; others, such as carrot, parsnip, celery, parsley, samphire and caraway, are most useful as food or for flavoring.

THE COMPOSITE FAMILY, THE LARGEST OF ALL

Largest of all these families is the Daisy Family, known as the Composite Family, because a great number of tiny stalkless flowers are packed together to form what is known as a flower-head. What we call a daisy flower is a bunch of about 250 flowers, or florets, of two forms, the outer row with a white strap-shaped corolla, and the inner one with yellow tube-like corollas. If we cut a daisy right through the middle we can see that this is so, and will understand why the family is called composite, or compound flowers. But all composite flowers are not exactly like the daisy; some, like the dandelion, the tansy and the thistle, have only tubular corollas.

In addition to the flowers named, this family includes, besides others, the asters, dog-daisy, wormwood, coltsfoot, groundsel, chicory, lettuce, sow-thistle, and goats-beard. Among well-known garden composites are the dahlia, chrysanthemum and sunflower.

THE BELLFLOWER FAMILY IS WIDELY SPREAD

There are so many plant families that it is impossible to describe them all. There is the Bellflower Family, of which the harebell, the Canterbury bell and campanula are examples.

These are herbaceous plants, with bell-shaped flowers usually of a white or blue color, though pink ones are occasionally known. The most common and best-known wild species is the "bluebell of Scotland," this delicate harebell found growing in rocky places around the globe in northern temperate regions. Then there is the Canterbury bell, cultivated in gardens for its showy bloom. These plants have milky juice, alternate leaves and scattered flowers.

THE HEATH FAMILY AND ITS MEMBERS

This family is a large one, with four well-marked subdivisions in North America. In Europe it includes heath, heather and ling. In South Africa it is abundant everywhere, and covers thou-

sands of acres, constituting indeed one of the chief forms of vegetation. In Great Britain heath, or heather, occupies great tracts of waste lands. Who indeed has not heard of the heather of the Scotch mountains and moors? It is used in some country districts to thatch houses, to make brooms and to stuff mattresses. Animals are pastured upon it, and bees extract a finely flavored honey from the flowers. Traditions of good fortune hang around its name, particularly associated with the "white heather." Among some of the family to be found in North America are the wintergreens, the Indian pipe, wild azalea, American rhododendron, mountain laurel and the beautiful trailing arbutus.

THE PRIMROSE FAMILY MAINLY IN THE MOUNTAINS

The Primrose Family gets its family name of *primula,* or "first," in allusion to its early blooming. It has a salver-shaped corolla with five opposite stamens borne on a long tube. There are over a hundred species, mainly dwellers in the mountains of Europe and Asia, although five live in North America. They are beautiful low-growing plants with perennial rootstocks. They may be white, pink, purple or yellow in color. The common, or true, primrose of Europe with pale yellow flowers has three varieties—the primrose, cowslip and oxslip. Woodland floors in early spring are a vision of beauty with these radiant blooms, which have inspired the pens of many poets.

The bird's-eye primrose of North America is pale lilac in color with a yellow eye; the four-leaved loosestrife was once cultivated in the East and now has escaped from gardens. The star-flower, the scarlet pimpernel and the shooting star are odd American members of the family—very different from the yellow primroses of Europe.

THE GENTIAN FAMILY REMARKABLE FOR ITS COLOR

To the Gentian Family belong the beautiful blue flowers that give the family its name. Once upon a time, says Pliny, the historian, there was a king of Illyria named Gentius who discovered the bitter virtue of the plant, which allows it to be used in medicine as a tonic. It is a large family found in the mountains and temperate regions of the northern hemisphere. It grows also in the Andes, and some forty members of it are natives of North America. Though usually blue, the flowers are sometimes white or yellow, and in the Andes even red. The ones we know best in North America are the rose pink, the fringed gentian and the bottle gentian. The beautiful fringed gentian comes in the fall, is a lover of the sun and opens only to its rays. It rarely appears in the same place each year, as it is an annual perpetuated only by its wind-borne seeds. The blind, or bottle, gentian is of a wonderful deep intense blue. It begins to flower late in August, and northward lasts as late as October, giving the bees the last feast of the season. The Swiss Alps and the Canadian Rockies afford wonderful sheets of color in the gentians, blooming on the edge of the snows.

THE BORAGE FAMILY MEANS "ROUGH-HAIRED"

The Borage Family (we should make its name rhyme with "courage") gains its name from a word meaning "rough hair" or "wool," in allusion to the roughness of the foliage of several of its members, particularly the brilliant blue borage. Other members are comfrey, bugloss, lungwort, forget-me-not and hound's tongue. Many are the legends associated with the lovely little forget-me-not, or myosotis. The commonest is that a lover, trying to gather some of these blossoms for his sweetheart, fell into a deep pool. As he sank before her he threw a bunch of the flowers at her feet crying "Forget-me-not!" It was from the forget-me-not's gold ring around its centre that botanists first discovered that the markings at the entrance of many flowers serve as pathfinders to insects.

Viper's bugloss, or snakeweed, owes its name to the time when people believed that God marked each plant with a sign that indicated its use. The spotted stem and the snake-head seeds of the bugloss seemed to show a cure for snake-bite and thus the flower was given its name.

THE NIGHTSHADE FAMILY NOT VERY NUMEROUS

This family in our hemisphere and climate includes the common nightshade and the bittersweet. Its foliage is rank-scented, and its berries are narcotic, often very poisonous. In the tropics there are many nightshades, but in our climate there are but few. The familiar tomato, egg and potato plants of our gardens are members of the family, as their blossoms

noticeably point out. Many of us in the autumn have sought out bittersweet for its attractive orange-coated berries, which crack in the warmth of our rooms and display the scarlet seeds within. The bright red oval berry of the common, or woody, nightshade is more attractive than its flower. It grows in moist thickets and along fence rows.

THE FIGWORT FAMILY INCLUDES MANY FAMILIAR FLOWERS

The Figwort Family is a large one, including the great mullein, yellow toad-flax, blue toad-flax, turtle-head, monkey-flower, common speedwell, American brooklime and the downy false foxglove. We all know the great torch-like stem of the great mullein growing in dry fields or on banks. Its thick velvety leaves seem encased with felt, so protected are they against the fierce sunlight of the open places where it grows. Its yellow flowers are seated around a thick long spike, often companied by goldfinches, with whom the seeds are a great favorite.

Yellow toad-flax, an immigrant from Europe, is rapidly spreading everywhere. Not only is its blossom spike of butter-colored flowers quite lovely, but the blue-green of its grass-like leaves is very charming. Both the yellow toad-flax and its cousin the blue toad-flax resemble the true flax before blooming. For this reason "toad," meaning "worthless," was prefixed by country people in olden days.

The white or pinkish turtle-flower, with its turtle-like head and jaws, offers quite a stiff resistance to the entrance of its "friendly enemy" the bee, therein dusting his back well with pollen to rub on the back of another flower.

THE MINT FAMILY VERY WIDELY DISTRIBUTED

This is a large and well-known family, most of its members having opposite aromatic leaves whose scent comes from an oil contained in small glands. The flowers are generally clustered; they are "lipped" and much visited by bees and butterflies. Many of them are blue or purple. Some are the butterflies' favorite hue, magenta. Some are small to the point of insignificance, others showy enough for the garden.

Many species have marched across three continents, so popular are they with the insects. We should look for bugle weed, germander, false pennyroyal, skull-cap, horehound, cat mint, ground ivy, self-heal, hemp nettle, wild bergamot, basil and thyme, and the different mints: spearmint, peppermint, water mint.

THE ORCHIS FAMILY, OR ORCHIDACEÆ

This family includes about five thousand species classed into about thirty tribes. They occur both in the tropics and in colder regions. Their flowers are generally beautiful, sometimes fragrant. Often they are grotesque imitations of animal forms. They grow from short or creeping rootstocks, tubers or thickened fibres. Their leaves are undivided, often fleshy, with parallel veining. Some of us know the yellow lady's slipper or moccasin flower, which has also a pink variety as well. The small yellow lady's slipper is fragrant, and sometimes its sepals and petals are purplish. It can be found as far west as the state of Washington. The showy, or spring, orchis wears magenta. The purple-fringed orchis is heavily perfumed and needs a visitor with a long tongue to gain its warmest welcome. In inaccessible bogs lives the beautiful white-fringed orchis, together with its brilliant sister the yellow-fringed orchis.

The grass pink and Arethusa are northern orchids to be found in damp places. The nodding ladies' tresses is to be found the last of the season.

Why is it that Darwin and other naturalists have devoted so much study to the Orchis Family? Not merely because they are so numerous, nor so many-climed, but because of all flowers they have adopted the most ingenious and varied devices for attracting insects. Of the six floral leaves which every kind of orchis has, one is always different from the others. Sometimes it is shaped like a pouch, sometimes like a horn. It may look like a fringed banner or a broad platform. This is the insects' "advertisement sign." Once the visitor has alighted "spring traps, adhesive plasters, and hair-triggers attached to explosive shells of pollen are among the many devices by which orchids compel insects to cross-fertilize them." Instead of living close to the ground, as so many of the northern orchids do, the orchids of the tropics climb trees to escape strangulation by the dense vegetation. Thus we have the aerial orchid, as contrasted with the terrestrial.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 4976.

FORTY WILD FLOWERS



1. Tansy. 2. Red Campion. 3. Rough Chervil (E.). 4. Cow Vetch. 5. Traveler's Joy. 6. Thistle. 7. Goose Grass. 8. Creeping Bellflower. 9. Lesser Celandine (E.). 10. Catmint (E.). 11. Yellow Bedstraw.

Flowers marked (E) are European and are not generally found in America.



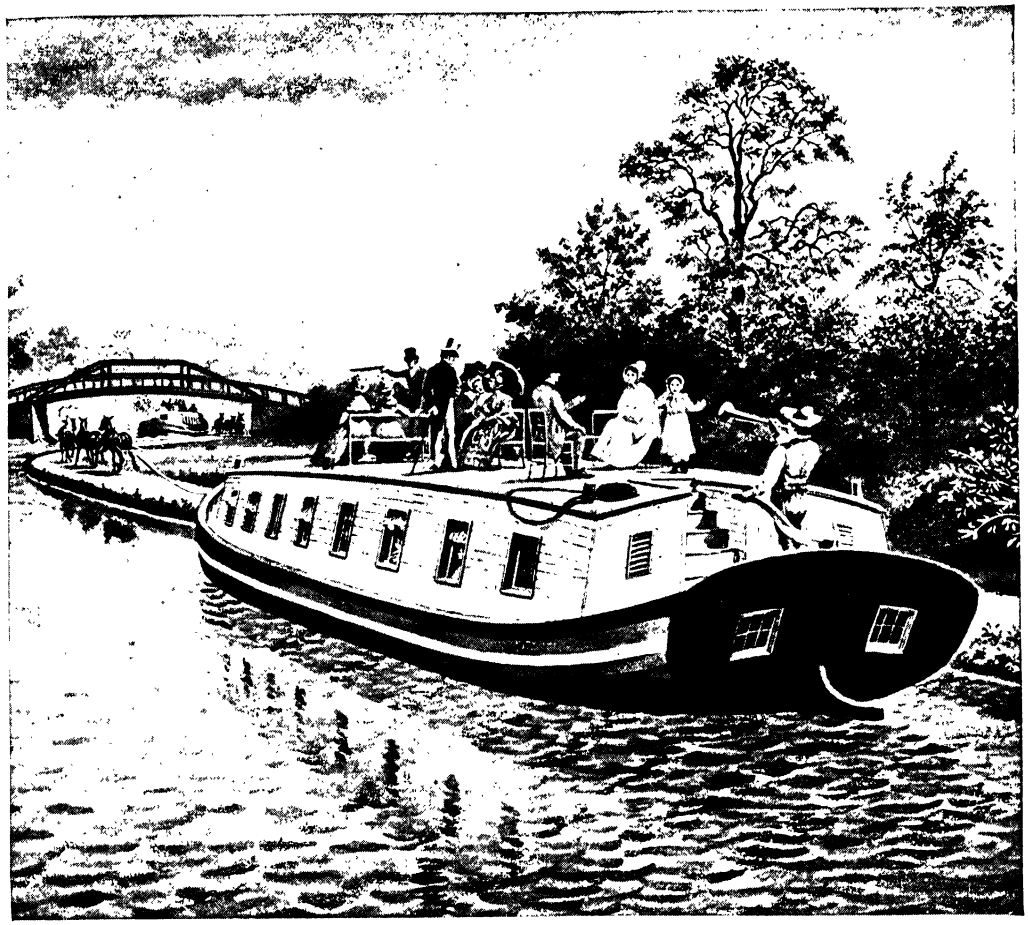
1 Agrimony 2 Sweet Violet (E) 3 Water Hemlock 4 Mouse ear Hawkweed 5 Honeysuckle (E)
6 White Dead Nettle 7 Acrid Lettuce (E) 8 Silverweed 9 Woundwort 10 Creeping Cinquefoil



1. Red Dead Nettle. 2. Bouncing Bet. 3. Hedge Mustard. 4. Motherwort. 5. Mullein. 6. Coral Root (E.). 7. Bramble. 8. Deptford Pink. 9. Scorpion Grass. 10. Creeping St. John's-wort. 11. Ivy-leaved Toadflax.



1. Dog Rose. 2. Woody Nightshade. 3. Greater Celandine. 4. Wild Cherry. 5. Germander Speedwell. 6. Evening Campion. 7. Herb Robert. 8. Primrose (E.). 9. Dog Violet (E.). 10. Hedge Parsley.



Brown Bros.

A pleasant trip on a passenger boat along the Erie Canal a hundred years ago. A team of three or four horses treading the tow-path could draw the boat smoothly along at four or five miles an hour.

THE ERIE CANAL

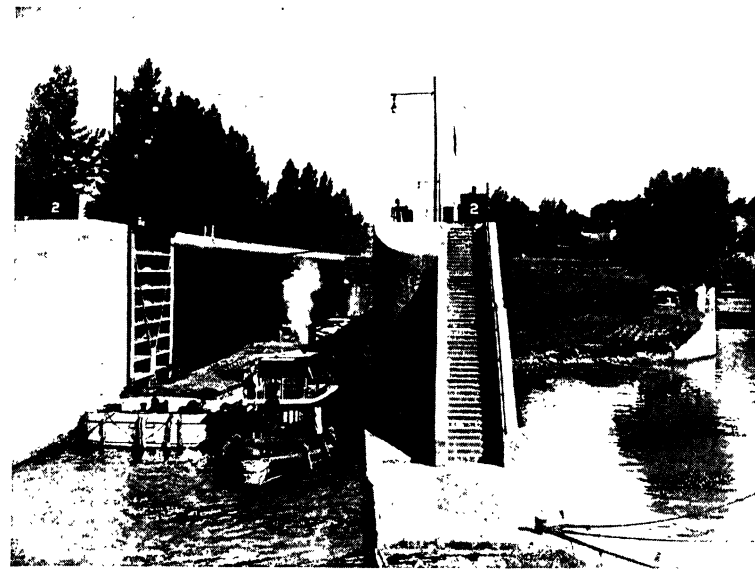
BEFORE the steam engine was invented and railroads were built, cities and towns were found chiefly near the sea or along the rivers. The ancient nations that first became civilized inhabited regions about the big waters. Babylon was on the Euphrates, the Egyptians lived on the banks of the Nile, and the Greeks inhabited the islands and the shores of the Aegean Sea. England, surrounded by sea and watered by rivers, was the first country in northern Europe to become densely populated.

The reason is simple. In those days water was the only practical means of long-distance transportation. Manufacturing, even of a primitive kind, was impossible away from the water because the manufacturers could not ship their wares to the markets. For the same reason it did not pay the farmers to raise more produce than they themselves could consume. There were a few exceptions, such as the cattle raisers; they could drive their cattle to market over long distances. Their produce transported itself.

The manufacturers and the farmers near the water could produce larger quantities, for they could load their wares and their produce on boats or ships at comparatively little expense and send them to be sold even

to other countries. Consequently all manufacturers and farmers wanted to be near the water. It was trade that developed civilization, but it was water transportation that made trade possible.

Railroads have since changed these conditions. Without the railroads the interior of our vast country would still be wild prairie and forest. Freight cars serve on land in the same way as ships serve on the water, but water has not lost all of its old-time importance. Even today there are fewer big cities far inland than near some large body of water—a lake or river.



Philip Gendreau, N. Y.

This tugboat and its two barges have just left one of the locks at Waterford, New York. They entered at an upper level; water was then run off, and as the water level went down the tug and barges went slowly down with it. There are five locks at Waterford. Together they raise or lower the boats a distance of 184 feet.

At the time the American colonies freed themselves from England, and for long afterward, there was no thought of railways. Steam had not yet been put to practical use. The population of the new United States was then confined to the Atlantic seacoast and the river valleys. Boston, New York and Philadelphia had become the most important cities, because they had protected harbors for shipping.

Meanwhile there had been some migration westward through the wilderness. The regions bordering on the shores of the Great Lakes and along the many rivers feeding these lakes consist of low, rolling country, especially adapted to the raising of grains.

Very early in the history of the country there had been farseeing men among the colonists who saw the tremendous advantages to the colonies that would follow establishing some means of transportation between the rich agricultural regions west of the Alleghenies and the Atlantic seacoast. The lands along the coast were not adapted to wheat-growing, yet the population needed wheat. With easy transportation the farmers of the West would not only be able to supply this demand, but they would also be able to export their grain to Europe. Such a route would also render the wilderness between New York and the lake country habitable, for the settlers along the way would also be able to ship their produce to market.

George Washington, practical surveyor and engineer, was one of the first to have his imagination roused by these possibilities. He had explored the country between Albany, on the Hudson, and Buffalo, on Lake Erie. Already much of this region was traversed by water routes. He became an enthusiastic advocate for connecting these waterways by canals so that boats might pass from New York to the interior. To him it was not only a question of trade. If the sturdy settlers who had cleared their little homesteads in the western wildernesses were not offered a means of communication with the states in the East, they would turn toward the power which held the Mississippi. Give them an outlet to the Atlantic coast and they would naturally maintain their allegiance to the States. To Washington and many others a waterway from the Great Lakes to the Hudson was necessary to develop a great united nation.

Possibly it was only those of big, broad minds who saw it from this point of view. More numerous were the merchants and tradesmen of New York, who, for more selfish reasons, agitated the idea with much energy. They feared the commercial rivalry of Boston and Philadelphia. If western grain could be exported to Europe by way of New

York, that city would become the great trade center of the country and its most important seaport. These men finally compelled the state legislature to take action.

In 1791 the legislature had ordered a survey made. Engineers were sent to study the country between Albany and Lake Erie and report on the possibility of digging a through waterway between those two points. Their report was warmly in favor of the undertaking. And so the first actual step was taken toward the digging of the Erie Canal.

TRAVEL WAS DIFFICULT IN THE DAYS BEFORE THE BUILDING OF THE ERIE CANAL

Travelers of that period have left interesting records of the difficulties to be encountered on the way. From New York City they journeyed from two to five days on sailing boats up to Albany, thence overland seventeen miles to Schenectady. Here they embarked again on boats, propelled by oars and sail, and sometimes, over shallow stretches, by means of poles. After traveling 104 miles up the Mohawk water course in this fashion, at the rate of about twenty miles a day, they would reach Utica, a small, log-hut settlement. Another nine days' journey by water and land brought them to Oswego, on Lake Ontario. Naturally very little merchandise was sent over this route, but such as was sent cost $100 a ton, or more, for freight.

At first the state attempted to encourage private companies to undertake the vast work of cutting through the waterway. Some were organized and even began work; short sections of canal were dug, connecting some of the various rivers and lakes on the way. But in those days there were few rich men, and it was found impossible to raise enough capital to finance the whole undertaking.

GOUVERNEUR MORRIS INTERESTS DE WITT CLINTON IN THE IDEA OF A STATE CANAL

One of the most enthusiastic advocates of the scheme was Gouverneur Morris, then representing New York in the United States Senate. "Some day," said he, "ships will sail from London bound for Buffalo, via the Hudson River." It was he who interested De Witt Clinton in the idea, the man whose determination and energy were yet to bring it to a complete realization.

It was nearly twenty years after the first survey had been made that the state again took action. By this time it was clear that the private companies could not accomplish much. So in 1810 the legislature appointed a canal commission to go to Washington and lay the matter before the President and Congress. As George Washington had already said years before, an Erie Canal was of great national importance: it would unite the nation—the East with what was then the West. The cost had been estimated at $5,000,000. Private capitalists could not subscribe such a amount, nor could the state be responsible, but surely Congress could appropriate such a sum for a work of such importance.

But in those days Congress did not make $5,000,000 appropriations so readily as it does now. There was much discussion and powerful opposition. Then came the War of 1812 and the federal government had other matters to which it must devote its energy and funds. It was then that De Witt Clinton began publicly to agitate for the digging of the canal. And finally, in 1816, the Governor of New York appointed a new canal commission authorized to raise a loan which would be guaranteed by the state. At the head of this commission the Governor placed De Witt Clinton.

THE ERIE CANAL BECOMES A POLITICAL ISSUE IN THE ELECTIONS

To test the interest of the people of the state in the canal scheme, Clinton made it a political issue; in the following year, 1817, he became a candidate for governor, promising that if he were chosen he would make the digging of the canal his chief business. He was elected by one of the biggest majorities that ever put an official into office. On July 1 he was inaugurated. Three days later, on Independence Day, he went up to Rome, on the Mohawk River, attended by his staff, and began the digging of the canal by turning up the first shovelful of earth.

According to the plans, the canal was to be 40 feet wide at the top, 28 feet at the bottom and 4 feet deep. The cost would be about $5,000,000. It was the size of the work that was most remarkable; as a feat of engineering skill it was then unusual, but, compared with the great works that are undertaken in the present time, it was not especially difficult.

Yet there were many supposedly well educated people in those days who thought the Erie Canal a wild dream. "You can not make water run uphill," they said, though the theory of locks, by means of which barges could be lifted to higher levels, had already been put into practice in canals abroad. The digging began. In two years a section fifteen miles in length was finished,

connecting Rome with Utica. The next year the canal reached the Seneca River.

De Witt Clinton had said that the work would be completed in 1823, but this promise was not fulfilled. It went more slowly than had been expected. His political enemies made the most of this in the next campaign for governor. In spite of this he was re-elected to a second term, but by a very slender majority. Plainly the people were growing discouraged with the slow progress of the canal work. At the next election, in 1822, Clinton was not even nominated as a candidate. His opponents came into office, though he remained the head of the canal commission. And then the Governor removed him from that office, which he had held since 1810, even while governor. His enemies, those who had been against the canal from the beginning, a political ring known as the Albany Regency, seemed to have triumphed. After this humiliation it was thought that Clinton's public career was ended. "Clinton's big ditch," his enemies called the unfinished canal in derision.

But the man who had transformed talk into action was not to be overcome so easily. Under the Albany Regency the work on the canal almost came to a standstill. This caused even more dissatisfaction than the slow progress. So two years later, in 1824, Clinton found himself with enough friends to be nominated as candidate for governor once more. And when the election came around he was again put into office by a great majority. Once more in office and at the head of his old canal commission, he began pushing the work with renewed energy. And a year later, October 26, 1825, the work was completed and the opening ceremony was celebrated.

The first boat to enter the canal at Buffalo was the Seneca Chief, a luxurious passenger packet. On board were Governor Clinton, his family, his friends and his official staff. A team of four powerful gray horses hauled the boat along, and as they began treading the tow-path a cannon at the entrance of the canal announced the official opening. A minute later another cannon boomed forth, some miles away; then a third, far off in the distance, almost beyond hearing.



Frederick Lewis

Lock gate on the New York State Barge Canal near Oswego. Oswego is on Lake Ontario, about thirty-six miles northwest of Syracuse. Here there is a fine natural harbor, where the largest lake steamers can dock under their own power. As the easternmost Great Lakes port in the United States, Oswego affords the shortest water route between the Great Lakes and the Atlantic seaboard, by way of the New York State Barge Canal.

These cannons were the first of a series of several hundred cannons stationed at intervals along the canal, reaching down along the Hudson to New York, each barely within sound of the other. And so the news of the opening was flashed down to New York as fast as sound could travel, passing down the line in one hour and twenty minutes.

A PROCESSION OF BARGES MAKES ITS WAY DOWN THE NEWLY COMPLETED ERIE CANAL

Following the Seneca Chief into the canal came a procession of barges, each gaily decorated with flags and flowers, crowded with people. One, called Noah's Ark, carried as passengers a bear, two fawns, two eagles, two raccoons and two Indians. And so the procession continued along the canal toward Albany. All along the route it was met with music and cheering crowds of farmers, most of whom had settled in anticipation of the benefits they would derive from the canal.

At Albany the barges were greeted with the booming of cannon, a grand military procession and a citizens' parade. Here the flotilla of barges glided into the Hudson and began its journey down the river to New York. The Washington, a new steamer, one of the first afloat on the Hudson, came up to meet them. "Where are you from and whither bound?" it signaled. "From Lake Erie, bound for Sandy Hook," replied the Seneca Chief.

The Washington and the Seneca Chief leading, the procession continued, passed New York to the sound of ringing bells and booming cannon, and continued down the harbor toward the Narrows. The journey from Buffalo had taken just nine days.

DE WITT CLINTON TRIUMPHS AFTER TWENTY YEARS OF UNCEASING EFFORTS

Outside the Narrows the flotilla paused. Then the Governor lifted a keg containing water from Lake Erie which he poured into the Atlantic Ocean, to signify the union of the two waters. Another keg, containing a mixture of waters from all the great rivers of the world—from the Ganges, the Thames, the Nile, the Amazon—was also poured over, to indicate that the commerce from all parts of the world would now pass that way. As the Governor pronounced the official address tears streamed from his eyes. For twenty years he had talked and worked for the canal, at times apparently on the verge of failure. Now he had triumphed.

The celebration that welcomed the Governor and his companions in New York City exceeded anything of the kind that had ever taken place before. Military and citizens' parades thronged the streets. All the trades were represented, the fire department leading. Heading the marching printers was a wagon carrying a printing-press. And as the procession marched the press turned out leaflets bearing the printed verse:

> 'Tis done! 'Tis done! The mighty chain
> Which joins bright Erie to the Main
> For ages shall perpetuate
> The glories of our native state.

The Erie Canal more than realized the expectations of those who had advocated its construction years before. Even as a mere business enterprise it proved a success from the beginning. In 1825, the year in which the work was completed, the tolls collected along the finished part of the route amounted to over half a million dollars. Five years later, in 1830, the state collected $1,000,000 in tolls. By the end of 1837, only twelve years after it had been opened, the Erie Canal had paid $15,000,000 into the treasury, which was more than the cost of digging and maintaining it in repair combined.

THE ERIE CANAL BRINGS ABOUT HUGE SAVINGS, WHICH BENEFIT ALL

For the business interests of New York it did even more. In 1824, the year before traffic was opened along the whole canal, it cost $88 to send a ton of freight from Buffalo to Albany. Eleven years later, in 1835, it cost only $3. This meant that the people of New York and those along the coast would get their bread so much cheaper. It also enabled the poor people of Europe to get their bread cheaper, for now vast quantities of wheat were shipped down the canal and exported to Europe. Over half of all the wheat exported from America to Europe came by this route. It was the Erie Canal that made New York the biggest business center on the Atlantic coast, the most important seaport in the country.

With a navigable waterway traversing it, New York State naturally developed very fast. What was once a wilderness, through which the early settlers had passed to reach the Great Lakes region, now became covered with prosperous farming communities. Even before the canal was completed numbers of immigrants had arrived to lay out their homesteads, in anticipation of the produce they would be able to raise for the New York, Boston and Philadelphia markets.

Already while the canal was being dug there was talk of wagons that should run on iron rails, drawn by steam engines, and in

GOING THROUGH THE LOCKS AT LYONS



Ewing Galloway, N. Y.

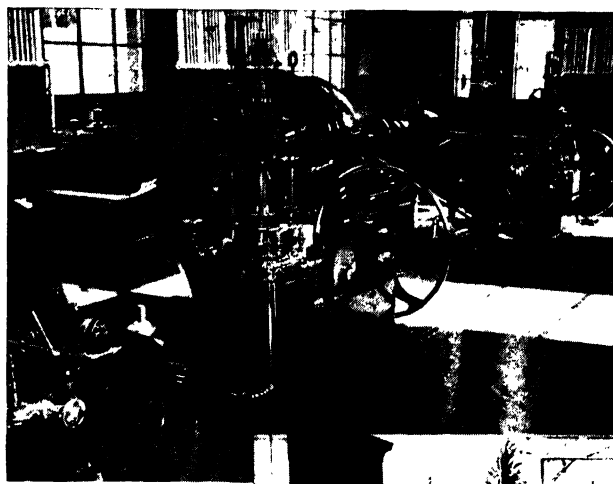
The sturdy little tugboat and the barge shown here are going into one of the locks at Lyons, New York. The gates will swing shut, closing the lock, then water will be let in. Lyons is a village about thirty-five miles southeast of Rochester. The canal has a depth of about twelve feet at this point.

1831 a railroad was actually built from Albany to Schenectady, a distance of seventeen miles. Ten years later the railroad had been extended to Buffalo. But the railroads did not have any great effect on the traffic on the canal. For the reason that it costs so much to build and maintain railroads and freight cars, water transportation is, and always will be, cheaper.

It is usually said that the Erie Canal was completed in 1825. But that is not quite true. It is not yet completed. Within ten years there was more freight than the canal barges could handle. Branches reaching out into other districts were continually being dug, until there were over a thousand miles of canal. Then the main canal was widened to 70 feet, so that barges large enough to carry 8,000 bushels of wheat instead of only 1,000 bushels could pass.

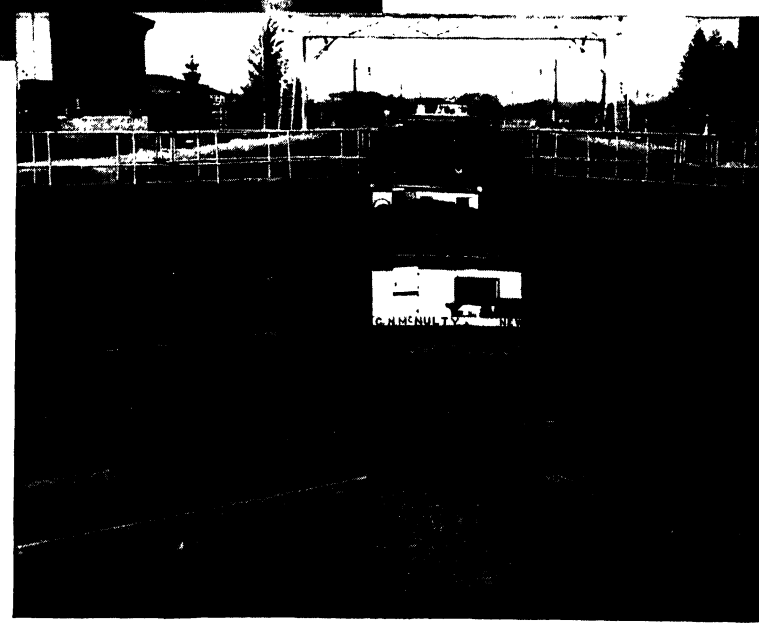
It was not long before the railroad companies began to show a bitter opposition toward the canal. Naturally the canal forced them to keep down their freight rates. In every way they could they tried to impede any improvements on what they called the "ditch." Through their efforts a law was passed abolishing tolls. Apparently this would make freight rates cheaper on the canal. And so it did. But it also abolished the source of revenue from which improvements could be made. This obliged the legislature to appropriate special sums of money for the purpose. And this again raised a strong sentiment against the canal among those who did not benefit directly from it and felt they were being taxed for the good of those who lived along its route. The consequence was that the canal was neglected.

But finally, in 1903, the people came to realize that the railroads were opposed to the canal only for reasons of self-interest. Then amends were made for the many years of neglect. The people voted in favor of spending over $100,000,000 to rebuild the old canal along entirely different modern lines, along which steam-



Both photos, Ewing Galloway, N. Y.

Above we see the machinery in the power-house that operates the locks at Lyons. The locks at Lyons are 310 feet long.



The gates of a lock at Lyons are closing after a barge has passed through. When the gates are closed, the level of water in the lock will be raised.

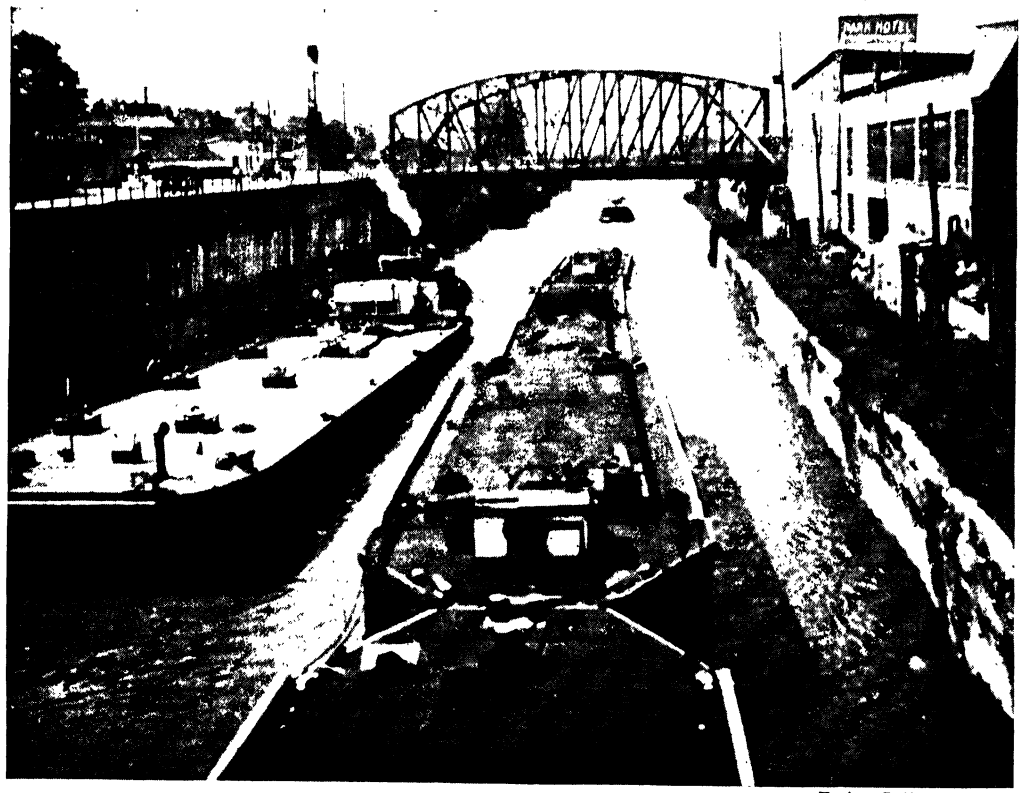
ers may sail as they do up and down the Hudson. The cost to the state turned out to be double what had been voted. The new canal follows, for the most part, the line of the old, but many miles have been relocated for several different reasons. Great and costly though the changes were, the canal never quite regained its former importance in the economic life of New York State.

The system of locks along the new Erie Canal, or the New York State Barge Canal, as it is now generally called, surpasses even the Panama locks. In a dry, sloping pasture behind the little town of Waterford the engineers have built what looks like a flight of giant steps—huge concrete blocks, in each of which is one of 5 locks. Combined they can lift the freight steamers 184 feet, more than twice as high as the Panama locks. At Little Falls, where the new channel of the canal ascends a narrow ravine, there is one lock, the highest in the world, which can lift the steamers over 40 feet in 8 minutes, as though they were being hoisted by a giant derrick. There are 57 locks in all.

Another wonderful feature is the great movable dams, big steel girders and steel plates riveted together, which are hinged on gigantic bridge-like structures. When navigation ceases in the winter these dams are swung up so that the ice floes may sweep down unimpeded. There are eight of these great dams, and each cost $800,000.

The barges which take the place of the old horse-hauled craft are of 2,000- to 3,000-ton burden, compared to the 250-ton burden of the old barges. Some are able to carry the contents of a freight train of seventy-five cars. That is the size of an average ocean-going freight steamer. And being propelled by their own power, these modern freight carriers are able to carry their cargoes from Buffalo to New York two and a half times faster than did the old barges.

A fleet of six barges, one being a power boat, can be passed through a lock at one time. Larger barges are used for special purposes. There are now no tow-paths on the canal, so all barges are drawn by power boats. Canal life has lost its quaintness.



Ewing Galloway, N. Y.

A view of modern steel grain barges passing the locks at Lockport, on the new Erie Canal, which is also known as the New York State Barge Canal. This canal follows the line of the old Erie Canal, for the most part. There is a remarkable system of locks in the new canal; there are fifty-seven locks in all.

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VOLUME XIV

The Book of Knowledge

The Children's Encyclopedia

THAT LEADS TO LOVE OF LEARNING

Editor-in-Chief

E. V. McLOUGHLIN, L.H.D.

Educational Consultant

LEONARD POWER, Ed.D.



With an Introduction by

ALEXANDER J. STODDARD, Ed.D., L.H.D., LL.D.

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THE SOUTHERN STATES—PART II

IN the early days there was considerable manufacturing in the South, but the invention of the cotton-gin led people to think that there was more profit in agriculture. So the number of factories did not increase so rapidly as in the North. Since the Civil War there has been a great change, and now the value of manufactures is greater than the value of the crops. But agriculture is still of surpassing importance in the South, as may be clearly seen from the fact that only about a third of the people of the South live in cities.

Now let us see what advantages the South has for manufacturing. In the first place, it produces the raw materials for many kinds of manufacturing; next, the Southern people have been successful as workers in factories; and, third, it has power for manufacturing. On the other hand, it has few great cities and is not so convenient to the principal markets of the world as some other sections.

We have already spoken of the coal resources of the South. Besides coal, the South has water power. At the inner edge of the coastal plain, from the Great Falls of the Potomac to Muscle Shoals there are rapids and falls on nearly every river. The energy in these rapids and falls is made into electricity. Like the refining of petroleum, this process is a manufacturing industry in itself. The electricity then supplies power for other industries. Storage reservoirs for the water, and an interconnecting system for the electricity (a super-power system, as in the Northeastern section) make this power available throughout the year. One of the greatest companies, the Alabama Power Company, serves three hundred industries and supplies a million people with electricity. The great-



State News Office, Raleigh, North Carolina

Tobacco is one of the great crops of the South. Here is a scene in a tobacco factory.

est power site in the South, second only to Niagara Falls, is Muscle Shoals, where the great Wilson Dam was built. This is the centre of a great government development project which includes the entire Tennessee Valley.

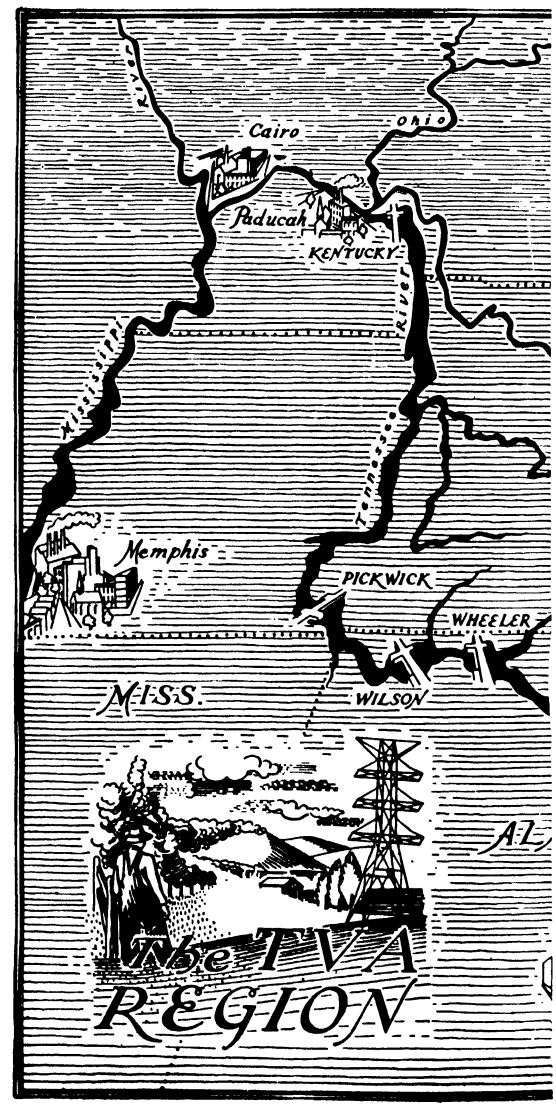
THE INDUSTRIES OF THE SOUTH ARE MANY AND VARIED

The most important manufacturing industry to-day is the making of cotton goods. Then come lumber and timber products, flour and grist mills, cotton-oil mills, petroleum refining, slaughtering and meat packing, tobacco manufacture, the making of iron and steel products, fertilizers and many other things. The country's largest pulp mill and its largest cotton mill are in the South. Of these industries a large per cent were brought about by Southern men using Southern capital. Some of them are as old as the South itself; some are new. A rather new industry is the making of rayon from wood fibre; another is making denatured alcohol for industrial uses from molasses; and still another is the making of paper from yellow pine or from cotton linters. The little gray seed of the cotton, once burned or thrown away, is now a box of blessings. From it comes golden oil that rivals olive oil and is used in making oleomargarine, shortenings, soap, perfumes and other things. Hulls and meal also come from it. From the cotton linters come guncotton, material for mattresses, rayons, paints and a great variety of molded articles that we call plastics.

Among many manufacturing cities we may think of New Orleans, noted for sugar refining; of Atlanta and Dallas, leading in the manufacture of agricultural machinery; of Birmingham, the centre for iron and steel products; of High Point, famous for furniture; of Winston-Salem, Durham and Tampa, manufacturers of tobacco; of Richmond, with a great variety of factories. Hundreds of little towns have one or more factories.

The South has its share of the population and area of the country. It has advantages for the development of agriculture, of the animal industries and for lumbering. It leads in many important mineral products. These industries supply raw materials for manufacture. It has a long coastline with good harbors and transportation lines from the interior leading to them. Its climate is not a serious hindrance to any industry or to any class of people. In view of these conditions and resources it is reasonable to predict that the South will continue its rapid progress in manufacturing.

Public-school work in the best cities of the South is much like that in the best cities of other sections. Education in some of the rural sections is below standard. Since the South is largely rural, it ranks low in educational development generally, but it is improving rapidly. In higher education the South has had a long and honorable history. The second oldest college in the United States is William and Mary, in Virginia, dating back to 1693. The best colleges and

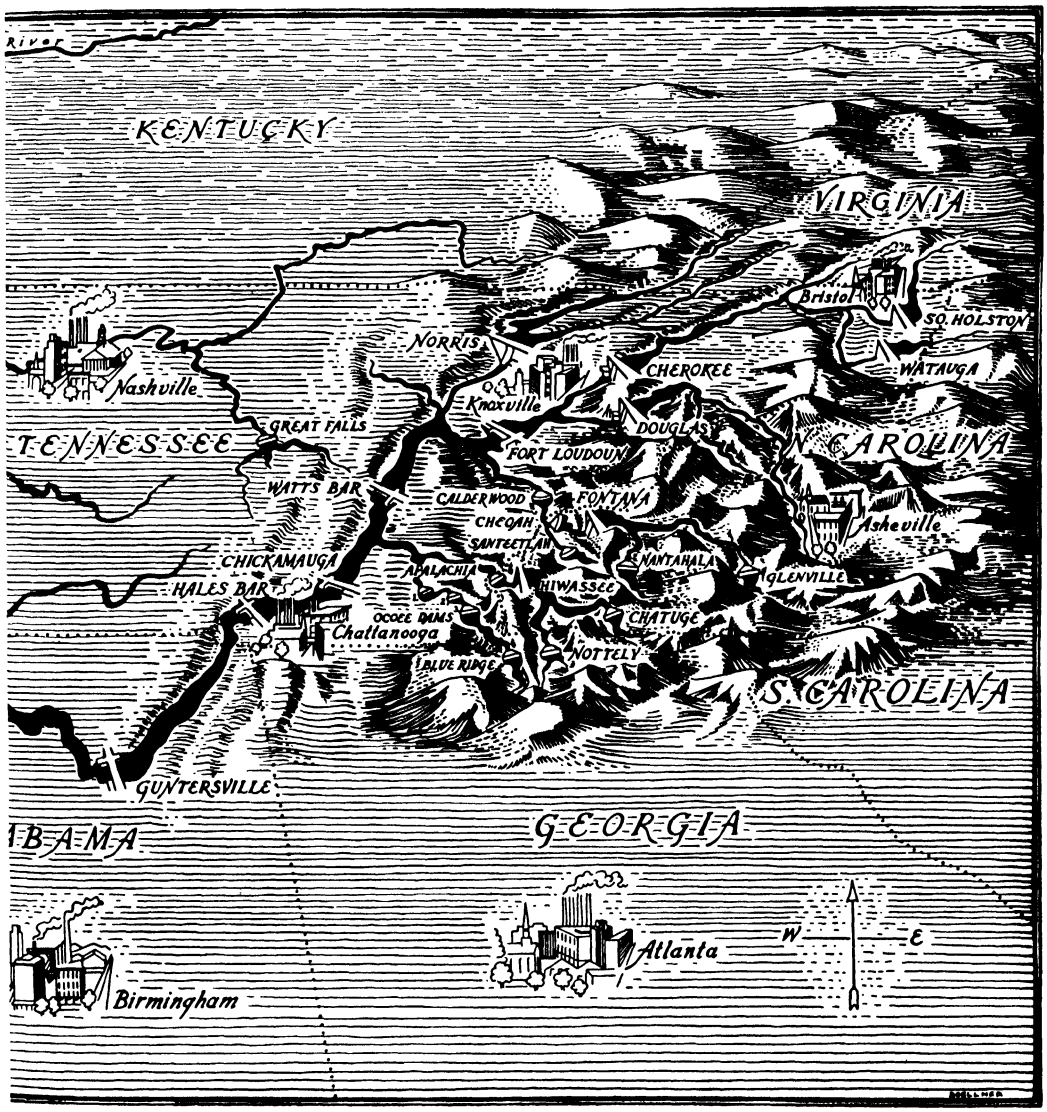


The great TVA water-power project. This map

universities of the South compare favorably with those of other sections. One of the greatest needs is for better-trained teachers. Peabody College for Teachers at Nashville, Tennessee, is the best-known school of its kind in the South, but there are many others.

There are special schools in the South for the foreigners who can not speak English, particularly for the Mexicans, and special schools for the Negroes. North Carolina, a leader along several lines, is leading also in bringing about equal educational opportunities for all her citizens. Among many schools for Negroes, the three best-known are Fisk University in Tennessee, Hampton Institute in Virginia and Tuskegee Institute in Alabama. The founder of Tuskegee was Booker T. Washington, of whom it was said that he did more for his race than any other black man that ever lived. That school, founded in 1881, has now more than 100 buildings, 275 men and women on its faculty and teaches many trades and skills.

"A democracy can not be built on the backs of ignorant men," said former Governor Aycock of North Carolina. The great-

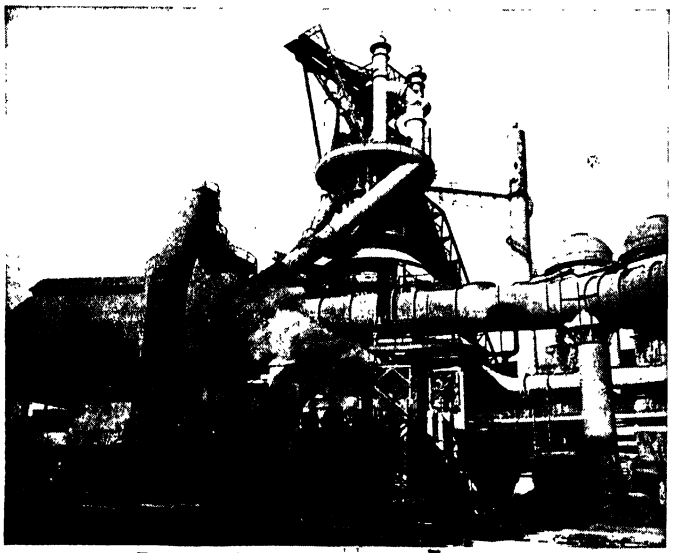


Courtesy, Tennessee Valley Authority

shows the dams on the Tennessee and other rivers, where electrical power is created in the TVA project.

est need of the South to-day is not wealth, or labor, or markets, but education for good citizenship.

In the South, from Baltimore to Brownsville, there are two main rows of cities. One is at the inner edge of the coastal plain,



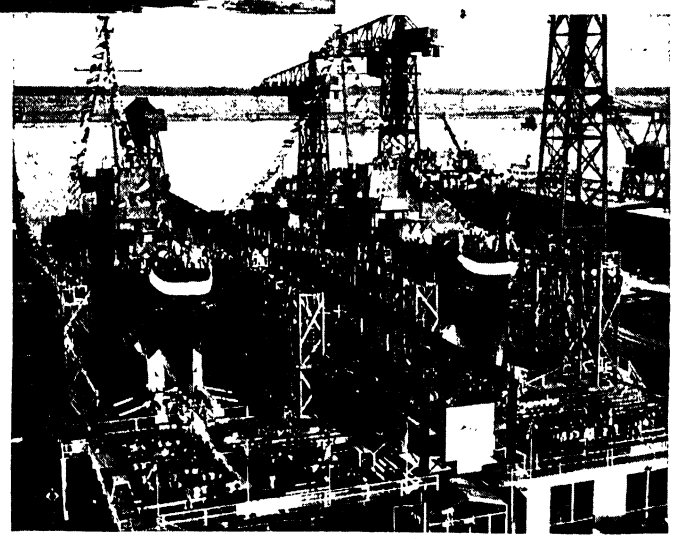
Tennessee Coal, Iron and Railroad Co.

An Alabama iron works. Iron and steel account for about a third of the state's manufactures.

where you have found that manufacturing is mainly carried on. The other row is along the three-thousand mile coastline wherever harbors are naturally good or have been improved by man. Between the two rows are smaller cities and towns, and across the Alleghenies are others.

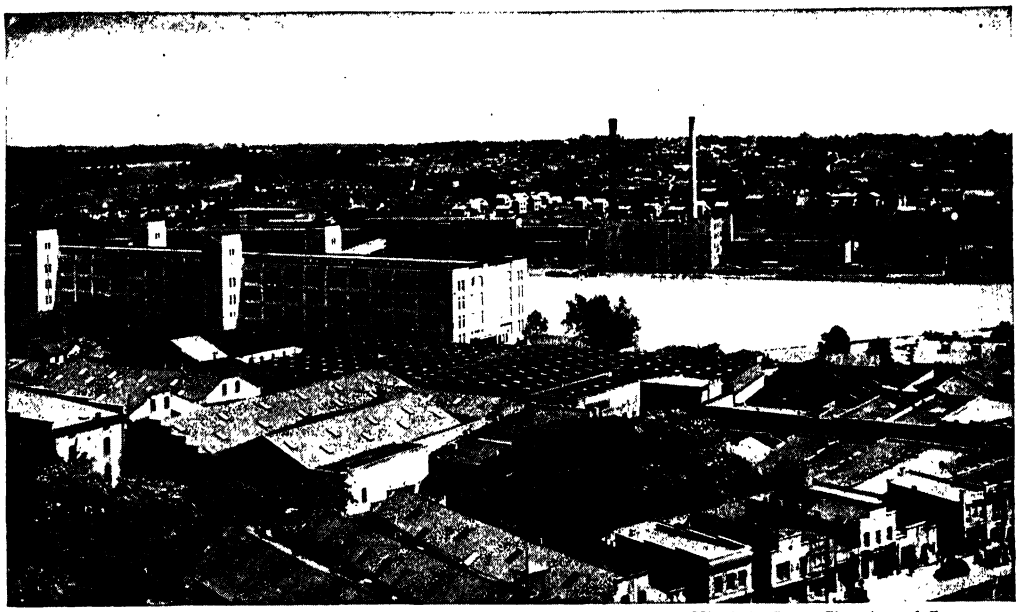
The South leads all other sections in value of exports, chiefly cotton, oil and tobacco. Through its ice-free ports it sends its own products and also many products of the Middle West. New Orleans is the most important Southern city in value of imports and in variety of exports. Among United States ports Houston is third in export tonnage with Port Arthur next. At Savannah, which is the largest market in the world for naval stores, the wharves are crowded with barrels of rosin, tar and turpentine for export. Other important ports are Tampa, Beaumont, Mobile, Charleston and Galveston. Through all the ports of the South exports go to foreign countries—cotton, tobacco, petroleum, lumber, naval stores, meat products—and much grain from the Middle West goes through Southern ports. The long coastline and the nearness to the Panama Canal give the South an advantage in trade with the Latin American countries to the south and with China and Japan. Distance from Europe is a permanent disadvantage for the Gulf Coast section.

It would take a long time to see all the show places of the South. Among the most interesting of the sights are the Southern homes of the old colonial type. Perhaps the best-known are Mount Vernon, the home of Washington; Monticello, the home of Jefferson; Arlington, Lee's home; and The Hermitage, the home of Jackson. Others just as interesting might be mentioned. These are open to the public. There are many private homes of the same type. Then there are hotels—quaint and old, new and expensive. St. Charles, historic old hotel of New Orleans, is among the most interesting of the old type. The



Official U. S. Navy photograph

A double launching at the Navy Yard in Charleston, South Carolina, during World War II. Charleston is one of the important ports of the South.



Virginia State Chamber of Commerce

Virginia, once a one-crop (tobacco) state, now has many products. Above, a cotton mill at Danville.

section has some of the finest resort hotels in the world, for example, the Grove Park Inn at Asheville.

Every state has natural show places of interest. Among many that might be mentioned are the Mammoth Cave of Kentucky, the Diamond Cave of Arkansas, the Natural Bridge in Virginia and the Great Smoky Mountains National Park. Florida, the greatest resort state of the Union at present, is called the "American Riviera," although it has no mountain background as has that famous coast of France and Italy. Because "summer spends the winter there," Northern people are coming down to Florida in increasing numbers every year to escape the cold of their sections.

Travel would be a weariness to the flesh if it were not for good transportation lines, which are necessary for business as well as for pleasure. In canals, navigable rivers, railways and improved highways the South is fairly well developed. While the South has only one-third of the area of the United States, it has more than half the mileage of navigable waterways. Bulky non-perishable materials, such as steel, coal, cotton, tobacco and wheat, are shipped by water. Oil and gasoline are among important products shipped north by water. Water transportation is not always satisfactory because of changes in the level and in the channels of streams.

The South led in early railway development. The first hundred miles of railway in operation in our country was in the South. To-day some of the largest locomotives, the largest freight cars and some of the longest lines are in the South. Many luxurious passenger trains run on Southern railways. North Carolina has led in the making of good



Virginia State Chamber of Commerce

Hundreds of crates of apples in cold storage at Winchester, in the heart of Virginia's famous orchard-country.



Farm Security Administration

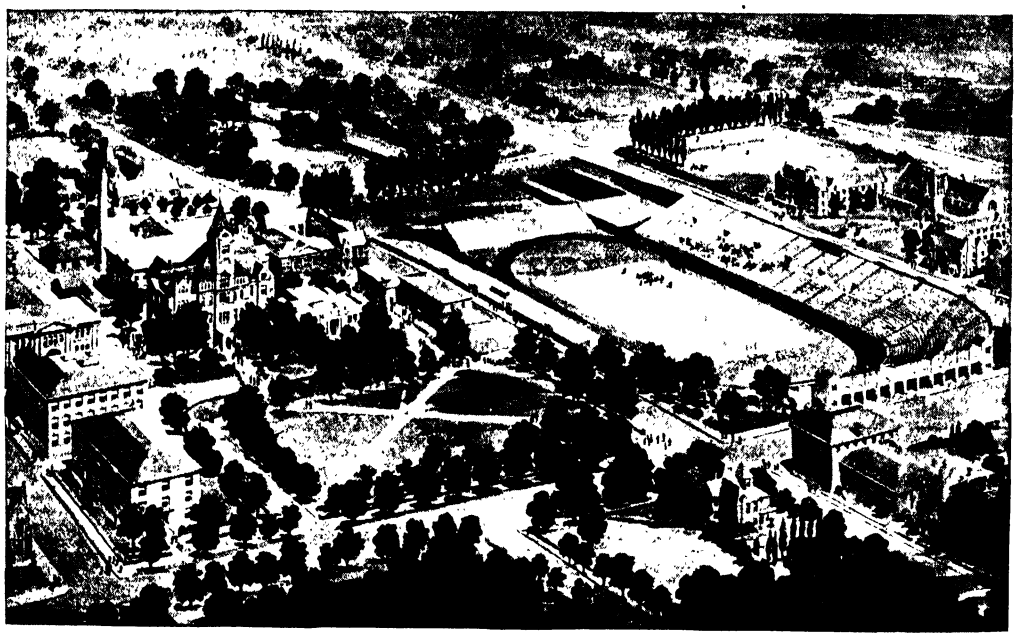
A modern school for Negroes at Mosquito Crossing, Georgia.

highways as it has led in education. Other states are active in this work. Southern highways are open for travel the year round. Motor transportation in the South, as in other parts of the country, is competing strongly with the railroads.

In spite of many natural advantages, the South has been under serious handicaps. Slavery and the position of the Negro gave the South a bad start. The Civil War set progress back for half a century. Now the greatest hindrances are probably three: too much dependence on cotton, both in farming and in manufacturing; the tenant system; and the wasteful use of natural resources. Those who know most about the situation in the country as a whole predict that the greatest agricultural improvement in the United States in the next twenty-five years will come in the South. That can become true only if diversification in farming becomes general. Diversification in manufacturing will probably proceed hand in hand with diversification in farming. Both these things are already on the way, as we have tried to show. All the people of the South will benefit.

The French people in the days of royalty had a saying: "The King is dead. Long live the King!" In the same forward-looking spirit we can say: "The Old South has gone like the night. The day of the New South has dawned!"

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 5061.



Georgia School of Technology at Atlanta. There are courses in civil, electrical, mechanical and aeronautical engineering, science, architecture and kindred subjects. There are about 3,000 students.

UNIVERSITIES IN THREE STATES



Left, the Rotunda, University of Virginia. Right, old well on the campus of the University of North Carolina.



Pictures courtesy Virginia State Chamber; State News Office, Raleigh, North Carolina; Houston, Texas, Chamber of Commerce

The Science Building at the University of Houston, Texas, part of the public-school system of Houston.

SIX IMPOSING GOVERNMENT BUILDINGS



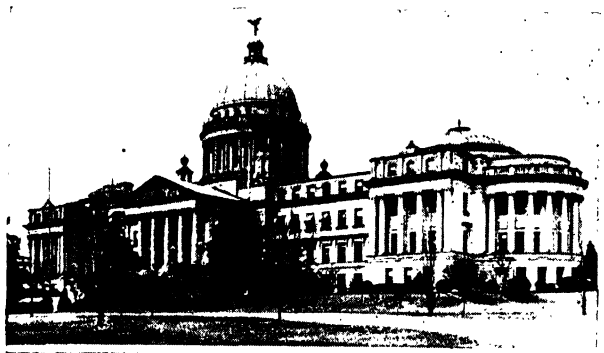
The Capitol at Charleston, West Virginia.



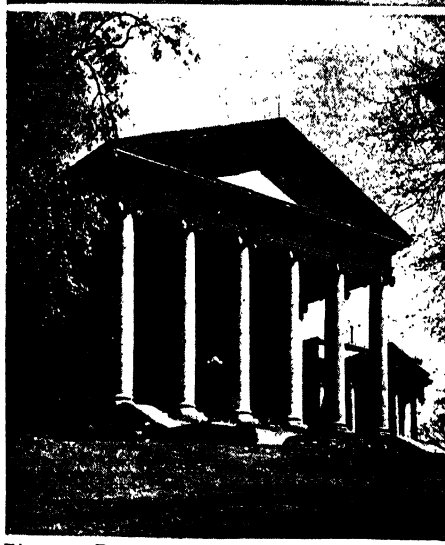
Above, Tennessee's State Building at Nashville.



Above, the Capitol at Raleigh, North Carolina.



Left, the Capitol at Jackson, Mississippi.



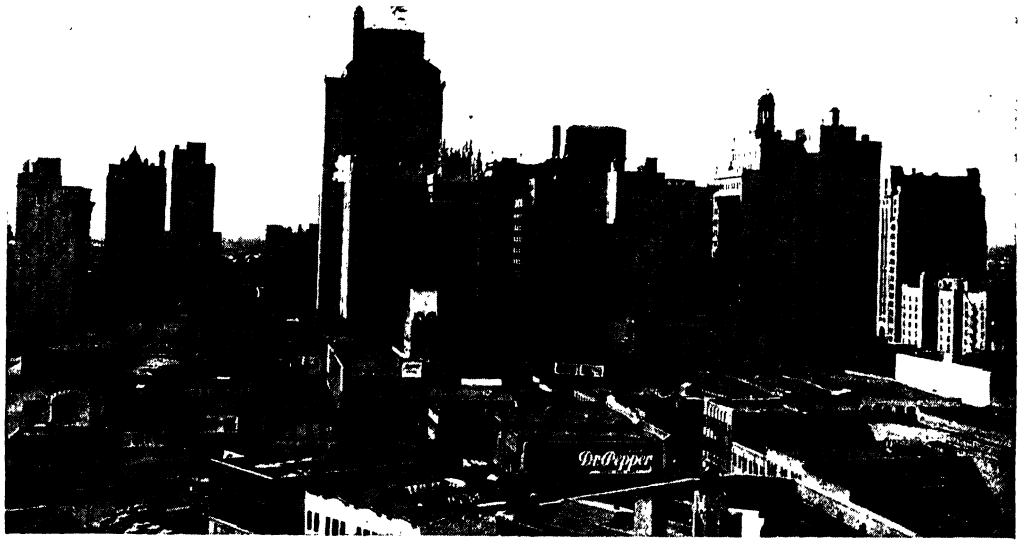
The Capitol at Richmond, Virginia, was designed by Thomas Jefferson, and built in 1785 to 1798.



The Florida Capitol at Tallahassee. This dignified State House set amid spreading lawns was built in 1840.

Pictures, Frederic Lewis; Philip Gendreau, N. Y.; State News Bureau, Raleigh, N. C.; Virginia State Chamber

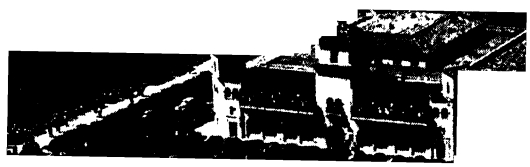
DALLAS AND ST. PETERSBURG



A. F. Sozio from Gendreau

A view of Main Street, Dallas, Texas, showing some of the skyscrapers. This is a modern, prosperous city.





Florida State Chamber of Commerce

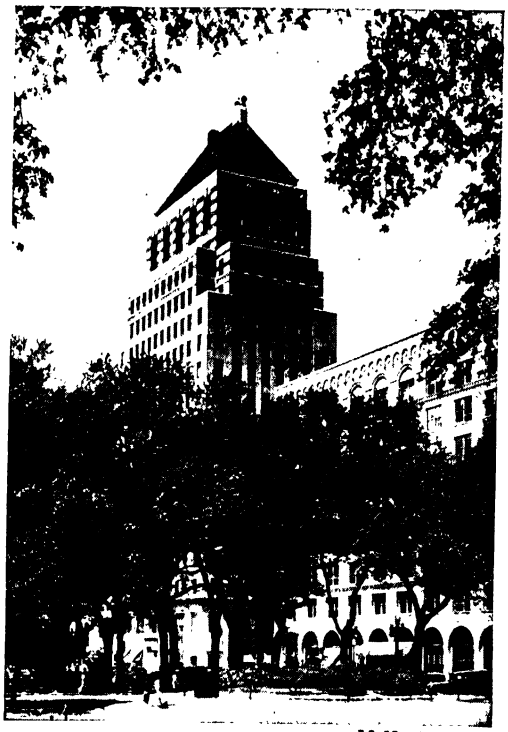
The recreation pier at St. Petersburg, Florida. This beautiful city attracts thousands of visitors every winter.

IN OKLAHOMA, ALABAMA AND GEORGIA



Oklahoma Chamber of Commerce

Oklahoma City, capital of the state, is a thriving centre. Oklahoma has great oil wealth.



McNeely Photo

Historic old Bienville Square, in the heart of Mobile, Alabama, with a modern skyscraper in the background.



Chamber of Commerce, Savannah, Georgia

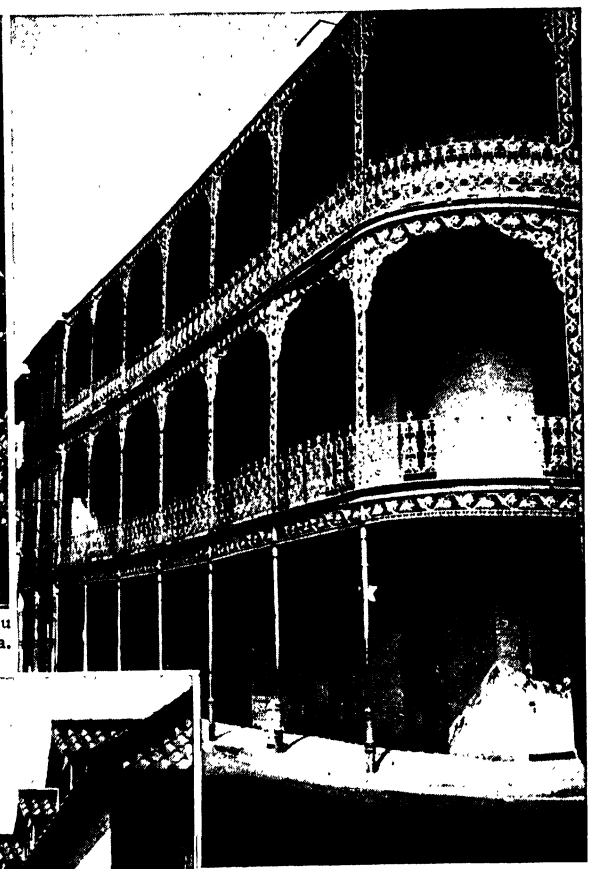
Victory Drive, Savannah, said to be the longest avenue of palm trees in the world.

MEMORIALS OF DAYS GONE BY



Screen Traveler, from Gendreau

Evangeline statue in St. Martinville, Louisiana.



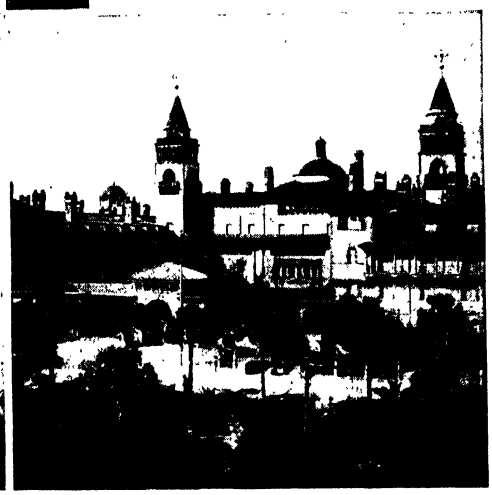
Screen Traveler, from Gendreau

Wrought-iron balconies in the old French section of New Orleans, Louisiana, remind us of an earlier day.



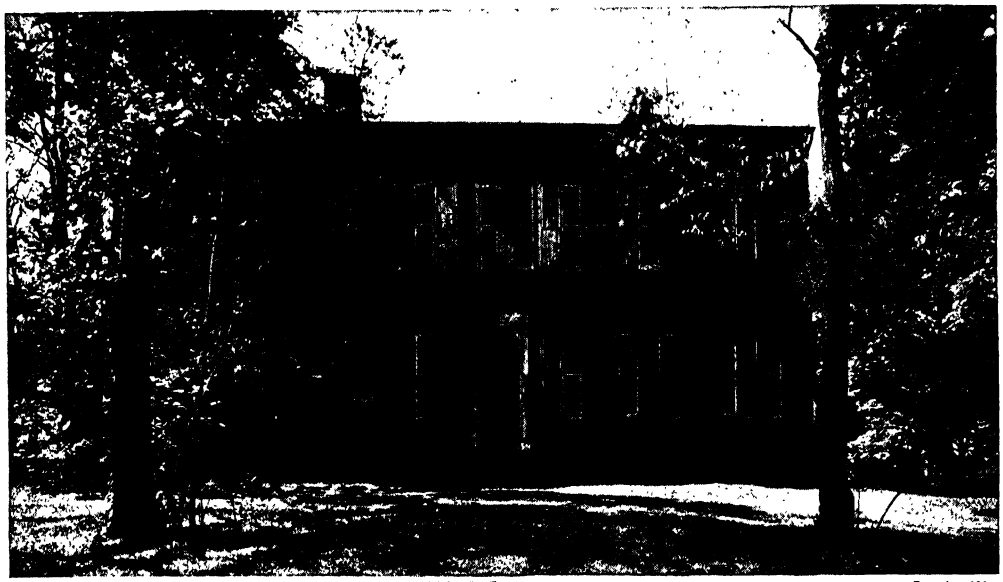
Florida East Coast Railway

A part of Aviles Street, St. Augustine, Florida, the oldest town in the United States.



Ponce de Leon Hotel in St. Augustine, named for the man who sought the Fountain of Youth in Florida.

HISTORIC BUILDINGS IN FOUR STATES



Canfield and Shook, Inc., Louisville
Stephen Foster's Old Kentucky Home, in Bardstown.



The old Pringle House, Charleston, South Carolina.



State News Bureau,
Raleigh, North Carolina
The Orton Mansion, built in 1725, between Wilmington and Southport, North Carolina.



The old Army arsenal, at Little Rock, Arkansas, birthplace of General Douglas MacArthur.



U. S. Federal Bureau of Investigation

A group of Special Agents practicing the latest methods of disarming criminals, on the Academy roof gymnasium.

THE G MEN

THE story of the Canadian Mounted Police is told in the chapter beginning on page 5831. This admirable body of men has long been famous for the capable way in which they maintain law and order in the scattered sections of Canada. The United States also has a body of men devoted to the exciting and dangerous work of bringing certain criminals to justice. These men are called Special Agents of the Federal Bureau of Investigation, or, more popularly, G men, or Government men.

The career of a G man is not an easy one. He must pass rigid qualifications before entering the service, and once he has become a part of the organization, his work is almost his whole life. When he enters the service, the G man is between twenty-five and forty years of age, that is, old enough to be given a man's responsibilities, young enough to face any sort of hard work with full strength and vigor. He is a graduate of a law school and member of the bar, or else an expert accountant with a degree from a recognized institution and three years of practical experience in accounting. He is a citizen of the United States, willing to serve in any part of the country or its possessions.

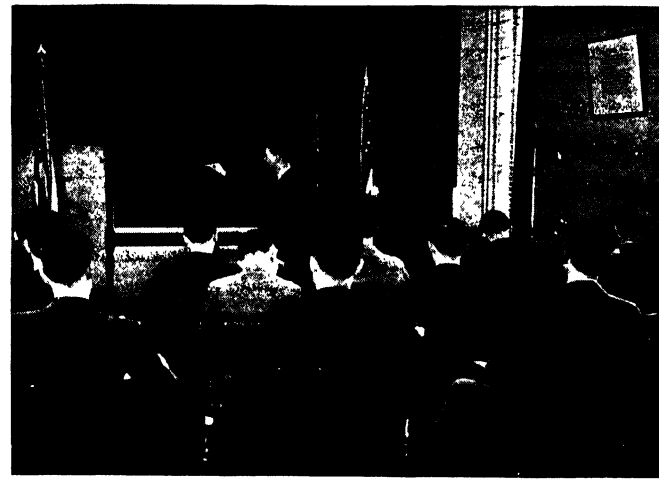
At the time of his application he must present a doctor's statement that he is in excellent health; and before he can be appointed he must pass a further physical examination. Blood tests, X-ray photographs and other modern methods are used to tell whether he is physically able to endure the stern life of a G man. He is then given an oral and a written examination to determine his mental fitness.

Let us say that he has met all the requirements. He is still not accepted—not until his whole past life has been reviewed, his marks at school and college, his personality records in school, his business and moral reputation, his friends. Investigators find out whether or not he pays his bills promptly. If he passes this thorough investigation, he is placed on the list from which new G men are chosen.

The great moment comes when he receives

word that he may go to Washington and enter the school. Yes, he must go to school again, even though, as sometimes happens, he already possesses several university degrees. But this is a very special kind of school. It lasts for only fourteen weeks, and there is never a dull moment in class.

There are lectures by famous experts in crime detection on such subjects as jiujitsu and defensive methods; evidence, confessions and circumstantial evidence; toxicology and medical examination, and many other topics. Even more interesting are crime plays, where a pretended crime is discovered and the student G men are led by a teacher through the steps of the investigation, until the pretended criminal is caught. Fingerprinting is taught, and the science of reading fingerprints. Some of the men study chemical analysis in relation to evidence. Sometimes the slenderest bits of clues—a little piece of string, a hair, a sliver of wood —may solve a crime if chemistry, high-powered cameras, X-rays and other scientific aids are called in. Motion-picture machines and lantern slides are also used.



U. S. Federal Bureau of Investigation

Criminals are often detected by their fingerprints. Here a class of Special Agents of the FBI is studying fingerprints.

One day the students are led into a room which is untidy and shows signs of having been recently abandoned. The lesson given is the task of figuring out from the appearance of the room who lived in it and, if possible, why the owners left it in such a hurry. Another day one part of the class may be told certain facts, and the other students must try by long, patient questioning to find out what these facts are.

Students often, during their course, assist in solving actual cases of lawbreaking, under



U. S. Federal Bureau of Investigation

Millions of fingerprints are filed here. The FBI has a criminal and a civil collection of prints.



U. S. Federal Bureau of Investigation
Learning jiu-jitsu. Knowing it may mean the difference between the capture or escape of a dangerous criminal.

the leadership of experienced G Men. They are given training in firearms and target practice. Every G man is an expert marksman.

A valuable method of teaching is the open class discussion. Talking over problems gives every man a chance to state his opinion and to share the knowledge of his classmates. When he is working, he will secure clues from conversations with other people. He must learn to listen, to sift out the valuable from the trivial and to make accurate mental notes in interviews when the other person does not know he is being officially interviewed. The G man is, in fact, always alert.

One day a class came into the schoolroom and found a small screen across the instructor's desk. A lamp, unlighted, stood in front of the screen. Two men sat behind the desk, but could not be seen by the class. One of the men back of the desk reached over and snapped on the light. It would not go on. The other man walked over to a wall switch and pushed a button, but the lamp remained unlighted. A third man who was sitting among the students rose, walked to the desk, screwed the bulb tighter in the socket, and the light went on. As he lighted the lamp, the third man knocked over the screen and the two strangers behind the desk were clearly visible for a moment, before the screen could be set up again. At this point the instructor came upon the scene and said "This is a perception test. Let us find out how clearly you see what happens before your eyes."

The students were asked to write down exactly what had occurred. Many different reports were made. Some thought only two men had tried to light the lamp. Some thought the wall switch had been snapped on first, after that the button on the lamp. Many other errors were made in reporting that simple scene.

Make a perception test like this among your friends, as an amusement, some day, and you will see that it is not easy to keep details sharp and clear in your mind without training. This will help you to realize some of the difficulties that stand in the path of the Special Agents. If they themselves made mistakes in describing a scene a minute after it happened, how could they expect other people to give them true accounts of events weeks or even months after they had taken place?

As the weeks go by, the student G men become quicker and keener in their observation. At the end of three and a half months of school, the class is ready for active service. Then men separate, possibly never to come together again as a group, for their



U. S. Federal Bureau of Investigation
A lesson in "reading" clues at the scene of a crime. (The clues have been "planted" by the instructor.)

calling is dangerous in the extreme, and it scatters them widely over the country, and even abroad. Each man, however, must return for a two weeks' retraining course, at least once in every eighteen months, to learn the latest methods of law enforcement and to keep his mind sharp. This refresher has proved to be an excellent thing. It tends to give him self-confidence so that he may better accomplish his dangerous and difficult tasks.

The work of the G men is amazingly varied and interesting. In every case, the man who is best suited to the job, by special talents or knowledge or experience, is assigned to bring the criminal to justice. Often disguises are necessary. A former musician procured employment in the orchestra of a night club to capture a criminal who was said to attend the club. Another Special Agent patiently peeled potatoes in a restaurant until he secured enough evidence to arrest an extortioner who worked in the same kitchen. A Special Agent who knew languages made friends with an alien who was trying to destroy a United States Navy airship, and was able to foil the criminal's plans.

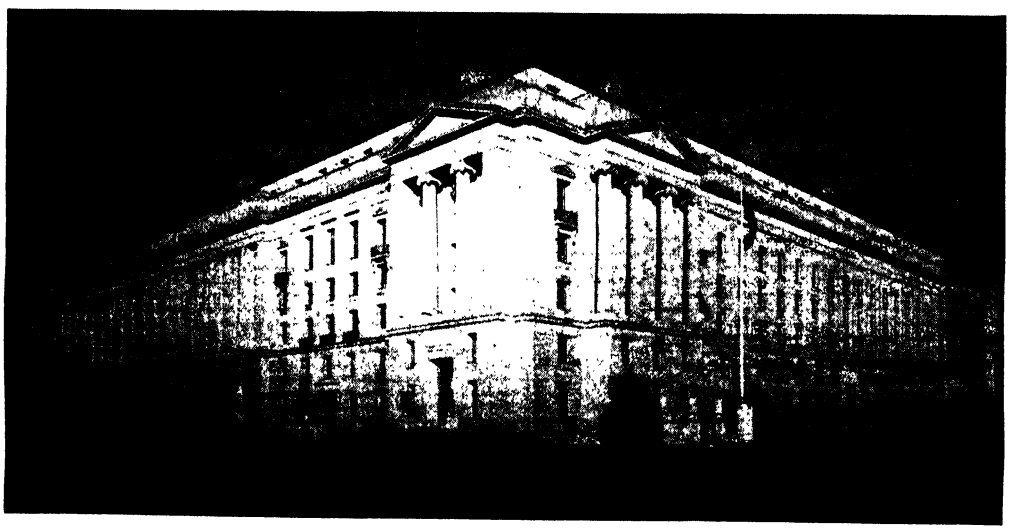
The average criminal is lower than the average person in general mentality but he is usually a specialist in his particular field of crime. His senses are sharpened and at the first sign of danger to himself he flies into hiding. If his place of concealment is found out, and he is cornered, he may turn and fight with the desperate fury of the coward brought to bay. He knows no truth or loyalty, even to his close friends, or to those who serve him, but like that foul jungle beast, the hyena, preys upon all. He rightfully regards as his bitterest enemy the G man, the Special Agent who has dedicated himself to the task of rooting out the horrid nests of crime.

The criminal can summon at moments a reckless bravado; the G man has at all times a calm bravery. The criminal cares only about himself. The G man spends his life in service for others. He goes without food or sleep if necessary. He has no set hours or days of work but is always at his country's call. Holidays have little place in his life. Often he must give up or postpone thoughts of home and family. When you and I are snug and safe in our homes, the G man of the United States and the Royal Canadian Mounted Policeman of Canada may be standing patiently in the cold for hours on a lonely dark street corner, or traveling hundreds of miles, or matching wits with a desperado. "Get your man!" is the command, and a Government agent rarely fails.

These brave men are heroes worthy of our admiration and gratitude. In the words of J. G. Holland, they are:

Strong minds, great hearts, true faith and ready hands!
Men whom the lust of office does not kill,
Men whom the spoils of office can not buy,
Men who possess opinions and a will,
Men who love honor, men who cannot lie.

THE NEXT STORY OF GOLDEN DEEDS IS ON PAGE 5375.



U. S. Federal Bureau of Investigation

The United States Department of Justice Building, Washington, D. C. This is the home office of the G men.



James Sawders

Picturesque bridge at Córdoba over the broad Guadalquivir River, one of Spain's few navigable streams.

THE STORY OF SPAIN

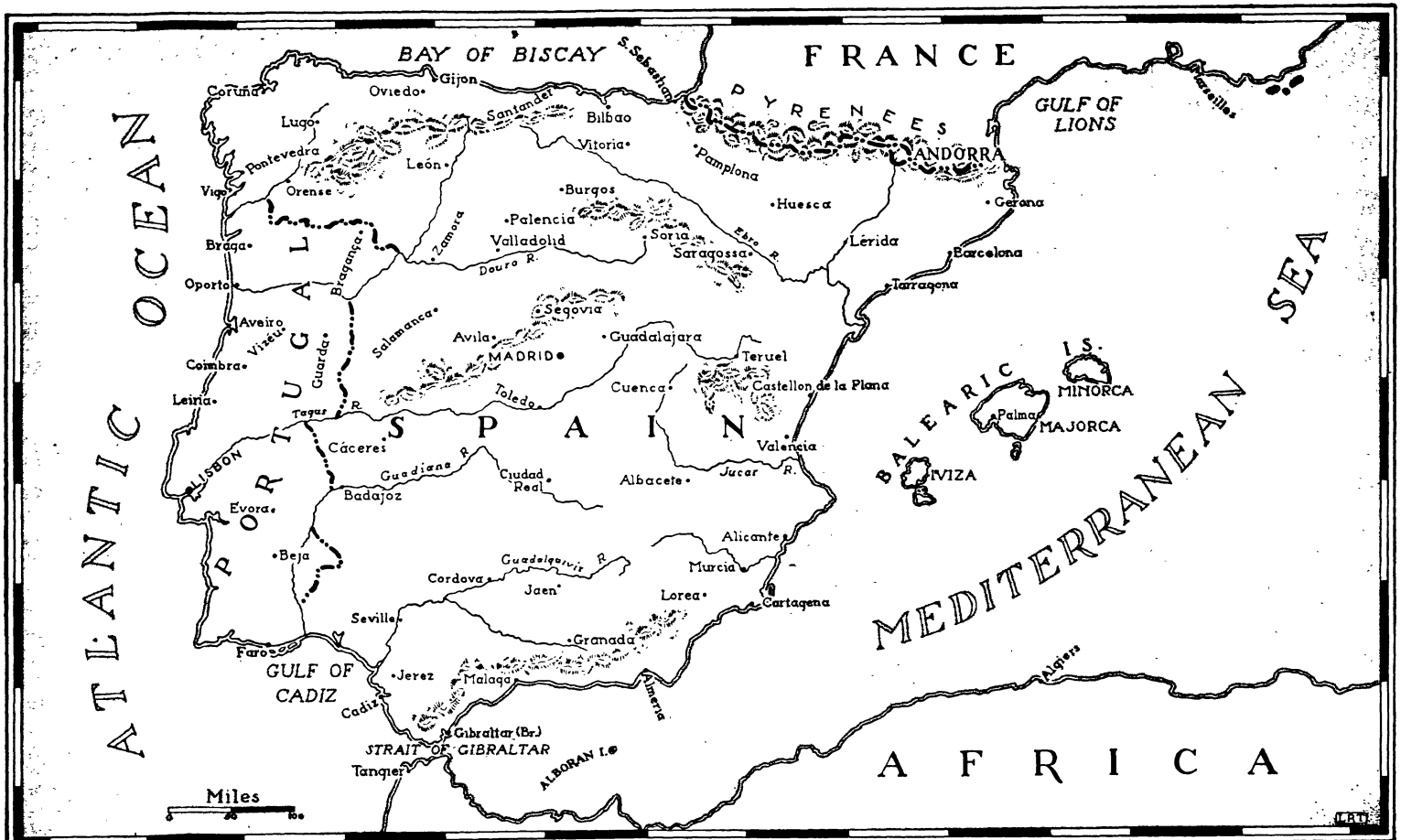
IN the southwestern corner of Europe lies a square-shaped peninsula, cut off from the rest of the continent by the mountain wall of the Pyrenees and separated from Africa only by the narrow Strait of Gibraltar. This land mass is called the Iberian Peninsula, from the name of its earliest inhabitants. The fair land of Portugal stretches along the western shores of the peninsula. On the southern coast is the great fortress of Gibraltar, an English possession. The rest of the peninsula—over seven-eighths of it—is occupied by Spain, whose story we are going to tell you in the pages that follow.

As you can see by the map, the country has a long coastline, which gives it free access to the Mediterranean Sea and to the Atlantic Ocean as well. Yet much of Spain is shut off from the sea. The interior is made up in large part of an immense tableland or plateau, hemmed in on three sides by mountains and on the fourth side by Portugal. This tableland, the Meseta (Spanish for plateau), averages some 2,500 feet in height above sea level.

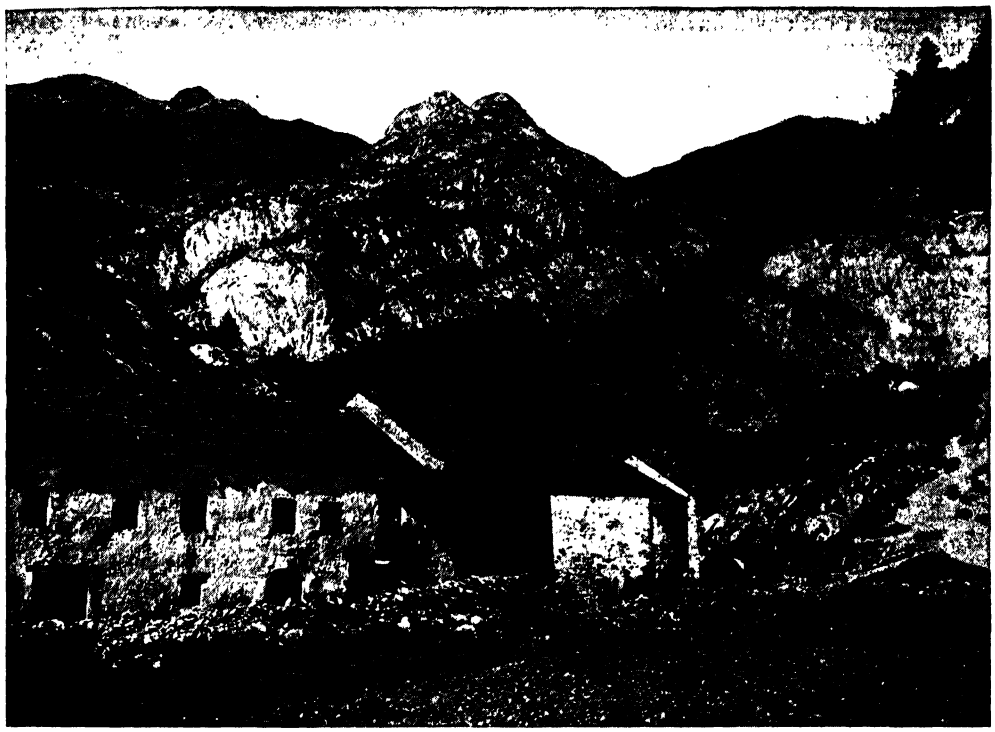
The northwestern boundary of the Meseta is formed by the Cantabrian Mountains, a continuation of the Pyrenees. To the northeast lies the Iberian Cordillera; to the east a series of short mountain ranges; to the south the Sierra Morena. To the west a steep slope leads to the Atlantic plain, occupied by Portugal. The Meseta is divided into several compartments by mountain ranges that cross it from northeast to southwest. Northernmost of these ranges is the Sierra de Guadarrama; farther south we find the Toledo Mountains.

Most of Spain's mountains either shut in the Meseta or cross it. The great range of the Pyrenees, however, is several hundred miles to the northeast. The Pyrenees form a natural boundary between Spain and France. Branches of the range reach far into Spain, particularly in the northeastern province of Catalonia. In the extreme south

EUROPE'S FARTHEST WEST—A BIRD'S-EYE VIEW OF SPAIN AND PORTUGAL



This map of Spain and Portugal shows the rivers, mountains and cities of the peninsula, and the narrow passage between the Atlantic and the Mediterranean.



James Sawders

The little Spanish village of Boucharo, in the very midst of the towering Pyrenees Mountains, just over the border from France. The Ara River flows near by. In the background you see several peaks of the Pyrenees.

of Spain we find the snow-capped range of the Sierra Nevada, which hugs the Mediterranean coast. Its loftiest peak, the Mulhacén (11,417 feet), marks the highest point in all Spain.

The country has many rivers but only a few of considerable size. Most of the longer streams flow from east to west. The Douro and the Tagus, which cross the great Meseta, water the fertile fields of Portugal before they empty into the Atlantic Ocean. Farther south, the Guadiana and the Guadalquivir flow into the Gulf of Cádiz, an arm of the Atlantic. The Ebro, which drains a large area south of the Pyrenees, is the only important river of Spain that empties into the Mediterranean Sea.

The rivers of Spain, with only a few exceptions, are not navigable for any considerable distance from their mouths. Their flow is too rapid; they are too narrow and winding. In summer some of them are reduced to mere trickles of water.

Spain offers startling varieties of climate. The northwestern areas, north of the Cantabrian range and facing the Atlantic and the Bay of Biscay, have a delightful climate, with mild winters and cool summers. In the Meseta there are great extremes of temperature. The summers are scorching; the winters are very cold. The eastern coastal lands have very short winters and long, sultry summers. In the south the climate is nearly tropical, with practically no winter at all.

Rain falls abundantly in the favored regions of the northwest. The rest of the country generally does not have enough rainfall. Moisture-bearing winds blow westward from the Atlantic, but the lofty Cantabrians act as a wall, barring their way to the Meseta and the lands east and south of the Meseta. In some places—in many regions of the Meseta and in certain areas of the south—lack of rainfall has created barren areas with very little vegetation or with no vegetation at all.

Spain has great natural wealth. In her mountains are found almost every mineral known to man; some of them are present in great quantities. Her soil is rich and yields abundantly when enough water is available, either through rainfall or irrigation. There are vast hilly areas and prairies suitable for sheep raising and cattle breeding. There are

great forests of cork oak, fir and beech.

The country is divided up by its mountains, rivers and other natural boundaries into a number of regions, marked by sharp differences in altitude, soil and climate. These regions are indicated in the map on page 4911. Galicia, Asturias and the Basque provinces lie in the north, beyond the Cantabrian Mountains and facing the Bay of Biscay. South of France, along the line of the Pyrenees, are the other northern provinces of Navarre, Aragon and Catalonia.

In the Meseta, north of the Sierra de Guadarrama, lie León and Old Castile; south of the Guadarrama is New Castile; sandwiched in between New Castile and Portugal is Estremadura. Beyond the eastern border of the Meseta lie the coastal provinces of Valencia and Murcia, washed by the waters of the Mediterranean; south of the Meseta is Andalusia.

All the regions that we have named were originally independent states; and later they were provinces. They have now been divided up into a number of smaller districts, also called provinces. The old names, however, are still in constant use.

There was a time when Spain was supreme upon the European continent; when her flag was raised over vast regions beyond the sea; when her riches were envied by all the nations. To-day Spain is no longer reckoned among the great nations of the world. She is outstanding neither in war, nor in science, nor in commerce nor in industry. The story of Spain's rise to power and her decline is a fascinating one.

The earliest inhabitants of Spain were the Iberians, who also extended beyond the Pyrenees into what is now France. In the course of time Celtic tribes from the north crossed the Pyrenees and succeeded in establishing themselves in various regions of the Iberian Peninsula. The two races intermarried and a new stock was produced—the Celtiberians. The Celtiberians occupied principally the high tablelands in the centre of the peninsula. Other parts of the land were occupied by the tribes of Iberians and Celts which had not mingled.

The Phœnicians were the first civilized people to land upon the Iberian Peninsula. Phœnician traders, seeking the iron and tin of the peninsula, passed the Strait of Gibraltar and founded Cádiz, on an island off the southern coast, about 1100 B.C. They also set up trading stations at various other places along the coast. Somewhat later the Greeks



Iberian captives of the Romans "passing under the yoke." The yoke, really a cross-bar fitting over the necks of oxen, has always been a symbol of slavery among various peoples. Here the "yoke" is formed by three spears.

appeared upon the scene and established a number of colonies, including Saguntum and Emporiæ, on the Mediterranean.

Then came the Carthaginians, who were the chief rivals of Rome in the days of the Roman Republic. In the period from 238 to 221 B.C. the great Carthaginian leaders Hamilcar and Hasdrubal conquered large areas of the peninsula. The Carthaginian possessions extended as far north as the Ebro River; they included the seaport of Carthago Nova (New Carthage), now Cartagena.

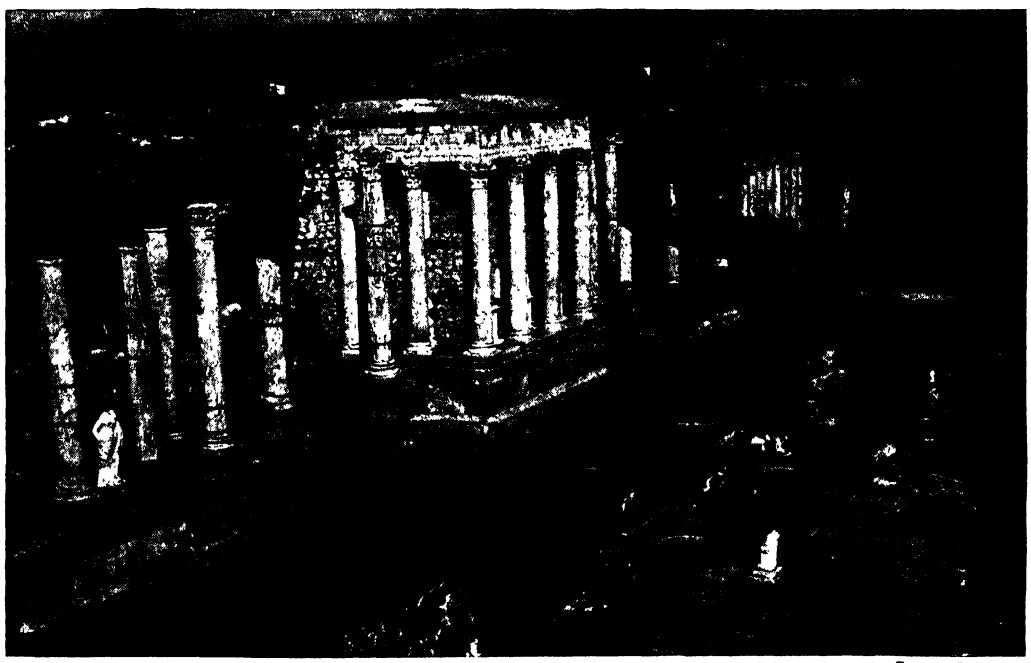
The Carthaginians did not remain long in Spain. In 218 B.C. war broke out with the Romans. This bitter struggle, known to history as the Second Punic War (218-01 B.C.), saw Rome invaded and almost conquered by the great Carthaginian general Hannibal. In the end, however, the Carthaginians were utterly defeated. They were forced to give up all their Spanish holdings.

The Romans now undertook to bring all the Iberian Peninsula under their rule. They soon conquered the greater part of the peninsula; but it was not until the reign of the emperor Augustus (27 B.C.-14 A.D.) that the northern tribes, who had held out to the last, were finally overcome. Augustus divided the Iberian Peninsula into three provinces: Tarraconensis, in the north; Bœtica, in the south; Lusitania (the modern Portugal), in the west.

Spain now became thoroughly Romanized. Roman soldiers and government officers and colonists (who were generally former soldiers) mixed with the native population. The Latin language drove out the native tongues. In a few generations the Iberian Peninsula became a centre of Roman civilization. Spain contributed two Roman emperors—Trajan and Hadrian—and also a great number of distinguished Latin writers, including Seneca, Lucan, Martial and Quintillian. Christianity was introduced at an early date into the peninsula. After the conversion of Constantine the Great, early in the fourth century A.D., it became the most important religion in the land.

To-day Spain still shows many relics of the Roman era. At Segovia there is a wonderful aqueduct, which brings water into the city from the mountains beyond it. There are the remains of a great amphitheatre at Tarragona, where bloody duels between gladiators took place. (See Amphitheatres, in the Index.) There is a fine bridge over the Tagus River at Alcántara. There is also the Spanish language, which is a development of classical Latin.

In the fourth century A.D. the Roman



James Sawders

Remains of a Roman amphitheatre at Mérida. There are many other relics of the ancient Romans in this small city.



The German tribe of the Visigoths or West Goths entering Spain in the fifth century A.D. After conquering several other German tribes that had settled in Spain, the Visigoths set up a mighty empire in that country.

Empire was divided into two parts—the Western Empire, with its capital at Rome, and the Eastern Empire, with its capital at Byzantium (the modern Istanbul). The Western Empire soon began to decline. Barbarians from the north swarmed into it by the thousands and the emperors could offer only weak resistance.

In the early part of the fifth century the Iberian Peninsula was invaded by German tribes—the Vandals, the Suevi and the Alans. The Vandals made themselves masters of a great part of southern Spain, which received from them the name of Vandalusia (now Andalusia). The Suevi settled in Galicia, in the northwest; the Alans in Lusitania, which included most of Portugal.

These peoples were attacked in their turn by another German tribe, the Visigoths or West Goths, who, after a struggle of many years, succeeded in conquering the whole Iberian Peninsula. The Visigoths abandoned the pagan beliefs of their fathers and adopted Christianity in 586 A.D. About this time, too, the Gothic language spoken by the Visigoths was replaced by Latin—or, rather, by the greatly changed Latin which was later to develop into Spanish.

The great Visigothic kingdom lasted until the eighth century, when it was broken up through treachery. Count Julian, an enemy of the reigning king, Roderick, invited the Moors of Africa to join with him against the King.

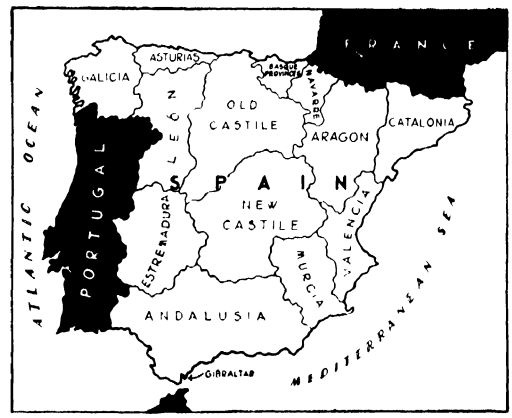
Who were the Moors? They were a Mohammedan people, living in northern Africa; they were subject to the orders of the caliph of Damascus, who ruled over a mighty Mohammedan empire. (The word *caliph* means successor in Arabic; the caliphs were held to be the lawful successors of the prophet Mohammed.) The Moors were made up of several different groups. The most important of these were the Arabs, who had come from the Arabian Peninsula, and the Berbers, who were natives of northern Africa.

Under their chieftain, Tarik, the Moors crossed the Strait of Gibraltar in boats provided by Count Julian (711). There followed a great battle by the banks of the Guadelete River, in Andalusia. King Roderick's forces were routed by the Moors; according to some accounts he was slain in the fighting. The Moors now overran most of the Iberian Peninsula, which became a province of the caliph of Damascus. Only in the northern areas of Galicia and Asturias did the Visigoths maintain their independence.

Fortunately for the newly conquered peo-

ples of the peninsula, the Arabs, who were the ruling class among the Moors, showed no great zeal in making converts to Mohammedanism. They were more interested in making their fortunes than in beginning a religious crusade. Hence they came to terms with most of their new subjects, allowed them to keep their religion, their language and even their customs.

Many great Christian landowners retained their estates by paying tribute to the invaders. The serfs lost nothing; in fact they gained their freedom. The Jews who had settled in the peninsula had been persecuted by the Visigoths; they now became the faithful allies of the Arabs. In the course of the centuries that followed, the Moors sometimes abandoned the policy of tolerance, particularly when narrow sects among them gained the upper hand. However, in general, the rule of the Moors was not severe.



This map shows the regions that formerly made up the Spanish motherland. At present they have been divided up into a number of smaller districts; however, the old names are still in constant use.

The conquests of the Mohammedans in Spain were imperiled for a time by family quarrels among the invaders. The Arabs fought among themselves, and also against the Berbers. Then a strong Arab prince, Abder-Rahman I, established his rule over all the Mohammedans of the peninsula. Toward the middle of the eighth century he set up an independent state, which came to be known as the Caliphate of Córdoba.

A remarkable civilization soon developed there. At a time when learning was at a very low ebb in the rest of Europe, the Arabs of the Caliphate produced great scientists, mathematicians, artists and writers. They built beautiful palaces and mosques and stately city walls. They produced wonderful artisans in metal and leather work. The Jews who dwelt in the Caliphate at this time developed an outstanding civilization of their own.

In the meantime the Christians of the north had kept up the fight against the Moorish invader. Pelayo, a renowned Spanish hero, founded the tiny kingdom of Oviedo, in Asturias, in the early part of the eighth century. The successors of Pelayo began to win back the lands lying to the south. By the tenth century, they had regained considerable territory, including León and Old Castile.

Asturias, León and Old Castile were united into a single kingdom called León. Another kingdom, Castile, arose in the centre of the Iberian Peninsula; it originally occupied the region known as New Castile. Still other independent Christian states were founded; among them were Aragon and Navarre.

As these states extended their conquests southward, a considerable number of Moors remained in the newly won territories. Sometimes these Moors would be armed and turned against the Christian enemies of their new masters; for the Christian kingdoms of Spain often fought each other as fiercely as they fought the Moorish foe.

Toward the end of the tenth century, Almansur Billah, a renowned conqueror, became the caliph of Córdoba. This ambitious soldier now waged relentless war on the Christian kingdoms to the north and at last he conquered them all. When he died in 1002, his rule was enforced almost throughout the Iberian Peninsula.

The successors of Almansur, however, proved to be weaklings and soon the powerful Caliphate of Córdoba fell to pieces. The Caliphate was split up into a number of independent states, which carried on continual warfare against one another. The Christian princes of the north soon recovered their former domains. They also began to carry the war to the Mohammedans in Valencia, Toledo and as far south as the city of Seville (or Sevilla).

The Almoravides, a powerful Mohammedan sect, came upon the scene in the eleventh century. They had founded a great empire in Morocco. They were now summoned to Spain by the Moslems (Mohammedans) of Córdoba and Seville to help them against the Christian foe. The Almoravides succeeded for a time in holding the Christians at bay.

Among the Christian leaders at this time



A medieval lord sits proudly astride his horse while his knights and vassals kindle a huge bonfire. The same heraldic device appears on the banner, the lord's tunic and the knights' breastplates. On the ground are crossbows; the bows are set crosswise on the stocks.

was the famous Rodrigo Díaz de Bivar, better known as the Cid (pronounced sid). The Cid became famous in legend as a mighty champion of the Christians against the Mohammedan foe. The greatest epic of Spain, the Poem of the Cid, was based on his exploits. Actually, however, the Cid was an adventurer, or soldier of fortune, who fought Christians and Moors with the same ferocity, and with the same purpose, to make his way in the world. He was the subject of a play by the famous French playwright Corneille.

The Almoravides turned upon the Moslem princes who had called on them for aid, and soon they had won mastery over all of Mohammedan Spain. About the middle of the twelfth century they were overthrown in their turn by the fanatical Moslem sect of the Almohades. The Almohades relentlessly persecuted all those, Mohammedans and Christians and Jews alike, who did not share their beliefs. As warlike as they were fanatical, the Almohades began to press the Christians back from their hard-won possessions.

The Christian monarchs now united their forces and turned against the Moorish foe. They routed the Almohades in the Battle of Las Navas de Tolosa, in the Sierra Morena. They then continued their advance to the south. Córdoba and Seville fell. By the end of the thirteenth century the Mohammedans, who had once been masters of almost all of the Iberian Peninsula, ruled only over Granada and a line of ports that extended to Cádiz. Furthermore, they had been forced to recognize the supremacy of Castile, to which they paid tribute.

Henceforth the Mohammedan states of Spain play a comparatively unimportant part in the history of the country. Two powerful Christian kingdoms, Castile and Aragon, now come to the fore. From the early part of the thirteenth century to the latter part of the fifteenth, the history of Spain is largely the history of the growth of these two states. By the middle of the fifteenth century they had swallowed up almost all their rivals.

In the year 1469 Prince Ferdinand of Aragon, heir to the throne, married his cousin, Isabella, Queen of Castile. When Ferdinand mounted the throne of Aragon in 1479, a new era dawned for Spain. Almost all of the land was now ruled by this famous royal couple, who were known as the Catholic monarchs because of their piety.

At the beginning of their joint rule, Spain was not a single united nation, but a partnership between two great states. Isabella administered Castile; Ferdinand, Aragon. But the Catholic monarchs were in full agreement in attacking the problems that faced the country. They were determined to make



From an old print

Episode of the surrender of Granada in January, 1492. Ferdinand and Isabella are receiving the keys of the city from Boabdil, its last Moorish king. With the fall of Granada, Moorish rule in Spain came to an end, though Moors continued to live there for a good many years. In 1609 those remaining in Spain were exiled.

Spain a united land with a strong central government.

Ferdinand and Isabella had a difficult task before them. For one thing there were great differences in language, in customs and in laws among the various regions of Spain. In some places feudalism reigned. (See the article on Feudalism.) In other places the large cities were practically republics, living under their own laws. In still other places the clergy were almost in complete control. To add to the general confusion, robbery and violence abounded in many regions, for centuries of constant fighting had broken down almost all respect for the law.

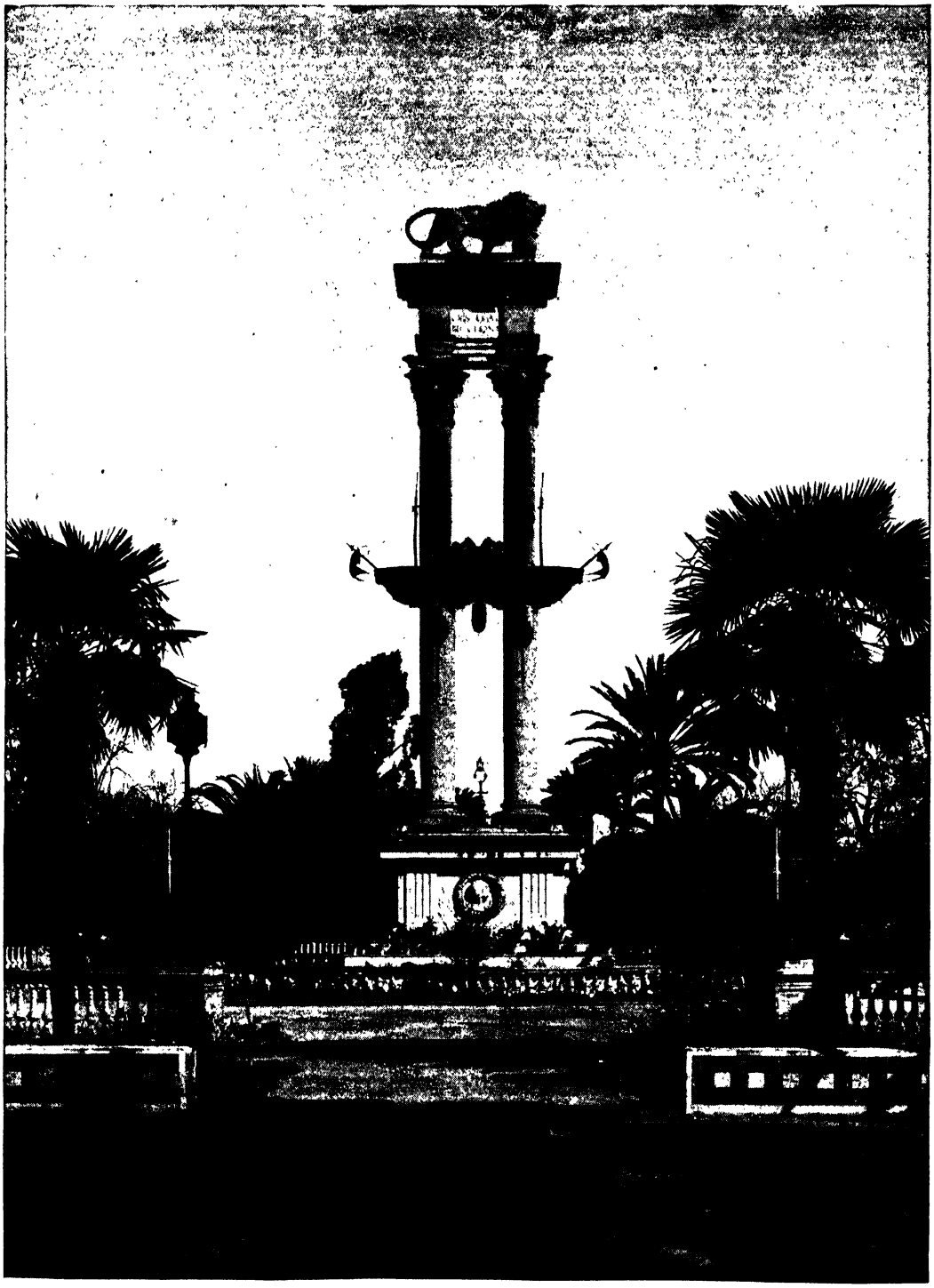
The Christian monarchs, together with their great minister Jimenes (or Ximenes) de Cisneros, now set about the task of establishing peace and order, obedience to the central authority and unity. They did not abolish all the old laws, but they managed to keep the real power in the hands of the central government. They set up the famous Santa Hermandad (Holy Brotherhood), a fine body of mounted police, to put down crime and to check the power of the nobles.

To bring about unity of religion Ferdinand and Isabella established the Inquisition in Spain. The Inquisition was a tribunal or court, whose duty it was to discover, examine and, if necessary, to punish heretics. (Heretics are persons who do not accept all the teachings of their religion.) The Inquisition had already been set up at various times in other lands—France, Italy, Germany and Poland. In 1481 Ferdinand and Isabella introduced it into Castile and, several years later, into their other domains.

The first task of the Inquisition was to deal with the Jews and Mohammedans who had been converted to Catholicism but who were suspected of continuing to practice their old religious rites in secret. Many of these offenders were burned at the stake. The Inquisition was also turned against Christians who were accused of not accepting all the doctrines of the Church. It was used by the government, too, in order to deal with certain crimes and to get rid of political offenders.

Early in their reign the Catholic monarchs had turned their attention to the Mohammedan state of Granada. The existence of

SEVILLE'S TRIBUTE TO A GREAT MAN



James Sawders

A landmark of Seville—the magnificent monument to the memory of Christopher Columbus. As you all know, the discoveries of Columbus contributed a great deal to the establishment of the great Spanish Empire, on which the sun never set. This empire is represented by the Spanish lion, at the top; it holds the world under its paw.

this state was held to be not only an insult to all true believers but also a constant threat to the security of Spain. In 1481, therefore, Ferdinand and Isabella set out to drive the Moors from their last stronghold in the country.

The war dragged on for years, since there were so many other problems that occupied the attention of the Catholic monarchs. At last the city of Granada surrendered (January, 1492), and Moorish rule in the peninsula was definitely at an end. Thousands of Moors, however, continued to dwell in the land; not till the seventeenth century were they all driven out.

After the conquest of Granada it was felt that the time had come to stamp out the last traces of non-Christian belief in Spain. In March, 1492, all Jews who did not agree to be converted to Christianity were expelled from the kingdom. In 1501 the same order of exile was extended to Mohammedans who refused to be baptized.

THE REMARKABLE ACCOMPLISHMENTS OF FERDINAND AND ISABELLA

By the end of the fifteenth century Ferdinand and Isabella had successfully completed the great task they had set. Spain was a strong, centralized state, where neither disobedience nor violence was tolerated. It was a nation of valiant warriors, hardened by centuries of constant fighting. The restless force that had been turned against Christian and Moor alike could now be directed against lands beyond the Iberian Peninsula. Spain was soon to become one of the mightiest empires in all the history of mankind.

Her imperial career began with the discovery of the New World in 1492 by Christopher Columbus, a Genoese mariner in Spanish employ. There followed an era of exploration, conquest and colonization in the New World, Africa and the Pacific such as has never been equaled in any age. (See Early History of South America; Islands of the West Indies; Mexico and Central America.) By the end of the sixteenth century Spain possessed most of South and Central America and a great deal of the North American continent. She also ruled over the Philippines, the Marianas and other islands of the Pacific, as well as considerable territory in Africa.

Isabella died in 1504. Her hopelessly insane daughter Juana had been married to a Hapsburg prince, Philip, who ruled over the Netherlands and Burgundy. At Isabella's death Philip and Juana succeeded to the throne of Castile. Philip died in 1506, and as poor mad Juana was quite incapable of ruling, her father Ferdinand became regent of Castile. Thus his kingdom of Aragon and Castile came under one head.

YOUNG CHARLES I BECOMES THE RULER OF A STRONG AND UNITED SPAIN

When Ferdinand died in 1516, he left all his possessions to Juana; her son Charles was to act as regent. Juana was again set aside. Charles became the king of Spain under the title of Charles I. He ruled over all the Iberian Peninsula with the exception of Portugal. His possessions included the Netherlands and Burgundy, over which his father Philip had reigned; they also included certain areas in Italy and the first Spanish conquests in the New World. In 1519 Charles was elected emperor of the Holy Roman Empire (see page 4408) as Charles V. It is by that title that he is generally known.

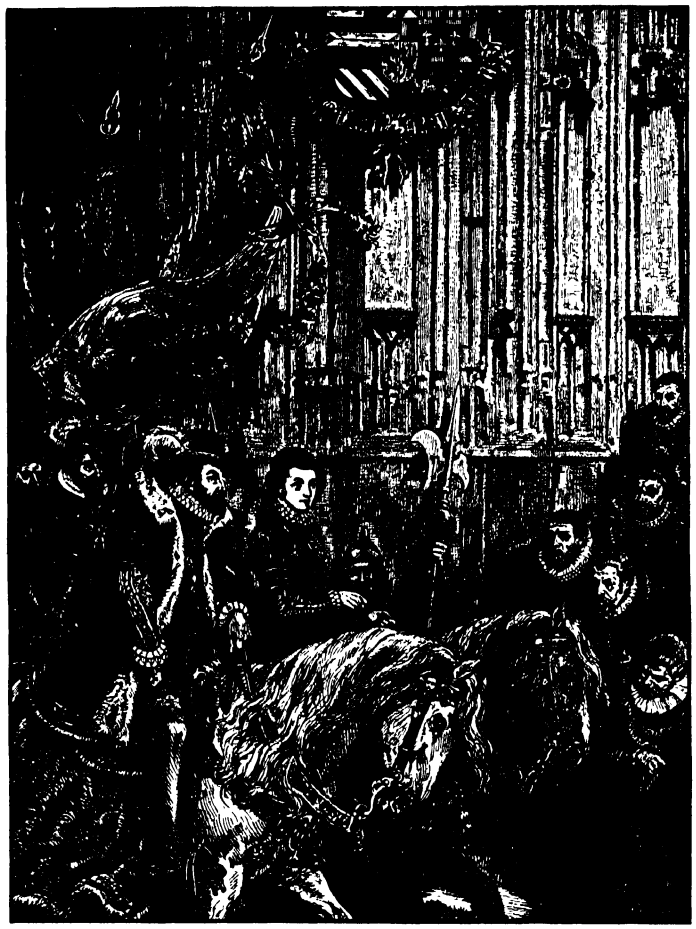
Charles was perhaps the greatest monarch in Spain's long history. At home he made the royal power more secure than ever. He carried forward with great vigor the program of exploration and colonization. Abroad his foreign policy made the name of Spain respected throughout all Europe. There was almost continuous fighting in this reign. Spanish armies won famous victories in Italy, in Spain, in Germany; they earned the reputation of being unconquerable. Their weapons were turned not only against Spain's Christian rivals in Europe. In 1535 a great expedition against the pirate Barbarossa in Tunis brought about the freeing of 20,000 Christians, who had been held as slaves.

As Holy Roman Emperor, Charles was called on to play a prominent part in the religious quarrels that divided Europe in the sixteenth century. He was the chief defender of the Roman Catholic party in its struggle against the Protestants. Yet the King seems to have believed in moderation; and he tried more than once to bring the two great religious parties together.

KING CHARLES TURNS OVER HIS MIGHTY EMPIRE TO HIS SON, PHILIP

In 1555 Charles gave the rule of the Netherlands to his son Philip; in the following year he turned over to Philip the rest of his domains. He then retired to a monastery in the west of Spain, and there he dwelt until his death in 1558.

He had left a mighty empire to his successor, Philip II. The sun never set on the possessions of Spain in Europe, the Americas,



From an old print

Philip II and his queen in procession. Under the reign of this gloomy king, Spain was drawn into many costly wars, which exhausted her manpower and her treasury alike. She was soon to enter a long period of decay.

Africa and Asia. The wealth stripped from these far-flung lands was pouring into the Spanish treasury in a steady stream. There was flaming national pride in Spain. There was a spirit of adventure, too, such as the world has seldom seen. Even the poorest Spanish boy dreamed of making his fortune in the lands that lay beyond the sea. Had not Francisco Pizarro, a peasant lad who once tended pigs in Estremadura, become the master of fabulously rich Peru?

Yet all was not well with the great Spanish Empire. The wealth drawn into Spain from so many different sources led to extravagance at home, forced up prices and thus caused misery among the common people. Nor was all this wealth enough to pay the costs of the constant wars. Taxes became very high.

Besides, the very greatness of Spain's position in the world had led to the neglect of trade and industry at home. The adventurers who lived on the booty of many foreign lands despised honest toil. This attitude spread to almost all classes of the population. The most promising Spanish youths of the day thought only of winning a fortune with their swords; they scorned the idea of helping to build up industries at home.

Of course there were still tradesmen and potters and weavers and farmers in the land. Yet their numbers had been reduced when the unconverted Moors and Jews had been driven out. Furthermore, they faced all kinds of restrictions and ruinously high taxes. The upper classes enjoyed many special privileges and exemptions from taxation; therefore the burden fell chiefly upon the middle class and upon the poor.

The unity that had been won in Spain was more or less on the surface. The various regions were as far apart as ever in many ways; there were a great many bitter feuds, which were checked only by the strong central government. Later on, when the central government was not so strong, regional quarrels broke out again and again.

Finally, the Inquisition had unfortunate effects. Out of the fear of this tribunal men were apt to follow, generation after generation, in the paths that were considered safe. The Inquisition discouraged freedom of thought; it discouraged the introduction of new and fertile ideas from foreign lands.

Philip II (1556-98) was a gloomy and haughty monarch. His policy was "World-wide power for Spain and the Roman Catholic Church." Because of this policy, he was drawn into endless wars, as his father had been before him. He met with certain successes. He put down a revolt of converted Moors in Granada (1568-71). Spaniards were prominent in the great expedition that defeated the Turks in the sea fight of Lepanto in 1571. In 1580 Spain annexed the

neighboring and weak kingdom of Portugal.

But in Philip's reign Spain met with serious reverses. Goaded by Spanish intolerance and the cruelty of Spanish troops, the northern provinces of the Netherlands revolted. In 1579 they declared their independence and were lost to Spain. In 1587 the famous English sea captain Francis Drake burned a great many Spanish ships in the harbor of Cadiz. In 1588 the Armada, a great Spanish fleet that was intended to conquer England, was badly defeated by English men-of-war and severely pounded by storms at sea. Less than half of the Armada's ships managed to limp back to port.

At home Philip ruled with a rod of iron. He had his own son, Don Carlos, put to death because the unfortunate prince had been suspected of disloyalty. The few remaining free institutions of Spain were destroyed. Taxes were heaped upon taxes; many small tradesmen were ruined.

SPAIN'S INDUSTRY AND COMMERCE SUFFER WHEN THE MORISCOS ARE EXILED

Though Spain suffered grievous wounds in the reign of Philip II, she was still a mighty power at his death in 1598. Under Philip's unworthy successors in the seventeenth century, she entered upon a period of decline. Philip III (1598-1621) was a lazy and incapable monarch. In his reign a heavy blow was struck at the commerce and industry of the country when the Moriscos, or converted Moors, were all driven out. The Moriscos, who numbered some 600,000, were for the most part valuable citizens—farmers and artisans and thrifty traders. Their departure deprived certain provinces of almost half the population.

Portugal was lost to Spain in 1640 in the reign of Philip III's successor, Philip IV (1621-65). The fortunes of Spain reached a low ebb, indeed, when Charles II (1665-1700) was on the throne. Charles was a feeble-minded creature—a mere puppet in the hands of his corrupt advisers. By the time of his death Spain had lost great possessions on the European continent. Gone was her military renown. Waste and corruption reigned at home. The finances were in a wretched condition.

Charles II died childless. In his will he bequeathed his dominions to Philip of Anjou, a member of the great Bourbon family of princes. Philip, who mounted the throne as Philip V, was a grandson of the French king Louis XIV, the mightiest monarch of that day. The other great kingdoms of Europe feared that Louis would be the power behind the Spanish throne, and this brought on the War of the Spanish Succession, which lasted from 1701 to 1713.

By the Treaty of Utrecht (1713), which ended the war, Philip managed to keep his throne, but Spain was deprived of a great deal of territory. It was then that England acquired the great fortress of Gibraltar that guards the strait of the same name—a fortress that has remained firmly in British hands ever since.

THE BOURBON PRINCES WHO REIGNED IN THE EIGHTEENTH CENTURY

The first three Bourbon princes who ruled over Spain in the eighteenth century—Philip V, Ferdinand VI and Charles III—proved to be more energetic monarchs than the weaklings who had preceded them on the throne. The reign of Charles III (1759-88), in particular, marked a period of reform. Charles, a wise if rather despotic monarch, encouraged agriculture and commerce and carried out many useful public works, including large drainage projects. The population of the country began to increase rapidly in his reign.

Charles IV (1788-1808) might have been a fairly good king in a more peaceful age. But his reign happened to fall in one of the stormiest periods of European history—the period of great upheavals and constant warfare that began with the French Revolution of 1789. Charles was not the man to guide the country safely through all the perils of such an epoch.

SPAIN BECOMES AN ALLY OF FRANCE WITH DISASTROUS RESULTS TO HERSELF

Spain joined England, Prussia and Austria at first in warring on the newly created French Republic. In 1795, however, she was drawn into an alliance with France through the efforts of Charles' favorite, Manuel Godoy. The French alliance proved to be disastrous to Spain. For one thing, she lost almost her entire fleet in 1805, when the Spanish ships were defeated by the English under Lord Nelson in the Battle of Trafalgar. Besides, Napoleon Bonaparte, who became emperor of France in 1804, seemed to consider Spain as a French province rather than as an independent ally. He made that country supply great numbers of troops for his armies. He even sent his own soldiers to garrison some of Spain's strongest fortresses in the north.

As time went on, Napoleon's ambitious designs on Spain became more and more

evident. At last he threw off all pretense; in 1808 he sent a French army of 100,000 men to occupy Madrid. When the Spanish people realized what the French alliance had brought upon their country, they revolted against their unpopular king. In March, 1808, Charles abdicated in favor of his son, who became Ferdinand VII. But Napoleon had no intention of letting either Charles or Ferdinand reign. He summoned them both to Bayonne, in southern France, and made them give up all claims to the Spanish throne. He then gave the crown to his brother Joseph, whom previously he had made king of Naples.

Joseph, a well-meaning man, tried to win the support of his new Spanish subjects by abolishing the special privileges of the upper classes and by putting an end to the terrible Inquisition. All his efforts were in vain. The Spanish people refused to accept this foreigner who had been forced upon them. They sneeringly called him José Botellas (Joseph Bottles) because of his rather notorious fondness for good wine. They were not moved by his efforts at reform.



From an old print
Joseph Bonaparte, brother of Napoleon. He ruled over Spain from 1808 to 1813.

A revolutionary group, the Junta of Seville, called the people to arms, and a series of revolts broke out all over the country. In July, 1808, the Junta made an alliance with Great Britain, Napoleon's chief enemy, and there began a fierce struggle, known as the Peninsular War.

The French were defeated everywhere until Napoleon took command personally. This great military leader, backed by a powerful army, defeated the Spaniards and their allies in one battle after another. By the end of 1808 most of the country was reoccupied and King Joseph was again firmly on the throne. Spanish opposition to French rule was not stamped out, however. The Junta had been driven out of Seville by the French, but these patriots took refuge in Cádiz, which became the centre of independent Spain.

A new revolutionary organization, the Junta of Cádiz, was now formed. Besides directing the struggle against the soldiers of the French emperor, the Junta sought to bring about reform. In 1812 it drew up a liberal constitution which matched the reforms already introduced by King Joseph: it did away with many of the privileges of the aristocracy and it abolished the Inquisition.

Napoleon was forced to leave Spain in 1809 because a war with Austria had broken out; he took great numbers of troops with him. The great Emperor never returned to Spain. In the next five years his generals carried on a stubborn but losing fight against the Spanish and British armies and the swarms of Spanish guerrillas. By the end of 1813 the last French soldier had been driven from Spain; in 1814 peace was brought about at last.

Ferdinand VII now returned to the throne. He proved to be most reactionary. He did away with the constitution of 1812; he brought back the Inquisition; he restored the privileges of the upper classes. The Spanish people, who had fought stubbornly against the French in Ferdinand's behalf, realized that they had fought in vain.

In 1820 General Rafael del Riego y Núñez, a popular military leader, led a revolt against the king. Ferdinand, abandoned by his own troops, was compelled to swear to uphold the constitution of 1812. But in 1823 France, which was again under the rule of the despotic Bourbon kings, moved to restore absolutism in Spain. A French army crossed the Pyrenees and swept all before it. With this foreign aid Ferdinand became once more the absolute master of Spain. He brought back all the old privileges and abuses.

It was in Ferdinand's reign that Spain lost all her colonies in the New World, with the exception of Cuba and Puerto Rico, in the West Indies. Spain had not governed these colonies very wisely, in spite of her long experience as a colonial power. She had tried to make them trade only with Spain—a policy that caused the introduction of smuggling on a great scale. Many of the Indian inhabitants were mere serfs. Even the American-born children of Spanish parents had been snubbed by the mother country. These Creoles, as they were called, could occupy only the lower offices in the government and in the Church.

The discontented elements in the colonies took advantage of the troubled times that



James Sawders

The Royal Palace at Madrid. This magnificent building covers an area of about five acres in the western part of the city. It occupies the site of an old Moorish alcázar, or castle. The Royal Palace has a fine library with many thousands of volumes and a wonderful collection of arms, including weapons of the Middle Ages.

followed the abdication of Charles IV and Ferdinand VII in 1808 to rise in revolt. Even those who upheld the rule of the motherland in the New World hardly knew to whom they were to be loyal. Should they obey King Joseph, a foreigner who had been forced upon them? Should they follow one or the other of the deposed kings, Charles IV or Ferdinand VII? Should they give their allegiance to a revolutionary junta?

As time went on, it became clear that Spain was too weak to put down the widespread revolts in the New World. It seemed at one time as if certain conservative kingdoms in Europe—France, Austria and Prussia—would intervene in Spain's behalf, since they did not wish to see democracy spread in the world. But Great Britain served notice to these powers that she would not permit them to interfere. The American president, James Monroe, also told foreign nations to keep hands off in the Americas in a famous message to Congress, which is known to-day as the Monroe Doctrine.

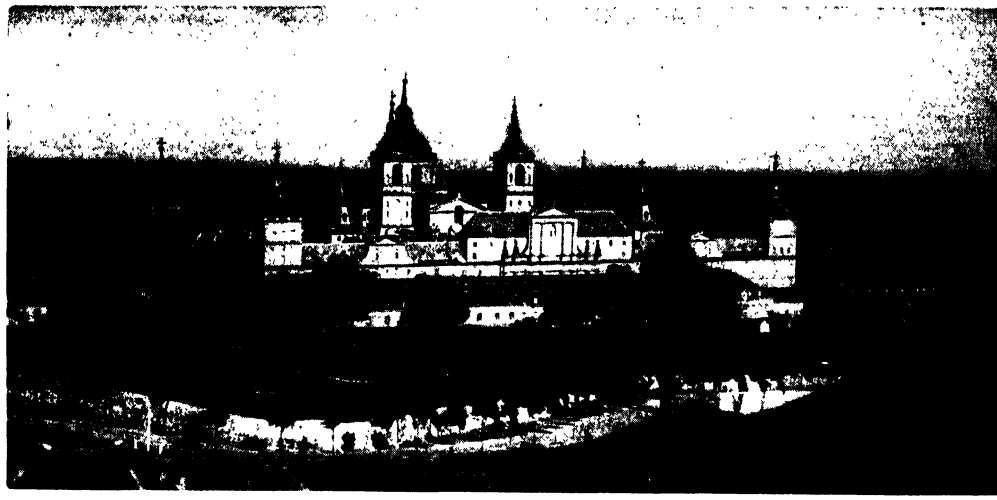
And so Spain's flag disappeared almost completely from the New World. We tell you more about the revolts of the Spanish colonies in other articles. (See Mexico and Central America; Republics of South America.)

When Ferdinand died in 1833, his daughter Isabella, who was only three years old, was declared queen; her mother, Christina, became regent. Ferdinand's brother, Don Carlos, claimed the throne and fighting broke out between his supporters and those who remained true to the child queen. This civil war, known as the First Carlist War, ended in 1840 with the defeat of the rebels.

In 1843 Queen Isabella was declared of age. She was as tyrannical as her father Ferdinand and she became very unpopular. There were a number of revolts toward the end of her reign and at last, in 1868, she was forced to leave the country. For a time Spain was ruled by a provisional government which proposed "to lead the nation to liberty and not allow it to perish in anarchy."

In 1870 the crown of Spain was offered to Amadeus of Savoy, the second son of the great Victor Emmanuel II (see page 4412). Amadeus, who accepted rather reluctantly, made a sincere effort to rule the country well. Unfortunately, because of his inexperience he gave his confidence to unworthy men. Encouraged by the popular discontent, certain conservative groups revolted in 1872. This rebellion is generally called the Second Carlist War, since the leader of the rebels was another Don Carlos, grandson of the earlier pretender to the throne. Amadeus, who had known nothing but opposition in his brief reign, abdicated in disgust in February, 1873.

Spain now tried the experiment of a federal republic. But the leaders of the new government could find no solid backing, chiefly because Spain was not ready for a republic. At last the Prince of Asturias, son of the exiled Queen Isabella, won wide support and he became king in 1874 under the title of Alfonso XII. The Second Carlist War



Ewing Galloway

The Escorial, a royal palace built by Philip II in 1556. It stands on a slope of the Sierra de Guadarrama, about twenty-four miles northwest of Madrid. The Escorial is not merely a palace. Within its walls are found a library, monastery and church, as well as the Pantheon or burial place of the kings of Spain.

dragged on until 1876; then it was crushed and Don Carlos fled to France.

Spain, exhausted by years of civil strife, now enjoyed a period of peace. Alfonso was a conservative monarch, who got on well with the Church, the aristocracy and the middle classes. His minister, Cánovas, made an effort to win the liberals to the support of the monarchy. While he was not very successful, at least he warded off revolution in the reign of his royal master—a remarkable achievement for the time.

Alfonso died in 1885 and was succeeded by his posthumous son, Alfonso XIII. (A posthumous son is one who is born after the death of his father.) Maria Christina, the widow of Alfonso XII, became regent. It was in her regency that Spain lost the islands of Cuba and Puerto Rico, the last Spanish possessions in the New World. The Cubans had opposed Spanish rule for many years. At last the United States intervened (in April 1898) and war resulted.

Spain was in no condition to wage war against a first-rate power and she suffered a series of crushing defeats. As a result of the war, which lasted only four months, Spain lost not only Cuba and Puerto Rico but also the Philippine Islands and Guam in the Pacific. In 1899 Spain, in dire financial need, sold her remaining island possessions in the southern Pacific to the German emperor, William II.

Alfonso XIII mounted the throne in May, 1902, when he was but sixteen years of age. As time went on, he showed considerable political shrewdness; a charming man, he became popular with most of his subjects. Alfonso, however, could never make up his mind to follow a definite policy. He shifted from a very conservative policy to one of mild liberalism and then back again to conservatism of an extreme kind.

Spain remained neutral in World War I, though both the Allies and the Central Powers made strong efforts to win her support. On the whole, though some of her ships were sunk by German submarines, Spain profited by the war, since she supplied the Allies with war materials that they needed desperately. But after the war the country lost all of its profitable markets and a great depression set in.

Riots broke out, particularly in Catalonia, where radical thought flourished. To add to the difficulties of the government, Spain found herself involved in a desperate struggle in Morocco, where Spain had maintained a foothold for many years. In 1921 the rebel tribesmen of the Riff district in Morocco inflicted a terrible defeat on the Spaniards at Melilla.

A strong man, General Miguel Primo de Rivera, came to the fore. In 1923 he seized the city government in Barcelona as a first step in protest against what he called the corrupt and inefficient administration of the country. He won the support of other officers in the army and soon the King made him premier. Primo set up a totalitarian state, modeled to a certain extent on fascist Italy. (See the article on Italy as It Is.) The Cor-

tes, or Parliament, was dissolved; trial by jury was suspended and the country was placed under military rule. Primo became the dictator of Spain.

He was an honest and patriotic man and he made a sincere effort to improve conditions in Spain. New highways were built; important irrigation projects were started. An attempt was made to curb official corruption. A number of new schools were opened. The war in Morocco was brought to a successful conclusion, with the help of France.

Yet hostility to Primo's government was strong. He ruled with an iron hand. There was strict censorship; criticism of the government was sternly suppressed. Furthermore, the financial condition of the country continued to be bad. To get money for his many ambitious projects, Primo had to increase taxes continually, and this brought about rising discontent.

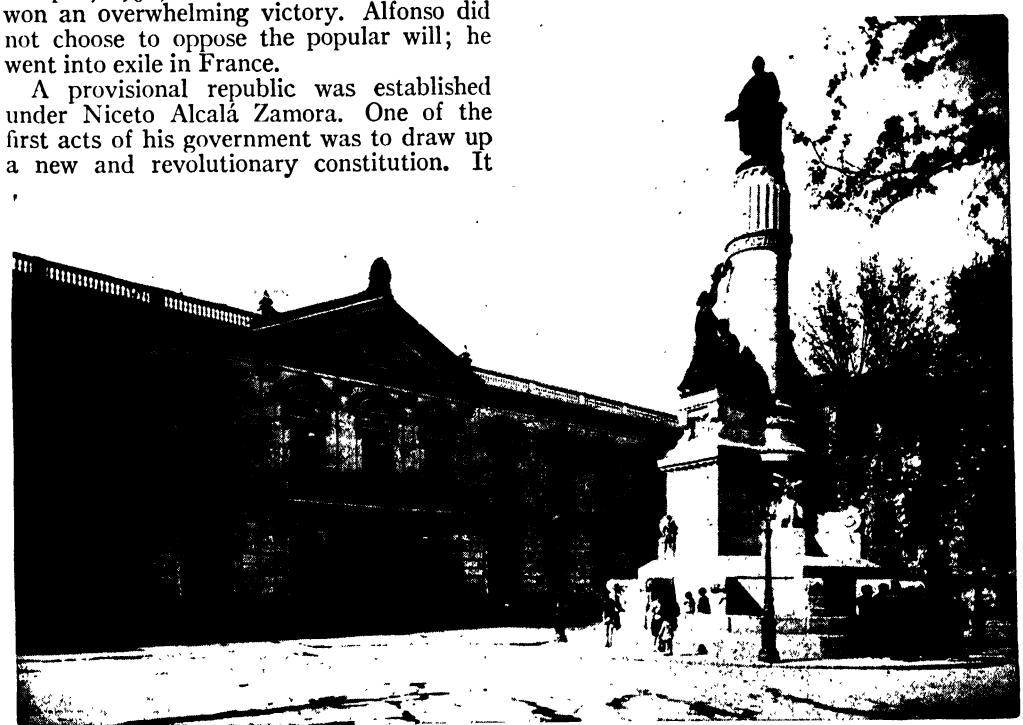
At last opposition to his rule became so strong that he was forced into exile in 1930. Alfonso tried to appease the people by setting up a more liberal government. But he had lost his popularity, and demands for a republic arose on all sides. In the elections of April, 1931, those who wanted a republic won an overwhelming victory. Alfonso did not choose to oppose the popular will; he went into exile in France.

A provisional republic was established under Niceto Alcalá Zamora. One of the first acts of his government was to draw up a new and revolutionary constitution. It gave the vote to all citizens of both sexes over twenty-three. It abolished special privileges of all sorts. Church and State were to be separated. Religious orders were no longer allowed to teach. Several days after the constitution was adopted, Alcalá Zamora was elected president by the Cortes (December, 1931).

Many reform laws were now passed. Labor was given the right to organize. The Army, which had always been opposed to reform, was sharply reduced in size. It was decided to break up great estates and to divide them up among the peasants.

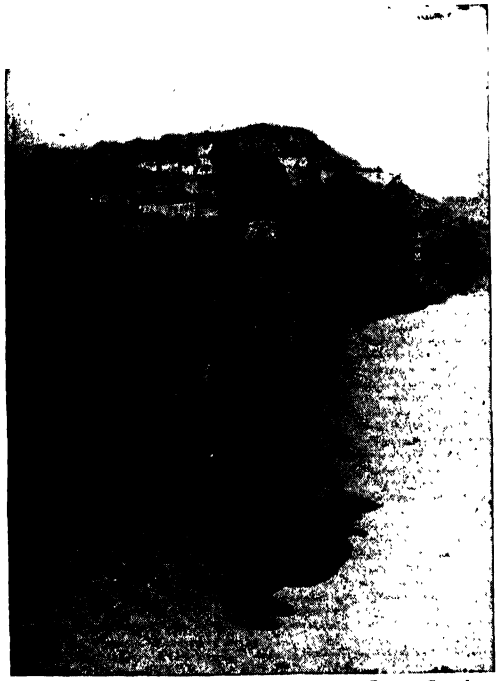
In trying to put this reform program into effect, the new government faced difficulties. The program was opposed by all those whose privileges were to be taken away. In many provinces the new laws were ignored because the governors thought the program went too far. On the other hand, many left-wing (radical) elements claimed that the government of Alcalá Zamora did not go far enough. "Now that we have our republic," they cried, "let us have our revolution!" Both conservatives and radicals showed their dissatisfaction by a series of revolts.

The elections of 1933 showed a swing to



Philip D. Gendreau

The Senate Building at Madrid. It was formerly a college of the Augustinian order. The monument in the foreground was erected in honor of Antonio Cánovas del Castillo, a statesman of the nineteenth century.



James Sawders

A sturdy peasant woman of Mojácar, Almería.

a more conservative policy. As a result, some of the more daring reforms were set aside. There was now an insistent demand from the more conservative groups that the constitution be revised. Yielding to this pressure, Alcalá Zamora, a weak man, dissolved the Cortes and called for new elections.

In the elections of 1936 the leftists or liberals won a great victory. President Alcalá Zamora was impeached and removed from office for having dissolved the Cortes; he was replaced by Manuel Azaña. The new government again set forth on the path of reform. As before, the conservative elements opposed every governmental move. Unfortunately, too, the more radical groups began to get completely out of hand. They murdered political opponents, burned monasteries and engaged in endless strikes. They greatly embarrassed the government, which was trying to bring about reform in an orderly way. They also stirred up the conservative elements of the country to the point of armed rebellion.

In July, 1936, a series of revolts, organized by conservatives, broke out all over the country. Most of the officers of the Army and Navy joined the movement, and for a time it seemed as if the revolutionaries would sweep aside all opposition. The government, however, showed unexpected strength. With the aid of militiamen, labor groups and foreign volunteers it put down the revolt in the north, east and centre of Spain. What had begun as an attempt to overthrow the government by a sudden stroke developed into a bloody civil war that lasted for almost three years.

Civil war in Spain has always been particularly savage. The Civil War of 1936-39 was no exception. Both sides showed great cruelty toward their opponents. Loyalist groups, often without the approval of the government, massacred rebel supporters; the rebels, for their part, slaughtered many noncombatants and at first took no prisoners. When they won control in the air, they mercilessly bombed the cities that were held by their foes.

The leader of the rebels was General Francisco Franco, an able military leader, who set up a dictatorial government with its centre at Burgos. He had the support of those who wished to see Spain once more ruled by a king, and also of the newly organized Falange Española Tradicionalista (Traditional Spanish Phalanx). This was a fascist group, organized on the model of the Italian black shirts. The members of the group were called falangists.

From the very outset the other nations of Europe had taken a great interest in this civil war. The totalitarian states of Germany and Italy claimed the cause of the rebels as their own. They sent Franco men and supplies by way of Portugal. Soviet Russia just as openly favored the cause of the loyalists (those who were loyal to the republic). At first she, too, sent supplies and also technical experts.

GREAT BRITAIN AND FRANCE TRY TO KEEP THE SPANISH CIVIL WAR FROM SPREADING

Great Britain and France feared that the Spanish struggle might develop into a general European war. They took no part in the fight themselves, though at first France allowed volunteers and supplies for the loyalists to pass over her frontiers. In 1937 Great Britain and France persuaded most of the great nations of Europe to set up a committee to prevent military supplies from reaching either the rebels or the loyalists by patrolling the coasts and the frontiers of Spain.

Germany and Italy joined the committee but openly violated their promises and continued to aid the Spanish rebels. Great Britain and France continued their strict

neutrality. France even went so far as to close the Pyrenees border to the loyalists. As time went on, therefore, Franco's forces continued to be abundantly supplied, while the loyalists began to lack the necessary equipment and munitions.

Franco now pressed the attack. The Basque provinces in the north were overrun. The tide of battle swept to the northeast into Catalonia. To escape the onrushing rebels, thousands upon thousands of loyalist soldiers and sympathizers crossed over into France, where they were interned.

THE CIVIL WAR COMES TO AN END AFTER ALMOST THREE YEARS OF FIGHTING

The last crushing blow to the loyalist cause was the recognition of the Franco government by Great Britain and France. In March, 1939, the Civil War came to an end. Spain was again united under a single government, which was soon recognized by almost all the principal powers of the world, including the United States.

The falangists, who had so ardently supported Franco, now became the only legal party. The Grand Council of this party met at Barcelona and announced that the government would be organized on fascist lines. Franco was proclaimed Caudillo, or leader (just as Mussolini was called Duce, the Italian word for leader, and Hitler was called Führer, the German word for leader).

Franco now set about the task of restoring stricken Spain. After three years of civil war Spain had been bled white. Trade was in a chaotic state. Many schools had been closed. Some of Spain's fairest cities had been battered by artillery fire and aerial bombs. But the war had left even deeper scars than these. Both sides had been guilty of the most terrible deeds; the memory of these deeds would remain for many a year. Nor did Franco do anything to bring the hostile factions of the country together; he treated the supporters of the former republic with great severity.

SPAIN, EXHAUSTED BY CIVIL WAR, REMAINS NEUTRAL IN WORLD WAR II

Franco had not been long in power when World War II broke out—a war that Great Britain and France had tried so desperately to prevent. Spain remained neutral, though Franco made no effort to conceal his sympathy with the Axis cause. Perhaps the chief reason for this neutrality was that the country was too exhausted to take part in any new adventures.

Spain now began to recover from the terrible effects of war. Roads and bridges were restored to use; houses were rebuilt; roads were reopened. As in World War I, war brought new markets to Spain. She sold the Allies a good deal of important war materials —wolframite, mercury, iron ore and copper.

Spain is still a fascist power, under the more or less absolute rule of the Caudillo. Yet Franco's rule is not very secure. His domestic policy is based upon brute force; there is no open opposition because all opponents of the government are pitilessly crushed. There is, however, plenty of underground opposition to fascism. Furthermore, Franco's policy of avowed friendship for the Axis rose to plague him, after World War II ended in total Axis defeat. The chances of Spanish fascism in the Europe of tomorrow do not seem particularly bright.

Let us now turn our attention to the Spain of to-day. At one time, as we have seen, the Spanish Empire included not only the entire Iberian Peninsula but also considerable areas in the European lands that lay beyond the peninsula as well as vast areas in the New World, the southern Pacific and Africa. To-day Spain's dominions are reduced indeed. Her European possessions include only



James Sawders

A typical Spanish farmhouse. The faithful oxen shown here are used in all the work of the field.

GLIMPSES OF THE SPANISH SCENE



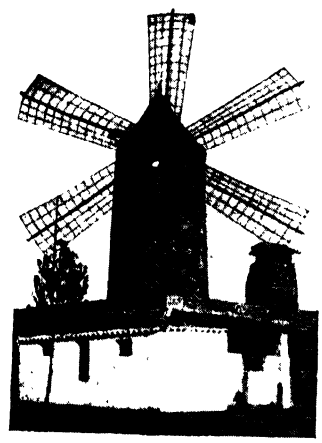
Ewing Galloway

A little gipsy dancer, who dwells in the fair city of Granada. The gipsy quarter of Granada is one of the most famous in all Europe.

Burton Holmes from Ewing Galloway

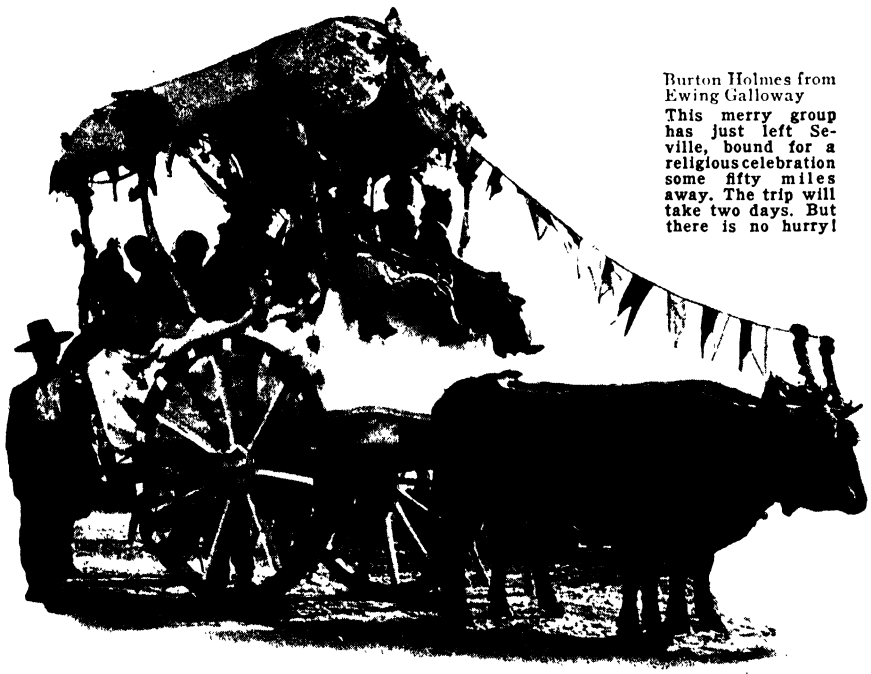
An Andalusian boy on his way to market. The donkey will be well loaded on the return trip. Spanish donkeys are noted for their sturdiness.





James Sawders

A windmill of Mallorca, one of the Balearic Islands. The Balearic group lies off Spain's eastern coast.



Burton Holmes from Ewing Galloway

This merry group has just left Seville, bound for a religious celebration some fifty miles away. The trip will take two days. But there is no hurry!

continental Spain and the Balearic Islands, in the Mediterranean. The Balearic Islands are considered a part of the Spanish homeland; so are the Canary Islands in the Atlantic, off the coast of Africa. The area of continental Spain plus the Balearic Islands and the Canaries is 196,000 square miles; the population is 26,000,000.

The only colonies that Spain possesses today are in Africa. They include Rio de Oro and Ifni, on the Atlantic Ocean, and certain areas on the Gulf of Guinea. The country also holds a protectorate over a small part of Morocco. These Spanish colonies (including Morocco, which is to all intents and purposes a colony) cover an area of some 139,000 square miles; the population is 935,000.

These figures seem far more impressive than they really are. Rio de Oro, which is by far the largest colony, with an area of about 109,000 square miles, is an unproductive region, which the Spaniards were able to acquire principally because no other European power cared for it. We tell you more about Spain's colonies on page 6814.



James Sawders

These graceful young señoritas are executing a typical dance step. They are wearing the charming national costume, which includes a high comb, a long, flowing mantilla (veil) and a ruffled skirt.

What kind of people live in the Spain of to-day? Before we answer this question we must point out that, just as the various regions of Spain differ from one another, so do their inhabitants. There are many physical types in Spain—types developed from the mingling of Iberian, Phœnician, Greek, Roman, Gothic and Moorish blood. Most Spaniards are dark-haired and dark-eyed, with olive-colored skins. Light hair and blue eyes are not uncommon, however, in the provinces of the north. Many Murcians, on the other hand, are very dark—a legacy of Moorish ancestors.

In other respects, too, Spaniards differ among themselves. The men of the Basque provinces are stern and uncompromising; they are devoutly religious. The men of Catalonia are apt to be impatient of all authority; they are energetic and restless. Castilians are capable of great feats of endurance, but they are just as apt to put things off till to-morrow. Andalusians, who are also inclined to believe in *mañana* (to-morrow), have a highly developed imagination and a great poetical gift.

Yet there are certain national characteristics which are found among Spaniards of every region. One is bravery; for in every age the Spaniard has been a matchless fighting man. Another is dignity—a dignity shown by waiters and porters as well as by aristocrats. Perhaps the most winning trait of all is hospitality. Few people in this world are as generous as the Spaniards.

The language of the Spaniards is derived from Latin, which was spoken throughout the Iberian Peninsula when Spain was only a Roman province—or, to speak more exactly, three provinces. You see, Latin underwent different changes in the different parts of the peninsula. By the eleventh century it had developed into a number of dialects — Castilian, Araganese, Leonese, Catalan, Valencian, Portuguese, Andalusian and so on. In the course of time the kingdom of Castile won a commanding position among the states of Spain, and so Castilian became the official language. To this day Spanish is often called Castilian. The Portuguese dialect became the language of independent Portugal.

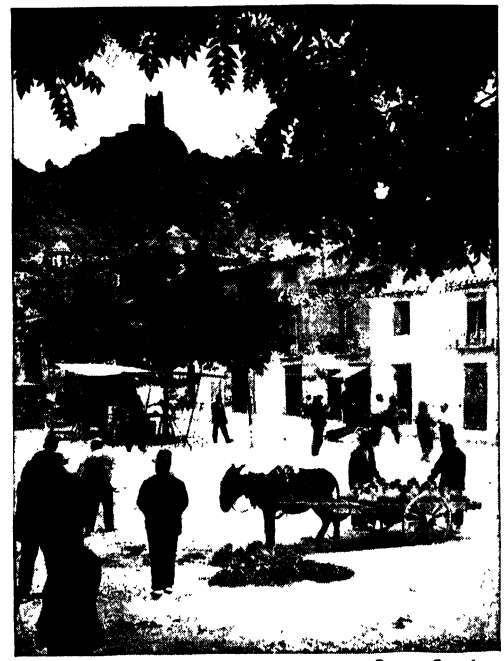
Though Castilian is the official language of Spain, the other dialects have by no means disappeared. In general they are used by uneducated people. However, Catalan, spoken in Catalonia, is still used as a literary tongue by poets and novelists and essayists. In the north of Spain there is a language which has no relationship whatever to Spanish or, for that matter, to any other European

language. This is the Basque tongue, spoken in the Basque provinces as well as in certain parts of southern France. It is commonly thought that Basque is derived from the language of the ancient Iberians.

Since the language of Spain followed the Spanish flag to the New World, Spanish is spoken in all the countries of Latin America, with the exception of Brazil and Haiti. (Portuguese is spoken in Brazil; French in Haiti.) The Spanish spoken in the New World differs in certain respects from that spoken in Spain, and the language also varies somewhat from country to country in Latin America. These differences, however, are not greater than those which exist between the English spoken in the British Isles and that used in the United States.

Spanish is also spoken to a certain extent in the Philippine Islands, which were for centuries a Spanish possession. The Moors and Jews who were exiled from Spain carried the Spanish language to certain places in North Africa and Greece and Turkey; in these places a rather corrupt sort of Spanish is still spoken. Altogether, Spanish is used by about 102,000,000 people in various parts of the world.

In the past, education in Spain was limited chiefly to the upper and middle classes. Even as late as 1930, census returns showed that only 47 per cent of those above six years of age could read and write. Some progress was made under the short-lived republic of 1931-39. But the terrible civil war that broke out in 1936 had a ruinous effect on Spain's schools, many of which were closed.



James Sawders

The plaza or principal square of a Spanish town. Here farmers sell their products on market days.



James Sawders

Flatcars loaded with cork bark, stripped from the cork-oak tree. The production of cork, used for many different purposes, is important in Spain.

Spain's educational system, under fascism, is organized much as it was before the establishment of the republic in 1931. The country is divided into eleven educational districts, each with a university as its centre. Primary education is free and obligatory, at least in theory. Much of the instruction is in the hands of the religious teaching orders.

Higher education is provided in Spain's eleven universities — Barcelona, Granada, Madrid, Murcia, Oviedo, Salamanca, Santiago, Sevilla, Valencia, Valladolid and Zaragoza. The largest of these universities is Madrid; the oldest is Salamanca. The University of Salamanca, founded in the thirteenth century, was one of the most famous in all Europe in the Middle Ages. Its students, who numbered 14,000 at one time, came from all parts of Europe.

Spain has been called the most Catholic country in the world. Catholicism is the state religion; the great majority of Spaniards are Catholics. Religious orders flourish. The ceremonies of the Catholic faith are carried on with brilliant display. Holy week, in par-

ticular, is a time of great religious observance, when people flock to the cathedrals and churches and the streets are given over to processions arranged by religious brotherhoods. However, there has been a current of opposition to Catholicism among certain groups of the population in the last few generations. This opposition showed itself most strongly, perhaps, in the legislation that was directed against the Church in the early days of the Spanish Republic of 1931-39.



By Burton Holmes from Ewing Galloway

Packing apricots in a fruit-raising area of Valencia, one of the most fertile provinces of Spain.

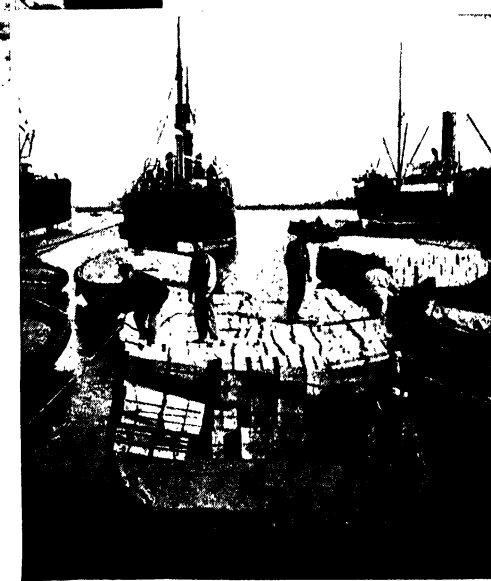
Spanish agricultural and industrial production has been on the increase in the present century, but the country does not rank among the leading nations in this respect. For one thing, it lacks good transportation. The builders of highways and railways face serious obstacles, for in many areas they must burrow through lofty mountains, or cross swift rivers or bridge deep ravines.

As a result, the total mileage of all of Spain's railways and highways and local roads is comparatively small—about 81,000 miles. (The corresponding figure for France, which is only two-thirds as large as Spain, is 392,000 miles.) Manufacturers and traders in Spain sometimes find difficulties in the way of shipping goods from one part of the country to the other, or from the interior to the seaports.

Agriculture is the principal occupation in Spain. As we have already pointed out, the soil of Spain is very fertile. It yields fruitful harvests in the regions of the north—Galicia, Asturias and the Basque provinces—where rainfall is plentiful. There are also rich crops in many areas of Valencia, Andalusia and other provinces, where fine irrigation systems make up for the lack of rainfall.

The main crop is that of the cereals. Wheat, barley, oats and rye flourish in many different areas of Spain; rice is grown extensively in Valencia. Oranges, lemons, pomegranates, figs, dates and melons grow in the coastal provinces of the east and south. Spanish olives, which were probably introduced by the Phœnicians into the south of Spain, are noted for their size and firm flesh.

Every province of Spain has its vineyards. From their grapes are pressed the wines for which Spain is famous. Best known of these wines are Alicante, Malaga, sherry (from the splendid old town of Jerez, in the province of Andalusia) and tent (from the Spanish adjective *tinto*, which means deep-colored.)



James Sawders

Loading oranges for export at the great seaport of Valencia, in the province that bears the same name.

Industrial crops (those not used for food but for industrial purposes) are important. Cotton, hemp, flax and tobacco are raised on a large scale. The bark of the cork oak yields great quantities of cork. Mulberry trees flourish in Valencia. Since the growing silkworms feed on mulberry leaves, this region

has become the centre of Spain's silk production.

The great hilly regions of Spain and her broad plateaus are well suited for pasturage. Great flocks of sheep roam over the Meseta. Goats and pigs are bred in many different areas of the country; so are donkeys and mules, which are famous for their sturdy qualities. The finest milk cows are found chiefly in the northern coastal areas. On the pasture lands of Andalusia are bred the magnificent bulls that are used in bullfights.

Spain's fisheries have considerable importance. Formerly whales were caught in the Bay of Biscay by the bold fishermen of Galicia, Asturias and the Basque provinces. To-day whales have practically disappeared from this part of the world, but quantities of codfish, tuna, sardine and other fish are still brought in.

Spain's mineral wealth includes great deposits of copper, lead, mercury, iron, coal, zinc, cobalt, manganese, wolframite, silver, sulphur and phosphates. Some of the richest of these deposits have not been developed or have been only partly developed because of difficulties of transportation. The minerals most actively worked at the present time are coal, iron, copper, lead, zinc, sulphur, manganese and wolframite.

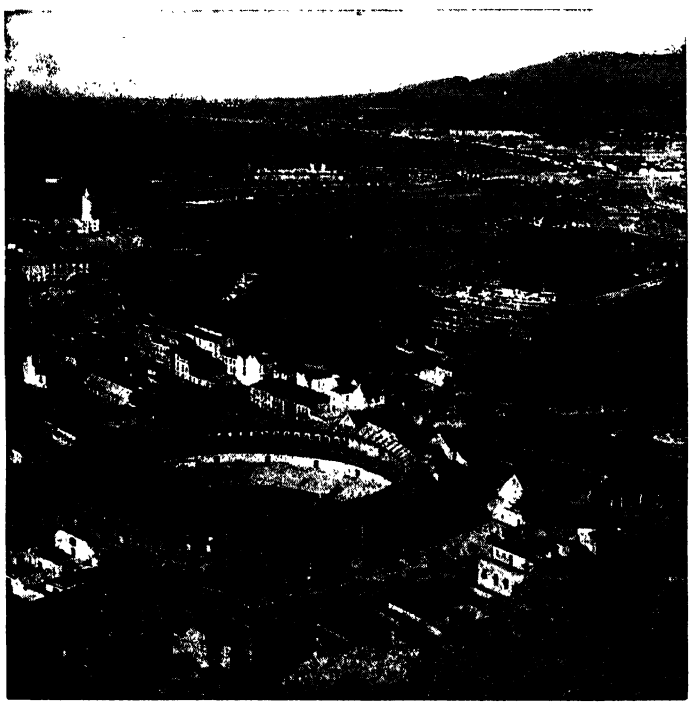
Textiles — cotton, silk and wool — are Spain's leading manufactures. Steel and iron are quite important. The Balearic Islands are a prominent shoe-manufacturing centre. A considerable chemical industry with its headquarters at Barcelona, has been built up in the present century. The principal chemical products are fertilizers, drugs, perfumes and dyes.

Power for Spain's industries is provided to a considerable extent by coal. Within recent years the country has turned increasingly to the production of hydroelectric power—that is, electric power derived from the force of running water. (See our article on Water Power of the World.) Spain has many possible sources of this power in swift streams in many areas.

A number of sports are popular in Spain. Soccer has its faithful followers; so have golf and tennis; so has *pelota,* a combination of handball and tennis. But the truly national sport of Spain is the bullfight, a colorful and dramatic spectacle, in which men fight against bulls.

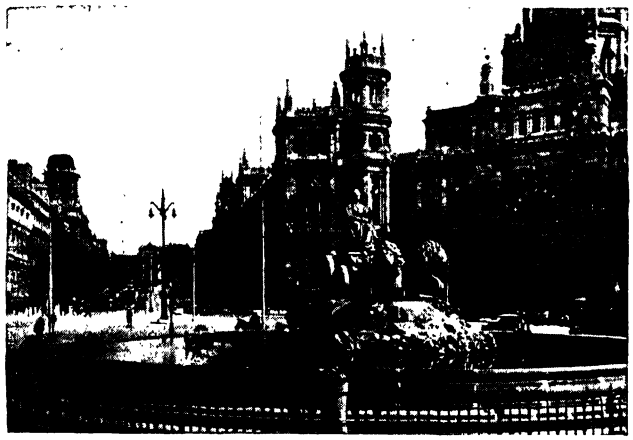
Each bullfight consists of three *suertes* or innings. In the first inning the bull attacks the *picadores,* men armed with lances and mounted on horses. As the bull charges at a *picador,* the man jabs at the animal with his lance. This weapon has only a short iron tip, so that it can not inflict a serious wound on the bull. Often both horse and rider are knocked to the ground. The bull is then drawn away from the fallen *picador* by men waving capes.

In the second inning a bullfighter runs at the bull with a dart, called a *banderilla,* in each hand. Skillfully avoiding the animal's horns, he thrusts the darts in its hide. Three pairs in all are planted in this way. In the third and last inning the *matador,* who is the principal bullfighter, gives the bull the death blow by plunging his sharp sword just back of the animal's neck. Often several thrusts are necessary to kill the bull.



James Sawders

Málaga, a busy seaport of southern Spain. The landlocked harbor of Málaga is one of the finest in the Mediterranean Sea; here, almost every day, one finds ships of many different countries. The big circular building in the foreground is the Plaza de Toros or Bull Ring.



Philip D. Gendreau

The Plaza (Square) of Castelar, Madrid. At the right is the Palace of Communications, centre of Madrid's telephone and telegraph systems. In the foreground is the Fountain of Cybele. Cybele, shown in a chariot drawn by lions, was a goddess of Asia Minor.

From six to eight bulls and a certain number of horses are killed in the course of every bullfight. It is a dangerous sport for men as well as for beasts; a number of bullfighters are wounded each season and a few of them die of their wounds. Thoughtful Spaniards have denounced the sport as a brutal spectacle. It has been abolished at various times. Yet whenever this has happened, there has been a great public outcry and bullfighting has been restored to favor. The Spanish conquerors introduced the sport into the New World. It is still very popular in Mexico.

Almost all the important cities of Spain are in the provinces that surround the great central plateau. The only large city of the Meseta is Madrid (population 1,167,000), the capital of Spain. It is the railway and aviation centre of the country, as well as a trade and industrial centre of very great importance.

The streets of Madrid are laid out rather irregularly around a central square, called the Puerta del Sol (Gate of the Sun). The principal thoroughfares are broad, long and airy; the houses in general are well constructed and substantial. Madrid suffered greatly in the Civil War of 1936-39. The battlefront ran through the northern outskirts of the city for the greater part of the war, and a good deal of fighting took place here.

Of the other cities of the Meseta, Burgos (population, 33,000), in the northern part of Old Castile, is remarkable chiefly for its magnificent cathedral. Salamanca (population, 37,000), also in Old Castile, has a famous university and many beautiful churches. Segovia (population, 16,000), forty-three miles northwest of Madrid, has a fine aqueduct that was built by the Emperor Trajan. It is several miles long.

Toledo, on the Tagus River, forty-five miles southwest of Madrid, was the capital of Visigothic Spain and, later on, of Castile. In the Middle Ages this city was one of the foremost cities of Europe. When Madrid became the capital of Spain in 1560, the decline of Toledo set in. To-day it is a sleepy town of some 25,000 inhabitants, basking in the memories of the past.

The largest city of the northern coastal provinces is Bilbao (population, 220,000), in the Basque province of Vizcaya. Bilbao is situated on the Nervion River, a few miles from the Bay of Biscay. It is a flourishing seaport and has a big shipbuilding industry. Its iron foundries have been famous for centuries. Other seaports on the northern coast include Santander, Gijón and La Coruña (Corunna).

The most important city of Aragon is



James Sawders

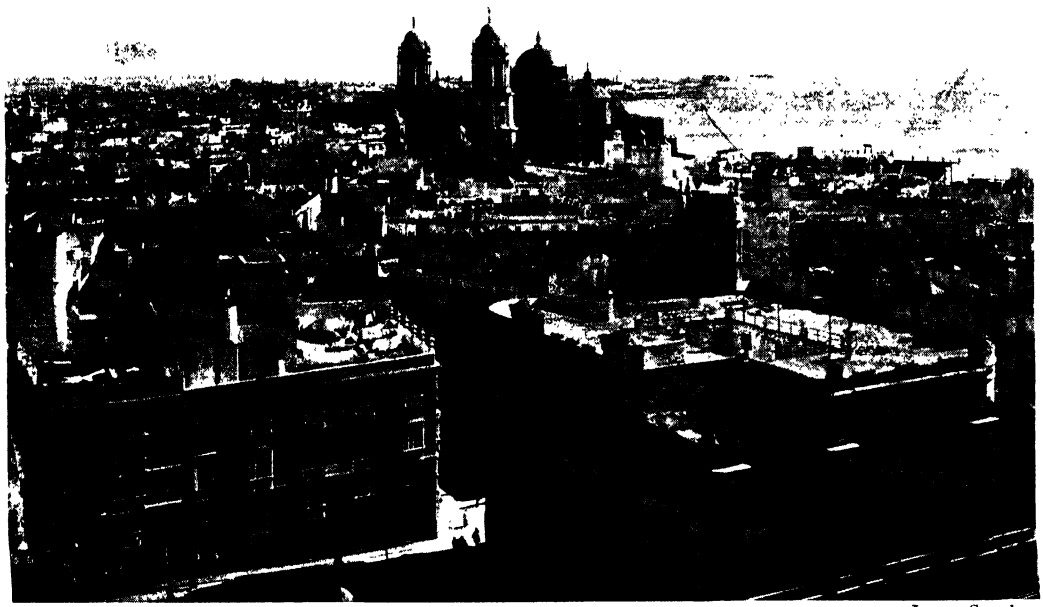
The broad Paseo de Gracia (Boulevard of Grace) in Barcelona. The fine apartment house at the right shows the rather odd modernistic type of architecture found in many of Barcelona's buildings. Note the almost complete absence of straight lines.

Saragossa (Zaragoza), which has a population of 208,000. It was originally the Roman military colony of Caesarea Augusta; Zaragoza is the Spanish version of this name. Later the city was the capital of the old kingdom of Aragon. Saragossa is a very picturesque town with its forests of towers, cupolas and spires. It is an important railway centre, with a thriving trade.

In the northeastern province of Catalonia is mighty Barcelona (population, 1,351,000), the largest city in Spain and one of the most important seaports of the Mediterranean. Its site is very picturesque, for on the land side it is almost completely surrounded by hills. The harbor is spacious; its entrance is protected by a great mole (a wall built out into the outlet for a marvelously fertile truck-garden and fruit-growing area.

As we continue southward along the coast, we come to another flourishing seaport—Cartagena (population, 97,000), in the province of Murcia. The largest city of this province is Murcia (population, 175,000), on the Segura River, about thirty-five miles from the Mediterranean.

Entering now the southern district of Andalusia, we find ourselves in the wonderful old city of Granada (population, 125,000), once the centre of a great Moorish kingdom. The crescent-shaped city lies at the foot of the snow-capped Sierra Nevada. Granada has an active trade in agricultural products and has manufactures of consid-



James Sawders

View of Cádiz, looking over the city toward the harbor; the great Cathedral crowns the scene. Cádiz, one of Spain's most important seaports, goes back to the days of the old Phœnicians. It was founded about 1100 B.C.

a harbor). Barcelona is the chief industrial centre of Spain. Its flourishing manufactures include textiles (cotton, wool and silk), iron castings, machinery, paper, glass and chemicals. Barcelona's tanneries are famous.

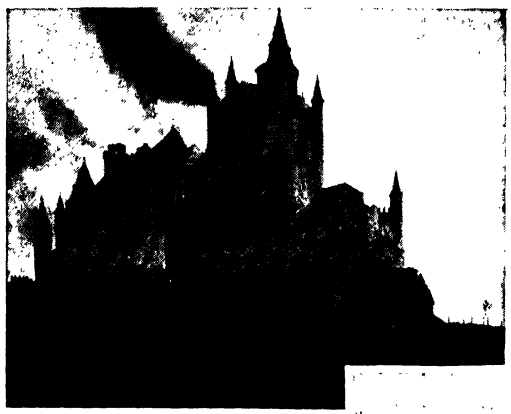
Two hundred miles southwest of Barcelona, we find the seaport of Valencia, with a population of 399,000. Valencia's harbor is about three miles up the Turia River, which empties into the Mediterranean. The city has important manufactures of tobacco, silk, paper, hemp and other products. It is also

erable importance. Its crowning glory, however, is the Alhambra, the famous citadel-palace of the Moorish rulers. The Alhambra is the highest achievement of Moorish art in Spain. It is a labyrinth of richly adorned apartments, arcades, columns, arches and courts. It is set upon a lofty height that commands a full view of Granada and, beyond it, of a charming countryside. We tell you more about the Alhambra elsewhere in our book (see the Index).

An important seaport in Andalusia is Má-

laga (population, 227,000), which lies about sixty miles northeast of Gibraltar. Málaga is a thriving trade centre. Sheltered on the north and east by mountains and cooled by the soft breezes blowing from the Mediterranean, it is also a favorite resort.

The largest city in Andalusia is Seville (Sevilla), which has a population of 251,000. It lies on the Guadalquivir River, some forty miles from its mouth. Big vessels can make their way up the river and dock at the city's piers. Seville is one of the richest of Spanish cities in its memories of the past. The Alcázar or Castle, built in the twelfth century, was once a Moorish royal palace. The Cathedral, which ranks second only to St. Peter's at Rome, was built in the fifteenth century on the site of a Moorish mosque. It is a treasure house of works of art—paintings, wood-carvings, sculptures, metal work and stained glass. Close by the cathedral stands the bell tower of the Giralda, perhaps the finest in Europe.



Burton Holmes
from Ewing Galloway

The Alcázar, or Castle, at Segovia. The original castle was built by Alfonso VI in 1358. The towers are part of the old castle; the rest was rebuilt after the structure had crumbled away.

Some sixty-five miles further up the Guadalquivir we come upon Córdoba (Cordova), another famous old city. Córdoba, which has a population of 103,000, was the capital of the Caliphate of Córdoba under Moorish rule. At that time the city is said to have had a population of a million souls. To-day, though it is shorn of much of its greatness, it is still a town of considerable commercial importance. Córdoba is famed for its cathedral, which was formerly a mosque, erected in the eighth century. This remarkable building, only thirty feet high, covers an immense area. Its floor is paved with gorgeous Byzantine mosaics.

Beyond the Strait of Gibraltar is the famous old seaport of Cádiz (population, 75,000). Cádiz is on the Isle of León, off the southwestern coast of Andalusia. It is situated at the very end of a long tongue of land that projects from the island. The harbor of Cádiz is a magnificent one; it consists of a large basin, enclosed by the mainland on one side and the projecting tongue of land on the other. The city reached its greatest prosperity after the discovery of America, for it became the centre of Spain's trade with her rich colonies in the New World. Naturally the loss of these colonies dealt Cádiz a heavy blow. However, it is still one of the most important seaports of the country.



James Sawders

Herding sheep outside the city walls of Avila, in Old Castile. These walls were built in the last years of the eleventh century. Avila, once one of the richest cities of Spain, has very little importance to-day.

So ends our account of Spain. This land, once a mighty empire and now so fallen from its former greatness, is one of the question marks of modern Europe. Its natural resources are great; it has fine ports; its people have shown in the past that they are capable of great deeds. There seems to be no reason why Spain should not occupy a high rank among modern nations.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 5039.

A GREAT PORTRAIT STATUE



Photo, De Witt Ward.

In this statue of Abraham Lincoln in Lincoln Park, Chicago, Augustus Saint Gaudens shows the president as if standing lost in thought before addressing an audience. There is nothing over-dramatic or posed in the attitude. The quiet figure, treated simply but with vigor and breadth, indicates great force.



Photo, Ewing Galloway.

The Indian Hunter, by J. Q. A. Ward, in Central Park, New York.

SCULPTURE IN THE UNITED STATES



IN the United States sculpture had a late start, but its advance in the last fifty years has been thrilling in progress and promise. In colonial days there was no place for sculpture in the lives of the settlers and their children. To many of them a statue, or "image," was a sinful thing. Among the household goods unloaded from the Mayflower, someone has said, "We may be sure that never a statue came out of her hold." If a colonial youth had longings to express a feeling for beauty in form, he might find satisfaction in making furniture or planning buildings and their decorative details. Never seeing statues or reliefs, he had little to lead him to attempt them. And even had he thought of such a thing, proper materials and tools were not to be had. There was no fine marble at hand, and the difficult art of casting statues in bronze was not to be introduced west of the Atlantic until about the middle of the nineteenth century.

Out of a Quaker home in New Jersey came a "sculptress," the first American we know of who made sculptural forms—Mrs. Patience Wright, whose wax portraits of king and queen, noble lords and others set all London talking after she went there to live in 1769.

Then followed the Revolutionary War, and after it the desire to preserve in lasting monuments the forms and features of its leaders. Houdon was persuaded to leave France long enough to make a study of George Washington for a statue to be set up in Richmond, Virginia. Besides this statue and a bust of Washington copied from life, the French sculptor made busts of Franklin, Jefferson and others.

But Americans were soon to try their own skill in making likenesses of their great men. The first effort was in wood, and the first real American sculptor was William Rush, of Philadelphia, who first won fame by the figureheads he carved for well-known ships. He produced a statue of Washington in 1812. A fountain figure which he made in wood and which is called the Nymph, or Spirit, of the Schuylkill, has been reproduced in bronze and stands in Fairmount Park. Rush, one of the founders of the Pennsylvania Academy of Fine Arts, had great influence in the art life of his city. Then came John Frazee, a New Jersey stonecutter who, about 1834,

"executed without teacher or instruction" marble portrait busts of Daniel Webster and others; and Hezekiah Augur, a modest Connecticut carver, who timidly proceeded from wood to marble.

ITALY BECOMES THE GOAL FOR STUDENTS OF SCULPTURE

But we have come to the moment when young Americans, first turning to a serious study of sculpture, went to Italy for training and inspiration. Foremost among these seekers for enlightenment was Horatio Greenough (1805–52), who became a sculptor through his admiration for a statue in the garden of his father, a prosperous Boston merchant. After college the young man went to Rome to study his art. In Italy, where the ancient marbles and bronzes spoke for themselves, while Canova and Thorwaldsen declared them the only models to follow, Greenough did most of his work, although it was made for his n tive land. When his statue of Washington, ordered by Congress for the rotunda of the National Capitol, crossed the ocean, it appeared as a seated figure of colossal size, with only loose drapery across the knees and falling over one arm, in place of the first president's accustomed garments. The huge marble mass was too heavy for the floor, so that the statue had to be banished out of doors, where it was unfairly viewed for many years before being taken into the shelter of the Smithsonian Institution. Do not too lightly laugh at Greenough's Washington represented as Olympian Zeus, but think of it as the work of a pioneer, and remember the high purpose of the sculptor and the seven years of thought and labor spent upon the statue. If Saint Gaudens could say of the earlier sculptors, "Those men were greater than we know," shall we not pause in judging?

Another "first thing" that Greenough did was to make marble groups, one of which, The Rescue, standing on a buttress of the Capitol's east front, shows a pioneer saving his wife and child from an Indian, while their dog stands by.

Thomas Crawford, an Irish American who studied and worked in Rome, undertook three hard problems in adornment for the National Capitol. His figure of Freedom for the dome in its simplicity of line and mass is well suited to being viewed at a distance. His statues and groups for the pediment of the Senate wing, ambitiously presenting the Past and Present of the Republic, are not held together in unity of composition, but come nearer success than might have been expected from Crawford's inexperience. He also designed bronze doors for the Senate entrance.

Soon, from the studios of Americans in Italy, engulfed in an atmosphere of revived classic ideals, flowed a wealth of smoothly finished, gracefully posed maidens and youths in cold, pure marble —all too smooth, too posed, too classic. The most highly praised of them all in Europe and America was the Greek Slave by Hiram Powers, who lived in Florence from 1837 until 1873. This fair captive, with her chained hands and her air of gentle patience, was copied many times over for an admiring public, as were a number of other figures that pleased the fancy of the sculpture-starved land. Such were two appealing statues— the Lost Pleiad and the blind girl, Nydia —by Randolph Rogers. Among the best —in modern judgment far surpassing the Greek Slave—are the White Captive by Erastus D. Palmer and a Clytie by William H. Rinehart. The group of American artists in Rome included a brisk little woman, Harriet Hosmer, who was noted for such differing types as a mischievous Puck and a stately captive queen, Zenobia.

William W. Story, a scholar and a man of social gifts, in his studio in Rome created a company of large, mournful— often tragic—marble forms of women, heroines of literature: Cleopatra, the Libyan Sibyl, Medea and others. Utterly different are the small story-telling statuettes of John Rogers, usually spoken of as "Rogers groups," which were to be found in plaster in almost every American household in the Seventies and Eighties of the nineteenth century.

EARLY WORK IN PORTRAITS AND EQUESTRIAN STATUES

All of the sculptors we have mentioned made portrait busts, and most of them, portrait statues. Good and dignified monumental portrait work was done by Thomas Ball, who, like Palmer, became a sculptor through instinct and love for the art, developing with but little instruction. His Washington, made for Boston, was the first equestrian group in New England.

New York already had its bronze

SCULPTURE OF YESTERDAY AND TO-DAY



The Sun Vow, by Hermon A. MacNeil.



The Nymph of the Schuylkill, by William Rush.



The Bear-tamer, by Paul W. Bartlett.



Frog Fountain, by Janet Scudder.



Dancer and Gazelles, by Paul Manship.



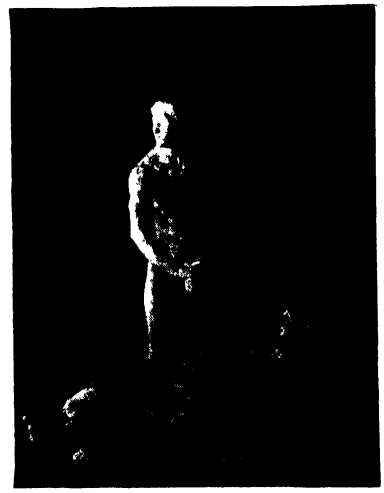
Little Dear with the Tiny Black Swan, by A. S. Calder.



Jeanne d'Arc, by Anna Hyatt Huntington.



Medea, by William W. Story.



The Two Natures, by George Grey Barnard.

Photos on this page by DeWitt Ward, Philip B. Wallace and the Metropolitan Museum of Art.

Washington on horseback, finished ten years before, in 1854, by Henry Kirke Brown, who owed little to foreign influence or training. The Washington (badly placed in Union Square) was his greatest achievement and still counts as one of the best equestrian statues in America. It gives a noble impression of a great man. The very first equestrian statue made in the country, however, had been dedicated in the city of Washington one year earlier, in 1853. It was by Clarke Mills, who had never seen an equestrian statue before he made this one of metal from an old cannon. It shows General Andrew Jackson upon a horse astonishingly balanced on its hind legs. Though it is not good sculpture, we must remember that Mills built his own foundry and modeled and cast his statues himself —a true pioneer in the mechanical side of the art.

Henry Kirke Brown's bronze Washington was cast in a New York foundry and put together with great difficulty and effort. When the sculptor's young assistant climbed for the last time out of the horse's body, where, as he afterward said, he had spent more days "than Jonah did inside the whale," we may think that the hour had come when American sculpture was to step forward out of the pioneer stage. The young man, whose name Brown insisted upon placing with his own on the pedestal of the statue, was John Quincy Adams Ward (1830-1910), who became one of the three leading American sculptors of the period. The other two were Augustus Saint Gaudens and Daniel Chester French.

JOHN QUINCY ADAMS WARD, A LEADING SPIRIT IN THE MARCH FORWARD

J. Q. A. Ward, born in Ohio, began to model in clay while but a farmer boy in the Middle West. Ill health and a visit to Brooklyn led to his becoming a pupil in Brown's studio, where he stayed for seven years. Soon after the Washington statue was finished Ward made an independent start, his first public work being The Indian Hunter, for Central Park, New York, shown in our headpiece. He had made a trip among the Indians of the Northwest to get the right models for this group, which, standing among the shrubbery of the park, charms us with its alert and eager vitality. Success and orders came quickly. Indeed, orders for portrait statues kept Ward so busy most of his life that he found little time to give to ideal subjects.

He went to Italy to enlarge his knowledge and vision, but not to stay, believing that an artist would best serve his age by working at home. Of his many works we can name only a few—the noble figure of Washington in front of the Subtreasury Building, and the Horace Greeley, New York; statues of General Thomas and of Garfield in Washington; and a Henry Ward Beecher monument in Brooklyn. He did not hesitate to clothe the modern man in his own commonplace modern coat, trousers and boots; but he managed to make the man seem more important than his garments: to make the garments help to express the man in some degree.

When the Centennial Exposition of 1876 was held in Philadelphia and the United States began to realize what sculpture really means, J. Q. A. Ward, as president of the National Academy of Design, put much effort into making the exhibit a worthy one. And when in 1899 a splendid temporary arch to greet Admiral Dewey after his victory in Manila Bay was raised in New York, the sculptors who gave their best to make it beautiful were led by the dean of them all, J. Q. A. Ward, then president of the National Sculpture Society. His was the crowning group—Victory in her sea-chariot drawn by six spirited horses.

"THE MOST ILLUSTRIOUS FIGURE IN AMERICAN ART"

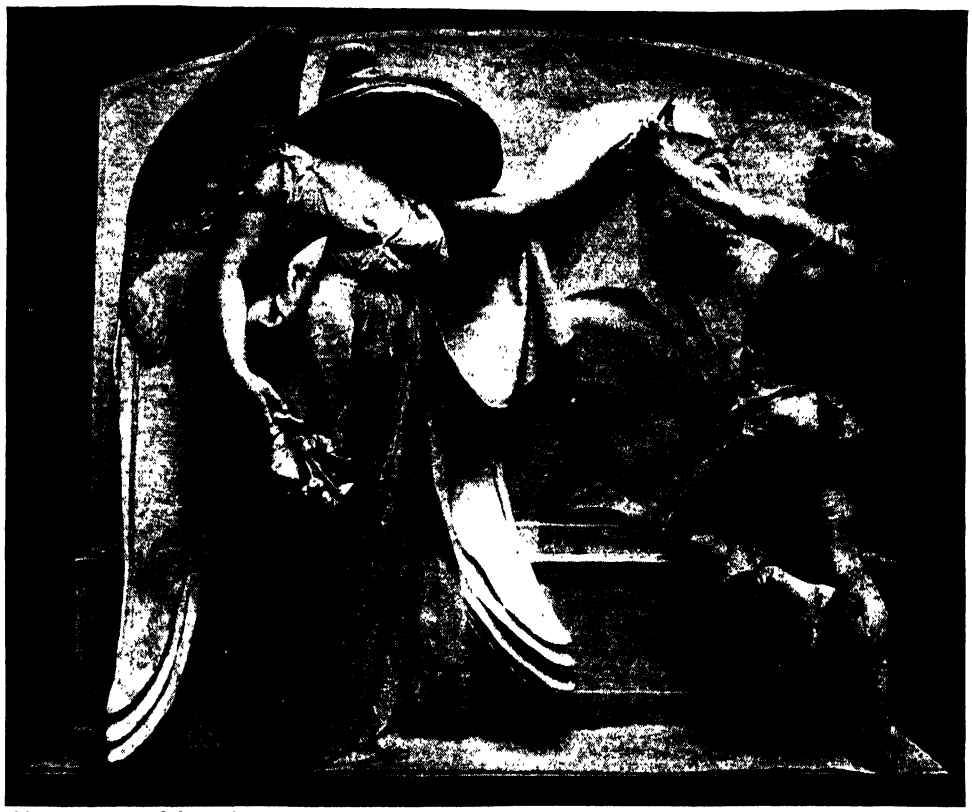
In the days of the Civil War a young man, son of a French father and an Irish mother—immigrants to the United States —was working as apprentice to a cameo-cutter in New York. Twice the lad saw President Lincoln: first, on the way to Washington; later, lying in state during the funeral journey after the assassination. To-day in the minds of many the name of Lincoln calls up the face and form of a figure in bronze standing in Lincoln Park, Chicago; for the young cameo-cutter was Augustus Saint Gaudens (1848–1907), who became in time "the most illustrious figure in American art," and whose skill and genius as a sculptor have given to the United States lasting records of some of her greatest heroes.

Study at Cooper Institute and the National Academy of Design, followed by several years in Paris and Rome, transformed the cameo-cutter into a recognized sculptor, who opened a studio in New

York in 1875. His first public commission was to make a statue of Admiral Farragut—the sturdy bronze sea captain at Madison Square, whose interesting pedestal, designed by Stanford White, the architect, and Saint Gaudens working together, introduced a new idea for the base and setting of a statue.

The years of earnest, almost unceasing work that followed brought forth rich results: the Shaw Memorial, in relief, for Boston; the Lincoln Monument, for Chicago; The Puritan, for Springfield, Massachusetts; the Adams Memorial, in Rock Creek Cemetery, Washington; the famous Sherman Statue at the entrance to Central Park, New York; and other public works, besides a number of portrait busts and reliefs. "There was no branch of his art in which he did not excel; it was an art designed in general for the flowingness of bronze rather than for reproduction within the confines of the marble block."

From the delicate portraits of children in low relief to the great forward-sweeping figures of the Sherman group, the general on his horse led on by a serious but eager winged Victory, there is a broad range, yet all show the craftsmanship of a master's hand and the creative power of a poet's mind. A proof of the greatness of his art is that in looking at his works we can forget the artist and his technique—everything but the meaning of what he has made.



Photo, courtesy of the sculptor.

The Angel of Death and the Sculptor, by Daniel C. French.

In Daniel Chester French we find an artist who seems to have skipped the introductory phases—to have become a sculptor almost without knowing it. Born in New Hampshire in 1850, the boy grew up in the country, interested in birds and animals. His genius was not discovered until one day, when he was about nineteen, he carved from a turnip a grotesque figure of a frog in clothes. He was then living near the historic and literary town of Concord, Massachusetts—a "Daniel

among the lions," cultured and kindly lions, whose homes were there. From Miss May Alcott, the Amy of Little Women, the young man had his first art lessons, and with tools borrowed from her he made his earliest attempts at sculpture.

At twenty-three the sculptor, who by way of training had had some lessons in anatomy and had spent one month in the studio of J. Q. A. Ward, modeled for the battlefield of Concord his figure of the Minute Man—a statue so original and satisfying you would hardly guess that the artist's only models were a cast of the Apollo Belvidere and himself.

DANIEL CHESTER FRENCH, WHOSE WORK COMBINES TRUTH, BEAUTY AND FORCE

A year of study at Florence, Italy, with Thomas Ball, ten years of work on commissions in America, another year of study in Paris—the centre to which all young American artists were turning—then D. C. French settled in New York.

From his studio went far and wide a quiet but compelling influence. Believing "that beauty and truth are acceptable to the human mind," he created forms of beauty that speak simply and truly to all sorts of human beings. None of his works lacks dignity and force, though all have the touch of tenderness and refinement. They are "imagined simply and naturally."

In Washington are his General Cass, the group of Gallaudet with a little deaf-mute pupil, and the impressive seated Lincoln of the Lincoln Memorial; in Lincoln, Nebraska, a statue of Lincoln standing; in or near Boston his John Harvard, the John Boyle O'Reilly Monument, and the Milmore Memorial with its exquisite Angel of Death and the Young Sculptor; New York has the serene Alma Mater at Columbia University, the lovely Memory in the Metropolitan Museum, and other works. These are far from all of the fine pieces that have come from his hand. In collaboration with the sculptor of animals, Edward C. Potter, he produced such works as an equestrian statue of General Grant for Philadelphia, one of Washington for France, and one of General Joseph Hooker for Boston. He died in 1931.

For sculptors in America the Columbian Exposition at Chicago in 1893 was a test that showed remarkable gain over 1876. This and the other great fairs that have been held since have opened wide gates of opportunity. Perishable and passing though much of the work for these expositions has been, it has given a message of beauty to hosts of men and women, and has introduced the sculptors to their public.

MACMONNIES, BORN WITH A SENSE OF BEAUTY IN MODELING

In the Court of Honor at the Chicago Fair stood Daniel C. French's stately but gracious statue of the Republic; and in the lagoon was the great wonder ship, the Columbian Fountain, which came to be known everywhere as the MacMonnies Fountain. Its designer, Frederick MacMonnies, was one of a number of young sculptors who had been privileged to work under the generous and inspiring leadership of Saint Gaudens. A familiar bit of work by MacMonnies is the statue of Nathan Hale in City Hall Park, New York. Some others of note are the bronze groups on the Soldiers' and Sailors' Memorial and two groups of Horse-tamers for Prospect Park, Brooklyn; the Bacchante in the Metropolitan Museum; and the Winged Victory at West Point. MacMonnies seemed to "possess an intuitive sense of beauty in modeling." His apparent ease was the result of knowledge and painstaking work. He died in 1937.

It is impossible in a few words to do justice to the group of sculptors who have been adding honors to the account of the United States since 1893. We can simply give an introductory glimpse.

Paul Wayland Bartlett (1865-1925), while he worked in Paris most of his life, has left his native land a number of figures, some of unusual interest, such as the Columbus and the Michelangelo in the Library of Congress and the sculptures in the pediment for the House of Representatives at Washington; a McClellan for Philadelphia; and a General Warren for Boston. The Bohemian Bear-tamer in the Metropolitan Museum is a good example of his early work when, in his own words, he was "animal-crazy." His equestrian Lafayette, presented to France by the school children of the United States, has the honor of standing in the garden of the Louvre.

George Grey Barnard (1863-1938) was a man of high courage and vision, of whom it has been said that he spent his life thinking great thoughts in stone. The Two Natures, The Hewer, and the unsurpassed Lincoln (in Cincinnati) replicas

of which were made to be placed in London and Paris, are famous. Barnard was intensely interested in medieval architecture and sculpture, and formed a wonderful collection known as The Cloisters, now a branch of the Metropolitan Museum of Art in New York.

Gutzon Borglum and his brother Solon, who died in 1922, have hardly been excelled in the modeling of horses, whether in such sympathetic records of the old West as Solon's On the Border of White Man's land, and Stampede of Wild Horses, or in Gutzon's Horses of Diomed (see page 2703). Gutzon Borglum's notable works include the seated Lincoln in Newark, New Jersey, a colossal head of Lincoln, in the rotunda of the Capitol at Washington; and large statues of the Apostles for the Cathedral of Saint John the Divine in New York City. In recent years he devoted himself to two vast projects, the Confederate Memorial, carved on the face of Stone Mountain in Georgia, and the National Memorial carved in the rock of Mount Rushmore in South Dakota. Both were unfinished when he died in 1941.



Photo, courtesy of the sculptor
Motherhood, by Bessie Potter Vonnoh.

The changing life in the western United States is further presented in James Earle Fraser's Indian group, The End of the Trail, made for the San Francisco Exposition. It is shown on page 266. A native of Minnesota, Fraser in his boyhood studied Indians and buffaloes at close range and felt the tragedy of their losing fight. As a portrait sculptor and a designer of medals he has had great success.

From Massachusetts came another who has made sympathetic studies of the American Indian. They are beautifully modeled figures and groups by Hermon Atkins MacNeil, who took with him to Rome and Paris a great interest in the vanishing race and returned with the feeling still strong. The Moqui Runner, Primitive Chant (shown on page 6898), and The Sun Vow are among the best of his works on this motive. For the Marquette Building in Chicago he made four panels illustrating scenes in Père Marquette's life. For the McKinley Memorial in Columbus, Ohio, he made the figure of McKinley and two bronze groups, Industry and Peace. On the campus at Cornell University stands his statue of Ezra Cornell; and he designed one of the groups on the Washington Arch in New York. Larger commissions have occupied him in later years. "His work is full of delightful touches and felicitous passages."

Again we find the epic of the American Indian, told this time by Cyrus E. Dallin. In such groups as The Appeal to the Great Spirit, in Boston, and The Medicine Man, in Philadelphia, he combines "with complete naturalism the poetry of the Indian subject." To Philadelphia belongs another Indian group, The Stone Age, made in 1888 by John J. Boyle, from whose hands later came a seated Benjamin Franklin for the same city—an informal, benevolent Franklin.

In 1896 a fatal accident ended the work of Olin Levi Warner, a man gifted with a remarkable sense of the monumental in form. His portrait busts, heroic statues and ideal studies, noble in feeling and expression, give an impression of high breeding and deep-mindedness joined with eager delight in the beautiful. He made an exquisitely proportioned fountain for Portland, Oregon, and designed a set of bronze doors for the Library of Congress in Washington. Knowledge of form and monumental dignity distinguish the large athletic figures and the portrait works of Charles H. Niehaus. Among the best are: Garfield, in Cincinnati; Hahnemann, in Washington; and a bust of J. Q. A. Ward. Some of the most virile modern portrait sculpture is that of Charles Grafly, of Philadelphia, whose technique was vigorous and individual.

To set down names in classified lists is dangerous, as most of the artists included have done good things in more than one field; but we shall place them in the departments in which they seem to have reached the greatest distinction. Among the makers of portraits, then, we

shall mention William Ordway Partridge, Jonathan Scott Hartley, W. R. O'Donovan, J. H. Calverley, Mrs. Bryson Burroughs, Edmond T. Quinn, Adolph A. Weinman, Malvina Hoffman, John Flanagan and Jo Davidson.

With great sensitiveness and delicacy of feeling Herbert Adams has fashioned portrait busts of women that recall the art of the old Florentines. In some of them he has resorted to the ancient custom of introducing color or even a variety of materials. In his memorials and larger works, for example his tympanum and doors for Saint Bartholomew's Church, New York, he has achieved distinction in architectural decoration.

DECORATIVE SCULPTURE FOR THE GREAT EXPOSITIONS AND ELSEWHERE

In this field of decorative sculpture some who have contributed to the adornment of American buildings and memorials were born in other lands but were early transplanted. Among these are Philip Martiny and F. Wellington Ruckstuhl, from Alsace; J. Massey Rhind, from Scotland; Isidore Konti, a Viennese; and a gifted Italian family, the Piccirillis, who have brought fine craftsmanship to the decorative arts in America. Two of them, Attillio and Furio, are sculptors of ability. Karl Bitter (1867-1915), from Vienna, was at his best in decorations permitting heroic exaggeration. William Zorach, Lee Lawrie and Maurice Sterne are outstanding, as was Gaston Lachaise, who died in 1935. Rockefeller Center in New York has examples of the work of these four men, including Lawrie's heroic figure of Atlas.

Lorado Taft, of Chicago, has produced finely composed and significant groups; Robert I. Aitken, of San Francisco, stands among the foremost in force, originality and technique; Bela L. Pratt's work is notably an expression of sentiment; and R. Hinton Perry at his best shows imagination combined with charming treatment of form. To the important class of large decorative and commemorative works Evelyn Longman Batchelder and Gertrude Vanderbilt Whitney have made valuable contributions.

In designs for fountains and other out-of-door decorative sculpture a number of artists show great skill and charm: Janet Scudder, Chester Beach, Edith Barretto Parsons, Brenda Putnam and Harriet Frishmuth, John Gregory, Karl Gruppe and others. In the handling of ornamental form Edward McCartan and Paul Manship are especially happy, giving proof of inventive power and a feeling for the rhythms of design.

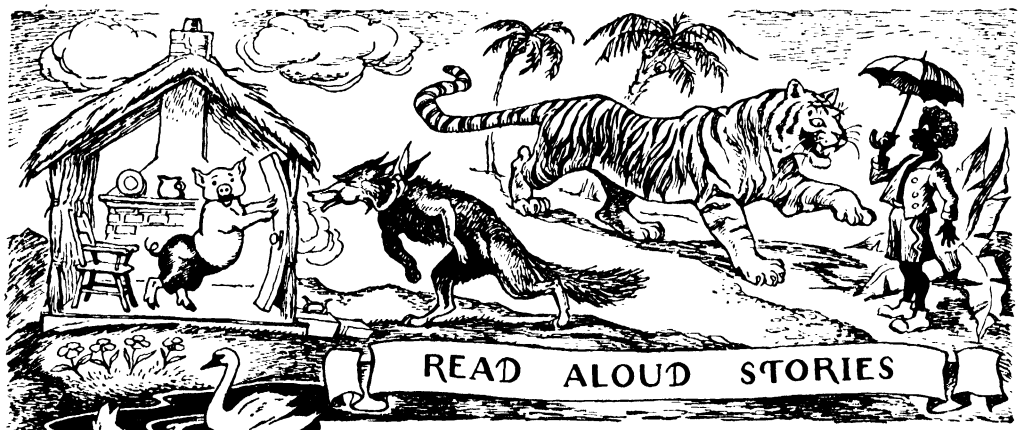
The distinct field of "figurines," or small bronzes, was first entered by Bessie Potter Vonnoh, whose little groups of tender motherhood and graceful girlhood quickly won a place for themselves. Abastenia Eberle, Manship and Jennewein are others whose figurines have been much admired. Alfeo Faggi is one of the few modern sculptors whose work conveys real religious feeling. His Saint Francis in the museum at Santa Fe has a spiritual fervor that reminds one of the figures in Mediaeval churches.

Many sculptors have been particularly successful in their representations of animals. Edward C. Potter's horses are especially fine. Other names that stand high among sculptors of animals are Edward Kemeys, Frederick G. R. Roth, Eli Harvey, H. K. Bush-Brown, Augustus Lukeman, Henry Merwin Shrady, Anna Hyatt Huntington, Sally James Farnham, Charles Cary Rumsey, Edward F. Sanford, Laura Gardin Fraser and Albert Laessle.

A. Stirling Calder, Sherry Fry, F. E. Elwell and Arthur Lee have produced original and beautiful conceptions of ideal themes. Mahonri Young creates realistic figures of cowboys, stone-workers and other laborers. Alexander Archipenko, an American of Russian birth, Noguchi, a Japanese-American, and John Storrs are among those who are interested in abstract sculpture, which is concerned only with form and design, and not with the representation of natural objects. Sometimes these abstract sculptures are intended to convey an idea to those who view them, but in many instances they are simply exercises in the application of line and form to carved stone or molded metal. As works of art they excite curiosity rather than admiration in most people who see them.

No work of art has life and value unless it bears some impress of the artist's own personality, but "the great artist strives to bring his personality and his work into harmony with the best that he knows of human effort," and at the same time to keep in touch with his own age and race. Toward these high attainments sculpture in the United States has been steadily moving.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 5075.



Puss in Boots

THERE was once a miller who had three sons, and he left them his mill, his donkey and his cat. The eldest son received the mill, the second the donkey and the youngest nothing but the cat. This worried the youngest son greatly, for he did not know how he could make his living. "My brothers," said he, "may join together and use the donkey to work the mill, but what can I do with a cat?"

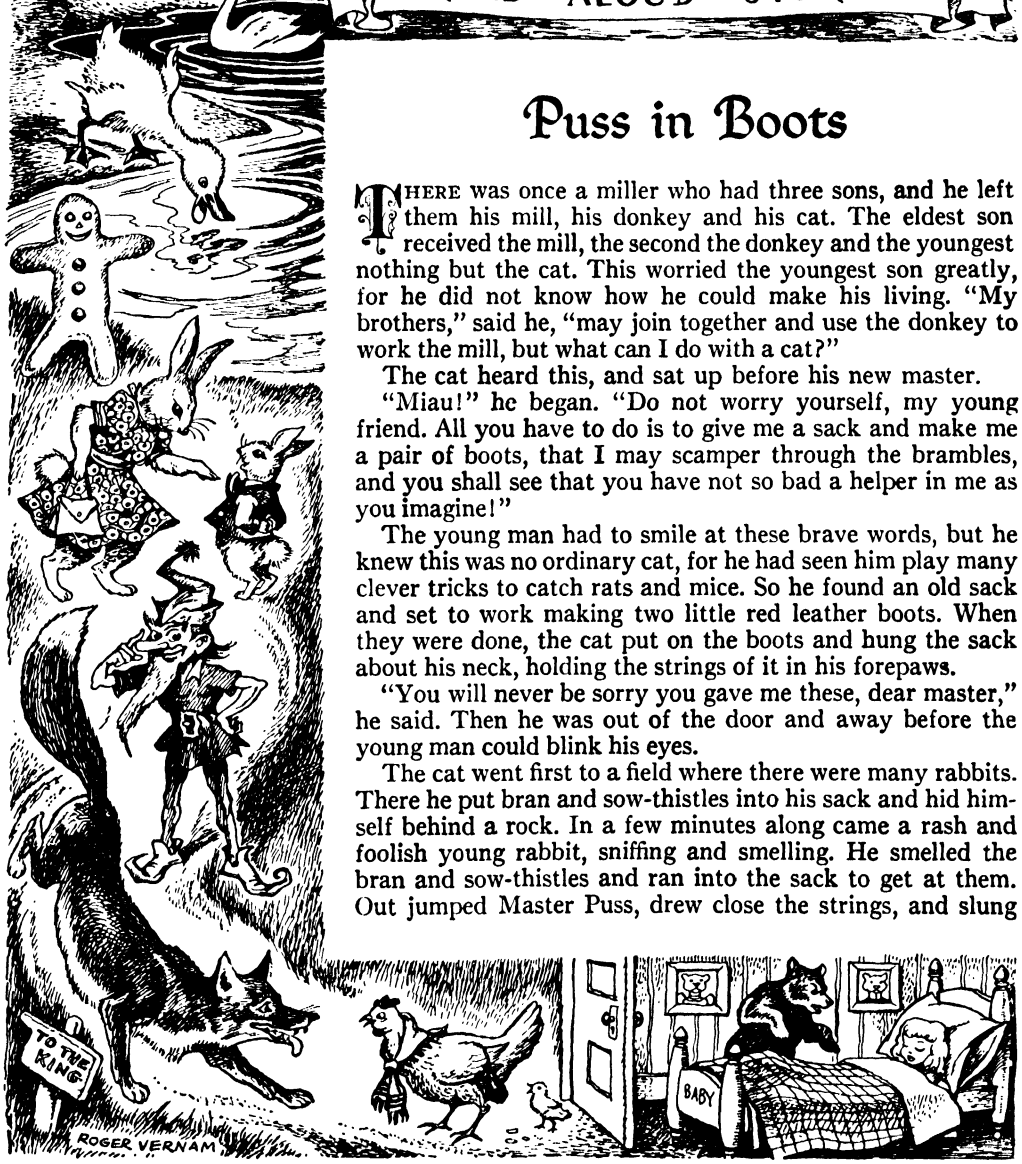
The cat heard this, and sat up before his new master.

"Miau!" he began. "Do not worry yourself, my young friend. All you have to do is to give me a sack and make me a pair of boots, that I may scamper through the brambles, and you shall see that you have not so bad a helper in me as you imagine!"

The young man had to smile at these brave words, but he knew this was no ordinary cat, for he had seen him play many clever tricks to catch rats and mice. So he found an old sack and set to work making two little red leather boots. When they were done, the cat put on the boots and hung the sack about his neck, holding the strings of it in his forepaws.

"You will never be sorry you gave me these, dear master," he said. Then he was out of the door and away before the young man could blink his eyes.

The cat went first to a field where there were many rabbits. There he put bran and sow-thistles into his sack and hid himself behind a rock. In a few minutes along came a rash and foolish young rabbit, sniffing and smelling. He smelled the bran and sow-thistles and ran into the sack to get at them. Out jumped Master Puss, drew close the strings, and slung





the rabbit about his neck. He ran with it to the palace and asked to speak with the king.

"Your Majesty," he said, bowing low, "I have brought you a rabbit which my noble lord, the Marquis of Carabas" (for that was the name which Puss made up for his master) "has commanded me to present."

"Tell your master," said the king, "that I thank him and that he gives me a great deal of pleasure."

On the next day, the cat went and hid himself among some standing corn, holding his bag open and making the sharp sound of a partridge. A pair of young partridges came running when they heard this; they ran right into the open sack, and the cat drew the strings and went again to the king.

"These are from my master, the noble Marquis of Carabas," said he.

This time the king ordered some money given to the cat, and Puss took the money to his master, but would not tell where he got it.

On the third morning, the cat caught two fine plump trout in the brook and carried them to the king.

"These are from my master, the noble Marquis of Carabas," said he. And again the king ordered that money be given to the cat.

Now, on this third morning, the cat overheard two coachmen talking, and the first coachman said: "The king has ordered his coach brought around that he may take an airing along the riverside." And the second coachman said: "Yes, and his daughter, the most beautiful princess in the world, goes with him."

Upon hearing this, the cat ran as fast as he could to find his master, and said: "Come with me and your fortune is made! You must bathe in the river, in that part I shall show you, and leave the rest to me."

The young man did as the cat told him, thinking no harm could come from so simple an act. The water was warm and pleasant, and he swam about, enjoying himself. But while he swam, clever Puss hid his ragged clothes under a rock and ran out to the road. When he saw the king's coach approaching, he cried out as loud as he could:

"Help, help! My lord Marquis of Carabas is going to be drowned!"

At this noise, the king put his head out of the coach window and commanded his driver to stop, whereupon Puss ran up, pretending to be greatly frightened, and said:

"While my master was bathing, there came by some thieves who went off with all his clothes! Now he will not come out of the river, for he has nothing to cover him, and I fear he will be drowned!"

The king immediately commanded the officers of his wardrobe to run and fetch one of his best suits for the lord Marquis of Carabas, and he sent his guards to help his noble lordship out of the river.

When the fine clothes came and the young man, too surprised to speak, was clothed in them, he looked so handsome that the king invited him into his coach to drive on with them, and the princess fell in love with him.

The cat was overjoyed at seeing his plan succeeding, and he scampered on before them. Soon he met with some countrymen who were mowing a meadow. "Good people," he said,

"you who are mowing, if you do not tell the king, who will soon pass this way, that the meadow you mow belongs to my lord Marquis of Carabas, you shall be chopped into mincemeat."

Now came the king riding by. "Who owns this fine meadow?" he asked the countrymen. "My lord Marquis of Carabas," answered they, all together, for the cat's threat had frightened them. The king was well pleased.

Still Puss scampered ahead, and met with some reapers. "Good people," said he, "you who are reaping, if you do not tell the king, who will presently go by, that all this corn belongs to the Marquis of Carabas, you shall be chopped into mincemeat."

When the king passed by and asked to whom all that corn belonged, the reapers replied: "To my lord Marquis of Carabas." And the king, well pleased, told the young man how fine his fields were.

Now the young man, who had been thinking all these things over, began to see what Puss was up to, but he dared not speak out. So he sat up a little straighter and looked at the Princess, and she looked back at him.

Puss came at last to a forest in the middle of which was a castle where there lived a wicked ogre. Now you must know that all the lands which the king had gone over belonged to this castle, and for years the reapers and the mowers had been forced to work for this cruel master.

"What do you want?" the ogre roared, when he saw the cat running through the gate.

"Nothing, nothing," said the cat. "I have heard how wonderful you are and thought I would see for myself. Is it true that you can change yourself into a lion or an elephant or anything else you choose?"

"It is true," answered the ogre, showing his big teeth and rolling his one eye.

"I don't believe it," said the cat. On the instant there came a clap of thunder, and a lion was standing where the ogre had stood.

"Now do you believe it?" roared the lion.

"Oh, well," said the cat, "it's easy enough to make yourself larger. But I don't believe you could make yourself tiny like a mouse."

There came another clap of thunder; the lion was gone, and there was a tiny mouse. Puss no sooner saw this than he pounced upon the mouse and ate him up.

Meanwhile, the king drove up, and seeing this fine castle, had a mind to go into it. Puss heard the noise of the coach and ran out crying:

"Your Majesty is welcome to the castle of my lord Marquis of Carabas."

"What! my lord Marquis!" exclaimed the king. "Does this castle also belong to you? Let us go into it, if you please."

Inside, they found a dinner waiting, which the ogre had prepared for himself, and his majesty was so charmed with the castle and the handsome Marquis of Carabas that he told him he might marry the princess.

So the young man and the princess were married, and the cat danced at the wedding in his shiny red leather boots.

THE NEXT READ ALOUD STORIES ARE ON PAGE 5322.





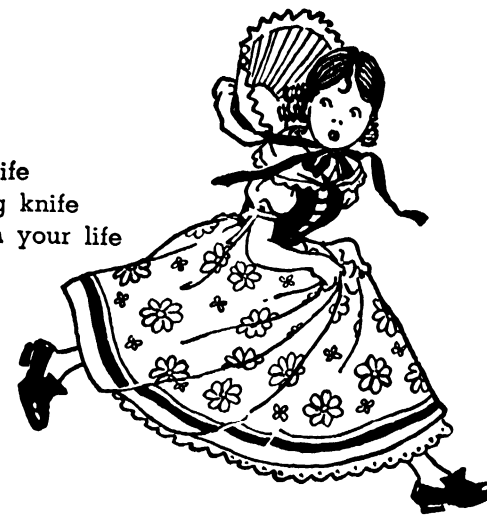
I Had a Little Husband

I had a little husband,
No bigger than my thumb;
I put him in a pint pot,
And there I bade him drum.
I gave him a pair of garters
To tie his little hose;
And a silk handkerchief,
To wipe his little nose.

Three Blind Mice

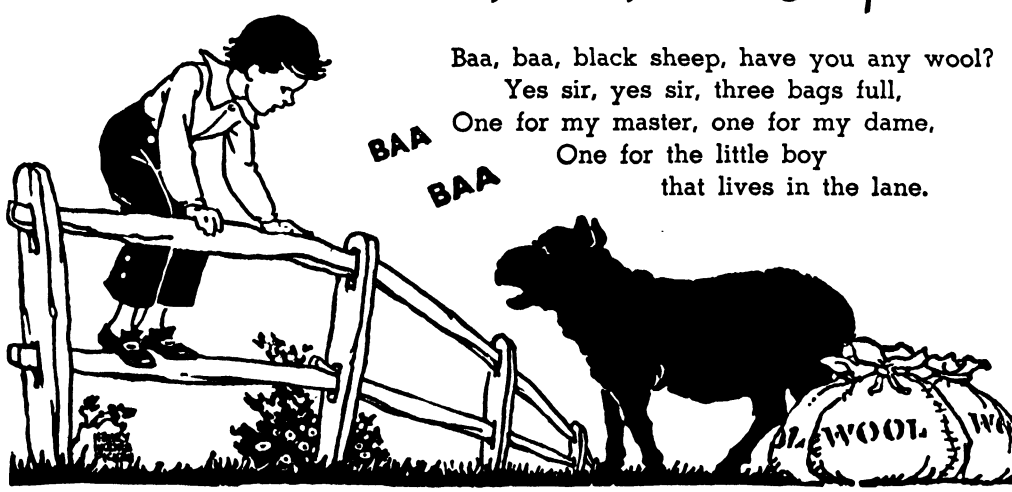
Three blind mice!
See how they run!
They all ran after the farmer's wife
She cut off their tails with a carving knife
Did ever you hear such a tale in your life
As Three Blind Mice?

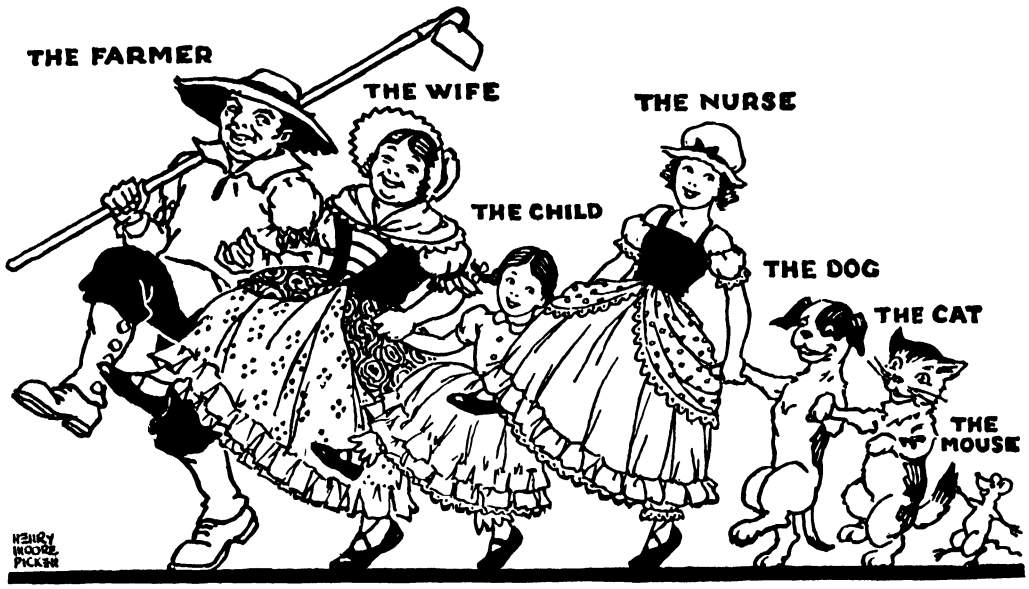




Baa, Baa, Black Sheep

Baa, baa, black sheep, have you any wool?
Yes sir, yes sir, three bags full,
One for my master, one for my dame,
One for the little boy
that lives in the lane.





The Farmer in the Dell

THE FARMER in the dell
The farmer in the dell
Hi-ho the merry-o
The farmer in the dell.

THE FARMER takes a wife
The farmer takes a wife
Hi-ho the merry-o
The farmer takes a wife.

THE WIFE takes a child
The wife takes a child
Hi-ho the merry-o
The wife takes a child.

THE CHILD takes a nurse
The child takes a nurse
Hi-ho the merry-o
The child takes a nurse.

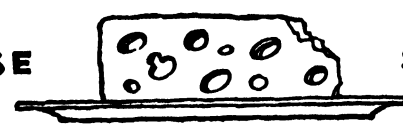
THE NURSE takes a dog
The nurse takes a dog
Hi-ho the merry-o
The nurse takes a dog.

THE DOG takes a cat
The dog takes a cat
Hi-ho the merry-o
The dog takes a cat.

THE CAT takes a mouse
The cat takes a mouse
Hi-ho the merry-o
The cat takes a mouse.

THE MOUSE takes a cheese
The mouse takes a cheese
Hi-ho the merry-o
The mouse takes a cheese.

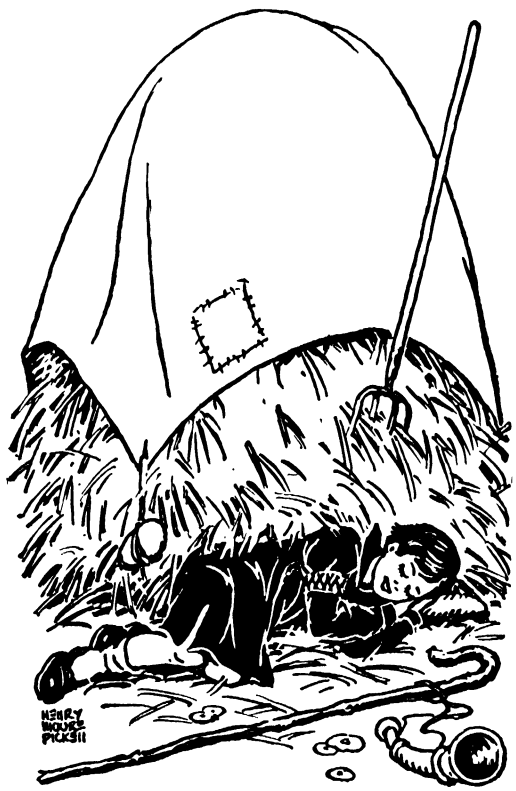
THE CHEESE stays alone
The cheese stays alone
Hi-ho the merry-o
The cheese stays alone.

THE CHEESE  **STAYS ALONE**



There was an old woman
tossed up in a basket,
Ninety times as high as the moon:
But where she was going
I couldn't but ask it,
For under her arm she carried a broom.

"Old woman, old woman, old woman," said I,
"Whither, ah! whither,
whither, whither so high?"
"Oh! I'm sweeping the cobwebs
off the sky,
And I'll be with you by and by."



Little Boy Blue,
Come, blow your horn!
The sheep's in the meadow,
The cow's in the corn.
Where's the little boy
that looks after the sheep?
He's under the haystack
fast asleep.

Roses are red,
Violets, blue;
Honey's sweet
And so are You.



One, I love; Two, I love;
Three, I love, I say;
Four, I love with all my heart;
Five, I cast away;
Six, he loves; Seven, she loves;
Eight, both love;
Nine, he comes; Ten, he tarries;
Eleven, he courts;
and Twelve, he marries.

HOW DOES A GEIGER COUNTER WORK?

DURING the various tests with atomic bombs, Geiger counters were used to find the time when the radioactivity had fallen off to the point where it was safe to go near the targets. That is how many people came to hear for the first time about Geiger counters, those versatile little gadgets which scientists in their laboratories have been using for almost forty years.

The counter is named for the physicist Hans Geiger who, in 1908, first constructed the instrument to measure exactly how much radiation a radioactive material like radium sends out. You probably know that all the atoms in a lump of radium explode by and by. During each explosion rays are shot out from the nucleus of the exploding atom. There are three kinds of such rays: the alpha rays (α rays), which are just little pieces of positively charged material; the beta rays (β rays), which are even smaller but negative particles, also called electrons; and gamma rays (γ rays), which are waves like light, but invisible and very penetrating. The Geiger counter has proved that one ounce of radium sends out over 1,000,000,000,000 α rays every second!

But besides checking α, β and γ radiation, counters in various forms have been used for a host of different purposes. They are able to measure the strength of other kinds of rays—for example protons, cosmic rays, X rays, ultraviolet and even visible light. With the help of a few tricks, one can also detect neutrons, or tell various kinds of rays apart, or even see exactly from which direction the radiation is coming.

Now, how does a counter work? Let us look at one of the first and simplest models. One end of a pointed wire is surrounded by a cylinder, or tube, made by rolling up a sheet of copper. The other end of the wire is connected to a very high resistor, and goes from there on to the metal cylinder. The wire inside the cylinder does not touch the cylinder, and the air between them is ordinarily a good insulator; therefore no current will flow between the wire and cylinder,



Joint Army-Navy Task Force One

The men pictured above are called safety monitors. Equipped with a Geiger counter, they are checking the radioactivity of Bikini Lagoon.

although the electric field is almost enough to make a spark jump from one to the other.

Now, let a ray, say a (positively charged) α particle, shoot through the space between wire and cylinder. As the ray rushes past some one atom in the air, it can rip from the atom a negative electron by collision—or simply by attraction, just as a strong magnet can lift nails out of a keg.

This loss of one negative charge disturbs the delicate balance of positive and negative charges in the affected mother-atom, and leaves it with a surplus of one positive charge. We say the atom has become ionized—it is now a positive ion.

But what happens to the wayward electron that rushed after the passing (positive) α particle? So fast did the α ray travel that the electron, unable to catch up with it, has found itself lost among strange atoms. It may attach itself to one of them as it passes by, and so convert a neutral atom into a negatively charged ion.

But by now the strong electric field between the cylinder and the wire begins to

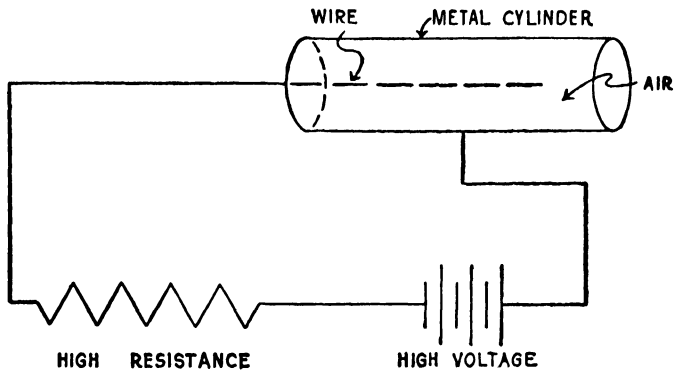


Diagram of the Geiger counter. An ionizing ray passing through the tube causes an electrical current to flow between the wire and the metal cylinder. The tiny discharge of current is then carried through the high resistor. Sensitive devices (high voltage) amplify the discharge and register a click for every ray passing through the counter.

act. The old positive ion (created when the α ray tore an electron from it) will be strongly attracted and pulled over to one side, and the negative ion to the other side. As the two ions gather speed in opposite directions, they may bump into neutral atoms in the air, knocking electrons out of them in their haste, and so they create new ions by collisions. Those new ions, too, will bump into atoms, making still more and more ions.

Together with any electrons that still are floating around unattached, these gathering clouds of ions finally reach the wire or the cylinder. There they are stopped and give up their charges. A tiny equalizing current then flows for a moment from the wire to the cylinder, through the high resistor. And now the counter returns to its undisturbed state; all charges have neutralized one another, and everything is set for the next α particle to start the whole story over again.

With apparatus that may look like a radio set, we can amplify that small discharge of current set off by every passing particle; and so we shall hear a click in a loudspeaker or headphones every time a ray falls into the counter. If the particles come in heavy showers, the noise heard will not be click-click-click, but will rather sound like rain splashing on a tin roof. So you can tell simply by listening to the apparatus whether the radiation all around is weak or strong, safe or dangerous. Or, instead of listening in, we can let the Geiger tube trigger a mechanical counter to show the actual number of rays passing through.

You may wonder how uncharged particles (neutrons) or waves like cosmic rays and light can set off the production of ions when they rush through the counter. We do not yet know exactly in every detail how the Geiger counter works, but we can say that these kinds of rays first knock some ordinary electrons out of the walls of the counter tube or other materials placed near by; these freed electrons are what start the ion clouds.

By some clever yet simple arrangements one can make counters that distinguish between different kinds of rays, and count only one kind even while another kind is also passing through. Another way of making a counter immune to undesired rays is to surround it with a material that absorbs them while letting other rays pass on. Of course, cosmic rays are so powerful that they are not stopped by any man-made screens; they always set off the counter. But luckily they never come down in heavy showers. In one minute only a very few cosmic rays fall into a counter of usual size (a few inches long); normally we can neglect them altogether.

MEASURING HOW RAPIDLY RADIOACTIVE MATERIAL FALLS APART

Here is an interesting and frequent use of the Geiger counter: We can determine with it how rapidly a radioactive material is falling apart. For example, during the explosion of the second atomic test bomb at Bikini the salt in the sea water near the targets became dangerously radioactive. A cupful of water scooped up right after the blast sent out so much radiation that a counter near by fairly went wild trying to record each passing ray. But after about fifteen hours the counter showed that the radiation had died down to half the initial amount. After another fifteen hours it had decreased again by a half, and so on until the radiation became feeble and safe. We call the time needed for the radioactivity to die down to one half of its original strength, the half-life. (For radium it is very long—about 2,000 years!)

Counters can also indicate from which direction the rays are coming. One can take two counters (for instance, one a few feet above the other) and connect their electric circuits so that the loudspeaker will make a sharp noise only if a ray happens to go through both counter tubes. (If you

make a little drawing of the two tubes you will see that rays that can pass through both must come straight from above or below.) With the two tubes in different positions we can then find out how many rays come from different directions. If one takes such a device up high in a balloon or a plane one can prove that cosmic rays come to us evenly from all sides beyond our earth.

Finally we should confess that modern counters are more complicated than our early model. So-called proportional counters, Geiger-Muller counters and many other types, have made this instrument more and more sensitive, speedy and useful. Scientists have even suggested that soon we shall be able to shoot rockets containing such counters and some automatic transmitter stations up to the moon. When they land they would broadcast down to us on the earth how strong the cosmic radiation is up there! But no matter how strangely the newer counters may be used, they still look and act much like the original counter made of a pointed wire in a metal tube.

By GERALD J. HOLTON.

WHAT IS A HEAT PUMP?

When you go for a walk in the country on a cold winter afternoon, you notice little wisps and rising plumes of smoke curling up from the houses that dot the countryside. Each house has a furnace or stoves, and possibly fireplaces. Coal or oil or wood is burning away merrily to keep these homes warm. The wood, however, has to be cut; the coal has to be shoveled, or oil has to be delivered by truck to a storage tank and piped into the cellar. This involves a great deal of work.

Twenty years from now all of this may be very much changed. On your walk through the country you may then see no smoke from burning coal or wood pouring from chimneys. Perhaps there will be no chimneys, for we may by then be heating our homes from the great furnace in the earth. Think what a saving this would be in labor and fuel. While we have plenty of coal as yet, our supplies of oil are dwindling; and it will be eons before nature can make more. But heat from the earth is inexhaustible.

Yes, in the ground, whether it is covered with the green cloak of summer or with cold, white layers of snow, there is a great deal of heat—an actual furnace in the earth. Below a certain level, the earth never freezes. How far down that level is depends on your position on the globe. Below this freezing line, whatever its depth, the ground remains at the same temperature throughout the year. In New York, for example, the temperature of the earth thirty feet below the surface is always about 52° F. To the north the temperature at that depth is generally colder—to the south, it is warmer. For each additional sixty feet of depth, the temperature increases by one degree.

Engineers have now learned how to draw heat from this great furnace in the earth, to keep our homes comfortable in cold weather —without coal, wood or fuel of any kind. The new kind of miracle furnace that taps the heat reserves in the earth is known as a heat pump.

The heat pump itself is not a very large machine. It could be encased in a steel box about six feet high, six and a half feet long and three feet wide. It could be kept up in the attic, or down in the cellar, or even under the kitchen steps.

To draw on the vast, ever present supply of heat within the earth, the heat pump burrows deep underground. One kind of heat pump has a loop of one-inch pipe that runs from the pump down to a depth of two hundred feet below the surface of the earth. This loop of pipe then arches back up through the earth and into the pump again. Circulating through the pipe and the pump is the vital blood stream of the heat pump, a liquid known as a refrigerant, a word that comes from the Latin word meaning coolness. This liquid carries the heat from the earth into your house.

The heat pump, strangely enough, works in very much the same way as does the refrigerator in your mother's kitchen. In your refrigerator, cold air is not pumped into the compartment where the food is kept, as so many people imagine; instead, heat is taken away from the food. In a chamber in your refrigerator a gas that will easily turn into liquid—perhaps ammonia or sulfur dioxide —is put under great pressure. The gas is then forced into another chamber and into metal coils where it is cooled to such an extent that it becomes a liquid. After this the liquid passes into the coils inside the food chamber of the refrigerator, where it changes back into a gas. As it evaporates, it takes up heat from the food stored in the refrigerator. Then the gas, containing the heat absorbed from the food, passes out of the food compartment. It is again put under pressure, cooled to liquid form, and pumped back through the coils.

The heat pump, instead of extracting heat from food as does the gas in your refrigera-

tor, draws heat from the earth. Let us see what happens to the liquid refrigerant in its journey through the pump and its coils of pipe. When it starts down through the pipe into the earth, the liquid is cold, but as it travels downward the fluid begins to pick up heat. The farther down it travels, the more heat it collects. On its return trip to the pump, the liquid runs no risk of losing the heat it has gathered, since the upper half of the pipe through which it passes back to the pump is well insulated, or protected, against the loss of heat. Before the refrigerant enters the pump itself, the heat it picked up from the earth is widely scattered throughout the liquid. Then, in the pump, the liquid is compressed or squeezed together into a smaller space and the heat is concentrated. As a result of this, the temperature of the liquid shoots up.

Now the "hot" refrigerant passes out of the pump, into other coils that are not insulated. As the air passes over these coils, it becomes warm. This warm air is then distributed throughout the house. The refrigerant has now given up much of its heat. It is further cooled by being allowed to expand. By this time it is ready to return once more to its duties of picking up heat from deep underground.

The heat pump can draw heat, not only from the earth, but also from the air, or even from the water in deep wells, from any source with a year-round temperature between 40° and 80°. With a heat source of only 50° the pump can warm a house to 70°.

You may wonder how heat can be extracted from well water, which is famous for being cold. Well water is usually at a temperature somewhere between 50° and 55°, which makes it a good source of heat for the pump. Everything contains some heat, even if it is cold by our standards. Only at absolute zero (—459.6°) is there no heat whatever. Even in a cold stone there is heat that could be used if there were some way of getting at it.

When summer comes, the heat pump proves its usefulness in another way. A turn of a switch or of a valve will reverse the direction in which the liquid flows in the coils. Then the refrigerant will pick up heat from your uncomfortably warm house, transfer it to the earth which will be cooler than the air, and return to the house bringing coolness. The air in the house, as it passes over the coils of the pump, gives up its heat, and the house is cool.

DOES HOT WATER TAKE MORE ROOM OR LESS ROOM THAN COLD?

If we take water at 32° Fahrenheit, the freezing temperature, and then slowly heat it, we find that it shrinks until it reaches 39.2° on the same thermometer. That, however, is a special exception. If we go on heating the water after 39.2° Fahrenheit, it expands and takes up more room. This is true of almost anything—solid, liquid, or gas.

We can find some kind of explanation for this if we think of heat as a to-and-fro motion of the tiny parts of which all matter is made. The hotter the thing, the wider is this to-and-fro motion of its particles.

Suppose we have a crowd of children standing still in a room. The only to-and-fro motion each of them makes is in breathing. Fifty such children could stand close together in a small room. If, instead of making only the little movement of breathing, each of them wanted to be making little runs of five yards backward and forward, they would not be able to remain in so small a room as before.

If, instead of children, we think of molecules of matter, and if we think of heat as sending these molecules of matter running to and fro, we shall see why water and other things swell when they are heated. No one knows just what happens in the case of water between 32° and 39.2° Fahrenheit.

WHAT IS A THERMOSTAT?

A thermostat is a kind of thermometer that does more than merely tell the temperature; it regulates the temperature. If you live in a house heated by a modern oil-burner you know that there is a thermostat with a lever which may be set for whatever temperature you choose.

Let us say we have set this lever at 70°. The furnace in the basement is going full blast and the temperature in the living-room slowly rises. The thermometer in the thermostat also rises. The moment 70° is reached the thermostat makes a contact that shuts off the furnace. When the temperature falls below 70° again, the thermostat makes another contact that turns the furnace on again. The temperature is kept even.

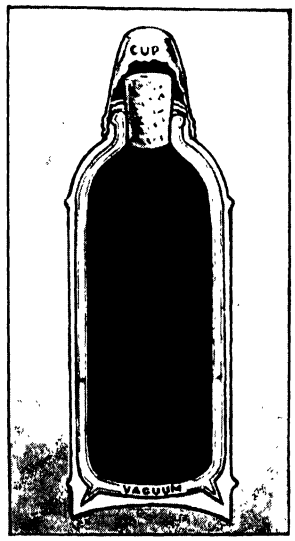
A similar thermostat turns the machinery in a mechanical refrigerator on and off, only here the thermostat is set at a low temperature. Sometimes thermostats are used to set off fire alarms. The thermometers in these thermostats, by the way, are not always the usual mercury thermometers we know, but

instead often use other liquids, gases or even solid metals. However, whatever material is used, they all perform the same duty.

WHAT IS A THERMOS BOTTLE?

A thermos is a double bottle (one sealed inside the other) that keeps a hot liquid hot for hours. *Thermos* is simply the Greek word for heat; but it is really not a particularly good name for a thermos bottle; though it keeps a hot liquid hot, it also keeps a cold liquid cold. That fact really gives us the key to what happens. Heat is something, and cold is only the absence of heat. Therefore, when this bottle keeps a hot thing hot, it must, somehow or other, be keeping the heat in, and when it keeps a cold thing cold, it must somehow be keeping heat out.

Now, we know perfectly well that a woolen blanket, for instance, acts in just the same way. It will keep a hot thing hot because it keeps heat in, and it will prevent ice from melting because it keeps heat out. It does these things because it is a very poor conductor of heat.



A thermos, or vacuum, bottle is really two bottles, one inside the other, with a sealed space between. The air has been drawn from the space.

A thermos bottle is also a bad conductor of heat. Between the outer and inner walls there is a space from which most of the air has been pumped out. If there was the usual amount of air in this space, the air would very quickly conduct the heat from the inner wall to the outer wall, or from the outer wall to the inner wall. However, the space between acts very much like a moat or a ditch over which the heat can not jump in or out. When these bottles were first made, they were called vacuum bottles; but that is not a good name, for the space is not a complete vacuum. A little air is left.

WHERE DOES THE WARMTH IN OUR BODIES COME FROM?

Our warmth is the result of the burning that goes on ceaselessly within our bodies. We do not realize how much this burning is, for we are always losing heat. If we lost no heat, our bodies would become as hot as boiling water in a few hours. All this heat is made by the burning of our food. It burns, as other things burn, by combining with oxygen, and that comes into the body through our breathing. The chief part of the burning that produces our heat occurs in our muscles, and in the large gland—the largest in the body—called the liver.

We may think of the muscles as the furnaces of the body, and the fuel burned there is mostly fat and sugar. A great deal of heat is produced when a muscle contracts, and that is why hard exercise makes us so hot. Even when the muscles are still, this making of heat is always going on. The liver, too, is always active; and the blood leaving the liver is hotter than the blood going to it.

Though all parts of the body do not produce equal warmth, they are all kept at about the same temperature by the circulation of the blood. This circulation takes heat from the hottest places, such as the liver, and carries it to the coldest places, such as the fingers and toes. In a cool room, if you have grown chilly sitting still, you can get warm most quickly by getting up and exercising vigorously. This will make the blood move faster and also increase the burning of the fuel in the muscles used.

WHY DO WE NOT SEE OUR BREATH ON A WARM DAY?

Though the breath coming out of our bodies is always about the same temperature, the temperature of the air outside varies very much. You know that there is a good deal of moisture in our breath, in the form of water gas. On a cold day this gaseous water condenses as it leaves our bodies. That is, it is suddenly turned so cold that it forms a little cloud, made, like other clouds, of drops of water. That is what we see when we say that we see our breath. It is the water in our breath that has been turned liquid by the cold. There is just as much water in our breath on a warm day, but then it remains in the form of a gas as it comes from our bodies. But if we take a piece of cold glass, even on a warm day, and breathe on it, we get a little cloud of water on the glass, and that is "seeing breath."

THE NEXT WONDER QUESTIONS ARE ON PAGE 5081.

American Writers for Children



EVER since the day, some three hundred years ago, when the first literary-minded settler prepared the first hornbook for colonial children, American writers of juvenile literature have climbed a rocky road of progress. Beset on the one side by adult standards and demands, and on the other side by children's own reading interests — which were often in direct conflict with adult ideas — authors have struggled and changed with the new country, passing through several eras of writing style.

To understand the slow progress of American writers from their first stilted preachments to our modern tales, one must study them against the background of their times. They appear to divide into the following, according to four eras: 1) 1638-1800: the Religious Writers; 2) 1800-60: the Romantic and Moralistic Writers; 3) 1860-1910: the Realistic and Adventure Writers; 4) 1910-45: the Transition Writers.

The Religious Writers: 1638-1800

In the year 1638 the first shipment of printing type arrived in the American colonies and was set up in Cambridge, Massachusetts. But the first children's books printed were not written by American authors. The great English ships that sailed into the harbors of the New World brought tracts and books which were pirated by American printers: that is, they were copied. American writers—what few there were—were ignored. Early printers, who built their shops near the harbors as a matter of convenience, found it easier to take a batch of pamphlets off a ship, and copy them, than to seek out American writers in the "backwoods." And the pioneers were too busy clearing fields, tilling land and fending off Indians to spare time to write or to take long, difficult journeys to the printers. Unfortunately, the result of this beginning was that for over two hundred years Americans read mostly the work of English writers. Even as late as 1800, only about 30 per cent of the books printed in America were by American authors. This figure had risen by 1860 to about 70 per cent; but for a long time, most American writers used European books as models for their own work. Only within our century has American writing become truly American.

The first American children's book was not, properly speaking, a book at all, only a thin board on which was pasted a printed page containing the alphabet and a prayer. It was called a hornbook, because a thin, transparent covering of horn protected the page from soiling or tearing. It was soon replaced by the NEW ENGLAND PRIMER, a tiny, crudely bound book, first printed about 1690, which contained the alphabet, spelling words,

catechism and verses for religious training. For over a hundred years, in dozens of revised forms, this most famous of all early children's books was the standard elementary text. Its original author is unknown.

The first American writer for children of whom we have record is Cotton Mather of Boston (1662 or 63—1727 or 28). Books were published for children before Mather's time; the first NEWBURY CATECHISM probably came out in 1642; and Increase Mather, father of Cotton, wrote before his son did. But Cotton Mather was the first to write anything but catechisms, hymnals or instructions. This does not mean that he wrote to amuse or entertain the young! His best-known children's book, published in 1700 and reprinted thereafter for more than fifty years, was A TOKEN FOR THE CHILDREN OF NEW-ENGLAND OR, SOME EXAMPLES OF CHILDREN, IN WHOM THE FEAR OF GOD WAS REMARKABLY BUDDING BEFORE THEY DIED, IN SEVERAL PARTS OF NEW-ENGLAND. This book with the very long title was printed as an addition to the famous work of an English author: the Reverend Janeway's A TOKEN FOR CHILDREN. Although Cotton Mather had fifteen children of his own, he never wrote with tenderness or love, but solely to exhort and terrify the young into being good. He was a prodigy of learning; he entered college at twelve, was a preacher at seventeen, and wrote 470 books and tracts in six languages, including an Indian dialect. Every publication of his which has been preserved breathes the stern and terrible righteousness of the early Puritan. For a hundred years, the Puritan spirit was the soul of all writing; indeed, children were taught their letters chiefly that they might read their Bibles and catechisms. The first printing presses were in Boston and Philadelphia, where the Puritan influence was strong, so even the lighter-spirited southern colonies had little but religious tracts to read until the Virginia presses got to work.

A few more titles are perhaps especially worth noting for their extreme lack of cheer. The first, a funeral elegy by Benjamin Colman, was printed in Boston in 1714: A DEVOUT CONTEMPLATION ON THE MEANING OF DIVINE PROVIDENCE, IN THE EARLY DEATH OF PIOUS AND LOVELY CHILDREN. In the same year, not to be outdone by Boston, an unknown Philadelphia writer brought out A LEGACY FOR CHILDREN, BEING SOME OF THE LAST EXPRESSIONS, AND DYING SAYINGS, OF HANNAH HILL, JUNR. OF THE CITY OF PHILADELPHIA, IN THE PROVINCE OF PENSILVANIA, IN AMERICA, AGED. ELEVEN YEARS AND NEAR THREE MONTHS. Cotton Mather replied with EARLY PIETY IN ELIZABETH BUTCHER OF BOSTON, BEING JUST EIGHT YEARS AND ELEVEN MONTHS.

We have called the writers of this era the religious writers because even their primers were full of the religious spirit and tradition, yet the colonial children did have fiction. It was in the form of little chapbooks, so-called because they were first peddled in the streets in England by men called chapmen. These were folk tales, such as TOM THUMB, brought from the great presses of England and reprinted in America. They became numerous after 1744, when John Newbery of London began to publish children's books, but Cotton Mather and other American ministers fought their "pernicious influence."

The NEW ENGLAND PRIMER was followed by Noah Webster's first SPELLING BOOK. Written in its original form in 1782, this speller was the first American text to include material not exclusively religious, but Webster took care to include, here and there among the spelling lessons, fables and stories with religious and moral warnings. Webster's speller, like the NEW ENGLAND PRIMER, lasted a hundred years; it was used until readers took the place of spellers.





After the Declaration of Independence, patriotism brought a change in the spirit of children's books. Pride in the country aroused writers to tell young people how fortunate they were to be growing up in a brave, new, free world. They wrote life stories of the Revolutionary heroes, and American geographies and natural histories. After the Revolutionary War was won, this patriotic pride blossomed vigorously. Freedom was in the air. Writers were turning out native American fiction, and stories that combined fiction and facts—factual narratives, we may call them. One of the earliest of the narratives was A WONDERFUL DISCOVERY OF A HERMIT by an American who was thought to be James Buckland. Printed in 1786, it was one of the best sellers of the year.

Few of these early narratives were preserved, for children read them with more zeal and destructiveness than they did the "Dying Sayings," but we know that they were numerous, as they were mentioned in the advertisements of early booksellers.

Following is a list of early books for children. Many of the books named may be seen in the A. S. Rosenbach collection in the Free Library of Philadelphia. You will notice that most of the titles are extremely long and explanatory. This was the custom in books for grownups too in those days.

EARLY BOOKS FOR CHILDREN

DATE	AUTHOR	TITLE
1642?	James Noyes	THE NEWBURY CATECHISM
1699	Cotton Mather	A FAMILY WELL-ORDERED
1700	Cotton Mather	A TOKEN FOR THE CHILDREN OF NEW-ENGLAND
1702	George Fox	INSTRUCTIONS FOR RIGHT-SPELLING, AND PLAIN DIRECTIONS FOR READING AND WRITING TRUE ENGLISH
1714	Benjamin Colman	A DEVOUT CONTEMPLATION ON THE MEANING OF DIVINE PROVIDENCE, IN THE EARLY DEATH OF PIOUS AND LOVELY CHILDREN
1714	Samuel Moodey	JUDAS THE TRAITOR HUNG UP IN CHAINS
1727	William Penn	FRUITS OF A FATHER'S LOVE
1727	Thomas Prince	MORNING HEALTH NO SECURITY AGAINST THE SUDDEN ARREST OF DEATH BEFORE NIGHT
1738	Samuel Phillips	THE HISTORY OF OUR LORD AND SAVIOUR JESUS CHRIST EPITOMIZ'D
1745	?	THE HISTORY OF THE HOLY JESUS
1779	Anthony Benezet	THE PENNSYLVANIA SPELLING-BOOK, OR YOUTH'S FRIENDLY INSTRUCTOR AND MONITOR
1786	James Buckland (?)	A WONDERFUL DISCOVERY OF A HERMIT
1794	Charley Columbus	THE NATURAL HISTORY OF BEASTS
1795	Tommy Trip	THE NATURAL HISTORY OF FOUR-FOOTED BEASTS
1795	Nathaniel Dwight	A SHORT BUT COMPREHENSIVE SYSTEM OF THE GEOGRAPHY OF THE WORLD
1797	Enos Weed	THE AMERICAN ORTHOGRAPHER, IN THREE BOOKS
1803	Caleb Bingham	JUVENILE LETTERS

The Romantic Writers: 1800-1860

The sixty years between 1800 and 1860 saw a tremendous increase in the number of writers for children, and as the harshness of early Puritanism waned, fiction and narrative became more common. There were now schoolmistresses as well as schoolmasters. Like the men, the women wrote texts first and, later, stories. One of the first American women to write for children was Susanna Rowson, a Boston schoolmistress, whose book, A SPELLING DICTIONARY, was published in 1807.

Fiction was at first either an imitation of the English folk tale or was based on folklore. John Davis' CAPTAIN SMITH AND PRINCESS POCAHONTAS, AN INDIAN TALE, was published in 1805. At about the same time, Noah Webster wrote his only work of fiction for the young, THE PIRATES. As fiction for children increased, it took on a pattern. Stories were short, patronizing and ended in a moral.

The children in the stories were either little angels or they were very, very bad, with a pride, curiosity (considered a lamentable trait in the young) or disobedience that was fittingly punished. Such a book was STORIES FOR LITTLE CHILDREN, written by S. Hayes. This is one of the earliest pieces of American fiction which has been preserved. That kind of writing, where the people and places and happenings are not true to life, is called romantic writing, and the authors are called romanticists.

After 1815, stories and poems for children appeared in great numbers, and romantic writing became very popular. This kind of writing is highly imaginative, sometimes telling of heroes and marvelous happenings, or perhaps of places where everything is ideal. In nineteenth-century America, the romanticists wrote fiction and poetry. They liked mythical or legendary plots and they pictured events of a long-gone day or a remote place.

Many of the romanticists were women, of whom the most important are the following:

A FEW EARLY WOMEN WRITERS

AUTHOR	DATES	TITLE
Mrs. Sarah Josepha Hale	1788-1879	"MARY HAD A LITTLE LAMB"
Eliza Leslie	1787-1858	ALTHEA VERNON; THE AMERICAN GIRL'S BOOK
Catharine Maria Sedgwick	1789-1867	LOVE TOKEN FOR CHILDREN
Lydia H. Sigourney	1791-1865	POETRY FOR CHILDREN
Lydia Maria Child	1802-1880	PHILOTHEA, A ROMANCE



Alice Cary (1820-71) and Phoebe Cary (1824-71) form a connecting link between the women writers of the early 1800's and those who came later. The gifted Cary sisters wrote mostly poetry, and produced perhaps the best juvenile verse yet written in America. Juvenile writing means writing for young people. The work of Phoebe Cary was particularly distinguished. Her poem THE LEAK IN THE DYKE is on school reading lists today; its setting—the ever-present threat of the sea in Holland—teaches geography as well as the heroism which is the theme of the poem. You may read the poem on page 4472.

Some of the books which children love best were written, not for boys and girls, but for adults. Children today still enjoy some of the stories of one of the great men of letters of this era, Washington Irving (1783-1859). Among these are the rollicking DIEDRICH KNICKERBOCKER'S A HISTORY OF NEW YORK, published in 1809, which has been called the first great book of humorous writing in American literature; the tale of RIP VAN WINKLE, published in 1819; and THE LEGEND OF SLEEPY HOLLOW, published the next year.

Three men who wrote for children are important in the latter part of this era. Each was unique in his style of writing and each started a new trend in children's literature. These men were Samuel Goodrich, Jacob Abbott and Nathaniel Hawthorne.

Samuel Griswold Goodrich (1793-1860), writing under the name of Peter Parley, published more than a hundred books for young



people, including geographies, histories, travels, stories and popular accounts of the arts and sciences. His was the most varied talent up to this time in the field of children's books.

Jacob Abbott (1803-79) was a wise and understanding minister and educator, possessing one of the finest intellects of his day. He believed that every book for children should have two objects—entertainment and instruction. One of the first to write books in series, he began the famous ROLLO books in 1834. Among other series which he wrote for children were the FRANCONIA STORIES and the LUCY books (Lucy was Rollo's cousin). In addition, he wrote American histories and short stories. Little Rollo was the best-known



literary character of his time, and children are said to have learned more geography and European history from Rollo's travels than they did from their school books.

Nathaniel Hawthorne (1804-64) introduced an entirely new note into children's literature. Instead of writing down to children, instructing them and preaching at them in the guise of a story, he wrote as he would have written for adults, with depth of thought and great power. His was the greatest writing genius that had yet been employed in America expressly for the entertainment of children. Hawthorne's WONDER BOOK FOR GIRLS AND BOYS (published in 1851) and his TANGLEWOOD TALES FOR GIRLS AND BOYS (published in 1853) were planned and written for children. They were such masterpieces that they still live as fresh as when they were written. This great romanticist gave to children, as he did to adults, the full flowering of his poetic genius, his deep knowledge of human nature and his charming style.

Two other men writing at about this time had a great effect upon children's literature although their books were written for adults. These were James Fenimore Cooper and Herman Melville. Cooper (1789-1851) is best known for his Leatherstocking Tales: THE DEERSLAYER, THE LAST OF THE MOHICANS, THE PATHFINDER, THE PIONEERS and THE PRAIRIE. These five stories tell of the American Indian and his hopeless but brave struggle with white men. In many respects, Cooper showed life in America as it really had been. The sea, the primeval forest and the prairie were the settings for his great narrative genius; Europeans, who read his books in many translations, learned for the first time about America's grandeur and beauty. Cooper was a romanticist in his love of high adventure, but many of his descriptions were surprisingly accurate and real.

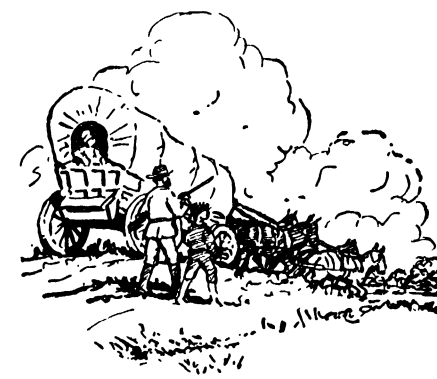
Herman Melville (1819-91) wrote sea stories which were excellent in every respect. TYPEE, published in 1846, was followed by OMOO, MARDI, REDBURN, WHITE-JACKET and then by his great masterpiece, MOBY DICK, which was published in 1851 and dedicated to his friend Nathaniel Hawthorne. Melville never again equalled these stories of adventure, written before he was thirty-three years old. These stories of sails and sailors, with a touch of mystery and suspense, had an immediate effect upon writers for children. Observing how popular Melville's books became



with children, other writers hastened to imitate them.

Each of the writers named above was followed by a large number who consciously or unconsciously copied their style or content. Some of these less talented followers attained considerable importance in their own right. Such a one was the Reverend Daniel Clarke Eddy (1823-96) whose WALTER books sent his young hero, Walter, on travels through the Holy Lands in much the same way that Abbott had taken his Rollo through Europe. Walter Aimwell achieved popularity with his series of realistic tales with such titles as OSCAR, OR, THE BOY WHO HAD HIS OWN WAY, and JERRY, OR, THE SAILOR BOY ASHORE.

Among the children's magazines started in this 1800-60 period was the beloved YOUTH'S COMPANION. The magazines were encouraging to writers, giving an outlet for their stories and some financial return.





The Realists: 1860-1910

After the year 1860, writers for children, following the lead of Abbott, Goodrich, Cooper and Melville, became increasingly realistic. Realism is the form of writing that is based on fact, on the everyday situations in which real people might find themselves in actual life. As romanticism prefers the mythical or legendary in plot, and pictures events of a long-ago-and-far-away world, realism prefers the factual in plot and pictures native scenes in a present-day world. Home and school life and adventure in various parts of the United States were the themes of the new realists.

The most successful of the realists during this era was Louisa May Alcott (1832-88), who has aptly been called "Invincible Louisa." Her LITTLE WOMEN broke completely from the English tradition and was as American as pumpkin pie. The first volume of LITTLE WOMEN, written in 1868, was so popular that Miss Alcott wrote a second volume the next year. This beloved story was followed by AN OLD-FASHIONED GIRL, LITTLE MEN, EIGHT COUSINS, ROSE IN BLOOM, SILVER PITCHERS, UNDER THE LILACS, JO'S BOYS and other stories. Miss Alcott had great talent, and her stories of home life paved the way for other writers, but her gift for making characters really seem to live was something that could not be imitated. As Hawthorne was a milestone in the previous period, Louisa May Alcott was a milestone in this later period.

The work of Hawthorne and Alcott and other gifted writers who were turning their talents to juvenile literature was along conventional, approved lines. There was, how-



ever, an entirely new and unconventional trend starting in America, so sensational that it upset the whole writing world. Yet it started mildly enough. In the summer of 1860, the printing house of Beadle and Company — later, Beadle and Adams—published MALAESKA: THE INDIAN WIFE OF THE WHITE HUNTER, by Mrs. Anne S. Stephens. Mrs. Stephens, a woman of culture and education, was a well-known writer, and her story had first been published as a prize story in the LADIES' COMPANION. Beadle brought it out as a small book, measuring four by six inches, with a salmon-colored cover bearing a picture of Malaeska in native costume. The important thing was that it cost only ten cents. Partly because the story was good and partly because the price was low, MALAESKA was a great success—and the dime novel was born.

In October, 1860, Beadle and Company published the eighth little book in this new venture—the first novel of young Edward S. Ellis: SETH JONES; OR, THE CAPTIVES OF THE FRONTIER. This was a story of the New York wilderness in 1785. Six hundred thousand copies of SETH JONES were sold and it was translated into a number of foreign languages. But more than that, SETH JONES made the dime novel the property of youth, or of the juvenile-minded whatever the age.

Beadle's dime novels were published at the rate of one a week and soon Beadle was keeping writers at work in a room above the printing presses, turning out stories at lightning speed. Other publishing houses entered the field, made contracts with writers and dropped the price to a "half-dime." The thin books (no bigger than pamphlets) were a literary sensation. The stories were of romance and adventure in American settings — tales of Indians and whalers, hunters and soldiers, of the new West and of the frontier.

The young soldiers of the Civil War exchanged dime novels, eagerly awaited new ones, and more than one soldier died with a dime novel clutched in his hands. In three years' time, five million dime novels had been sold, and after ten years of undiminishing sales there was hardly an American boy who did not have a little stack of them secreted somewhere, away from disapproving parental eyes.

The dime novel was uniquely American; its writers were the first to dramatize the American pioneers and the opening of the West. Its settings were often highly authentic.



Many of the writers were frontiersmen themselves. After about thirty years of popularity, however, the stories cheapened to a sensationalism that aroused a storm of protest from adults, and finally lost the interest of the young people. But before that day came, the names of many dime-novel writers were engraved on the hearts of youth.

Perhaps the most picturesque of the dime-novel writers was Colonel Prentiss Ingraham, who wrote over 600 stories. He was a professional soldier who fought in the Civil War and later fought under several foreign flags. He was a companion of Buffalo Bill (William F. Cody) in the West, and Buffalo Bill became the hero of about 200 of his novels. Indeed, it is likely that he was "ghost writer"



for many of the novels attributed to Buffalo Bill himself. A ghost writer is one who does the actual work on a piece of writing to be published under another person's name.

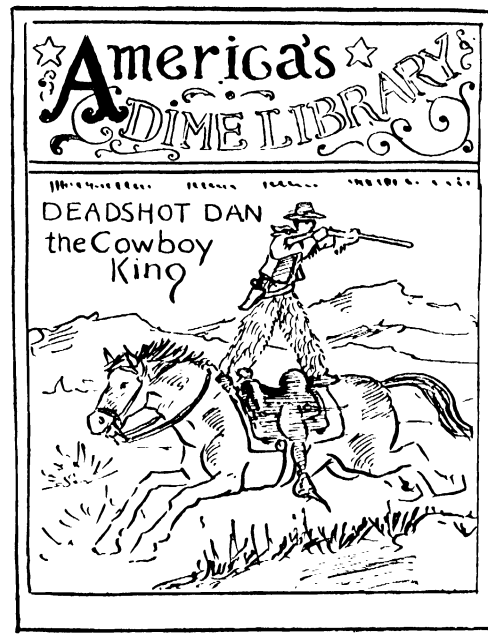
Not so striking in appearance, but fully as colorful in the stories he wrote was Edward L. Wheeler, creator of the famous Deadwood Dick tales, including DEADWOOD DICK ON DECK; OR, CALAMITY JANE, THE HEROINE OF WHOOP-UP. Another Army man was Major Sam S. Hall, or "Buckskin Sam" as he called himself. He was a frontier boy and wrote of frontier life, with such titles as DOUBLE DAN, THE DASTARD; OR, THE PIRATES OF THE PECOS.

One of the most striking things about this group of writers was the tremendous torrent of words which flowed from their pens. In the case of Ellis, whose SETH JONES we have mentioned, his writings are almost too numerous to count. He wrote under at least six different pen-names and had more than that number of publishers. Besides his many adventure and hero stories, he wrote a great deal of biography and history as well as a number of textbooks.

Edward Zane Carroll Judson was another prolific writer, producing some 400 novels. (A prolific writer is one who writes many works.) He wrote under the name of "Ned Buntline." His life was filled with one extraordinary adventure after another. When he was a youngster he ran away to sea as a cabin boy; after that, his experiences continue to sound very much like one of his own dime novels. In later years he told people that he had been chief of the Indian scouts with the rank of colonel. He is credited with giving Cody the nickname of Buffalo Bill; for a time the two were boon companions and Buffalo Bill is the hero of a number of his novels.

Three other astonishingly prolific writers were: Joseph E. Badger, another frontiersman, who penned such tales as OLD BULL'S EYE, THE LIGHTNING SHOT OF THE PLAINS; Albert W. Aiken, whose Western and detective stories were for years turned out at the rate of one a week; and Charles Dunning Clark who, under the pen-name of "W. J. Hamilton," specialized in historical novels and Indian tales.

When dime novels died of their own cheapness and sensationalism, their place was taken, in youthful favor, by small paper or cloth-bound books, written in series. School life and athletic achievement were the favorite themes



of these new books. To be sure, they were not exactly new as to content. As early as 1850, William Taylor Adams (1822-97) had pioneered in the field of adventure writing in series form, and became best known for his books and short stories written under the name of "Oliver Optic." He found time as well to edit the popular OLIVER OPTIC'S MAGAZINE FOR BOYS AND GIRLS. The Oliver Optic heroes were all athletic, manly, upright lads whose shining virtue and habit of exhorting others to equal virtue would be painful to today's young readers; but their exciting adventures on land and sea were popular reading for the youths of that day.

One of the most popular authors of books for boys was Horatio Alger (1834-99). In New York City, Alger became very much interested in the Newsboys' Lodging House and spent much of his time there. The street gamins were devoted to him, and he wrote many books about their way of life, including the popular RAGGED DICK and the LUCK AND PLUCK series. In his stories, virtue and hard work were always rewarded with success, and his biographies of American statesmen followed the same formula, under such titles as FROM FARM BOY TO SENATOR and FROM CANAL BOY TO PRESIDENT. Many of Alger's books were reprinted until far into the 1900's and some are still being republished today.

To modern children, the Alger tales may appear stiff and silly, but they present a true picture of the ambitions of most American boys from about 1870 to the turn of the century (around 1900).

An even more prolific writer than Alger was George W. (Gilbert) Patten (1866-1945). Writing under the pen-name of "Burt L. Standish," he created Frank Merriwell, a flawless hero, whose school and athletic adventures formed the longest series of books ever produced in any land. Writing his first Merriwell stories in 1896, Patten wrote weekly stories about him for many years. Before the adventures of Frank and his brother, Dick, had run their course, Patten had written 900 stories. After their first publication, they were reprinted in 208 books, of which some 125,000,000 copies have been sold.

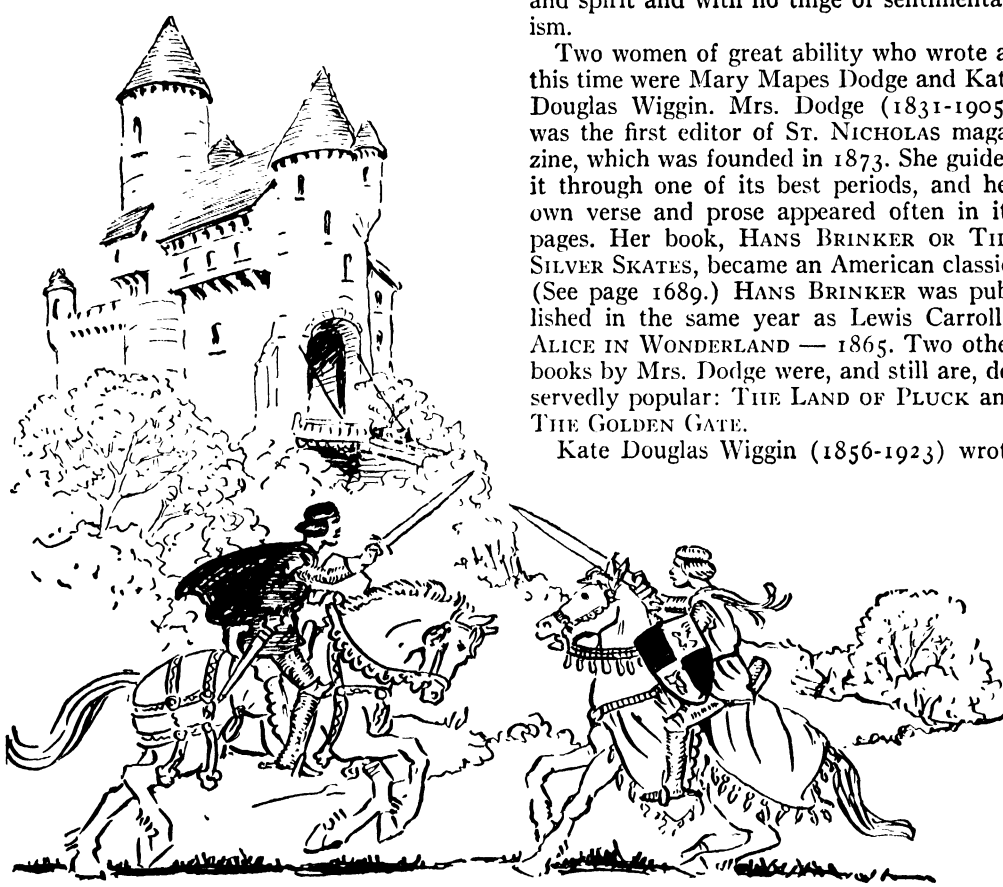
Alger and Patten were the last of a group of prolific fiction writers whose output has been called "unparalleled in the history of literature in any time and place"; yet so hastily written were their stories that there was not a single piece of first-rate fiction in all their work.

During this 1860-1910 period, however, there was another group of writers at work who were continuing in the tradition of Hawthorne and Louisa May Alcott, in that they were producing few children's books, but these were of high and enduring quality.

Howard Pyle (1853-1911) was a man of great talent. He was both author and illustrator. He believed art to be his primary field, but as his writing talent grew, his illustrations became secondary. THE MERRY ADVENTURES OF ROBIN HOOD, published in 1883, has been called his best book, but others are of equal literary value: MEN OF IRON, THE GARDEN BEHIND THE MOON, THE CHAMPIONS OF THE ROUND TABLE and still others. Pyle was a romanticist. He wrote imaginative tales and legends of the age of chivalry with great vigor and spirit and with no tinge of sentimentalism.

Two women of great ability who wrote at this time were Mary Mapes Dodge and Kate Douglas Wiggin. Mrs. Dodge (1831-1905) was the first editor of ST. NICHOLAS magazine, which was founded in 1873. She guided it through one of its best periods, and her own verse and prose appeared often in its pages. Her book, HANS BRINKER OR THE SILVER SKATES, became an American classic. (See page 1689.) HANS BRINKER was published in the same year as Lewis Carroll's ALICE IN WONDERLAND — 1865. Two other books by Mrs. Dodge were, and still are, deservedly popular: THE LAND OF PLUCK and THE GOLDEN GATE.

Kate Douglas Wiggin (1856-1923) wrote



partly in this period and partly in the early 1900's. She was a distinguished woman in many fields. She organized the first free kindergarten on the Pacific coast; and when she turned to writing, she produced such widely popular stories as THE BIRDS' CHRISTMAS CAROL, MOTHER CAREY'S CHICKENS and REBECCA OF SUNNYBROOK FARM.

Four men writing at this time achieved a thoroughly national and American literature of unusual quality. Frank R. (Francis Richard) Stockton (1834-1902) wrote short stories and novels that were humorous and gay. THE LADY OR THE TIGER is his most famous short story and THE CASTING AWAY OF MRS. LECKS AND MRS. ALESHINE is his most popular novel. These were written for adults, but Stockton also wrote especially for children—charming, imaginative stories that have endured the test of years: TING-A-LING (1870); THE FLOATING PRINCE AND OTHER FAIRY TALES (1881); and THE BEE MAN OF ORN AND OTHER FANCIFUL TALES (1887).

James Otis, whose full name was James Otis Kaler (1848-1912) wrote fine historical narratives, but his little book TOBY TYLER; OR, TEN WEEKS WITH THE CIRCUS has remained the story children like best. Joseph Alexander Altsheler (1862-1919) wrote in series form. His output was great, but his work was uniformly good. He wrote of various periods in American history: a Civil War series, French and Indian War series, the Young Trailer series, and single books, such as his popular treasure-hunt tale: APACHE GOLD.

Joel Chandler Harris (1848-1908) was a humorist who reached world-wide fame with his folklore studies. His UNCLE REMUS tales, picturing the humorous side of Negro characters, became classic. Probably the best-loved of these tales is the story of Tar-Baby.

Considered by many at the head of all other writers of this era is the beloved humorist Mark Twain (pen-name for Samuel Langhorne Clemens) (1835-1910). Twain's THE ADVENTURES OF TOM SAWYER, THE ADVENTURES OF HUCKLEBERRY FINN and THE PRINCE AND THE PAUPER are American classics.

To summarize the late nineteenth-century books for children, we see that writers had turned to realism, with the accent on stories of home and school life and of sea and land adventures in American settings; and humor had been accepted at last as a proper part of



children's reading. Of the many great American poets in this era, James Whitcomb Riley and Eugene Field turned their talents to a special form of verse for children, while Henry Wadsworth Longfellow and John Greenleaf Whittier wrote both for and about children.

If you will look in the Poetry Index in Volume 20 of your BOOK OF KNOWLEDGE you will find listed under the poets' names several of their most beloved poems.

NINETEENTH-CENTURY WRITERS FOR CHILDREN

(This list includes some books which children enjoy although they were written for grownups.)

NAME	DATES	BEST-KNOWN WORK
Jacob Abbott	1803-79	ROLLO BOOKS
Louisa May Alcott	1832-88	LITTLE WOMEN
Thomas Bailey Aldrich	1836-1907	THE STORY OF A BAD BOY
Horatio Alger	1834-99	LUCK AND PLUCK series
Jane Andrews	1833-87	EACH AND ALL
Jane Goodwin Austin	1831-94	STANDISH OF STANDISH
James Baldwin	1841-1925	THE STORY OF ROLAND
Daniel Carter Beard	1850-1941	THE AMERICAN BOYS' HANDY BOOK
John Bennett	1865-	MASTER SKYLARK
Elbridge Streeter Brooks	1846-1902	THE MASTER OF THE STRONG HEARTS
Noah Brooks	1830-1903	THE BOY EMIGRANTS
Frances Hodgson Burnett	1849-1924	LITTLE LORD FAUNTLEROY
Charles Edward Carryl	1841-1920	DAVY AND THE GOBLIN
Harry Castlemon, pen-name of Charles Austin Fosdick	1842-1915	FRANK: THE YOUNG NATURALIST series
Mary Hartwell Catherwood	1847-1902	ROCKY FORK
Susan Coolidge, pen-name of Sarah Chauncey Woolsey	1835-1905	WHAT KATY DID series
James Fenimore Cooper	1789-1851	THE LAST OF THE MOHICANS
Richard Henry Dana, Jr.	1815-82	TWO YEARS BEFORE THE MAST
Mary Mapes Dodge	1831-1905	HANS BRINKER, OR THE SILVER SKATES
Edward Eggleston	1837-1902	THE HOOSIER SCHOOLBOY
Eugene Field	1850-95	POEMS OF CHILDHOOD
Martha Farquharson Finley	1828-1909	ELSIE DINSMORE series
William Elliot Griffis	1843-1928	JAPANESE FAIRY TALES
George Bird Grinnell	1849-1938	THE STORY OF THE INDIAN
Lucretia Peabody Hale	1820-1900	THE PETERKIN PAPERS
Joel Chandler Harris	1848-1908	UNCLE REMUS
Nathaniel Hawthorne	1804-64	TANGLEWOOD TALES FOR GIRLS AND BOYS
Washington Irving	1783-1859	RIP VAN WINKLE
Helen Hunt Jackson	1830-85	RAMONA
Sarah Orne Jewett	1849-1909	BETTY LEICESTER
Herman Melville	1819-91	MOBY DICK
Oliver Optic, pen-name of William Taylor Adams	1822-97	ONWARD AND UPWARD series
James Otis, pen-name of James Otis Kaler	1848-1912	TOBY TYLER
Thomas Nelson Page	1853-1922	TWO LITTLE CONFEDERATES
Peter Parley, pen-name of Samuel Griswold Goodrich	1793-1860	PETER PARLEY series
Howard Pyle	1853-1911	THE MERRY ADVENTURES OF ROBIN HOOD
James Whitcomb Riley	1849-1916	RHYMES OF CHILDHOOD
Horace E. Scudder	1838-1902	GEORGE WASHINGTON
Margaret Sidney, pen-name of Harriet Mulford Lothrop	1844-1924	FIVE LITTLE PEPPERS AND HOW THEY GREW
Nora Archibald Smith	1859-1934	CHILDREN OF THE LIGHTHOUSE
Frank R. Stockton	1834-1902	FANCIFUL TALES
John Townsend Trowbridge	1827-1916	CUDJO'S CAVE
Mark Twain, pen-name of Samuel Langhorne Clemens	1835-1910	THE ADVENTURES OF TOM SAWYER
Kate Douglas Wiggin	1856-1923	REBECCA OF SUNNYBROOK FARM
Gulielma Zollinger	1856-1917	THE WIDOW O'CALLAGHAN'S BOYS



The Transition Writers: 1910-1945

In the early years of the twentieth century, America's children were reading many of the books listed above. America's girls were reading Susan Coolidge's WHAT KATY DID AT SCHOOL, and demanding more lively stories of school life. They were beginning to reject Martha Finley's ELSIE DINSMORE series, considered such excellent reading by their elders, and waiting their turn at the libraries for Helen Hunt Jackson's RAMONA and Jean Webster's DADDY-LONG-LEGS. Boys were steeping themselves in adventure, travel, and success-after-adversity series, such as FRANK THE YOUNG NATURALIST, JACK HAZARD, FRANK MERRIWELL and Horatio Alger's LUCK AND PLUCK.

Both boys and girls were reading the fairy tales and folk tales of England, France and Germany, collected by Andrew Lang, Joseph Jacobs and the Brothers Grimm. MOBY DICK, HANS BRINKER, THE MASTER OF THE STRONG HEARTS and Howard Pyle's books had shown children types of reading which they liked. Now the larger publishing houses opened special departments for children's literature, with editors in charge whose duty it was to find out what children wanted and then to see that they got it.

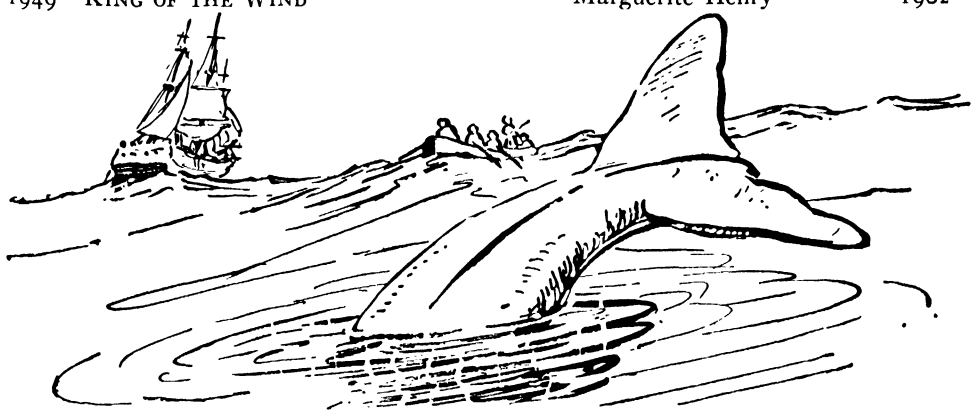
The first half of the twentieth century has come to be called the Transition Era. American writers of children's books are in a transition period, striving to meet adult requirements as imposed by publishers and librarians, and to satisfy children's reading interests as disclosed by various school surveys. The result is a combination of romanticism and realism. The romanticism is patterned on English literature favored by adults. The realism is purely American, favored by children.

In 1921, the Children's Section of the American Library Association voted to award a medal to the author of each year's "most distinguished contribution to American literature for children." This medal was called the John Newbery Medal in honor of the eighteenth-century English bookseller, John Newbery. Newbery Medal winners through the year 1945 are given below.



NEWBERY PRIZE WINNERS

YEAR OF THE AWARD	BOOK	AUTHOR	DATES
1922	THE STORY OF MANKIND	Hendrik Willem van Loon	1882-1944
1923	THE VOYAGES OF DR. DOLITTLE	Hugh Lofting	1886-1947
1924	THE DARK FRIGATE	Charles Boardman Hawes	1889-1923
1925	TALES FROM SILVER LANDS	Charles Joseph Finger	1871-1941
1926	SHEN OF THE SEA	Arthur Bowie Chrisman	1889-
1927	SMOKY, THE COWHORSE	Will James	1892-1942
1928	GAY-NECK	Dhan Gopal Mukerji	1890-1936
1929	THE TRUMPETER OF KRAKOW	Eric P. Kelly	1884-
1930	HITTY, HER FIRST HUNDRED YEARS	Rachel Lyman Field	1894-1942
1931	THE CAT WHO WENT TO HEAVEN	Elizabeth Coatsworth	1893-
1932	WATERLESS MOUNTAIN	Laura Adams Armer	1874-
1933	YOUNG FU OF THE UPPER YANGTZE	Elizabeth Foreman Lewis	1892-
1934	INVINCIBLE LOUISA	Cornelia Lynde Meigs	1884-
1935	DOBRY	Monica Shannon	
1936	CADDIE WOODLAWN	Carol Ryrie Brink	1895-
1937	ROLLER SKATES	Ruth Sawyer	1880-
1938	THE WHITE STAG	Kate Seredy	
1939	THIMBLE SUMMER	Elizabeth Enright	1909-
1940	DANIEL BOONE	James Daugherty	1889-
1941	CALL IT COURAGE	Armstrong Sperry	1897-
1942	THE MATCHLOCK GUN	Walter D. Edmonds	1903-
1943	ADAM OF THE ROAD	Elizabeth Janet Gray	1902-
1944	JOHNNY TREMAIN	Esther Forbes	
1945	RABBIT HILL	Robert Lawson	1892-
1946	STRAWBERRY GIRL	Lois Lenski	1893-
1947	MISS HICKORY	Caroline Sherwin Bailey	1875-
1948	TWENTY-ONE BALLOONS	William Péné DuBois	1916-
1949	KING OF THE WIND	Marguerite Henry	1902-





One of the chief contributions of twentieth-century writers has been in animal stories. Because of the size of the country and its many types of wild animals, writers have a wide field and have done well in it. Children of all ages seem to enjoy animal stories.

SOME WRITERS ABOUT ANIMALS

WRITER	DATES	BEST-KNOWN BOOK ABOUT ANIMALS
Delia Akeley	1875-	J. T., Jr.
Paul Annixter		Wilderness Ways
Eleanor Atkinson	1863-1942	Greyfriars Bobby
Olaf Baker		Shasta of the Wolves
William Gerard Chapman		Green-timber Trails
James Oliver Curwood	1878-1927	The Grizzly King
Walter Prichard Eaton	1878-	On the Edge of the Wilderness
Hal G. Evarts	1887-1934	The Cross Pull
John T. Foote		Pocono Shot
Clarence Hawkes	1869-	Redcoat; the Phantom Fox
Thomas Clark Hinkle	1876-	Trueboy
Vance Joseph Hoyt	1889-	Silver Boy
Martin Elmer Johnson	1884-1937	Lion
Osa Johnson (Mrs. Martin Johnson)	1894-	Jungle Babies
David Starr Jordan	1851-1931	True Tales of Birds and Beasts
Jack London	1876-1916	The Call of the Wild
William J. Long		Wood Folk series
Jack O'Brien	1898-1938	Silver Chief, Dog of the North
Mary O'Hara	1885-	My Friend Flicka
Edith M. Patch	1876-	Mountain Neighbors
Herbert Ravenel Sass	1884-	Gray Eagle
Samuel Scoville, Jr.	1872-	Wild Folk
Ernest Thompson Seton	1860-1946	Wild Animals I Have Known
Dallas Lore Sharp	1870-1929	Beyond the Pasture Bars
Albert Payson Terhune	1872-1942	Lad: A Dog
Walter Wilwerding	1891-	Punda, the Tiger-horse

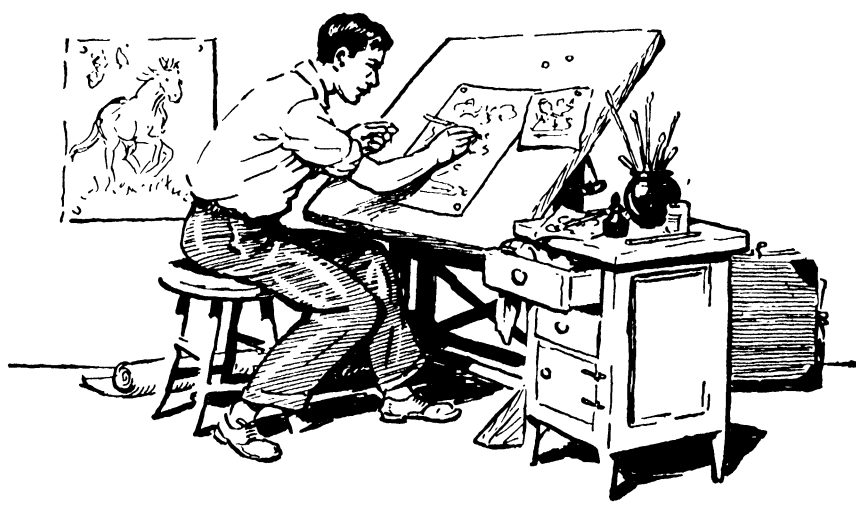


Another twentieth-century trend is a rebirth of interest in biographies. At the close of the Revolutionary-War period, biographies appeared, but they lost popularity during the 1800's and early 1900's. After 1930, however, they increased rapidly in number. Within ten years' time, more than 150 good biographies appeared for older children, most of them well illustrated and written in narrative style with the effect of fiction. Helen Nicolay, Jeanette Eaton and Hildegarde Hawthorne (granddaughter of Nathaniel Hawthorne) are prominent among those who pioneered in the new type of story-biography.

TYPICAL TWENTIETH-CENTURY BIOGRAPHIES FOR CHILDREN

AUTHOR	DATE OF BIRTH	BOOK
Francis E. Benz	1899	PASTEUR, KNIGHT OF THE LABORATORY
James Daugherty	1889	DANIEL BOONE
Jeanette Eaton		YOUNG LAFAYETTE
Madeleine Goss		BEETHOVEN: MASTER MUSICIAN
Frank Graham		LOU GEHRIG, A QUIET HERO
Shirley Graham and George D. Lipscomb		DR. GEORGE WASHINGTON CARVER, SCIENTIST
Elizabeth Janet Gray	1902	PENN
Anna Gertrude Hall	1882	NANSEN
Hildegarde Hawthorne		ROMANTIC REBEL
Cornelia Lynde Meigs	1884	INVINCIBLE LOUISA
Helen Nicolay	1866	WIZARD OF THE WIRES
Mildred Mastin Pace		CLARA BARTON
Bellamy Partridge		AMUNDSEN, THE SPLENDID NORSEMAN
Claire Lee Purdy		HE HEARD AMERICA SING
Carl Sandburg	1878	ABE LINCOLN GROWS UP

A third twentieth-century trend has been the growing importance of pictures and illustrating. Indeed, the first half of the 1900's may go down in literary history as the Picture Era. Children's books were being illustrated so beautifully that an annual award was established in 1938 for the finest work of the year. This award, given by the American Library Association, is the Caldecott Medal, so named in honor of the English illustrator of children's books, Randolph Caldecott. The medal is given each year to "the illustrator of the most distinguished American picture book for children." This award has done a great deal to encourage artists to enter the field of illustrating children's books.



CALDECOTT PRIZE WINNERS

YEAR OF THE AWARD	ILLUSTRATOR	DATE OF BIRTH	BOOK	AUTHOR
1938	Dorothy P. Lathrop	1891	ANIMALS OF THE BIBLE	Text selected from the King James Bible by Helen Dean Fish
1939	Thomas Handforth	1897	MEI LI	Thomas Handforth
1940	Ingri d'Aulaire and Edgar Parin d'Aulaire	1904 1898	ABRAHAM LINCOLN	Ingri and Edgar d'Aulaire
1941	Robert Lawson	1892	THEY WERE STRONG AND GOOD	Robert Lawson
1942	Robert McCloskey	1914	MAKE WAY FOR DUCKLINGS	Robert McCloskey
1943	Virginia Lee Burton	1909	THE LITTLE HOUSE	Virginia Lee Burton
1944	Louis Slobodkin	1903	MANY MOONS	James Thurber
1945	Elizabeth Orton Jones		PRAYER FOR A CHILD	Rachel Field
1946	Maud and Miska Petersham	1890 1889	THE ROOSTER CROWS	Maud and Miska Petersham
1947	Leonard Weisgard	1916	THE LITTLE ISLAND	Golden McDonald
1948	Roger Duvoisin	1904	WHITE SNOW BRIGHT SNOW	Alvin Tresselt
1949	Berta and Elmer Hader	1889	THE BIG SNOW	Berta and Elmer Hader



As you may see in the above list of Caldecott prize winners, some present-day illustrators not only draw the pictures but write the text that goes with them, as Howard Pyle used to do. At first, many illustrator-authors made picture books for small children, often with only a few written words to explain the pictures. Later, picture books were made for older children.

In addition to the winners of the Caldecott Medal, outstanding modern illustrators and illustrator-authors include N. C. Wyeth, James Daugherty, Helen Sewell, Lynd Ward, Katherine Milhous, Valenti Angelo, Diana Thorne, Kurt Wiese, Elinore Blaisdell, Emma Lou Brock, Wanda Gág, Peggy Bacon, Ludwig Bemelmans, Clare Turlay Newberry, E. Boyd Smith, Berta and Elmer Hader, and Margaret Ayer, who has illustrated this article for you.

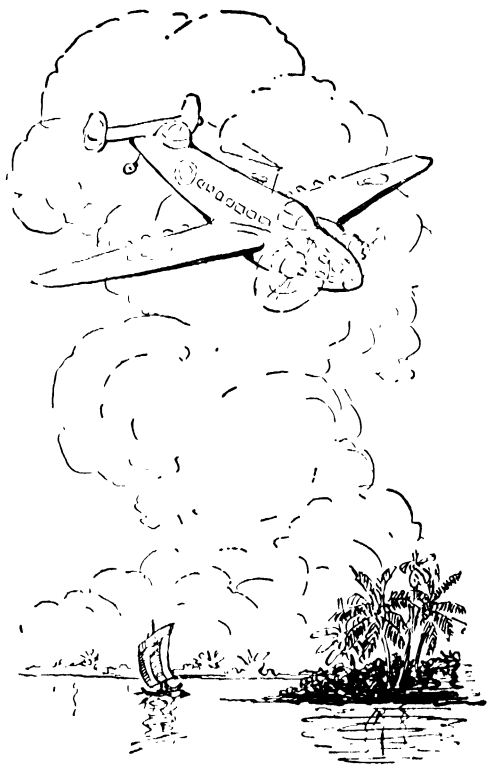
As the artistic picture book grew increasingly important, another type of pictured story developed, the so-called "comic." The comics began with newspaper story-pictures and grew into book form, finding the same type of popularity with the same type of readers as had the dime novel. They are cheap little paper leaflets costing five or ten cents. These comics (few of which make any pretensions to comedy) deal with adventure and heroic deeds. DAN DUNN, SECRET OPERATIVE 48 AND THE GANGSTER'S FRAME-UP; LITTLE ORPHAN ANNIE AND THE BIG TOWN GUNMEN—those are typical. Not only children and adolescents but young men as well have bought several millions of these picture dime novels. As the young soldier of the Civil War read the exploits of Buffalo Bill and Deadwood Dick, so the Yanks of World War II read the adventures of Terry Lee, Dick Tracy and Superman. The chief difference is that the dime novel was told in many words and a single picture, while the comic is told in many pictures and few words. The popularity of both indicates the interest of youth in fast-moving adventure with contemporary American settings. The popular illustrator-authors of comics are: Chester Gould, creator of DICK TRACY; Milton Caniff, creator of TERRY AND THE PIRATES; Jerry Siegel and Joe Shuster, creators of SUPERMAN; Major Zack Mosley, creator of SMILIN' JACK; Harold Gray, cre-

ator of LITTLE ORPHAN ANNIE; and Norman Marsh, creator of DAN DUNN. With smaller children, Walt Disney's comics, particularly Donald Duck booklets, are most popular.

The early twentieth century saw, too, an expansion of natural-science literature that started in 1794 with THE NATURAL HISTORY OF BEASTS by Charley Columbus, and developed slowly with such naturalists as John Burroughs and Neltje Blanchan. In the 1900's, a group of writing naturalists turned their attention to writing entertainingly as well as instructively, and although they wrote principally for adults, they also made a notable contribution to children's literature. Chief among these are: William Beebe, Raymond Lee Ditmars, Frank M. Chapman, William T. Hornaday, and W. H. Hudson.

Still another twentieth-century development has been in the field of American legends. Since Washington Irving's LEGEND OF SLEEPY HOLLOW, there have been few writers who have been able to make American legends, even Indian legends, popular. However, the characters of the mythical Paul Bunyan, the mighty logging hero, of Pecos Bill, John





Henry, the steel-driving man, and Old Stormalong, the deep-water sailorman, gave writers new inspiration. Best-known among legend collectors are: Frank Shay, Carl Carmer, Wallace Wadsworth, Esther Shephard, Leigh Peck, James Bowman, Dell McCormick, Glen Rounds, James Stevens, and Ida Turney.

If the adult books read by children today are indicative of a new type of children's books tomorrow, then the next development will be the journalistic, personal experience account. Librarians have noted in past years the popularity with older children of such personal experience narratives as Stefansson's MY LIFE WITH THE ESKIMO, Mark Twain's ROUGHING IT, Knud Rasmussen's ACROSS ARCTIC AMERICA, and Martin Johnson's SAFARI. Later they observed an unexpected interest in Jack Belden's RETREAT WITH STILWELL, James Childers' WAR EAGLES, Colonel Robert Scott's GOD IS MY CO-PILOT, and Ted Lawson's THIRTY SECONDS OVER TOKYO. So far, this type of literature has been suited only to the older child, but there are indications that it may be adapted.



MORE TWENTIETH-CENTURY WRITERS FOR CHILDREN*

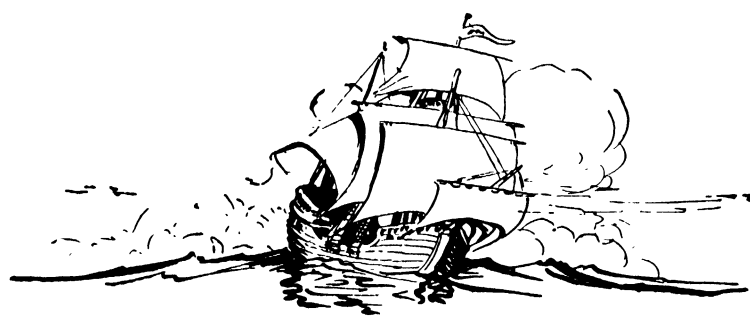
(This list does not include writers whose books have previously been mentioned.)

NAME	DATES	BEST-KNOWN WORK**
Andy Adams	1859-1935	THE LOG OF A COWBOY
Merritt Parmelee Allen	1892-	THE SUN TRAIL
Margaret Eliza Ashmun	?-1940	ISABEL CARLETON series
Ralph Henry Barbour	1870-1944	THE HALF-BACK
Katharine Lee Bates	1859-1929	IN SUNNY SPAIN
Lyman Frank Baum	1856-1919	THE WONDERFUL WIZARD OF OZ
Erick Berry, pen-name of Allena Best	1892-	BLACK FOLK TALES
Henry Beston	1888-	FIRELIGHT FAIRY BOOK
Margery Williams Bianco	1881-1944	THE LITTLE WOODEN DOLL
Esther Brann		NANETTE OF THE WOODEN SHOES
Emma Lou Brock		THE RUNAWAY SARDINE
Abbie Farwell Brown	1872-1927	THE LONESOMEST DOLL
Edna A. Brown	1875-	FOUR GORDONS
Gelett Burgess	1866-	GOOPS AND HOW TO BE THEM
Thornton W. Burgess	1874-	OLD MOTHER WEST WIND stories
Cornelia James Cannon	1876-	THE PUEBLO BOY
Russell Gordon Carter	1892-	THREE POINTS OF HONOR
Ramon Peyton Coffman	1896-	THE CHILD'S STORY OF SCIENCE
A. Frederick Collins	1869-	THE BOY ASTRONOMER
Francis Arnold Collins	1873-	SENTINELS ALONG OUR COAST
Helen Coale Crew	1866-	ALANNA
Irving Crump	1887-	THE BOYS' BOOK OF RAILROADS
Alice Dalgliesh	1893-	THE LITTLE ANGEL
Hawthorne Daniel	1890-	THE GAUNTLET OF DUNMORE
Floyd Lavern Darrow	1880-	THE BOYS' OWN BOOK OF SCIENCE
Therese Osterheld Deming	1874-1945	LITTLE EAGLE
Charles Alexander Eastman	1858-	INDIAN BOYHOOD

*Because of the difficulty of separating early 20th century and late 19th century writers, those who wrote in both eras are divided according to the number of books published in each era.

**The "best-known work" was based on reports of a small group of librarians; a larger group or publishers' records might give a different choice.

Lucille Foster Fargo	1880-	PRAIRIE CHAUTAUQUA
Parker Hoysted Fillmore	1878-1944	MIGHTY MIKKO
Marjorie Flack	1897-	ANGUS AND THE DUCKS
Beulah Marie Dix Flebbe	1876-	SOLDIER RIGDALE
Allen French	1870-	THE STORY OF ROLF AND THE VIKING'S BOW
Wanda Gág	1893-1946	MILLIONS OF CATS
Berta Hoerner Hader and Elmer Stanley Hader	1889-	THE FARMER IN THE DELL
Helen Eggleston Haskell		KATRINKA
Fjeril Hess	1893-	BUCKAROO
Agnes Danforth Hewes		SPICE AND THE DEVIL'S CAVE
William Heyliger	1884-	DON STRONG, AMERICAN
Virgil Mores Hillyer	1875-1931	A CHILD'S HISTORY OF THE WORLD
Rupert Sargent Holland	1878-	HISTORIC BOYHOODS
Clara Whitehill Hunt	1871-	ABOUT HARRIET
Annie Fellows Johnston	1863-1931	THE LITTLE COLONEL series
Alden Arthur Knipe and Emilie Benson Knipe	1870- 1870-	THE LUCKY SIXPENCE
Rose Bell Knox	1879-	GRAY CAPS
Anne Dempster Kyle	1896-	THE APPRENTICE OF FLORENCE
Harold Albert Lamb	1892-	BOY'S GENGHIS KHAN
Louise Lamprey	1869-	GREAT DAYS IN AMERICAN HISTORY series
Marion Florence Lansing	1883-	GREAT MOMENTS IN EXPLORATION
Mary Harmon Lasher		LOGGING CHANCE
Eleanor Frances Lattimore	1904-	LITTLE PEAR
Munro Leaf		THE STORY OF FERDINAND
Lois Lenski	1893-	THE LITTLE TRAIN
Henry Bolles Lent	1901-	FULL STEAM AHEAD!
Marian Hurd McNeely	1877-1930	THE JUMPING-OFF PLACE
May Yonge McNeer		PRINCE BANTAM
Alida Sims Malkus	1895-	THE DRAGON FLY OF ZUÑI
Stephen Warren Meader	1898-	THE BLACK BUCCANEER
Florence Crannell Means	1891-	A CANDLE IN THE MIST
Elizabeth Cleveland Miller	1889-1936	PRAN OF ALBANIA
Lucy Maud Montgomery (Canadian)	1874-1942	ANNE OF GREEN GABLES
Carl Moon	1878-	THE FLAMING ARROW
Grace Purdie Moon	1883-1947	THE BOOK OF NAH-WEE
Anne Carroll Moore	1871-	NICHOLAS, A MANHATTAN CHRISTMAS STORY
Kirk Munroe	1850-1930	THE FLAMINGO FEATHER
Charles Bernard Nordhoff also collaborator with James Norman Hall	1887-1947 1887-	THE PEARL LAGOON MUTINY ON THE BOUNTY



Frances Jenkins Olcott		WONDER TALES FROM FAIRY ISLES
Helen Fuller Orton	1872-	CLOVERFIELD FARM stories
Albert Bigelow Paine	1861-1937	THE BOY'S LIFE OF MARK TWAIN
Ralph Delahaye Paine	1871-1925	BLACKBEARD BUCCANEER
Ethel Parton	1862-1944	TABITHA MARY
Howard Pease	1894-	THE SHIP WITHOUT A CREW
Anne Merriman Peck	1884-	ROUNDABOUT SOUTH AMERICA
Lucy Fitch Perkins	1865-1937	THE DUTCH TWINS
Maud Fuller Petersham and Miska Petersham	1890- 1888-	MIKI
Ethel Calvert Phillips		A NAME FOR OBED
Arthur Stanwood Pier	1874-	BOYS OF ST. TIMOTHY'S
Anne Emilie Poulsson	1853-1939	THROUGH THE FARMYARD GATE
Edith Ballinger Price	1897-	SILVER SHOAL LIGHT
Katharine Pyle	?-1938	NANCY RUTLEDGE
Alice Hegan Rice	1870-1942	MRS. WIGGS OF THE CABBAGE PATCH
Laura Elizabeth Richards	1850-1943	CAPTAIN JANUARY
Dorothy Rowe	1898-	RABBIT LANTERN
Edwin Legrand Sabin	1870-	ON THE PLAINS WITH CUSTER
Marshall Saunders (Canadian)	1861-1947	BEAUTIFUL JOE
James Willard Schultz	1859-	WITH THE INDIANS IN THE ROCKIES
Augusta Huiell Seaman	1879-	THE BOARDED-UP HOUSE
Elsie Singmaster	1879-	A BOY AT GETTYSBURG
Elmer Boyd Smith	1860-1943	SO LONG AGO
Caroline Dale Snedeker	1871-	DOWNRIGHT DENCEY
Evaleen Stein	1863-1923	GABRIEL AND THE HOUR BOOK
Emma Gelders Sterne	1894-	NO SURRENDER
Clifford MacClellan Sublette	1887-	THE SCARLET COCKEREL
Eva March Tappan	1854-1930	WHEN KNIGHTS WERE BOLD
Booth Tarkington	1869-1946	PENROD
Lowell Thomas	1892-	THE BOY'S LIFE OF COLONEL LAWRENCE
Eunice Strong Tietjens	1884-1944	BOY OF THE DESERT
John Robert Tunis	1889-	ALL-AMERICAN
Dillon Wallace	1863-1939	UNGAVA BOB
Rhea Wells	1891	BEPPO THE DONKEY
Eliza Orne White	1856-	WHERE IS ADELAIDE?
Stewart Edward White	1873-1946	THE BLAZED TRAIL
Raoul Whitfield		WINGS OF GOLD
Elinor Whitney	1889-	TYKE-Y

This article is by Margaret Lima Norgaard, co-author with Lewis M. Terman of CHILDREN'S READING.

THE NEXT STORY OF LITERATURE IS ON PAGE 5007.

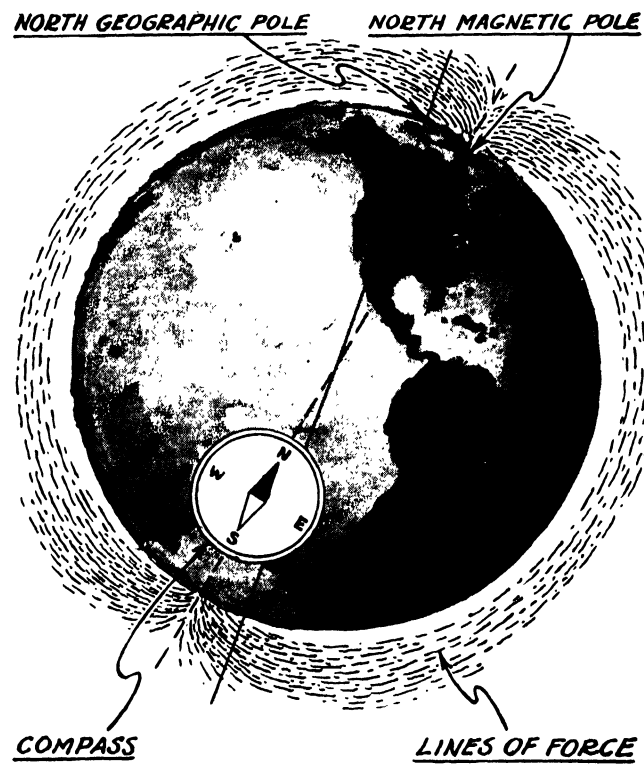


THE EARTH *as a* MAGNET

DOWN through the ages has come the story of Magnes, a shepherd of Crete, who, while he was tending his flocks in the hills, accidentally discovered one of the great forces of nature. This simple country boy suddenly found himself held to the ground with what seemed to be more than the usual force of gravity. Upon investigation he found that the iron nails in his shoes and the iron tip of his shepherd's staff were being attracted by a peculiar mass of metal in the ground which appeared to him as a kind of rock. Because of this legendary association with Magnes, "rock"—actually metal—of this kind has ever since been called magnetite, and its properties are said to be magnetic. In other words, we use the word "magnetic" to indicate the peculiar type of metal which exerts a strong attraction upon iron. This kind of attraction is known as "magnetism." Symbolically the word magnetism is also used to indicate any great power of attraction—as in speaking of a "magnetic personality," a personality which draws others to it.

There are probably few people who have not at some time in their lives held in their hands one of those fascinating little metallic horseshoes which will pick up nails and small pieces of iron filings, holding these bits of iron to it as though with a powerful grasp. This little horseshoe, of course, is one type of magnet, which the dictionary defines as "a variety or a piece of magnetite or magnetic iron ore, having naturally the property of attracting iron."

Probably the most important, and certainly one of the most familiar uses of magnetic iron has been in connection with the magnetic compass. How important that use is you will realize if you stop for a moment to let pass through your imagination the long line of discoverers, explorers, navigators and breakers-of-boundaries who have been constantly pushing back the frontiers of the known world for many centuries. This has meant that men from Phoenicia, England, China, Italy, Scandinavia—from all parts of the world in all ages of history—have left the safety and security of their home ports to venture upon the frighteningly wide and unknown oceans of the world. There



The lines of force about the earth. The earth seems to act as though a bar magnet were thrust through its middle with one magnetic pole not far from the North Pole and the other not far from the South Pole. A compass, therefore, does not point to the North Pole, but to the North Magnetic pole. The magnetic poles do not always stay in the same spot, but move slightly. This variation seems to be influenced by the spots on the sun. There is also a slight daily variation which appears to have something to do with the rising and setting of the sun.

were for the pioneers no guides to go ahead, beckoning showing the way across uncharted seas and trackless wilderness.

To what could these men look for guidance? To the stars, Yes, perhaps, and sometimes; but for weeks at a time the stars in some latitudes and some seasons might be hidden by stormy weather. Furthermore, some of the most famous explorers, like the great Columbus himself, knew almost nothing of navigation by the stars, nothing beyond a simple acquaintance with the Pole Star. From the twelfth century, what these intrepid adventurers relied upon was a tiny piece of magnetic iron mounted either in a bowl of water, or on a spindle, the magnetic compass. During the last thousand years countless thousands of ships have plowed and skimmed their way across the blue oceans, their safety depending upon this small device whose very essence we still understand so little.

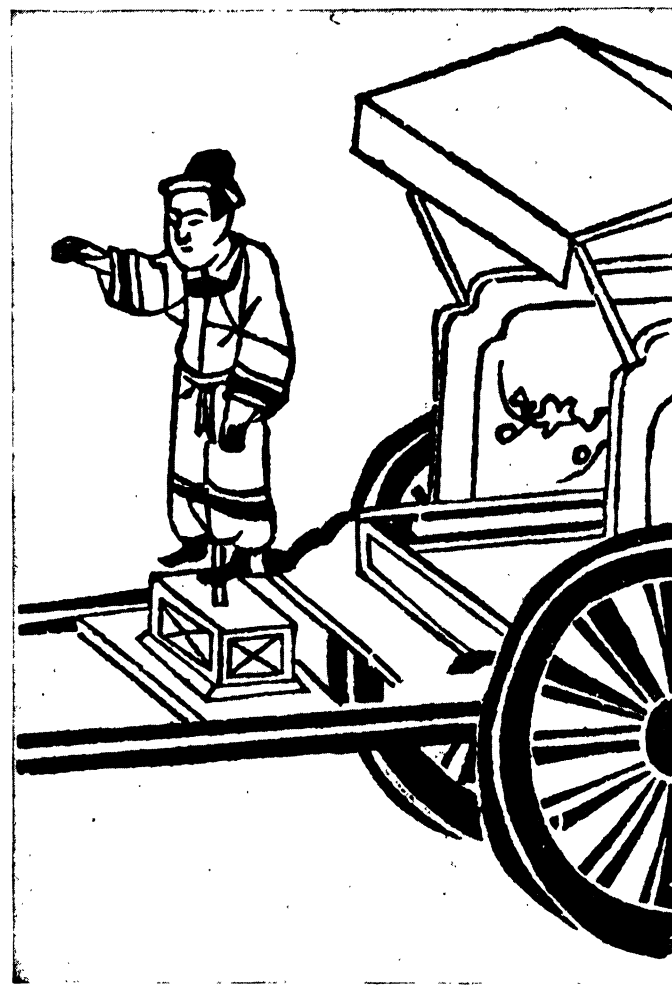
Some authorities believe that the Chinese discovered the principle of the magnetic compass as long ago as twenty-five centuries, but this can not be proved. It is certain, however, that the compass was known in very early times and in widely separated countries, a fact which seems to indicate that the principle of the magnetic needle was discovered independently by different peoples.

The Chinese used what is known as the "south-pointing cart," upon which was mounted on a pivot a small figurine two or three feet in height. One arm of this little figure was hollowed out and in the arm was placed a piece of magnetic iron. The power of this piece of magnetic iron would cause the figurine to pivot until the arm with its outstretched finger pointed to the South Magnetic Pole.

The article Electricity and Magnetism in Volume Eleven, will tell you much more about the magnetic compass, and about the other important ways in which magnetism is made to work for man. Here we are concerned with the question: Is the earth as a whole a great magnet?

It often seems to act like one, or, to be more exact, it seems to act as if a great bar magnet were thrust through its middle with the one magnetic pole not far from the North Pole, and the other magnetic pole not far from the South Pole. The exact locations can not be given because in recent years scientists who study the earth's magnetism have learned that the positions of the magnetic poles shift from time to time. The cause of the shifts is unknown. However, the changes in position are not so great as to interfere seriously with the usefulness of a compass under ordinary conditions.

Now, naturally, scientists have been tre-



The Bettmann Archive

A Chinese "south-pointing cart." A magnet was concealed within the extended right arm of the figure. As a result it always pointed south.

mendously interested in this problem of the earth's magnetism. Why does the magnetic needle behave as it does? Is the earth really a huge magnet? What makes it so? We have learned something of the answer to these questions, but certainly far from a complete answer. There is no doubt that the earth *behaves* as though it were an enormous magnet, alway pulling the magnetic needle down toward one of its magnetic poles. The forces which are involved, however, bring not only the earth, but also the sun into the picture.

WILLIAM GILBERT TRIES TO EXPLAIN THE STRANGE BEHAVIOR OF THE COMPASS NEEDLE

Early makers of compasses discovered that when a nicely balanced magnetized needle (and a needle can be magnetized by rubbing it with a lodestone) points to the North Magnetic Pole, it is not only pointed, but dips down, and that the dip increases as one goes farther north. William Gilbert, one of the most important scientific figures of the late sixteenth and early seventeenth centuries, and probably the first serious student of terrestrial magnetism, believed that the magnetic needle behaved as it did because the interior of the earth was a huge magnetized iron ball, with a nonmagnetic surface, and with magnetic poles.

GILBERT'S THEORY OF THE EARTH'S MAGNETISM IS NO LONGER ACCEPTED

This was certainly a simple explanation, but one, unfortunately, which was too simple to explain what really happens. To demonstrate his theory, Gilbert built small spheres of lodestone which he called terella, letting them represent the earth as he conceived it to be constituted—a sphere of magnetic iron. Then he set up upon the surface of the terella small rods of iron, and found that exactly at the poles of these iron spheres the little rods stood up perpendicularly, but that at other places they leaned at varying angles. To Gilbert this proved that the magnetic needle acted as did his little rods on his terella for the same reason, because the earth was composed mostly of magnetic iron. This theory at first seemed to explain everthing very nicely, because, of course, at the magnetic poles of the earth the magnetic needle points straight down. However, Gilbert's theory had soon to be discarded as too simple to explain the complex manifestations of terrestrial magnetism.

Today we realize that there must be varying fields of magnetic attraction, for there are very definite variations in the way the magnetic compass behaves. Some of these variations could in no way be accounted for if the earth were, as Gilbert believed, a huge sphere of lodestone, for in this case the behavior of the magnetic needle should be constant. Neither can these variations be accounted for by the supposition that great deposits of iron might exist at the magnetic poles.

The real answer to the mysterious behavior of the magnetic needle apparently lies in the fact that ninety-three million miles away a large bright star which we call the sun affects the magnetic force of the earth itself. Frequently storms occur in the sun's hot gaseous body.

SUN-SPOTS CAUSE DISTURBANCES ON EARTH IN THE FORM OF MAGNETIC STORMS

These storms are almost like cyclonic disturbances, but are both electrical and magnetic in nature. We know this, for one thing, because when sun-spots are observed, very definite disturbances take place here on the earth, in the form of magnetic storms. Magnetic storms manifest themselves in various ways—in beautiful displays of northern or southern lights, in powerful disturbances of the magnetic compass, in certain upsets in systems of communication like telegraph, telephone and cable lines, and especially in short-wave radio. But these are not storms, at least as we experience them here on the earth, which can be seen or felt. They are known only by their effects.

The variation in the magnetic compass needle also seems to keep pace with the eleven-year cycle of sun-spot activity, in addition to the daily variation which appears to have something to do with the rising and setting of the sun.

THE PROBLEMS OF MAGNETIC POWER STILL AWAIT A FINAL ANSWER

It is now clear that the question as to just how and why the earth is a magnet, and how much of its magnetic power is really that of the sun, is one which can not be answered at the present time. There is probably no more interesting field of investigation open to the scientist of the future than this one, at which we have taken a brief look. We are at the present time, indeed, able only to walk around this problem, hoping that as the years pass scientists will be able to veer in closer and closer, finding at last what lies at the center of all this mystery.

By MARIAN LOCKWOOD.

THE NEXT STORY OF THE EARTH IS ON PAGE 5865.



L. W. Brownell

One of the loveliest sights in northern woods is a bed of wood-sorrel. In the center of its snowy blossoms are streaks of purple or pink—signposts for the bees seeking nectar. Here the clover-like leaves are open wide to the sun.

PLANTS *of* TWO WORLDS

THERE are a number of flowers which we think of as belonging to our continent that have been introduced into North America from other places. On the other hand, there are certain plants that grow naturally in both the Old and the New World.

In the first group we find the wallpepper, or mossy stonecrop, which spreads its stem, crowded thick with scale-like succulent leaves, in great mats over stones and dusty waysides. We may find it thus escaped from cultivation from Nova Scotia to Ontario, in southern New York and Virginia. Its wide-spreading, fine petals look like golden stars on green cushions. All members of the stonecrop family have thick leaves, in which they store up moisture which enables them to grow in the hot, dry, stony places where they are mostly found.

The English ivy is known to most of us. In Canada and the northern states it is a favorite house plant, for it trails gracefully from jar or vase and needs little attention. In the southern states it grows upon walls and trees, climbing by means of "hold-fast" roots that appear along the stem. It is an evergreen.

The delicate wood-sorrel grows in cold woods throughout the Northern Hemisphere. Its knotted slender crimson stems run through the leaf-mold, and put out their large trefoils (three leaflets on a stem) and look like pale clover leaves. Above them rise thin stalks that support a single flower of pure white, streaked with fine lines of purple or pink to show where the nectar is to be found at the base of the petals. There are ten stamens, and the single pistil has five stigmas. The seed-vessel has five ridges, which split when the seeds are ripe and they are shot out to a distance of a yard or more. Before the seeds are ripe, the plant keeps the seed-vessel hidden under its leaves; but afterward the stalk stands upright to raise the seed-vessel well above the leaves, so that the seeds may land far away.

The wood-sorrel, like some violets, has two kinds of flowers. One kind is that which we have just described, and the other has little greenish bud-like affairs borne on recurved stalks at the base of the plant. Although these flowers never open up, and have no means of attracting insects, they are able to develop seeds that will grow,

because they pollinate themselves. If insects visit the gay flowers above, well and good, but if not, the cleistogamous (closed) flowers will ripen into fruit. The leaflets drop in the sunshine, and at night they "sleep"—that is, they droop and close against one another.



American Museum of Natural History

Herb Robert which, as its leaves tell, is a member of the geranium family.

In the large, widespread geranium family we find the soft, hairy herb Robert, in our country often perched on damp rocks and banks. It has much divided leaves, more or less reddened (and sometimes entirely red), which have an unpleasant smell when passed through the hands. We do not know who was the Robert for whom this "holy herb" was named—perhaps a Benedictine monk, perhaps a duke of Normandy. It has pale magenta flowers with fine lines, or "honey-guides," of red on its petals. Its stems are red, also, and its joints where the leaves are attached are swollen. It flowers all summer. The seed-vessels have a long column or beak with a circle of five one-seeded pockets at its base. By a process of unequal drying when the seeds are ripe, the coverings of these cavities, which are prolonged into long tails reaching to the apex of the beak, are suddenly jerked up and curled in rolls at the tip of the fruit, and the seeds which they contain, are sent flying away. It is done so quickly when one touches a thoroughly ripe capsule that it makes a person jump. And this is the habit of all the geraniums.

Plants which are found along railroad tracks and about seaports, the seeds of which have slipped out of grain-bearing freight cars, or during the process of unloading grain from ships, or have, perhaps, been brought in the ballast of ships, are often called ballast plants. They are generally inoffensive, and are regarded as fugitives, as it were from foreign countries. Occasionally, however, they become weeds.

There is a stretch of railroad track along the Hudson River that is gay with the viper's bugloss, a bristly ballast plant with oblong and lance-shaped leaves and a long straight stem three feet high. From the upper part of this stem short curved side branches are given off, which bear crowded flower sprays. These flowers, before they fully open, are often purplish red in color, but when they expand they turn to a most brilliant red. In Canada and elsewhere it is called blueweed, and is a troublesome plant in rocky pastures. The quartet of little nutlets that each plant contains are scattered broadcast as the dead plants are blown over the country. The scarlet stamens and the style, jutting well out from the flower, form a platform for insects, by means of which they both deposit and take away pollen carried on the under-surface of their bodies.

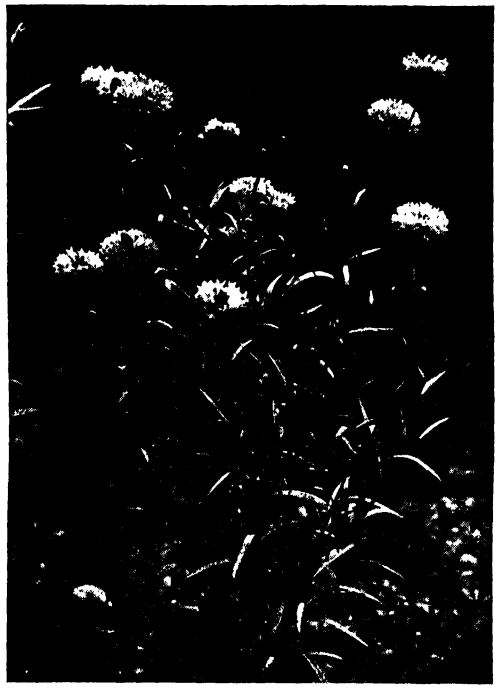


L. W. Brownell

The English ivy, that brightens our homes and festoons old walls.

The blueweed, in spite of its coarseness, is a very close relative of the delicate forget-me-not and heliotrope, all alike belonging to the borage family.

The bird's-foot trefoil with the pale yellow flowers, that is common in every field of England, here appears only as a ballast plant.



Vivid color for our gardens—sturdy bachelor's buttons.

It belongs to the pea family and has some odd habits. It is one of the plants that sleep at night, each one of the triple leaflets hanging straight down from the tip of the leafstalk after sundown. The wings are folded over the keel so as to form a kind of cushion for a honey-seeking insect, and as it settles down astride their saddle a little worm-like thread of paste appears at the tip of the keel and sticks to the bee's undersurface. This is pollen. The club-shaped anthers form a sort of partition between the main cavity of the keel and a small one at its very tip. This latter space is filled with pollen by the anthers, the longest style projecting into the mass. Pressure on top of the keel forces the stamens and the style upward and forward, so that they push the pollen out through a small hole at the tip exactly as the plunger of a pump forces water out of its spout. If the keel be pressed, the style itself is pushed out, and is likely to take up some pollen from the visitor's coat.

In the pea family we also find the old-field, or stone clover, whose fluffy heads of flowers are supposed to resemble the foot of a tiny hare, whence its common American name of rabbit-foot clover. It does not look much like a clover at first sight, for its trefoil leaves have very slender leaflets, and its calyx teeth are so much longer than the petals that they give the flower head the appearance of a soft brush, amid which the tiny pink petals are almost hidden. It has become very thoroughly naturalized, but is useless for fodder, and therefore is left in sole possession of dry stony fields.

The tufted vetch, another pea, is just as much a native of America as it is of Europe or Asia. Its weak stems thrust out dense one-sided sprays of bright blue drooping flowers that, like those of the rabbit-foot clover, are fertilized by means of the pressure exerted on the keel. It is a persistent perennial, difficult to get out of old meadows; but its foliage with many leaflets affords a good fodder (whence, perhaps, its name of cow vetch).

In the carrot family, we have the poisonous fool's parsley, which, although originally brought from Europe, has made itself at home in waste places. It is a slender-stemmed herb, with delicate shiny much divided leaves, known as fool's parsley because no wise person would be likely to mistake its uncurled leaves for those of the true parsley. It grows to about two feet in

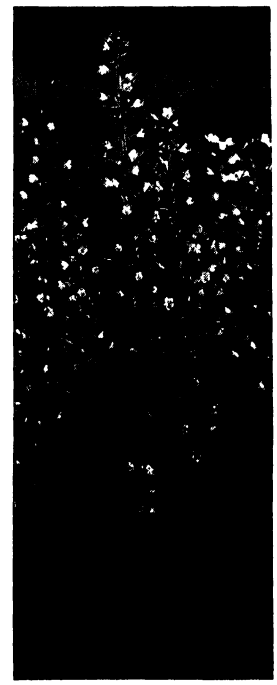


Both pictures, L. W. Brownell

Sprays of blue flowers droop from the tufted vetch.

height and bears umbels of tiny white flowers. From the base of each umbel hang down from three to five slender green points, or bracteoles. This should be remembered as an especial point by which to recognize this poisonous plant. Its seeds are in pairs forming nearly spherical, strongly ribbed shining fruits.

Another one of the poisonous plants that we find depicted here is the woody nightshade, or bittersweet, a member of the potato family, which has made itself thoroughly at home in our thickets, and climbs in a half-hearted manner over shrubs, or merely straggles along the ground. It has rather unusual leaves, ovate (egg-shaped) or hastate (spear-shaped) in general outline, but three-lobed or divided. It has a typical potato blossom, in cymes, star-like, with yellow stamens projecting like a beak. Usually the flower is dull purple. The berries are among our most striking fruits, as they are fleshy and egg-shaped, and when fully ripe are a brilliant scarlet; but in one cluster we may find green or yellow as well as red berries. It is a dangerous plant to eat.



L. W. Brownell

Viper's bugloss, which is called blueweed in Canada.

In Great Britain there is also the early flowering stinking hellebore and the green hellebore, both of them belonging to the buttercup family. As in some other members of this family, the showiness of the flowers is due to the large sepals. The green hellebore's leaves are large and handsome, and are divided into a number of leathery slender leaflets which spread out from the top of the leaf stalk like the outstretched fingers of our hands. They are dark green, and retain their color and freshness throughout the winter; but in the new year the stem makes a sudden growth and puts forth oval leafy bracts and large drooping flowers. We should scarcely find the true petals unless we knew where to look for them. They have been turned into little green two-lipped tubes filled with nectar, hidden at the bottom of the flower beneath the many stamens that stand crowded around the two or three pistils. The flower opens slightly, when the curved stigmas overtop the unripe stamens and receive pollen brought by any early bees or flies, which have to crawl over them and into the flower to reach the nectar. Later the stamens spread out more, the outer sepals get a line of purple along their edges, and the anthers shed their pollen. When this is all gone the stamens drop off, and the pistils grow into seed-pouches that open at the top, something like those of the columbine.

Another garden plant which we know well is the sweet marjoram, a mint that in its native land covers wide stretches of downs. Its perennial underground rootstock sends out runners all round, so that we always find it in masses. The branching square stems grow to about three feet high, and are clothed with oval leaves that end in clusters of purple flowers. These are of two sizes; the larger dark purple ones having both stamens and pistil, while the smaller and paler ones have only a pistil. The yellow-dotted calyx is almost hidden by the larger purple bracts. Beginning to flower in July, they keep up a continuous display well into the autumn.

Another common garden flower is that composite of many names, such as bachelor's button, bluebottle and cornflower. (We must remember that corn to the Englishman usually means grain, especially wheat.) The round base of the cornflower's flower head, covered or protected by broad scales, suggests a thistle, but it has conspicuous rays. The inner flowers are purple and tubular, but the outer florets are like trumpets with jagged brims. The florets in the cornflower have divided their duties. The brilliant azure of the large flaring flowers on the outer circle of the flowering heads serves only to attract insects, for they are without pistil or anthers. The fruitful ones are the insignificant purplish ones within the center. These have both pistil and stamens, the latter united into a ring about the flower, poised on slender filaments. They exude pollen until the tube of the flower is quite filled, and this helps to attract insects.

Many a child regrets that the stinging nettle ever extended its travels from the Old World to the New, for this plant gives sharp, painful stings when touched. The stings are

inflicted by the peculiar weapons, in the form of hairs, borne by the nettle for warding off plant-eating animals. Each hair is expanded at the base and at the top is swollen into a little round cap bent to one side. At this bent portion the walls are very thin, and the head is broken off at the slightest touch, leaving a sharp point that penetrates the skin, and by means of which the irritating contents of the hair are forced into the wound. Oddly enough, an acid possessed by ants, which helps to make a bite of that insect burn, is present in these nettle hairs. These hairs irritate the membranes of the mouth and nose of browsing beasts, and the animals carefully avoid the plant.

Among the nettles may grow the dead-nettles that are members of the mint family, and therefore are not nettles at all, but have been so called because the leaves of the white ones are very much like those of the stinging nettle. As these do not sting, they are called dead-nettles, or in some places dumb-nettles.

Most frequently we shall find the white dead-nettle growing against, or among, a clump of stinging nettles, and then we shall notice how much the leaves of the two plants are alike. The dumb animals, dreading lest they be stung by the real nettles, and evidently observant of the general appearance of a nettle plant, carefully avoid all other plants of like appearance. Consequently the dead-nettle is left uneaten and is able to ripen its seeds in safety, especially when in company with the stinging nettles. This is a form of self-defense obtained by a likeness to a dangerous plant.

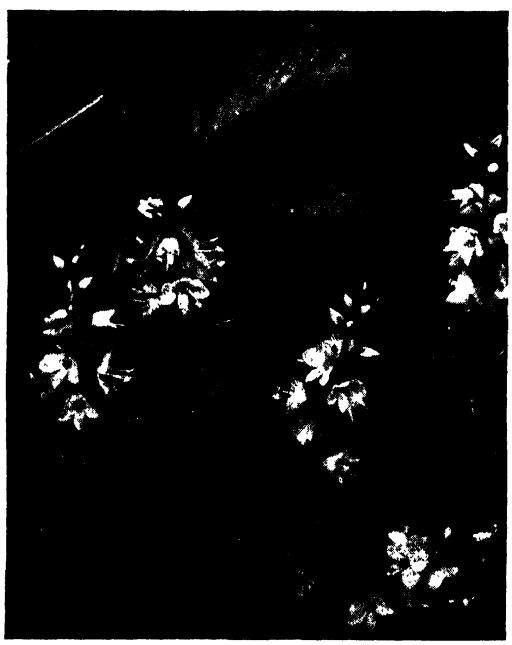
The ground ivy, another scentless mint, has earned for itself the name of Gill-over-the-ground. It is a kind of name that reminds one of creeping jenny or wandering Jew. These names have been earned by the plant's habit of traveling over the ground by means of long runners. We often see the ground ivy along damp banks or in shady thickets, forming carpets of furry, nearly round and evenly toothed foliage, and holding up little clusters of blue-purple flowers very early in spring. It also has smaller flowers containing only a pistil.

Upon sunny banks in early summer we are sure to find the germander speedwell, or bird's-eye. The bright blue blossoms in the axils of the upper sessile leaves have a short tube to the corolla. Of the four lobes that represent the petals only two are of the same size. All are marked with fine lines of darker blue, leading to the mouth of the tube, and to guide the flies that carry the pollen each is margined with white. The stamens bend downward and inward, thus insuring pollination.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 5159.



The stinging nettle, which well deserves its name.



Both pictures, L. W. Brownell

Mossy leaves and blue flowers mark the speedwell.

FLOWERS OF TWO WORLDS



1. Tree Mallow. 2. Sea Purslane (E.). 3. Sea Radish (E.). 4. Storksbill. 5. Seaside Smooth Gromwell (E.). 6. Common Tamarisk. 7. Golden Samphire (E.). 8. Marsh Mallow. 9. Purple Sea Rocket. 10. Sea Heath. 11. Cranesbill. 12. Common Fennel. 13. Halberd-leaved Orache. 14. Sand Rocket (E.). 15. English Stonecrop (E.). 16. Beach Pea.

Flowers marked (E.) are European and are not generally found in America.



1. Yellow Horn Poppy. 2. Sea Lavender. 3. Red Bartsia. 4. Burnet Rose. 5. Sea Wormwood (E.). 6. Sea Kale (E.). 7. Rest-harrow (E.). 8. Sea Campion (E.). 9. Dwarf Tufted Centaury (E.). 10. Common Alexanders (E.). 11. Convolvulus. 12. Great Sea Stock (E.). 13. Seaside Cudweed.



1. Common Broom (E.). 2. Greater Butterfly Orchis (E.). 3. Hairy Violet. 4. Harebell. 5. Common Tormentil (E.). 6. Good King Henry. 7. Furze (E.). 8. Yellow Fleabane (E.). 9. Rockrose (E.). 10. Devil's-bit Scabious (E.).



1. Common Bird's-foot (E.). 2. Wild Mignonette (E.). 3. White Horehound. 4. Small Bugloss. 5. Columbine (E.). 6. Needle-whin (E.). 7. Wood Cudweed. 8. Wall Hawkweed. 9. Common Burdock. 10. Common Calamint (E.).



1. Hawkweed Picris. 2. Quinsywort (E.). 3. Hawk's Beard. 4. Salad Burnet (E.). 5. Common Saw-wort (E.). 6. Aspersit. 7. Dwarf Plume Thistle (E.). 8. Spider Orchis (E.). 9. Common Autumn Gentian (E.).



1. Marjoram (E.). 2. Grass Vetchling (E.). 3. Goat's Beard. 4. Field Fleawort (E.). 5. Plume Thistle. 6. Autumn Lady's Tresses (E.). 7. Chalk Milkwort (E.). 8. Common Mallow. 9. Great Knapweed.



1. Downy Rose (E.). 2. Goldilocks. 3. Lily-of-the-Valley (E.). 4. Hyacinth (E.). 5. Bird's-nest (E.). 6. Cranesbill. 7. Linnæa Borealis, or Twin Flower. 8. Marsh Hawk's Beard. 9. Narrow-leaved Everlasting Pea. 10. Cornel (E.). 11. Rosebay, or Willow Herb.



1. Tutsan (E.). 2. Bitter Vetch. 3. Yellow Dead Nettle (E.). 4. Ramson (E.). 5. Spreading Bell-flower (E.). 6. Orpine. 7. Sweet Woodruff (E.). 8. Ivy-leaved Lettuce (E.). 9. Common Yellow Cow-wheat. 10. Yellow Pimpernel (E.). 11. Myrtle. 12. Wood Strawberry.



1. Groundsel. 2. Borage. 3. Ling. 4. Woad (E.). 5. Slender-flowered Thistle. 6. Yellow Figwort (E.). 7. Teasel. 8. Basil Thyme (E.). 9. Great Broom Rape (E.). 10. Ciliated Heath (E.).



1. Common Star Thistle. 2. Smooth Hawk's Beard (E.). 3. Rampion (E.). 4. Common Wormwood. 5. Common Hound's Tongue. 6. Lesser Stitchwort (E.). 7. Milkwort (E.). 8. Dyer's Weed (E.). 9. Black Horehound. 10. Rough Sow Thistle.



1. Ivy-leaved Sowbread (E.). 2. Common St. John's-wort. 3. Bush Vetch. 4. Oxlip (E.). 5. Barberry. 6. White Star of Bethlehem. 7. Fetid Iris (E.). 8. Snowdrop (E.). 9. Enchanter's Nightshade. 10 Herb Bennet. 11. Wood Violet. 12. Giant Bellflower.



1. Tuberous Bitter Vetch. 2. Trailing Rose. 3. Forget-me-not. 4. Yellow Star of Bethlehem. 5. Daffodil (E.). 6. Crested Cow-wheat (E.) 7. Bird-cherry (E.). 8. Corn Cromwell. 9. Speedwell. 10. Pine Bird's-nest (E.). 11. Wood Germander



1. Common Fumitory. 2. English Catchfly (E.). 3. Lady's Fingers. 4. Viper's Bugloss. 5. Rough, or Hairy, Hawkbit. 6. Great Burnet. 7. Yellow Rattle. 8. White Clover (E.). 9. Common Eyebright.



1. Creeping Plume Thistle (E.). 2. English Daisy. 3. Field Gentian (E.). 4. Bird's-foot Trefoil. 5. Mountain Cranesbill (E.). 6. Penny Cress. 7. Wild Basil. 8. Meadow Saxifrage (E.). 9. Field Speedwell. 10. Black Knapweed. 11. Spring Cinquefoil.



1. Ox-tongue (E.). 2. Sweet-scented Orchis (E.). 3. Sweetbriar. 4. Great Snapdragon (E.). 5. Milk Thistle. 6. Round-headed Rampion (E.). 7. Tufted Centaury (E.). 8. Biennial Hawk's Beard.



1. Clustered Bellflower. 2. Black Nightshade. 3. Ragwort. 4. Nipple-wort. 5. Musk Thistle. 6. Bee-orchis (E.). 7. Pasque Flower (E.). 8. Pale Blue Toadflax. 9. Cat's Ear.



1. A young short-wave fan tuning the receiving set described in detail in this article.

LEARNING TO BE A RADIO AMATEUR

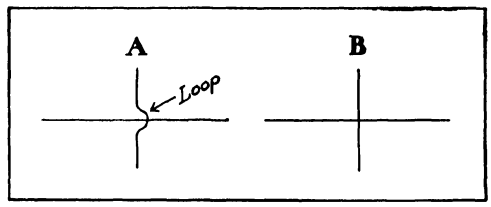
THE thousands of people in the ranks of radio amateurs have always formed a most interesting group, for they have included persons of all ages and all walks of life—schoolboys, college professors, doctors, lawyers, engineers, garage mechanics, newsboys, housewives.

The first radio amateur was Guglielmo Marconi (1874-1937), the famous Italian inventor, who began to communicate by wireless telegraph about the end of the nineteenth century. He was followed by other amateurs in many lands. The United States and Canada have led in amateur radio operation almost from the outset. At the present time there are more than 50,000 amateur operators and stations in the United States alone. The amateur radio stations operate on certain short-wave channels that have been set aside for them.

Amateur radio operators (or hams, as they are called) have had many and varied interests. Many are the experiments that hams have tried with new apparatus. A large number of amateurs enjoy friendly "rag chews" or talks by radio with other amateurs in different parts of the world. Others are interested in relaying messages while still others work "DX" (contact stations as far away as possible).

The hams have proved that their hobby is not merely an interesting form of recreation. They have added much to the technical development of radio. More than once an amateur with little money and much ingenuity has solved a problem that had baffled great research laboratories.

Many times, too, radio amateurs have rendered vital services in time of disaster. They have come to the rescue when hurricanes, earthquakes or floods have resulted in the failure of the telephone and other means of communication. They have often risked their lives to maintain communication between a stricken area and the outside world. For example, in 1938 when a great hurricane swept across Long Island and New England, bringing death and destruction, amateur radio operators played a large part in the rescue work.



2. How the circuit diagram indicates two wires that are to cross without connection (A); how it indicates two wires that are to be connected (B).

Military authorities have found radio amateurs an important element in the national defense. American amateurs who are willing to volunteer their time and their equipment have been organized into amateur Army and Navy networks and have been trained in Army and Navy radio procedure. These networks are ready to do their part in civilian defense whenever needed. Besides, many amateurs serve as radio operators in the military forces in time of emergency.

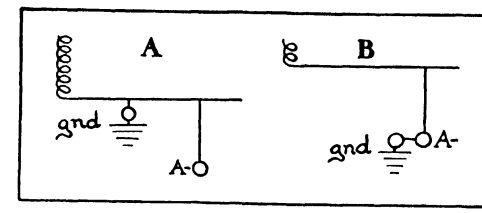
Many amateurs build their own radio receivers and radio transmitters, while others buy their equipment ready-made. No person is permitted to operate a radio transmitter without obtaining a license from the Government. No permission is needed, however, to operate a receiver. In this article we show you how to build a two-tube battery-operated receiver that will give excellent results. When you have built this set, you will have taken the first step in becoming a radio amateur.

Following is a list of the parts that you will need. The letters and numerals that precede most of the parts given here refer to the diagram on page 4999.

(A-bat.) 1½-volt dry cell A-battery (No. 4 size or equivalent).
(B-bat.) 45-volt B-battery (Eveready No. 762, or equivalent).
(C_1) Antenna trimmer condenser, 3-30 $\mu\mu$f (micromicrofarad).
(C_2) Band setting variable condenser, 140 $\mu\mu$f (Hammarlund "Star" type).
(C_3) Band spread variable condenser, 15 $\mu\mu$f (Hammarlund "Star" type).
(C_4) Grid leak condenser, fixed mica condenser, 100 $\mu\mu$f.
(C_5) Regeneration control variable condenser, 100 $\mu\mu$f (Hammarlund "Star" type).
(C_6) Detector plate by-pass condenser, fixed mica condenser, 100 $\mu\mu$f.
(F_1, F_2, etc.) Fahenstock terminal clips; 2 double-clips, 4 single-clips.
(L_1, L_2) Wholesale Radio Company's plug-in coil kit for short-wave (K10040), with 4 plug-in coils in kit; or Allied Radio 60-680, or equivalent.
(Phones) 1 pair headphones.
(R_1) Grid leak, fixed resistor, ½ watt, carbon, 5 megohms.
(R_2) Audio grid bias resistor, fixed resistor, ½ watt, carbon, 2,000 ohms.
(RFC) Radio-frequency choke, 2.5 mh (millihenrys).
(So_1, So_2) Octal tube-sockets, above chassis type (EBY).
(So_3) Coil socket, 4-prong, above chassis type (EBY).
(T_1) Audio transformer, 3/1 ratio.
(V_1, V_2) Detector and audio tubes, type 1G4-GT/G.
Chassis, hardwood, 10" x 7" x ½". Dial (National type BO).
Panel, aluminum or other metal, 1/16" x 9¼" x 7½".
2 brass right-angle brackets; 1½ inch legs.
2 knobs (National HRO or similar).
Wood screws, assorted sizes.
4 ½-inch 6-32 machine screws and nuts.

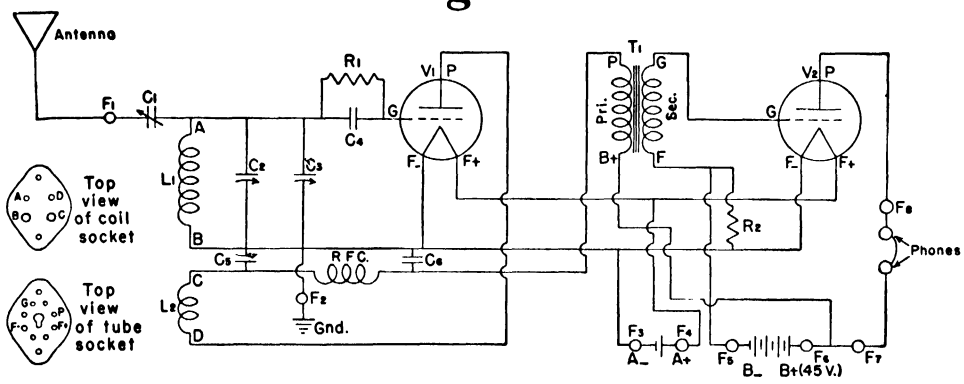
In building the set you should constantly refer not only to the diagram (figure 4) but also to the drawing of the set in figure 5. By comparing the diagram and drawing, you will be able to put each part in place and also to make the proper connections.

The chassis for the receiver is a wooden breadboard 10 inches long, 7 inches wide and ½ inch thick, of the type that can be bought in a five-and-ten-cent store. A piece of ½-inch hardwood can be cut to the same dimensions instead. A metal panel should be used for the receiver. The panel shown in the photograph of the receiver is a piece of aluminum 1/16 inch thick, 9¼ inches long and 7½ inches high. Aluminum is easy to cut and drill, but, if it is not available, other metals may be used. A suitable panel may be made from a heavy, shallow cake-baking pan of rectangular shape and of approxi-



3. A shows the connection of the ground terminal as indicated in the circuit diagram. B shows how the ground connection should actually be made.

A. Wiring of Receiver



B. How to Identify Receiver Parts

Part and name	Part number in diagram	Circuit symbol
Dry-cell	A-bat.	
B-battery	B-bat	
Variable trimmer condenser	C_1	
Variable condenser	C_2, C_3, C_5	
Fixed mica condenser	C_4, C_6	
Dial	None	None
Fahenstock clips	$F_1, F_2, F_3, F_4, F_5, F_6, F_7, F_8$	

Part and name	Part number in diagram	Circuit symbol
Ground	Gnd.	
Coils	L_1, L_2	
Headphones	Phones	
Fixed resistor	R_1, R_2	
Radio frequency choke	R.F.C.	R.F.C.
Socket	So_1, So_2, So_3	None
Audio transformer	T_1	P, G, Primary, Secondary, B+, F
Triode tube	V_1, V_2	Plate (P), Grid (G), Filament (F-, F+)

4. The circuit diagram (A) shows the wiring of the set; the key (B) explains the symbols used. The circuit diagram and key and the drawing on page 5001 will enable you to construct the set without difficulty.

mately the size needed. The baking pan should be mounted on the wood with the sides to the rear of the chassis.

PREPARING THE PANEL

The panel should not be attached to the chassis until the holes for the variable condenser shafts have been drilled in the panel. These holes are drilled along a straight line, parallel to the bottom and 3 inches from it. One hole is drilled at the center of this line; the other two should be 3 inches to either side of the center. Each of the three holes should be ⅜ inch in diameter. Most breast drills do not take a drill larger than ¼ inch, so that it will probably be necessary to enlarge the holes with the end of a small round file or the reamer from a Scout knife.

Three ⅛ inch holes should now be drilled along the bottom of the panel, so that it may be screwed to the chassis. These holes should be drilled ¼ inch from the bottom, one in the center and the other two ¼ inch from the ends. The panel is screwed to the chassis with wood screws.

Two brass right-angle brackets are now attached to the panel and chassis at either end to strengthen the panel and prevent it from bending. Four 6-32 holes are drilled in the panel, two at each end, so that the upright part (or leg, as it is called) of the bracket may be fastened to the panel. These holes should be ½ inch from the ends of the panel. The height at which these holes must be drilled in the panel will be determined by the position of the holes in the brackets. The upright leg of each bracket is now fastened to the panel by means of ½-inch long, size 6-32 machine screws and nuts. The horizontal leg of the bracket is attached to the chassis by means of wood screws.

THE CHASSIS

The three variable condensers should next be mounted on the panel, and the main tuning dial attached to the shaft of the middle condenser (C_3). Then the tube sockets, coil socket and audio transformer should be mounted as shown in figure 5. Next the Fahenstock clips should be screwed across the top of the rear edge of the chassis and about an inch apart. If two Fahenstock double-clips are used, only four single-clips are needed. One single-clip (F_1) is used for the antenna terminal, a double-clip (F_2, F_3) for A— and ground, a single-clip (F_4) for A+, a single-clip (F_5) for B—, a double-clip (F_6, F_7) for B+ and the phone wire attached at B+, a single single-clip (F_8) for the other phone wire. The antenna trimmer condenser (C_1) must now be fastened to the chassis with screws.

WIRING THE RECEIVER

The receiver is ready to be wired. Figures 4 and 5 will enable you to understand how the connections should be made. The grid leak resistor (R_1) and the grid leak condenser (C_4) do not require special mounting, since they are soldered directly to the coil-socket terminal. The radio frequency choke (RFC), detector plate by-pass condenser (C_6) and audio grid bias resistor (R_2) likewise are soldered to solidly mounted parts and therefore need no special mounting.

The tubes are triodes, having three elements—plate, grid and filament. The filament has two terminals, plus and minus, and therefore there are four connections to each tube. The diagram of the tube-sockets (figure 4) shows the correct terminals to which the connections are to be made. The extra prongs on the tubes serve no purpose in the operation of the receiver.

Notice that when two wires cross with a loop in the diagram there is no connection; if they cross without a loop a connection should be made (see figure 2). Connections need not be made exactly as shown in the circuit diagram; they are made at the most convenient point. For instance, in the diagram the ground terminal is shown connected along the main wire running from the bottom of coil L_1 to the filament of tube V_2, but if the ground is simply connected to the A— terminal, the connection shown can be omitted and the result produced will be the same. This is best accomplished by using a double Fahenstock clip at A—, so that there is room to attach both the battery wire and the ground wire (see figure 3).

SOLDERING THE CONNECTIONS

It is essential that all connections be properly soldered if the receiver is to work satisfactorily. The soldering iron is the tool that you will use most in building radio equipment, so that you should become familiar with its use.

A small electric soldering iron should be used and may be bought inexpensively from a hardware or radio supply store. The tip of your iron should be kept clean and "tinned" (see the table on the last page of the article) with a coating of solder, and the connection that is to be soldered should be scraped until it is bright and shiny. In radio work it is necessary to use rosin core solder and not

acid core solder; the latter would eventually corrode the connections and cause noisy operation. Number 18 tinned copper push back wire is suggested for wiring this set since it is very easy to bare the ends of the wire and the tinned wire solders readily. Aluminum is the principal metal used in radio construction that is not easily soldered and requires special solder, flux and technique.

DETAILS OF THE WIRING

After the set has been completed, the wiring must be carefully checked, because an incorrect connection may result in the tubes burning out at once. When the wiring has been checked, connect the lead-in wire of an outdoor antenna to the antenna terminal (F_1) on the receiver. The antenna should be put as high as possible, clear of other wires, and 25 to 100 feet long. A lightning protector such as Birnbach #650 should be connected to the antenna lead-in and grounded. Attach the ground terminal (F_2) to a ground wire that is clamped to a water pipe or to a long pipe driven 6 feet or more into moist soil. Hook up the batteries and headphones and place one of the four coils in the coil socket.

INITIAL ADJUSTMENTS

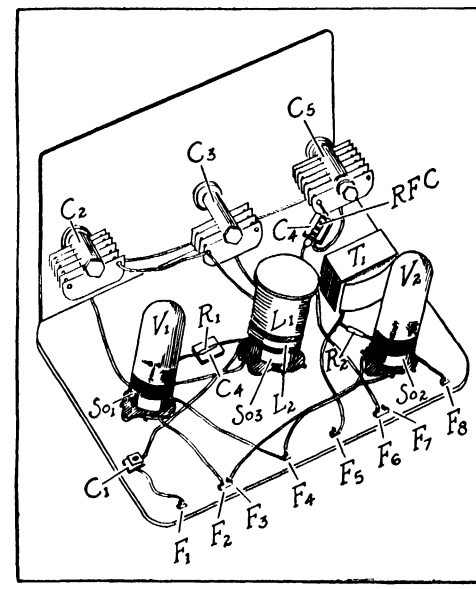
The receiver should now be operating properly; and when the regeneration control (C_5) is adjusted to the correct point, a weak rushing sound should be heard. To test for this condition, a finger may be touched to the stator plate connection of C_2 or C_3. Over a portion of the range of the regeneration control (C_5), a click will be heard in the phones when the finger is touched or removed from C_2 or C_3. The detector (V_1) is then oscillating. As C_5 is turned, a point will be found at which V_1 just stops oscillating as shown by the absence of or reduced loudness click when the finger is touched to C_2 or C_3. The receiver is most sensitive for radio-telephone signals when the regeneration control is adjusted so V_1 just fails to oscillate. Radio-telegraph stations sending telegraph code may be received with V_1 oscillating, and the dots and dashes will then be heard. The set is most sensitive for radio-telegraph signals when C_5 is adjusted so V_1 is just at the oscillation point. The band set condenser (C_2) should be slowly turned until signals are heard. The main tuning condenser or band spread condenser (C_3) is used on the amateur bands to separate the stations from one another. The regeneration control (C_5) should always be kept in proper adjustment as described above.

FINAL ADJUSTMENTS

Your receiver will be able to pick up short-wave broadcasting stations, as well as radio-telegraph and radio-telephone signals. The signals heard as you turn C_2 or C_3 will be in the form of whistles or code. A radio-telephone station will be heard as two whistles close together on the dial. To hear the station clearly, the regeneration control (C_5) should be carefully adjusted so that the whistle disappears and the music or speech is heard. On weak radio-telephone stations, it will be necessary to leave the receiver in oscillation—that is, with the regeneration control so set that the whistles are heard. Then you should tune C_3 in between the whistles in order to hear the station clearly. Radio-telegraph stations (called code stations) are received with the set in oscillation.

The antenna condenser (C_1) should be set with a screw driver to the point where the signals come in the loudest, while it is still possible to set the regeneration control so that the rushing sound is heard.

You will find that it adds greatly to the pleasure you get from your set if you are able to understand the radio-telegraph signals that you hear on it. To do so, it will be necessary to learn the International Morse



5. Pictorial diagram of the receiving set. The letters in the diagram are explained in the key on page 4999 (Part B in the diagram). By consulting the key you will be able to identify the parts.

Code (also known as the Continental Code). This consists of a series of dots and dashes arranged in various ways as follows:

A .–	M ––	Y –.––
B –...	N –.	Z ––..
C –.–.	O –––	1 .––––
D –..	P .––.	2 ..–––
E .	Q ––.–	3 ...––
F ..–.	R .–.	4 ....–
G ––.	S ...	5 .....
H	T –	6 –....
I ..	U ..–	7 ––...
J .–––	V ...–	8 –––..
K –.–	W .––	9 ––––.
L .–..	X –..–	0 –––––
Period (.) .–.–.–	Query (?) ..––..	
Comma (,) ––..––	Error	

It is easier to learn this code if you think of the letters, not as dots and dashes, but as dit and dah sounds. Thus the letter C should not be thought of as dash-dot-dash-dot but as dah-dit-dah-dit. You will find it useful practice to substitute dits and dahs for the words in this article.

When you have memorized the code, the next step is to try to recognize the letters as you hear them over the air. Pick out a station that is sending very slowly, and try to write each letter that you hear in code. At first you will probably get only one letter in ten, but with constant practice you will be able to do much better.

Amateur radio licenses for operating amateur transmitters are issued to those who pass the required examinations. These examinations require the reception of International Code at thirteen words per minute, a knowledge of simple transmitter and receiver theory and familiarity with all the radio laws which apply to amateur radio operators.

You should learn how to send and receive the code. You may practice sending with a telegraph key and a door buzzer, attached to a couple of dry cells. A telegraph key may be bought in almost any radio supply store. After you obtain an amateur license, you can enjoy all the fun of operating an amateur radio station and contacting other operators in distant places.

There are many interesting and well written books on amateur radio that will help you in getting started in this fine hobby. Among these are How to Become a Radio Amateur and the Radio Amateur's Handbook, both published by the American Radio Relay League, West Hartford, Connecticut. The American Radio Relay League (called ARRL) is a non-commercial organization; it is run by amateurs and many amateur operators belong to it. The ARRL publishes a monthly magazine, QST, devoted entirely to amateur radio.

One of the best ways of getting started in amateur radio is to join an amateur radio club. You will find that the club members are always glad to give advice and help to those who are less experienced than themselves. Then, too, you will be able to make lasting friendships in these clubs.

Articles and illustrations by H. F. Meyer, Amateur Radio Station ex-W1GLR.

AMATEUR RADIO TERMS AND ABBREVIATIONS

BCL Broadcast listener; one who listens to ordinary radio programs.
BODY CAPACITY Change in strength and tuning of signals noticed as hands or other parts of body are moved near receiver.
BOTTLE Transmitting tube.
BRASS-POUNDER Radio telegraph operator.
BUG Semi-automatic transmitting key.
CANS Headphones.
CUL "See you later."
DX Distance; contacting or hearing stations many miles away.
ES "And."
FB "Fine business; excellent."
FIST Referring to the operator's style of sending code.
HAM Amateur radio operator.
HI Laughter; over radio-telegraph stations.
LID A poor operator.
MIKE Microphone.
OM "Old man." Every male operator regardless of age is an "old man."
OT "Old timer."
OW "Old woman"; the operator's wife.
PSE "Please."
PUNK A poor operator.
RCVR Receiver.
SHACK The place where the station is located, whether separate building, cellar, bedroom or living room.
TINNING Applying thin coating of solder on tip of soldering iron.
TMW To-morrow.
WORK To contact another station.
WX Weather.
XMTR Transmitter.
XYL Wife.
YL Young lady.
73 "Best regards."
88 "Love and kisses."

FIRST AID TO THE INJURED: LESSON IV

HOW TO STOP BLEEDING

A COMMON form of accident is that in which some blood vessel is injured and the blood begins to leave the body. Sometimes the wound is caused by a knife or piece of broken glass or other sharp object; sometimes it is caused by the end of a broken bone piercing a blood vessel. Bleeding should be stopped as quickly as possible, or there may be serious consequences.

The technical name for bleeding is hemorrhage. This word is made up of two Greek words meaning blood and to break; hemorrhage really means bleeding because of the breaking of a blood vessel.

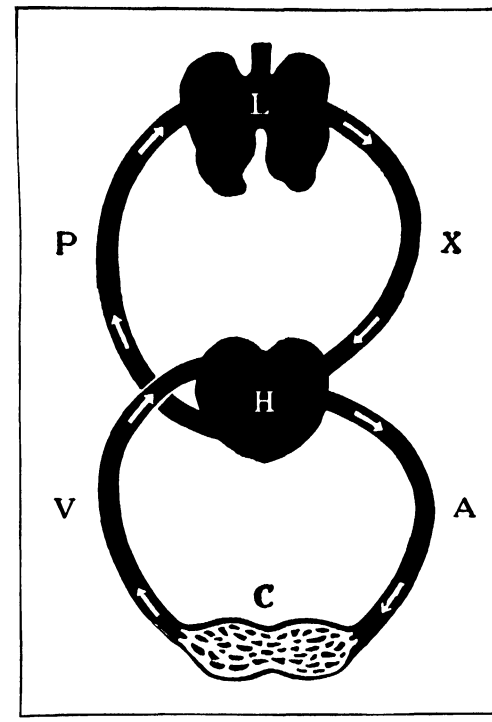
When we injure ourselves and blood comes from the wound, this blood is sometimes bright scarlet in color and at other times it is dark red. The blood may spurt out of the wound or it may ooze out or it may slowly trickle. It is the color of the blood, as well as the manner in which it comes out, that enables us to know where the blood comes from—whether from an artery or a vein or a capillary. This knowledge is very important.

ARTERIAL BLEEDING

First of all, we must be able to recognize arterial bleeding. This is the most serious kind of bleeding; it is extremely dangerous when one of the more important arteries is injured. In arterial bleeding the blood is bright scarlet and spurts out in jets; this is caused by the pumping action of the heart. At each pump of the heart a jet of blood is spurted out.

In bleeding from a vein (venous hemorrhage) the blood is dark red and flows in a slow, steady, trickling stream. When we bleed from a capillary, the blood is red and oozes from the wound, sometimes only drop by drop. This kind of bleeding, called capillary hemorrhage, is the least serious.

Before learning how to stop bleeding, we must remind ourselves of the direction in which the blood flows through the blood vessels. In the arteries the blood passes away from the heart; while in the veins it is passing toward the heart. The simple diagram in figure 1 shows how the blood circulates in our body. The pure blood, bright red in color, is pumped from the lower part of the left side of the heart (H) through the arteries (A), into the capillaries (C). From these it passes into the veins (V), having now become impure and dark in color. The veins carry the blood back to the upper



1. This diagram shows us how the blood circulates. To make the diagram as simple as possible, the organs and blood vessels that are shown here have not been drawn in actual proportion.

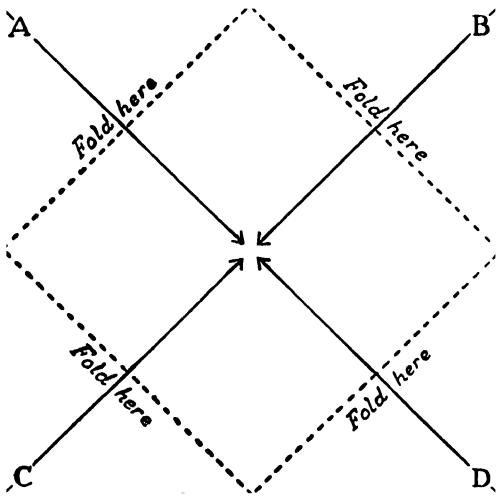
right-hand side of the heart, from which it passes to the lower part of the right side. It is then pumped through an artery, (P), called the pulmonary artery (which means simply the lung artery) and is carried to the lungs (L). There the blood is purified and carried back to the upper left-hand side of the heart by the pulmonary or lung veins, (X). The blood is bright red in all arteries, except in the pulmonary artery, where it is dark and impure, it is dark red in all the veins with the exception of the pulmonary veins, where it is blood red and pure, because it has come straight from the lungs.

To stop the flow of blood we must shut off the circulation of the blood at the point of the injury. To stop bleeding from an artery, first of all we press with the fingers and, as most of the larger arteries run close to the bones, we can press the artery against the bone. We should again examine the picture on page 4622, showing the main arteries of the body and the places where, in case of injury, we apply pressure in order to stop the bleeding. In arterial bleeding

we must always press on the side of the wound nearer to the heart and thus meet the blood coming from the heart and prevent it from spurting out of the wound.

The pressure may sometimes be applied to the wound itself. In this case we press on the bleeding point with finger and thumb, and so close the hole in the artery from which the blood is coming.

The pressure of the fingers is a temporary method of stopping the bleeding. If the doctor is slow in coming, other methods must be used. A helper or the patient himself should continue pressure with the fingers while you are preparing another method.



2. How to fold the pad described in the text.

When the small arteries of the face and scalp are affected, bleeding may generally be stopped by applying a pad over the wound. The pad in question may be made out of a clean pocket handkerchief. We spread out the handkerchief and fold the corners (A, B, C and D in figure 2) toward the centre; we keep on folding in this way until a hard pad of the required size has been formed. Sometimes it is useful to put a small smooth stone inside the pad, as this will considerably stiffen it. This pad should be held in place by a bandage tied around the head. In the case of severe bleeding from the limbs, we shall have to prepare and apply a pad and bandage to the wound and to press the artery at the pressure point with a tourniquet (from a French word meaning a little turn). The tourniquet that doctors use is a special strap-bandage with a screw attached. In practically every case where first aid is to be given, a tourniquet of this sort is not available and we shall find it necessary to make our own tourniquet.

First of all we apply a pad and bandage to the wound. We place the smooth surface of the pad in contact with the wound and secure it with a bandage tied around the limb. Then under the bandage, at the opposite side from the pad we pass a strong stick or any similar object and we twist it round and round until the pressure of the pad stops the flow of blood. The tourniquet should be loosened somewhat from time to time (at intervals of about fifteen minutes), so that the circulation of the blood may not be too seriously affected.

PACKING THE WOUND

When bleeding continues for a considerable time, it will be necessary to pack the wound. Clean linen rag or muslin or cotton should be torn into narrow strips and these should be forced into the wound by means of a pencil or some similar object until the wound is filled with the packing. Then a bandage is to be applied to the wound to hold the packing in place.

The treatment applied for stopping bleeding from a vein is like that used in arterial bleeding, except that we apply the pressure to the vein on the side of the wound farther from the heart.

In capillary bleeding, when the wound is slight, the blood may clot and stop up the cut. If bleeding does not stop, sterilized gauze or a clean linen rag may be tied upon the wound. Styptic powder, which often comes in the form of a pencil, is effective in stopping bleeding from small cuts.

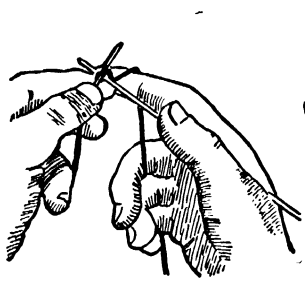
There are several important things to bear in mind when giving first aid in the case of severe hemorrhages. The patient should be kept quiet. He may sit up if the wound is in the head or neck; otherwise he should lie down, with the injured part raised. Pieces of broken glass, earth and so on, should be removed from the wound. No attempt should be made to wash a wound except with water that has previously been boiled. If a clot of blood forms over a wound, it should never be disturbed. All tight-fitting garments, such as collars and garters, should be loosened. The first aid worker should keep cool; he should not let the sight of blood affect his efforts. He should work as quickly as possible. Remember that in all but a comparatively few cases bleeding can be stopped, if you act at once.

THE NEXT LESSON IN THE FIRST AID SERIES WILL BE FOUND ON PAGE 5597.

HOW TO KNIT A CHILD'S SOCK

ANYONE who wishes to knit a sock should first practice plain knitting with the knitting needles. Several methods are in use; we have chosen what is perhaps the simplest. The stitches are formed on a long eyeless needle held in the left hand; they are regulated by the thumb and first finger, the other fingers steadying the needle. The right hand holds the second needle with the yarn placed under the little finger, over the top of the ring finger, under the middle finger and over the index finger. In this way the supply of yarn to the right needle is controlled. Figure 1 shows how the needles should be held.

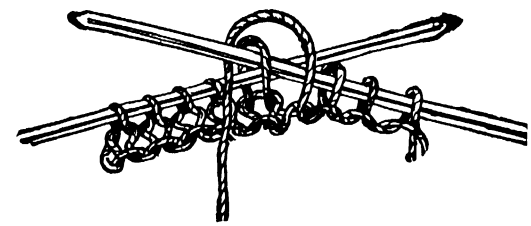
A pair of socks for a child of about three, if knitted in the way described here, would use up about 2½ ounces of rather fine yarn. A sock can be knitted on four standard steel knitting needles.



1. How to hold needles.



2. Plain knitting.



3. Purl stitch or purling.

We begin with the leg of the sock. We start at the top by casting 29 stitches on a needle held in the left hand, with the fingers enclosing the needle, after tying on to it a loop at the end of the yarn. Casting on is done by taking another needle, putting it into the loop, bringing the yarn forward and drawing it through the loop which is on the needle in the left hand, then placing this loop over the point of the needle in the left hand. We must not draw the yarn too tight, or the stitches will be too close together and hard to knit.

When all the 29 stitches are on the first needle, the second one is used and 24 stitches are cast on that, without of course breaking the wool; then the same is done with the third needle. There are now three needles forming a triangle, and holding altogether 77 stitches.

Knitting or rather, plain knitting, is done in the following way. We insert the point of the right needle through the stitch on the left needle so that it comes out on the other side of it. Then, with the first finger of the right hand, the wool is looped over the point of the needle in the right hand and is drawn through the stitch; the left needle is withdrawn. Plain knitting is shown in figure 2. It is not difficult. You will note that we really make a stitch on the right needle before withdrawing the left one.

After taking another stitch like the first one, we make quite a different one, called a purl stitch (see figure 3). Purling is done by bringing the wool in front of the right needle, putting this through the front part of the stitch on the left needle, then twisting the wool around the right needle, passing it through the loop and finally withdrawing the left needle It is really knitting on the reverse side.

We now take another purl stitch and then repeat the 2 plain stitches and the 2 purls three times; next we knit 2 plain stitches and 1 purl. This last purl stitch is going to make the seam stitch down the back of the sock, so we distinguish it by tying a little piece of white cotton on it. We now continue knitting 2 plain and purling 2 (putting it more briefly, we knit 2 and purl 2) to the end of the needleful. Then we knit 2 and purl 2 till the stitches on the second and third needles are off.

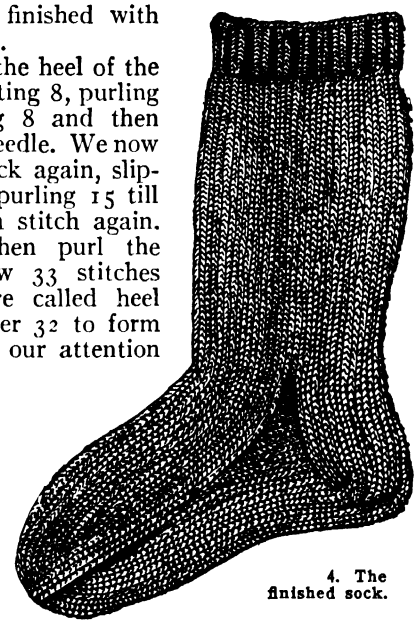
If we look at the sock in figure 4, we see that the upper part of the leg is different from the rest. It is ribbed or welted, to prevent the sock from sliding down the leg. The furrows beside a rib are caused by the purl stitches. The ribbing may be made deeper, if you prefer.

We need twenty-three more rounds like the first one and when these are done we knit sixteen plain ones, always purling the seam stitch when we come to it.

By this time we must think of decreasing the stitches, because the leg gets smaller toward the ankle. So in the next round we knit plain until we reach the third stitch before the seam stitch and then we knit 2 together. To do this we put the needle through 2 stitches and knit them as if they were one. Then we knit 1 and arrive at the

seam stitch, which we purl. After that we decrease in another way by knitting 1, slipping 1—done by lifting the stitch on to the right needle—knitting 1 and with the left needle drawing the slipped stitch over the one just knitted. The round is finished plain. The next five rounds are plain and the sixth is like the one described above, which decreases. These six rounds are repeated four times, and by then we have only 17 stitches on the first needle, the odd one in the middle being the seam stitch, while there are still 24 on each of the other two needles. The leg of the sock is finished with twenty more plain rounds.

It is now time to start the heel of the sock. This we do by knitting 8, purling the seam stitch, knitting 8 and then knitting 8 on the second needle. We now turn the work and go back again, slipping the first stitch and purling 15 till we are back at the seam stitch again. This we knit plain; then purl the next 16. There are now 33 stitches on one needle; they are called heel stitches. Leaving the other 32 to form the instep later, we turn our attention to these heel stitches. We knit one row and purl one row till we have twenty-eight rows; we must take care to slip the first stitch and to retain the seam stitch. Now for the heel we slip the first stitch, knit 6, make 1—that is, make 2 stitches on the same stitch, 1 on the front and 1 on the back of it—knit 2 stitches together, knit 4, again knit 2 together then knit 1.



4. The finished sock.

We are now at the seam stitch. After purling it, we continue to knit 1, slip 1, knit 1, draw the slipped stitch over, knit 4, slip 1, knit 1 and draw the slipped stitch over. It is now necessary to turn again, so we make 1 and purl to the ninth stitch after the seam stitch. The next time we turn we proceed as above from "make 1" and we continue till all these side stitches are knitted; in the last turn we omit the first stitch before purling.

We should now have 15 stitches for the top of the heel. We knit 15 plain from them and take up and knit on the same needle 15 stitches that are on the side of this piece. Next we return to the 32 instep stitches and knit them plain on to one needle. The 15 stitches on the other side of the heel are also taken up, and 7 stitches knitted on to the top of the heel. If we count our stitches correctly, we shall now find that we have 77, the number with which we started on the three needles.

To make the gussets at the sides, we start with the first of the two foot needles by knitting 1, slipping 1, knitting 1 and drawing the slipped over. That is to decrease. Then we knit plain to the third stitch from the end of the second foot needle and dispose of these by knitting 2 together and knitting 1. There is still the instep needle, which we knit plain; we follow that by knitting two rounds.

This knitting for the gussets we repeat until the round consists of 65 stitches, 33 stitches on two of the needles and 32 instep ones on the third. After knitting thirty rounds we give our attention to the toe of the sock. The toe is naturally obtained by decreasing. We knit 3, slip 1, knit 1, draw the slipped stitch over, knit till we reach the fifth stitch from the end of the second foot needle and finish by knitting 2 together and then knitting 3. There is now the instep needle. This we dispose of by knitting 3, slipping 1, knitting 1, drawing the slipped stitch over and at the fifth stitch from the end knitting 2 together and then knitting 3. Two plain rounds follow.

These toe rounds are repeated three times. Then a decrease round alternates with a plain round till only 25 toe stitches remain. The 13 foot stitches are now transferred to one needle, which is placed alongside the instep needle and 2 stitches knitted through together; but as there is an odd central stitch on one needle, we dispose of that by knitting 3 together. We make the last loop big enough to pass the ball of yarn through it, draw the yarn tight and cut it about an inch from the sock. That finishes the sock, which should now look like the one shown on this page.

Young knitters will find directions for knitting twin sweaters on page 5510.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 5331.



Charles Scribner's Sons
Ernest Hemingway, writer of novels.



Rinehart and Co., Inc.
Stephen Vincent Benét, best known for two novels in verse, JOHN BROWN'S BODY and O WESTERN STAR.



Press Association, Inc.
T. S. Eliot, poet and essay writer.

AMERICAN LITERATURE

V. TWENTIETH CENTURY (1920-) PART II

IN the twenty years between the end of the first World War and the outbreak of World War II, the stream of American literature continued to flow with restless strength and many new currents of thought. During the first World War and the peace conference that followed it, the American people became interested in the world outside their borders, in a way that they had never done before. People wanted to know more about the life, the culture and the problems of the nations of Europe. American newspaper correspondents, writers on politics and economics, and novelists wrote millions of words explaining, accusing or defending nations across the Atlantic. In addition, the works of living European writers, especially of fiction, began to be more widely read on this continent.

At the same time, Americans continued to read and to write about their own country with an even keener interest than before. The fresh contact with the ideas of other countries stimulated the younger American writers to compare and contrast our newer civilization with that of the Old World. This stimulus is still strong in American literature. The march of history has stirred the imagination of American writers in the second quarter of our century. Fascism, communism, the depression that swept the world, the second World War—all these things have given life and strength to literature. In ordinary conversation the more different opinions people have, the more interesting the talk will be. So it is with writing. The chief reason for the liveliness and richness of the literature of this period has been the variety of ideas expressed.

After the first World War most people believed that we were entering a new age of peace. Almost everyone hoped that in the future international problems would be solved without armed force. Mankind seemed to be starting a new and brighter chapter in its life, and writers young and old entered with zest into the business of housecleaning our civilization.

Among the novelists of this period, one who has made the most striking impression upon the people of his time is Sinclair Lewis, the first American to be awarded the Nobel Prize for literature. He received this award in 1930, but even before that he was one of the most famous of American authors. He was known all over the world for his vivid, and not at all flattering, novels about American people and their ways of thinking and acting. The novels that made his reputation as a sharp critic of his fellow-countrymen were MAIN STREET, BABBITT, ELMER GANTRY, ARROWSMITH and DODSWORTH, all of them written in the 1920's.

Sinclair Lewis (1885-) was born in Sauk Center, Minnesota, and was graduated from Yale. For several years he wandered all over the United States, doing newspaper



Press Association

Sinclair Lewis ridicules stupid and selfish people.

work and free-lance writing of various kinds, and editorial work for magazines and publishing houses. He wrote a number of magazine stories and two novels, not very original. Then he decided to take time off and write a novel that would please himself, saying the things he really thought, and not caring whether the novel sold or not. This was MAIN STREET, published in 1920. In it he pictured the life of a small American town as it appeared to him. This book was followed by BABBITT, the scene of which was a typical American city.

Both books were tremendously successful. Readers were either delighted with the author's attacks on the smugness, hypocrisy and conceitedness of the average middle-class American, or they were enraged. The books were widely read and talked about and they had an important effect upon American ways of thinking.

In ELMER GANTRY Lewis turned his attention to the clergy and religious leaders of all denominations. In ARROWSMITH he told what he thought about the medical profession. Lewis never meant that everybody in the United States—doctors, social workers, preachers, business men—were like the unpleasant examples he attacked in his novels. He was at heart a sentimental idealist and a reformer, and since the world began reformers have felt little interest in people and things that did not need reforming.

Lewis's later novels have not had the force and power of his earlier ones. He seems to have lost some of his fierceness as the years have gone by. One exception, IT CAN'T HAPPEN HERE, was a stern and realistic warning against the growth of fascism in America. His other novels include ANN VICKERS, BETHEL MERRIDAY, GIDEON PLANISH and CASS TIMBERLANE.

Another novelist came to stand for the clever, restless, discontented young people of the 1920's. This was F. Scott Fitzgerald (1896-1940). Born in St. Paul, Minnesota, he spent four years at Princeton University, but left before graduating to join the Army. His first novel, THIS SIDE OF PARADISE, was published in 1920, and was a great success. This was not because it had exceptional literary value, but because it expressed perfectly the ideas and feelings of the post-war generation of young people. Fitzgerald's characters were usually young people who did not have to worry greatly about money or earning a living. They lived a feverish life, craving excitement and change, yet receiving little satisfaction from either. They were the "flaming youth" of the Jazz Age. Fitzgerald wrote a number of clever, amusing short stories and several more novels about this type of people, but he did not seem to be able to write about anything deeper. When, some years later, a new and different generation came along, Fitzgerald could not interpret it so well. THE GREAT GATSBY, which shows the skyrocket career of a bootlegger, is generally considered his best novel. Others are THE BEAUTIFUL AND DAMNED, TENDER IS THE NIGHT, and THE LAST TYCOON, a story of Hollywood which he did not live to finish. It was published after his death and received much favorable criticism.

WRITERS WHO FIERCELY CONDEMN THE WICKEDNESS AND WASTE OF WAR

A number of books were written about World War I. In the United States, as in the countries that had suffered more directly from the conflict, there was a general feeling of war-weariness and a strong desire that there should be no more such terrible, wasteful struggles. People began to realize that wars are not all flags and parades, romantic courage and military glory. They began to think more about the mud and the vermin of the trenches, the dullness and drabness of the soldier's life, and the tragic cost in wounds and disability and death. Writers who had seen the uglier face of war wrote books filled with bitterness and disillusionment. Among the American novels "debunking" war were

THREE SOLDIERS, by John Dos Passos, PLUMES, by Lawrence Stallings, and SOLDIERS' PAY, by William Faulkner.

Lawrence Stallings (1894-) never wrote another novel after PLUMES. He has written several plays and many movie scenarios. Both Dos Passos and Faulkner have written many finer novels since their war books, but those have a special value because they show a frame of mind that was shared by thousands, perhaps by most of the people of the civilized world. It was a frame of mind that lingered through the 1930's. It inspired a large body of literature in which the authors tried to show the causes of war. In some of these books the blame for wars was laid upon various groups, such as politicians, financiers, industrialists and others. Some of the liveliest and most interesting of these books were DYNASTY OF DEATH and THE EAGLES GATHER, by Taylor Caldwell (1900-), and the Lanny Budd series by Upton Sinclair, which we told you about in Part I of this article.

THE NOVELS OF JOHN DOS PASSOS GIVE A PICTURE OF AMERICA

In the last paragraph we spoke of the other books written by Dos Passos and Faulkner, and now we shall tell you something about these two authors. John Dos Passos (1896-) was born in Chicago, of Portuguese and old American ancestry. He was graduated from Harvard. As a child, and later as a newspaper correspondent, he lived in a number of European countries, in Mexico and in the Near East. He has published essays, verse and travel books, but his reputation rests chiefly upon his novels. The best of these are MANHATTAN TRANSFER, a vast and detailed portrait of New York, and his trilogy called U. S. A., made up of the novels, THE 42nd PARALLEL, NINETEEN NINETEEN and THE BIG MONEY. Like Sinclair Lewis, Dos Passos is a master of description but his stories move along at a much swifter pace than that of Lewis. His novels give a superb portrait of twentieth-century America.

William Faulkner (1897-) was born in Mississippi, attended the University of Mississippi, and served in the Royal Air Force during World War I. For years he has made his home in Oxford, Mississippi, and he has made this town the scene of many of his novels, most of which are written about a family named Sartoris. Faulkner has a style of writing that is sometimes very difficult to read; in fact, a critic once said that Faulkner's novels had to be read twice to be really understood. Most of his characters are eccentric in the extreme; many are vicious, and the novels are not especially cheerful reading. Nevertheless they have a sort of nightmare fascination. SARTORIS, SANCTUARY, LIGHT IN AUGUST and THE SOUND AND THE FURY are among his best known. He writes brilliant short stories which are much more easily read than his novels.

THE FLOWING LIFE-IMPRESSIONS OF THOMAS WOLFE

Faulkner is often associated in people's minds with another Southern novelist of great power who appeared on the literary scene at about the same time: Thomas Wolfe (1900-38). Wolfe was born and grew up in Asheville, North Carolina, attended the University of North Carolina, and Harvard, and was for a while an instructor in English at New York University. He had always wanted to be a playwright, but the dramatic form was too restricted for him; he needed more room for the expression of his ideas. So he turned to the novel and, in 1929, his first book, LOOK HOMEWARD, ANGEL, was published. It had a remarkable success, but it also made a great many of his acquaintances furiously angry. In this, as in all of his later works, Wolfe used his own experiences and the people with whom he came in contact as raw material. He himself, under various names and guises, was the principal character of all his novels. This was not because he considered himself different from everyone else, but because he felt that his thoughts and aspirations and emotions were the same as those of all other men. He was so deeply sincere and honest in his writing that no one could long remain angry with him for using the life and the people he knew.

Wolfe's novels are very long, for words and ideas gushed forth from his mind in great torrents. His style is sometimes a bit complicated, but there is a great deal of pure poetry in it and all of his characters are vital human beings. Besides LOOK HOMEWARD, ANGEL, perhaps his greatest books are OF TIME AND THE RIVER, THE WEB AND THE ROCK and YOU CAN'T GO HOME AGAIN.

If Faulkner's and Wolfe's styles of writing are sometimes too dreamy and complicated, the same complaint could not be made about the style of Ernest Hemingway, (1898-). Hemingway's novels, and especially his short stories, are famous for their clipped, swiftly paced sentences, with no words wasted. Perhaps the most famous example of the way his characters talk is his short story, THE

KILLERS. Hemingway is first of all a short-story writer, for even his novels often seem like interlinked short stories. He writes of violent things and people; bullfighting, war, gangsters, the killing of big game. But he writes with the underlying sadness and indignation of a person who hates the cruelty he writes about.

Ernest Hemingway was born near Chicago. After graduating from high school he went to work as a newspaper reporter, but left his job to drive an ambulance in Italy during World War I. After the war he became a newspaper correspondent in the Near East, then lived for some years in Paris. There he wrote the novel that made him famous, THE SUN ALSO RISES. It is a story of a group of rather useless people, American and English, in post-war Paris. Later he spent some time in Spain. The two novels which are considered his finest are A FAREWELL TO ARMS, a beautiful and tragic love story set against the background of war-torn Italy; and FOR WHOM THE BELL TOLLS, a story of the Spanish civil war.

HISTORICAL NOVELS ABOUT EARLY AMERICA

During this period between the two great wars Americans continued to write and to read historical novels. Many of these were simply stories of romance and adventure set against a historical background. There was, however, an astonishing number in which the authors made a genuine effort to bring the past to life and to make real human beings of their characters. We have already told you about the historical novels of Willa Cather, Joseph Hergesheimer and others who have helped us to more intimate knowledge of American history. Now we shall tell about some other outstanding writers in this field.

Kenneth Roberts, Walter D. Edmonds, Thomas Boyd and Conrad Richter have all written vivid and realistic stories of the colonial and Revolutionary times. Kenneth Roberts (1885-) is a native of Maine, a graduate of Cornell University and a former newspaper man. He has written a series of novels under the general title, CHRONICLES OF ARUNDEL (Arundel was the original name of his home town, Kennebunk). Among these novels are ARUNDEL, THE LIVELY LADY, RABBLE IN ARMS and CAPTAIN CAUTION. All of them contain a great deal of action and adventure on land and sea. Another novel, OLIVER WISWELL, gives a view of the Revolution from the side of the Tories, or Loyalists. His most popular work is the long novel, NORTHWEST PASSAGE, which tells the story of Rogers' Rangers and their daring leader, Robert Rogers, in the wars against the Indians and the French. Roberts has a passion for accuracy of historical detail. He does an enormous amount of historical research to make sure that all of his facts are right, but he also knows how to tell a lively and interesting story.

Walter D. Edmonds (1903-) was born on a farm in New York State, graduated from Harvard and began to have his stories published while he was still in school. All of his books have been about his home state. DRUMS ALONG THE MOHAWK is a story of the Revolution as it affected the peaceful farmers of upper New York State, with the terrible Indian raids and massacres and the constant threat of invasion from Canada. YOUNG AMES is a delightful story about New York City in the days when Andrew Jackson was president and clipper ships sailed into New York Harbor laden with rich cargoes. Edmonds' first successful novel, ROME HAUL, was about the building of the Erie Canal, and in this, as in his other historical stories, he is interested in the people that really made the country—farmers, merchants, boatmen—and not just the famous generals and politicians.

ELIZABETH MADOX ROBERTS WROTE OF THE LAND AND ITS SETTLERS

Elizabeth Madox Roberts (1886-1941) was a descendant of Kentucky pioneers and most of her books were written about Kentucky—not the Kentucky that most fiction-writers dwell on, full of pillared mansions, horse races and Civil War veterans, but farming country where the people live close to the earth. THE TIME OF MAN, her first novel, is a story of the people who live in the Kentucky hills. In THE GREAT MEADOW she wrote of the people who crossed the Appalachian Mountain wall and settled in the beautiful land beyond. Miss Roberts was also a poet, one of the finest of our time, and the poetic mind shows in her novels. The style is rhythmic, almost musical; in fact, the poetic qualities of the writing sometimes slow up and confuse the story.

Another novel that follows the great trek across the Alleghenies to settle the Middle West is Conrad Richter's TREES. It is a strongly realistic story of pioneer life. The reader is made to feel the oppressive gloom of the dark forests that were all around the tiny settlements. Another of Richter's novels of pioneer days is THE SEA OF GRASS, written,

as the title suggests, about the settling of the prairie lands. Conrad Richter (1890-) was born in Pennsylvania, and started out, as so many novelists do, as a newspaper reporter and editor.

Most Americans have read some of the stories of Edna Ferber, or have seen the movies made from them. Born in Michigan, Miss Ferber grew up in Wisconsin and started her career as a reporter on her home-town newspaper. She began by writing short stories, but her great popularity came with the series of novels laid in various sections of the country. So BIG is about truck farming near Chicago about half a century ago. SHOW BOAT, which was made into a famous musical play, started out with life on the Mississippi River after the Civil War, jumped to Chicago's World's Fair of 1893, and ended in New York in the present century. CIMARRON is an exciting tale of the settling and growth of Oklahoma. SARATOGA TRUNK gives a vivid picture of the famous health and pleasure resort, Saratoga, New York, in its palmiest days. These are perhaps the best of Miss Ferber's novels of this type. In almost all of them the principal character is a woman, whose ups and downs are traced from girlhood to middle age. These heroines are always courageous and high-spirited, with a strength of character that enables them to overcome both good and bad fortune.

SOME FICTION THAT WAS POPULAR IN THE 1930'S

Of the three most popular works of fiction in the 1930's, two were historical novels of enormous length, packed with action and romance. They were ANTHONY ADVERSE, by Hervey Allen (1889-), and GONE WITH THE WIND, by Margaret Mitchell (1900-1949). The third novel was THE GOOD EARTH, by Pearl Buck. We shall tell you about this author's work farther on in our story.

Hervey Allen was born in Pennsylvania, was graduated from the University of Pittsburgh, and lived for a while in Charleston, South Carolina. There he became a friend of the poet and novelist Du Bose Heyward. Together they wrote a book of poems, CAROLINA CHANSONS. ANTHONY ADVERSE describes the adventures and wanderings of its hero in Italy, France, the slave coast of Africa, the West Indies, Louisiana and the western plains of the United States. There is a wealth of color and detail in the book. Another long novel by Allen, ACTION AT AQUILA, centers upon a brief engagement in the American Civil War. ISRAFEL: THE LIFE AND TIMES OF EDGAR ALLEN POE, is one of the most important biographies that have been written about that unhappy poet. Hervey Allen is himself a poet of note.

GONE WITH THE WIND was Margaret Mitchell's first and only novel. It is a story of the American Civil War and the Reconstruction of the South. The scene is Atlanta, Georgia, and the country around it. Atlanta was Miss Mitchell's home town. Throughout her childhood, listening to the talk of older friends and relatives, she came to know all of the history and lore of those tragic times. This novel has almost every kind of incident that you could imagine in a story of the period. It has color, romance, excitement, but it is told from a realistic, rather than a sentimental viewpoint. Scarlett O'Hara, the heroine, is a fascinating character. You may not really like her, but you can not help admiring her courage and loyalty.

ROMANTIC ADVENTURES TOLD BY NORDHOFF AND HALL

There have been a great many more works of historical fiction than those we have told about here, and more are continually being written. Not all of them are based on events in American history. One of the most interesting and exciting works of this kind is the BOUNTY trilogy by Charles Nordhoff and James Norman Hall. The novels that make up this trilogy are MUTINY ON THE BOUNTY, MEN AGAINST THE SEA, and PITCAIRN'S ISLAND. Pitcairn is a real island in the Pacific Ocean. The people who live on it today are descended from the rebellious members of the crew of a British ship, Bounty, which sailed to the South Seas on a government mission in 1789. The rebels, or mutineers, seized the ship, set the captain and the rest of the crew adrift in a boat, and sailed away, looking for a place where they could be safe from discovery. The first book tells of the mutiny. The second tells of the heroic voyage of Captain Bligh and his remaining men in their open boat. The third book tells what happened to the mutineers on Pitcairn Island.

Nordhoff and Hall made full use of the British Admiralty records and other historical materials having to do with this long-ago adventure. When you read about it you will almost feel as if you had lived it. Both of these writers have written other books, together and separately. Charles Nordhoff (1887-1947) was born in England of Amer-



Little Brown & Co.

Illustration by Henry Pitz for Nordhoff and Hall's MUTINY ON THE BOUNTY. This is the adventurous tale of men forced to battle the sea in a frail boat after their ship has been seized by the ship's men who have mutinied.

ican parents. James Norman Hall (1887-) was born in Iowa. Both men grew up in the United States, both joined the Allied armies when the first World War broke out in 1914. They met and became friends while both were in the Escadrille La Fayette of the French air force. After the war they went together to Tahiti, in the South Pacific, and there they lived and wrote until the war in the Pacific began in 1941.

We have spoken of THE GOOD EARTH, by Pearl Buck (1892-). This novel became immensely popular, won the Pulitzer Prize for its author. Later Pearl Buck won the Nobel Prize. It is a simple, moving story of Chinese peasants, humble people who live close to the earth and carry on the struggle for existence with patience and fortitude. Mrs. Buck was the daughter of missionaries. She was born in West Virginia, but was taken to China as a small child and grew up there. She has a deep affection and admiration for the Chinese people, and most of her books have been written about them. Some of her best are SONS, THE MOTHER, THE PATRIOT, and DRAGON SEED. Her stories of China are written in a style that is almost Biblical, and which does a great deal to heighten the effect of her character-drawing. Since 1934 Mrs. Buck has made her home in the United States, but she takes an active interest in international affairs, especially those having to do with China, India and other Asiatic countries.

From the rice paddies of China to the prairies of South Dakota and Minnesota is a long way; but the great human qualities of courage and fortitude are the same in all countries. In recent years we have had many fine novels about the pioneer farmers who have built up the Middle West, but perhaps the greatest of these sagas of the prairies is

GIANTS IN THE EARTH, by Ole Rolvaag (1876-1931).

Rolvaag was born in a tiny fishing village on the coast of Norway, and went to the United States in live when he was about twenty years old. For a while he worked on his uncle's farm in South Dakota, then became a traveling salesman. All the while, however, he was completing his education at colleges in South Dakota and Minnesota; and after a year at Oslo University in Norway, he became a teacher at St. Olaf College in Minnesota. It was then that he began to write. All of his works of fiction were written in Norwegian and translated into English, although Rolvaag actually spoke English extremely well. GIANTS IN THE EARTH has been called the fullest and most powerful novel that has been written about pioneer life in America. PEDER VICTORIOUS, which carries on the story of the chief characters in GIANTS IN THE EARTH is almost equally fine. Others of his novels are PURE GOLD, a remarkable study of the character of a miser, and THE BOAT OF LONGING, a poetic and mystical story centering around the heartache of the man who leaves his native country forever.

DIFFERENCES IN AMERICAN BACKGROUNDS GIVE RISE TO DIFFERENT LITERATURES

America is a land of such variety, not only in climate and scenery, but in the origins and traditions of its people, that it offers wonderful possibilities for the novelist. We have seen in these chapters on American literature how the regional novel or short story has been developed in the past hundred years. You will notice, however, that such stories seldom take in all of the different types and classes of people in a particular region. Most of them are studies of the way of life of a single group. Thus we have Rolvaag's Norwegian emigrants, Elizabeth Madox Roberts' Kentucky hill people, and Faulkner's decayed Southern gentry, to mention only a few. Some writers tend rather to become specialists on the lives, character and environment of a small class or group. We are going to tell you about some more of these writers, and you will agree that reading the stories of all of them would give you a fascinating patchwork-quilt impression of America, with pieces of many sizes and shapes and colors and textures.

There are, for example, the stories that Marjorie Kinnan Rawlings (1896-) writes about the backwoods people of Florida. When you read SOUTH MOON UNDER or THE YEARLING, or CROSS CREEK—a non-fiction work about her own farm and the friends and neighbors round about—you can hardly believe that this simple, idyllic life exists in the same state with the feverish modern life of such cities as Miami and Jacksonville. THE YEARLING, a simple and charming story of a twelve-year-old boy and his pet fawn, has already come to be looked upon as a classic of boyhood. It was awarded the Pulitzer Prize in 1939.

Erskine Caldwell (1903-) also writes about simple people in remote sections of the southern states. But his characters and the viewpoint from which he writes are quite different from those of Mrs. Rawlings. They belong chiefly to the class that is known in the South as poor whites. Most of them are of the oldest American stock, but they live in poverty and ignorance. It is interesting to compare the broken-down poor whites of Caldwell's TOBACCO ROAD with the broken-down gentry of William Faulkner's novels. TOBACCO ROAD was made into a famous play which had the longest run of any play in the history of the American theater. Many people were shocked by the speech and behavior of Jeeter Lester and the other characters in TOBACCO ROAD, but there could be no doubt that here was a truly remarkable slice of human nature. Caldwell has also written many short stories and non-fiction works. Another of his novels which has been much talked of is GOD'S LITTLE ACRE. As a boy Caldwell traveled all over the southeastern states and lived among people of all types and classes. He knows thoroughly the kind of people he writes about, and he writes about them with complete frankness and a kind of grisly humor.

JOHN STEINBECK'S "GRAPES OF WRATH," A TRAGEDY OF DUST BOWL FARMERS

John Steinbeck (1902-) is best known for his powerful and sympathetic novel of migratory workers in California, GRAPES OF WRATH. In it he tells of the Joad family, who, like many other farm people, had been ruined by the long drought in the Dust Bowl part of the Middle West. They gathered their few remaining possessions into the rickety family car and started out for California. There they hoped to get a new start in life, but thousands of other people had the same idea, and the story tells of the disappointments and hardships that the Joads, and others like them, had to endure. The book is filled with violence and brutality, but it is written in a style that often becomes poetic.

Many people regard his short novel, OF MICE AND MEN, as his masterpiece. It is sheer tragedy, simply told. In this, as in his other stories, you feel the author's sympathy for the people whom he considers the underdogs in our civilization. TORTILLA FLAT and CANNERY ROW are also stories of the waifs and strays and odd characters that Steinbeck is most interested in. The setting of these books is his native California. There is a good deal of humor in his work, and, some readers think, a little too much sentimentality at times.

Steinbeck is interested in deep-sea biology, and his non-fiction work, SEA OF CORTEZ, was the outcome of a scientific expedition which he made to the Galápagos Islands. During the second World War he departed from the usual scenes of his fiction and wrote THE MOON IS DOWN, a novel about a town that had been invaded by the Germans. He did not name the country, but it was probably suggested by the invasion of Norway.

"NATIVE SON," A POWERFUL TRAGEDY BY RICHARD WRIGHT

One of the most interesting and varied elements in the population of the United States is the Negro. Many writers, both Negro and white, have recorded in fiction the lives and problems of Negroes of different types and backgrounds. Among the outstanding novels of recent years has been NATIVE SON, a powerful and tragic story by Richard Wright (1908-). In this book, as in Theodore Dreiser's AMERICAN TRAGEDY, the principal character is driven to commit a murder; and like Dreiser, the author of NATIVE SON places the blame for the tragedy on the social conditions that surround his characters. Richard Wright was born near Natchez, Mississippi, and has lived in Memphis, Chicago and New York. The scene of NATIVE SON is Chicago. The novel was made into a successful play and has won its author many honors, including the Spingarn Medal for achievement by an American Negro. In BLACK BOY Wright tells the story of his own early years.

Claude McKay (1890-) is equally well known as a poet and as a novelist. His best novel is undoubtedly HOME TO HARLEM. It is a vivid, realistic picture of that part of New York which forms the largest Negro city in the world. Other novels are BANJO, GINGERTOWN and BANANA BOTTOM. McKay was born in the West Indies and has lived in England, France and Russia. He is intensely interested in Negro workers, and in the water-front characters, of all colors, in the European seaports. He has an extraordinary gift for painting character, and his style of writing is distinctly that of a poet.

Jessie Redmon Fauset (1884-) writes of a quite different class of Negro from those in either McKay or Wright's novels. Her characters are chiefly of the white-collar and professional classes. She herself was born in Philadelphia, educated at Cornell, the University of Pennsylvania and the Sorbonne in Paris, and has taught and lectured in various schools and colleges. Two of her most outstanding novels are PLUM BUN and THE CHINABERRY TREE.

Before we leave this subject we must mention MAMBA'S DAUGHTERS and PORGY, by Du Bose Heyward (1885-1940) and the stories by Julia Peterkin (1880-) of the plantation Negroes of the South Carolina coast: BLACK APRIL, BRIGHT SKIN and SCARLET SISTER MARY. Both of these writers were natives of South Carolina. Heyward was a poet as well as a novelist, but he was at his best when he wrote of the life of Colored Charleston. PORGY was made into an opera, or musical play, and the wonderful music by George Gershwin will probably live for a very long time.

SANTAYANA COMBINES EXQUISITE PROSE WITH SUBTLE PHILOSOPHY

New England was for a century the literary center of the United States. In recent years it has given us some fine serious literature, both fiction and non-fiction. THE LAST PURITAN, by George Santayana (1863-), is a novel written by a philosopher. Santayana is an unusual figure in the American literary scene. He was born in Madrid, of mixed Spanish and New England ancestry, and though he was educated in Boston and at Harvard, he has said that he feels himself to be a guest in the English-speaking world. He has been a famous teacher in universities in the United States and abroad, and has written verse, fiction and philosophical treatises. His style of writing has been called a "singing" style. His books have not generally had a wide popular appeal. For this reason it was a great surprise to himself and to the critics when THE LAST PURITAN became a best seller.

John P. Marquand (1893-) is another gift of New England who was born elsewhere, in Wilmington, Delaware. Readers of the popular magazines in the 1930's were familiar with his short stories about Harvard undergraduates and his serials about mysterious adventures in the Far East. His literary

fame, however, rests upon his more serious novels, especially THE LATE GEORGE APLEY and H. M. PULHAM, ESQUIRE. In these two books, written in the form of memoirs, he gives a sharply etched, but not unkind, study of a certain type of Bostonian: conventional, self-satisfied, and yet not insensitive at heart. Marquand writes of his characters with a dry humor and an underlying tenderness, and his books appeal to many readers to whom the types he pictures are unfamiliar.

Wit, satire and the romantic appeal of far-off times and places helped to make popular the novels of John Erskine (1879-) and Thornton Wilder (1897-). John Erskine, born and educated in New York, is a poet, essayist, novelist and an accomplished musician. His novel THE PRIVATE LIFE OF HELEN OF TROY came out at a time when it was fashionable to "debunk" history, and to prove that great or famous men and women were really stuffed shirts or figures to ridicule. The really clever thing about Erskine's story of the legendary queen was that he made her human and lovable without sacrificing the glamour. Erskine followed HELEN with several other novels of the same type, including GALAHAD and ADAM AND EVE; but in these later stories the satire was stronger and the characters seemed a little wooden.



Charles Scribner's Sons
Marjorie Rawlings has given us colorful Florida stories.

THORNTON WILDER, PLAYWRIGHT AND NOVELIST

Thornton Wilder was born in Wisconsin, grew up in China, and completed his education at various universities in the United States. He has written a number of plays, including the unusual and highly successful OUR TOWN, but his most memorable works are three novels. THE BRIDGE OF SAN LUIS REY, a romantic and satiric tragedy of colonial Peru, was a tremendous popular success. An earlier novel, THE CABALA, is considered by many people to be even better. It is about Rome in the late nineteenth century, when the aristocracy was divided in sympathy between the Vatican and the new monarchy. The third story, THE WOMAN OF ANDROS, is an exquisite tale of ancient Greece.

In the years between the two world wars the American short story continued to grow in quality and in popularity. It developed along two different lines. In the magazines of large circulation the need seemed to be for stories with well-defined plots, smoothly and skillfully written, the characters being of less importance than the action or the background. In what we might call the literary short story, there came to be little, if any, plot. Most of the stories were studies in personality and character as revealed in some trivial incident in daily life. We have mentioned the short stories of Ernest Hemingway. He has had a tremendous influence upon the short-story writers who have come after him. Dorothy Parker (1893-) writes stories in which bitterness almost drowns out an intense sentimentality. John O'Hara (1905-) is a realist. He shows us people as they appear on the surface and leaves it to us to praise or condemn, or to ask what lies below the surface.

Stephen Vincent Benét (1898-1943) left us a group of short stories, some of which will linger for a long time in the literature of the English language. His best stories are of a kind that has been called a ballad in prose. Benét was a poet, one of the finest of our time and country. Since we are going to tell something about the poetry of this period, we shall begin with him and his brother, William Rose Benét (1886-).

Stephen Vincent Benét was born in Pennsylvania, of a family that had produced a number of American army officers, and in the present generation, a number of writers and poets. His first volume of verse was published when he was seventeen, and he never followed any other profession than that of

writing. It was JOHN BROWN'S BODY, a long story-poem about the American Civil War, that really established his fame. In it he put all of his feeling for the American past, for the glory and pathos and meanness of human endeavor. It is a book that you can read over and over, finding new things each time to touch your heart and cling to your memory. Benét wrote a number of American ballads, as well as other lyric poetry, and when he died he had completed the first part of WESTERN STAR. This long poem was intended to show the spirit that built America.

William Rose Benét writes poetry that is colorful and romantic. There is a fresh, gentle humor to be found in much of it, as well as in his critical writings. Many people like best the short poem, WHALE, which you will find in your BOOK OF KNOWLEDGE. The poet himself likes best his long poem, THE GREAT WHITE WALL. This poem tells about the conquest of China by the Tartar tribes, long ago.

BEAUTY AND FANTASY FROM THE PEN OF ELINOR WYLIE

William Rose Benét was married to another poet, Elinor Wylie (1885-1928). Her delicate, precise verse and her clear thought set her apart from most other modern poets. Elinor Wylie also wrote several novels, poetic fantasies, including JENNIFER LORN and THE VENETIAN GLASS NEPHEW. She wrote a life of Shelley, called THE ORPHAN ANGEL, that is as much a fantasy as either of the two novels. Mrs. Wylie was herself as romantic a figure as any we read about in history or legend. She was very beautiful, imaginative and intense, and she had an amazing amount of genius.

About the year 1922 there appeared a poem which has been called a stepping-stone in the course of world literature. This was THE WASTE LAND, by T. S. Eliot. Thomas Stearns Eliot (1888-) was born in St. Louis and was a member of the distinguished Boston family of which the late President Eliot of Harvard was a member. He himself graduated from Harvard. In his class were Heywood Broun, Walter Lippmann and Stuart Chase. At Harvard, Eliot studied under George Santayana, whom we have already mentioned. Later Eliot studied in Europe and settled down to live in England. Like Henry James, Eliot can be claimed by both England and America.

Eliot knew a great deal about the French poets who were called Symbolists; he was an admirer of the early work of Ezra Pound; also of the great Elizabethan poet, Donne, and the Italian, Dante. Because he liked all of these poets and their methods of writing, he used their methods and added ideas which were entirely modern and his own. This has given his poetry curious contrasts. While much of it is very modern, it is sprinkled with quotations from the poets and ages that we have mentioned.

Before THE WASTE LAND appeared, Eliot had already published several slim volumes of verse, among them PRUFROCK AND OTHER OBSERVATIONS. It was the 434 lines of THE WASTE LAND, however, with its summing up of the disillusionment of the post-war generation, that made him famous.

In the years since Eliot became a model and an inspiration to the young poets of his time, he has developed and changed in a number of ways. In 1935 came his MURDER IN THE CATHEDRAL, a poetic drama about the assassination of Thomas à Becket in Canterbury Cathedral, hundreds of years ago. This work showed how its author's views of life had changed. It is a most moving and beautiful drama, and it has been acted successfully many times in Britain and in the United States. Eliot has said that he now believes in a national church, like the Church of England, and in a government headed by a king.

E. E. CUMMINGS, POET AND PAINTER, AND ARCHIBALD MACLEISH, POET

Among the younger poets of the time who were influenced by Eliot's WASTE LAND were Edward Estlin Cummings (1894-) and Archibald MacLeish (1892-). These men were poets with a powerful genius of their own, and they soon outgrew the influence of Eliot. But it was of value to them just the same. Cummings, who always signs himself e. e. cummings, was born in Massachusetts and educated at Harvard. Before America entered World War I he served as an ambulance driver with the French. From his experiences at this time he wrote a book, THE ENORMOUS ROOM, which is considered one of the best of the war books of the period. Cummings is a painter as well as poet, and in both of these arts he is such an individualist that not many people really know what he is driving at. In poetry, it is as if he wrote only for himself, and if you happened to be the kind of person who felt and thought as he did, then, and then only, you would understand his poetry. The best way to find out about any poetry is to read it, but Cummings' poetry has the added



Photographs, left to right: Press Association, MacMillan, and Leja Gorska

Santayana writes from quiet Roman seclusion. Mary R. Beard and Charles Beard (wife and husband), historians.

difficulty of being poetry for the eye and not for the ear: you can't sing it.

Archibald MacLeish was born in Illinois and educated at Harvard. The American people know him, not only as a poet, but as Librarian of Congress and head of the Office of Facts and Figures under President Roosevelt. This writer once heard him say that librarians thought of him as a poet, and poets thought of him as a librarian. However this may be, he has written some of the really fine poetry of our time. He handles words as if they were jewels, to be set in a mosaic picture. He has a gift for rhythm and cadence, and, somehow, even his most impassioned poetry is cool and musical to the senses.

There have been, during the years since about 1910, many young and vivid American poets. Certainly, a hundred years from now, people will look back upon our time as a fresh, blossoming springtime of poetry. We have tried to tell about some of the individual poets in these chapters; but the only way to know poetry is to read it. You will find poems by many modern American poets in the poetry chapters of your BOOK OF KNOWLEDGE. It is a good idea to go to your public library and find others by the same poets. Reading a book of poetry is like prospecting for gold. You never know when you are going to find something to treasure and to make your heart sing.

We have told about fiction and poetry; but they are only a part of literature. It is true that the spirit of an age is often best expressed in the fiction that it produces, but that is not entirely the case with our own age. There are, for example, the essayists. Magazines and newspapers carry many articles which belong to the same literary family as the essays of the eighteenth and nineteenth centuries. Many of these charming and even brilliant trifles, such as those printed on the editorial page of the New York TIMES, are published without an author's name. On the other hand, such writers as Heywood Broun and Alexander Woollcott have given delight and instruction to millions of readers.

Heywood Broun (1888-1939) was born in Brooklyn. He spent four years at Harvard but did not graduate. After that he became a sports writer on a New York paper. He did not consider sports writing to be beneath his talents: instead, he wrote so well and with such a delightful style that he soon had a personal column, It Seems to Me. Many of the pieces published in his column were of only fleeting interest, but some of them are as interesting to read today as when they were first written. A number were collected and published in book form. Broun also wrote two novels, THE BOY GREW OLDER and THE SUN FIELD, and a number of nonfiction works. He was a kindly man, interested in the welfare of those less fortunate than himself. He was a firm believer in the American ideals of freedom of speech, freedom of religion, and fair treatment of those who do not agree with you. These ideals show in all of his writings.

Alexander Woollcott (1887-1943) was born in New Jersey and spent his childhood in Kansas City and Philadelphia. He graduated from Hamilton College, did graduate work at Columbia, and was dramatic critic on the

New York TIMES for a number of years. He wrote for other papers and periodicals, acted in several plays—he even had plays written about him—and talked over the radio about the many subjects that attracted his interest. He knew almost everyone who was celebrated and, in addition, he was the warm friend of many persons who were absolutely unknown to fame. He wrote enchanting biographies of several of his favorite men and women of the theater. He produced also a number of other works. The best way to enjoy his work is to read WHILE ROME BURNS, a selection of essays on a wide variety of subjects. Woollcott had a leisurely, conversational way of writing, but if you read one of his pieces over carefully you will see that he did not waste words. Therefore he was able to pack a great deal into a very small space, without seeming to be hurried.

WHAT LIFE IN AMERICA MEANS TO THE IMMIGRANTS

In the 1920's there was a particularly fine group of autobiographies published by people who had come to the United States and had had distinguished careers in different fields. One of these was THE AMERICANIZATION OF EDWARD BOK. The author, Edward Bok (1863-1930), was brought to America from Holland at the age of six. He had to leave school much earlier than is considered wise, but this did not stop him from learning and growing in intelligence and achievement. He worked on many papers and periodicals, and was for thirty years editor of the LADIES' HOME JOURNAL. For his autobiography, written after he had retired from active work, he received the Pulitzer Prize.

FROM IMMIGRANT TO INVENTOR, by Michael Pupin, was another tale of an immigrant boy who gave much to his adopted country. Michael Pupin came to America from what was then Bohemia, and, in spite of ups and downs, became one of the outstanding American physicists. His story was written in a fascinating way. It was as interesting as fiction, and yet it was all true.

In the field of history, American writers have been very active during the first half of the twentieth century. About the time when the Englishman H. G. Wells wrote his famous OUTLINE OF HISTORY, a number of works appeared which were of the same general type. Among these were THE STORY OF MANKIND, by the Holland-born American writer, Hendrik Willem van Loon (1882-1944). This work, like all of the books he wrote later, is so clear and so friendly and confidential in style that to read it is like listening to a wise and humorous friend talking. Later Van Loon wrote lives of Bach, Rembrandt, and Peter Stuyvesant; a history of art, and books on many other subjects, most of them illustrated with his own delightful pen-and-ink sketches.

Famous among historical writers of the twentieth century are Charles and Mary Beard. Together they have written THE RISE OF AMERICAN CIVILIZATION, and each has produced a number of historical works of great merit. Charles Beard (1874-1948) was born in Indiana and educated at De Pauw, Oxford, Cornell and Columbia. He started as a newspaper owner and editor but turned to teaching and became a professor at Columbia University. His wife, Mary Ritter Beard (1876-), was also born in Indiana and is a graduate of De Pauw. She is especially interested in the labor movement and in the welfare of women, and has written a number of books on these subjects.

VERNON PARRINGTON'S SOCIAL HISTORY WHICH EVERY AMERICAN SHOULD READ

One of the most influential works on what is called social history, and the first really important one to be written about the United States, is MAIN CURRENTS OF AMERICAN THOUGHT, by Vernon Louis Parrington (1871-1929). Parrington was born in Illinois. He graduated from Harvard and became a teacher in various Middle Western colleges. During the last twenty years of his life he was professor of English at the University of Washington. His great work, MAIN CURRENTS OF AMERICAN THOUGHT, is a history of American literature from the earliest times. This is far more than a discourse on books and writers. It brings in American life from age to age—how people thought, how they made a living, their play, their government. It is not easy to describe the work in a few sentences, but this much can be said: every American who reads it will have a far greater understanding of his country and its culture and its destiny; and no American who has not read it has completed his education.

Allan Nevins (1890-) is another son of Illinois who has distinguished himself in the field of history. He has been for some years professor of American history at Columbia University. He has edited a number of source books, such as the diaries of Philip Hone, John Quincy Adams, President Polk, the letters of Brand Whitlock and of President Grover Cleverland. In addition he has written a number of excellent works on

American history and American biography.

Lewis Mumford (1895-) is a critic and historian who takes all human culture for his field. He is perhaps best known for his works on architecture and building—a very important part of any civilization. He has, in recent years, been at work on an enormous study of machines, cities and buildings, of which the first two volumes are TECHNICS AND CIVILIZATION and THE CULTURE OF CITIES. His earlier books, THE GOLDEN DAY, STICKS AND STONES and THE BROWN DECADES are intensely interesting and still make good reading.

WHY WE RESPECT THE JUDGMENT OF THE CRITICS

The field of criticism is a most important one. The playwright, the novelist, the poet and the historian write out of the fullness of their hearts and the depths of their understanding, but each writes what seems true to himself. Since these writers rarely have the same viewpoint, it is left to the people who read their books to decide how reasonable or how inspired or how accurate each writer is. Most readers have neither the time nor the knowledge to judge the works of the many excellent writers. Therefore we have the critics—men and women whose lives are spent in reading the works of others; comparing and judging them in many ways. Critics are supposed to be impartial, but since most of them are clever people with ideas of their own on most subjects, it is not surprising to find that they are sometimes a little biased in certain directions. Among the critical writers of our time there have been many brilliant persons. We have space here to tell you about only a few of them.

Henry L. Mencken (1880-), born in Baltimore, educated at Baltimore Polytechnic, and still further educated through his work on newspapers, was the terror and the delight of writers and readers in the 1920's and early 1930's. As editor of the magazine SMART SET and later of THE AMERICAN MERCURY, his acid wit and sledge-hammer criticism combined to annoy practically everyone who came to his critical attention. He has always been liberal in the old-fashioned American sense of the word, but after all, it is quite as painful to be hit on the head by a liberal as by the most hidebound conservative. Mencken had enthusiasms as well as prejudices, and among these enthusiasms were the works of Sinclair Lewis, James Branch Cabell, Theodore Dreiser and Joseph Hergesheimer, whose work he consistently praised and brought to public attention. In his later years Mencken has taken pleasure in writing a series of memoirs and in compiling a dictionary of the American language. His memoirs read like a combination of the adventures of Huckleberry Finn and Penrod Schofield. Nothing could be more amusing and delightful to read. His work on the American branch of the English language is scholarly and valuable.

Stuart P. Sherman (1881-1926) was born in Iowa and attended Williams College and Harvard University. He taught English at the University of Illinois and edited the HERALD TRIBUNE BOOKS in New York, and published a number of critical essays. In spite of his early death he had reached a point in his career where his judgments were regarded with respect. They are still quoted.

BERNARD DE VOTO AND VAN WYCK BROOKS, CRITICS OF AMERICAN LITERATURE

Bernard de Voto and Van Wyck Brooks are often thought of together, perhaps because they had a famous disagreement on the subject of Mark Twain's life and works. Van Wyck Brooks (1886-) was born in New Jersey, educated abroad and at Harvard. He has always been interested in the life and literature of New England, and his two most widely known books are THE FLOWERING OF NEW ENGLAND and NEW ENGLAND: INDIAN SUMMER. The first is a fascinating study of the great period of New England culture, the time of Emerson. The second tells of the period of Lowell and other later writers.

De Voto (1897-) was born in Utah. He attended the University of Utah and Harvard, and taught at Northwestern and Harvard before becoming editor of several literary reviews. He is especially interested in American history and in American literature of all periods. He has written a number of works on Mark Twain, and has edited Mark Twain's unpublished papers. He disagreed with Van Wyck Brooks's published idea that Mark Twain was a genius who was kept from being great by his friends and family.

Edmund Wilson (1895-) is one of the leading critics of the present day. Born in New Jersey, he was educated at Princeton and started out as a reporter on a New York newspaper. Later he became book-review editor on various periodicals. He has written verse, plays and a novel, but he is first of all a critic. He is equally interested in literature and economics, and these two interests are apparent in his books. The most highly re-

garded of his critical works is AXEL'S CASTLE. In 1936 he published TRAVELS IN TWO DEMOCRACIES. Half of this book was taken up with his experiences during a stay in Soviet Russia, and the other half with certain travels in the United States. Neither country appears to have lived up to the author's expectations.

The writing craft is taught today in most American colleges. More and more gifted young people are turning to some form of writing as a career. More books are printed than ever before, and more people turn to books for entertainment and information.

THE NEXT STORY OF LITERATURE IS ON PAGE 5101.

SOME OTHER 20TH CENTURY AMERICAN AUTHORS

Louis Adamic (1899-)
Sociology and fiction
THE NATIVE'S RETURN
MY AMERICA

James Truslow Adams (1878-)
History
THE ADAMS FAMILY
AMERICA'S TRAGEDY
EMPIRE ON THE SEVEN SEAS

Bess Streeter Aldrich (1881-)
Fiction
A LANTERN IN HER HAND
A WHITE BIRD FLYING
SPRING CAME ON FOREVER

Margaret Culkin Banning (1891-)
Fiction
COUNTRY CLUB PEOPLE
LETTERS TO SUSAN

Louis Bromfield (1896-)
Fiction
THE GREEN BAY TREE
POSSESSION
EARLY AUTUMN
THE STRANGE CASE OF MISS ANNIE SPRAGG
THE RAINS CAME
TWENTY-FOUR HOURS

W. R. Burnett (1899-)
Fiction
LITTLE CAESAR
THE DARK COMMAND

Maxwell Struthers Burt (1882-)
Fiction
THE INTERPRETER'S HOUSE
THE DIARY OF A DUDE WRANGLER

James M. Cain (1892-)
Fiction
THE POSTMAN ALWAYS RINGS TWICE
SERENADE
MILDRED PIERCE

Carl Carmer (1893-)
Local history and folklore
STARS FELL ON ALABAMA
LISTEN TO A LONESOME DRUM
THE HUDSON

Gladys Hasty Carroll (1904-)
Fiction
AS THE EARTH TURNS
NEIGHBOR TO THE SKY

Mary Ellen Chase (1887-)
Fiction
MARY PETERS
SILAS CROCKETT

James Gould Cozzens (1903-)
Fiction
THE LAST ADAM
GUARD OF HONOR

Hart Crane (1899-1932)
Poetry
WHITE BUILDINGS
THE BRIDGE

Homer Croy (1883-)
Fiction
WEST OF THE WATER TOWER
THEY HAD TO SEE PARIS

Countee Cullen (1903-1946)
Poetry
COPPER SUN
CAROLING DUSK

Clarence Day, Jr. (1874-1935)
Essays
THIS SIMIAN WORLD
LIFE WITH FATHER

Lloyd C. Douglas (1877-)
Fiction
THE MAGNIFICENT OBSESSION
GREEN LIGHT
THE ROBE
THE BIG FISHERMAN

Will Durant (1885-)
History
THE STORY OF PHILOSOPHY
THE STORY OF CIVILIZATION

Mathilde Eiker (1893-)
Fiction
MRS. MASON'S DAUGHTERS
THE SENATOR'S LADY
HEIRS OF MRS. WILLINGDON

Susan Ertz (1894?-)
Fiction
MADAME CLAIRE
NOW EAST, NOW WEST
NO HEARTS TO BREAK

James T. Farrell (1904-)
Fiction
STUDS LONIGAN (a trilogy)
A WORLD I NEVER MADE
ELLEN ROGERS

OTHER 20TH CENTURY AUTHORS *(continued)*

Rachel Field (1894-1942)
Fiction and poetry
For Children { TAXIS AND TOADSTOOLS; HITTY: HER FIRST HUNDRED YEARS }
ALL THIS, AND HEAVEN TOO
AND NOW TOMORROW

Douglas Southall Freeman (1886-)
History
R. E. LEE (4 volumes)
LEE'S LIEUTENANTS (4 volumes)

Zona Gale (1874-1938)
Fiction
MISS LULU BETT
FAINT PERFUME
PREFACE TO A LIFE

Martha Gellhorn (1908-)
Fiction
WHAT MAD PURSUIT
THE TROUBLE I'VE SEEN
A STRICKEN FIELD

Ben Hecht (1893-)
Fiction
ERIK DORN
GARGOYLES
COUNT BRUGA

Langston Hughes (1902-)
Poetry
THE WEARY BLUES
DEAR LOVELY DEATH
SHAKESPEARE IN HARLEM

Rupert Hughes (1872-)
Fiction and biography
THE CUP OF FURY
WITHIN THESE WALLS
STATELY TIMBER
GEORGE WASHINGTON (3 volume biography)

James Weldon Johnson (1871-1938)
Poetry and essays
AUTOBIOGRAPHY OF AN EX-COLORED MAN (fiction)
GOD'S TROMBONES
SELECTED VERSE

Josephine Winslow Johnson (1910-)
Fiction
NOW IN NOVEMBER
WILDWOOD
PAULINA
JORDANSTOWN

MacKinlay Kantor (1904-)
Fiction
LONG REMEMBER
THE VOICE OF BUGLE ANN
THE NOISE OF THEIR WINGS

Christopher La Farge (1897-)
Poetry and fiction
EACH TO THE OTHER: A NOVEL IN VERSE
THE WILSONS

Oliver La Farge (1901-)
Fiction
LAUGHING BOY
SPARKS FLY UPWARD
ALL THE YOUNG MEN

Adria Locke Langley (190?-)
Fiction
A LION IS IN THE STREETS

Josephine Lawrence (1897?-)
Fiction
YEARS ARE SO LONG
IF I HAVE FOUR APPLES
NO STONE UNTURNED

Walter Lippmann (1889-)
Politics and economics
THE NEW IMPERATIVE
THE POLITICAL SCENE
A PREFACE TO POLITICS
THE GOOD SOCIETY
SOME NOTES ON WAR AND PEACE

Grace Lumpkin (190?-)
Fiction
TO MAKE MY BREAD
A SIGN FOR CAIN
THE WEDDING

William Maxwell (1908-)
Fiction
THE FOLDED LEAF

Christopher Morley (1890-)
Fiction and essays
WHERE THE BLUE BEGINS
THUNDER ON THE LEFT
KITTY FOYLE
PARNASSUS ON WHEELS
THE HAUNTED BOOKSHOP

George Jean Nathan (1882-)
Dramatic criticism
THE CRITIC AND THE DRAMA
THE AMERICAN CREDO (with H. L. Mencken)
PASSING JUDGMENTS

Robert Nathan (1894-)
Fiction
THE SEA-GULL CRY
THE PUPPET MASTER
WINTER IN APRIL
PORTRAIT OF JENNIE
THEY WENT ON TOGETHER
TAPIOLA'S BRAVE REGIMENT

Anne Parrish (1888-)
Fiction
THE PERENNIAL BACHELOR
ALL KNEELING
PRAY FOR A TOMORROW

Bellamy Partridge (1878-)
Biography and fiction
THUNDER SHOWER (novel)
COUNTRY LAWYER
BIG FAMILY

OTHER 20TH CENTURY AUTHORS *(continued)*

Elliot Paul (1891-)
Fiction
LIFE AND DEATH OF A SPANISH TOWN
THE MYSTERIOUS MICKEY FINN
THE LAST TIME I SAW PARIS
I'LL HATE MYSELF IN THE MORNING

Donald Culross Peattie (1898-)
Natural history
GREEN LAURELS
SINGING IN THE WILDERNESS
AN ALMANAC FOR MODERNS
THE ROAD OF A NATURALIST

Josephine Pinckney (1895-)
Fiction
HILTON HEAD
THREE O'CLOCK DINNER

Katherine Anne Porter (1894-)
Fiction
NOON WINE
FLOWERING JUDAS
PALE HORSE, PALE RIDER
HACIENDA
NO SAFE HARBOR

Herbert Quick (1861-1925)
Fiction
DOUBLE TROUBLE
VANDEMARK'S FOLLY
THE HAWKEYE

John Crowe Ransom (1888-)
Poetry
CHILLS AND FEVER
TWO GENTLEMEN IN BONDS

Muriel Rukeyser (1913-)
Poetry
THEORY OF FLIGHT
A TURNING WIND
U. S. 1

Betty Smith (1904-)
Fiction
A TREE GROWS IN BROOKLYN

Chard Powers Smith (1894-)
Poetry and fiction
ALONG THE WIND
PRELUDE TO MAN
ARTILLERY OF TIME (novel)

Leonora Speyer (1872-)
Poetry
CANOPIC JAR
SLOW WALL

James Still (1906-)
Poetry and fiction
HOUNDS ON THE MOUNTAIN (poems)
RIVER OF EARTH
ON TROUBLESOME CREEK

Phil Stong (1899-)
Fiction
STATE FAIR
IRON MOUNTAIN
PITTSVILLE GOES TO WAR

T. S. Stribling (1881-)
Fiction
BIRTHRIGHT
THE STORE
THE FORGE
THE CATHEDRAL

Jesse Stuart (1907-)
Poetry and fiction
MAN WITH A BULL-TONGUE PLOW (poems)
HEAD O' W-HOLLOW
TREES OF HEAVEN

Ruth Suckow (1892-)
Fiction
COUNTRY PEOPLE
IOWA INTERIORS
THE BONNEY FAMILY

James Ramsey Ullman (1907-)
Fiction
THE WHITE TOWER

Louis Untermeyer (1885-)
Poetry
THE BOOK OF LIVING VERSE
DOORWAYS TO POETRY
BURNING BUSH
SELECTED POEMS
COLLECTED PARODIES

Carl Van Doren (1885-)
Criticism and biography
THE AMERICAN NOVEL
THE ROVING CRITIC
BENJAMIN FRANKLIN

Mark Van Doren (1894-)
Poetry and criticism
A WINTER DIARY AND OTHER POEMS
THE LAST LOOK AND OTHER POEMS
AMERICAN AND BRITISH LITERATURE SINCE 1890 (with Carl Van Doren)

Carl Van Vechten (1880-)
Fiction
PETER WHIFFLE
THE TATOOED COUNTESS
NIGGER HEAVEN

Glenway Wescott (1901-)
Fiction
THE GRANDMOTHERS
THE PILGRIM HAWK
APARTMENT IN ATHENS

Ben Ames Williams (1889-)
Fiction
ALL THE BROTHERS WERE VALIANT
IMMORTAL LONGINGS
THREAD OF SCARLET
THE STRANGE WOMAN

Stark Young (1881-)
Fiction
SO RED THE ROSE
HEAVEN TREES
FELICIANA

AMERICAN PLAYWRIGHTS OF THE 20TH CENTURY AND THEIR PRINCIPAL WORKS

George Ade (1866-1945)
- The Sultan of Sulu (operetta)
- The County Chairman
- The College Widow

Zoë Akins (1886-)
- Déclassée
- Footloose
- Daddy's Gone A-Hunting
- The Varying Shore
- The Greeks Had a Word for It
- The Old Maid

Maxwell Anderson (1888-)
- What Price Glory (with Lawrence Stallings)
- Saturday's Children
- Gods of the Lightning
- Elizabeth the Queen
- Night Over Taos
- Both Your Houses
- Valley Forge
- Winterset
- The Wingless Victory
- High Tor
- Knickerbocker Holiday
- Key Largo
- Candle in the Wind
- The Eve of St. Mark

Paul Armstrong (1869-1915)
- The Heir to the Hoorah
- Salomy Jane
- Alias Jimmy Valentine
- The Deep Purple
- A Romance of the Underworld
- The Escape

Philip Barry (1896-)
- The Youngest
- White Wings
- Paris Bound
- Holiday
- Hotel Universe
- Tomorrow and Tomorrow
- The Animal Kingdom
- The Philadelphia Story

S. N. Behrman (1893-)
- The Second Man
- Serena Blandish
- Brief Moment
- Biography
- Love Story
- Wine of Choice
- No Time for Comedy
- The Tally Method
- Dunnigan's Daughter

Clare Boothe (1903-)
- The Women
- Kiss the Boys Goodbye
- Margin for Error

George H. Broadhurst (1866-)
- What Happen to Jones
- Why Smith Left Home
- The Law of the Land
- Bought and Paid For
- The Man of the Hour

George M. Cohan (1878-1942)
- The Governor's Son
- Little Johnny Jones
- Forty-five Minutes from Broadway
- George Washington, Jr.
- Seven Keys to Baldpate
- Hit-the-Trail Holiday
- The Song and Dance Man
- The Tavern
- Gambling

Marc Connelly (1890-)
- The Wisdom Tooth
- The Green Pastures
- Dulcy
- The Copperhead
- To the Ladies
- Beggar on Horseback
- Merton of the Movies

(Dulcy, The Copperhead, To the Ladies, Beggar on Horseback, Merton of the Movies — written with George S. Kaufman)

Rachel Crothers (1878-)
- The Three of Us
- A Man's World
- Old Lady 31
- A Little Journey
- 39 East
- Nice People
- Mary the Third
- Expressing Willie
- Let Us Be Gay
- As Husbands Go
- When Ladies Meet
- Susan and God

Owen Davis (1874-)
- Nellie the Beautiful Cloak Model
- Icebound
- Detour
- The Nervous Wreck
- The Great Gatsby (from the novel by F. Scott Fitzgerald)
- Ethan Frome (from the novel by Edith Wharton)

Martin Flavin (1883-)
- Children of the Moon
- The Criminal Code
- Spindrift
- Broken Dishes
- Around the Corner

Rose Franken (1895-)
- Another Language
- Claudia
- Soldier's Wife
- Outrageous Fortune

AMERICAN PLAYWRIGHTS OF THE 20TH CENTURY AND THEIR PRINCIPAL WORKS

Susan Glaspell (1882-)
- Trifles
- Suppressed Desires
- Inheritors
- Alison's House

Montague Glass (1877-1934)
- Potash and Perlmutter
- Abe and Mawruss
- Present Company Excepted
- Lucky Numbers
- You Can't Learn Them Nothing

Paul Green (1894-)
- In Abraham's Bosom
- The Field God
- Roll, Sweet Chariot
- The House of Connelly

Clayton Hamilton (1881-)
- A Night at an Inn
- The Love That Blinds
- Thirty Days
- Friend Indeed

Moss Hart (1904-)
- Merrily We Roll Along } written with George S. Kaufman
- You Can't Take It With You } written with George S. Kaufman
- I'd Rather Be Right } written with George S. Kaufman
- The American Way } written with George S. Kaufman
- The Man Who Came to Dinner } written with George S. Kaufman
- George Washington Slept Here } written with George S. Kaufman
- As Thousands Cheer
- Face the Music
- Lady in the Dark

Ben Hecht (1893-)
- The Egotist
- To Quito and Back
- The Front Page } written with Charles MacArthur
- Twentieth Century } written with Charles MacArthur
- Fun to Be Free } written with Charles MacArthur
- The Great Magoo, written with Gene Fowler

Lillian Hellman (1905-)
- The Children's Hour
- The Little Foxes
- Watch on the Rhine
- The Searching Wind

Sidney Howard (1891-1939)
- Swords
- They Knew What They Wanted
- Lucky Sam McCarver
- The Silver Cord
- Half Gods
- The Late Christopher Bean
- Alien Corn
- Ode to Liberty
- Yellow Jack
- Paths of Glory
- The Ghost of Yankee Doodle

Hatcher Hughes (1886-)
- Hell-Bent for Heaven
- Ruint
- Wake Up, Jonathan, written with Elmer Rice

George S. Kaufman 1889-)
- The Butter and Egg Man
- The Royal Family } written with Edna Ferber
- Dinner at Eight } written with Edna Ferber
- Stage Door } written with Edna Ferber
- The Land Is Bright } written with Edna Ferber
- The Dark Tower } written with Alexander Woollcott
- The Channel Road } written with Alexander Woollcott
- First Lady, written with Katherine Dayton
- Of Thee I Sing, written with Morris Ryskind

(See Moss Hart for a list of plays written in collaboration by Mr. Hart and Mr. Kaufman.)

George Kelly (1887-)
- The Torchbearers
- The Show-Off
- Craig's Wife
- Daisy Mayme
- Behold the Bridegroom
- Maggie the Magnificent
- Philip Goes Forth
- Reflected Glory

Charles Rann Kennedy (1871-)
- The Servant in the House
- The Chastening
- The Admiral
- Old Nobody
- The Salutation

Sidney Kingsley (1906-)
- Men in White
- Dead End
- Ten Million Ghosts
- The World We Make

Lawrence Langner (1890-)
- The Pursuit of Happiness
- Susanna and the Elders

John Howard Lawson (1895-)
- Processional
- Loudspeaker
- The International
- Success Story

Charles MacArthur (1895-)
- Lulu Belle, written with Edward Sheldon
- Salvation, written with Sidney Howard
- The Front Page } written with Ben Hecht
- Twentieth Century } written with Ben Hecht
- Fun to Be Free } written with Ben Hecht
- Johnny on the Spot

William Vaughn Moody (1869-1910)
- The Great Divide
- The Faith Healer

AMERICAN PLAYWRIGHTS OF THE 20TH CENTURY AND THEIR PRINCIPAL WORKS

Kenyon Nicholson (1894-)
- The Barker
- Eva the Fifth
- Sailor Beware

Clifford Odets (1906-)
- Awake and Sing
- Waiting for Lefty
- Till the Day I Die
- Golden Boy
- Rocket to the Moon
- Clash by Night

Eugene O'Neill (1888-)
- Bound East for Cardiff
- Moon of the Caribbees
- Beyond the Horizon
- The Emperor Jones
- The Hairy Ape
- Anna Christie
- The First Man
- The Fountain
- All God's Chillun Got Wings
- Welded
- Desire Under the Elms
- The Great God Brown
- Marco Millions
- Lazarus Laughed
- Strange Interlude
- Dynamo
- Mourning Becomes Electra
- Ah, Wilderness
- Days Without End

Channing Pollock (1880-)
- The Pit
- In the Bishop's Carriage
- Roads of Destiny
- The Sign on the Door
- The Fool
- The Enemy
- Mr. Moneypenny
- The House Beautiful
- Stranglehold

Elmer Rice (1892-)
- On Trial
- The Adding Machine
- Wake Up, Jonathan
- Street Scene
- Councillor-at-Law
- The Left Bank
- We, the People
- Judgment Day
- American Landscape
- Two on an Island
- Flight to the West
- Dream Girl

Lynn Riggs (1899-)
- Roadside
- Green Grow the Lilacs
- Russet Mantle
- The Cherokee Night

William Saroyan (1908-)
- My Heart's in the Highlands
- The Time of Your Life
- Love's Old Sweet Song
- The Beautiful People
- Sweeney in the Trees
- Across the Board on Tomorrow Morning
- The Human Comedy
- Get Away, Old Man

Edward B. Sheldon (1886-1946)
- Salvation Nell
- The High Road
- Romance
- The Song of Songs
- Lulu Belle, written with Charles MacArthur
- Jenny
- Dishonored Lady

Robert Emmet Sherwood (1896-)
- Waterloo Bridge
- Reunion in Vienna
- The Petrified Forest
- Idiot's Delight
- Abe Lincoln in Illinois
- Revelation
- There Shall Be No Night
- The Rugged Path

Augustus Thomas (1857-1934)
- Alabama
- Arizona
- Oliver Goldsmith
- Champagne Charlie
- The Earl of Pawtucket
- The Embassy Ball
- The Witching Hour
- The Harvest Moon
- As a Man Thinks
- The Nightingale
- The Copperhead
- Nemesis

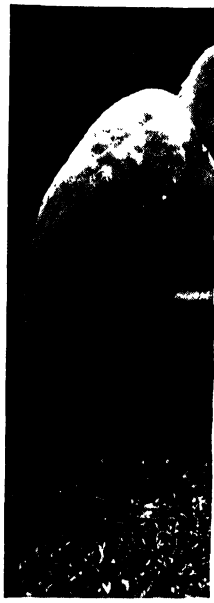
Bayard Veiller (1869-1943)
- Within the Law
- The Thirteenth Chair
- The Trial of Mary Dugan

Lula Vollmer
- Sunup
- The Shame Woman
- The Dunce Boy
- Trigger
- Sentinels
- In a Nutshell
- The Hill Between

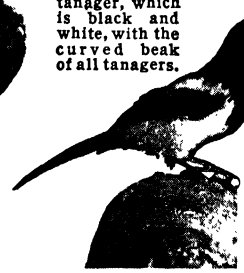
Thornton Wilder (1897-)
- The Trumpet Shall Sound
- The Angel that Troubled the Waters
- Our Town
- The Merchant of Yonkers
- The Skin of Our Teeth

MORE BIRDS OF

BIRDS OF THE



The snowy plumage of the great white heron makes it a striking sight in the Florida Everglades.



The big magpie tanager, which is black and white, with the curved beak of all tanagers.

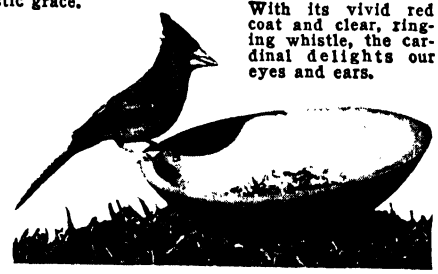


The bitterns are shy and seldom seen, but their weird booming call can be heard coming from the marshes. This is a zigzag bittern.



At rest the turkey vulture is ugly, but in flight it is the picture of majestic grace.

Picture below, Allan D. Cruickshank from NAS; all others, New York Zoological Society



With its vivid red coat and clear, ringing whistle, the cardinal delights our eyes and ears.

MOST of the birds we shall describe in this article belong to families most abundant in the tropics. Most of them migrate to spend the winter in Mexico and Central America. To take their places there is an inflow of northern birds, which are satisfied with the winter temperature and freedom from snow of the Gulf states. So this region has more birds all the year round than any other part of the United States. This is owing to the fact that birds may find food there when northern states are under a pall of snow, ice and cold winds.

Let us begin with the water birds. Most of the sea fowl and the ducks pass on in spring to northern breeding-places, so that only the laughing gull, with the slate-colored head, and a few terns represent in the South the great gull family. The large, crested Caspian tern, the smaller but similar royal tern and several other rarer ones make their nests among the shells of the sandy islands along the coast. All these sea swallows are dressed in white and pearl-gray, with black caps. Two or three kinds of dark-colored terns are also present, one of which, the noddy, reverses the usual coloring, for the top of its head is silvery white and the rest of the plumage is dark brown. All of the other terns make little or no nest, and lay four heavily blotched eggs. The tern makes a rude nest in bushes and low trees and lays whitish eggs. Great colonies of noddies inhabit the Tortugas Islands. A relative of these is the black skimmer, a tern-like bird with a very long straight beak, the lower part (mandible) of which is longer than the upper. The bird flies close to the water, with this long underlip cutting the surface, and so scoops up any little fish it can catch.

Along the coast of the Gulf of Mexico are to be seen such birds as darters, cormorants, ibises and man-o'-war birds, and great numbers of brown pelicans.

The wood duck, the most beautiful of all our ducks, is known in summer all over the United States wherever woods and waters lie together. The female is streaked brown, but the drake wears a splendid dress. His

NORTH AMERICA

SOUTHERN PROVINCE

head is rich glistening green, the feathers prolonged backward into a pointed crest. A white line runs on each side from the red base of the bill over the eye to the tip of the crest, and other white lines diversify the checks. The back and tail are dark green; the breast chestnut; the flanks buff; and the under part of the body white; and these blocks of color are separated by lines and touches of white.

This lovely duck makes its nest in a hollow of a broken tree or dead stub. This may be sixty feet or more above the ground, and sometimes it is a mile or more from any water, so that one wonders how the ducklings are to be got down and given an opportunity to learn to swim. The drake leaves that to the mother, and she manages it in several ways. Sometimes the little ducklings, soon after they are born, are just pushed out of the doorway of their home, and float down without harm like balls of down; and sometimes they are carried down one by one on their mother's back; but usually she lifts them in her bill by a wing or leg and carries them to safety. If water is near by, they go into it at once, but frequently have to scramble a long way to reach it.

Many kinds of wading birds are residents of the South, where the extensive swamps and marshes along the Gulf coast and the lower reaches of the Mississippi afford them the food and nesting-places they like. They are mostly of the heron tribe. Five of them are particularly attractive. The flamingo has a very long neck, long legs and an ugly beak, but its rosy red plumage makes up for its awkwardness. The roseate spoonbill gathers its food from the soft mud. Both are now rare, though formerly common. The egret, or white heron, its lesser cousin the snowy egret, and the chestnut-colored glossy ibis are also rare.

Some other herons are still fairly common. The great blue heron stands three and a half feet high. The Louisiana heron is slaty blue and is somewhat smaller. The little blue, the little green, and two night herons, the black-crowned and the yellow-crowned, are



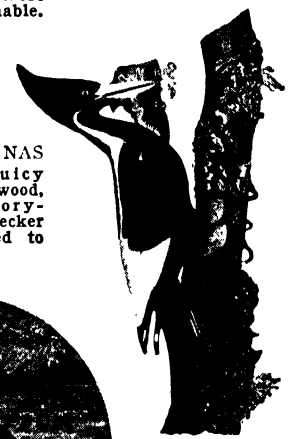
New York Zoological Society

The elegant black-necked stilt is built to find its food in shallow ponds.



A. Dawes Du Bois from NAS

"Pee-ah-weeee" sings the wood pewee, in the most mournful notes imaginable.



NAS

There's a juicy grub in that wood, and this ivory-billed woodpecker is determined to chisel it out.



NAS

A shimmering green crown and reddish breast add color to the black-and-white wood duck.

Eliot F. Porter from NAS

The roadrunner of the Western deserts can run with astonishing speed.



also to be found in considerable numbers. All feed on fish, frogs, snakes, crayfish and similar creatures found in the marshes. They build rude nests of sticks in trees and bushes growing in or near water. Sometimes hundreds of these nests are crowded together in a great company called a rookery. Some of these species, as the blue herons and the night herons, are also found elsewhere in America.

Marshes as far north as the Great Lakes are inhabited by various bitterns and marsh hens, or mud hens, known also as gallinules, rails and coots. These are plump, brownish or purplish birds, varying in size from that of a chicken to that of a partridge. They are good swimmers as well as runners, and feed on insects and small animals. Most of them are good eating.



The harsh "caw" of the crow is well known in America.

New York Zoological Society

The bittern is a long-necked, long-billed, streaked bird that has the habit, when alarmed, of stiffening its body into an upright attitude, with its beak pointing straight up. Then its stripes blend with the light and dark lines of the reeds about it, and it can scarcely be seen. The bittern makes a loud booming in the marshes at dusk.

Shore birds—sandpipers, stilts, oystercatchers, plovers, curlews and their like—are noticeable in southern and central United States mainly during their spring migrations, when they alight on our shores after a night spent in crossing the sea from the West Indies or Venezuela, and for a few days haunt the beaches and wet lands, then pass on to summer residences in the Far North.

A few, however, remain. One of these is the woodcock, which is nearly the size of the bobwhite and dwells in wet woods. It is mottled brown, with broad blackish bars across its head, neck and back, and flies with a startling *whirr* when you come near it. Like the snipes, it probes in soft earth and sand with a sensitive bill which feels the earthworms and buried grubs that it seeks; and it feeds mainly at night, resting by day in some shadowy recess where its nest and white eggs are hidden.

The snipe is much smaller and dwells in wet lowlands. On the higher, drier grounds are to be found the Bartramian sandpiper, usually miscalled upland plover, and certain true plovers. The plovers are birds somewhat bigger than a robin, with rather long legs and with bills that resemble those of a pigeon. Most of them are black and white, with touches of brown, and with a dark ring about the neck. The most familiar is the golden plover, known all over the world. The noisy yelling of the killdeer is to be heard in all open country, and its eggs are as likely to be found on the ground in plowed fields as in wild uplands.

This brings us to the family of game birds, including the bobwhite, or quail, the ruffed grouse and the prairie chicken, descriptions of which will be found elsewhere (see Index). The only one of the group that is distinctly southern is the wild turkey.

Our wild turkey, which, before white men and their guns came here, was found in Ontario and all over the eastern United States, is the same as the Mexican turkey; and there is a second species in Yucatan. It was found by the Spanish conquerors of Mexico, early in the sixteenth century, domesticated among the Indians. Living specimens were sent back to Spain and soon became domesticated there and elsewhere in Europe. The people had only a vague idea as to where this new fowl came from—some thought from Turkey, others from India. In France, therefore, it is still called *dinde,* but in England it was known as Turkey-bird. The British colonists in New England imported it under this name with their chickens and cows; and in this roundabout way our barnyard turkeys got back to their native soil, very little changed from their wild brethren, which are now rare except in thinly settled parts of the United States and Mexico.

Another bird that formerly was seen in the central part of the country in enormous numbers every summer was the wild, or passenger, pigeon. It is now extinct.

Another smaller pigeon, the Carolina, or turtle, or mourning, dove, as it is variously called, is still common all over the country, and especially in the South, where in winter vast numbers gather to pass the cold months, and in some states are regarded as game birds. This dove is smaller than the domestic pigeon, and utters a plaintive, moaning note, constantly heard in the woods in

early summer. It nests in low trees, on rocks, stumps and logs, or even on the ground in the prairie regions, and lays two eggs on a very rude little platform of twigs.

Among the birds of prey, two vultures, the turkey buzzards and the black vulture, are peculiar to the South, although examples are to be seen now and then all over the country. Both are black throughout, and have the head and neck naked of feathers; but in the turkey buzzard the bare head is red, and in the black vulture this part is blackish. They feed almost altogether on carrion, and in far southern districts are protected as scavengers.

Very often within a few minutes after an animal dies one or more of these birds comes circling down. There has been much dispute as to whether these birds are guided by scent or sight. Most students of the habits of birds now believe that their sight is so keen that they can discover food while high above the earth.

The long-winged, light-colored hawks called kites are common in the South, where they glide over the marshes in search of snakes, frogs and insects, on which they feed. The swallow-tailed kite is the one most often seen, and is perhaps the most graceful of all our birds of prey. The fish hawk and its tyrannical associate, the bald eagle, are common there, but the golden eagle is unknown, except toward Mexico. Many of the northern hawks and falcons spend their winters on the southern coasts.

Much the same may be said of the owls. The little screech owl, the barn owl, the great horned and the barred owls belong to the southern as well as to the northern states, but most of the species breed only in the North. One, however, calls for a brief description—the little burrowing owl, which may be found from Florida to southern California, and all over the plains and mountain valleys from Nebraska to Utah and southward to Panama.

It is ten inches long, and is buffy, dotted with white, so that it has the color of the half-bare ground where it lives; and it stands upright on long yellow legs, and does much running about, but little flying. It rarely alights on trees. It lays its white eggs in a nest made in a burrow.

Often the burrows of these owls are dug by themselves; but they sometimes make a home in a furrow made by some other animal. Therefore, these owls are always common in prairie-dog colonies, not only because they find there many empty holes and burrows suitable to their need, but because the young prairie-dogs furnish them with plentiful food. This owl is strong and courageous, despite its small size, and catches and eats all sorts of ground squirrels, rats, mice, shrews and other small mammals, besides insects, snakes and an occasional bird. Those in the Northwest migrate to warmer regions on the approach of winter.

We have now come to the long list of birds of woodland and field, which please us by their elegant form and color; delight us by their singing; and, best of all, serve us by aiding in our constant fight against insects that devour our crops and injure our trees. These birds are nowhere more numerous and useful than in the central and southern parts of the United States.

The almost tropical character of the Gulf coast is shown by the presence there, as annual stragglers, of several birds whose proper home, as a species, is in the West Indies or Mexico. Such are the mangrove cuckoo, the coal-black anis, tick birds, which build community nests, and the famous roadrunner of Arizona and southern California. This is a queer kind of ground-dwelling cuckoo which can outrun a good horse, and catches for food swift lizards, agile snakes and jumping grasshoppers. It makes a big thorny nest in cactus plants, and feeds its young on lizards. The gorgeous green-and-red tropical trogons are represented by one sort, the coppery-tailed trogon, that crosses the Mexican border into Ari-



New York Zoological Society

Raising its feathers to their fullest spread, this wild turkey struts with pride. Its tamed cousins are in barnyards.

zona. In body it is somewhat larger than a robin, but has a crested head and a tail longer than its body. Trogons have the habits of flycatchers, live mainly on insects, but also eat fruit, and make their nests in holes in trees in the mountain woods. The Mexicans call them "widows" on account of their peculiar crying notes.

The large woodpecker tribe has been pretty well described elsewhere, but some species are never seen in the northern states. Chief of these southern woodpeckers is the great ivory-bill, now very scarce everywhere. This magnificent woodpecker is twenty inches long, and has a chisel-shaped bill truly ivory-like in appearance, two and three-quarters inches long. It is black, with a white stripe running from the mouth down the side of the neck and over the shoulders, and the wing quills are white; its head is crowned by a high scarlet crest.

The red-cockaded woodpecker has a red tuft on each side of the head; the red-bellied is barred with alternate lines across the back and wings, and has a red cap and red beneath the tail; and the gila woodpecker of Arizona has a gray head broken by a red patch on the crown.



Ruth H. D. Wheeler from NAS

Sunlight dapples the drab olive-brown dress of a female Bullock's oriole.

The South has a noisy nightjar called, from its cry, "chuck-will's-widow." It is just a big whippoorwill, browner and with more bristles about the great mouth, which opens to trap and swallow the largest moths as well as flying beetles and lesser insects. Like its relatives, it hides away by day on the ground in a shady dell, or at the edge of the woods, and at dusk it begins its powerful flight in search of food to be caught on the wing, darting up and down, here and there, with astonishing agility. Now and then it captures and devours small birds. It is at such hours, and all though the night in the breeding season, that the loud calling of these birds, one to another, echoes through the air. The eggs of this species, like those of the other nightjars, are laid on the bare ground or among leaves in thickets or dense woods, with no nest whatever; there are only two, and they are very darkly blotched.

The most beautiful North American bird of the flycatcher family is southern—the scissor-tailed, or swallow-tailed, flycatcher of Texas and Oklahoma. It is a small bird, nearly white in general appearance, with two tail feathers as long as its body. These long outer tail plumes, which it can open and close at will, and its rose-pink flanks make the bird as conspicuous as it is beautiful. It restlessly moves about, with extremely graceful movements; or perhaps, at twilight, it will rise high in the air, and then flutter down in zigzag flight, waving and twisting its beautiful plumes as it falls through the evening air. It spends most of its time in open places, where it can see, dash after, and seize the flying insects on which it feeds; but it builds a deep, downy nest in some woodland tree and lays cream-colored eggs prettily spotted.

The eastern and western kingbirds are widely distributed and well known, and two or three additional species of similar habits come a little way over the border from Mexico. One of them, the gray kingbird, is a summer resident in Florida or along the Gulf coast, where its sharp cry, *pitirri, pitirri,* rather than its appearance, distinguishes it from its northern cousins.

The phoebe and other pewees are to be seen all over the country, though nesting mainly in the northern states and Canada; and the handsome, vigorous, loud-whistling, brown-and-yellow crested flycatcher, which likes to weave an old snake skin into its nest in some hole in a dead tree, is as well known in the South as elsewhere.

The same may be said of the blue jay, so familiar in Dixieland as "jaybird." Florida has a different, more brownish, species of its own. In the Southwest, too, are several all-blue jays and one green species; but the noisy, blustering, swashbuckler manners of all are much alike. The crow lives and nests all over the South, but that region, all along the coast, has also the smaller fish-crow, not known north of the lower Hudson Valley. It subsists mainly on what it can pick up along the beaches and river banks,

and is a mischievous robber of birds' nests in the spring. The feathers have a metallic sheen, purplish above and greenish below.

This brings us to the large family of orioles and blackbirds, most of which have been elsewhere described (see Index).

The meadow lark is known in the South as "old-field lark." The bobolink is known there as "rice bird" when, especially during the autumn migration, and again in the spring, it attacks the rice crops in vast flocks. Of the grackles, or "crow-blackbirds," the great boat-tailed grackle is peculiarly southern, nesting in colonies wherever swamps attract it along the coast and large river courses from Carolina to Texas. Its plumage is a glistening bluish or purplish black.

Now we come to the extensive and widely distributed family Fringillidae, which includes the sparrows, buntings, finches and grosbeaks. "They present," says Chapman, "wide diversity of form and habit, but generally agree in possessing stout, conical bills, which are admirably adapted to crush seeds. They are thus chief among seed-eaters, and for this reason are not so migratory as insect-eating species. It is only of late years that their great economic value as the destroyers of weed-seeds has been recognized."



Allan D. Cruickshank from NAS

The redbird, or cardinal grosbeak remains in the South all year. It is among the largest of its race, as big as a robin, but stouter in build; and is dressed in cardinal red, set off by a bold crest and a black ring about the base of the strong coral-red beak. It visits plantations, villages and city parks, cheering everybody by its joyous whistling, and lighting up the foliage with its gay color; and in the dull days of winter it seems gayer still by contrast with the dull landscape. Occasionally it is found as far north as the Great Lakes or in New England. The Texas cardinal has a yellow beak without the black ring.

The cardinal is often confused with the tanagers by those who do not know the birds very well. The tanager represents another family of brilliant plumage very numerous in the tropics, of which we have two species, the scarlet tanager and the summer tanager. The former visits all eastern North America in summer, and the male is dressed in scarlet, with jet-black wings and tail. The summer tanager is rose-red, with dusky wings, and is rarely seen north of Virginia and the Ohio River. Neither is crested like the cardinal. Both birds are fond of forests, and the latter is especially a denizen of pine woods. The call of the scarlet tanager is a loud, distant *chip chur-r-r,* while the summer tanager says *chicky-tucky-tuck;* but both have excellent songs while their mates, quietly dressed in greenish brown, brood over their eggs in nests in the trees.

The South has several blue birds of exquisite plumage. One of these is the blue grosbeak, a large finch dressed in dark purplish blue and black. It is not very conspicuous either in appearance or song. Much better known, and more interesting, is the indigo bird, or indigo bunting, which is not only southern, but is a delightful summer visitor to all northern states as well. Its sweet and sparkling music is heard even in late summer, when most other birds have ceased to sing. The coat of this little singer is pure purplish blue, with changing tints as the light strikes it; but his wife, at rest in her snug nest in the bush beneath his perch, is dressed in soft browns and drabs. In fact, almost all female birds whose males are brilliantly arrayed are themselves quietly



George A. Smith from NAS

The mockingbird (top) sings all the day, sometimes imitating the songs of other birds. Below, a mother indigo bunting feeds her fledgling. Her mate's coat is a brilliant blue.

dressed. Were the females and young brilliant, it would be hard for them to hide.

Similar to the indigo bird in size, habits and song is the lazuli bunting of Texas and the Pacific coast; but only the head, throat and back are blue. The lower surface is pure white, separated from the light blue of the throat by a cinnamon band across the breast. Along the Mexican border we find in summer the varied bunting, whose coat is patterned in a mixture of red, purple, and blue. The painted bunting, or nonpareil, as it was admirably named by the French people of Louisiana long ago, has a head of dark blue; the back and fore part of the wings are golden green; the wing quills, rump and tail dull red; and the throat and whole lower surface bright red. This is the male. The female is olive-green above and greenish white below. This elegant finch is more often heard than seen, for it generally hides in dense thickets. It is to be found in summer from North Carolina to Texas, and northward to Arkansas.

The warblers are a strictly American family of small, unusually brightly colored, insect-eating birds. There are about a hundred species in all, many of which do not visit North America at all. However, a large number and variety of kinds of warblers visit us annually from the tropics, and retreat in the fall. A large proportion go to the Far North to make their nests, and few indeed are to be counted among really southern birds. Such are the orange-yellow and green prothonotary warbler; the brown-and-yellow Swainson's warbler, with the cinnamon-striped head; and the greenish, black-capped Bachman's warbler—all of which pass their lives in the damp underbrush along the rivers, and make their nests on, or near, the ground. Others are the parula warbler, gray above, with a yellow patch on the back, and yellow below, with a black breast, which forms its nest in tufts of Spanish moss; the bluish gray myrtle warbler, with yellow rump and crown, which spends the winter in great numbers in the southern states feeding on the waxen myrtle berries; the bright blue-and-white cerulean warbler of the southern Alleghenies; the gray, black-checked, yellow-throated warbler; the bright yellow prairie warbler, which is fond of brushy hillsides and pasture lands; the yellow-and-black Kentucky warbler and the familiar black-faced yellow-throat, both of which love stream banks and swamps, and nest on the ground.

Some authorities still class together the wrens proper, the catbird, mockingbird and thrashers. Some of the wrens and the catbird and brown thrasher are described in the chapters dealing with northern birds, but several of the species are distinctly southern.

Foremost among these is the famous mockingbird, which is common in the southern states and west to California. It is our most famous American song bird. It is noticeably larger than the catbird, measuring ten and a half inches from the tip of its curved bill to the end of its long tail; and is ashy gray above; somewhat lighter on the under surface; has the wings and tail pale brown; the quills edged with white. Its song is exquisite. It is a wonderful ventriloquist, and can imitate any sound it hears made by bird or animal.

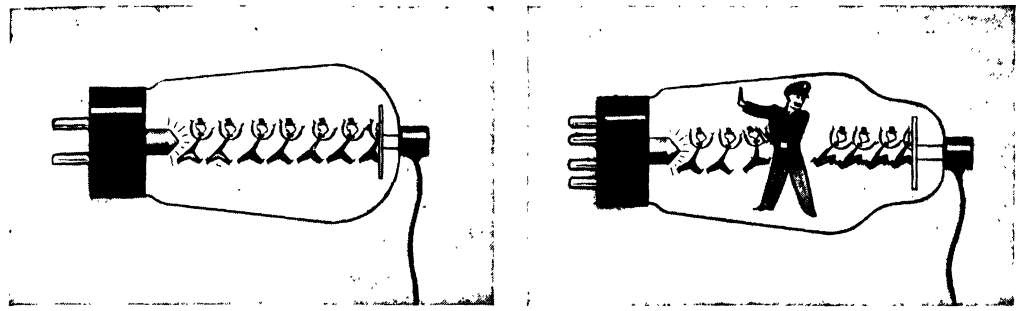
Of the wrens two are far more common in the southern than in the northern states. One is the Carolina wren, which is somewhat larger than the familiar house wren, and utters a startlingly loud song in which, sometimes, the bird seems to mimic others. Bewick's wren is more like the house wren, but darker brown. Both are often seen in the Middle West. The chickadee is to be found all over the country, and the South has a cousin of his in the pretty tufted titmouse, often called Peto from its call, "Peter, peter, peter." It is gray and white, with a handsome pointed crest. Another little gray bird of the southern woods is the tiny blue-gray gnatcatcher, which constructs a soft, lichen-embroidered cup of a nest balanced on a tree limb, and hides within it five bluish thickly speckled eggs. It is a close relative of the kinglets which nest in the North.



S. A. Grimes from NAS

A man-made house for a demure tufted titmouse. Its acrobatics are fun to watch.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 5133.



Courtesy, Allen B. DuMont Laboratories. All other sketches by General Electric Company

The picture at the left shows the simplest electron tube—electrons boil out of the cathode and stream towards the anode. At the right, a new element has been added to the tube—the grid—which acts as a traffic officer.

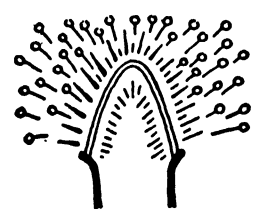
THE *Magical* ELECTRON TUBE

WHEN you look inside a radio cabinet, you see a number of tubes made of glass or metal; it is these tubes and their big brothers in the broadcasting station which make our radio possible. The magic of radio is only one example of the use of such tubes. Electron tubes we call them; and the science of electrons and electron tubes is called electronics.

This is the story of the electron tube, in which electrons that have been set free of their original substance are controlled and put to work for us. By means of these freed electrons, we are enabled to extend our human senses to amazing lengths. We can "see" objects many times too small to be seen through the most powerful glass-lens microscope. We can "hear" sounds no human ear has heard. We can open and close doors without touching them, and perform other tasks by remote and effortless control. Electronics, in short, is a modern Aladdin's genie.

You know that electrons are very tiny negatively charged electric particles which are parts of atoms. In addition, there are, in all things, free electrons which are not part of any particular atom. We may think of these free electrons as lazily drifting through a substance. When we have a brisk mass movement of electrons along a wire, we call it a current of electricity.

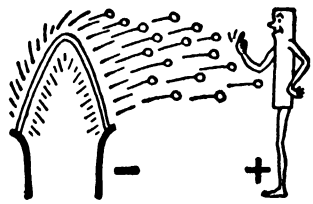
Ordinarily, electrons in a current can move only along the wire, and very few escape due to the presence of certain restricting forces at the wire's surface. It is possible, however, to cause some of them to leave the wire by giving them enough speed. The energy needed to conquer the surface forces is usually provided by heat. The heat causes the electrons to move about more rapidly; and as more and more heat is applied, large numbers of electrons are moving fast enough to be carried through the surface. Some of the escaped electrons are slowed down and return to the wire, but still others break through the surface. So a continual interchange of electrons takes place, from the inside of the wire through the surface into the surrounding space, and back again.



One form of cathode—a tungsten filament heated by electricity. Electrons "boil out" of the wire.

Even before we had a clear idea of electrons, certain effects had been noticed which drew the interest of scientists to the escaping negative electric charges. In 1883, Thomas A. Edison made a special electric-light bulb in which a little metal plate was sealed into the lamp near the wire loop (filament) which is heated to provide light. When an electric current flowed through the filament loop, making it white-hot, Edison observed a small current flowing through the space between the wire of the filament and the little metal plate, accompanied by a faint blue glow. This happened when the metal plate was connected to the positive end of a battery. Edison was too busy with other inventions to study this further but some of his light bulbs that had the added metal plate were sent to England. There, after a number of years, the British scientist J. A. Fleming made

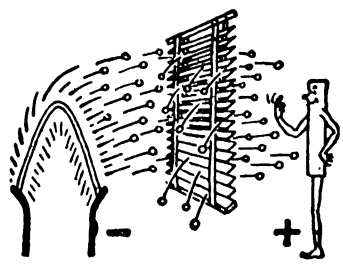
further experiments on the flow of electric charges—that is, the electric current in the bulb, moving through the space between a hot filament and a positively charged metal plate. In 1904, Fleming found that such a bulb would let current go in one direction only, that is, from filament to plate. This "one-way" characteristic of the current flow through the bulb space is called its rectifying characteristic. Fleming used



Electrons are negative. Therefore, when they boil out of the cathode, they are attracted to a positive anode.

this special light bulb as a rectifier (or detector) of wireless telegraph signals which are received in rapidly alternating current form. Such a bulb, with filament and plate, was the first electron tube. Because it had these two parts it was called a diode (from the Greek *dis* meaning twice, or double, and *hodos*, meaning way).

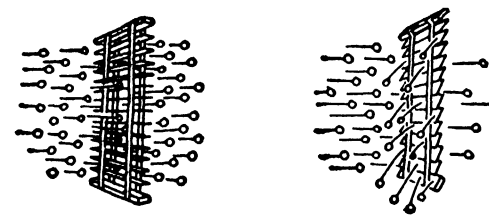
Probably the most important improvement in electron tubes was made when the American scientist Lee De Forest added a third part to Fleming's diode in the form of a wire mesh (grid) which was mounted between the hot filament and the cold plate.



The grid controls the stream of electrons from cathode to anode.

The grid is used to control the number of electrons which reach the plate. This control is secured by applying a small charge to the grid. Usually the grid is negatively charged. Since the electrons are also negatively charged, they tend to go away from the grid; only a small number of them have enough energy to overcome this force and reach the plate. Of course, when the negative charge on the grid is smaller, the repelling force is less and more electrons get past it, and when the repelling charge is increased, fewer electrons can reach the plate. Since all the electrons in the space current must pass through the grid, the grid is in a very strategic position. It is very close to the filament and only very small voltages on the grid are needed to control large numbers of electrons flowing from the filament to the plate. By using the grid in an electron tube in this manner, a large amount of current in the plate can be controlled by a tiny amount of current applied to the grid itself. It is just like a child using his small amount of energy to turn the water faucet, and thereby controlling a powerful flow of water. De Forest's three-part tube is called a triode (from the Greek *tri* meaning three).

For a number of years after De Forest's important addition, advances were slow. Then two large electrical companies, the



The grid acts like a venetian blind. When it is open, many electrons stream through it to the plate. When the blind is closed, however, only a very few electrons can pass. So, whoever controls the grid is able to control the flow of electrons.

American Telephone and Telegraph Company and the General Electric Company, became interested in De Forest's mysterious glass tube. They set their research scientists to work learning more about how it operated and how to improve it. Soon many companies and scientific groups were discovering new applications and inventing new improvements of the electron tube. It took many different shapes, and often more than three parts were used. These varied tubes have many names, but electron tube is probably the best family name. Many people call them vacuum tubes because most of the tubes contain no air or other gas. This is so in order that the electrons can move through the space inside the bulb without colliding with air particles.

Although they come in many sizes and designs, all electron tubes are combinations of certain basic elements. First there must be a cathode, which is the name for the

source of free electrons described above as the filament. This was one of the first types. Today there are other kinds of electron sources. The modern cathode may be a red-hot cylinder coated with special chemicals. It may be a blue spot on a surface of a pool of mercury, or a special surface which shoots off electrons when hit by light. This last kind is the important part of the photo-tube, or photo-electric cell, or as we sometimes call it, the "electric eye."

ELECTRONS WILL TRAVEL FROM THE CATHODE TO A POSITIVELY CHARGED ANODE

Second, there must be an anode, or plate, which collects the space current. (Cathode and anode are so called from the Greek words for going down and going up. Down and up were thought to correspond to the minus and plus of a battery in an electric circuit.) In all cases, the electrons escape from the cathode and stream toward the anode when it is positively charged, unless they are stopped by a negative charge on the grid. Cathode, anode and grid are called electrodes. Some modern tubes have eight or more electrodes, each performing a certain task.

At this point let us review briefly the path along which men have traveled in learning to use electricity for communication.

A simple example of the use of electric current along a wire is the telegraph. A flowing current is interrupted by pressing a little key down, thus breaking the contact. A short moment of pressure makes a signal called "dit"; a longer moment is called "dah." These are the familiar dot and dash of our code systems. According to the combinations of dits and dahs given in the code used by the sender and the receiver, letters can be sent along the wires to spell out words. And so most civilized countries today are covered with a network of telegraph wires, and along the sea bottoms are great cables through which telegraph messages are sent.

GUGLIELMO MARCONI BEGINS THE SENDING OF MESSAGES THROUGH THE AIR

About fifty years ago, Guglielmo Marconi, an Italian scientist, reached the conclusion that telegrams could be sent through the air, across the seas, and even from ships in mid-ocean, without the use of wires. Others had dreamed of and worked toward this goal, but Marconi brought it to reality. He based his invention on the work of Heinrich Hertz, a German, and Clerk-Maxwell, a Scot. These two had proved that high-frequency alternating electric currents cause waves to flow outward into space with the speed of light. These Hertzian waves, or radio waves, spread out in all directions into space from their electrical origin, just the way waves on a pond spread and ripple away from the point at which a stone is dropped into the water. As the waves move away from the source they become weaker, and so wireless telegraphy was, at first, successful only for short distances. But gradually devices were invented to increase the signal strength. Before the start of World War I in 1914, long-distance wireless telegraphy was successful and all large ships at sea were equipped with wireless sending and receiving apparatus. In 1912, when the steamship Titanic struck an iceberg and sank in the North Atlantic, calls for help were sent out to the world by wireless. The Carpathia heard them and rushed to the rescue; she saved the lives of some of the passengers and crew.

THE SENDING OF SIMPLE DIT-DAH MESSAGES WAS FOLLOWED BY VOICE TRANSMISSION

However, wireless could at this time send only simple signals of the dit-dah code. Scientists began to dream of using radio waves to carry human voices, and music, and complicated sound effects. Alexander Graham Bell had shown that sound-waves could be used to set up electric currents which were sent over a wire; these currents in turn could be made to reproduce the original sound-waves at the other end of the wire. The invention that converts sound to electric currents and back again is, of course, the telephone.

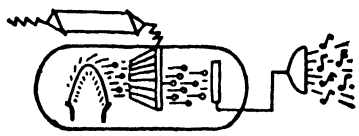
Wireless telegraphy continued to be improved, mainly by increased clarity of the signals, and the idea of a wireless telephone became more possible. Along came Fleming's detector use of the diode electron tube. Then De Forest put the grid in the tube. With these as new tools, wireless telephony (or, as we call it, radio) was well on the way. The chief services of these new electron tube tools were: (1) to create the pattern carried by the high-frequency currents at the sending (transmitting) station, and (2) to detect and amplify (strengthen) weak electric currents at the receiver.

STRENGTHENING, OR AMPLIFYING, ELECTRIC CURRENTS IS DONE BY ELECTRON TUBES

Modern radio uses a number of electron tubes in the transmitter. Sound-waves picked up by a microphone (which is like a telephone) produce a weak electric current. This is fed to the grid of a triode electron tube. The tiny electric current grows

stronger and weaker following the pattern of the sound which causes it. In the triode, as we have seen, the grid controls a large flow of current by its own small effort. With the triode tube then, a large flow of current is made to take the pattern of any sound-waves which are picked up by the microphone. The currents may again be amplified by being fed to the grid of another electron tube. Thus tubes are used in steps until the electrical pattern of the sound-waves made by the trill of a bird or the voice of an actor has been powerfully strengthened. This is known as amplification.

This current is used, in its turn, to control the high-frequency electrical currents which create the radio waves flowing out from the transmitting outlet (antenna). These radio waves carry the pattern of the original bird song with them through space



The energy caught out of the air by your aerial is amplified many times in the electron tube so as to enable it to produce sound in your loud speaker.

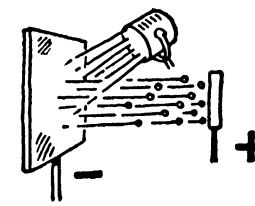
toward the distant receiving antennas, scattered perhaps hundreds of miles away. In the article on Radio and How It Works we explain to you how the antenna of your radio receives this particular sound-pattern, though there are many transmitters sending out programs at the same time.

What happens now? When the radio waves are received by the receiving antenna, they cause tiny currents to flow in the wire of the antenna. These currents are carried to the grid of a special electron tube, an amplifier in your radio. Here the high-frequency current, which, you remember, still carries the pattern of the original sounds, passes the pattern on to a much larger current flowing through the tube. If the amplified current is still not strong enough, it can be further strengthened by other tubes.

Now the current goes to another electron tube known as a detector, or rectifier. You remember a rectifier's "one-way" nature. In this tube the very rapidly alternating current which has carried the sound-pattern through space is dropped out by the rectifier's one-way nature. What is left is a current having a frequency corresponding to the original sound-frequencies. It is a very weak current. This is amplified by one or more electron tubes and finally fed to the loudspeaker where it is changed into sounds. Then you hear the actor . . . and all this happens in the fraction of a second after he speaks into the microphone, perhaps thousands of miles away!

Electron tubes are used in other fields besides wireless telegraphy and telephony. Amplifier tubes in long telephone lines are used to keep up the strength of the currents from far distant voices. They are also used to amplify the signal currents in electric phonographs and public-address systems. One kind of tube helps to reproduce sound from film for talking motion pictures. The article on Motion Pictures tells you something about this.

Some electron tubes can change light and its intensities into electric currents of varying strength, and other tubes can do just the opposite—they can change electric currents into light. With the help of different tubes of this type we can see in New York a picture that a man took in Europe only an hour ago. Or we can see on a television screen a baseball game as it is being played many miles away. The tubes which convert light into electric current are called phototubes, and they have more magical uses. Doors open and close without a hand touching even a button; colors are matched; the light from a distant star is accurately measured; the speed of a bullet is measured to within thou-



In a phototube, electrons are made to boil out of a metal cathode when light falls on the metal.

sandths of a second. Many, many more uses of the phototube have been found; their most general character is that of relieving man of routine jobs that would require constant, tireless care. Through the science of electronics these jobs can be performed without fatigue, without boredom and, of course, without any thinking involved. This last element is the key to many uses of electronics; electronics can substitute all its wonders of accuracy and speed for tasks that require one of man's senses, such as sight, in combination with his muscles, but which do not

ELECTRONS AT WORK IN HOME AND INDUSTRY



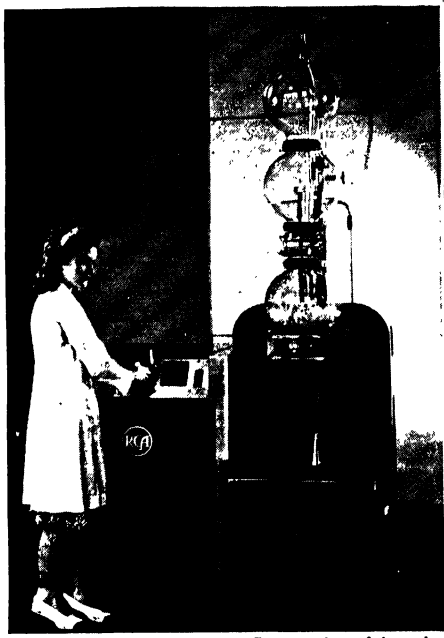
Courtesy, Westinghouse Electric Corporation

Here is the phototube, or electric eye, at work. When the waitress walks through the beam of light across the doorway, the electric current will change in the mechanism's circuit. This causes the doors to be opened automatically.

Courtesy, Radio Corporation of America

An electronic sewing machine "stitches" up a hem. The fabric is coated with a special plastic that joins together when "sewed" by the machine. This system is used extensively in making raincoats, food wrappings and many other things.





Courtesy, Radio Corporation of America



Courtesy, Westinghouse Electric Corporation

At the left is a unit of an all-electronic penicillin drying system. It completes in thirty minutes a process of penicillin manufacture which would ordinarily take twenty-four hours. Right, bacteria in this nursery are destroyed by the sterilamp; this is a device in which electrons cause the radiation of ultraviolet light.

require his thinking brain. In this way he is made free for other work.

Here are a few more things that electron tubes do. They change alternating current to direct current in great industries. With their aid, paint is evenly spread on automobiles and then dried; welding and riveting are done speedily and accurately; tobacco is cured; foods are dehydrated; vitamins are measured; objects are examined for flaws, counted, classified, sorted, and records are made of the assortment; machine tools are made more precise; dust is removed from the atmosphere; burglar alarms are controlled. Perhaps the most spectacular use of the electron tube is in the atom-smashing machine with which the physicists change one element into another and release energy from within the atoms. And the wonderful X-ray tube, a kind of diode electron tube, has a story all its own. See the article on X-RAYS. See also RADIO and HOW IT WORKS, TELEVISION, MOTION PICTURES and other ELECTRONIC DEVICES for more details on how the electron tube helps to make our civilization a modern wonderland.

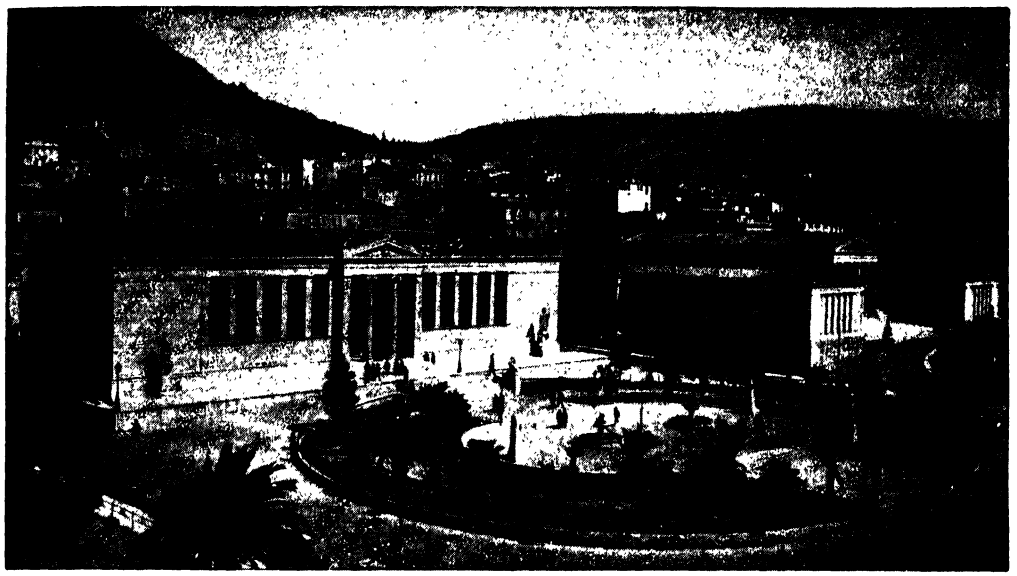
By W. C. WHITE and R. S. COHEN.

THE NEXT STORY OF SCIENCE IS ON PAGE 5119.



Courtesy, Hercules Powder Company

The wonderful electron microscope which magnifies to a much higher degree than the optical lens microscope.



Keystone View Co.

Two fine modern buildings of Athens—the National University (left) and the Academy of Arts and Sciences.

GREECE, RUMANIA AND BULGARIA

ALL the civilized nations of modern times realize how much they owe to ancient Greece, a tiny land where a wonderful civilization once flourished. Though for a moment Greece was great as a military power—in the time of Alexander—her real influence has always been exercised in the world of the spirit. This influence has survived in her thought, her language and her art. We discuss the accomplishments of Greece in these fields in other chapters.

In the chapter beginning on page 908 we tell you about the early history of Greece down to the year 146 B.C., when all the land came under the rule of the conquering Roman Republic. The Roman masters of Greece were fascinated by her literature and art. In the course of time Roman civilization was so much influenced by that of Greece that this little land may be said to have conquered its conquerors.

Then she was buried and almost extinguished, except for her existence in books and works of art, under the great Mohammedan invasion of eastern Europe. It was not until 1821 that the Greeks finally revolted in good earnest against their Turkish rulers. In 1828, with the aid of England, France and Russia, they acquired their independence. Then they began to spread over the southern part of the Balkan Peninsula, which was their ancient home, and over many islands of the Aegean Sea which they had colonized in ancient times.

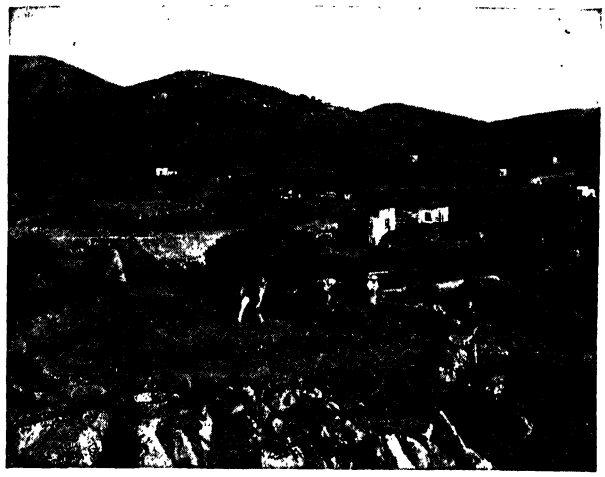
Greece played an important part in the Balkan Wars of 1912-13. In 1912 the country fought side by side with the other Balkan states against Turkey for the liberation of territories which were under the harsh Turkish rule. The Balkan allies were victorious and in April, 1913, the Turks were obliged to sign an armistice. Dissatisfied with the division of the territory taken from the Turks, Bulgaria went to war with the other Balkan states, including Greece. The Bulgarians were forced to surrender in August, 1913, and as a result Greece won much territory.

Greece remained neutral in the first years of World War I, chiefly because her king, Constantine, a Danish prince, married to the German emperor's sister, was strongly pro-German. At last the country was influenced by Premier Venizelos to take a stand in favor of the Allies. On June 11, 1917, the King abdicated in favor of his

THE LAND OF GREECE, AND ITS NEIGHBORING ISLES



Scan



Farmers threshing wheat on the island of Skyros. Farming methods used in Greece are generally quite primitive.



This flock is being driven to pasture on a wide road that leads to the famous old city of Sparta.

second son, Alexander; on June 30, Greece broke off relations with Germany and Austria-Hungary. Thereafter she fought in the war on the side of the Allies. As a result her claims were considered favorably at the Versailles Peace Conference and she added greatly to her domains.

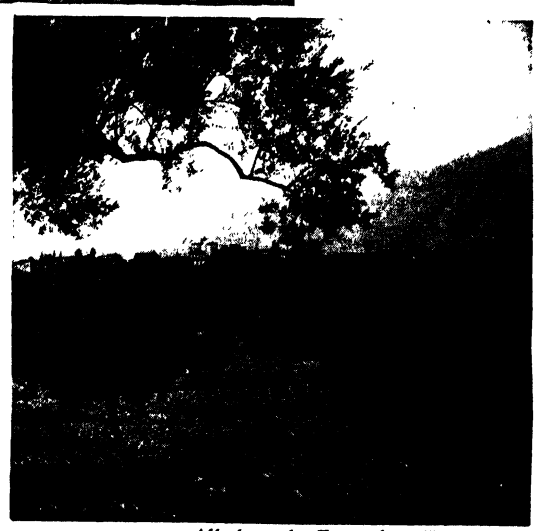
Her possessions now extended across Thrace to the Black Sea, leaving Turkey only a small territory in Europe around Constantinople (Istanbul). The Greeks also ruled over Smyrna, the chief port of Asia Minor, and the country around Smyrna. Through the influence of Venizelos, modern Greece had realized her rightful ambitions.

Alexander died in 1920, and Venizelos soon lost his office. Ex-King Constantine was recalled to the throne and the Greeks started on an ambitious advance into Asia Minor. They were completely routed by the Turks, who drove even the peaceful Greek population of Anatolia back into Europe. So Turkey recovered eastern Thrace and Adrianople and shut Greece off from the Black Sea.

Constantine was dethroned and another son was made king, as George II. George was also dethroned in 1923, but was restored in 1935. Within a few weeks after his return a dictatorship was set up under General John Metaxas. Until his death in the spring of 1941, this powerful military leader was the real ruler of the country.

Greece was drawn into World War II in October, 1940, when the Italians invaded the land from Albania, a neighboring state, which Italy had conquered in April, 1939. The plucky Greek soldiers, with the help of British planes, drove the invaders out of the country and pushed on into Albania. Many hardy Albanian mountaineers joined with the Greeks.

Germany, Italy's ally, had taken no part in the fighting at first. Finally in April, 1941, a German army was sent down into Greece through Yugoslavia and the heroic little



All photos by Evans from Three Lions

A flourishing olive grove in the vicinity of Sparta.

SCENES FROM THE FAIR LAND OF GREECE



Fruit-stand and outdoor market on the island of Crete, the largest of the Ionian group.



Fruit peddler of Agurgitica, in southern Greece, talking business with a customer.



The seaport of Skyros, on the island that bears the same name. This fertile little island is in the Ægean Sea.

Ewing Galloway

Greek soldier on guard duty. The courage of the Greek fighting man has been proverbial from the earliest days.



All photos, except lower left, by Evans, from Three Lions

Greek peasant woman spinning wool. The Greeks are a sturdy people, devoted to liberty.

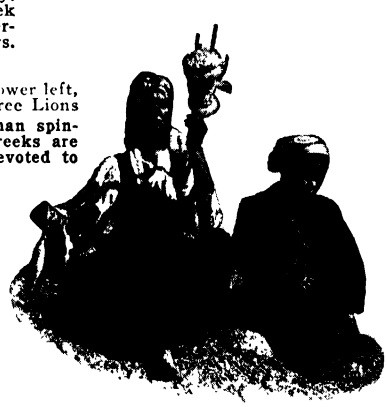
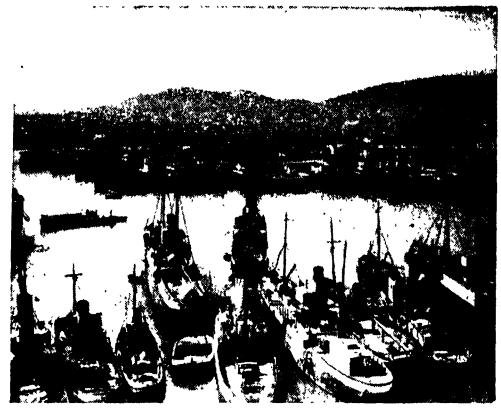




Photo by Evans from Three Lions



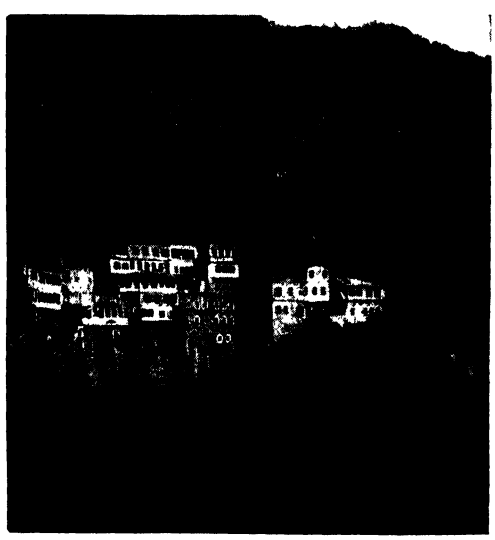
Keystone View Co.

At the left we see the city of Phira, on the island of Santorin. Santorin is a small island in the Aegean Archipelago, about sixty miles north of Crete. It is covered with vineyards. At the right is seen the harbor of Piraeus. Piraeus is the port of the city of Athens; it lies some five miles southeast of that city.

country was crushed. Following Italy's surrender to the Allies in September, 1943, Germany was the sole master of Greece. She treated the Greeks with great cruelty. Their food was taken by German soldiers, and thousands of Greeks died of starvation. Yet nazi brutality could not crush the spirit of these heroic people. Greece was liberated by the Allies in the autumn of 1944.

The area of Greece is 50,147 square miles (including the near-by islands). Her population is estimated at 7,000,000. The only large cities are Athens, with a population of 393,000, and Salonika (Thessalonike), 237,000. Other Greek cities include Patras, 61,000, Corfu (situated on the beautiful island of the same name), 32,000, and Calamata, 28,000.

Greece is chiefly an agricultural country. Tobacco, currants, olives, grapes, oranges, lemons and figs are cultivated. Greece does not grow enough wheat to feed herself, and her forests are rapidly being destroyed for fuel. There is a great variety of mineral wealth, but it is worked only to a small extent. Iron, magnesite and lead are the chief ores. The Aegean Islands are particularly rich in mineral deposits.



Ewing Galloway

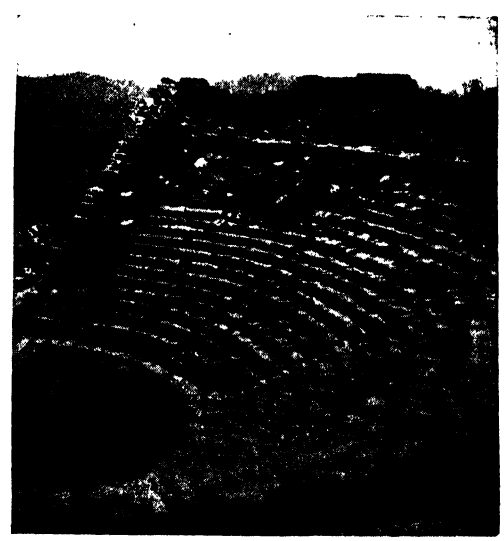


Photo by Evans from Three Lions

Left: the famous monasteries of Megaspelion. The rear part of some of these picturesque buildings extends into deep caves, hollowed out by nature. Right: an amphitheater that goes back to ancient days. It was in open-air theaters of this kind that the great plays of Aeschylus, Sophocles and Euripides were presented.

THE EASTERN BALKAN STATES



Bulgaria and Rumania are divided more than halfway by the Danube River. South of Bucharest, the mighty stream swerves north to flow through Rumanian territory until it reaches the Black Sea. The mountains of Rumania form a hollow wedge pointing east, with the Carpathians on the north and the Transylvanian Alps on the south. This is the region called Transylvania. Between the Pruth (or Prut) and Dniester rivers is the section called Bessarabia. Bulgaria is neatly cut from east to west by the Balkan Mountains. Both of these countries have rather indirect access to world shipping lanes by way of the Black Sea. However, their cargoes must pass through the Bosporus and Dardenelles, straits which are under the control of Turkey.





Photos from Three Lions

Left: view of the fine harbor of Constanta, where the important Rumanian oil pipe line has its terminal. Right: the Iron Gates, a narrow gorge in the Transylvanian Alps, through which the mighty Danube flows.

RUMANIA AND THE RUMANIANS

THE origin of the Rumanian people is somewhat in doubt. The country represents the Dacia of Roman imperial days. Dacia was an outlying province of the Empire; it bore the brunt of repeated attacks by barbarians pouring down from the lands now called Russia and Hungary. It was therefore strongly fortified and garrisoned along the line of the lower Danube. The Rumanians say that they are descended from these defenders of Rome and so have a close kinship to the Latin peoples. Like most modern stocks, however, Rumanians have a mixture of Greek, Gothic, Turkish and Slav elements. Much of the Slav blood is that of the ancient Wallachs who remained attached by language and tradition to Rome.

In the course of time the states of Wallachia and Moldavia were formed from old Dacia. They were conquered by the warlike Turks in the Middle Ages and for centuries they were ruled by Turkish governors. By the eighteenth century they had won a large share of local government, but they had to pay heavy tribute to Turkey.

Toward the end of the century the two states drew nearer together and they became known as the Danube principalities. In the course of the nineteenth century Russia took them more or less under her protection, and the Turks had to give them an increasing amount of self-government. In 1861 the two states were united and the name of Rumania was adopted. The country won its independence in the year 1878.

Rumania entered World War I on the side of the Allies in 1916. Though much of her territory was overrun by the Germans, Hungarians and Austrians, she kept up the struggle. At the close of the war she became the ruler of the lands beyond her frontiers where Rumanians were in a majority. In this way she gained from Russia Bessarabia as far eastward as the river Dvina; from Austria, Bukovina; and from Hungary, all Transylvania and certain other districts.

The new Rumania formed a compact country, and was able, for a while, to rank as a fairly important European power. But she was poor, divided by factions and badly governed. Furthermore, the people who, before the war, had been ruled by Hungary, Austria and Russia seemed never to be satisfied with their Rumanian masters.

In World War II, Rumania was neutral at first, but she was not permitted to remain so. In 1940, a great deal of land was taken away from her and she was obliged to set up a government agreeable to Hitler.

First, Rumania lost Bessarabia and North Bukovina to Russia; then a part of Transylvania to Hungary. In September, she ceded southern Dobruja to Bulgaria. And Rumania lost not only land but a king in 1940. On



Ewing Galloway



James Sawders

The peasant women on the left are returning from work in truck gardens just outside Bucharest. On the right we see a great oil development in the Prahova Valley. Rumania ranks high among the world's oil producers.



Philip D. Gendreau

A flock of sheep grazing in the foothills of the snowy Carpathian Mountains, in central Rumania.

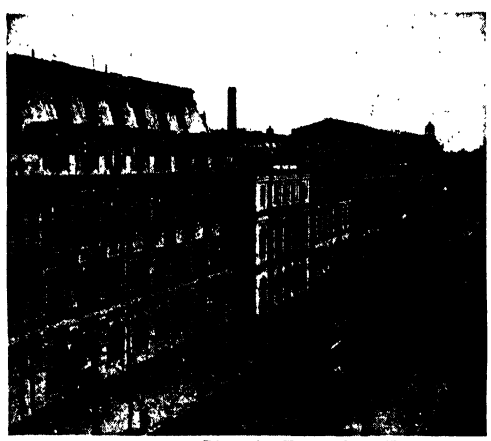


Photo by Evans from Three Lions

Main building of the University of Bucharest. The capital city is the centre of Rumania's learning.

September 6, King Carol II was forced to abdicate and flee into exile. His son Michael became king, but the real ruler was the dictator, Ion Antonescu.

Under Antonescu, Rumania soon became an ally of Germany in the war. Three years later (August 1944) Rumania was able to shake off the dictator; and then Michael declared war on Germany. The next month Rumania signed an armistice with Russia on behalf of the Allies. Late in 1947 Michael abdicated and the country was proclaimed a republic. Rumania has since been governed by the Communists, and has cemented many ties, in trade and other fields, with the Soviet Union.

Rumania is a country of fine resources. She has rich soil and wide forests; she has great oil-fields, centring around Ploesti, and considerable deposits of gold, copper, iron, lignite and saltpetre. The Danube serves as a waterway to the open seas. Agriculture is the mainstay of the country; crops include various cereals and fruits, tobacco, hemp and flax. Livestock—particularly cattle, sheep and swine—is important.

The area of Rumania is 91,584 square miles and the population is estimated at more than 15,500,000. This area is the result of the 1944 armistice; Bessarabia and north Bukovina now belong to Russia. Subject to the peace settlement, north Transylvania is once again under Rumanian control. Bucharest, the capital of Rumania, has a population of more than 600,000; Constanta, Rumania's greatest port, on the Black Sea, more than 60,000; Galatz, a port on the Danube, 102,000. Jassy, the chief town of Moldavia, has 104,000 inhabitants.

HERE AND THERE IN RUMANIA



Ewing Galloway

"Who'll buy onions to-day?" — Vegetable seller in a market place of Bucharest.



Photo from Three Lions

Ancient church and castle in the quaint old town of Christian, Transylvania.



Photo by Pasi from Three Lions

Windmills in northeastern Rumania. When we think of windmills, we generally picture a Dutch landscape. However, they are found in many other parts of Europe.



Ewing Galloway

A seller of wooden kitchen articles displaying his wares.

Ewing Galloway

A farmer near Bucharest takes his corn to the mill to be ground.



James Sawders

A group of young Rumanian peasants, dressed in picturesque native costumes.



BULGARIA, LAND OF MOUNTAIN AND PLAIN



Ewing Galloway

Bulgarian farmers still use primitive ox-drawn wooden plows, like that shown here. The soil of Bulgaria is fertile and there are abundant crops of wheat, fruit and vegetables; a considerable quantity of wheat is exported. Agriculture is the chief occupation of the country.

Philip D. Gendreau

Picking roses in the Kasanlik district. From them is distilled attar of roses.



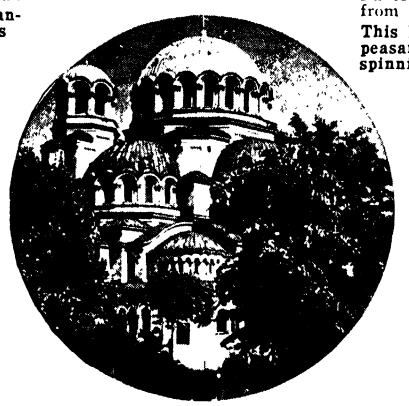


Photo by Schalek from Three Lions

This Bulgarian peasant girl is spinning wool.



Photo from Three Lions

The St. Alexander Church, near Sofia. Russian influence is clearly to be seen in the style of this church. It was built in honor of the freeing of Bulgaria from the Turks by Russia.

Ewing Galloway

Two pretty Bulgarian girls, in striking native costume, at a village fountain.



James Sawders

Shepherd with his flock at a water hole in the Tcherganovo Campagna, in southern Bulgaria.

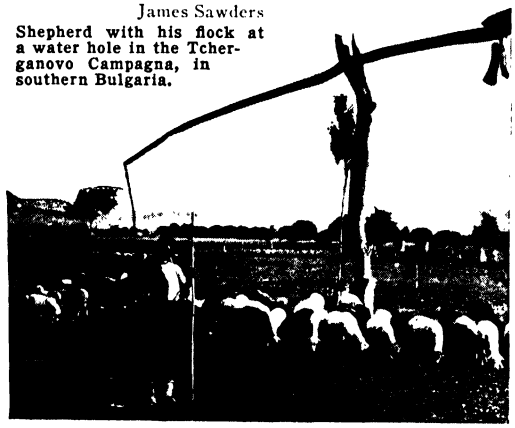




Photo by Evans from Three Lions

Stately Parliament Building in Sofia. Sofia, the capital of Bulgaria, consists of two distinct sections—the old town and the new town, built since 1880. There is a very interesting gipsy quarter in the old town.

BULGARIA AND THE BULGARS

TO the south of the Danube, and crossing the Balkan range to the Rhodope Mountains, lies Bulgaria. The inhabitants are descended from the Bulgars, a Tartar race, who occupied the land about the year 800 A.D. and adopted the Slav language. The Bulgars were converted to Christianity in the ninth century. At the beginning of the tenth century their emperor Simeon ruled from the mountains of Greece to the Carpathians and from the Black Sea to the Adriatic. Later the Bulgars fell under the rule of the Byzantine emperors. In the middle of the fourteenth century they were conquered by those fierce warriors, the Turks.

No other part of the Balkans suffered more from Turkish rule. In 1876 it reached its high tide of cruelty in the massacre of 15,000 men, women and children. At last Russia went to war in defense of the people who were of the same religion and partly of the same race as herself.

Finally, by a treaty signed at Berlin, Germany, in 1876, by Russia, Turkey, Austria and Great Britain, it was agreed that Bulgaria should continue to be a principality under the Sultan but that it should have a government and a prince elected by the people. The province on the other side of the Balkans—Eastern Rumelia—was to remain under the direct authority of the Turkish Sultan. In 1885 Rumelia was united with Bulgaria. The country was declared an entirely independent kingdom in 1908.

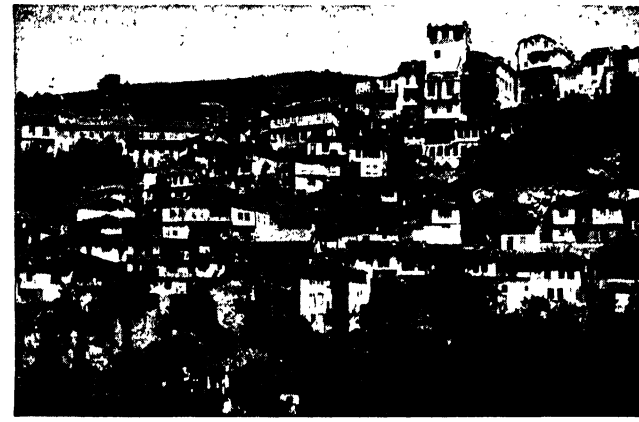
In the year 1912 Bulgaria, Serbia, Montenegro and Greece united in war against Turkey. The complete defeat of the Turks was followed by a division of almost all their European territory. But a conference held in London failed to make a division that would satisfy all the conquerors. In June, 1913, another war broke out in the Balkans. This time Bulgaria found herself facing the combined forces of Serbia, Montenegro and Greece, joined later by Rumania and Turkey. Defeated and exhausted, Bulgaria was forced to submit; she lost to each of her enemies territory that would have been hers under the Treaty of London.

After the outbreak of World War I, King Ferdinand of Bulgaria thought he saw a way to recover Bulgaria's losses and to make her the chief power in the Balkan Peninsula. Since he thought the Germans were invincible, he entered the war on the side of Germany in October, 1915. The King was

TOWN AND CHURCH IN OLD BULGARIA



Houses at Tarnovo (or Tirnovo), a beautiful old town perched above the Yantra River. Building styles change rarely here.



Two upper photos by Schalek from Three Lions

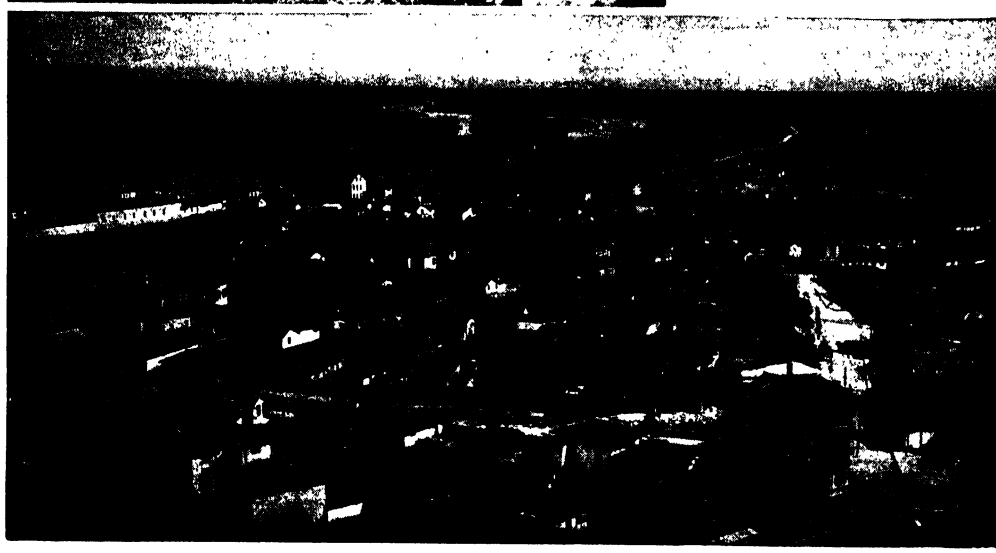
Here is another view of Tarnovo, on the Yantra River. The rows of houses, as you see, are in terraces, set one above the other upon the slope of a steep hill. Dyeing is carried on and silk and coarse cloth are manufactured on a modest scale.



The Preobrajensky Monastery, in northern Bulgaria, high above the Yantra River. It is perhaps the most beautiful religious building in all Bulgaria. Its walls are lavishly adorned with striking murals.

Lower photos by James Sawders

In the foreground is seen the Hadji Asa Machla section of the city of Plovdiv. Beyond the city we see the winding Maritza River. In the distance is the fertile Plovdiv Valley, with its numberless grain fields.



not a good prophet for, as we know, Germany did not win the war. Ferdinand was forced to abdicate and to leave the country; his son Boris became king with the title of Boris III. Under the peace treaty Bulgaria lost to Yugoslavia part of Macedonia, while she had to give up Thrace, Adrianople and part of the Black Sea coast to Greece.

Bulgaria came under the influence of the Axis in World War II. Like his father before him, Boris had a blind faith in the might of German arms; he thought that Germany and her ally Italy would surely win the war. Therefore he joined the Axis in March, 1941.

Boris died in 1943. He was succeeded by his son Simeon; the boy was only six years old, and so a regency of three persons ruled in his name. In 1944 Bulgaria signed an armistice with the Allies. Shortly afterward Communists were able to gain power in the government, and in 1946 the monarchy was abolished. Bulgaria became a republic, with Soviet ties. Bulgaria is one of the countries "behind the Iron Curtain." In other words, it is not easy for us to learn what is going on in the country because all news is strictly censored.

Bulgaria is mainly an agricultural country; three-fourths of the people obtain their living from the land, chiefly on small farms which they own. Wheat and corn are the principal crops and in normal times much wheat is exported. Sheep are bred in considerable numbers; cattle are also numerous. Much fruit is grown; tobacco is also cultivated on a great scale. Bulgaria is rich in coal and iron, but her mineral wealth has not been greatly developed.

Among the special products of the country are her embroideries and the perfume known as attar of roses. The decisive battle of Shipka, fought against the Turks in 1877, took place in the very midst of the rose gardens that cover thousands of acres on the slopes of the Balkan Mountains.

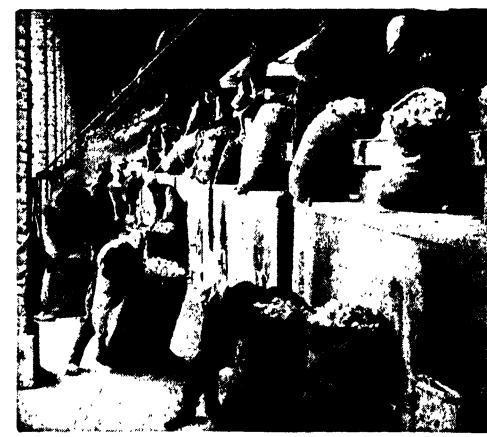
Bulgaria has an area of about 43,000 square miles and a population estimated at 6,549,664. Sofia, the capital, with nearly 401,300 people, stands on a high plain and is of great antiquity. It was an important town under imperial Rome, and it still has a church which is said to have been a Roman temple. Later this edifice became a church, then a mosque; now it is a church again. Other large Bulgarian towns include Plovdiv (Philippopolis), 100,000; Varna, 70,000, and Ruschuk, 70,000.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 5088.

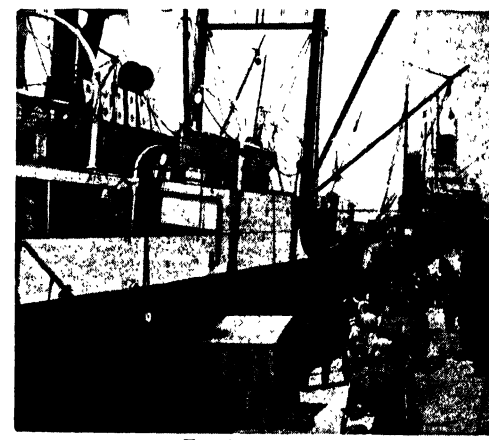


Ewing Galloway

This illustration shows women stringing tobacco for drying near Ruschuk, in northern Bulgaria. Bulgaria's tobacco is noted for its fine quality.



A perfume manufactory in the Kasanlik district of Bulgaria. The roses heaped high in the sacks are about to be dumped into the distilling tanks.



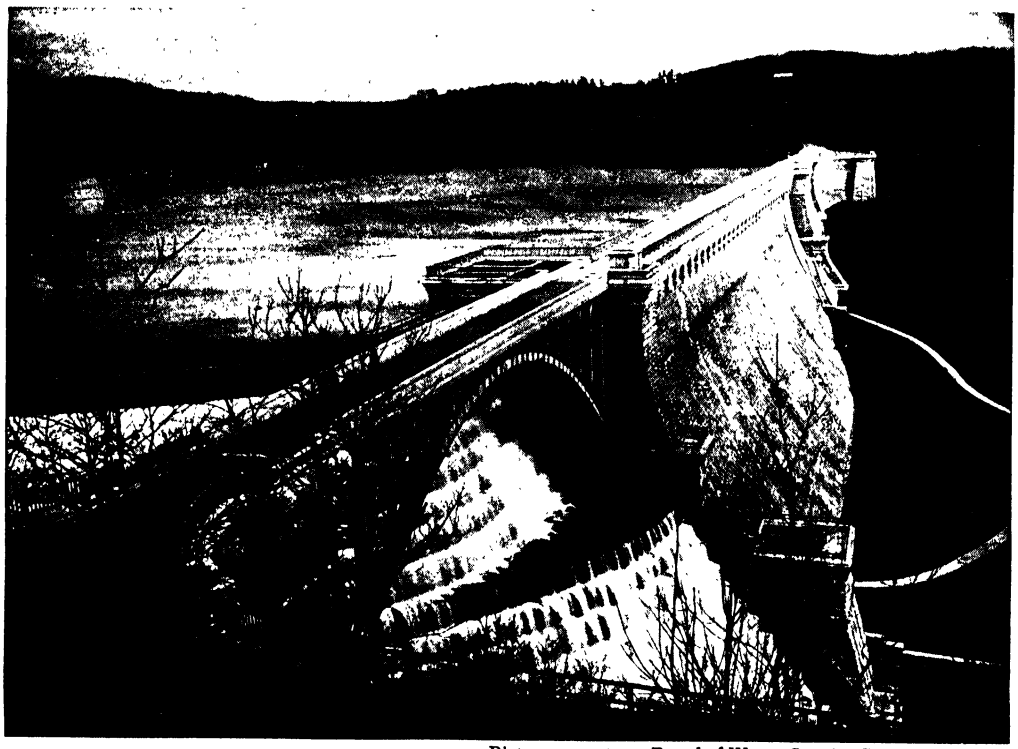
Two lower photos by James Sawders

Loading grain at the Black Sea port of Burgas, in the southeastern part of Bulgaria. Bulgaria exports most of its grain through this busy port.

WATER FOR NEW YORK CITY



The aerator at the Ashokan Reservoir. Every drop of water is thrown up in a fine spray so that it comes in contact with the air. By this means gases and vegetable matter which might give the water a slight taste or odor are destroyed. You know that oxygen burns up dead matter.



Pictures, courtesy, Board of Water Supply, City of New York

Some of New York's water comes from a reservoir about forty miles north of the city. The Croton River is dammed and an artificial lake formed, from which an aqueduct can carry to the city as much as 300 million gallons of water in a day. Above is Croton Dam and Spillway, and a corner of Croton Lake.



Board of Water Supply, City of New York

Gilboa Dam across Schoharie Creek, part of the Catskill System that serves New York.

OUR WATER SUPPLY

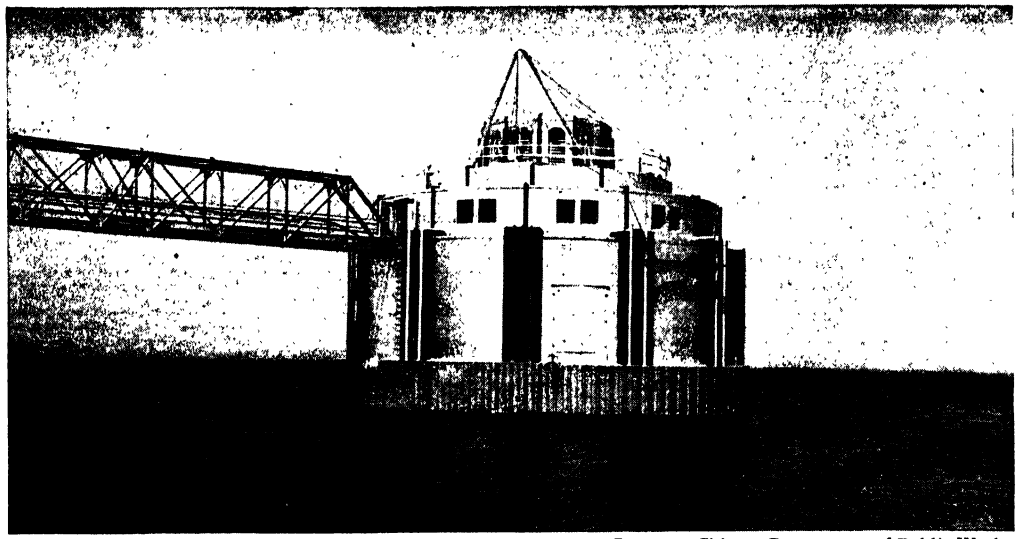
WE all know that we must have air in order to live. Water is just as necessary for man as air. Each of us loses as much as five pounds of water a day because of the waste products thrown off by the sweat-glands, the lungs, the kidneys and so on. If a man does not replace the water lost in this way with drinking water or with foodstuffs containing water, he will soon feel very uncomfortable. If he goes without water for days, he will become continually weaker and at last he will die.

Fortunately, the supply of water upon the earth is so great that, except for certain regions and certain periods of drought, there is plenty for all. And Nature constantly renews this generous abundance of water. On the surface of the earth there are flowing streams, ponds and lakes. Then there is the water that collects underground and that is brought to the surface or gushes to the surface—the water of wells and springs.

In days of old, wells furnished water in many lands; they are still to be found all over the world. Many wells serve country homes or small towns; some contribute to the water supplies of even the largest cities (as, for example, New York). Springs also provide water for many villages and farms. The water supply for the larger towns and cities is generally obtained from flowing streams, large and small, from ponds and from lakes. Many communities are located at or near these sources of water; others must bring water over great distances from streams that arise in far-off hills or mountains. Los Angeles is such a city.

Water for the use of towns and cities is sometimes collected in large reservoirs constructed near the source of supply. This is practically always the case when cities get their water supply from distant streams. Often a creek or river is dammed up so that the water may collect in the lake thus formed. (The construction of dams is described on page 2548.)

Why are reservoirs necessary? We must remember that streams are generally most full in the spring and that they are at their lowest in the summer, when water is most needed. Reservoirs serve to store up the water when there is plenty of it, so that



Courtesy, Chicago Department of Public Works

Chicago's water supply is taken from Lake Michigan. Six large cribs have been built out in the lake, their foundations resting on the lake bottom. Water flows into pipes at the cribs. The pipes lead to tunnels dug under the lake. Pumping stations send the water from the tunnels to the city mains.

there will be a steady supply at all times. Otherwise many cities would have more water than they needed at certain times; not enough at other times.

Some reservoirs are as large and deep as lakes. Such is the great Ashokan Reservoir (in the Catskill Mountains) that stores up water for New York City. To build this man-made lake, the land where it was to be constructed had to be bought and the ground cleared. Seven villages, sheltering some 2,000 inhabitants, had to be destroyed. Thirty-two cemeteries had to be moved. Eleven miles of railroad track which crossed the land chosen for the new lake had to be taken up; eleven miles of new track had to be laid at one side of the reservoir. The dam that holds back the waters of the Ashokan Reservoir is nearly a mile long. As for the reservoir itself, it is forty miles around and 190 feet deep at the deepest part.

Water is brought to communities from the source of supply in pipes or aqueducts. (An aqueduct is a tube or passageway through which water is made to flow.) When cities draw their water from nearby streams or lakes, the problem of transporting water is generally not a very difficult one.

Of course, if the water is taken from a lake at a considerable distance from the shore, it may be necessary to build tunnels. Chicago, for example, gets its water supply from Lake Michigan. The waters of the lake flow into pipes at six cribs, which are round structures resting on the lake bottom and extending above the surface of the water. These cribs are set out at distances of from two to four miles from the shore. From the pipes at the cribs the water flows through tunnels dug under the bottom of the lake; there are fifty-eight miles of these tunnels in all.

When water must be brought to the city over great distances, many problems arise. The aqueduct in which the water is transported may meet such natural obstacles as lofty mountains, deep valleys, broad rivers and wide stretches of desert. A description of two outstanding aqueduct systems—the Catskill Aqueduct and the Los Angeles Aqueduct—will give some idea of the way in which modern engineers overcome the difficulties which arise.

The Catskill Aqueduct brings the waters of the Schoharie and Esopus creeks in the Catskills to New York City, about 150 miles away. We may describe the aqueduct as a huge sort of tunnel, eighteen feet wide in some places.

When there are no natural obstacles in the way, the type of aqueduct known as cut-and-cover has been constructed. In this sort of construction a trench is dug in the ground; a floor of concrete is laid in the bottom of the trench. Concrete side walls are added and the side walls are connected by an arch of concrete. A protective dirt

covering, with grass on the top, is then set on the concrete roof. You see now how this sort of aqueduct gets its name—it is placed in a trench dug or *cut* in the ground and it is *covered* with dirt.

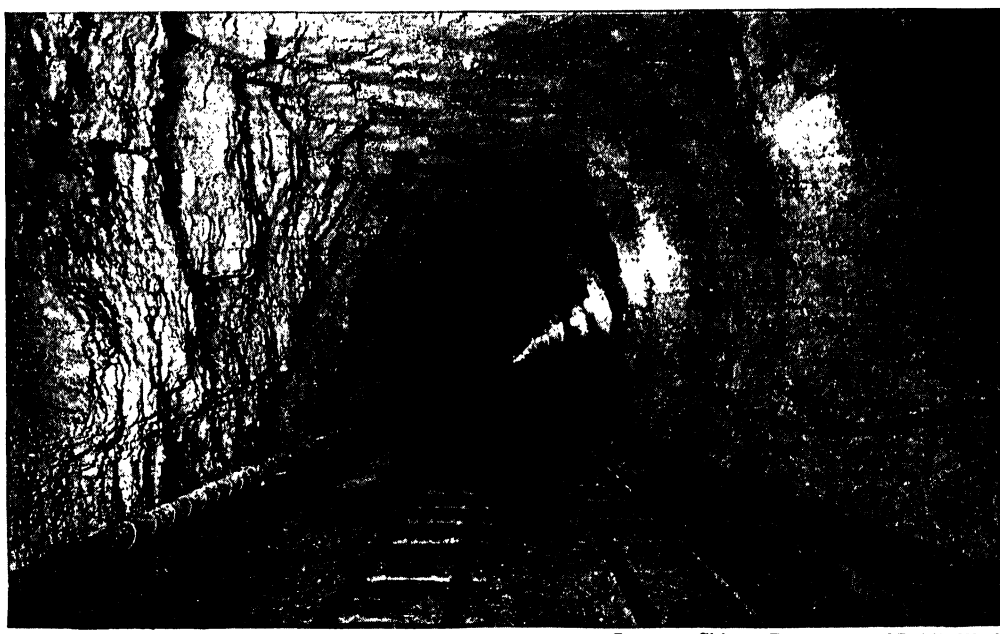
When the engineers in charge of the Catskill project encountered hills or mountains and found that it would not be convenient to have the aqueduct go around them, tunnels were dug through them and lined with concrete. A different sort of problem was faced when the aqueduct had to cross a valley. In the days of the Romans, engineers would have met the difficulty by putting the aqueduct on top of a lofty bridge of stone or concrete, spanning the valley. Entirely different methods have been used in the construction of the Catskill Aqueduct.

In certain cases a vertical shaft, built in solid rock, connects the aqueduct with a tunnel, also built in solid rock, that extends across the valley, deep under the surface. At the other end of the tunnel another vertical shaft leads upward to a place just below the surface of the ground; here the cut-and-cover type of construction is continued. The tunnel just described is called a pressure tunnel—it is built to withstand the great pressure of the water plunging as a cataract down the vertical shaft that leads to the tunnel. Pressure tunnels have been used to cross the rivers in the path of the aqueduct.

Across the smaller valleys or in valleys where the rock is not suitable for a pressure tunnel, the aqueduct is continued just below the surface. Riveted steel pipe, imbedded in concrete, is laid in trenches and covered with a grassy embankment.

There are several reservoirs in the Catskill Aqueduct system—the Schoharie and Ashokan reservoirs, in the Catskills; the Kensico Reservoir, about 75 miles from the Ashokan Reservoir, the Hillview Reservoir, on the outskirts of New York City. From the Hillview Reservoir the water is brought into the city through a pressure tunnel, eighteen miles long, dug out in solid rock far below the surface of the streets.

The Los Angeles Aqueduct brings water to Los Angeles from the far-off slopes of the Sierra Nevada, about three hundred miles distant. Not only must the aqueduct cross mountains and rivers and valleys and canyons; it also passes through great expanses of desert land. Where tunnels have been dug through mountains and under the beds of rivers and lakes, construction similar to that in the Catskill Aqueduct has been adopted. Where the aqueduct passes through the desert, open canals have been provided; these are lined with concrete to prevent leakage of the water. In some cases huge

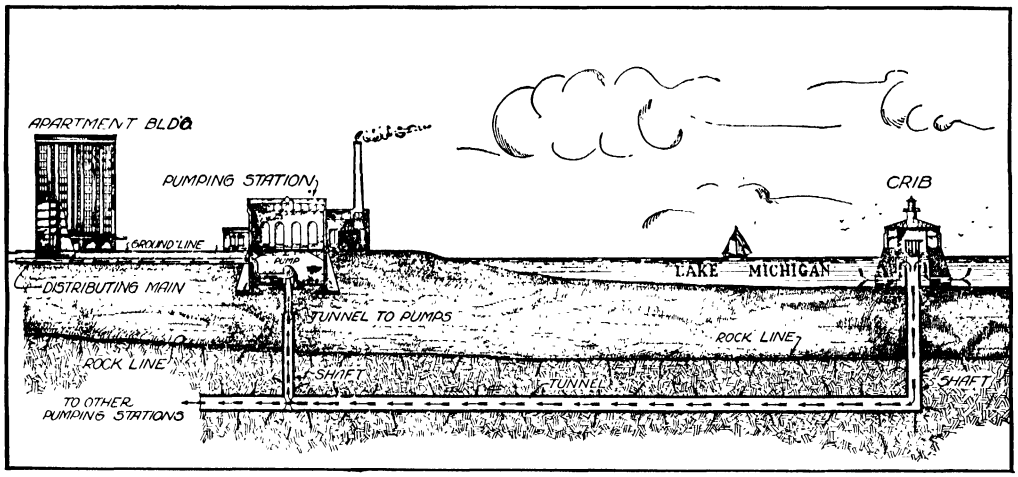


Courtesy, Chicago Department of Public Works

The Chicago Avenue tunnel, during construction. This is one of the largest of the water tunnels under Lake Michigan and under the city of Chicago. Railroad cars carried materials to the workmen under the lake.

steel pipes, resting on concrete supports, have been laid upon the surface of the ground. They bring the water up towering mountain slopes, down on the other side and across deep valleys.

As in the case of the Catskill Aqueduct, the Los Angeles Aqueduct system has a number of large reservoirs. Two great hydroelectric plants have been constructed in the San Francisquito Valley to harness the rapid flow of the water of the aqueduct; other hydroelectric plants are operated by the waters of the aqueduct within the city limits of Los Angeles.



Courtesy, Chicago Bureau of Engineering

A diagram of Chicago's water system. Water from the lake flows into pipes at the crib (right), then down the shaft into the tunnel which lies below the bottom of the lake. A pump raises water from the tunnel to a main pipe for city use. There are several cribs and pumping stations and fifty-eight miles of tunnels.

You now have some idea of the way in which water is brought into cities. Not all aqueduct systems use the expensive steel and concrete construction that we have just described. In the western part of the United States, large wooden pipes, consisting of staves bound together by steel hoops, are in common use. Wooden flumes (boxes open at both ends and at the top), supported on wooden trestles, are also used to carry water over deep valleys.

The water carried in the aqueduct finally reaches the city and is distributed to the various sections of the city in pipes. Just what means is used to force the water through the pipes? If the aqueduct that carries the water to the city is set on a long downward slope, the water will probably be forced to the tops of the highest buildings by the natural pressure of gravity. In certain cases the water may be forced up in this way to all but the upper stories of certain buildings. To supply people living in these upper stories, the water must be pumped up. Many buildings have their own water pumps in the basement. The pump raises the water up to a water tank on the roof; from this it is distributed to the higher floors. The lower floors are supplied with water raised by natural pressure.

Certain areas of the city may be too high to be reached by the gravity method. In that case water is supplied by means of pumping stations set up in various parts of the city. Pumping stations are also used to supply water to consumers when this water is derived from wells, springs, rivers or lakes.

The reservoirs situated within the city or in the vicinity of the city may serve several different purposes. In certain cases the reservoir serves as a sort of go-between. It receives water from the aqueduct and then sends it on to the various parts of the city. In other cases reservoirs are constructed in order to keep an adequate emergency supply of water on hand in case the supply from the aqueduct is shut off for any reason. (There might be a break in the aqueduct, or else the flow of water might have to be shut off so that the aqueduct could be cleaned.) In a number of cases there is no reservoir at all even in a large water supply system. In Chicago, for example, the water that reaches the city from tunnels underneath Lake Michigan is directed by means

of vertical shafts to twelve pumping stations; these pump the water to the different sections of the city.

The system of pipes by which water is distributed in our great cities is a very complicated one. The main pipes or mains spread out all over the city. These mains are provided with valves at intervals, so that the flow of water may be shut off if necessary in case of emergency. From the mains run smaller pipes. The smallest of all distribute water to the houses.

Up to the beginning of the nineteenth century water pipes were generally of wood; they consisted of tree trunks hollowed out so that the water could pass through. Nowadays most pipes for water supply systems are made of cast iron. The larger water mains are sometimes made of steel plate, a half-inch or so in thickness.

A part of the water supply is piped (distributed in pipes) to hydrants and this water is available for fire fighting. In certain cities the water pressure at the hydrants would not be great enough to force the water up to the higher floors of certain buildings. In such cities there is generally a high-pressure system which may be used when the regular system is inadequate.

The water-pipe system of a city is only a part of the complicated network of tunnels, sewers, gas mains, steam pipes, electric conduits and so on that you would find below the surface of the street. City water supply departments must know the location of all parts of this amazing network. For one thing, men must be able to get to water mains so that repairs may be made or new connections fitted in the mains. It would be most unfortunate, to say the least, to find that a gas main or a series of steam pipes blocked the way. Again, the water mains must be protected from the weight of other structures set in place above them. Finally, enough space must be left in the streets so that new mains may be installed to meet the ever growing demands for water. In most cities, therefore, the water supply department must be consulted before any new gas mains or electric conduits or pipes of any sort are placed below the surface of the street.



Courtesy, Department of Water and Power, Los Angeles

There are a number of reservoirs along the Los Angeles aqueduct. The picture shows a valve at an outlet from the Lower San Fernando reservoir.

HARMFUL SUBSTANCES MUST BE KEPT OUT OF WATER

It is not enough to provide a plentiful supply of water; the water must also be fit to drink. It should be free from disagreeable odors or smells, from mud and mineral substances, from particles of refuse such as are brought into the water by sewage and by the waste products of various industries. Above all, it should be as free as possible from bacteria. Not all bacteria, to be sure, are harmful; but the harmful species, such as the typhoid germ, the cholera germ and the tetanus germ, are a terrible menace, against which modern science wages unceasing warfare.

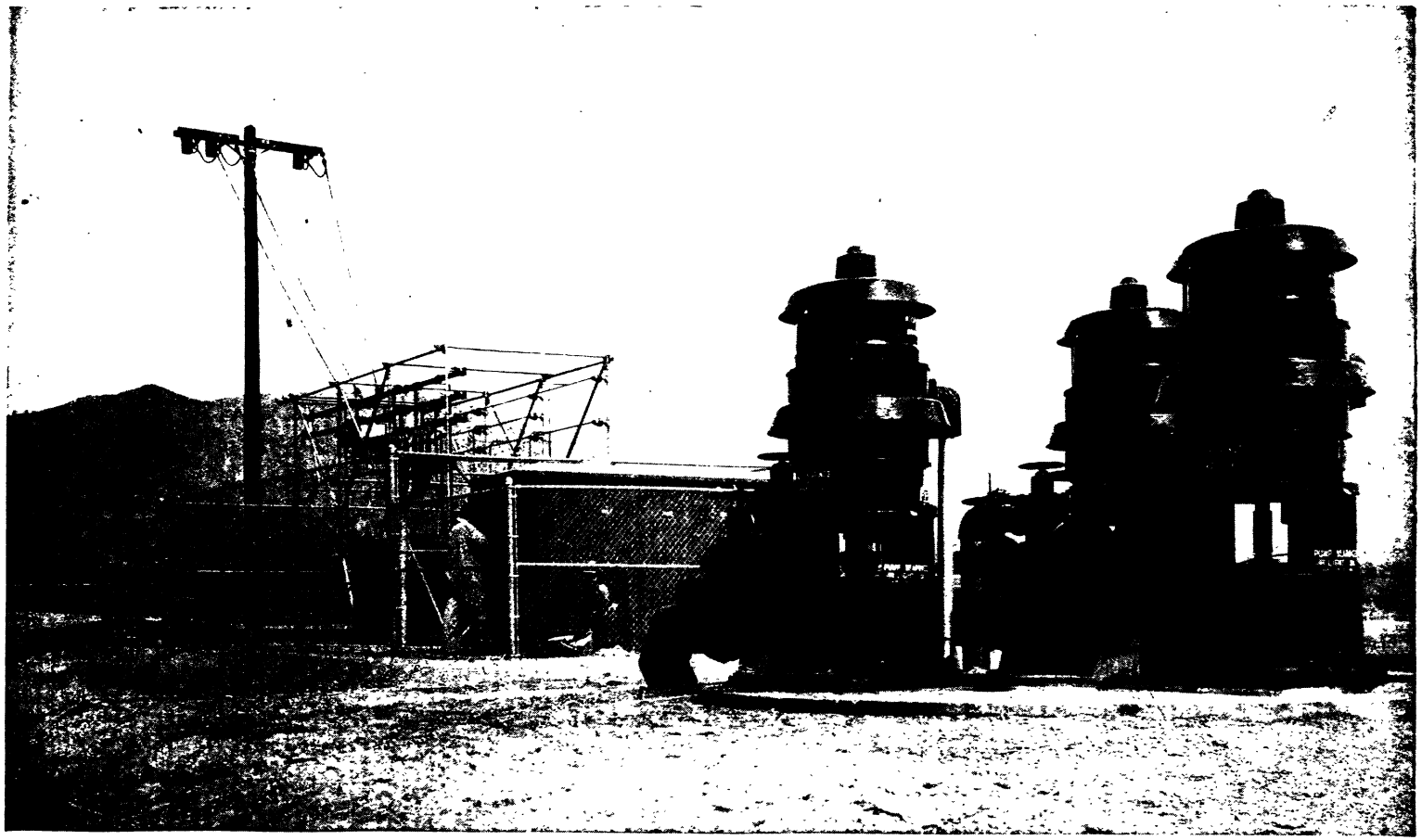
We now know that impure water may cause the spread of disease. In the Middle Ages, rivers or springs or wells would often become polluted (to pollute means to make impure) with sewage and other forms of refuse. Yet, because people did not realize how dangerous this water was, they kept on drinking it. It was chiefly because of the polluted water supply that so many medieval cities suffered from the terrible pestilences of which history tells us.

HOW OUR DRINKING WATER IS KEPT PURE

In these days we have come to realize that the greatest precautions must be taken to provide only pure water. Even the smallest communities have their drinking water analyzed from time to time to see if it is safe. The larger cities maintain well equipped laboratories to examine water taken from different places in the water system. If any of this water is shown to be unsatisfactory, steps are taken to make it fit for humans to drink.

There are a number of different ways in

PUMPING WATER FOR LOS ANGELES



Courtesy, Department of Water and Power, Los Angeles

Along the Los Angeles aqueduct there are many pumping stations that pump water from wells into the water system and also "boost," or raise, water from a lower to a higher level where this is necessary. The picture shows the McClay pumping plant at the Upper San Fernando reservoir, quite near the city.

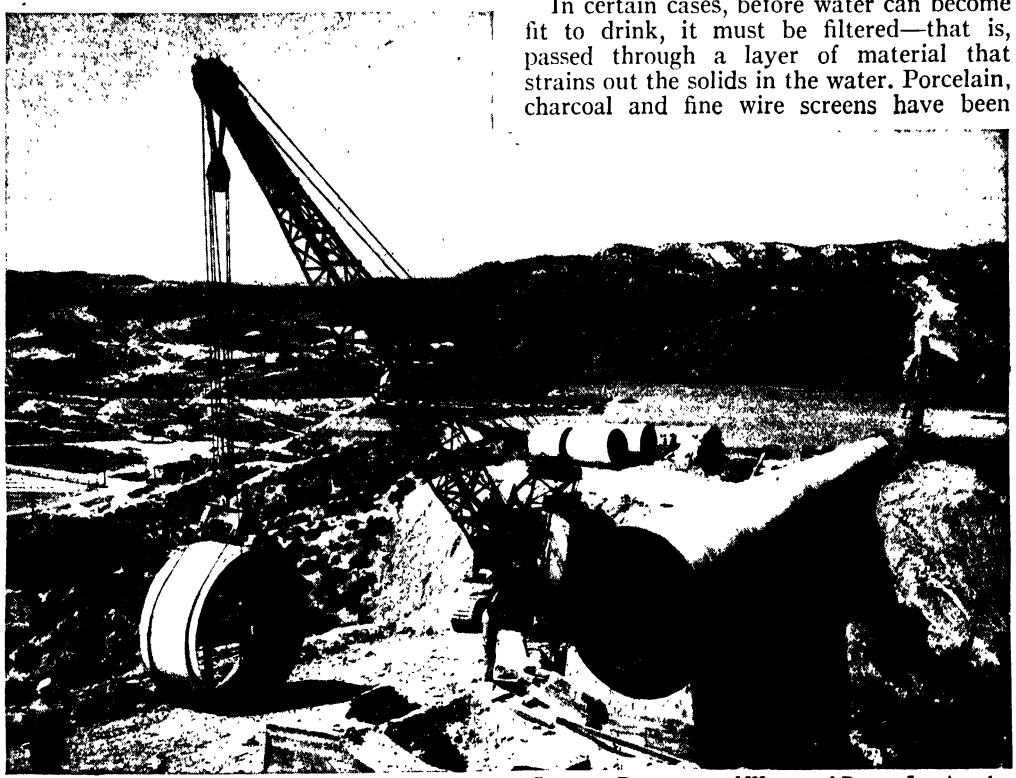
which water may be purified. If the water contains particles of mud or refuse, it is sometimes made to flow into a shallow basin, where it stands for several days. Most of the particles in the water gradually sink to the bottom. This is called the sedimentation process (sediment is the name given to the substances in a liquid that settle to the bottom).

Another process, called the coagulation method, is sometimes used to rid the water of foreign particles. A chemical like alum or lime is added to the water; this causes the particles of refuse to coagulate—that is, to be drawn together in a jelly-like mass, which then sinks to the bottom. Neither sedimentation nor coagulation rids the water of all particles, but water that has been treated by one or the other of these processes is often found to be pure enough to drink.

In some cases, in order to free water from gases producing an unpleasant odor or taste, the water is aerated—that is, sprayed into the fresh air from a great number of nozzles. Some water is treated by ozone, a gas produced by the discharge of electricity in oxygen or air (air is made up principally of oxygen). The ozone is pumped through the water that is to be treated, or else the water is showered downward through towers in which the ozone is circulated. Ozone is a powerful disinfectant; it destroys bacteria. The ozone method of killing germs is a very expensive one, however, and for that reason it has not been widely adopted in North America.

The germicide, or germ-killer, that is used most extensively throughout the world is the chemical called chlorine. It is usually in the form of a liquid and is supplied in steel cylinders. It is mixed with the water in doses that vary according to the number and kind of bacteria present in the water. Chlorine is a very effective as well as a very cheap way of killing germs found in water. However, if the water that is to be treated is particularly bad, so much chlorine may have to be used that the water will have an unpleasant taste and odor.

In certain cases, before water can become fit to drink, it must be filtered—that is, passed through a layer of material that strains out the solids in the water. Porcelain, charcoal and fine wire screens have been



Courtesy, Department of Water and Power, Los Angeles

The Los Angeles aqueduct system is 300 miles long. The water is carried across deserts and over hills. It is made to flow uphill in many places, through siphons such as this one, which has the mournful name of Deadman Siphon. It is the downward pressure of water behind which forces water to flow uphill.

used as filtering material, but the most effective filter of all has been found to be sand. There are two chief kinds of sand filters—slow and rapid.

HOW THE SLOW SAND FILTER PURIFIES THE WATER

Water to be treated by the slow sand filter is run into a large basin, sometimes covering an acre or so. Gravel is laid upon the bottom of the basin, the coarsest particles of gravel being placed at the bottom; then fine sand is put on top of the gravel. The water that is to be filtered keeps flowing into the basin. As the water sinks through the sand and gravel, a layer of microbes, tiny plants and other matter settles on the top of the sand. In about two days this layer, which is called the slime mat, becomes so thickly matted that it keeps back practically all the particles of refuse and bacteria, while permitting the water to pass through. By the time the water has reached the bottom of the tank, it is pure and ready to be used for drinking purposes. It is drawn off from the basin by means of pipes.

In about a month or so the slime mat will become so thick that it will hold back the water almost as effectively as the bacteria. It then becomes necessary to remove the slime mat. The water above the filter is run off from the basin, exposing the filter to the open air. Sometimes, after the slime mat has been permitted to dry for a while, it may be rolled up like a carpet and removed! More often, the top layer of sand, containing the slime mat, is scraped off and placed in piles. Men with wheelbarrows remove the piles, pushing the wheelbarrows on planks which are set end to end at intervals on the sand surface.

WATER IS PARTLY PURIFIED BEFORE ENTERING THE RAPID SAND FILTER

Water which is to be passed through the rapid sand filter is always treated beforehand by sedimentation and coagulation; thus the larger particles are removed from the water before it is filtered. The filter box or basin is much smaller than that used in the slow sand filter; it is generally about fifteen feet wide and from fifteen to twenty feet long. As in the case of the slow sand filter, the basin has layers of gravel and sand at the bottom; a slime mat also forms on the top of the sand as the water passes through. However, this slime mat is removed, not once a month, but once every twenty-four hours or so. First the standing water in the basin is drained. Then a current of water is made to flow upward from the bottom of the tank, while the top layer of sand is stirred by a mechanical rake. This dislodges the slime mat, which is washed away through drain pipes.

SOME OF THE WAYS BY WHICH NEW YORK'S WATER SUPPLY IS KEPT PURE

The rapid sand filter purifies water much more quickly than the slow sand filter. For one thing, all but the smallest particles have been removed from the water by sedimentation and coagulation before the water is put through the filter. Besides, the frequent removal of the slime mat makes the flow of water through the filter much more rapid. However, treatment of water by this process is much more expensive than the slow sand filter method. Not all the processes described above are in use in all water supply systems. Sometimes only one is used; sometimes two or more are applied in the same purification plant; often one or more may be used in various parts of a water supply system. In the New York system, for example, all water is treated with chlorine, sometimes in the reservoir, sometimes at various pumping stations within the city. Alum and lime are added to the Catskill supply above the Kensico Dam in order to cause coagulation of the particles in the water. These particles settle at the bottom of the reservoir before the water flows from it to the city. Water is aerated at the Ashokan and Kensico reservoirs of the Catskill Aqueduct system. Finally, rapid sand filters are used to remove iron from the water at several stations within the city.

THE ARMY OF MEN WHO LOOK AFTER A CITY'S WATER SUPPLY

The task of providing an adequate and pure supply of water for a large community is indeed a complicated one; it requires the services of a great number of men (there are almost four thousand in the Los Angeles water supply system). Special police often patrol the drainage areas that supply the city, to see that the water is not polluted. Inspectors examine the various parts of the system at frequent intervals. Chemists and bacteriologists are constantly at work to discover any harmful substances that may have gotten into the water in spite of all the precautions that are taken. Many men are necessary to provide service within the city itself—to trace the source of wasteful leaks, to do repair work, to lay new pipes and to do many other things besides.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 5167.



A group of Camp Fire Girls from Sandusky, Ohio, meets around the hearth.

THE CAMP FIRE GIRLS

GIRLS of to-day are very lucky beings. If we look back a hundred years we must feel sorry for the girls who lived then. Our great-grandmothers would have been horrified if their daughters had tried to play or go about as almost every girl does to-day. As for girls "camping-out"—no great-grandmother could possibly have imagined such a thing!

Even twenty-five years ago, when girls were allowed a great deal of freedom, it was a rare thing for camps to be devoted entirely to girls. Parents would take their families out camping, and boys were allowed to go out to the woods in groups. But there were no organizations which encouraged girls to join together and enjoy life in the great out-of-doors. When boys began to join the Scouts, their sisters looked at them with envy.

Then, fortunately, someone decided that there was no reason why the sisters should not have their own organization. Girls can swim. They can paddle or go on hikes. They can sew or use tools. They can cook or signal with flags. They can learn woodcraft. Those things, and hosts of others, girls can do if someone will teach them or guide them as the boys are taught and guided.

Camp Fire Girls, founded in 1912, is a programme of leisure-time activities for girls ten years of age and over. Girls are encouraged to develop interests and skills in seven different worthwhile fields: Hand Craft, Home Craft, Health Craft, Camping, Nature Lore, Business and Citizenship.

Each of the groups has not less than six nor more than twenty members, and must have as leader, or guardian, a woman at least eighteen years of age. Each girl pays annual dues of one dollar, which she is encouraged to earn. Upon request, application blanks are sent by the National Headquarters in New York. As soon as the blank, properly filled out, together with the dues of each member, is received at Camp Fire Headquarters in New York, the guardian receives her certificate and the group a charter. The group may then begin to work for honors.

There are hundreds of things for every Camp Fire Girl to do, things that she likes to do and things that she wants to learn. These are called the Camp Fire "Honors" because when a girl has done any one of these things, she has the honor of wearing a bead on her ceremonial gown to symbolize her achievement.

The Honors are grouped under the Seven Crafts, each having its symbolic color. Home Craft, flame color for the hearth fire, includes such Honors as making menus, marketing, cooking, taking care of a baby or repairing kitchen gadgets. Health Craft, red for sunshine and life, covers Honors in swimming, hiking, skiing, riding, sleeping a certain number of hours, preparing an in-

valid's tray. Camp Craft, brown for the earth and trunks of trees, takes in all kinds of camping and out-of-door knowledge like rolling a poncho, sleeping on the ground, making bread on a stick over an open fire, sending messages by semaphore, making a rainproof shelter.

Hand Craft, green for creation and growing things, means doing and making things as decorating a pair of Indian moccasins, making party favors, tooling a leather book cover, designing a dress, making puppets.

WINNING HONORS IN NATURE CRAFT

Nature Craft, blue for the sky, includes such things as making a book of flower prints, planting a rock garden, raising chickens, learning the constellations, keeping a weather chart. Business, whose Honor beads are yellow for harvest, induces such activities as selling tickets for a play, keeping a budget, earning and saving money, using a typewriter or mimeograph.

Citizenship, with the national colors of red, white and blue, includes Honors like singing Christmas carols to shut-ins, helping with a community tree planting, collecting American stamps, teaching English to a foreigner, or taking part in a play or historical pageant.

CAMP FIRE GIRLS MAY ATTAIN FOUR RANKS

As soon as a girl becomes a member she begins to work for Rank, earning Honors by learning to do new things. There are four Ranks that a Camp Fire Girl may attain. To become a Trail Seeker she earns one Honor in each of the Seven Crafts, starts a personal Camp Fire notebook, sketches ten Indian symbols, and does other things that Camp Fire Girls like to do. She may wear the Trail Seeker's pin.

Next comes the Wood Gatherer who makes herself a woven headband using her symbol design, keeps a nature book, cooks outdoors on a hike, keeps the Camp Fire



These little western ponies take the Texas Camp Fire Girls on many a thrilling ride. Not only in the western camps do the girls have an opportunity of riding ponies, but in many of the eastern camps as well.



These girls are painting trail signs on the trees so that other hikers will not lose their way. Each year Camp Fire Girls go camping for a week or two during the summer months at a big camp usually not far from the city.

Health Chart, and does other things with her group. Her insignia is the Wood Gatherer's ring.

The Fire Maker comes third, and to achieve that Rank and wear the Fire Maker's bracelet, a girl earns thirty Honors, prepares and serves a dinner indoors, repairs or makes certain household articles, demonstrates first aid, gives a talk on a subject of special interest to the Camp Fire group, and does other things which are included in various Crafts.

There are seventeen different ways to earn the Rank of Torch Bearer Craftsman. For this Rank a Camp Fire Girl chooses her favorite Craft and develops her skill in it by study, research, teaching others or working at it with others. She is asked to make notebooks, sketches, illustrated maps, collections or some form of record of how she won her Rank, which she sends in to the National Headquarters. She wears her own symbolic design on her gown.

The Torch Bearer's pin, in the form of a half circle, is the insignia of her Rank. A girl must earn two of these Ranks, besides fulfilling other requirements which develop her executive ability and give service to the community in various directions, in order to become a Torch Bearer in Social Leadership. With the winning of this Rank she has learned to do many different things successfully. She has developed special interest and ability in certain fields, and she has learned, most of all, to cooperate with others. She can be very proud of this highest of Ranks. To her Torch Bearer Craftsman pin is added another half circle, making the circle complete.

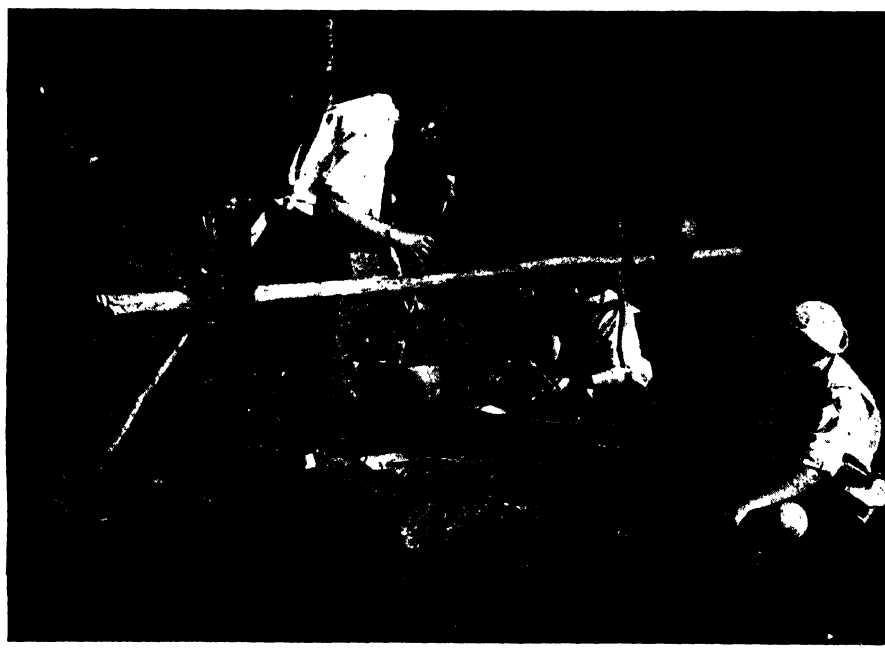
Each Rank has a Desire. A Camp Fire Girl has no pledges to make, but she expresses her desire to follow the Law of the Camp Fire which is: Seek Beauty, Give Service, Pursue Knowledge, Be Trustworthy, Hold on to Health, Glorify Work and Be Happy.

To celebrate the birthday of the organization, which comes in March, a special na-

HIKING AND COOKING ARE LAND SPORTS



In faraway India people wind little strips of meat on skewers and roast them over the open fire, making an exceedingly tasty dish known as "Kabob." Camp Fire Girls know what kabobs are too, and here we see them roasting kabobs and bread snakes for a big feast at the end of a hike at Lake Cohasset in Harriman Interstate Park, New York.



Making fires for outdoor cooking is a part of Camp Craft honors. These open fires are often started without matches. Sometimes the girls make biscuits in a reflector oven, or kabobs on a stick over the open fire. Sometimes potatoes are roasted under the bed of coals provided by the camp fire. Whatever they cook is good, and their hungry companions appreciate it.

tional project is carried on by all the Camp Fire Girls each year. These have included Tree Planting, Flower Gardening, Study of the American Indian, International Friendship, Home Decoration, and many others.

A project of great interest was Hobbies, when girls all over the country chose hobbies for which they made collections and scrapbooks, built model stage sets, went on nature hikes to observe and make notebooks, tried out new recipes in the kitchen, took photographs of things that interested them or designed costumes for characters in a play.

In 1937 the Camp Fire Girls celebrated their Silver Jubilee Year. Many changes were made in the Camp Fire program to keep up with the changes that had come during the past twenty-five years, in social customs, scientific inventions and a new appreciation of nature. Pictures of "then and now" were compared, contrasting customs dramatized, inventions for modern efficiency in housekeeping tried out, the possibilities of camping and outdoor life expanded, and the responsibility of Camp Fire Girls to their communities as participating citizens was carried out in various ways.

In many cities Camp Fire Girls made a recreational survey which was presented at public meetings and resulted in the building, in some places, of new playgrounds, and park improvements. Conservation was the 1938 Birthday Project. Camp Fire Girls studied dust storms, floods and forest fires to see what could be done to eliminate waste in their country. They investigated the growth or dying out of certain wild flowers, birds and animals in special localities, to determine the cause. Through their own Crafts they emphasized ways that wild life can be conserved. Committees for each locality made reports and suggestions for needed action, and a representative committee went to Washington where the Honorable Hattie W. Caraway welcomed them and recommended that their findings on conservation should be published in the Congressional Record.

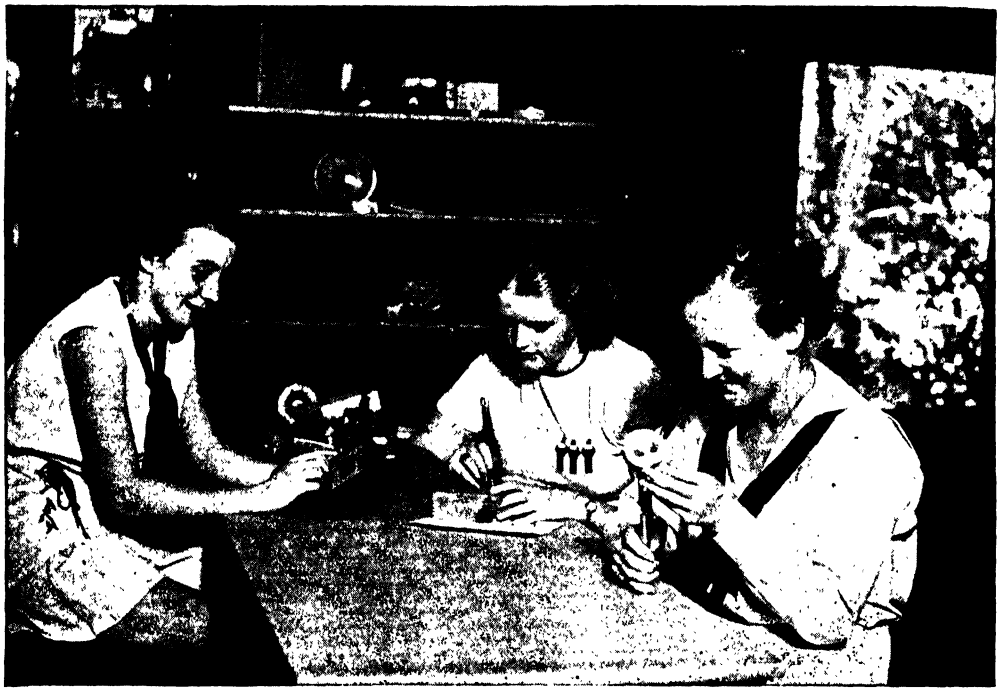


For entertainment at camp in the evening there are songs and games around the fire or a play. Here the girls of Camp Letoli at Ardmore, Oklahoma, are giving a dress rehearsal of "Two Bright Eyes," an Indian Legend.

An American Project was the theme for 1939 and Camp Fire Girls left hardly a page of American history unturned in their search for information on American crafts, inventions, discoveries and men and women of achievement. They held old-time costume parties and invited Grandmother to come in one of her charming old-time frocks brought down from the attic store room.

SYMBOLISM FOR CAMP FIRE IDEALS

Indian symbolism was taken as a beginning for Camp Fire symbolism because the



Woodcraft is always popular at camp for materials can be found in plenty in the woods around. Many small and useful articles are made and toys for a younger brother or sister, but it is fun, too, to make camp furniture.

Indians used nature almost entirely in their symbolism and because it is very simple in form and idea. The Camp Fire Girls have adapted it to fit their own needs and ideas.

The first thing a Camp Fire Girl does is choose her Camp Fire name. It represents her ideals, something that she wants to do or to be. Perhaps it is something that she wants to overcome. It is the symbol of herself as she would be. She may use an Indian word that expresses her idea, or the name may be suggested in a poem or legend.

When she has chosen her name, a Camp Fire Girl designs her own symbol which she uses in decorating her ceremonial gown and in any other way she chooses. She may weave her autobiography in beads, having a symbol which tells about each step in her life.

The ceremonial gown, adapted from the Indian girl's dress, is made of khaki and is trimmed with brown leather fringe. Though basically like every other, each ceremonial gown, decorated by its owner with her symbols and the record of her achievements and good times, written in gaily-colored beads, is an individual expression of herself. It is worn only at Council Fires and Ceremonial meetings which take place occasionally.

Once every two months, at least, the Camp Fire Girls have a Council Fire. This is a meeting around an open fire (or candles to symbolize the fire, if the fire is impossible) where the girls sing their songs, repeat their laws and desires, and dedicate themselves to their ideals. They have simple rituals which express their purpose and give dignity and beauty to the meeting. Once a year all the groups of Camp Fire Girls in a community meet for a Grand Council Fire.

Camp Fire Girls have no uniform, but when they want to dress alike they wear the service costume of dark blue skirt, white middy, and red tie. The blue beret and the blue arm band, embroidered with the crossed logs and flame, give distinction and finish to this costume.

A TYPICAL DAY AT CAMP

Almost every Camp Fire Girl goes camping for at least one week every summer. The cities that support local Executives who are in charge of Camp Fire work have their own big camps somewhere not far from the city. Most of these camps are on beautiful sites in the mountains or on the shore of

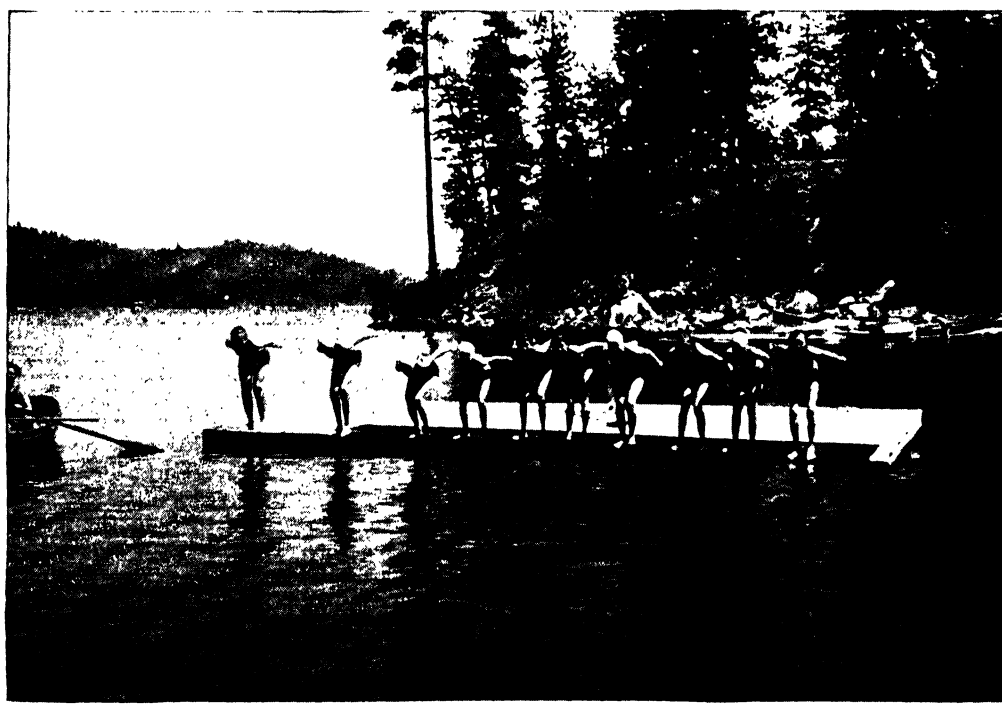
some lake or river or the ocean. The girls live in tents or cabins, and share a common dining-room and assembly room. In the bigger camps, from one to two hundred girls are in camp at one time.

The camp period usually lasts two weeks, which means that every two weeks many girls go home and new girls come. This arrangement gives all the girls in the community an opportunity to use the camp. In charge of the large camp are a camp director and camp Counselors. These are special counselors for swimming, handicraft, nature work, dancing, dramatics and so on.

Wakened by a reveille from the camp buglar, the girls open their eyes to the freshness of a sunny day, hop into their clothes and get ready for a good breakfast. Those who feel particularly energetic may want to take a dip in the lake or river first. At breakfast there is enthusiastic talk about what everyone is going to do. It may be the day of a special event—a gipsy trip by covered wagon when the whole camp will journey for two or three days, sleeping on the ground and cooking over campfires, or a canoe trip up the river for girls who are expert swimmers and paddlers, or a big clambake on the beach across the bay.

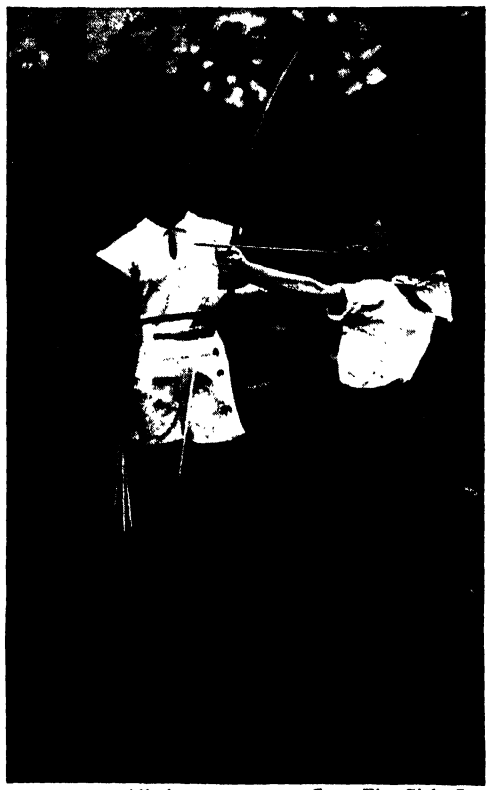
After cabin inspection there is often morning "sing" out under the trees, or around the fire if it is cold. The girls sing and discuss their plans for the day. Sometimes at these assemblies the girls and Counselors give one-minute talks on something that they are interested in. Assembly lasts only five or ten minutes, then the craft classes or gipsy trips, or whatever is the program of the day, begins.

Some girls will go off to attend first-aid or pottery or woodcraft classes. There is great fun in learning to make camp furniture and equipment from the materials found in the woods. Others join in the rowing or paddling classes. Still others may be busy making costumes for a play that some of the girls have written and are going to present the next afternoon. Some girls may start off with the nature Counselor into the woods to find specimens for the camp herbarium. There are always enough things in progress to satisfy the wants of every girl and to keep her busy and interested until time for morning swim. There are always patrols of Red Cross Life Savers, and boats which guard the swimmers.



On the annual summer camping trip, swimming is one of the greatest attractions. Camp Fire Girls have four swimming tests—the Pollywog, the Frog, the Fish and the Flying Fish—to gain Health Craft Honors.

The Camp Fire Girls have four swimming tests which they all try to pass. The first is the Pollywog test whose requirements make the girl at home in the water. The requirements for the Frog test are harder, and include several types of floating and swimming, as well as breaking strangle holds. Girls who pass the third, or Fish test, are real swimmers. They must know how to dive, excel in a certain stroke, assist Pollywogs, and demonstrate resuscitation.



All pictures, courtesy Camp Fire Girls, Inc.
At camp there are always many activities in progress. These girls are busy at target practice.

Flying Fish is the highest rank. When a girl reaches this stage she can be trusted in the boats in rough weather and is given patrol duty. She is an excellent swimmer, knows standard dives, and has passed life-saving requirements. In many instances Camp Fire Girls have put their lifesaving knowledge into real practice rescuing drowning children.

After lunch there is a rest hour when the girls remain quietly on their cots. During the first half hour they may read or write, so long as they do not disturb the others in the tent. Usually they all sleep before the hour is over. Then they get up to pursue new activities on a free schedule that lets each one follow her special hobby. Some may work at handicrafts they want to finish. They may rehearse a play or sew on costumes. Others play games like paddle tennis, volley ball, archery or badminton. Perhaps the camp has planned a treasure hunt; then all the girls turn out to find the buried treasure. If it is a pirate treasure hunt, the girls first array themselves as pirates, and divide in bands to seek the clues that will direct them to the treasure. Such treasure as books, a box of candy, a bag of shiny pennies, are buried.

LEARNING WOOD CRAFT THROUGH GIPSY TRIPS

Perhaps a group of girls will tie their bright middy ties around their heads and start off on a gipsy trip. They may go in the scow or the rowboat or on foot with their packs on their backs until they find a nice place to set up their overnight camp. After supper the gipsies sit about the fire and sing. Someone has brought her ukulele. There may be stories, too, and charades. By nine o'clock all is still, and each gipsy is sinking off to sleep under the stars or snugly wrapped in her poncho.

Back at camp the girls who are left, after an afternoon swim, have been cooking their evening meal over open fires on the beach. They may have made biscuits in a reflector oven and cooked chickens in a hole in the ground. Or they may have made kabobs on a stick over the open fire. After supper there are songs or impromptu dramatics or games around the fire, or a stunt or dress-up party at the hall. At nine o'clock the good-night song or bugle sounds over the water.

THE CAMP FIRE CAMPING STANDARDS

In communities where there is no large camp for the Camp Fire Girls, groups go off camping by themselves, sometimes in a cottage, sometimes in a tent on the shores of a lake. Their Guardian or some older person goes with them. They follow much the same program as is followed in the large camps. They try to keep up the Camp Fire camping standards, by safely putting out fires, cleaning up and seeing that no wild life has been destroyed through carelessness.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 5273.

Little One Eye, Two Eyes and Three Eyes

ADAPTED *by* MARGARET LIMA NORGAARD FROM THE HORACE SCUDDER VERSION OF AN OLD FAIRY TALE

THERE was a woman who had three daughters. The eldest was called Little One Eye because she had only one eye in the middle of her forehead; the second, Little Two Eyes because she had two eyes like other people; and the youngest, Little Three Eyes because she had three eyes, one of them being also in the middle of the forehead.

Because Little Two Eyes looked no different from other people, her sisters could not bear her and they turned her mother against her. They said: "She is like common people. We are different. We are very beautiful." This they said, though they were, in truth, very ugly with their one eye and three eyes. They pushed Little Two Eyes about, made her wear ragged clothes, and gave her for food only scraps left over from their meals.

Every day Little Two Eyes had to go into the fields to watch the goat while it grazed, and she was always hungry because her sisters gave her so little to eat. One day, when she was crying bitterly with hunger, a woman suddenly stood before her who asked: "Little Two Eyes, why do you weep?"

Little Two Eyes answered: "Because I have two eyes like common people, so my sisters can not bear me. They push me from one corner to another, and leave me only scraps from the table to eat. Today they gave me so little that I am faint with hunger."

The wise woman said: "Little Two Eyes, dry your tears; you shall no more be hungry. Only say to your goat:

Little goat, bleat,
Table appear!

and a table of food will stand before you. Eat as much as you like, and when you are satisfied, say:

Little goat, bleat,
Table away!

and it will all disappear." Then the wise woman vanished.

Little Two Eyes thought: "I must try di-



Scarcely had she spoken when a little table appeared.

rectly if it is true what she has said, for I am too hungry to wait." So she said:

Little goat, bleat,
Table appear!

Scarcely had she spoken the words when there stood before her a little table, covered with a white cloth on which was laid a plate, knife and fork, and silver spoon. And there were dishes of delicious foods, smoking hot.

Little Two Eyes ate as she had never eaten before in her life, and when she could eat no more she said, as the wise woman told her:

Little goat, bleat,
Table away!

In an instant the table and all that stood on it disappeared. "That is a delightful way of housekeeping!" thought Little Two Eyes, and was so happy that she played merrily with the goat all afternoon.

In the evening, when she came home with her goat, she found an earthen dish with food left from her sisters' meal, but she did not touch it. On the next day she went out again with her goat and did not eat the few crusts that were given her. After three days of this her sisters noticed it and they said: "Two Eyes leaves her food but she grows plumper every day. She must eat while she is out in the fields."

In order to learn the truth, they decided that Little One Eye should go with Little Two Eyes when she drove the goat to the meadow the next day. So when Little Two Eyes set out again, Little One Eye said: "I will go with you into the field and see that the goat is taken proper care of."

But Little Two Eyes saw what Little One Eye had in mind and drove the goat into long grass, saying: "Come, Little One Eye, we will sit down; I will sing to you."

Little One Eye was tired from the long walk and the hot sun and she curled up in the grass while Two Eyes began to sing:

Are you awake or asleep, One Eye?
Are you awake or asleep?
Are you awake, Little One Eye?
Are you asleep, Little One Eye?

Then Little One Eye fell fast asleep, and Little Two eyes said:

Little goat, bleat,
Table appear!

and she sat herself at her table and ate and drank her fill; then she said:

Little goat, bleat,
Table away!

and instantly everything disappeared.

When evening came, Little Two Eyes awoke Little One Eye and said: "Little One Eye, you fell asleep; if I had not been here the goat would have run all over the world. Come, we will go home."

When they reached home, Little Two Eyes did not eat again, and Little One Eye had to tell her mother and sister that she had fallen asleep and did not see what had happened.

The next day the mother said to Little Three Eyes: "Today you go and see if Little Two Eyes eats in the fields, and if anyone brings her food and drink, for I am certain she must be eating secretly."

So Little Three Eyes went out to the fields with Little Two Eyes, and Two Eyes drove the goat as before into long grass, and said: "We will sit down here, Little Three Eyes, and I will sing to you."

Tired and hot, Little Three Eyes curled up in the long grass, and Little Two Eyes began to sing:

Are you awake or asleep, Three Eyes?
Are you awake or asleep?

But when she came to the second part of her song, instead of singing as she should: "Are you asleep, Little *Three* Eyes? she thoughtlessly sang; "Are you asleep, Little *Two* Eyes?" and went on singing:

Are you awake, Little Three Eyes?
Are you asleep, Little Two Eyes?

So two eyes of Little Three Eyes fell asleep, but the third did not sleep. Little Three Eyes, to be sure, shut it and pretended it was asleep, but she kept peeping through it.

When Little Two Eyes thought that Little Three Eyes was fast asleep, she made her table appear, ate what she wished, and made it disappear again. At evening time she awakened Little Three Eyes, and said: "Have you been asleep, sister? You keep watch well! Come, we will go home."

When they got home, Little Two Eyes again did not eat, and Little Three Eyes said to the mother: "I know why the proud thing does not eat. When she says to the goat:

Little goat, bleat,
Table appear!

there stands a table before her with the best food, much better than we have here. And when she is finished eating she says:

Little goat, bleat,
Table away!

and everything is gone again. I have seen it all. She put two of my eyes to sleep with a

song, but the one on my forehead luckily remained awake."

Then the envious mother cried out, "Shall she be better off than we are?" And she fetched a butcher's knife and killed the little goat.

Little Two Eyes, seeing this, went out and threw herself down on a hillock, weeping bitterly. At once the wise woman stood before her again, and asked: "Little Two Eyes, why do you weep?"

"Because the little goat who laid the table so beautifully has been killed. Now I must suffer hunger and thirst again."

The wise woman said: "Nay, but listen, Little Two Eyes. Beg your sisters to give you the heart of the goat, and bury it in the ground before the house door, and again luck will be yours."

Little Two Eyes went at once to her sisters and said: "Only give me some part of my goat. I do not ask for anything good; give me but the heart."

Then they laughed and said: "You can have that, surely!"

Little Two Eyes took the heart and buried it before the house door, as the wise woman had said.

Next morning, when the sisters awoke, there stood a splendid tree in front of the house, with leaves of silver and fruit of gold. Nothing more beautiful could be seen in the wide world. But they did not know how the tree had come there in the night. Little Two Eyes alone knew that it had grown out of the heart of the goat, for it stood just where she had buried it.

Then the mother said to Little One Eye: "Climb up, my child, and gather us some fruit from the tree."

Little One Eye climbed up, but when she tried to seize a golden apple, the branch sprang out of her hand. This happened every time.

Then the mother said: "Little Three Eyes, do you climb up; you can see better with your three eyes than One Eye can."

Little Three Eyes climbed up, but she could gather no more than her sister; the golden apples sprang back from her grasp. At last the mother climbed up herself, but she, too, could grasp only the empty air; the apples swung back from her and the branches scratched her hands and face.

Then Little Two eyes said: "Let me try!"

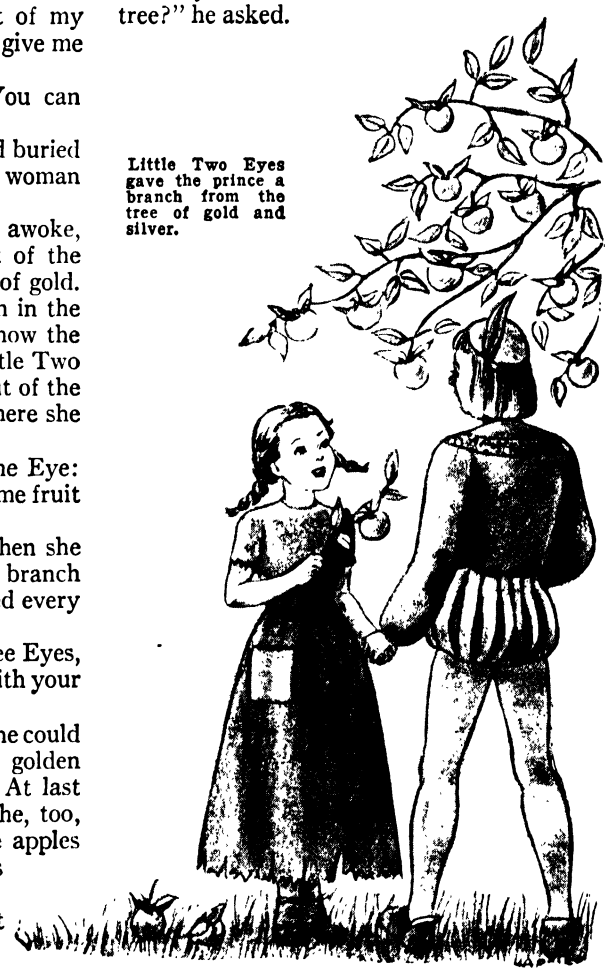
"You!" cried the sisters. "With your two eyes, what can you do?"

But when Little Two Eyes climbed up, the golden apples dropped themselves into her hand, so that she could gather one after the other, and she brought down a whole apron full. Her mother took them from her with an angry look, and her sisters were more envious than ever.

As they stood there, they saw a party of horsemen approaching.

"Quick, Two Eyes," said the sisters, "creep under this cask so that we may not be ashamed of you." And they threw Two Eyes and the apronful of golden apples under a cask just as the horsemen drew nearer. One of them proved to be a handsome prince who drew up his horse, admiring the beautiful tree of gold and silver.

"May I have a branch from this beautiful tree?" he asked.



Little Two Eyes gave the prince a branch from the tree of gold and silver.

Then Little One Eye and Little Three Eyes said that the tree was theirs and they would gladly break off a branch for him. Both of them tried again and again, but the branches and fruit sprang back from them. Then the prince said:

"It is strange that the tree belongs to you, and yet you can not gather anything from it."

As he spoke, Little Two Eyes rolled a few golden apples from under the cask, so that they ran to the feet of the prince. When he looked down and saw them he was astonished and cried:

"You who roll golden apples from under that cask, come out!"

Then Little Two Eyes came out from under the cask, and the prince was amazed at her great beauty. He said: "Can you gather me a branch from the tree?"

"Gladly," said Little Two Eyes, and she climbed up and easily broke off a branch with its silver leaves and golden fruit, and handed it to the prince.

"What shall I give you for it, little maiden?" he asked.

"Oh," answered Little Two Eyes, "I suffer hunger and thirst, sorrow and want; if you would take me with you, I should be so happy!"

Then the prince lifted Little Two Eyes onto his horse and took her home to his father's castle. There the queen gave her beautiful clothes, food and drink, and because she was so beautiful and so good the prince fell in love with her and married her.

Now the two sisters almost died for envy, but they said: "At least, the gold and silver tree is ours!" But the tree disappeared overnight, and all their hopes with it. Then all sorts of misfortunes overcame them until at last they had to go from door to door begging their bread. They came one cold day to the door of Little Two Eyes, who recognized them and was good to them. Then they repented in their hearts for all the evil they had done, and they lived for the rest of their lives in a cottage close by the palace of Little Two Eyes.

Jack the Giant-Killer

AN OLD NURSERY TALE FROM CORNWALL, ENGLAND

IN the days of King Arthur there lived a farmer's son named Jack. Not far away from Jack's home was a cave, and in the cave lived a horrible giant called Cormoran.

Cormoran was three times as big as any other man; his appetite was so enormous that the only way he could get enough food to eat was by stealing all the sheep and oxen he could find. For one meal the giant could eat as much as six oxen and twelve sheep, and Jack's father said that if this went on much longer all the farmers for miles round would be ruined.

This set Jack thinking, and being a brave lad, he determined to find a way to kill the monster.

So one night he set out for the mountain in which the giant had his cave. With a spade Jack dug a deep pit and covered it with sticks and gravel, so that it looked like earth. Then, when all was ready, he blew a loud blast on his cowhorn and waited.

The giant awoke in a terrible rage, and came stamping down the mountain to see who had dared to come so near his cave. Suddenly he caught sight of Jack.

"You young rascal!" he cried in an awful voice. "I'll kill you and eat you for my supper!"

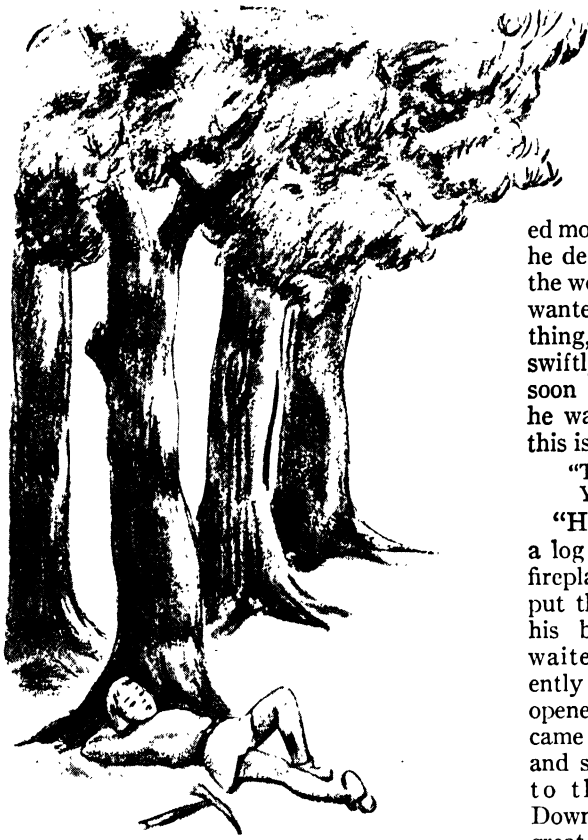
He rushed after Jack, but just before he reached him his foot caught in the pit, and down he came, crash! Up jumped Jack, and in a twinkling he drew out his ax and chopped off Cormoran's head.

Jack ran all the way home, and the farmers were so delighted at being rid of the monster that they presented the hero with a sword, and named him "Jack the Giant-killer."

Jack was so proud of his success that he determined to rid the world of another monster, named Blunderbore, who lived in a castle in the midst of a lovely forest.

Jack set out bravely, but the day was warm, and he had not gone very far when, overcome by the heat, he lay down under a tree and fell asleep. Soon Blunderbore came along, and catching sight of Jack, he picked him up, flung him over his shoulder, and carried him to his castle.

When Jack awoke and found himself in



While Jack was asleep Giant Blunderbore came along.

the giant's castle, he was in terror. Through the window he could hear the cries and groans of the giant's other victims, and his teeth began to chatter.

"This is dreadful," he said to himself. "I must find a way out of this place somehow."

Just at that moment Jack heard voices in the courtyard below, and peeping through the rails of his prison window, he saw Blunderbore and another giant enter the castle. Looking round, he caught sight of a coil of rope which lay in a corner. He made a noose at each end of the rope, and grasping the middle firmly in his hand, he flung an end over each of the two giants' heads. Quick as lightning he swung the rope round a beam by the window, and then, holding on to it with all his might, he pulled it tight until both giants were strangled.

Jack set free all the knights and ladies whom Blunderbore had imprisoned in his castle, and set out again upon new adventures.

The next evening he found himself at the door of a lonely castle in Wales. He knocked, and to his amazement, the door was opened by a tremendous giant with two heads. Jack was startled, but the giant seemed so friendly that when he offered him a bed for the night Jack gladly accepted.

Now, Jack found that this two-headed monster had four valuable treasures, which he determined to possess—a coat that made the wearer invisible, a cap that told him all he wanted to know, a sword that could cut anything, and shoes that could carry him as swiftly as the wind. Jack went to bed, and soon fell asleep. In the middle of the night he was awakened by someone singing; and this is what he heard:

"Though you shall lodge with me this night,
You shall not see the morning light."

"Ho, ho!" cried Jack, looking round for a log of wood which he had noticed by the fireplace. Jack put the log in his bed, and waited. Presently the door opened, and in came the giant and strode up to the bed. Down came his great club — crash! again and again.



"Farewell, my young friend," he bellowed. "You'll make me a fine delicious dinner by and by."

Jack had a good laugh over this, and when the giant had gone he crept back into bed, and was soon fast asleep.

In the morning Jack walked boldly into the room where the giant was breakfasting from a huge basin of batter pudding. The giant was so astonished at seeing Jack alive that he scarcely knew what to say to him.

Jack sat down, and began to eat a good

breakfast. But all the time he ate he was thinking. Suddenly a grand idea came into his mind, and when the giant was not looking he hid as much of the pudding in his jersey as he could possibly get, so that he seemed to eat as much as the giant.

As soon as breakfast was over, Jack said: "*You* can't plunge a knife into your chest without hurting yourself. See *me!*"

Picking up a knife, Jack thrust it into his jersey, and out fell the pudding, piece by piece, upon the floor.

The giant did not like to be outdone by such a little creature as Jack, so he drew out his own knife, and, without more ado, plunged it into his chest—and fell down dead.

Then Jack caught up the cap and the shoes and the coat and the sword, and went on his way.

At the next castle to which he came a great ball was taking place. The knights and ladies, who had all heard of Jack, made him welcome, and he was just beginning to enjoy himself when in rushed a messenger to say that a hideous giant was on his way to the castle.

"Have no fear," cried Jack, fastening on his invisible coat. "Leave all to me."

He put on the shoes which carried him as quickly as the wind, and went out.

Round the castle ran a moat, and when the giant reached the drawbridge that stretched across it he sniffed the air around, and roared in an awful voice:

"Fe, fi, fo, fum,
I smell the blood of an Englishman;
Be he alive, or be he dead,
I'll grind his bones to make my bread."

"You must catch me first," cried Jack; and then throwing off his coat, he led the giant a fine dance round the castle.

Jack ran on swiftly until he came again to the drawbridge. He ran across, but as he reached the other side he bent down, and with one stroke of his magic sword severed the bridge in two just as the giant was halfway across. Down crashed the drawbridge, and into the moat fell the giant; and that was the end of him.

Jack had many other adventures, and when he was tired of them all he went home again and married a beautiful princess whom he loved dearly.

And they lived happily ever after.

THE NEXT STORIES ARE ON PAGE 5193.





Courtesy, Grand Central Art Galleries

This interesting sculptured frieze by R. Tait McKenzie shows runners in a relay race passing the baton.

SCULPTURE IN CANADA

IT can scarcely be realized, so little are we aware of it now, that at various times in the world's history, sculpture was an every-day part of city life. In Greece and Rome the great buildings were ornamented with sculpture, statues lined the principal streets and squares of the cities and, outside their walls, sculptured tombs, monuments and altars stood almost shoulder to shoulder along some of the highways.

In medieval times, too, and later in the Renaissance, sculpture on buildings and also statues formed the accustomed ornament of even a very small city.

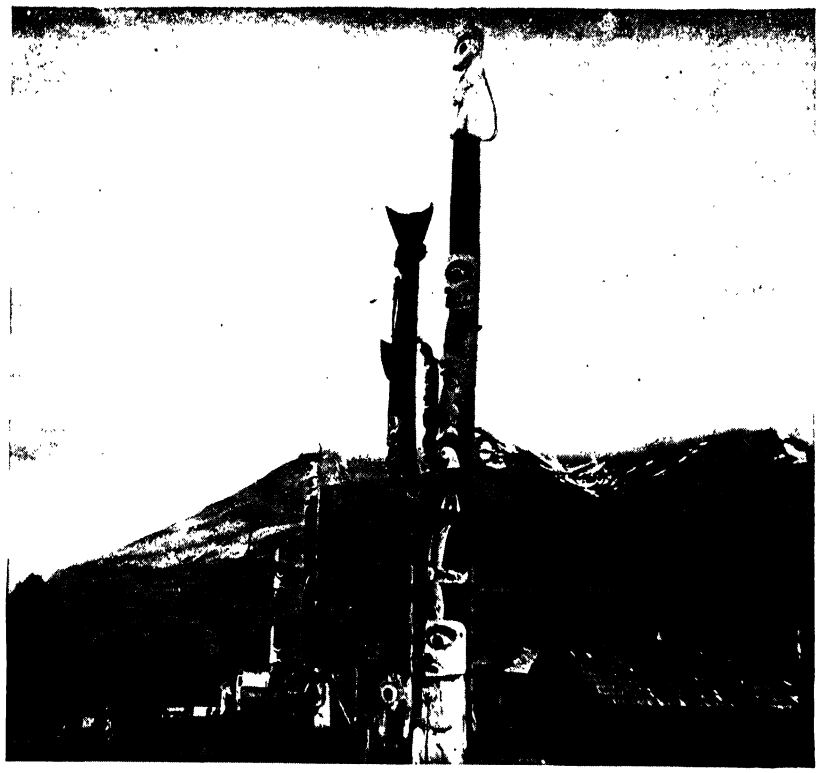
To-day, except for the occasional statue in a public park and for some incidental carving on an important building, sculpture has vanished from the open air. In Canada it has not really vanished for it was never there. The great days of sculpture were long past when Canada began to be settled, and Canadians have never become aware of sculpture as a familiar part of city streets and open places.

But sculpture still has its place, and Canadian sculptors, though few in numbers, have produced some notable achievements. Though the tradition of city sculpture has died out, there are other ways in which it is used—as memorials in churches and other public buildings, as objects of decoration and interest in houses and still, to a small extent, as monuments in the open air.

The Indians on the coast of British Columbia used sculpture to decorate their villages. The illustration shows Kitwango with its great totem poles, carved with infinite patience by means of stone tools from the great trees of the surrounding forest, stained and painted in brilliant colors. Here is sculpture which commands the scene. These stark poles, carved into fantastic shapes, standing in front of the houses are most impressive, even to us who know little of the meaning they had for the Indians who carved them. For the Indian they were both symbols of protection and at the same time records of family history. To them, birds, beasts and fishes were real, perhaps even more real than human beings, and their tribes and families traced their honorable descent from some fabulous beast of long ago. In such legends, beasts have magical properties and when they came to be carved on the totem poles all sorts of transformations took place. Bears stand upon eagles' shoulders, men lose their heads and have faces on their stomachs, you enter a house through the gaping jaws of a monster—all sorts of strange things happen. The carver, knowing them to be strange, made his shapes stranger still in his effort to express the overwhelming power of the forces around him which affected so strongly and so mysteriously his daily life. But if you look carefully at the illustration of the totem pole in Alert Bay you will find that, fantastic as the figure is, there is a sort of weird harmony like strange music—the deep gouge of the eye-sockets balances the horizontal slash of the mouth. There are play and variety of shape and surface up and down the pole.

It is these harmonies and patterns which give to the dead wood its living quality as sculpture. To-day there are no more totem poles being made—new conditions and new ideas have shattered the old intimacy of the Indian both with his environment and his

INDIAN CARVING OF THE NORTH-WEST



These giant totem poles stand in front of the houses at Kitwango, in British Columbia. Note the salmon on the second of the two nearest poles.

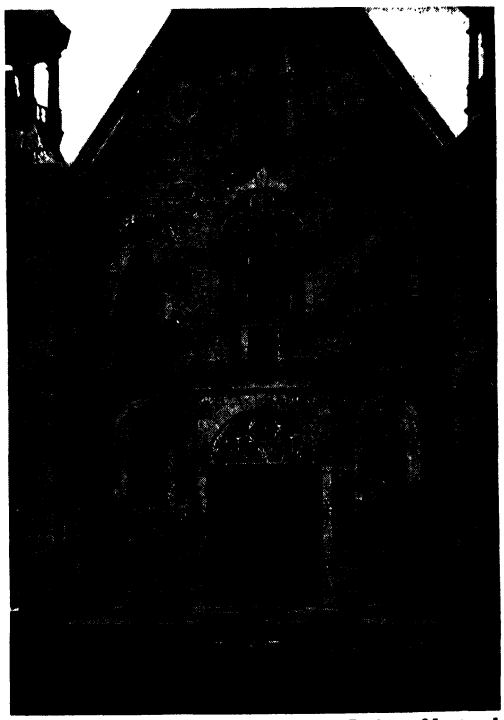
Pictures courtesy, The Art Gallery of Toronto



Totem poles combine the arts of painting and sculpture. Here we see the Thunder Bird Totem pole in the Indian village at Alert Bay, in British Columbia.

traditions — not quite completely perhaps, but sufficiently to break the spell which produced the wood-carvers of the totems. No other Indian tribes in Canada produced any sculpture to compare with this.

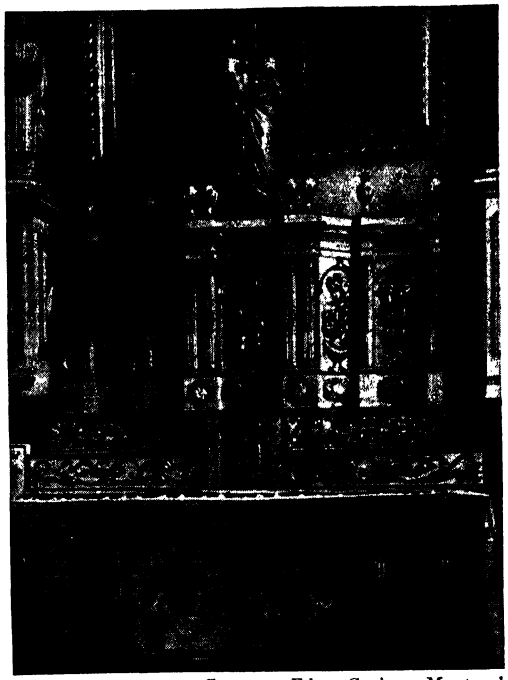
When the French began, after the days of Champlain, to sail in numbers to Canada, they settled chiefly between Quebec and Montreal. There they cleared the forests, set their plows and built their houses. There Laval, the first Bishop of Quebec, directed that new churches should be built. In order to make them as fine as possible, he brought out from France carpenters, masons and wood-carvers who formed a French-Canadian School of Sculpture and Decoration. This school has continued almost to the present day. (A school of art is a group of artists who work in somewhat the same style.)



Courtesy, Edgar Gariepy, Montreal

The Church of the Holy Family (Sainte Famille) on the island of Orleans near Quebec. Note the sculptured figures of saints set in niches in the wall.

These craftsmen who came to Canada brought with them the memory of the old cities of France, which, as we have said, were rich in sculpture. The European sculpture was, remember, as vivid and alive to the people as the totems were to the Indians. This sculpture was everywhere — in their streets, on their buildings and particularly



Courtesy, Edgar Gariepy, Montreal

The exquisitely carved altar of the Blessed Virgin in the Church of the Guardian Angel (L'Ange Gardien) in Quebec is a fine example of the wood-carver's art.

on their churches, both inside and outside.

The new struggling, poverty-stricken colonists could afford no richness like that of Europe but their hands raised churches which stand to this day as evidence of their faith and hope. These churches faced the village main street and on their fronts were placed niches for figures of the patron saint of the village and other saints to whom special reverence was paid. We show you a picture of the front, flanked by two towers, of the Church of Sainte Famille on the Island of Orleans near Quebec; you can see the niches with their statues of saints looking down on either side of the main doorway.

This was as much as the French Canadians could do outside the building to reproduce the richly decorated fronts of the churches of France. But inside, they could and did do far more. Architect and carver, painter and gilder worked together to produce as rich and glorious an effect as possible. Here is a figure of a Madonna and Child carved in the eighteenth century which shows, in its easy attitude and swinging lines, an air not only of reverence but also of friendly intimacy. Though it is nobly inspiring, the figure with the energetic child in its arms is also very human. Hundreds of figures such



Courtesy, The Art Gallery of Toronto

Alfred Laliberté's bronze figure, La Travailleuse Canadienne, shows the dignity and serenity as well as the vigor of the working woman.

as these, though not all so good, still stand in their proper places about the altars and in the niches of the churches of Quebec. We show you one that is in the Church of L'Ange Gardien.

The Quebec wood-carver did not spend all his time carving statues of saints for churches. Quebec at one time had a thriving business in building and the wood-carver turned out many a fine figure-head for the wooden ships that sailed the St. Lawrence.

CANADIAN SCULPTURE CARRIES ON ITS GREAT TRADITION

Canada thus has two national schools of sculpture, the West Coast Indian and the French-Canadian. The West Coast Indian school has now come to an end and the French-Canadian school is no longer so important as it once was. Folk arts and handicrafts can not flourish side by side with factory production and the tourist trade. They are both products of a self-contained and somewhat isolated way of life which is shaken to its foundations when it comes in contact with the modern commercial world.

However, you must not suppose that there are no longer any Canadian sculptors just because the schools of sculpture rooted in the soil of Canada have lost their living quality. The new robust civilization carries in its train individual sculptors, who though they have received but scant general attention, continue with modesty and seriousness to carry on the great tradition.

The new circumstances, however, have shut the sculptor up into a very narrow field. No longer do we ask him to carve our buildings, and no longer is he asked, as Michelangelo was commissioned, to carve mighty tombs for great men. Now the sculptor makes portraits and garden figures; occasionally he produces important monuments for public works, such as Allward's Vimy Ridge Memorial. He is asked occasionally to make decorations for buildings or designs for coins. Generally, however, he follows his own desires, and designs figures and groups for his own satisfaction. These have no relation with any particular place, for he does not know where they are to find a home.

The director of a great museum once said that there are only two kinds of art—flat art, like pictures and drawings, and "bumpy" art. Sculpture is one of the bumpy arts, and for that reason it is difficult to take care of. A painter can put hundreds of his paintings in a cupboard, but sculptures can not be packed away so easily. Sculpture, moreover, is very expensive to make — for stone is heavy to transport and metal is difficult to



Courtesy, The Art Gallery of Toronto

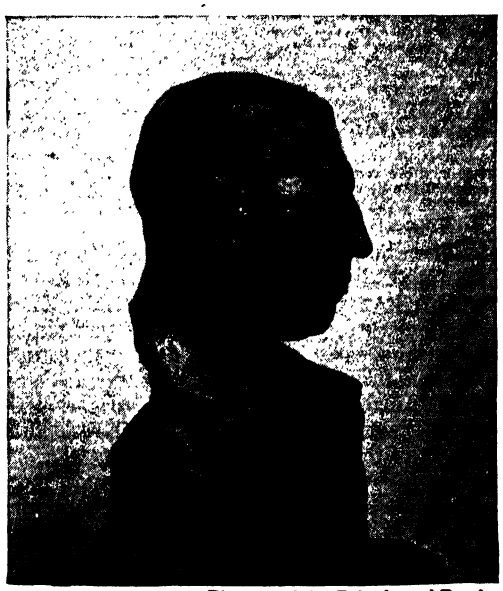
This Madonna and Child is believed to have been carved by Paul Labrosse, about 1750. The artist's affection and reverence for his subject is apparent.

cast. As a result, the volume of individual sculpture in modern times (say, the last seventy-five years) in permanent material, is comparatively small, and many fine things, for that reason, remain in plaster casts only.

QUEBEC HAS PRODUCED MUCH FINE MODERN SCULPTURE

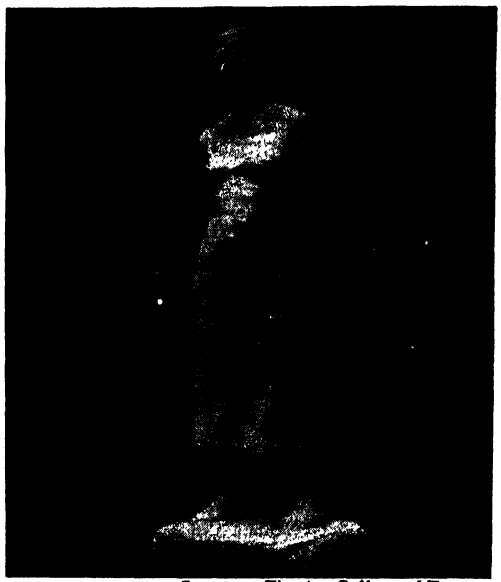
Modern sculpture in Canada had its first development in Quebec and Alfred Laliberté (1878–), Louis Philippe Hébert (1850–1917), Aurèle Suzor Coté (1869–1937), most of whom had gone to Europe to study, returned to find their opportunity in making sculptures of the great figures of Canadian history for monuments in parks and squares of Quebec and Montreal. They also showed their interest in the hardy and cheerful "little people." The figure of the working woman, La Travailleuse, in bronze, by Laliberté shows how sympathetic this interest was. This figure, though small in size, is fairly typical of the Quebec sculptor's work.

Among the first Canadian sculptors of English parentage was Hamilton P. MacCarthy, who came to Canada from England in 1885. He executed (made) monuments to great Canadians in public parks in Montreal and Toronto, besides many portrait heads. Alexander Phimister Proctor (1862–), was born in Ontario and studied in New York and Paris. Though a Canadian he found most of his work in the United States, and his architectural sculpture and monuments can be found in New York, Kansas City, Princeton, Denver and St. Louis. He is best known for his heroic figures and statues of wild animals.



Photograph by Pringle and Booth, Courtesy, Art Gallery of Toronto

Frances Loring's portrait head of Sir Frederick Banting is a fine work. It emphasizes the strength and intellectual force of the great scientist.



Courtesy, The Art Gallery of Toronto

Linda, by Elizabeth Wynn Wood, is an appealing example of the sculptor's interest in portraying the various physical types found among Canadians.

THE PHYSICIAN WHO BECAME A FAMOUS SCULPTOR

Dr. Tait McKenzie (1867–1938) graduated in medicine from McGill University. As a boy he had studied drawing and painting and his natural interest soon led him to take up sculpture, in particular the figures of athletes, first as a relaxation from his professional duties, and later on as his main work. He, too, settled in the United States; and his bronze and stone figures, mostly quite small, are in many museums. His figures are poised for action, and in his few portraits and memorials this poised athletic fitness seems also to be present.

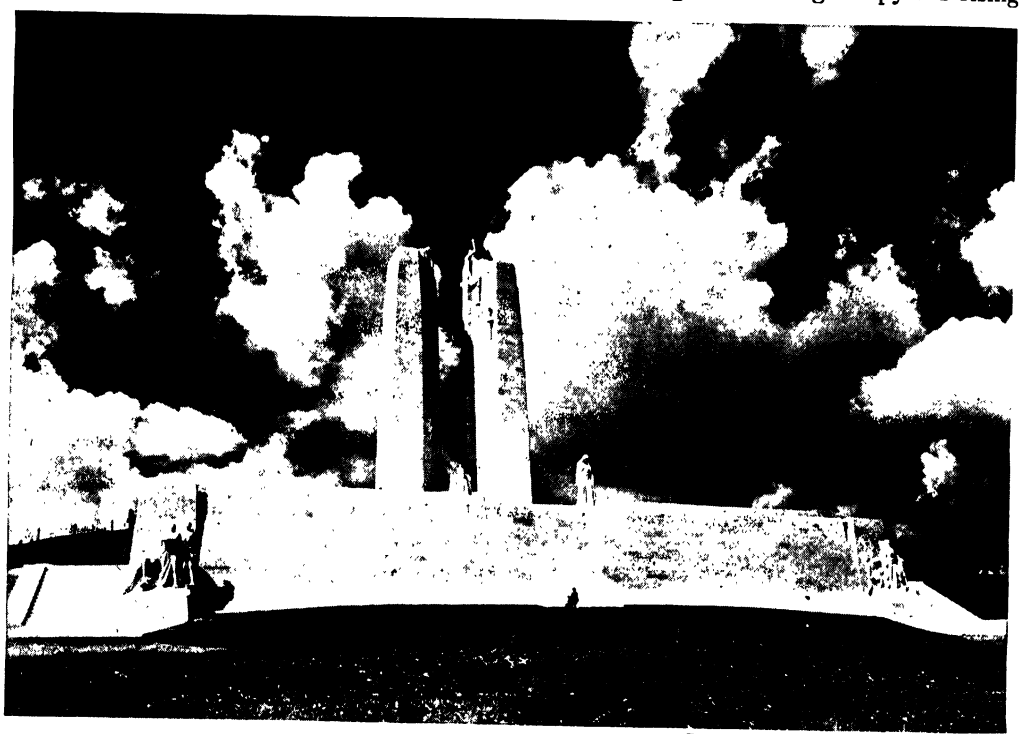
Emanuel Hahn of Toronto is distinguished for his designs of medals and for his Canadian silver coins, his portraits and several war monuments and other monuments.

Elizabeth Wynn Wood (Mrs. Hahn) has done several war memorials and many imaginative portrait studies. Her studies of racial types (such as Linda, here illustrated) are vigorous, simple and sturdy and are perhaps her best contribution to Canadian sculpture.

Florence Wyle and Frances Loring are friends who left their homes in the United States to live and work in Toronto. Portraits, garden figures and decorative panels form the body of their work which, though somewhat similar in approach, is very personal and different.

Walter Allward is perhaps the best known of the Canadian sculptors of our day. He was born in Toronto, and he began to study architecture but soon settled on sculpture as his vocation. His first commission was the memorial for the Riel Rebellion, in Queens Park, Toronto. He has always inclined to the monumental side of sculpture and his memorials, busts and figures of public men are full of character. One of the first of them is his figure of John Graves Simcoe, the first governor of Upper Canada. His South African War Memorial in Toronto and his Alexander Bell Memorial in Brantford are in a different mood. They show how he became more and more deeply interested in symbolism and allegorical figures set against simple architectural forms. (An allegorical sculpture is one in which a figure, or other object, stands for a quality or ideal or idea.)

This distinctive character of Allward's work comes to most brilliant fulfillment in his famous design for the great memorial to the Canadians of World War I at Vimy Ridge, France. It is one of the largest designs of modern days and took fifteen years in the making. The two great pylons rising behind the massive wall with its alternation of single mourning figures and close-knit groups is a very moving conception. Here is sculpture on a heroic scale woven again, as in the early days of Quebec sculpture, into an architectural background. It is in the strongest possible contrast to the little bronze working woman by Laliberté. Far apart as these two works are, they share a quality of beauty which belongs also to most other fine sculptures . . . a composed, tender feeling which is linked at the same time with the sense of balance and of stillness which are so essentially a part of sculpture. Canadian sculpture to-day has a range and a freshness and vigor that is remarkable.



Courtesy, The Art Gallery of Toronto

On the summit of Vimy Ridge, in northern France, Allward's noble memorial was completed in 1936 and dedicated by His Majesty King Edward VIII to the deeds and sacrifices of the half a million Canadians who served overseas in the first World War. It would be difficult to imagine a more majestic and inspiring memorial.

THE NEXT STORY OF FINE ARTS IS ON PAGE 5207.

WERE ALL FLOWERS ONCE WILD?

CERTAINLY all flowers once were wild —and all animals, too. There are certain kinds of flowers and animals which men have developed by choosing the kind of thing they wanted and leaving the rest, and so gradually getting such things as the garden rose, the pouter pigeon, and so on.

These are what we call cultivated varieties, but all of them, even the most curious and newest orchid, or pigeon or breed of dog, have been made from wild or natural forms. Even now, if we are careless, our garden plants will return sometimes more or less completely to their natural state, and so will domestic animals.

Plant breeders can do wonderful things in the way of developing new varieties, and it is now possible for them to secure patents on their new specimens. One of the most interesting patented flowers is the super-double nasturtium, holding flower patent 141. The ordinary single nasturtium has five petals; the ordinary double blossom has ten or twelve. The super-double nasturtium has about fifty petals. Mr. Joseph Simson, president of the W. Atlee Burpee Company which owns the patent, tells you the story.

"Nasturtiums were first found growing wild in South America over three hundred and fifty years ago and seed was taken to Europe. They became favorite garden flowers, and as time passed, many new colors were found, but until 1931, all of the garden nasturtiums had only five petals, just like the wild ones first found in South America. Then some plants were found in Mexico whose flowers had from ten to twelve petals. Seed of this new double nasturtium called Golden Gleam was brought to the United States.

"It became so popular that seedsmen immediately wanted to get doubles in other colors. To get these, David Burpee had over 40,000 crosses made. Golden Gleam was crossed with all the different colored singles known. Mr. Burpee knew that it would take at least two generations to get the colored doubles he wanted, so the work was speeded up by shipping the valuable crossed seed by airplane to parts of the world where the winters were warm. All of the plants in this first generation were single, like their parents. The seed was carefully saved, and planted and the second generation watched carefully. When the plants came into bloom, about one out of every four had double flowers. [We tell you more about the laws of heredity elsewhere. See the Index.]



Courtesy, W. Atlee Burpee Co.
Single, double and super-double nasturtiums

"One evening Mr. Burpee was walking through the greenhouses looking at his new double nasturtiums when all at once he noticed one that was different from all the rest. Instead of having ten or twelve petals, like the other doubles, it had about fifty petals and looked like a begonia. This new super-double nasturtium was watched with the greatest of care, but it would not set any seed because the flowers did not have any pistils.

"New plants could be grown, however, by cutting off pieces of the branches and sticking them in wet sand, where they would take root. Although the super-double nasturtiums did not give any seed, the flowers had some pollen, and this was used to make crosses on ordinary doubles.

"Finally, by making many crosses and taking cuttings, success was achieved."

WHY HAS A FLOWERPOT A HOLE IN THE BOTTOM?

Like human beings, plants must have water to live, but stagnant water is almost as harmful to them as it is to us. If there were no hole at the bottom of the flowerpot, any water that the plant did not drink would not be able to escape. The soil would become stagnant mud in which the plant would soon die.

WHY ARE SOME FLOWERS SWEETER AT NIGHT?

To produce seeds many plants need pollen from the flowers of another plant. This pollen is sometimes carried by the wind and sometimes by insects. Now, insects are attracted to blossoms by their color, their shape, their nectar or their scent. In one way or another all sorts of insects—beetles, earwigs and butterflies—are attracted, and, in their visits to flowers, they carry fertilizing pollen from one to another. Thus, day by day, a partnership is carried on between the plant and the animal worlds. By night also the partnership is carried on; but by night the flowers can not attract insects by color, so they do it by sweet scent.

The flowers that become specially fragrant at night attract certain night-flying moths. The moths light upon the sweet blossoms, collecting pollen from one, rubbing it off upon another, and so fertilizing the flowers. Thus these plants develop seeds. This is but one of the many chapters in the story of plant-animal partnership.

WHY DOES MANURE MAKE A PLANT GROW FASTER?

You know that a plant needs sunlight, air water and certain other foods if it is to prosper. The sunlight and air are provided above the ground. The water and other foods are taken into the plant from the soil. Now, if plants are grown on the same plot of ground year after year, some of the food elements in the soil—especially nitrogen, phosphorus and potassium—are used up. The soil becomes poor, and plants starve. Manure contains water, nitrogen, phosphorus and potassium. Therefore, when manure is added to soil, these food elements sink into the ground and are ready to feed another crop of plants. We say the manure fertilizes, or enriches, the soil.

Farm manure is not the perfect fertilizer. Its proportion of phosphorus is generally too small for the nitrogen it contains; and its proportion of all the needed minerals is small, so that a great deal of manure must be used. Nevertheless, it is a fine help to the farmer and the gardener.

Pale honeysuckle blossoms, which fill the air with the sweetest fragrance of all on warm nights in the spring.
L. W. Brownell





Roman Vishniac

For the gift of nectar deep in the flower, the bee will be dusted with pollen and carry it to another bloom.

WHEN BEES TAKE HONEY FROM FLOWERS DO FLOWERS GET MORE?

It is a mistake to suppose that bees get ready-made honey from flowers. No flowers contain honey as we know it; honey is a substance specially made by the honeybee from materials taken from the flower. The sugary material, or nectar, produced by the flowers serves the flower indirectly. The bee visits the flower to get nectar. Pollen from the blossom brushes off upon the bee's body. The bee goes to another blossom of the same species, for more nectar. Pollen brushes off its body upon the second blossom, and so this blossom is fertilized.

The flower does get more nectar, although it can by no means make a fresh supply at once. The production of this sugary substance, to which the bee helps itself, is a long and difficult chemical process, depending upon sunlight, the drawing-up of water from the soil, and the slow building-up inside the plant of sugar and other complicated chemical materials.

SHOULD WE HAVE PLANTS IN A SICK-ROOM?

We often hear that it is not good to keep flowers and plants in a sick-room, especially overnight. There is some reason for this belief. During the day plants take in the carbon dioxide, which we exhale from our lungs, but at night they can not do this. Plants can absorb carbon dioxide only in sunlight. At night they breathe oxygen just like ourselves. However, the amount of oxygen that plants use is small and is not likely to affect the air supply in a modern, well-ventilated sick-room. A more serious objection is that flowers having a strong scent may cause annoyance to sensitive persons. In general, flowers bring so much joy and cheer to sick people that there seems to be little reason to banish them unless there should be an unusually large number.

WHERE DOES A FLOWER GET ITS SMELL FROM?

The smell of flowers is due to special kinds of essences, or oils, that the plant makes within itself. There is perhaps a kind of family resemblance between most flower scents, especially when they are made by plants that belong to the same family or order. Almost all the plants that make these oils seem to go to work on the same general principles, and the type of them is the oil that we usually call turpentine, made by a special kind of plant.

This oil is really a very complicated compound of two elements—carbon and hydrogen—with sometimes a little oxygen. This class of compounds is often called the *volatile* oils, for volatile simply means "flying." This tells us that they very readily escape into the air and move about in it.

DO SEEDS BREATHE JUST AS PEOPLE DO?

Breathing is the process of taking in (inhaling) oxygen, combining it with other materials, and expelling (exhaling) the unwanted materials formed by the new combination. Seeds are no exception to the rule that every living thing must breathe. Nor are eggs. Perhaps you have never thought that an egg is alive? But if you varnish an egg so that no air can get through the shell, it will die, and no chicken will come out of it. The seed gets its air, or rather, its oxygen from the air, through little pores in its outer coat. You must not plant a seed too deeply, or it will not get enough air and will die.

WHY ARE SOME PLANTS POISONOUS?

When we say a thing is poisonous we mean that it is poisonous to us. Some things that are poisonous to us are poisonous to all living creatures, but most so-called poisonous things are poisonous to some creatures and not to others; indeed they may be very good for the others.

We are only now beginning to learn the meaning and the uses of the various chemical compounds, poisons and others, that we find in plants. Some of them seem to be waste products that the plant is gradually getting rid of. Some poisons aid the plant by warding off insects or animals that would otherwise injure or eat it.

CAN ONE PLANT PRODUCE THOUSANDS OF SEEDS IN A SINGLE SEASON?

Kerner, a German botanist who gave years of study to this subject, gives this list of plants with the average number of seeds produced by each in a single season:

Henbane	10,000	Fleabane	120,000
Radish	12,000	Tobacco	360,000
Shepherd's purse	64,000	Flixweed	730,000

But these are as nothing compared with the number of seeds produced by some of the orchids. One of these, the *Acropera,* has been estimated to produce 74,000,000 seeds in a season. Even that is small compared with the production of ferns, most of which produce spores far in excess of any seed-bearing plants. Some of the ferns produce hundreds of millions of spores. It is not at all uncommon for some species to produce a thousand millions. The fungi are even more prolific, as we can understand when we realize that the cloud of dust from a bursting puffball is made up of millions of tiny spores.

But the bacteria are the most wonderful of all plant forms from the production point of view. A well-known scientist states that under suitable conditions and in a suitable temperature a cell of the *Bacillus subtilis* will take about twenty minutes to divide into two. If this process were repeated continuously, and every cell thus formed did the same, the product of one germ in a single night would amount to more than 130,000,000.

Even with seed-bearing plants the results of production would be amazing should every seed become a plant and every plant yield seed. If a henbane plane developed 10,000 seeds in one year and 10,000 plants grew from these, producing 10,000 seeds each, at the end of five years there would



Standard Oil Co. (N.J.) photo by C. Brooks

In a single season one milkweed plant may bear a number of pods, from which burst hundreds of seeds.

be 10,000 million million plants, which would produce a 100 million million million seeds, and the whole of the dry land on the earth would be occupied with growing henbane plants. Another plant, the flixweed (which is a species of hedge mustard), would, if unchecked for three years, produce enough plants to cover the land surface of the globe many times over. The enemies against which the plants have to contend are many, and the majority of seeds and young plants are destroyed or die before they ripen.



WHY DOES A POTATO NOT ROT UNDER THE EARTH WHILE IT IS GROWING?

If certain kinds of low vegetable life are present in the soil they may attack the living potato and rot it; but usually the potato is protected by two things. One is its skin, which keeps out microbes and other organisms that would otherwise feed on it and rot it. The other thing is the life in the living cells that make the potato, especially those cells that lie on the outside and are the chief part of its food value. So long as they are alive these cells have the power of protecting themselves from such things as microbes or insects. When a potato rots it is because some other organisms have gotten inside and are using it as their food.

Standard Oil Co. (N.J.) photo by Badger

WHY IS SEAWEED USED AS A FERTILIZER?

Seaweed is a sea plant and resembles in its chemical composition the chemical composition of land plants. When it decays and decomposes it breaks up into substances that serve as food for land plants. It is specially rich in potassium salts. At one time a great deal of seaweed was burned in order to obtain these salts from it. Salts of potassium are very valuable food for some plants, such as potatoes. Potash is the familiar name for salts of potassium.

HOW DOES THE SEED MAKE THE COLORS OF A PLANT?

Substances called ferments, which may be described as tiny chemists, are probably produced in the seed, and make compounds impossible to be made in any other way. The right ferment starts the right process going in each part of the plant, and the end of these changes is the production of a green, a blue, a red or a white chemical compound.

This happens because it is the nature of the plant. But without nourishment the nature of no living thing can realize itself; and the food required by the plant when it is developing is much the same as that which it required when it is grown up; that is, water, salts, light and air. Light is necessary because light is power, and every chemist, even the ferment in a plant, requires power to work with. Most plants produce green leaves long before buds. The leaves catch the rays of sunlight and use them to make the colors of the bud and the very substance of the bud itself.

WHY ARE PLANTS WHITE WHEN GROWN IN THE DARK?

In the presence of light, the plant's green substance, known as chlorophyl, enables the plant to form sugar from a combination of carbon dioxide and water. The carbon dioxide is taken from the atmosphere and the water is supplied by the roots. After its manufacture, the sugar is used by the plant to form higher compounds such as starch and cellulose.

Without light, chlorophyl can not work. It is a law of nature that an organ that normally works dies if it stops working. So the green chlorophyl, which can not work in darkness, dies. Celery stems, normally green, are bleached by hoeing up dirt over them as they grow. The gardener in this way kills the chlorophyl in the stems by keeping light away from them.

THE NEXT WONDER QUESTIONS ARE ON PAGE 5191.

Although green celery is just as tender, many people prefer bleached stems. To keep the stalks white, they must grow in darkness. One way to do this is to heap soil over the plants. Another way, as shown in this picture, is to wrap the stems in paper, leaving only the leaves at the top exposed to light.

U.S.D.A. photograph





The poet Petrarch watching the artist, Simon Memmi, paint the portrait of his beloved Laura.

THE RENAISSANCE

IN the later Middle Ages there arose a movement, called the Renaissance, which was to bring about great changes in the civilization of Europe. The word renaissance, which comes from the French language, means rebirth; we give the pronunciation in the Table of Foreign and Unfamiliar names on page 5100. The Renaissance movement received its name because it began with a rebirth, or revival, of interest in the ancient civilizations of Greece and Rome.

It began, in other words, by looking backward into the past. Before long it was looking forward into the future. Thus it served as a sort of bridge between the Middle Ages and modern times.

You must not think that all knowledge about the Greeks and the Romans had been lost during the Middle Ages. On the contrary, some of the ancient teachers were still the great, trusted world teachers more than a thousand years after their time. In philosophy, the favorite guide was still Aristotle, the Greek, whose works had won wide favor in the universities. In science also most students followed Aristotle, or the Roman naturalist Pliny or the Greek-Egyptian Ptolemy.

However, most of the cultural works of the ancient pagan empires had been for centuries disregarded by the people of Europe. The plays and poems, the statues and vases and ornaments, the remains of classical buildings had been despised, along with the old pagan religions. You can see how this might happen. When the Romans forsook Jupiter and Venus and Apollo for God, they spurned also the statues of Jupiter and Venus and Apollo, which once they had actually worshiped. Objects of pagan art and literature were destroyed or thrown away with trash (where they became buried under layers of earth and new buildings put over them); some objects were forgotten for centuries, in old chests or storerooms.

Meanwhile, as the long years passed, a new Christian civilization developed. Some people have called the Early Middle Ages the Dark Ages; they were not completely

dark. Eminent scholars lived and taught in the fields of theology (religion) and law. Some wonderful books were written—grand hero-tales called epics, romances, lyric poems, chronicles and other works. Magnificent churches were built. Commerce flourished. Universities drew students from many lands, from many walks of life. Learning was respected.

During its first thousand years, Christianity was spreading and growing strong in Europe. Religion and religious ideals had an important place in the life of the people. There was a spirit of "otherworldliness" among men. What does this mean? It means that men were taught that the inner life, the life of the spirit, was more important than the life of the body. Fine houses, rich clothing and delicious food were things to enjoy lightly if one could have them, but not things to go after. In fact, thousands of men and women deliberately gave up such worldly pleasures, and spent their lives in poverty and service to the poor, or in fasting and prayer.

You can well imagine, therefore, that the works of art of the pleasure-loving ancients had small chance to be noticed by the folk of the Middle Ages who disciplined their bodies and also their imaginations for the sake of the other world—the world to come.

We have seen that the Greek scientist Aristotle was still studied by the men of the Feudal Ages. However, the Greek language was all but unknown to the men of Europe during this period. People knew very little, too, about Greek literature or philosophy. Aristotle's works were available only in extremely poor Latin translations which in many cases changed the meaning.



Cosimo de' Medici, the great Florentine ruler, portrayed by Benvenuto Cellini. Note the elaborate decoration of the armor.

However, a number of people knew Latin in the Middle Ages and in certain periods the more learned members of the community knew it very well indeed. Furthermore, most educated persons were familiar with various Latin classics, including works by Cicero, Virgil, Horace and Ovid. But medieval scholars generally studied the works of the great writers of ancient Rome as models of pure Latin, or as historical documents.

Most scholars made little effort to study the background of ancient culture—the customs, traditions and beliefs of the people, their works of art and their special skills. This is hard for us nowadays to understand; for we as a people have a keen interest in antiquities of all sorts. In that respect we are children of the Renaissance; because the Renaissance started when a few people here and there began to see beauty in the castoff works of the ancients. These people did not search for the "message" of an epic, or an ode or a historical work. They examined each piece purely as a work of art; and they came to realize that the old classics contained marvelous treasures for them to explore.

The revival of interest in classical antiquity began in Italy. This was natural enough. The Italian peninsula had been the seat of the old Roman Empire. Of all the lands of Europe it stood in closest contact with the vanished glories of Rome. In every nook and corner there were relics of Rome's wonderful past—majestic temples, lofty viaducts, statues, baths, pottery, coins. It became the fashion to "dig for treasure." The study of the ancient writings took on new life amid such surroundings.

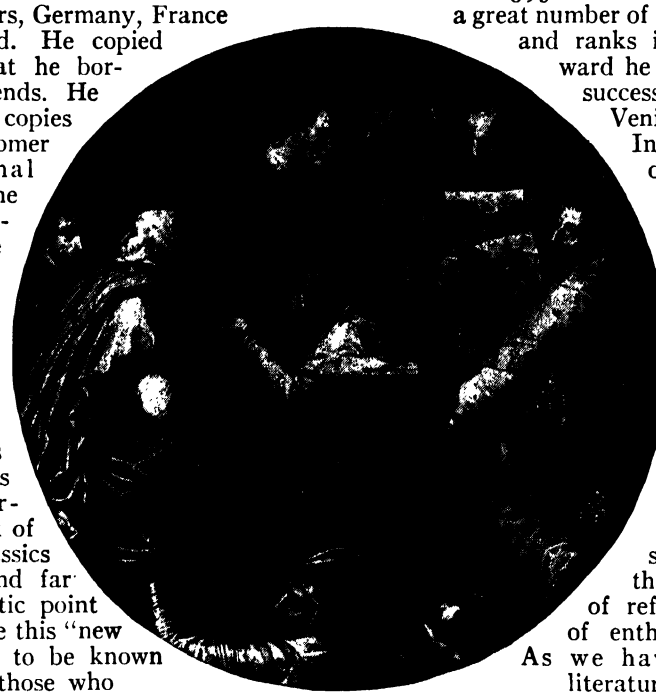
The earliest pioneer of the Renaissance was Francesco Petrarca (1304-74), a native of Florence. Petrarca, or Petrarch, as he is generally called by English-speaking people, was a master of the Italian language. His SONNETS ON THE LIFE AND DEATH OF LAURA, written in Italian, include some of the finest poems in world literature. But his first love, and one that remained with him always, was classical antiquity.

His father provided him with the best instruction in the Latin language and literature that the times afforded. Young Petrarch's classical studies opened up a new and fascinating world to him. In time he advanced far beyond his teachers. He became a master of Latin style and wrote a great number of works in the language of the ancient Romans. He also acquired a

deep knowledge of Latin literature and of the culture of Rome. The ancient world became as real to him as the medieval world into which he had been born.

He labored all his life to add to his collection of classical books. He bought Latin manuscripts in the course of his travels in Italy, Flanders, Germany, France and Switzerland. He copied manuscripts that he borrowed from friends. He even acquired copies of Plato and Homer in the original Greek. It was one of the great sorrows of his life that he never managed to learn the Grecian language.

Petrarch's enthusiasm for the classical authors was contagious. His followers carried on the task of studying the classics from a new and far more sympathetic point of view. In time this "new learning" came to be known as humanism; those who devoted themselves to it became known as humanists. (Both humanism and humanist come from the Latin word *humanitas*, which means education in the liberal arts.



The centerpiece of the elaborate ceiling decorations of the Hall of Cosimo I in the Palazzo Vecchio, Florence, painted by Vasari. It shows the first Cosimo de' Medici being created Duke of Florence.

The humanists spent a good deal of their time searching for the lost writings of the ancients. They made startling discoveries in the libraries of cathedrals and monasteries, in old bookshops and in dusty private libraries. They brought to light many long neglected works by Cicero, Lucretius, Pliny, Statius, Quintilian, Plautus and other masters.

In the latter part of the fourteenth century the study of the Greek language and literature began to attract numbers of humanists. Petrarch's friend, Giovanni Boccaccio (1313-75), was a pioneer in this field. He mastered the Greek language and took delight in reading Homer's ILIAD and ODYSSEY in the original. Other scholars followed in his footsteps.

Learned men from the Byzantine Empire (see Index) made their way to Italy from time to time and gave Greek lessons to the eager humanists. The most famous of these Byzantine scholars was Manuel Chrysoloras (died 1415). He was appointed professor of Greek literature at the University of Florence in 1395. He collected around him a great number of scholars of all ages and ranks in society. Afterward he taught with great success in Milan, Pavia, Venice and Rome.

In 1453 the Turks overthrew the Byzantine Empire by capturing its capital of Constantinople. To avoid falling into the hands of the cruel Turks, many Byzantine scholars fled to the West, bearing with them their precious Greek manuscripts. In Italy they found a place of refuge and crowds of enthusiastic students. As we have seen, Greek literature and philosophy had been almost a sealed book hitherto. It was with the greatest delight that the humanists discovered one masterpiece after another—the great epics of the ILIAD and ODYSSEY; the dialogs of Plato, who was perhaps the noblest thinker of antiquity; the histories of Herodotus, Thucydides and Polybius; the dramas of Aeschylus, Sophocles and Euripides.

As the interest in the works of classical authors grew, whole companies of scribes (copyists) were set to work turning out new copies of the Latin and Greek writers. And yet there were not enough books made to supply the demand. The discovery of printing from movable type, about the middle of the fifteenth century, helped to solve the problem of providing enough books for all who wanted them. We tell you about this discovery in the chapter Men Who Gave Us Printing.

By the second half of the fifteenth century, humanism had definitely won the day

in Italy. Its first home had been in Florence; but it had spread to other Italian cities, including Arezzo, Bologna, Rome, Ferrara, Venice and Naples.

There were many outstanding men among the humanists. There was the amazing Giovanni Pico della Mirandola (1463-94), who offered to debate all comers on any one of 900 different subjects—and found nobody to accept the challenge! There was Marsilio Ficino (1433-99), who tried to reconcile the philosophy of Plato with the Christian religion. There was Leonardo Bruni (1370-1444), who translated the works of Aristotle, Plato, Plutarch and Demosthenes. Two well-known popes—Nicholas V and Pius II—began their careers as humanists. All scholars were influenced by humanism.

There were numberless other scholars who devoted themselves to the study of Latin and Greek, and a few who studied Hebrew and Arabic with equal zeal. Bright young students followed their example. A number of new professorships in the ancient languages and literatures were set up to meet the demand. Great libraries were built to house the literary treasures that had been collected.

Italian princes, nobles, churchmen and merchant princes showered favors on the humanists. Perhaps the most famous patrons of the new learning were the members of the immensely wealthy Medici family of Florence. Cosimo de' Medici (1389-1464), who became the real master of Florence, placed the wealth of his family at the service of the humanists.



Leonardo da Vinci, scholar, artist, engineer. He was so brilliantly accomplished in so many fields that to many people he has come to typify the high tide of the Renaissance.

He provided for the financial needs of poor scholars; he also founded libraries; he set up in Florence an academy devoted to the study of Plato's philosophy. He was also one of the foremost collectors of manuscripts of that age. Because of his far-flung commercial enterprises, he was in constant touch with correspondents in the East and West. All of these correspondents were told to look for classical manuscripts, and to pay whatever price was asked, however high it might be.

Cosimo's grandson, Lorenzo the Magnificent (1449-92), was another renowned patron of humanists. Finally there was Giovanni, the son of Lorenzo, who became Pope Leo X in 1513. His papal court attracted the most distinguished scholars of the day.



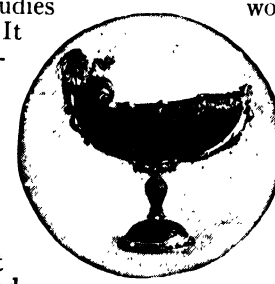
Niccolò Machiavelli had one of the most brilliant minds of his period. He believed that statecraft could be made a science, and wrote a book on the subject.

Now for some scholars the triumph of humanism meant simply a great increase of interest in classical studies and a more exact idea of the civilization of the ancients. Humanists like Leonardo Bruni and Ambrogio Traversari continued to be devout Christians; their classical studies had no influence upon their faith.

Some humanists, however, were more powerfully influenced by the essen-

tial spirit of ancient civilization and in particular by the civilization of the Greeks. They admired the boldness with which the ancient philosophers had discussed the deepest problems of life and death. They were fascinated by the ancient poets who sang of the beauty and goodness of life and who urged men to seek their happiness in this world. They praised the ancient pagan doctrine, "a sound mind in a sound body."

And so from their classical studies they drew a new way of life. It was a way of life in which personal freedom was the highest goal—freedom to express oneself without reserve; freedom to live one's own life to the full. "Away with otherworldliness!" they cried. They wanted men to seek happiness in this world; they did not want life to be a sort of training period for the life to come. And they began to practice what they preached.



At the time when the revival of classical learning was sweeping Italy, there was also a renaissance in the arts—particularly architecture, sculpture and painting. We tell you about the wonderful productions of the fifteenth and sixteenth centuries in Italy in other chapters of THE BOOK OF KNOWLEDGE. (See Renaissance art; Architecture, Renaissance; Sculpture, Italian.)

It is hard to say to what extent the renaissance in the arts was due to the influence of the ancients. The architects and sculptors of the time were influenced in part at least by ancient models. Yet there could be no talk of *direct* classical influence on painters, since the ancients had left almost no paintings.

However that may be, Renaissance art was a wonderful forward step in creative skill. In the earlier part of the Middle Ages the greatest art had been almost entirely religious. Cathedrals and chapels and monasteries had been the highest form of artistic creation. The ornamenting of these masterpieces had been the chief task of sculptors and painters.

Their works were often inspired by deep religious feelings; but these Primitives, as they are called, do not always appeal to modern eyes. There are many reasons for this. One is that the painters and sculptors worked according to certain rules and patterns of their day. Another is that they were largely self-taught. The lessons in art, learned by the ancients over many centuries, had been buried and forgotten, and the world's art had actually been set back. Yet the Primitives do have a hushed beauty of their own.



Upper photo, Metropolitan Museum of Art

Benvenuto Cellini and (above) a cup made in his style, of gold and gems.

Renaissance art is like something from another planet. It is lush, vigorous, full of motion and feeling. Color and light and shadow, nearness and distance, are true to life. Faces and figures are natural. The story of Renaissance art would require, not one chapter, but many books; for in this period which we call the Renaissance there sprang up men of genius such as the world had never known (except, possibly, in the Age of Pericles and probably not even then). These painters and sculptors and builders learned from the ancient masters; they learned from one another; they studied nature and man. They created new effects. They built and decorated cathedrals, churches, government buildings and libraries, city palaces and country villas. Many of them were workmen of prodigious output; and so, in Italy, and later in France, England, Germany and the Low Countries, man's handiwork blossomed forth in great beauty on the face of the land.

As humanism and the arts flourished in Italy, the



When the Renaissance reached Venice it took on added richness and color. Venice, the gateway to the East, had long ago accepted the luxurious ways of the Orient along with the gorgeous fabrics offered by its merchants.

ideals of personal freedom and worldliness and joy in life became widespread in society. It is generally agreed that humanism had an important part in bringing about the triumph of these ideals. In fact some people think that it was almost wholly because of the influence of classical antiquity that medieval ideals were over-thrown.

But there were other factors. The hold of the Roman Catholic Church upon men was weakened because of quarrels within the Church. Feudalism, which had bound men in a straightjacket of custom, had been overthrown. Besides, the geographical discoveries of the age widened men's horizons immensely. They made men more and more conscious of the wonders of the world that lay about them. We discuss these developments in our chapter on The Later Middlle Ages.

So there was a renaissance not only in learning and in the arts but also in the pattern of daily living. The humanists' ideals of freedom and joy in life were followed by many other people. Instead of fixing their thoughts upon happiness in the life to come, men sought to lead full and rich lives upon this earth. Certain choice spirits succeeded wonderfully in reaching this difficult goal.

Leonardo da Vinci (1452-1519) was a shining example. He was a marvelous painter and sculptor, an outstanding engineer and architect, a brilliant student of the natural sciences, an authority in anatomy. And with all these accomplishments, he was a brilliant talker and a great favorite in society. We tell you about the career of this remarkable man in another chapter of THE BOOK OF KNOWLEDGE.

The new joy in life showed itself not only in things of the spirit, but in outward things as well. The wealthy built gorgeous palaces and villas with richly ornamented gates; their gardens were filled with lovely statues and fountains. Men and women dressed themselves in rich costumes. Men wore doublets of brocade with slashed and puffed sleeves to show the fine linen shirt underneath; the surcoat, or outer coat, was of heavy velvet. The loosely flowing locks of women were bound with jeweled nets; gems of exquisite workmanship hung in the hollow of the neck.

The Renaissance ideal of the perfect gentleman was presented in THE COURTIER by Baldassare Castiglione (1478-1529). In the



Gramstorff Bros., Inc., Malden, Mass.

Michelangelo in his studio, pausing with mallet and chisel in hand to survey his latest creation in marble. This is the wonderful statue of Moses holding the tablets of the law.



Pope Julius II is shown the model of a palace that he had commissioned Michelangelo to design for him.

Middle Ages the perfect gentleman had been the true knight, who was required to be a man of action above all things. He was not supposed to busy himself with learning, which was to be left to men of the Church.

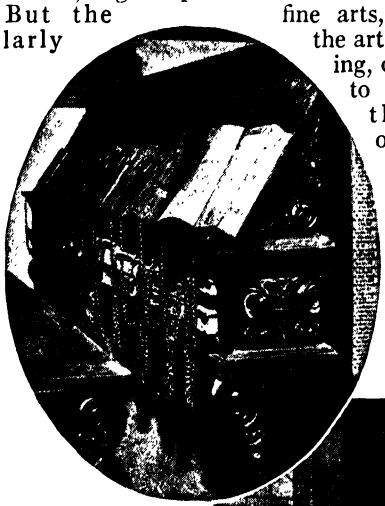
But the Renaissance gentleman, as portrayed by Castiglione, was quite a different sort of person. Like the medieval knight, he was to be accomplished in the use of arms and also in riding, swimming, jumping and running. He also was to be a fine Latin and Greek scholar. He was to be a skilled musician and painter. He was to have exquisite taste in dress. Finally he was to have all the social graces; he was to be able to converse wittily and dance well.

Women, too, were affected by the new spirit of the age. There was increasing equality of the sexes. Many women of that period were as famous for their ability as rulers and diplomats as for their social accomplishments. The humanist Leonardo Bruni set forth his idea of the perfect woman in a famous letter. This ideal creature, according to Bruni, was to be a sort of walking encyclopedia, with an extensive knowledge of the early Church fathers, the ancient writers, music, astronomy and many other things. She was to be able to express herself easily and gracefully. And last, but

by no means least, she was to be a charming hostess.

The spirit of personal freedom was often carried too far. Some of the humanists threw off all restraint in their conduct; so did many others. A number of rulers of the day also carried the notion of individualism to extremes. Personal success came to mean more to them than the ordinary decencies of life. In order to maintain themselves in power they were not at all particular about the methods they used. The idea that a ruler may adopt any means to achieve his purpose was set forth in a famous book—THE PRINCE, by Niccolò Machiavelli (1469-1527), a statesman and political writer of Florence.

The golden age of humanism in Italy came to an end in 1521 with the death of Pope Leo X, a great patron of the new learning. But the fine arts, particularly the art of painting, continued to flourish throughout the sixteenth century in the peninsula. Among the many renowned Italian painters whose works belong wholly or in part to this century were Leonardo da Vinci, Michelangelo (he was also a marvelous sculptor), Raphael, Correggio and Titian.



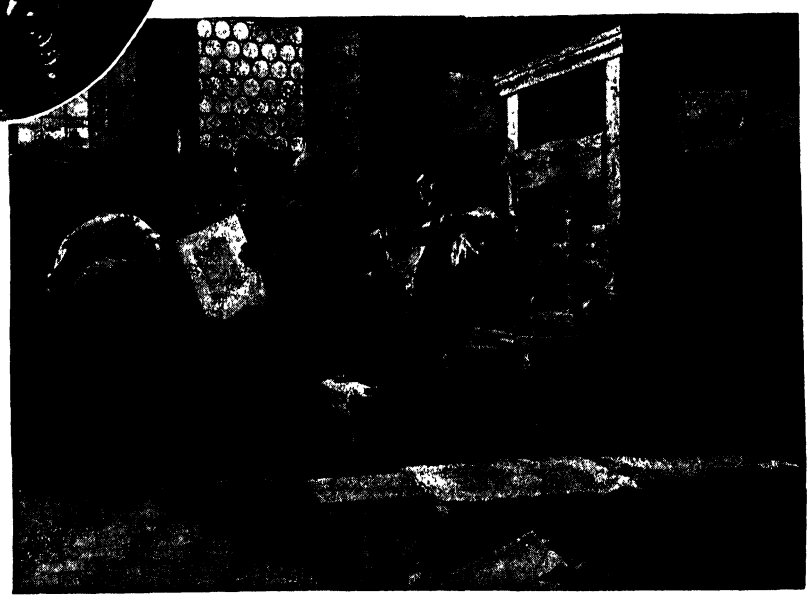
Photos by Alinari and by Anderson of Rome

In the latter part of the fifteenth century the Renaissance began to spread beyond the borders of Italy. As in Italy, the spearhead of the movement was the revival of interest in ancient civilization.

One of the leading spirits in introducing humanism beyond the Alps was the Dutch scholar Desiderius Erasmus (died 1536). He devoted himself to classical studies from his earliest youth and he became a renowned authority in Latin and Greek. He wrote many works on literature, languages and theology, as well as one of the most famous of all satires—THE PRAISE OF FOLLY. His letters, which number many hundreds, give us a vivid picture of the times.

Erasmus was like Petrarch in his ability to inspire men with his own enthusiasm for classical antiquity. Since his travels took him to England and France and other lands, his influence was felt far and wide. In most of these lands, however, the first seeds of humanism had been planted before his day.

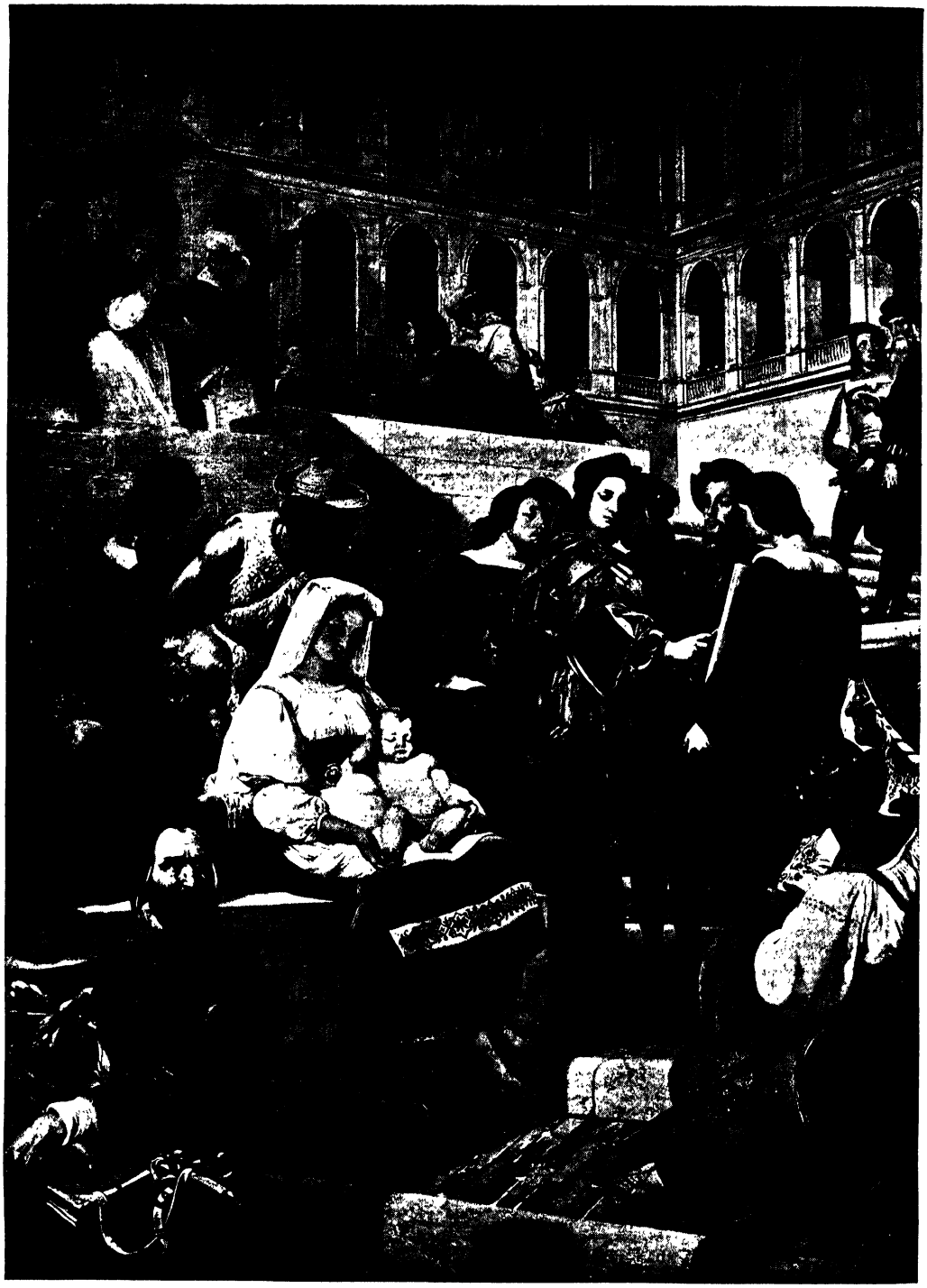
The pioneer humanist in Germany was Roelof Huysmann (1443-85). Since his name meant "farmer" in German, he took the name of Agricola, which is the Latin word for farmer. He spent seven years in Italy, studying Latin and Greek. Then he became a professor in Heidelberg University, where



In the early days of printing books were so valuable that they were sometimes chained to the reading stands for safekeeping, like these Florentine books.

The workshop of Bernardo Cennini, a master goldsmith, who was the first man to set up a printing press and make metal type in Florence. Here we see an assistant operating the press, while the master and another man examine the printed pages from the press.

RAPHAEL AT THE VATICAN



The nineteenth century French painter Vernet has left us this imaginary scene in the life of Raphael. The young artist is painting his Madonna of the Chair in the courtyard of the Vatican palace. Instead of using an easel and a palette, he has an assistant hold the canvas, while a page boy carries his box of colors and brushes.

he taught young Germans in the classical languages and literatures. Another accomplished humanist was Johann Reuchlin (1455-1522). Of him Erasmus said that he was "almost equally skilled in Latin, Greek and Hebrew and in every sort of learning."

Perhaps the greatest of all German humanists was Philip Schwarzerd (1497-1560). Schwarzerd means "black earth" in German. So Schwarzerd changed his name to the Greek equivalent of black earth: that is, Melanchthon. This gifted man taught Greek at the University of Wittenberg; he also gave much time to the study of theology, medicine and the law. One of Melanchthon's fellow-professors at Wittenberg was Martin Luther. When Luther broke away from the Roman Catholic Church, Melanchthon became one of his trusted supporters.



The development of humanism in France goes back to the invasion of Italy by a French army under King Charles VIII in 1494. The invasion was unsuccessful. After capturing Naples, Charles was driven out again and had to flee to France with his shattered army. But the expedition served the purpose of opening the eyes of the French to the wonders of the Renaissance.

Perhaps the earliest humanist in France was the Byzantine John Lascaris, who settled in Paris in 1495 and taught there until 1503. Then a number of native French humanists became prominent. There was Guillaume Budé, or Budaeus (1467-1540), a famous Greek scholar. There was the ill-fated Etienne Dolet (1509-46), who was burned at the stake for heresy. There was Joseph Scaliger (1540-1609), who was an authority in Hebrew and Arabic.

England first came in contact with the Renaissance in the first half of the fifteenth century. Humphrey, Duke of Gloucester, brother of Henry V, was a patron of learning. He invited many young Italian scholars to come to England to make translations for him from the Latin and Greek classics. In the latter half of the century, young Englishmen began going to Italy to study in the universities of that country.

Humanism took firm root in England in the opening years of the sixteenth century. Two friends, Thomas Linacre (1460-1524) and William Grocyn (died 1519), who taught at Oxford University at this time, interested a great number of young men in the classics. Among their students was John Colet, who founded St. Paul's Grammar School—the first English school in which the new learning played a prominent part.

The most important English humanist of the sixteenth century in England was Sir Thomas More. He was a famous statesman; in the course of his political career he was treasurer of the exchequer, speaker of the House of Commons and lord high chancellor. A man of great learning, he was the friend of Erasmus and other famous humanists. He used his influence at court to promote classical studies in England. (See Index, under More, Sir Thomas.)

And so in the sixteenth century humanism flourished not only in Italy but also in Germany, France, England and other European countries. In all of these lands the classics became the corner-stone of education. Young Frenchmen and Scotsmen, and Englishmen and Germans were brought up on a substan-



Upper photo, Metropolitan Museum of Art

Two Renaissance artists, the young Raphael and the aged Titian. Raphael died in his thirties; Titian lived and painted till he was ninety-nine years old.



Photo by Rischgitz

The city-states of Italy, during the Renaissance as before it, were continually warring and swallowing one another. This scene is supposed to be the famous siege of Siena, when even the grandest ladies helped carry rocks to repair breaches in the city walls—apparently not even waiting to change their brocade dresses and jewels.

tial diet of Latin and Greek. They learned a great deal about the mythology, history, literature and philosophy of the ancients. In fact some thoughtful people complained that many a student could tell you all about the bridge that Caesar built over the Rhine, but knew almost nothing about the history of his native land. This complaint continued to be heard almost up to the present.

As in Italy, the classical revival in the other countries of Europe was accompanied by a renaissance in the arts. The lands beyond the Alps were also affected by the new spirit of freedom, the new worldliness, the new eagerness to live life to the full. The fierce energy of the times was reflected in the colonizing activities that went on almost without pause throughout the sixteenth century. The English, Spanish, Dutch, French and Portuguese sent many expeditions to the New World and to other far-off lands. The Spaniards acquired a mighty empire beyond the seas. The sun never set on their possessions in the Americas, in Africa, in Asia and the islands of the sea.

Science now made great strides. In the chapter called Men of Science-II we discuss the great contributions of Leonardo da Vinci, Paracelsus, Vesalius, Gilbert, Copernicus and Bacon, who flourished while the Renaissance movement was in its height.

In the early years of the sixteenth century the spirit of the Renaissance made itself felt in the religious movement that we call the Reformation. Erasmus was one of the forerunners of the Reformation; in fact he "laid the egg that Luther hatched," to quote one of his enemies. In the satire called THE PRAISE OF FOLLY, he attacked certain abuses that had developed within the Church. In another famous work—THE HANDBOOK OF THE CHRISTIAN SOLDIER—he urged men not to accept the teachings of theologists, but to go directly to the Bible and to work out its meaning by themselves.

After having contributed powerfully to the movement of protest against Roman Catholicism, Erasmus withdrew from the ranks of the reformers and remained faithful to the Church. Other humanists, however—

particularly the Germans Melanchthon and Ulrich von Hutten—carried on the fight against the authority of the Church in religious matters. They were very influential in the early days of Protestantism.

As time went on, however, many Protestants abandoned the principles of freedom of conscience. To be sure, they claimed freedom for themselves, but they denied it to others. Such a man was John Calvin (1509-64), a French Protestant, who became the religious leader of Geneva, in Switzerland. He ruled with a hand of iron; he had a Spanish scholar, Michael Servetus, burned at the stake because he did not share Calvin's religious beliefs. Naturally this sort of fierce intolerance represented a break with the Renaissance spirit.

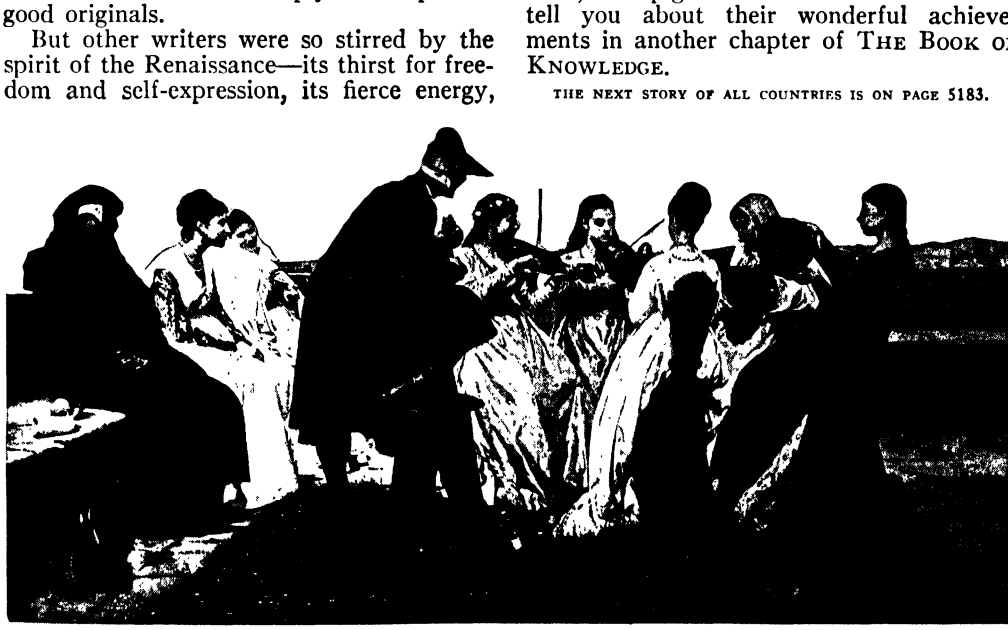
The Renaissance bore marvelous fruit in the field of creative literature. As one might expect, classical antiquity influenced this literature strongly. In fact certain critics—such as the Italian Vida, the Frenchman Du Bellay and the Englishman Sidney—worked out rules for composing literary works based on classical models. The classical influence was particularly strong in Italy and France, but it made itself felt everywhere. Some authors were weighed down by the authority of the ancients, and they became slavish imitators. They produced epics and plays and odes which were simply bad copies of good originals.

But other writers were so stirred by the spirit of the Renaissance—its thirst for freedom and self-expression, its fierce energy, its love of life—that they created original masterpieces. Ariosto, Ronsard, Tasso and Spenser rank among the greatest poets of all time. Rabelais still delights us with the robust humor of his STORY OF GARGANTUA AND PANTAGRUEL. Many people still find inspiration in the thoughtful essays of Francis Bacon and Michel de Montaigne. And finally there is mighty William Shakespeare, whose plays have never been surpassed. You may read about these great men elsewhere in THE BOOK OF KNOWLEDGE; consult the Index.

By the first years of the seventeenth century the full force of the Renaissance had been spent. Its effect, indeed, continued to be felt throughout the century, in what some men call the Post-Renaissance or After-Renaissance period. The classics were still studied industriously; many literary works continued to be based on the works of the ancients. There were great architects and sculptors and painters. Yet in general the literary and artistic works of the century lack the pioneering spirit of the true Renaissance. Something of youth and sparkle and freshness had gone.

This pioneering spirit lives again particularly in the scientists of the seventeenth century—in men like Galileo, Harvey, Torricelli, Descartes, Pascal, Boyle, Leeuwenhoek, Malpighi and Swammerdam. We tell you about their wonderful achievements in another chapter of THE BOOK OF KNOWLEDGE.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 5183.



Gramstorff Bros., Inc., Malden, Mass.

We always think of the people of Italy as being musical by nature, but perhaps it is because they have cultivated the musical arts for so many hundreds of years. Here is a party in Florence passing the time with music.

HOW TO PRONOUNCE THE FOREIGN AND UNFAMILIAR NAMES USED IN THIS ARTICLE

Aeschylus (ess'-kih-luss)
Agricola (ah-grik'-oh-lah)
Ariosto (ah-ree-awss'-toh)
Aristotle (ar'-iss-tot-'l)

Boccaccio, Giovanni (boc-cat'-choh, joh-van'-nee)
Bruni, Leonardo (broo'-nee, lay-oh-nar'-doh)
Budaeus, (boo-dee'-uss)
Budé, Guillaume (boo-day', gee-yohm'; g as in get)
Byzantine (bih-zan'-tin)

Caesar (see'-zer)
Calvin (cal'-vin)
Castiglione, Baldassare (cahss-teel-yoh'-nay, bahl-dass-sah'-ray)
Chrysoloras (kriss-oh-loh'-rass)
Cicero (siss'-eh-roh)
Colet (cawl'-et)
Copernicus (koh-per'-nih-kuss)
Correggio (coh-red'-joh)

Demosthenes (dee-moss'-theh-neez)
Descartes (day-cart')
Dolet, Etienne (doh-lay', ay-tih-en')
Du Bellay (doo bel-lay')

Erasmus, Desiderius (ee-raz'-muss, dess-ih-dee'-rih-uss)
Euripides (yoo-rip'-ih-deez)

Ficino, Marsilio (fee-chee'-noh, mar-see'-lee-oh)

Galen (gay'-len)
Galileo (gah-lee-lay'-o)
Giovanni (joh-van'-nee)
Grocyn (groh'-sin)

Heidelberg (hy'-del-berg)
Herodotus (hee-rod'-oh-tuss)
Homer (hoh'-mer)
Horace (hor'-ass)
Hutten, Ulrich von (hoot'-ten, ool'-rih-h' fohn)
Huysmann, Roelof (hoiss'-man, roh'-eh-loff)

Iliad (il'-ih-ad)

Lascaris (lahss'-kah-riss)
Leeuwenhoek (lay'-van-hook)
Linacre (lin'-ah-ker)
Lucretius (loo-cree'-shih-uss)

Machiavelli, Niccolò (mah-kee-ah-vel'-lee, nee-koh-loh')
Malpighi (mal-pee'-gee; g as in get)
Medici, Cosimo de' (med'-ee-chee, caw'-zee-moh day)
Melanchthon (mee-lank'-thun)
Michelangelo (my-kel-an'-jeh-loh)
Montaigne, Michel de (mon-tain', mee-chel' d')

Odyssey (od'-ih-sih)
Ovid (ov'-id)

Paracelsus (par-ah-sel'-suss)
Pascal (pas-cal')
Petrarca, Francesco (pay-trar'-kah, fran-chayss'-koh)
Petrarch (pee'-trark)
Pico della Mirandola, Giovanni (pee'-koh del'-lah mee-rahn'-doh-lah, joh-van'-nee)
Plato (play'-toh)
Plautus (plaw'-tuss)
Pliny (plin'-ee)
Plutarch (ploo'-tark)
Polybius (poh-lib'-ih-uss)
Ptolemy (tol'-ee-mih)

Quintilian (kwin-til'-ih-an)

Rabelais (rab-leh')
Raphael (raf'-ay-el)
Renaissance (ren'-eh-sawnss)
Reuchlin, Johann (roi'-h'-lin, yoh'-han)
Ronsard (rohn-sar')

Scaliger (scal-ih-jer')
Schwarzerd (schwarts'-erd)
Servetus (ser-vee'-tuss)
Sophocles (sof'-oh-cleez)
Statius (stay'-shih-uss)
Swammerdam (swam'-mer-dam)

Tasso (tass'-soh)
Thucydides (thoo-sid'-ih-deez)
Titian (tish'-an)
Torricelli (tawr-ree-chel'-lee)
Traversari, Ambrogio (trah-ver-sah'-ree, ahm-broh'-joh)

Vesalius (veh-say'-lih-uss)
Vida (vee'-dah)
Vinci, Leonardo da (veen'-chee, lay-oh-nar'-doh dah)
Virgil (ver'-jil)

Wittenberg (vit'-en-berg)



The stately old house in Windsor, Nova Scotia, where Judge Haliburton, the creator of Sam Slick, lived.

CANADA'S POETS *and* PROSE WRITERS

THE first people who lived in Canada were the various tribes of Indians. They, unfortunately, did not develop a literature, so we do not know very much about their history. Most of our knowledge about them comes from the records of early explorers and priests who came to Canada from Europe. The Indians did, however, have songs and chants—though they did not write them down—and some of these songs have been translated into English and printed. From these songs we learn something about the life of the Indians, their hunting exploits, their arts and crafts, their religious beliefs and tribal customs. You will find many beautiful examples of these early Canadian songs in a book by Constance Lindsay Skinner called SONGS OF THE COAST DWELLERS (1930).

If we were to follow a strict time order, we should concern ourselves next with early Canadian literature in French. However, let us reserve the story of French-Canadian literature until a later section of this chapter. Literary activity in English in Canada began in what are now known as the Maritime Provinces, and flourished first especially in and around the city of Halifax.

In 1749 a large number of settlers went to Nova Scotia from England and founded the city of Halifax. In the face of severe hardships their numbers dwindled; but new settlers came during the latter part of the century from the New England states. First came groups of Puritans, bringing with them devotional literature in the form of hymns, sermons and tracts. Of the Canadians who were moved to write devotional literature by this New England influence, the best known is Henry Alline (1748-84), sometimes called the Canadian Whitefield, after that great English evangelist. Alline wrote religious pamphlets, five books of hymns and a journal of his own life.

When the American Revolution began, a flood of colonists who did not wish separation from England left the thirteen colonies and poured into the Maritimes. These people were called United Empire Loyalists. Now, many of the Loyalists were educated men; their last years in the troubled colonies and their flight had stirred their very souls. It is no wonder that some of them turned to literature to express their thoughts and feelings. Many writers sprang up in the territory—men like Jonathan Odell (1737-1818),

Jacob Bailey (1731-1808) and Jonathan Sewell (1766-1839). They wrote mainly political satire, ridiculing the republican sentiments of the land they had fled, and patriotic odes in praise of the Empire of which they were determined to remain a part. Occasionally another, quieter, note crept into their verse: the note of longing for the homes which, for political reasons, they had left behind forever.

CANADIAN LITERATURE BEGINS TO REFLECT CANADIAN LIFE

This literature of the eighteenth century was not of a very high standard; and it can not really be called Canadian. In the early nineteenth century, however, a literature really reflecting life in the Maritimes began to appear. In 1825 Oliver Goldsmith, a nephew of the famous British poet of the same name, published THE RISING VILLAGE. Goldsmith was a native of Nova Scotia, having been born at Annapolis Royal in 1781. In his long poem he describes the natural surroundings of his home, and the hardships, achievements and hopes of the Loyalist settlers. The poem is valuable for the insight it gives us into the lives of the early settlers. It has some beautiful descriptive passages; but it is not original in form or style. It follows closely the general plan of THE DESERTED VILLAGE.

In 1828, Joseph Howe became the owner and editor of a paper called THE NOVA SCOTIAN. Howe, born in Halifax in 1804, was the son of one of the original Loyalist settlers, John Howe, who had become editor of the Halifax GAZETTE. Joseph was destined to play a great part, not only in the literary development of his country, but also in its political development. As editor of the young magazine, he gathered around him a group of writers who became known as The Club. Among their number was the most famous of Canada's early writers, Thomas Chandler Haliburton (1796-1865). Howe's own achievement in literature, though surpassed by that of his friend, should not be overlooked. Howe was an extremely versatile writer. He was a journalist of the first order, an able political commentator, a writer of dignified and polished speeches. He wrote familiar essays in a happy, easy style; and he wrote poetry. He even tried his hand, quite successfully, at stories. His poems deal with natural scenery or patriotic or humorous subjects. He was not a great poet, nor did he pretend to be. His most ambitious poem, ACADIA, is an unfinished descriptive piece written in a manner very similar to Goldsmith's RISING VILLAGE, and it has the same value—as a record of the rigors of pioneer life and of the beauty of the Maritime scenery. His patriotic poems, such as the famous FLAG OF OLD ENGLAND, have verve and vigor and sincerity, but they are somewhat hackneyed in expression. Joseph Howe was at his best as a poet in his humorous verses, such as THE BLUE NOSE and THE SONG OF THE MICMAC, where a quick wit and a sprightly rhythm combine to produce a delightful effect of fun.

Had he done nothing more than sponsor Thomas Chandler Haliburton, Howe would deserve our lasting gratitude. Haliburton was born in Windsor, Nova Scotia, in 1796. His immortal THE CLOCKMAKER; OR THE SAYINGS AND DOINGS OF SAM SLICK OF SLICKVILLE appeared first as a series of sketches in Howe's magazine, THE NOVA SCOTIAN, in 1835-36. Published in book form in 1837, THE CLOCKMAKER took England by storm. Sam Slick became, and has remained, one of the few literary characters, like Falstaff and Mr. Micawber, whom almost every educated person knows and loves. Haliburton was hailed as the Father of American Humor. Certainly he had a great influence upon later American humorists such as Artemus Ward, Josh Billings and Mark Twain. It is also said that he influenced the English novelist, Charles Dickens.

Haliburton wrote many other books after the success of THE CLOCKMAKER, but none of them reached the level of that first inspired effort. Haliburton is important not only for his humor, which is unsurpassed of its kind, but also because he showed the world that literature of distinction could be produced in Canada. Haliburton's works were known and admired not only in Great Britain and the United States, but in most other countries also. They were translated into many languages.

A NEW LITERATURE ARISES IN UPPER CANADA

Meanwhile, a literature was beginning to develop in what was then known as Upper Canada, the modern Ontario. In 1832, three years before Sam Slick made his comic bow to the world, Major John Richardson published a historical novel called WACOUSTA; OR THE PROPHECY. Richardson, born near Niagara Falls in the same year as Haliburton (1796), had fought as a lad of sixteen in the War of 1812. In the war he had come

in contact with the famous Indian brave, Tecumseh. This acquaintance, plus his reading of James Fenimore Cooper's novel of Indian life, THE LAST OF THE MOHICANS, inspired Richardson to pay tribute to Indian bravery. In 1840 he published a sequel to WACOUSTA called THE CANADIAN BROTHERS. Richardson's novels have certain flaws. Some of the scenes are too violent, for instance, but his books are full of excitement and they tell us much about early life upon our continent.

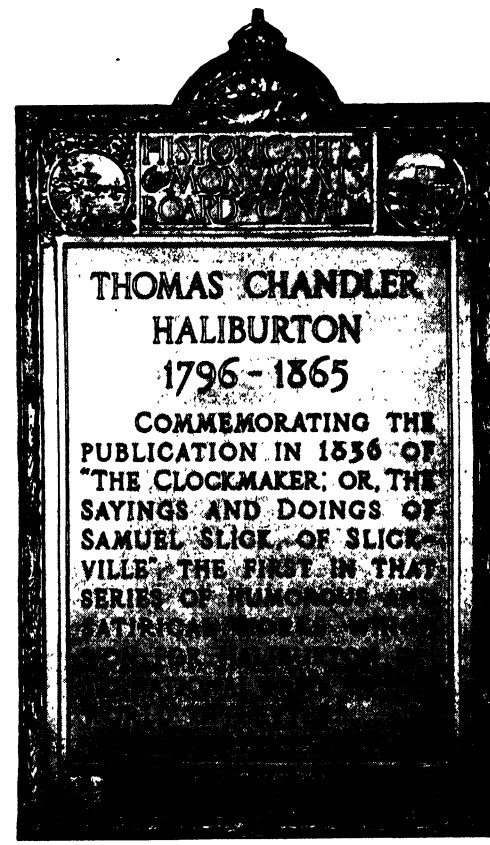
A more accurate and normal, but none the less exciting, account of early life in Ontario was published twenty years after the appearance of Richardson's WACOUSTA. This was Mrs. Susanna Moody's ROUGHING IT IN THE BUSH. Mrs. Moody (1803-85) had come to Ontario from England, and her lively account of how it felt to be plunged into primitive pioneering conditions makes fascinating reading.

ONTARIO'S FIRST IMPORTANT POET WAS CHARLES SANGSTER

The first poet of any importance to appear in Ontario, and the one who is usually considered to be the finest Canadian poet prior to the Confederation, was Charles Sangster. His first volume of poems, THE ST. LAWRENCE AND THE SAGUENAY AND OTHER POEMS, appeared in 1856. Sangster was born at the Navy Yard, Kingston, in 1822. He had a hard struggle as a child and youth, for his father died when he was very young. By the age of fifteen he was earning his own living, making cartridges at Fort Henry. After a long period at jobs which held little interest for him, he found an occupation more to his taste in newspaper work. He published another volume of poetry, HESPERUS, AND OTHER POEMS AND LYRICS, in 1860.

With these two volumes Sangster's reputation was established. He was acknowledged as the leading Canadian poet of his time. In recognition of his stature he was given a post in the Civil Service at Ottawa shortly after the establishment of the Dominion. He was also asked to write official poetry—for example, a poem to commemorate the erection of a monument to General Brock at Queenston Heights. He died in Ottawa in 1893.

Sangster wrote descriptive and reflective nature poems, love poems and patriotic odes. The poems of the last group reveal a genuine national spirit in Canada prior to Confederation. The Brock poem speaks of Canada having "one voice," and being "one people, one in heart." Yet these patriotic odes are a bit stiff and awkward. Sangster is at his poetical best when he is simplest, writing about the scenery of Muskoka or the Thousand Islands, or about the joys of rural life. His lines are at times extremely musical, tripping along with light-footed gaiety. His verse lacks, however, deep or strong emotion; and



The bronze tablet at Windsor in honor of Sam Slick, delightful product of Haliburton's imagination.

it is rather uneven; a fine lyrical passage is often followed by a rather awkward and prosaic one. Although Sangster's poetry clearly owes much to English romantic poets, like Byron and Scott, it is perhaps closest to the simpler lyrics of Longfellow.

To complete our survey of English-Canadian literature prior to Confederation, we must mention certain writers of Quebec (then Lower Canada). As early as 1769 an English lady, Mrs. Frances Brooke, wife of a chaplain stationed in Quebec, had written a novel which contained some pictures of Canadian

scenery and society. This was THE HISTORY OF EMILY MONTAGUE, the first novel which we know to have been written in Canada. As Mrs. Brooke did not long remain in the country, however, it is perhaps hardly proper to include that one novel in Canadian literature.

HISTORICAL NOVELS OF LIFE IN OLD QUEBEC

It was almost eighty years before there was another novelist of any importance in Lower Canada. In 1848, IDA BERESFORD was published, a novel by a sixteen-year-old girl, Rosanna Mullins (who become Mrs. Leprohon). She lived from 1832 to 1879. Rosanna Mullins wrote several other books, among them THE MANOR HOUSE OF DE VILLERAI and ANTOINETTE DE MIRECOURT. Her novels were of the type we call historical romances; that is, they are stories of life in bygone days. Rosanna Mullins wrote of Canadian life as it was before and immediately after the capture of Quebec by Wolfe. Because she treated the French régime in a sympathetic way, her novels were as popular among the French as among the British—a feat of which she might well be proud, for it does not happen in Canada nearly often enough.

There was only one poet of any importance writing in English in Lower Canada prior to Confederation; he was Charles Heavysege. Heavysege's work has never been very widely known and appreciated in Canada, though from time to time efforts have been made by critics to bring his writings to public attention. He was very highly praised by American and English critics in his own day; such men as Emerson and Longfellow, Hawthorne and Patmore made very flattering references to him. Heavysege was born in England in 1816, and came to Montreal in 1853. He had published one volume of verse just before coming to Canada, but his first important work was the long verse-drama, SAUL, published in 1857. As its title suggests, this drama has a Biblical theme; but its handling reveals Heavysege's wide reading in Shakespeare. It was called, indeed, the greatest dramatic poem since Shakespeare's time; and though few today would think it worthy of that praise, it certainly shows grandeur of imagination, a real feeling for character and a power of sonorous verse. Heavysege wrote another play, COUNT FILIPPO (1860), a long blank-verse narrative; JEPHTHA'S DAUGHTER (1865); and a number of sonnets. It is not hard to see why he has not been very popular. His work is rather heavy and cumbersome, his vision somewhat somber. But he had real power and deserves to be remembered.

In 1867 came Confederation; British North America ceased to be a mere group of colonies and became the Canadian nation.

The first new poet to make his bow to the young Dominion was Charles Mair, whose DREAMLAND AND OTHER POEMS appeared in 1868. Mair was born in Lanark, Ontario, in 1838, and attended Perth Grammar School and Queen's University. The year his poems were published he became a member of the federal civil service, and in 1869 was appointed paymaster of the first expedition sent to the North-West Territories (as the present Prairie Provinces were then called) by the Canadian Government. The object of the expedition was to open up an immigration route to the West by way of the Lake of the Woods. Mair was asked to write descriptive letters to eastern newspapers which might induce settlers to try their fortunes in the new territory.

While he was on this expedition, the first Riel Rebellion broke out; Mair and the bride whom he had just married in Winnipeg were taken prisoner. He managed to escape, but not without the loss of a number of poems in manuscript. He remained in the West until 1883, engaged in the fur trade. Then he returned to Ontario, and made his home at Windsor where, in the next two years, he wrote his most ambitious poem, the drama TECUMSEH. During the second Riel Rebellion, Mair served as quartermaster in the Governor-General's Body Guard. For most of the remainder of his life he was an officer in the Immigration Service. He retired in 1921 and died at a ripe old age in 1927.

POETRY THAT CAUGHT THE SPIRIT OF THE PRAIRIES

Mair's best poetry reflects his experiences in the Canadian West. Although his style sounds old-fashioned today, and although the phrases he uses are often heavy and awkward, over and over again he manages to catch the spirit of the prairie landscape, its immense distances, its solitude, its silence. He also has an eye for detail, and paints the flowers and grasses of the prairie with careful exactitude.

Ten years after Confederation, in 1877, appeared another valuable novel, THE GOLDEN DOG, by William Kirby (1817-1906). Kirby was born in England, but came to Canada in

his early teens. Most of his life was spent at Niagara. His novel, like those of Richardson and Mrs. Leprohon, is a historical romance and has its setting in old Quebec. It is in many ways a very good novel, full of color and story. However, its great success was in some sense a detriment to the development of good fiction in Canada. Other writers wanted to write historical novels too; and their eyes were turned to the past, away from the life of their own time and place.

The year 1880 is a very important one in Canadian literary history, for in that year there was published the first volume of poems by a young man who was to wield a great influence. The young man was Charles G. D. Roberts, freshly graduated from the University of New Brunswick; and the volume was called ORION AND OTHER POEMS. This volume was read in Toronto by a student at Trinity College, Archibald Lampman, and he in turn was inspired to write. In 1888 came Lampman's AMONG THE MILLET. Five years later, in 1893, two more major Canadian poets made their bow, a slightly younger cousin of Roberts, Bliss Carman, published his first volume, LOW TIDE ON GRAND PRÉ; and a friend and colleague of Lampman's, Duncan Campbell Scott, published THE MAGIC HOUSE. A real poetic era was under way in Canada!



Photo from Ewing Galloway

The famous gilded plaque on the house of the Bourgeois Philibert in Quebec, from which William Kirby took the title of his historic novel, THE GOLDEN DOG. It had a political meaning in the struggle between the progressive merchants and the royal favorites who controlled the trade of New France. Kirby translated the lines as follows:

"I am a dog that gnaws his bone,
I couch and gnaw it all alone—
A time will come, which is not yet,
When I'll bite him by whom I'm bit."

These four were the leaders, but not the only poets of merit in these fruitful years. In 1884, Isabella Valancy Crawford had published her first volume; in 1887, George F. Cameron published LYRICS ON FREEDOM, LOVE, AND DEATH; in the following year Frederick George Scott published THE SOUL'S QUEST AND OTHER POEMS, and Wilfred Campbell, SNOWFLAKES AND SUNBEAMS; in 1895, the part-Indian poet, Pauline Johnson, published THE WHITE WAMPUM; and in 1897 came W. H. Drummond's delightfully humorous poems of French-Canadian life, THE HABITANT. No

wonder these closing years of the nineteenth century are often referred to as the Golden Age of Canadian poetry!

Charles G. D. Roberts was born near Fredericton, New Brunswick, in 1860. He came of United Empire Loyalist stock and was the son of an Anglican clergyman. At Fredericton Collegiate School and at the University of New Brunswick he received an excellent classical education. After graduation he taught school for a while, edited a periodical in Toronto, THE WEEK (which published the early poems of most of the writers named in the previous paragraph), and in 1885 he became a professor at King's College, Windsor, Nova Scotia. In 1896 he gave up his professorship and went to New York to earn his living by writing.

Meanwhile, he had published two more books of poems: IN DIVERS TOMES (1886), and a series of sonnets, SONGS OF THE COMMON DAY (1893). In New York he wrote animal tales, poems, adventure stories and historical romances. He enlisted at the outbreak of the first World War in 1914 and rose to the rank of major. He remained in England until 1925, when he returned to Canada and made his home in Toronto. Long honored as the dean of Canadian letters, he died in 1944.

A LEADING FIGURE OF CANADA'S GOLDEN AGE OF POETRY

Roberts' stature as a poet has not yet been decided. Some profess to regard him as one of the great poets of the English-speaking world; others, while recognizing his creative influence in Canadian literature, feel that his own work does not justify the extravagant claims that have been made for it. Certainly he wrote some of the finest poems in Canadian literature. His famous ode CANADA is probably the best of Canada's patriotic poems. The grand story in verse, THE ICEBERG, is real poetry; and he wrote some lovely nature lyrics, such as THE MOWING, TANTRAMAR REVISITED and IN AN OLD BARN. At his best, Roberts is capable of extremely musical verse and accurate and sympathetic descriptions of nature. He could call up the atmosphere of homely scenes and activities. His poetry is sensuously rich; that is, it is full of the colors and scents and feel of things, especially of nature. In this, of course, he follows the English poets from whom he learned most: Keats and Tennyson. When he deals with ideas, or with love, his poetry is not so sure of touching a response.

Always closely associated with Roberts is Bliss Carman, his cousin, another New Brunswick poet, born at Fredericton in 1861. Like Roberts, Carman attended the Fredericton Collegiate School and later the University of New Brunswick, graduating in 1881. After advanced study at the universities of Edinburgh and Harvard, and some teaching, Carman worked on several American magazines. He spent most of his life in the United States, dying at New Canaan, Connecticut, in 1929.

BLISS CARMAN WROTE OF THE BEAUTIES OF NATURE

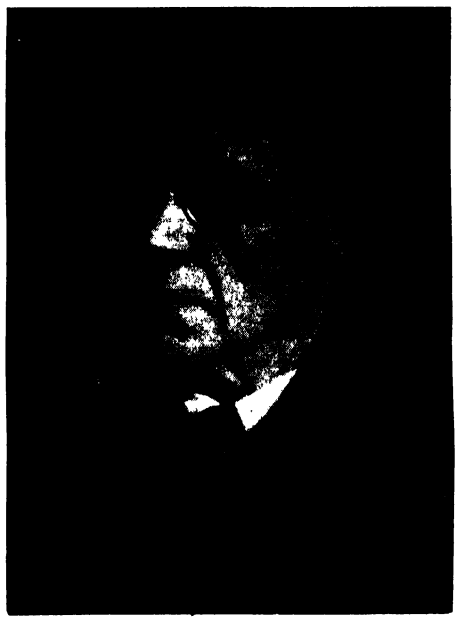
Carman, along with Roberts and Lampman, is another candidate for the title of Canada's greatest poet. Of the three, Carman has enjoyed the greatest reputation abroad; and poems by him are almost always included in American and English anthologies as well as in Canadian collections. Half a century ago he was looked upon as one of the major poets of the continent, and all the best American magazines of the time were eager to print his work. This was perhaps his undoing, for the fact is that Carman wrote too much, and many of his later volumes and single poems are inferior to the early work.

He probably never surpassed the early stanzas of the title poem of his first volume, LOW TIDE ON GRAND PRÉ. These stanzas paint vivid pictures of nature's beauty, but they do more than that; they create, by their slow, melancholy music and their carefully chosen words, a mood of mystery and sadness, a charged atmosphere of hopeless longing. At its best, his poetry always possesses this magic, this lonely, troubled music. Sometimes the effects of eeriness and trembling disquietude which he achieves remind us of Edgar Allan Poe; but he reminds us of that American poet also in one of his chief defects—his lack of real variety, his tendency to be obsessed by one kind of music and one kind of theme. There is a certain vagueness about nearly all of Carman's poetry; his landscapes are never drawn in clear, firm lines, as are those of Roberts, but are seen through a haze; and that haziness is true also of his ideas and his emotions. The result is that when haziness is in order, as in a poem like LOW TIDE ON GRAND PRÉ, he is successful; but when it is not in order, as in some of his more philosophical pieces, his work is weak.

Archibald Lampman never enjoyed the fame which came to Roberts and Carman;

outside of Canada, Lampman's name is scarcely known; and yet the tendency of recent criticism in Canada has been to regard him as a greater poet than either of the other two.

Archibald Lampman was born in the same year as Carman, 1861, at Morpeth, Ontario. He was educated at Trinity College School, Port Hope, and at Trinity College, Toronto, graduating in 1882. Like Roberts and Carman, he taught school for a while, but gave it up to enter the Dominion civil service. In 1897, when he was still a young man in his middle thirties, his health began to fail, and in 1899 he died.



Charles G. D. Roberts, a versatile man of letters.



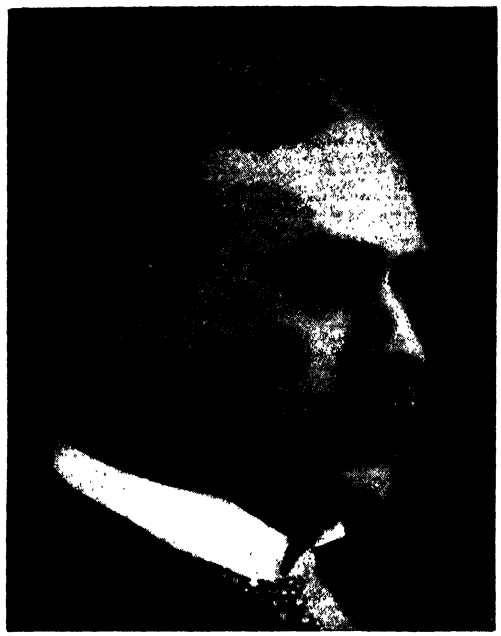
Bliss Carman, a poet of international fame.

We have already told how Lampman, while a student, read Roberts' ORION. He was thrilled to discover that such work could be done by a Canadian, and by a young man like himself. It gave him confidence to try his own poetic wings. The results were two fine volumes of verse: AMONG THE MILLET (1888) and LYRICS OF EARTH (1893). His collected poems were published, together with a memoir by his friend Duncan Campbell Scott, in 1900. In 1943, some hitherto unpublished manuscripts were printed in a volume called AT THE LONG SAULT AND OTHER POEMS.

Lampman's verse, like that of the other Canadian poets of his generation, is chiefly nature poetry. Like the others, also, he was influenced by the romantic poets of England, especially by Keats and Wordsworth. Of course this is not to his discredit—every poet must learn from those who have gone before—and as time went on Lampman developed his own personal manner and approach. His descriptions of landscape are astonishingly precise in detail.

If Lampman is a better poet than either Carman or Roberts—and that is a point far from settled—it is because he manages, in his best moments, to unite the finest qualities of each of them. Thus, in a poem like HEAT, probably Lampman's finest, we have the mood-music at which Carman is a master and the clear, lovely description at which Roberts excels. The music of his poetry, though it has not the sweep and vigor of Roberts at his best, nor quite the haunting cadence of Carman, has greater subtlety than either. There is little of philosophy in Lampman's poetry but there are some rather bitter comments upon Canadian political and social life. His greatest gift, however, and his most memorable contribution, is his power of word-painting. In Lampman's power to see, and to make his readers see with him, he is surpassed only by his master, Keats.

Duncan Campbell Scott, Lampman's close friend and editor, was born in 1862, in Ottawa. After graduating from Stanstead College, he became, like Lampman, a civil



Dr. William Henry Drummond.

servant, and eventually became head of the Department of Indian Affairs. His interest in, and knowledge of, the Indians, is frequently reflected in his poetry. His first volume, THE MAGIC HOUSE, was published in 1893, and it was followed by seven other volumes, of which the most recent is THE GREEN CLOISTER (1936). He has also published two volumes of stories in prose: IN THE VILLAGE OF VIGER and THE WITCHING OF ELSPIE.

Though Duncan Scott's poetry clearly belongs to the same general group as that of the three poets we have just discussed, it has always stood somewhat apart. For one thing, Scott has never been in the public eye as they were. For a long time the value of his work was not properly recognized. But the difference is not a mere matter of reputation; there is a different tone in Scott's poetry. The other three wrote mainly of the warm, bright glow of Canada's landscape, and the fields and barns of the countryside; Scott pictured the rigor and cruel power of the land in its wilder and fiercer areas. His poetry is more rugged than theirs—except in early poems like THE PIPER OF ARLL, where he weaves his poetry out of the stuff of dreams.

Scott is at his best in his narratives of Indian life. In these poems primitive passions play as on a stage set in the wilderness. There is danger of melodrama in handling such themes; but at his best Scott writes with restraint. He treats the Indians as intelligent and sensitive human beings, not as savages, noble or otherwise.

Of Isabella Valancy Crawford (1850-87) it has been said that she was the only Canadian woman poet of real importance in the last century. She had a very difficult life, having to support her mother and an invalid sister; and she died in the conviction that her poetry would be ignored. Her single volume, OLD SPOOKSES' PASS, MALCOLM'S KATIE, AND OTHER POEMS, sold only fifty copies. Her poetry is extremely energetic and vigorous; it gives us important pictures of rural Ontario life; it reveals a power of fantastic imagination.

George Frederick Cameron (1854-85) was born in Nova Scotia, went to Boston with his family as a boy, but returned to Canada in 1882 and became editor of the Kingston NEWS. He was a man of wide knowledge, and his poetry shows a mind and spirit tuned to the great world of cities and men. His poetry tends to be rather rhetorical, as if the writer were making a prepared speech to his readers rather than talking to them in a natural tone. Actually Cameron was a man of strong feeling, passionate in his love of liberty and justice, with a deep reverence for women, and a sharp sense of death. This passion gives a strength and energy to his best lines which makes them memorable.

FREDERICK SCOTT AND WILFRID CAMPBELL, POETS WHO WERE ALSO CLERGYMEN

Frederick George Scott was born in 1861 in Montreal. He was educated at Bishop's College, Lennoxville, and at King's College, London, and entered the Anglican clergy. He rose to be an archdeacon in the Church; during the first World War he was widely known and loved as a chaplain with the Canadian Expeditionary Force. Unlike most Canadian poets, especially of the nineteenth century, Frederick George Scott did not write much about nature; he chose his subjects rather in the realm of contemplation, of ideas. His best poems are characterized by a quiet dignity of expression, a loftiness of tone and theme, and a serenity of mood. His death in 1943 was widely mourned.

Wilfred Campbell was born in the same year as Scott, 1861. His birthplace was Berlin (now Kitchener), Ontario, and he was educated at the universities of Toronto and Harvard. Like Scott also, he entered the Anglican priesthood. However, after six years



Photo by Karsh

Duncan Campbell Scott.

in rural parishes in New England and New Brunswick he gave up the ministry to become a civil servant at Ottawa and to devote himself to writing. In Ottawa he became friendly with Lampman and D. C. Scott, and for a while joined them in writing a column of literary gossip and criticism in the old Toronto GLOBE. Campbell is another poet whose development did not measure up to his early promise. His earliest poems, describing the scenery of the Great Lakes, are far superior to the more ambitious efforts of his later years. He died in 1919.

Pauline Johnson was, and to an extent remains, a romantic and glamourous figure in poetical history. Born in 1862, the daughter of an Indian chief and of an English mother, she had the advantage of an unusual origin with which to appeal to the imagination of the public. Dressed in Indian costume, she would read her poetry to large audiences all over the English-speaking world. The fact is, however, that her poetry does not justify the place she held in public esteem. With the exception of a few brief lyrics such as the famous SONG MY PADDLE SINGS, her poems are awkward in expression and weak in emotion and thought. Enjoy her lyrics by all means, but do not make the mistake of thinking that they are great poetry.

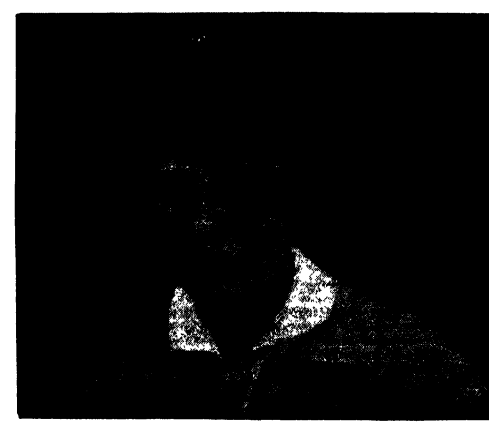
W. H. Drummond (1854-1907) was an Irish-born doctor who came to Canada as a boy, put himself through college and medical school (Bishop's and McGill universities) and practiced medicine in the province of Quebec. As a country doctor, he came to know and love the French-Canadian folk, and in his poems wrote of them with sympathetic humor. His poems, written in dialect, are a delightful blend of comedy and pathos. Probably his best-known single poem is THE WRECK OF THE JULIE PLANTE. Simple, sincere, unpretentious, his verses are apt to be remembered far longer than many more solemn efforts. Good humor has staying power.

This completes our survey of English-Canadian literature up to the year 1900.

CANADIAN LITERATURE IN THE TWENTIETH CENTURY

The period between 1900 and the end of the first great war was not a very fruitful one in Canadian literature compared to the period which preceded it. Most of the outstanding poets of the Golden Age were still writing—Roberts, Carman and Duncan Scott, for example—but, in general, their new work did not equal their old. No new writers were appearing who could compare with the masters of the Golden Age. In poetry, this period produced the work of Robert W. Service, Tom MacInnes, Marjorie Pickthall and one great war poem by John Macrae. In the novel, it was the "best-seller age" of Canadian fiction, with Sir Gilbert Parker, Ralph Connor and L. M. Montgomery selling their books by the thousands. But none of these writers was the equal of men like Roberts and Lampman.

Robert W. Service made his first appearance in 1907 with SONGS OF A SOURDOUGH. He published five other volumes in the years that followed, and his complete poems came out in 1941. Born in Lancashire, England, in 1876, and educated at the University of Glasgow, Service came to Canada as a young man and spent much of his time in the Yukon. This Yukon experience provided the material for his most famous poems: THE CREMATION OF SAM MAGEE and THE SHOOT-



Marjorie L. C. Pickthall.

ING OF DAN MCGREW. Service is the Canadian equivalent of English poets like Kipling and Henley who wanted to make poetry rugged and masculine. Service's rollicking yarns are good fun, and every young man (and woman) should read them, but they have no depth and should certainly not be mistaken for true poetry.

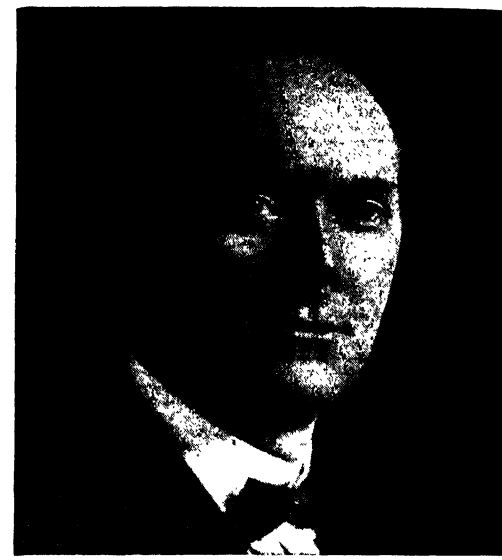
Tom MacInnes (1867-), though Canadian by birth and training, is a poet of very similar stamp, writing many robust and lively narrative poems. His first volume, LONESOME BAR, appeared in 1909, and his best-known volume, RHYMES OF A ROUNDER, came out in 1913. A lawyer of distinction who has served his country on many important commissions, MacInnes has a penetrating and original mind. Some of his poems, by their unconventional style and subject, are very refreshing.

Marjorie Pickthall (1883-1922) was a poet of a very different order. Where Service and MacInnes were influenced by the rugged metres of Kipling and Henley, she was influenced by the soft music and musings of the English Pre-Raphaelite poets (the Rossettis and William Morris) and by the dreamy twilight atmosphere of the Celtic Revival. Thus her poetry is quiet, gentle, melodious, full of beauty and tenderness. She has an eye for nature's beauty, a sincere religious feeling and an intuitive understanding of certain types of people. She is a good minor romantic poet.

IN FLANDERS FIELD, A POEM THAT WILL LIVE FOR EVER

John McCrae (1872-1918) was a distinguished doctor who served overseas with the medical corps in the first great war, dying of pneumonia. He is remembered because of one poem above all—IN FLANDERS FIELD. This is a poem which lives and will live because it caught up the thought and feeling of multitudes of men and gave them brief, pointed, simple but full expression.

Of the novelists who in the years before 1918 made their reputations, it is not necessary to say much in this limited survey. Sir Gilbert Parker (1859-1932), in novels such as WHEN VALMOND CAME TO PONTIAC and SEATS OF THE MIGHTY, continued the tradition of historical romances in Canadian fiction. He had undoubted talent and knew how to grip his reader's interest, but there is little depth to his work. Ralph Connor (1860-1937), whose real name was the Reverend C. W. Gordon, wrote BLACK ROCK, THE PROSPECTOR and THE SKY PILOT and



E. J. Pratt, one of Canada's greatest living poets.

other adventurous tales, partly to entertain and partly to instruct his readers. They make good reading but, like Parker's, they can scarcely be regarded as great literature. Ralph Connor himself, who was an intellectual leader in Canada of great distinction, knew the true worth of his books. Lucy Maud Montgomery (1874-1942) wrote novels which are suited for young people in their early teens. She created the famous Anne of Green Gables, a character likely to live much longer than the people in books far more pretentious.

Stephen Leacock (1869-1944) wrote neither poetry nor novels, but humorous sketches. Leacock made his first appearance in 1910 with LITERARY LAPSES, and until his death in 1944, continued to turn out volumes of engaging humor. An Englishman by birth, Leacock came to Canada as a boy, and spent most of his life in Montreal as professor of political science in McGill University. His best books, such as SUNSHINE SKETCHES OF A SMALL TOWN, provide not only irresistible humor but a real insight into the happier and gayer side of Canadian life. His books are read with equal enjoyment in Canada, the United States, England and France, and will be read in all likelihood for centuries to come.

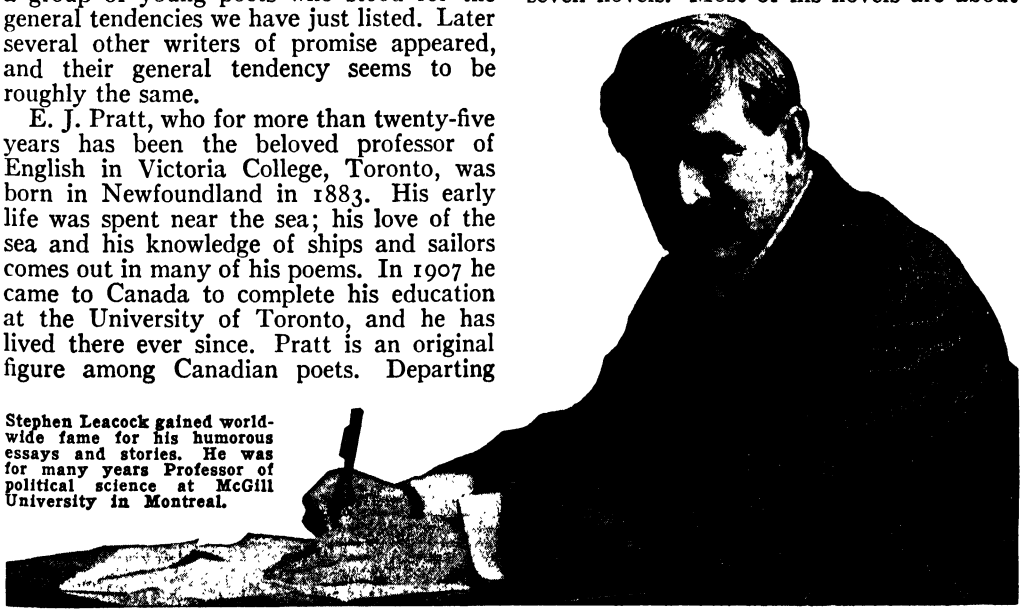
By 1920 it was clear not only in Canada but all over the English-speaking world that the war of 1914-18 had changed the course of literature. The tradition of romantic nature poetry, such as that written in Can-

ada by Lampman, Carman, Roberts and Scott, had been thoroughly worked out. A new start was needed. The great war had changed men's attitude toward the world. Men became suspicious of mere emotion and anxious to solve the world's problems by reason. Many thought that literature should play a part in building a better world. Poets and writers generally began to feel guilty about talking all the time about the beauty of nature when ugly things like war and hunger and slums still existed. The new literature, therefore, was quite different from the old. It was more intellectual and less emotional, more concerned with people and less with nature, more interested in waking people up to the problems and the evils about them and less interested in lulling them into a mood of peace by gentle, flowing music.

It was in the year 1923 that the first signs of the new movement became evident in Canada. In that year E. J. Pratt published his first volume of poems, A Book of Newfoundland Verse; Frederick Philip Grove published his first book, a group of essays called Over Prairie Trails; Mazo de la Roche published her first novel, Possession; and Merrill Dennison published a volume of four plays under the title The Unheroic North. In 1928 the new movement acquired further strength by the publication of Morley Callaghan's first novel, Strange Fugitive. In 1936 the anthology New Provinces brought to public attention a group of young poets who stood for the general tendencies we have just listed. Later several other writers of promise appeared, and their general tendency seems to be roughly the same.

E. J. Pratt, who for more than twenty-five years has been the beloved professor of English in Victoria College, Toronto, was born in Newfoundland in 1883. His early life was spent near the sea; his love of the sea and his knowledge of ships and sailors comes out in many of his poems. In 1907 he came to Canada to complete his education at the University of Toronto, and he has lived there ever since. Pratt is an original figure among Canadian poets. Departing from the Roberts-Carman-Lampman tradition of nature lyrics, he has achieved his greatest successes in long narrative poems. Of these, the best are: The Cachalot, the story of a gigantic whale; The Titanic, the story of the collision of that famous ship with an iceberg; The Roosevelt and the Antinoë, the account of a thrilling and heroic rescue at sea; and Brébeuf and His Brethren, the heroic story of the early Jesuit missionaries to Canada. Much of Pratt's verse is humorous. There is ruggedness and power in his music; and, when he wishes, he can handle ideas in poetry without becoming either pompous or dull. Pratt manages in an unusual degree to combine strength and subtlety, simplicity and depth. He is surely the greatest Canadian poet of this century.

Frederick Philip Grove was born in 1871 in Sweden. He spent his youth in various parts of Europe, and came to Canada when he was twenty-one. He had intended to return to Europe, but the death of his father in distressed circumstances compelled him to remain on this continent and set to work to earn a living. After various odd jobs, he settled down for twenty years to the life of a hobo in the West of Canada and the United States. In 1912 he became a school teacher in Manitoba, remaining there until 1928, when he settled in Ontario. Since 1931 he has lived on his farm near Simcoe. Grove has published three volumes of essays and seven novels. Most of his novels are about



Stephen Leacock gained world-wide fame for his humorous essays and stories. He was for many years Professor of political science at McGill University in Montreal.



Courtesy, The Macmillan Company
Frederick Philip Grove.

pioneer life in the West. The best of them are OUR DAILY BREAD, A SEARCH FOR AMERICA and FRUITS OF THE EARTH. His novels have weaknesses of style and form, but they are important because they grapple seriously with the problems of ordinary Canadian life. He is a very accurate observer both of man and nature.

Grove, Mazo de la Roche and Morley Callaghan are usually considered to be the three leading Canadian novelists of this period. Miss de la Roche (1885-) attained her greatest popular success in 1927 with the publication of JALNA, which won an important prize in the United States. So successful was this novel that its author has seemed reluctant to leave its characters behind; and most of her work since has consisted of additions to the Jalna series. Miss de la Roche has a genuine talent for writing but the Jalna books do not give a very accurate record of Canadian life today. The Whiteoaks, the family about whom the books are written, are more like English country squires than Ontario farmers.

Morley Callaghan (1903-) is much more successful at capturing the truth about Canadian life in his novels, though he perhaps makes it a little more American than it really is. Callaghan, a Toronto boy, spent some time in Paris as a young man and there came to know various young American writers—above all, Ernest Hemingway. In his novels, of which the best probably are STRANGE FUGITIVE and SUCH IS MY BELOVED, Callaghan reveals the influence of Hemingway and of French writers of the late nineteenth century such as Flaubert. His novels are about life in big cities, usually as it is experienced by the poor, the weak, the downtrodden. His strongest qualities are a supple and flexible style, a rich compassion and an imaginative understanding of ordinary, worried, harassed people.

It might be well to round out the story of the Canadian novel in this period. In addition to the three novelists mentioned, the following novelists, and some of the novels they have written, are worthy of mention: Raymond Knister (WHITE NARCISSUS, MY STAR PREDOMINANT); Laura Goodman Salverson (THE VIKING HEART, THE WEAVERS); Frederick Niven (THE FLYING YEARS); F. D. McDowell (THE CHAMPLAIN ROAD); Irene Baird (WASTE HERITAGE); T. H. Raddall (HIS MAJESTY'S YANKEES); Grace Campbell (THORN-APPLE TREE); Arthur Stringer (THE PRAIRIE WIFE, THE PRAIRIE MOTHER, THE PRAIRIE CHILD); H. G. Sallans (LITTLE MAN); Bruce Hutchison (THE HOLLOW MEN).



Courtesy, The Macmillan Company
Mazo de la Roche, author of the Jalna novels.



Frederick Niven, author of THE TRANSPLANTED, does not spend all of his time at his desk. Here he is with a friend enjoying the life of farm and field.

Of the younger novelists, the most promising are Sinclair Ross (AS FOR ME AND MY HOUSE), Hugh Maclennan (BAROMETER RISING, TWO SOLITUDES), Gwethalyn Graham (SWISS SONATA, EARTH AND HIGH HEAVEN), and Philip Child (GOD'S SPARROWS, DAY OF WRATH).

It must be admitted that Canadian novels have not matched Canadian poetry. The novelists, with the exception of Grove and Callaghan, have seldom examined society with serious critical eyes; they have been afraid of ideas; and they have been slow to experiment with new forms. The drama also has lagged behind. The last quarter century has been the golden age of drama in the United States, but Canada has only the early plays of Dennison and the plays of Gwen Pharis (STILL STANDS THE HOUSE; DARK HARVEST; THE COURTING OF MARIE JENVRIN) of which to be even modestly proud. The lack of really large cities (drama flourishes in cities of the size of New York, London and Paris), the scantiness of population, and the lack of fine theaters have combined to cut down the dramatic production. There has, however, been a promising development in the field of radio drama, where these obstacles do not count. Perhaps that is the field where Canada's dramatic contribution will lie.

Let us now turn to recent poetry, where the most exciting developments have taken place.

In the 1920's, Pratt was almost alone as a Canadian poet who was trying to do new things in a distinctive manner. Wilson Macdonald (1880-), a very versatile artist, showed early promise, but though he revealed a gift for melody he has not developed into a poet of great stature. Louise Morey Bowman (1882-), especially in DREAM TAPESTRIES (1924), revealed a genuine if limited talent. Perhaps the best of the new arrivals in the twenties was Leo Cox (1898-), who has continued to write with accuracy and grace of the scenery and life of Quebec.

In the thirties Pratt was joined by young poets whose work had a vitality similar to his own, though with a different style and different aims. In 1936 an anthology, NEW PROVINCES, was published, containing the work of Pratt himself, Leo Kennedy, Robert Finch, A. M. Klein, A. J. M. Smith and F. R. Scott. These poets each had a distinctive mode of utterance, but they possessed a number of qualities and interests in common—a desire to try out new forms of



Arthur Stringer.



Courtesy, The Ryerson Press
Dorothy Livesay.

verse; a determination to make poetry out of the stuff of the everyday world; an interest in ideas as well as in feeling; a desire to bring Canadian poetry close to the new poetry movements in other lands.

A. M. Klein and A. J. M. Smith have, as the years have passed, established themselves as the leaders of the group. Smith has written poems distinguished by compact form and intense thought and feeling. He has acted as spokesman for the new group in various magazines. He published THE BOOK OF CANADIAN POETRY (1943) which is the first Canadian anthology to do justice to the work of Canada's poets, from the earliest to the most recent.

A. M. Klein, in his HATH NOT A JEW . . . (1940), took up the long, long saga of Jewry. In THE HITLERIAD (1944), he wrote one of the finest satires upon the crimes of fascism.

Leo Kennedy's best work deals with love and death. To these classic subjects he brings a fresh approach. He has read deeply in seventeenth-century verse. He is a follower of T. S. Eliot. Kennedy's work shows interest in modern social problems.

Robert Finch, who is also a painter, writes sparely and simply, with an eye for detail and pattern. F. R. Scott, whose first volume, OVERTURE, appeared in 1945, is at his best when he is ridiculing the injustices, the greeds, the smug pomposities which mar our society.

Not all the new poets of promise made their appearance in NEW PROVINCES. In 1930, with very little stir, there appeared a slender volume, LACONICS, by W. W. E. Ross. Clear, simple, unpretentious, but astonishingly fresh, Ross's poetry, though small in quantity, is genuinely original and valuable.

In 1931 Audrey Alexandra Brown began her career with a volume called A DRYAD IN NANAIMO. Miss Brown is much more traditional in thought and style than the poets we have been discussing. She makes us think of such romantic writers as Marjorie Pickthall. At her best Audrey Alexandra Brown is capable of real beauty of expression, depth of feeling and accuracy of observation.

In 1932 Dorothy Livesay's SIGN POST appeared. The poems in this volume were delicate personal lyrics, but as the years passed Miss Livesay became more interested in social reform, and her best poems combine a passion for equality, justice and freedom with intensity of feeling and subtlety of expression. In 1939, THE WIND OUR ENEMY appeared, by another fine new poet, Anne Marriott.

After Smith and Klein, the most interesting of the younger poets are Ralph Gustafson and Earle Birney. Gustafson began his poetic career in 1935 with the publication of THE GOLDEN CHALICE. His best



Courtesy, The Macmillan Company
Audrey Alexandra Brown.



Courtesy, Macmillan | Photo by Nakash | Courtesy, Macmillan

Among the later twentieth century writers of exceptional merit are (left to right) Franklin Davey McDowell, Grace Campbell and Morley Callaghan. The different viewpoints and styles of these three make an interesting contrast.

work is in FLIGHT INTO DARKNESS (1944). Gustafson's poetry is rather difficult to understand, for it is the product of a complex nature. Responsive to the beauty of the world, and aware of the basic nobility of man, Gustafson is also alive to the ugliness and evil in us and around us. He tries in his verse to do justice to both sides.

Earle Birney's DAVID appeared in 1942. The title poem, DAVID, is a narrative poem about mountain climbing which almost everyone could enjoy. Like most of the poets we have been discussing, Birney's work is experimental in form, frequently satirical in method, and concerned with the problems of Canadian society. He has a distinctive manner, a kind of loping energy in the movement of his lines, and a sardonic but attractive humor.

During these years, also, poets of a more traditional kind have produced work of distinction. Prominent among them have been two other members of the famous Roberts family—Theodore Goodridge Roberts (who has also many novels and stories to his credit) and Lloyd Roberts, the son of the late Sir Charles Roberts. Others worthy of mention are Arthur S. Bourinot, Kenneth Leslie, Watson Kirkconnell and G. H. Clarke.

The story of a country's literature is never finished as long as the nation lives. Today there are many still younger poets than those we have been discussing, who are making their bid for public attention.

It is too soon to say which of them is most likely to achieve success, or what will be their distinctive note. The five poets who published the joint volume UNIT OF FIVE

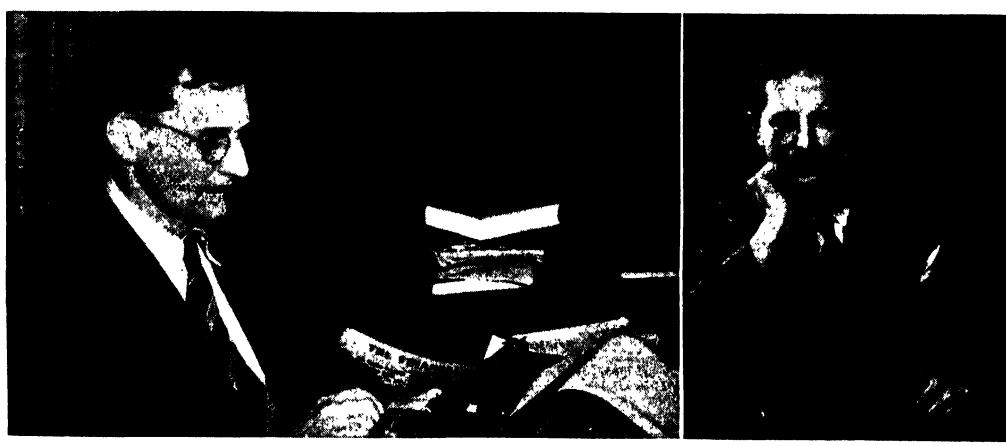


Photo by Nakash

Bruce Hutchison (left) and Hugh MacLennan (right), two of the outstanding younger novelists of Canada.

(1944)—James Wreford, Louis Dudek, P. K. Page, Ronald Hambleton and Raymond Souster—will be watched with interest.

The real beginning of literature in French Canada came in the middle of the nineteenth century. Prior to the Conquest, there were records and journals of explorers and missionaries. In the late eighteenth century there was the verse of Joseph Quesnel, and in the early nineteenth, Joseph Mermet and Michel Bibaud were writing verse.

Michel Bibaud (1782-1857), who wrote the first published volume of verse by a French Canadian, also wrote the first noteworthy history. The first volume of his HISTOIRE DU CANADA ET DES CANADIENS was published in 1837. Bibaud was a hard worker, a contributor to magazines and to the ENCYCLOPÉDIE CANADIENNE which he founded in 1844.

GARNEAU SHOWS THE GRANDEUR OF FRENCH CANADA'S STORY

Interest in the history of French Canada was growing. Bibaud's work and that of other historians prepared the way for a truly distinguished contribution to Canadian literature, HISTOIRE DU CANADA by François-Xavier Garneau (1809-66). Garneau's style was clear and vigorous. He gathered his facts with painstaking care at a time when information about Canada's past was not easy to come by. An ardent patriot, Garneau showed his fellow-Canadians the grandeur of the 300 years of their history and inspired future writers with great themes. Garneau's history was first published in 1845-48. It has been republished many times, and translated into English as well. A number of changes have been made in it, but to this day it is valued by French Canadians as a standard history of their country.

One of the most notable historians following Garneau was Abbé Jean-Baptiste-Antoine Ferland (1805-65), author of the COURS D'HISTOIRE DU CANADA (1861). Also published in 1861 was a delightful collection of folklore, LES LEGENDES CANADIENNES, by the historian Abbé Henri-Raymond Casgrain (1831-1904). Among other noteworthy historians are Antoine Gérin-Lajoie (1824-82), author of DIX ANS AU CANADA DE 1840 À 1850; Benjamin Sulte (1841-1923), author of HISTOIRE DES CANADIENS-FRANÇAIS and L.-Olivier David, author of LES PATRIOTES DE 1837-1838.

Another creative influence in the nineteenth century was that of the Romantic movement in poetry, which reached Quebec from France. From this source and from the interest in Canada's past arose the work of the "father of French-Canadian poetry," Octave Crémazie (1827-79). In the city of Quebec, where he was born, Crémazie joined with his brothers in running a bookshop which became famous. Literary people made it a meeting-place where they could enjoy talking together, for Crémazie was not only a man of culture and a poet—he always had the latest word from Europe on new ideas in writing and in art. Among his visitors were several writers whom you have just been reading about—Garneau, Ferland, Casgrain and Gérin-Lajoie. Crémazie's poems, few in number, were high in quality and strong in influence. Religious devotion and patriotic feeling were his main themes. Crémazie's enthusiasm for the French Romantic writers was shared by many of his contemporaries. Alas! Misfortune overtook Crémazie and he died an exile in France.

Of Crémazie's many disciples, the finest was Louis Fréchette (1839-1908). This romantic poet wrote about woods and gardens and his love for his native land, about religion, the family and the joys of friendship. He was the first French-Canadian writer to be honored by the French Academy which, in 1880, awarded him the Prix Montyon for his lyrics, LES FLEURS BORÉALES and LES OISEAUX DE NEIGE (1879).

Léon-Pamphile Le May (1837-1918), a friend of Fréchette, wrote excellent sonnets at a time when that verse form was little used in Canada. His finest volume is a collection of sonnets called LES GOUTTELETTES (1904).

Great love of country and love of the soil may be seen in the work of many French-Canadian poets. An early example is the poem LES LABOUREURS by Joseph Lenoir (1822-61). Among the many who wrote historical and patriotic poetry are Benjamin Sulte, the historian; William Chapman (1850-1917); and Adolphe Poisson (1849-1922).

A NEW GROUP WHO RECEIVED THEIR INSPIRATION FROM FRANCE

Around 1900 a new group of poets arose at Montreal. Inspired by such French poets as Baudelaire, Verlaine, Rimbaud and Mallarmé, the new poets tried new verse forms and wrote about strange states of sensation. Outstanding among them were Emile Nelligan (1882-1941) and Albert Lozeau (1878-1924). Nelligan's verse is sad, but full of glowing images and beautiful music. Lozeau,

a bed-ridden invalid, excelled as a poet of love and nature. Others of this group were Charles Gill, who wrote a fine nature poem called LE CAP ETERNITÉ; Albert Ferland (1872-), who wrote of the life of rural Quebec; Jean Charbonneau (1875-), who wrote of the past; and Paul Morin (1889-), who wrote one of the finest single poems of French Canada, LE PAON D'ÉMAIL (1912). Morin's verse owes much to Greek and pagan antiquity, and has clear, colorful pictures, varied rhythms and rich, full-bodied music.

Many new poets have arisen in the last few decades. The new writers belong to no one group. Guy Delahaye and René Chopin resemble Morin in their love of beauty and symbolism. Chopin (1885-) is the author of the lyrical LE COEUR EN EXIL. Alfred Des Rochers (1901-) has written good poetry of the soil, of the Quebec countryside. Des Rochers excels in the use of picture-words that make the reader see a scene through the poet's eyes. Nérée Beauchemin (1850-1931) was also a poet of the soil. His beautiful poem LA PRIÈRE ANCESTRALE is so simple and so moving that it has been compared to a poem by Robert Burns called THE COTTER'S SATURDAY NIGHT.

Paul Gouin (1898-) wrote MÉDAILLES ANCIENNES, a fine group of poems about some of the important people in the history of New France. Robert Choquette (1905-) won the Prix David of the provincial government for his first volume of poetry, A TRAVERS LES VENTS, published when he was only twenty. Choquette is a true lyricist, singing of high ideals and aspirations. Clément Marchand (1913-) in LE GESTE DE LA CROIX, was inspired by the story of Jacques Cartier planting the first cross on the soil of Canada. Modern free verse has attracted some French-Canadian poets, among them Roger Brien, St.-Denys Garneau and Rosiare Dion-Lévesque. Cécile Chabot has written impressive love poetry and François Hertel has written poems of distinction about complex ideas.

Let us now turn to the novel. The first important novel written in French Canada was LES ANCIENS CANADIENS, by Philippe Aubert de Gaspé (1786-1871). This historical romance is of outstanding interest for its accounts of eighteenth-century French-Canadian life. De Gaspé, when he was young, knew people who had lived through the stirring times of the Conquest. When he was about seventy-five years old, he determined to tell about the exciting events which had been described to him in his youth. LES ANCIENS CANADIENS tells us about the heroes of 1759, about the battles for Quebec, and gives in great detail a picture of the life of those days with its customs, songs and stories. It was published in 1863, just about a century after the events which it describes.

You will remember Antoine Gérin-Lajoie as one of the regular visitors at Crémazie's bookshop. This writer wanted to persuade his readers to cling to the soil of Quebec, and so he wrote the story of the life of a young colonist, JEAN RIVARD (1864). The author pictures the whole process of clearing new land, of the hardships which were encountered and of the joy of harvest time. As a novel, JEAN RIVARD is not very noteworthy, but it aroused widespread interest



An illustration from the novel, THORN-APPLE TREE, by Grace Campbell. In striking wood engravings the artist, Franklin Carmichael, has truly expressed the spirit of the story.

In this novel the author writes with sincerity and vitality of the pioneer life of Canada: the life of the fur traders, trappers, and homesteaders, the Scotch and the French.

when it was published and was of great influence in encouraging the French Canadians' love of the soil.

Two other historical novelists of the nineteenth century were Joseph Marmette (1844-95) and Napoleon Bourassa (1827-1916). The most popular of Marmette's novels was L'INTENDANT BIGOT (1872), a fine, dramatic example of French-Canadian historical novels. Marmette has said that Scott, Cooper and Dumas père were his favorite authors, and it is clear that their exciting stories formed a pattern for his own. Bourassa chose the tragic story of the Acadians for his finest novel, JACQUES ET MARIE.

Early in the twentieth century appeared the most famous novel about French Canada, Louis Hémon's MARIA CHAPDELAINE (1916). A Frenchman, Hémon went to French Canada and took it to his heart. He wrote of his adopted country with great charm and simplicity. This love story, set in the Quebec countryside, has had a great influence on French-Canadian fiction. Many writers have sought to capture the same charm, but none has quite succeeded.

In time there came a revolt against the Hémon tradition, based on the belief that MARIA CHAPDELAINE did not show life as it really is. Of books that tried to be a little more true to life, the best known outside of Quebec is TRENTE ARPENTS (1938). Two years later an English translation was published, called THIRTY ACRES. This novel is by Ringuet, a pen-name for Dr. Philippe Panneton.

A novelist whose style has won high praise is Abbé Félix-Antoine Savard, the author of MÉNAUD, MAÎTRE-DRAVEUR.

Among recent novelists and novels especially worthy of mention are Claude Henri Grignon (UN HOMME ET SON PÉCHÉ); Léo-Paul Desrosiers (NORDSUD; ENGAGÉS DU GRAND PORTAGE; LES OPINIÂTRES; SOURCES); Rodolphe Girard (MARIE CALUMET); Moisette Olier (MADEMOISELLE SÉRÉNITE; ETINCELLES); Robert Choquette (LES VELDER); Alfred Glauser (LE VENT SE LÈVE); Robert Charbonneau (ILS POSSÉDERONT LA TERRE).

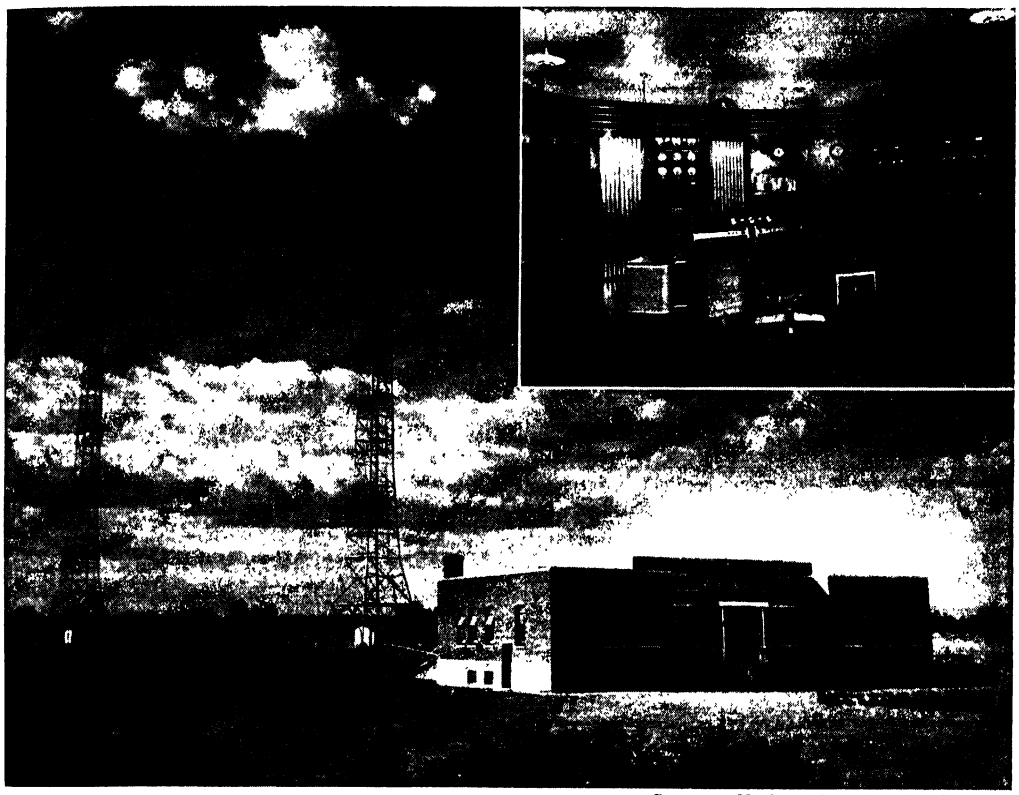
Literature in the two languages of Canada has a good deal in common. In poetry, both languages had in the nineteenth century romantic poets of nature and feeling; and in the twentieth century, poets concerned with experimental forms and the expression of ideas in verse. In the novel, both languages have concentrated upon historical and regional themes. Both tend to imitate the writers of their original homeland. Both have achieved fine things, which make the reader more fully alive to the beauties and burdens, the hopes and fears, of the great land of Canada.

By DESMOND PACEY.

THE NEXT STORY OF LITERATURE IS ON PAGE 5459.



Courtesy, The Macmillan Company



Courtesy, National Broadcasting Company

A radio broadcasting station, with its transmitter towers. Insert, control panels and dials in the transmitter studio.

RADIO *and* HOW IT WORKS

WHAT does the word radio mean to you? Probably a picture comes to your mind of the device you have in the parlor at home or in your family automobile—the mysterious box that brings you music, comedy, drama, news and other entertainment at the mere turn of a knob. That is what is commonly called a radio.

However, this radio, or as it is more accurately called, the home receiver, is but one part of the general field of radio. Although it is a comparatively new invention, compared with something as old as the steam engine—radio broadcasting as we know it today is only about twenty-five years old—it has developed swiftly. Today there are radio devices of all sorts, from machines that send pictures through the air to fuses used for exploding anti-aircraft shells.

Radio to most people, nevertheless, still means tuning in on the broadcast of a concert, listening to the play-by-play account of a ball game or laughing at the jokes of a comedian who may be thousands of miles away. And so we shall first discuss this phase of radio.

As we have said, the ordinary radio in your home is a receiver. To receive anything, something must be sent. Therefore, we also have senders, or more correctly, transmitters. A radio broadcasting station sends out a program by using a transmitter, and you hear it in your home with a receiver.

Now let us see how this is done. It has been found that electromagnetic waves can be set up that will travel great distances, even to the moon and back. They travel at the same speed as light; that is 186,000



Courtesy, Stromberg-Carlson

A combination radio and phonograph that is besides a beautiful piece of furniture in polished walnut.

miles a second, several hundred thousand times as rapidly as sound-waves. The waves pass not only through the earth's atmosphere, but also through walls, forests and mountains. Some are absorbed, but enough get through to affect the sensitive receiver, even though they can not be felt by any of our five senses. That is, our unaided senses can not tell whether the air is empty or full of these waves.

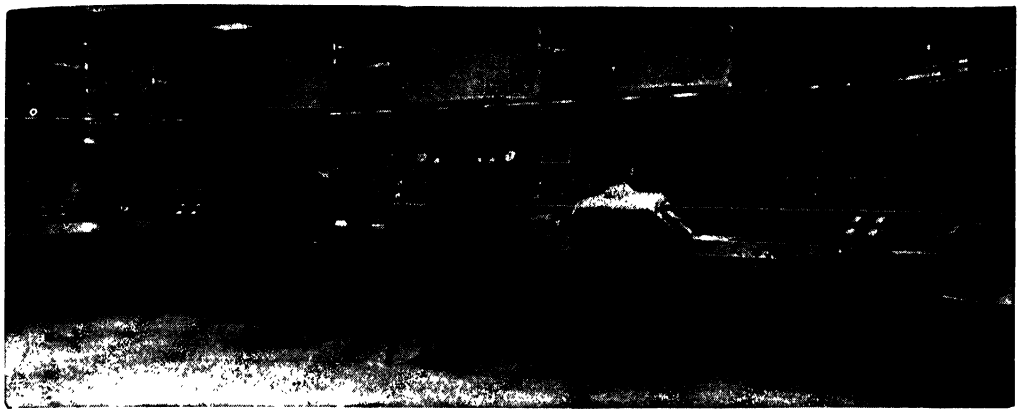
The waves travel in all directions from the center where they begin. Have you ever thrown a pebble into a pond and watched the circles of waves move out to the banks, growing weaker as the distance increases? Radio waves in the atmosphere move in a similar way, except that they move outward in every direction. Perhaps you can understand better the way they spread if you think of a soap bubble growing larger and larger. Now think of a succession of smaller bubbles, each inside the next larger one and each growing larger and larger; or think of the way the rays of light from a candle spread in every direction. Remember these illustrations, for you will need them again. It is easy to compare radio waves to pond waves, bubbles or light-rays.

These radio waves are produced by the vibration, or oscillation, of electric current. There is more than one kind of electric current. A direct current flows steadily in one direction, but direct current does not produce radio waves. An alternating current flows in one direction, reverses itself and flows back, goes forward again, flows back, and so on with marvelous rapidity. Each



Courtesy, National Broadcasting Company

Being present at a radio program is much like watching a stage performance. Many actors work better before an audience. Engineers in the control room watch the program through glass panels at the left.



Courtesy, National Broadcasting Company

The master control room of a great radio network may be compared to a train despatcher's office. For example, news reporters in Tokyo, Manila, London, Stockholm, Paris and Melbourne may send news reports (by shortwave), one after another. The control man receives them and sends them out to you as a single smooth, connected program.

complete change is called a cycle. Current in an ordinary electric bulb goes through about sixty cycles in a second. The rate of radio vibration in ordinary broadcasting is much higher—from 550,000 to as much as 1,500,000 cycles every second. This range of frequency is called the standard radio broadcast band.

You have been told that radio waves travel 186,000 miles in a second. It is plain, then, that the length of a wave, by which we mean the distance from the top of one to the top of the next, will be the distance that the current travels in a second divided by the number of vibrations in the same time. Now 186,000 miles is about 300,000,000 meters. This sum divided by a frequency of 1,000,000 cycles per second, say, gives a wave-length of 300 meters. By regulating the number of cycles different wave-lengths may be obtained.

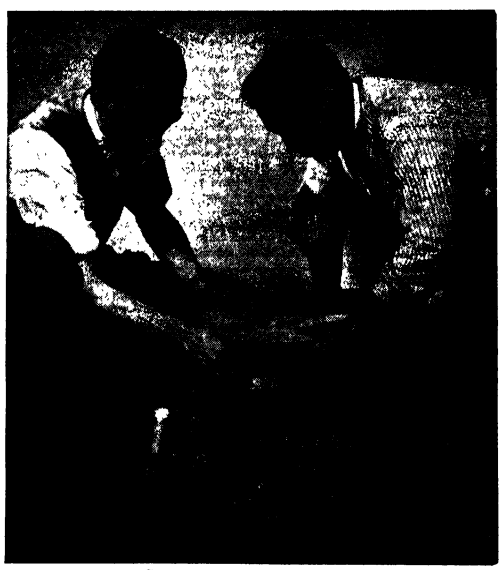
The transmitter is the machine, or instrument, that sends these electromagnetic waves into the air. There are many kinds of transmitters, but they all have the same basic principle.

First they all must have a source of electric current. This current is changed from a



Courtesy, National Broadcasting Company

The actors in a rehearsal of a radio play look to the director, in the control room, for criticism.



Courtesy, Columbia Broadcasting System

Sound engineers create sound effects. Here a box is scraped over pebbles, for the sound of beaching a boat.



Courtesy, Columbia Broadcasting Company

All important sports events, such as this football game, are reported by radio to enormous audiences.

low-frequency to a high-frequency current. A mouthpiece, or microphone, which responds to sound-waves is connected with the system; by speaking into it the pattern of the sound-waves is impressed on the high-frequency current. See Figure 1. The resulting wave is sent out into the atmosphere through an antenna. An antenna is a wire or wires stretched between two points some distance above the ground, from which the radio waves go off into the air, or are collected from the air. It could be called a wave radiator, somewhat similar to the radiator in your home, but giving off radio waves rather than heat waves.

Near your home receiver you have another antenna. This one catches the waves as they come through the air. You may ask why it doesn't become saturated and confused with all the different waves that are flying around. The answer is that the receiver to which it is connected can be adjusted to select waves of only one frequency, and to reject all others. It is just like unlocking a door. Only one key will be successful—all others fail.

Inside a simple receiver the high-frequency current from the antenna is sent through what is called a detector. Here the current is changed from AC to DC, that is, from alternating current to direct current—it is rectified. A telephone receiver, or speaker, which makes the waves audible (hearable) completes the set.

The simplest detector is a mineral crystal, usually galena, or lead sulfide. It allows waves to pass through in one direction much better than in another, thereby changing AC to DC.

Such sets require no battery. The cost is slight, but their power and range are limited. Crystal sets were the first type receiver widely used by the public. The principle on which they operate is much simpler than that of the electron-tube receivers, which are most common today. For this reason the crystal sets are still of great interest to radio amateurs, or "hams." They are often built and studied by young folks.

THE TWO GREAT AIDS TO RADIO GIVEN BY THE ELECTRON TUBE

As we have said, the usual radio of today is an electron-tube instrument. You have learned much about these wonderful tubes in reading the story The Magical Electron Tube. In reviewing what we learned there, we see that the electron tube performs two great services to radio: 1) it enables a very small current to control the pattern of a high-frequency wave, and 2) it rectifies and amplifies current.

Let us explain transmitters and receivers in more detail so we can see how invaluable the electron tube really is to radio.

Suppose you are a radio announcer. You speak into a microphone and the transmitter sends your voice out into the atmosphere. What happens is this:

As you speak, the rise and fall of your voice produces what we call sound-waves. The loud notes produce peaks in the waves and the soft notes produce just small bumps. In other words, the amplitude, or height, of the wave varies with your speech. This wave is changed into a very tiny electric current, which varies as your voice varies.

A SMALL CURRENT CONTROLS THE GRID; THE GRID CONTROLS A LARGE CURRENT

This current is fed to the grid of a three-element electron tube, called a triode. (The three elements are called plate, filament and grid.) You have seen how this current, even though it is weak, can control a much larger current. This is true because the grid is like the valve of the tube. A small current controls the valve and the valve controls the large current.

In this way each variation of your voice is mirrored by a variation in the large current.

The output of this tube may be fed to the grid of another tube. Here the current is again amplified (made stronger), with the output still following the rise and fall of your voice.

This procedure can go on through many tubes (and thereby through many stages of amplification), growing more powerful all the time, until the final output is the high-frequency wave that leaves the transmitting antenna to go through the air to your receiver. The wave still carries the sound-pattern of your voice.

THE WEAK SIGNALS COMING TO YOUR ANTENNA MUST BE STRENGTHENED

The antenna of your receiver catches all these transmitted waves and sends them to the receiver itself. Since they have traveled perhaps thousands of miles before you gather them in, they are weak. The tiny current produced is fed through as many amplifier tubes as are necessary to build up its strength, just as in the transmitter.

It is then sent to a detector tube. Here the electron tube exercises its ability to transmit current in one direction only. You will remember that a one-way tube rectifies current, that is, it changes it from alternating current to direct current.

Remember, this current still varies with every change in your voice. Coming from the detector, the current is strengthened again by one or more amplifier tubes, and finally is sent to the loudspeaker. This is just a telephone receiver. It changes the electric waves to sound-waves again. Thus your family hears you talking from the studio that is perhaps thousands of miles away from your home.

It is not very easy to explain without mathematics why a receiver will pick up waves of only one frequency, and will reject all others. There are many books devoted to radio alone where the explanation can be found. It is sufficient to say here that when we tune in, as it is called, on a certain station we vary a setting inside the radio receiver. This upsets a delicate balance and opens the door to an entirely different frequency.

THE DIFFERENCE BETWEEN AM AND FM RADIO

Ordinary radio broadcasting has used for a long time what is known as amplitude modulation, or AM for short. This means that the loudness and pitch of the sound entering the microphone control the amplitude of the radio wave. The louder the sound, the greater will be the amplitude of the wave; the pitch determines how rapidly the amplitude varies. In such broadcasting the frequency, or number of waves sent out each second, remains constant.

Another type of broadcasting, due largely to the work of Major E. H. Armstrong, is frequency modulation, or FM. Here, the amplitude of the radio wave remains the same, but the sound entering the microphone regulates the frequency of the radio wave. A loud sound produces greater variations of frequency than a low sound; the pitch of the sound determines the rate at which the radio wave-frequency varies.

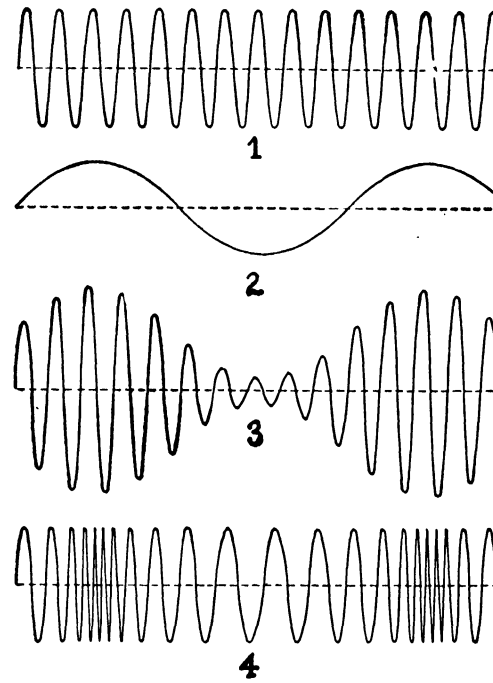


Fig. 1. In amplitude modulation, AM, the amplitude of the radio waves varies. The frequency (number sent each second) remains constant. In frequency modulation, FM, the amplitude is constant but the frequency varies. No. 1 shows the carrier wave on which the signal wave, 2, rides. No. 3 represents AM—the waves vary in height (amplitude) but the distance between is even. No. 4 represents FM. The height is even but the distances between vary.

For a picture explanation of AM and FM, See Figure 1.

Noise and static are largely eliminated by frequency modulation; naturalness of tone is increased. Because ultra-high-frequency (very, very high frequency) waves are used, frequency modulation broadcasting stations are usually located on mountain tops and other high places. Let us see why this is so.

Ordinary radio waves usually travel farther than ultra-high-frequency waves. This is true because 75 to 250 miles above the earth's surface there are layers of particles with electric charges forming what is called the

ionosphere. These layers are capable of reflecting the ordinary radio waves almost as a mirror reflects light; but ultra-high-frequency waves pass through without any great amount of reflection.

When the ordinary radio waves hit the ionosphere, they are reflected back to earth some distance from the transmitter. Sometimes the waves will bounce up once more from the earth to the ionosphere, and then down again. They may go on bouncing back and forth until the wave's energy is lost. (See Figure 2.) Up and down they go, each time carrying a program farther and farther from the transmitter. You can see how in this way ordinary radio broadcasts may travel great distances.

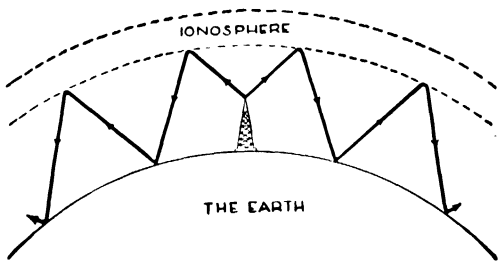


Fig. 2. Ordinary radio waves go out in all directions from the transmitter. Some go above the earth to a layer called the ionosphere, which reflects them. Some bounce back to earth, and may rebound several times. So, ordinary broadcasting travels far.

The ultra-high-frequency waves, however, such as those used in frequency modulation, are not reflected by the ionosphere; they go right through, and never bounce back. Without this reflection they do not travel very far; they are limited to motion along the earth's surface. And this motion is usually not much more than fifty miles, due to the curvature of the earth. Look at Figure 3. There you see waves leaving the transmitting antenna at angles such that they will bounce off the earth. Any wave more nearly horizontal than AB will never hit the earth. But if we raise the height of the antenna, more of the earth's surface will be covered. This is easy to see if you compare Figure 4 to Figure 3. That is why we locate FM transmitters in high places.

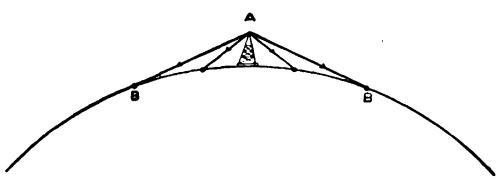


Fig. 3. Here we see ultra-high-frequency waves (such as those used in FM) leaving a transmitter. These will not bounce back from the ionosphere, but will travel through it. Only a small number (between B and B) will strike the earth, due to its curvature.

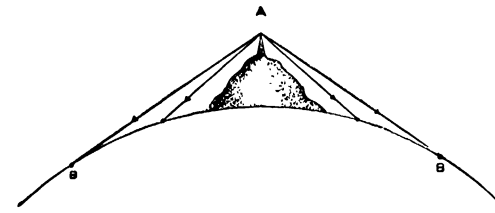


Fig. 4. Look at the diagram at the bottom of column 1. Now look at this one—we have placed the transmitter at the top of a mountain. Many more waves can reach the earth (between B and B). This is one way of overcoming the earth's curvature for FM radio.

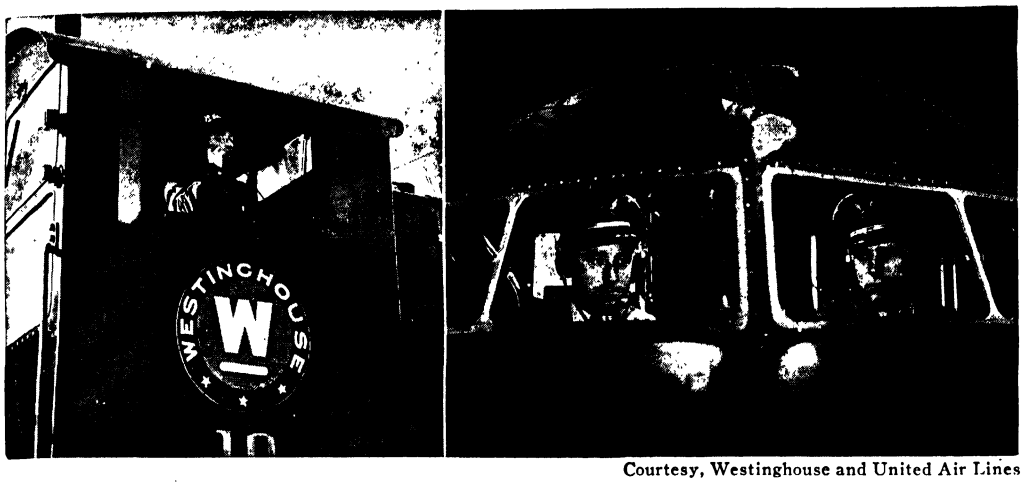
Special radio circuits are needed both to send and to receive frequency modulated broadcasts. Some receiving sets combine circuits for the reception both of frequency modulation and amplitude modulation. By throwing a switch the listener can change from one type of reception to the other.

You may ask, "Is it possible that radio will ever replace the telephone?" It is not likely. In a great city there are many thousands of telephone subscribers. It would be impossible to assign a different wave-length to each, yet if two calls were made at the same time on the same wave-length, they would interfere with each other.

Sending a picture by radio is now an everyday occurrence. At the sending station the photograph, check, blueprint or other suitable material is clamped in place on a cylinder which rotates like a wheel on an axle. In front of the cylinder are a lamp and a photo-electric cell which travel along the length of the rotating picture so that, in effect, a continuous spiral line of light from the lamp crosses every part of the picture like the sound track on an early cylindrical phonograph record.

Every picture reflects light thrown upon it. When the reflected light enters our eyes, we see the picture. Different parts of a picture reflect more or less light—that is how we distinguish between light and dark parts. In the same way, as the beam from the lamp falls on the picture on the cylinder, different parts reflect more or less light, and this light is focused on a photo-electric cell.

This photo-electric cell is commonly spoken of in the laboratory as the "eye" of the transmitter. It is able to "see" even the tiniest light variations; in fact, this eye sees and records electrically millions of different current impulses as the picture sweeps by



Courtesy, Westinghouse and United Air Lines

Left, the engineer talks to the despatcher by FM radio while his train is "on the run." Right, pilot's compartment of an airplane. Both pilot and co-pilot wear radio earphones through which they hear directional beam signals, weather reports and messages. The co-pilot is holding a microphone, through which he talks to ground officers.

the light-beam from the lamp. The photo-electric cell is therefore responsible for reproducing an infinite number of different electric-current values which correspond with the light or dark areas of the picture being transmitted.

After the signal impluses, or electric waves, from the photo-electric cell pass through a series of vacuum-tube amplifiers, they can be transmitted into space like a regular broadcast.

At the receiving end the operator receives a series of electrical impluses. A radiogram (a telegram sent by radio instead of by wire) would be received in the same way. The dot-dash code of a radiogram must be translated into words by an operator, or by a machine. Just so, in the radiophoto transmission, the



Courtesy, Radio Corporation of America

You can send radio messages to almost any country on the globe. You can talk—by means of telephone and radio—to persons in most countries. Here is a corner of the exchange board of a great radio communications central office. Each man handles communications to and from one country, Colombia, Brazil, Argentina, and so on.

impluses are translated into a picture automatically. The necessary apparatus consists of a cylinder, a lamp and a mirror galvanometer.

The lamp's intense light is focused on the mirror and is reflected by it to a photographic film wrapped on the cylinder. The amplified radio-wave impulses coming from the sending station cause the mirror to turn. Depending on the strength of these varying incoming impulses, the mirror will turn more or less in response to each variation in the current. In this way the mirror will reflect different amounts of light on the sensitive film of the cylinder.

To prevent distortion of the picture, the receiving cylinder turns exactly like the sending one. As the receiving cylinder turns, the lamp and mirror move along it exactly like the lamp and photo-electric cell at the transmitter. Thus there is reproduced line by line on the recording film the light variations which represent the impulses from the sending station. When this film is developed, a picture results which closely resembles the original picture at the sending station.

World War II brought forth an advancement in radio which has been ranked in importance with the atomic bomb and radar. It is the proximity fuse, a miniature radio transmitting and receiving set, located in the nose of a shell, bomb or rocket.

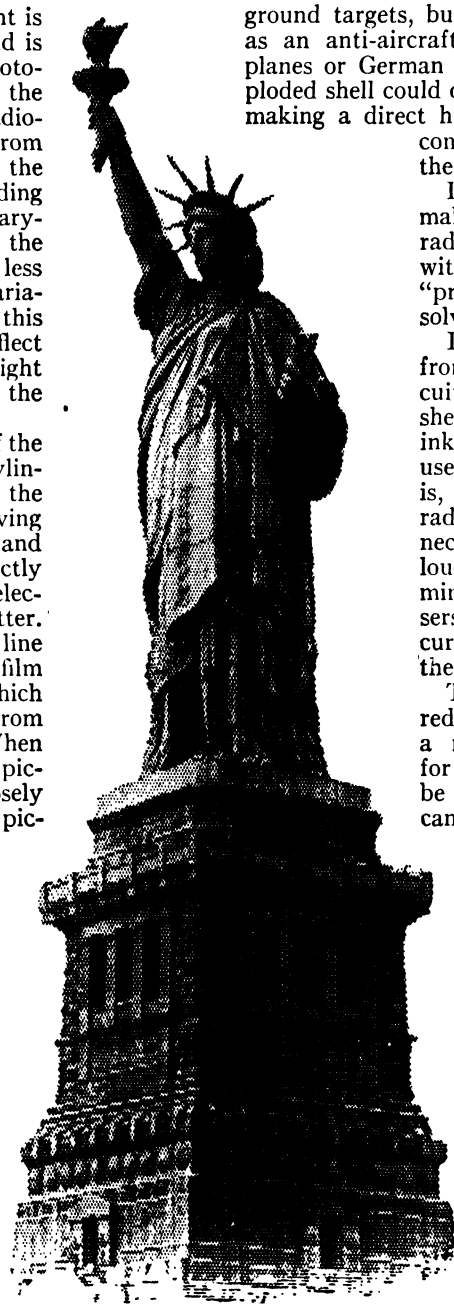
This tiny radio set sends out radio waves during its flight through the air. If these waves strike an object, they are reflected back to the receiver in the shell, where they set off the explosive. Thus any object within a certain range of the radio will cause the shell to go off.

This device was used successfully against ground targets, but its greatest value came as an anti-aircraft weapon. Fired at airplanes or German V-1 bombs, the radio-exploded shell could destroy the target without making a direct hit. All it had to do was come near to the object and the explosion took place.

It was not so difficult to make the tiny tubes for this radio as it was to do away with the wires. But a unique "printing" system of wiring solved this riddle.

Instead of running wires from point to point, the circuits were drawn on ceramic sheets with silver and carbon inks. If this radio is to be used for audio reception, that is, for turning the received radio signal into sound, it is necessary to include a tiny loud speaker. Adding the miniature tubes and condensers completes the set. House current or a battery supplies the power.

This late development in reducing radio size promises a real vest-pocket receiver for the near future. It will be no bigger than a bar of candy, but will have the reception of a table model. Improved hearing aids are possible, and portable radio telephones that you can hold in the palm of your hand may become common. Many different possibilities are in view. A vast, profitable business has grown up around radio. More important is the fact that in a few years radio has lifted the educational level of mankind swiftly, surely and effectively. It can do even more in the days to come.



Courtesy, RCA

An early radiophoto of the Statue of Liberty sent from New York to London. It went quite slowly, at the rate of one inch in six minutes.

THE NEXT STORY OF SCIENCE IS ON PAGE 5146.



THE AGE OF CAVALIER AND PURITAN

Illustrated by Elizabeth James

On His Blindness

By JOHN MILTON (1608-1674)

WHEN I consider how my light is spent
Ere half my days in this dark world and wide,
And that one talent, which is death to hide,
Lodged with me useless, though my soul more bent
To serve therewith my Maker, and present
My true account, lest He returning chide;
"Doth God exact day-labor, light denied?"
I fondly ask. But Patience, to prevent
That murmur, soon replies, "God doth not need
Either man's work or His own gifts; who best
Bear His mild yoke, they serve Him best; His state
Is kingly; thousands at His bidding speed,
And post o'er land and ocean without rest;
They also serve who only stand and wait."

Satan, the Fallen Archangel

AN EXCERPT FROM PARADISE LOST

By JOHN MILTON (1608-1674)

. . . . . His pride
Had cast him out from Heaven, with all his host
Of rebel Angels, by whose aid, aspiring
To set himself in glory above his peers,
He trusted to have equalled the Most High,
If he opposed, and, with ambitious aim
Against the throne and monarchy of God,
Raised impious war in Heaven and battle proud,
With vain attempt. Him the Almighty Power
Hurled headlong flaming from the ethereal sky,
With hideous ruin and combustion, down
To bottomless perdition, there to dwell
In adamantine chains and penal fire,
Who durst defy the Omnipotent to arms.
Nine times the space that measures day and night
To mortal men, he, with his horrid crew,
Lay vanquished, rolling in the fiery gulf,
Confounded, though immortal. But his doom
Reserved him to more wrath; for now the thought
Both of lost happiness and lasting pain
Torments him: round he throws his baleful eyes,
That witnessed huge affliction and dismay,
Mixed with obdurate pride and steadfast hate.
At once, as far as Angels ken, he views
The dismal situation waste and wild.
A dungeon horrible, on all sides round,
As one great furnace flamed; yet from those flames
No light; but rather darkness visible
Served only to discover sights of woe,
Regions of sorrow, doleful shades, where peace
And rest can never dwell, hope never comes
That comes to all, but torture without end
Still urges, and a fiery deluge, fed
With ever-burning sulphur unconsumed.
Such place Eternal Justice had prepared
For those rebellious; here their prison ordained
In utter darkness, and their portion set,
As far removed from God and light of Heaven
As from the centre thrice to the utmost pole.
Oh, how unlike the place from whence they fell!

. . . . . .

Forthwith upright he rears from off the pool
His mighty stature; on each hand the flames
Driven backward slope their pointing spires, and, rolled
In billows, leave i' the midst a horrid vale.
Then with expanded wings he steers his flight
Aloft, incumbent on the dusky air,
That felt unusual weight; till on dry land
He lights—if it were land that ever burned
With solid, as the lake with liquid fire;
And such appeared in hue as when the force
Of subterranean wind transports a hill
Torn from Pelorus, or the shattered side
Of thundering Aetna, whose combustible
And fuelled entrails, thence conceiving fire,
Sublimed with mineral fury, aid the winds,
And leave a singèd bottom all involved
With stench and smoke.

The Constant Lover

By SIR JOHN SUCKLING (1609-1642)

OUT upon it, I have loved
Three whole days together!
And am like to love three more,
If it prove fair weather.

Time shall moult away his wings
Ere he shall discover
In the whole wide world again
Such a constant lover.

But the spite on't is, no praise
Is due at all to me:
Love with me had made no stays,
Had it any been but she.

Had it any been but she,
And that very face,
There had been at least ere this
A dozen dozen in her place.







Upon Julia's Clothes

By ROBERT HERRICK (1591-1674)

WHENAS in silks my Julia goes,
Then, then, methinks, how sweetly flows
The liquefaction of her clothes!

Next, when I cast mine eyes and see
That brave vibration each way free,
—O how that glittering taketh me!

To the Virgins, To Make Much of Time

By ROBERT HERRICK (1591-1674)

GATHER ye rosebuds while ye may,
Old Time is still a-flying:
And this same flower that smiles to-day
To-morrow will be dying.

The glorious lamp of heaven, the sun,
The higher he's a-getting,
The sooner will his race be run,
And nearer he's to setting.

That age is best which is the first,
When youth and blood are warmer;
But being spent, the worse, and worst
Times still succeed the former.

Then be not coy, but use your time,
And while ye may, go marry:
For having lost but once your prime,
You may for ever tarry.

A Song for Saint Cecilia's Day, 1687

By JOHN DRYDEN (1631-1700)

Saint Cecilia was a Christian martyr who died in Rome in 230 A.D. She is the patron saint of music.

FROM harmony, from heavenly harmony,
This universal frame began:
When nature underneath a heap
Of jarring atoms lay,
And could not heave her head,
The tuneful voice was heard from high,
"Arise, ye more than dead!"
Then cold, and hot, and moist, and dry,
In order to their stations leap,
And Music's power obey.

From harmony, from heavenly harmony,
This universal frame began:
From harmony to harmony
Through all the compass of the notes it ran,
The diapason closing full in Man.

What passion cannot Music raise and quell?
When Jubal struck the chorded shell,
His listening brethren stood around,
And, wondering, on their faces fell
To worship that celestial sound:
Less than a god they thought there could not dwell
Within the hollow of that shell
That spoke so sweetly and so well.
What passion cannot Music raise and quell?

The trumpet's loud clangor
Excites us to arms,
With shrill notes of anger,
And mortal alarms.
The double double double beat
Of the thundering drum
Cries Hark! the foes come;
Charge, charge, 'tis too late to retreat!

The soft complaining flute,
In dying notes, discovers
The woes of hopeless lovers,
Whose dirge is whispered by the warbling lute.

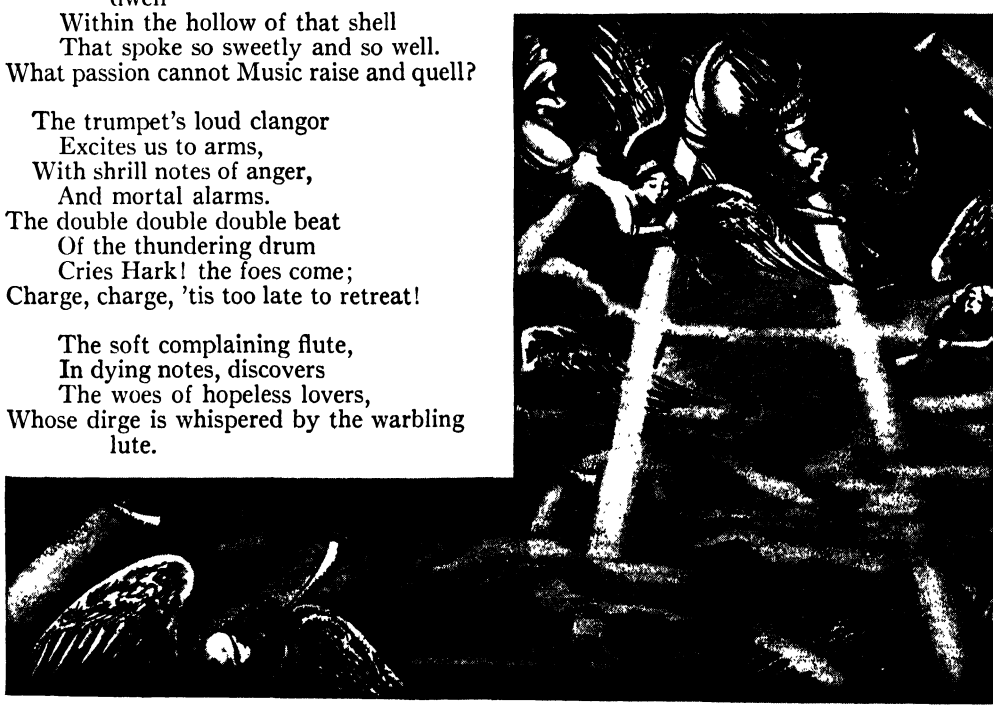
Sharp violins proclaim
Their jealous pangs and desperation,
Fury, frantic indignation,
Depth of pains, and height of passion,
For the fair, disdainful dame.

But O, what art can teach,
What human voice can reach,
The sacred organ's praise?
Notes inspiring holy love,
Notes that wing their heavenly ways
To mend the choirs above.

Orpheus could lead the savage race;
And trees uprooted left their place,
Sequacious of the lyre;
But bright Cecilia raised the wonder higher:
When to her organ vocal breath was given,
An angel heard, and straight appeared
Mistaking Earth for Heaven.

GRAND CHORUS

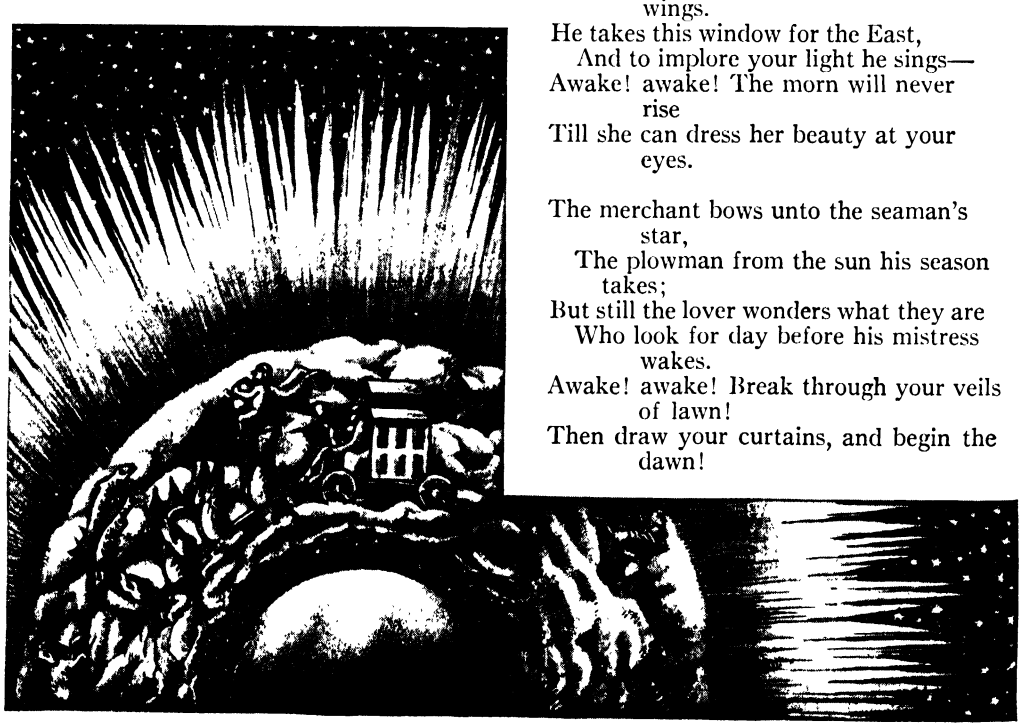
As from the power of sacred lays
The spheres began to move,
And sung the great Creator's praise
To all the Blest above;
So when the last and dreadful hour
This crumbling pageant shall devour,
The trumpet shall be heard on high,
The dead shall live, the living die,
And Music shall untune the sky!



Eternity

By HENRY VAUGHAN (1621-1695)

I SAW Eternity the other night
Like a great Ring of pure and endless light,
All calm, as it was bright,
And round beneath it, Time in hours, days, years
Driven by the spheres
Like a vast shadow moved, in which the world
And all her train were hurled.
. . . . . .
Yet some, who all this while did weep and sing,
And sing, and weep, soared up into the Ring;
But most would use no wing.
O fools (said I) thus to prefer dark night
Before true light!
To live in grots and caves, and hate the day
Because it shows the way,
The way, which from this dead and dark abode
Leads up to God,
A way where you might tread the sun, and be
More bright than he.
But as I did their madness so discuss,
One whispered thus:
"This Ring the Bridegroom did for none provide,
But for His bride."



The Mower to the Glow-Worms

By ANDREW MARVELL
(1621-1678)

YE living lamps, by whose dear light
The nightingale does sit so late,
And studying all the summer night,
Her matchless songs does meditate;

Ye country comets, that portend
No war nor prince's funeral,
Shining unto no higher end
Than to presage the grass's fall;

Ye glow-worms, whose officious flame
To wandering mowers shows the way,
That in the night have lost their aim,
And after foolish fires do stray;

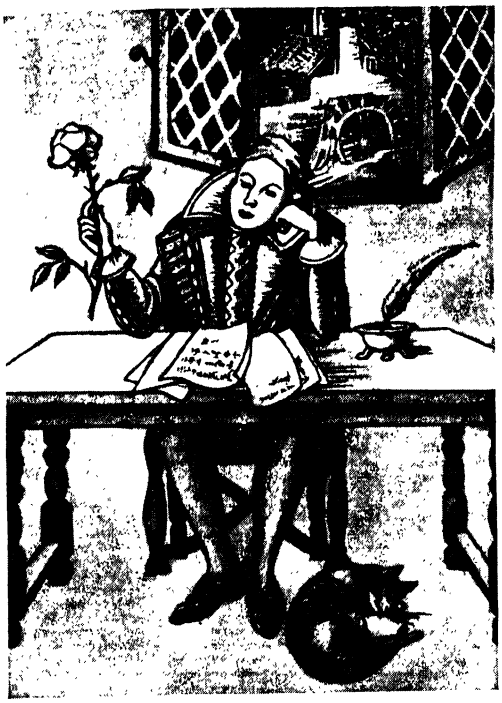
Your courteous lights in vain you waste,
Since Juliana here is come,
For she my mind hath so displaced
That I shall never find my home.

Morning Song

By WILLIAM DAVENANT
(1606-1668)

THE lark now leaves his watery nest,
And, climbing, shakes his dewy wings.
He takes this window for the East,
And to implore your light he sings—
Awake! awake! The morn will never rise
Till she can dress her beauty at your eyes.

The merchant bows unto the seaman's star,
The plowman from the sun his season takes;
But still the lover wonders what they are
Who look for day before his mistress wakes.
Awake! awake! Break through your veils of lawn!
Then draw your curtains, and begin the dawn!



Go, Lovely Rose

By EDMUND WALLER (1606-1687)

Go, lovely Rose—
Tell her that wastes her time and me,
That now she knows,
When I resemble her to thee,
How sweet and fair she seems to be.

Tell her that's young,
And shuns to have her graces spied,
That hadst thou sprung
In deserts where no men abide,
Thou must have uncommended died.

Small is the worth
Of beauty from the light retired:
Bid her come forth,
Suffer herself to be desired,
And not blush so to be admired.

Then die—that she
The common fate of all things rare
May read in thee;
How small a part of time they share
That are so wondrous sweet and fair!

The Bride

From A BALLAD UPON A WEDDING

By SIR JOHN SUCKLING (1609-1642)

Her feet beneath her petticoat,
Like little mice, stole in and out,
As if they feared the light:
But O she dances such a way!
No sun upon an Easter-day
Is half so fine a sight.

Her cheeks so rare a white was on,
No daisy makes comparison;
Who sees them is undone;
For streaks of red were mingled there,
Such as are on a Catherine pear,
The side that's next the sun.

Her lips were red, and one was thin,
Compared to that was next her chin
(Some bee had stung it newly);
But, Dick, her eyes so guard her face;
I durst no more upon them gaze
Than on the sun in July.

Her mouth so small, when she does speak,
Thou'dst swear her teeth her words did break,
That they might passage get;
But she so handled still the matter,
They came as good as ours, or better,
And are not spent a whit.





To Daffodils

By ROBERT HERRICK (1591-1674)

FAIR daffodils, we weep to see
You haste away so soon;
As yet the early-rising sun
Has not attain'd his noon.
Stay, stay
Until the hasting day
Has run
But to the evensong;
And, having pray'd together, we
Will go with you along.

We have short time to stay, as you,
We have as short a spring;
As quick a growth to meet decay,
As you, or anything.
We die
As your hours do, and dry
Away
Like to the summer's rain;
Or as the pearls of morning's dew,
Ne'er to be found again.



Death the Leveller

By JAMES SHIRLEY (1596-1666)

THE glories of our blood and state
Are shadows, not substantial things;
There is no armour against Fate;
Death lays his icy hand on kings:
Sceptre and Crown
Must tumble down,
And in the dust be equal made
With the poor crookèd scythe and spade.

Some men with swords may reap the field,
And plant fresh laurels where they kill:
But their strong nerves at last must yield;
They tame but one another still:
Early or late
They stoop to fate,
And must give up their murmuring breath
When they, pale captives, creep to death.

The garlands wither on your brow;
Then boast no more your mighty deeds!
Upon Death's purple altar now
See where the victor-victim bleeds.
Your heads must come
To the cold tomb:
Only the actions of the just
Smell sweet and blossom in their dust.

The Pulley

By GEORGE HERBERT (1593-1632)

WHEN God at first made Man,
Having a glass of blessings standing by—
Let us (said He) pour on him all we can;
Let the world's riches, which dispersèd lie,
Contract into a span.
So strength first made a way,

Then beauty flow'd, then wisdom, honour, pleasure:
When almost all was out, God made a stay,
Perceiving that, alone of all His treasure,
Rest in the bottom lay.

For if I should (said He)
Bestow this jewel also on My creature,
He would adore My gifts instead of Me,
And rest in Nature, not the God of Nature:
So both should losers be.

Yet let him keep the rest,
But keep them with repining restlessness;
Let him be rich and weary, that at least,
If goodness lead him not, yet weariness
May toss him to My breast.

THE NEXT POEMS ARE ON PAGE 5237.

BEAUTIFUL BIRDS OF THE FAR WEST



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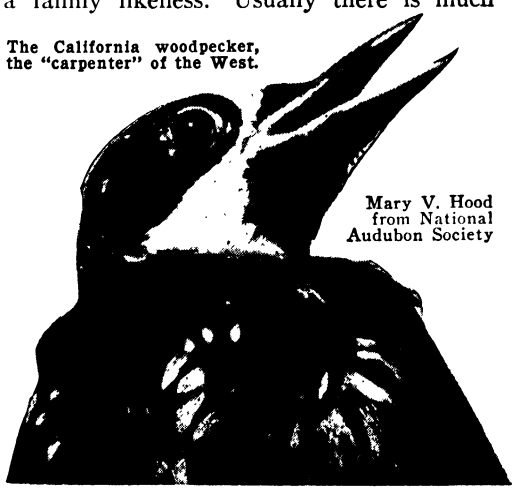
1. Violet Green Swallow. 2. Mountain Bluebird. 3. Western Bluebird. 4. Western Kingbird. 5. Western Tanager. 6. Audubon's Warbler. 7. Bullock's Oriole. 8. Redshafted Flicker. 9. Rufous Humming-bird. 10. Rusty Song Sparrow. 11. Varied Thrush. 12. Steller's Jay.

BIRDS OF NORTH AMERICA

BIRDS OF THE PACIFIC COAST

THE Pacific coast of North America has many interesting birds, which differ to a considerable extent from those of the regions to the east. Of course there are many birds strong of wing, such as the crow, that range over the whole of North America. The same may be said of the eagles and some of the hawks. Some of the smaller birds are also the same east and west of the Rockies, but others are quite different. Southern California has many tropical birds that come up from Mexico and go much farther north than do those from the East.

Look for woodpeckers along the edges of thickets, in orchards, among dead trees and on shrubs. They are searching for beetles, ants and grubs, and sometimes for juicy fruits. Be patient, alert and quiet and you may learn of woodpecker ways. Woodpeckers are easily recognized. Their patches of bright colors, their sharp, clear notes and their noisy ways soon attract our attention. Hear them *tap, tap, tap,* as they bore for larvae. Not all birds seen on the trunks of trees are woodpeckers. Nuthatches and the tiny kinglets also search for insects on the bark of trees. But they don't "sit upon their tails" like the woodpeckers. In the colors and styles of their dresses woodpeckers show a family likeness. Usually there is much black and white, with dashes of scarlet or yellow about the head. These patches of bright colors may be of different shapes and in different positions, upon the crown, nape or throat, or in stripes down the sides of the head and neck. The females and young birds usually lack the bright markings of the males.



The California woodpecker, the "carpenter" of the West.

Mary V. Hood from National Audubon Society

The California woodpecker is a true bird of the West. It is at home in the mountain ranges in Mexico and northward into Washington. It need not worry about food even when snow lies deep among the conifers of the uplands, because during the fall it provides for winter. It is known among the Mexicans as *El Carpintero,* "the carpenter." Carpentering is both its profession and its recreation. In autumn, when acorns are plentiful, holes are dug in the trunks of trees, above the level where snow might drift; and with great patience and skill acorns are fitted into the holes. A whole tree may be covered with thousands of acorns bedded into the



National Audubon Society, by R. and H. D. Wheeler and Paul J. Fair

Above, the California quail; below, the blue grouse.

bark so tightly that other animals can not remove them. During the winter months the woodpeckers congregate and feed upon the insects that have developed in the acorns. The upper parts, wings and tail are glossy, greenish black; the rump and lower parts white; and the black breast streaked with white along the sides. The crown of the adult male is crimson.

Lewis' woodpecker is of historic interest because it was one of the birds collected by the Lewis and Clark Expedition to the Northwest. It is a dark-colored bird, about eleven inches long; with underparts pinkish red; hoary gray chest and collar; and forehead, cheeks and chin of crimson. Males and females are colored alike. This woodpecker has the peculiar habit of fluttering erratically in the air while in flight. Probably it is catching flies. The range of this bird is along the Pacific coast and eastward to the Rocky Mountains from Arizona to British Columbia.

The northern pileated woodpecker is a shy but spirited woodland bird found in the remote timbered regions of the Rocky Mountains and westward to the coast. This all-year resident is of great economic importance on account of the millions of wood-boring insects it destroys every year. The pileated woodpecker is the largest of woodpeckers. The body is blackish slate; the throat is white, with a white stripe across the cheek and down the neck; and the whole top of the head in the male is a brilliant scarlet. Both sexes have the scarlet crest, or red cap, that gives the bird the name of "pileated."

The northern hairy woodpecker has upper parts of glossy black, with a broad white stripe down the back; wings thickly spotted with white; white underparts; and tail with the three outer pairs of tail feathers white. There are two white and two black stripes on the sides of the head, and the adult male has a scarlet crown.

The Cabanis woodpecker and the Harris woodpecker are near relatives. The former has a very wide white stripe down the back, and the latter has dirty-white or sooty underparts with a few spots on the wings. These medium-sized woodpeckers are found in timbered regions of the West, especially where the timber has been scorched by fire.

Gairdner's woodpecker is one of the smaller forms. The underparts are smoky white. It is more social than the other species, coming to orchards during the winter, when it destroys the codling moth, plant lice and other harmful orchard insects.

The flicker has many names—about thirty-six in all. Some of the names are: yellowhammer, high-hole or golden-winged woodpecker. The red-shafted flicker is the western form of the golden-winged woodpecker so common in eastern America. It is common in many parts of the West, where it often remains all the year. The back and wings are brownish gray, barred with black; the underparts brownish yellow, spotted with black from the breast downward; the rump white; and the tail and wings red beneath. The adult male has red jaw patches. The hammering of the flicker is a familiar sound. This bird clings to the tree by fastening its claws firmly in the bark and bracing itself with the stiff quills of its tail. It hammers on the bark in search of delicious ants,



M. H. Oldham from National Audubon Society

Though condemned as an impudent thief, Steller's jay delights the eye with rich deep blues and velvety black.

larvae and other insect pests. Near the foot of a tree one may see a pile of chips. Several feet above the ground there is a large round hole cut out of the trunk of the tree. The hole is the entrance to the flicker's nest. Five or six white eggs are laid on a bed of chips at the bottom of the deep cavity.

The red-breasted sapsucker is a small woodpecker celebrated for its interesting habit of cutting holes in trees during springtime. The sap flows out and hardens, and insects collect on the sticky paste. In this way sapsuckers secure food for themselves. They are occasionally destructive to apple trees, but ordinarily are found on the mountain ash, alders or other trees of the woods, where the injury they do is not of economic importance. The upper parts of the red-breasted sapsucker are black, mottled with white; and the underparts are whitish yellow. The head, neck and breast are uniform crimson. Adults of both sexes are colored alike. It is found near the Pacific coast, on both sides of the Cascades, but is ordinarily a summer resident north of California.

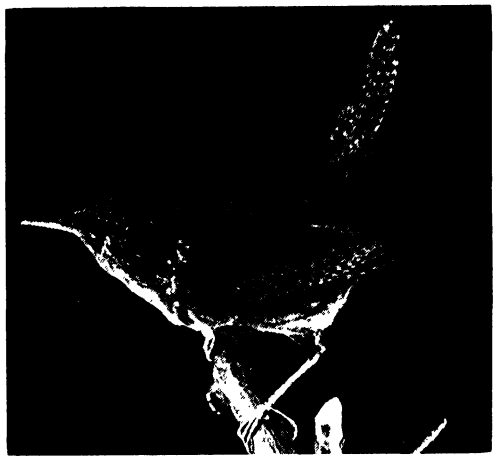
SOME GAME BIRDS THAT ARE FOUND IN THE WEST

The mountain partridge, or mountain quail, is a very common bird on the Pacific coast. It is readily recognized by the conspicuous crest, which points *backward*. In habits and flight this quail resembles other members of its family, but the cry is quite different. The call of alarm is a rather faint chirp. The hen has a cluck like that of the farmyard hen, when calling together her brood.

The valley quail of California, found along the Pacific coast region as far north as British Columbia, is distinguished by the crest plume, which, in this species, curls *forward*. On the belly there is an area of rich golden brown; the forehead is whitish with black lines; and the long feathers of the sides have sharp white stripes like those of the back.

The Oregon ruffed grouse is a true bird of the open woods. The colors are those of the brown leaves on the ground. This game bird is distinguished by the peculiar ruffs of feathers on the sides of the neck. It is called the "drummer" because the male bird produces a rapid beating noise with the wings against the sides of his body. This grouse differs from the eastern ruffed grouse only in the brighter red-brown tinge of the back.

The sooty, or blue, grouse is found in the



American Museum of Natural History
A "little spitfire," the western house wren.

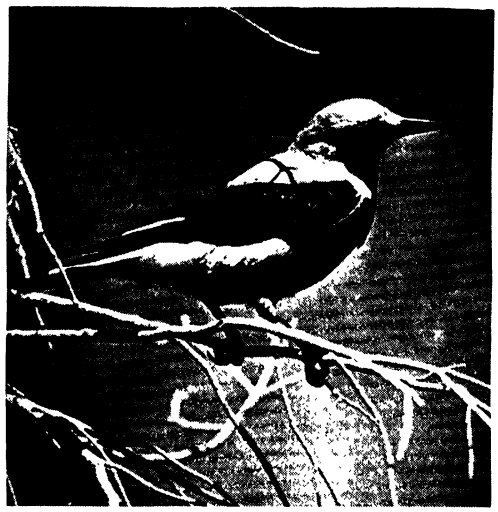
edge of timberland, and is commonly called the "hooter," from the owl-like tones that it utters. It is a bird as large as a hen, dull-colored and uninteresting in appearance. Above each eye is a featherless space, and on the neck of the male are two pouches of bare skin that become pinkish orange in spring when the boom, or hoot, of the bird is heard. During the act of booming, these pouches stand out like small oranges on each side of the head. "When he wishes to sound his mellow love call over the canyon, he takes a position on a limb fifty feet, or higher, from the ground, and, crouching low, with wings drooping and tail spread, fills his air sacks till they almost hide the head, opens his bill, and sounds a *poom-poom-poom-um-poom*—the love call to his mate."

The California jay is about the size of a robin. It has blue upper parts, changing to brownish gray on the back, and whitish underparts. The crown and sides of the head are uniform cobalt-blue. This jay is found in the lower altitudes of the Pacific coast district from California to British Columbia. While the jay has the reputation of wrecking the homes of other birds and feasting on their eggs, for the most part it lives on grains, fruits, grasshoppers and other insects. The piñon jay resembles the California jay, but has a much shorter tail.

Steller's jay is one of the large, dark-blue, spirited jays of the Pacific coast region. The head, neck and back are sooty black; the wings and tail are a rich blue; and the breast and rump a dull blue. Its call is a harsh *shaack, shaack, shaack*. Farmers condemn this alert, restless, saucy, inquisitive

bird. They claim that it destroys garden stuff such as cabbage leaves or sprouting corn.

The Oregon jay is known by many names —moosebird, whiskey jack, camp robber and others. It is found in woods on the Pacific coast. This jay is about the size of a robin. Upper parts are deep brownish gray; the underparts white, tinged with brownish shades. The nest, placed well up in a conifer, is a bulky structure made of twigs and lined with fine mosses and feathers. "There is a child-like insouciance about the way in which the bird annexes a piece of frizzled bacon, humbly intended for the man. 'Shoo,' did you say? 'Why, what do you mean? Can't I have it?' And the bird retires before a flying chip, baffled and injured by such a manifest token of ill breeding. He complains mildly to his fellows. They discuss the question in gentle *whews,* generously conclude you don't mean it and return unabashed to the quest."



Ralph A. Woolsey from National Audubon Society
Clark's nutcracker uses its bill like a crowbar.

The western meadowlark is a beautiful bird of the meadows, loved by all, even though to many it is but a voice. It is very much the color of the dead grass that covers the ground in spring. The brownish yellow dress is relieved by a throat and breast of brilliant yellow, set off by a large, black crescent-shaped collar and yellow cheeks. The nest is made of thick grass and weeds, in a slight depression overarched with dry grasses. The four to six white eggs are speckled or spotted with brown or purple. There are two broods each year, one in April and one in June. It is a little larger than the meadowlark of the East and a little duller in color.

THE WESTERN LARKS, WHICH KEEP THEIR KIN'S REPUTATION FOR SONG

The Columbian horned lark is a small sparrow-like bird that breeds from California well up into British Columbia and east to Idaho. It has a black crescent on the upper chest, and black cheek and crown patches, and feathertufts or horns directed backward. Its song is a little ditty of sprightly, pleasing notes. On a post, or in the free air above, at almost any hour of the day he may send words of cheer and greeting to the little wife sitting on the nest below.

The Pacific, or streaked, horned lark is very similar to the Columbian, but has the upper parts streaked broadly with black and tinged with buff. The adult male is handsomely marked. This small sparrow-like bird, with its black line across the breast and small black tufts on the side of the head, resembles the English skylark in its habit of singing while high in the air.

The western robin is similar to the eastern robin except for the paler cinnamon-rufous underparts, and the paler gray of the upper parts. The robin's coming is the sure sign of spring.

The mountain robin, or varied thrush, has a blackish collar, and wings with tawny markings. It is a resident of the forests and mountains from Alaska to California. This thrush loves rain. While the sun shines brightly it is silent; but let the raindrops filter through the conifers and the thrush wakes up, mounts to the top of a fir tree, and at intervals gives forth a single long-drawn tone of great beauty—a strange call that, in the silence of the forest, is mysterious and thrilling. The voice seems to come from the ground, now from a tree top, from the right and from the left, while the singer sits motionless all the while on a branch above.

The western hermit thrush, or mountain hermit, is a shy, gentle and unassuming bird of the forests, but its song, once heard, haunts the memory forever after. The russet-backed thrush is a shy, secluded bird found in low timber, especially near swampy places, on the Pacific coast. It is a uniform olive-brown above, with whitish underparts and heavy spotting on the chest. The sides of the throat and the entire chest have triangular marks of deep olive-brown. Unlike the hermit thrush, the russet-backed thrush is not much given to song, but occasionally

the woodside may ring with its *wee loo, weelo, weeloee.*

The western bluebird is found west of the Cascades, and less commonly eastward toward the Rocky Mountains. It is of sparrow size, with the head, neck and upper parts a rich blue that is brighter on the hind neck, rump and wings; the breast and sides are chestnut; and the underparts dull grayish blue. The adult female resembles the male, but is paler and duller. The nest of sticks and grasses lined with fine grasses, feathers and strings may be found in hollow trees, stumps, woodpecker holes, or in birdhouses. The four to six eggs are of uniform pale blue. The bluebird is liked for its beauty and gentle courtesy; but it does not sing. Bluebirds like human society, and they will respond quickly to the offer of birdhouses for their nests.

The mountain, or arctic, bluebird is a true bird of the West, and is a summer resident on the eastern slopes of the Cascades. The adult male in summer is "blue all over," with the rich cerulean blue of the upper parts shading to pale blue on the chest and underparts. The under tail feathers are whitish. The female is paler in color than the male. Like its brothers, the mountain bluebird readily accepts the invitation to use birdhouses. Bluebirds are of great value in destroying cutworms, and every effort should be made to attract them to the home grounds.

A female black-chinned humming-bird lacks the patch. Eliot Porter from National Audubon Society



The California thrasher is a dull grayish brown bird of the coast region. It is a great mimic, and is able to weave into its own songs the calls of many other birds. From the top of a high bush it shouts out *kick-it-now, kick-it-now; shut-up, shut-up; dor-o-thy, dor-o-thy; whoa-now, whoa-now;* and many other calls.

THE KINGLETS, THE "LITTLE KINGS" SPLASHED WITH GOLD AND RED AND ORANGE

Next to the humming-birds, the kinglets are our smallest birds. As the name suggests, they are "little kings." They wear their crowns at all times. One wears a crown of ruby red, and the other one of yellow gold. Kinglets are fluffy little things with grayish olive coats and whitish vests. They spend the summer in the high mountains, but during the spring and fall migrations they may spread out all over the wooded parts of the West.

The western golden-crowned kinglet has a crown patch of bright orange, with plain yellow feathers overlying the orange on the sides, which in turn are bordered by black in front and on the sides. The nest, made of mosses, lichens and fine grasses, is attached to the underside of a fir bough near its tip, about five feet from the ground. The five to nine eggs are dull white, finely sprinkled with brown. While the mother bird is sitting on the eggs the male tends her faithfully, but spends much of his time making decoy nests in the near-by trees.

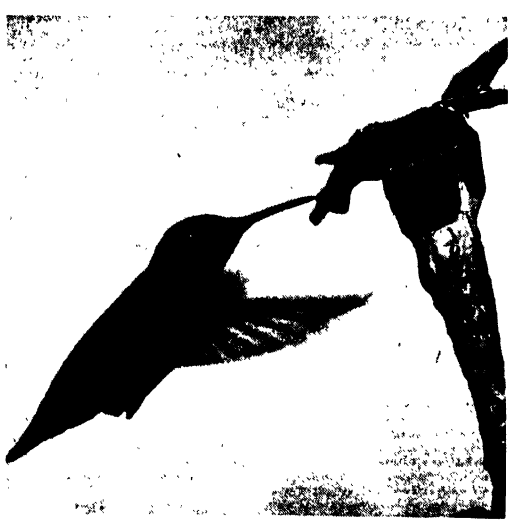
The ruby-crowned kinglet has a distinctive scarlet crest. He is a plump little fellow. The upper parts are olive green, and the lower parts yellowish white. On top of the head is a narrow stripe of bright ruby color. We see these little birds flitting about the branches of trees picking out small insects and insect eggs and eating them. They are nervous and vivacious as they flit from limb to limb, moving their wings too quickly to be seen and frequently uttering a titter of alarm, which sounds like *chit-tit* or *chit-it-it.*

The Oregon, or black-capped, chickadee is similar to the black-capped chickadee of eastern North America, except for the smaller size and the much darker coloration. The top of the head is shining black, the throat dead black, with a white band on the side of the head and neck. The breast and belly are white. Males and females are colored alike. The nest, made of moss and grasses and lined

with rabbits' fur, wool and feathers, is placed low in a hole of a stump or tree. The five to eight tiny white eggs are sparingly marked with brown spots. Chickadees take their name from the familiar call, *chick-a-dee-dee-dee*. There are other cries. The most musical one is a clear, sweet whistle or two or three tones with a minor interval between them. The *swee-tee* cry is the quickest call in the bird world. When annoyed, the chickadee may fly near the intruder, scolding *dee-dee-dee*. The chickadee plays blindman's buff, hide-and-seek and tag among the tree branches, looking all the while with keen eyes for juicy insects or eggs in the cones and catkins. On the coldest day it is active in search of food.

The chestnut-backed chickadee resembles the Oregon chickadee in general, but has more chestnut color on the back. Both are of great value because of the large number of insects they eat. They wage war on beetles and nits as they peer into every crevice of bark and cone.

The nuthatches are friends of kinglets, chickadees and tits. One hears a fine-drawn, high-pitched piping sound—a *tay, tay, tay*. It is the call of the red-breasted nuthatch, also found in the East. This is a medium-sized bird, black and grayish blue above, with strong markings of reddish color on the breast and a black line through the eye. The underparts are bluish gray. As a nuthatch runs up and down a tree in spirals it stops a moment to look at you, and then goes on its tireless search for insect eggs.



Lewis Wayne Walker from National Audubon Society

Allen's humming-bird, a flash of red and green.

The slender-billed nuthatch does not have the black eye line. The bill is long and slender and slightly curved. This species is of rare occurrence west of the Cascades, and is found chiefly in wooded regions on the edges of desert land.

The pigmy nuthatch is a bird of the mountains remote from dwellings. The pine tree is its home. These birds are very sociable and are usually seen in a flock on one tree. With its tiny beak this Lilliputian chisels out a hole in the dead portion of a pine tree, from four to twelve inches deep, with an entrance about one inch in diameter. The nest is made of soft fibers, fur, hair and feathers.

A BIRD THAT WOULD RATHER CLIMB THAN FLY, THE CALIFORNIA CREEPER

The California, or tawny, creeper is another tree bird resembling the woodpeckers in its climbing habits, but in no way related to them. It has the peculiar habit of climbing from the bottom of a tree up the bark until the branches are reached, when it suddenly drops to the bottom of another tree and begins another climb. The upper parts are rusty brown, broadly and loosely streaked with ashy white; the underparts are dirty white, tinged on the sides with buff. The nest of twigs and moss, lined with plant down, is crowded beneath a warping piece of bark on a conifer. The creeper is a fine example of protective coloration. If it were not for its movements, its presence on the side of a tree would be hard to detect, the color is so like that of the brown bark. But the faint metallic squeak attracts attention. Hark! *Tew, tewy, tewy, ping, tewy;* and again, *ke-kus, wit-it, tee-swee*. The ordinary work call is a faint *tsip*.

Bush tits are tiny birds, brownish in color, with light gray underparts and a conspicuous brownish cap. The nest of the bush tit is a hanging pouch from six to twelve inches long and three or four inches in diameter, with a small entrance hole in the side near the top. It is made of mosses and plant down bound together with cobwebs, with a lining of fur, down and feathers, and an outer covering of lichens.

With a *chick-chick, chick-chick, chick,* the western winter wren bobs about among the bushes. It is a tiny bird, dark brown above and lighter below, and more or less speckled and barred all over. The song is very attractive to bird-lovers in the West.

The rock wren has dull grayish brown upper parts, a finely streaked breast and whitish underparts. The slender bill is as

long as the head. The point of the bill curves downward. This little bird loves the rocks or the arid regions.

The tule wren lives in the marshes, among the tules (rushes), where it builds its nest a foot from the water. The nest is a bulky affair made of water-soaked pieces of rushes



Ruth and H. D. Wheeler from National Audubon Society
A female Bullock's oriole, ashy tinged with yellow.

which become very hard when dry. The Seattle wren is a large wren with strongly contrasting black and white bars on the tail, and a light line over the eye. It is found around dwellings, but is known from the western house wren by its whiter underparts, smaller size and more deliberate movements. It is very attractive because of its vigorous clear-cut song. The nest, made of grasses, wool, hair and feathers, is placed in a stump, brush heap, a deserted woodpecker hole, or in a birdhouse.

The western house wren is larger than the winter wren. It is common around buildings and readily uses a birdhouse. The male is an untiring songster. House wrens are little spitfires during the nesting season. They scold and assault one and all who dare approach their nests. The wren-tit is a little brown bird with bright yellow eyes and a long tail which flits up and down as the bird flies. The song has many variations, but is usually a clear descending *keep-keep-keep-keep-keep-it, keep-it, keep-it.*

The northern raven is about twice the size of a crow. It is shining black all over, and has a long, rounded tail. The raven is a bird of the wilderness, where its harsh, croaking cries resound in the still air. Like other members of the crow family, it is cunning, quick-sighted and bold. Ravens eat insects, worms and frogs, and sometimes devour the eggs and young of other birds. When very hungry they may attack rabbits and young lambs. The nest, made of sticks, lined with grass, wool and hair, is placed high in an evergreen tree or upon a cliff. The young are fed on stolen eggs.

The western, or California, crow is found along streams and in settled portions of the country from the Rocky Mountains to the Pacific coast. It has beautiful glossy black plumage reflecting greenish and purplish tints. The bill and feet are black. The northwest crow, a smaller form found chiefly near the coast, has the peculiar habit of carrying clams high in the air and then dropping them on the rocks, thus obtaining the juicy meat within.

Brewer's blackbird ranges from the plains to the Pacific Ocean. The male is glossy blue-black with a whitish eye; the female is dull black in color. This is a bird of the country, or the city backyard.

The yellow-headed blackbird, a summer resident of the Columbia River valley, has an orange-yellow head, neck and breast. Its cry sounds like yodeling.

The northwestern red-winged blackbird is a bird of the swamps. The scarlet patch on the wing of the male is interesting and attractive. The female is a mottled and streaked brownish gray in color. The nest is hung between reeds or in the branches of a low bush near the water. It is a comfortable bag-like affair deep enough and big enough to hold the restless bird-babies. When the mother redwing is sitting on the nest her mate stays near. From an uplifted branch he sings a loud sweet *hiva-ker-ee* which may be heard a long way off. He is very nervous and uneasy and makes a great row if anyone comes near, with such cries of distress that one would think he was hurt or that his nestlings were being stolen.

MAGPIES, CUNNING ROBBERS AND NOISY "TALKERS"

The magpie is a medium-sized, long-tailed representative of the crow tribe. The male is lustrous black above, except for a long patch of white on the wing, and pure white on the lower breast, flanks and sides. The nest is as big as a bushel basket. It is

made of interlaced sticks stuck together with mud, and carefully lined for half its depth with small sticks and fine rootlets. The nest may contain from seven to ten pale grayish green spotted eggs. The magpie is a bold and cunning thief. He robs the nests of other birds and carries away eggs and young birds. Magpies are noisy, vivacious fellows, ending their "speeches" in riotous laughter. Some magpies can be taught to talk.

The cowbird, or cow blackbird, is found in all parts of the country from the Atlantic to the Pacific. It is one of the smaller blackbirds, and may be seen in pastures with cows. The male has a shiny black body and a brown head; the female is rather dingy in appearance. This blackbird has a habit of laying its eggs by stealth in the nests of various other birds that lay small eggs. The larger egg of the cowbird receives a greater share of warmth during incubation and hatches sooner, and the lusty young cowbird soon asserts its leadership in the nest. The foster mother, whether through ignorance or fear, gives more attention to the care of the foundling, even to the neglect of her own young.

Clark's nutcracker is another relative of the crow tribe, found in the high mountains of the West. The plumage of the adults is smoky gray becoming dirty white on the head. The wings and tail are contrasting black and white colors. It was named in honor of Lieutenant Clark, of the Lewis and Clark Expedition. The nutcracker receives its name because it uses its strong bill like a crowbar, to pry open the scales of cones to obtain the seeds within. The cone is held firmly with the powerful claws of one foot, and the other foot supports the bird while the seeds are gouged out from under the scales.

TIRELESS SINGERS OF SPRING, THE QUIET-COLORED VIREOS

The vireos are small, inconspicuous, quiet-colored birds that appear in the spring. They are tireless singers, and during the nesting season may be heard at any time of the day. Their long slender bills are well adapted to holding worms. They build curious hanging nests of pieces of bark and fibers, lined with down and attached to the forking twigs near the end of a bough.

The red-eyed vireo, also common in the East, is the largest of the vireos and is distinguished by the white line over the eye and by the red iris. The Cassin vireo has a grayish head, an olive-green back, whitish underparts and a whitish eye ring. It is seen most often during migrations in lower altitudes, but is a common summer resident on both sides of the Cascades.

The western warbling vireo is one of the most common species remaining during the summer at low levels. It is very plainly colored, with no distinguishing marks; but there is little need for showy dress. It remains, for the most part, concealed in dense foliage, and pours forth a continuous song of flute-like, tender and melodious tones.

The Hutton vireo is common in California. The upper parts are dull olive-brown, tinged with green on the rump, wings and tail; the underparts are a dingy color, tinged on the sides with yellow. The nest, which is made of fine mosses, is hung in a scrub oak among the hanging mosses that cover the tree.

FLYCATCHERS, WHICH SNAP UP THEIR INSECT FOOD ON THE WING

Say's pewee, or Say's phoebe, is one of the first flycatchers to arrive in the spring, east of the Cascades. The colors are drab above and cinnamon below. The song is of a melancholy nature. The black phoebe, which is black all over except for a white belly, is one of the most attractive of the flycatchers. As it sits watching for insects, the tail and wings quiver; then it darts out, snaps up an insect and returns to its perch. The notes are a rising *kee-ree* and a falling *kee-wray*.

The western wood pewee is a summer bird of the orchards. The upper parts are dark, appearing black, and the underparts white or yellowish white. As we watch one of these birds sitting on a post or tree stump, it cocks its head, makes a sudden dart for an insect, and then returns to the perch, and, as if from some sudden impulse, utters a rather plaintive sound, *pueer* or *tweer*.

The olive-sided flycatcher has upper parts of brownish slate, a whitish throat and belly, and heavily shaded sides. It is a bird of the tree tops which tells you where it is by shouting *"see here."* It is easily alarmed in the presence of strangers, and moves about with a restless cry.

Trail's flycatcher is one of the smaller flycatchers, and is usually found in swampy places. It is of olive color, and utters a smart *swit-choo* when disturbed. The nest is very interesting. It is a bulky structure of grass and rootlets, carefully lined with fine grasses and placed in a tree a few feet from the ground. The loose, ragged ends of grass hanging from the nest serve to distinguish

MORE INTERESTING WESTERN BIRDS



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1. Lazuli Bunting. 2. Green-backed Goldfinch. 3. Lewis' Woodpecker. 4. Townsend's Warbler. 5. Chestnut-backed Chickadee. 6. Bush Tit. 7. California Woodpecker. 8. W. Evening Grosbeak. 9. Seattle Wren. 10. Oregon Junco. 11. Spurred Towhee. 12. California Jay.

it from the nest of the wood pewee, whose nest is very neatly and compactly built.

The western flycatcher is one of the commonest flycatchers; and its recognition marks are the pervading yellowness, the bend of the wing being sulfur-yellow. The call is a soft *piswit*. The nest is a cup-shaped structure, covered with mosses and lined with hair and feathers, and placed in the niche of a cliff, in a mossy bank or on a stump.

Humming-birds are found only in America. They are tiny birds whose plumage shows brilliant metallic luster and various bright colors. They dart about in rapid flight, now pausing to thrust the long slender bill into a flower in search of insects, now sucking the nectar from the depths of another flower. Many persons imagine humming-birds live on the wing, and it is true that they are seldom seen sitting; but, as a matter of fact, they spend only a small part of their time on the wing. They are so tiny that they are seldom noticed except when the hum of wings attracts attention. It is a pretty sight to see a humming-bird hovering before a blossom, the wings vibrating so fast that they look like a mist, and probing the flower with quick, eager thrusts. In a moment it is gone like a flash. The tiny nest is built of fine mosses bound together with cobwebs and ornamented with lichens in imitation of the tree limb on which it is placed. It contains two tiny pure white eggs.

The rufous hummer is distinguished by its bright rufous or cinnamon-red colors, which change to bronzy green on the crown and face, and to white on the belly. It is a common summer resident on the western slopes of the Cascades.

The calliope hummer is a summer resident east of the Cascades. It is the smallest of the northern species and is recognized by the rose-purple hue of the radiating feathers of the male's gorget. The upper parts are golden green, and the sides of the throat and the underparts are white, washed with greenish and brownish shades on the sides.

The black-chinned, which has a distinctive black gorget, and Allen's humming-bird, with a fiery gorget and a green back, are other western species.

The western tanager is one of the most attractive birds of the West. Sometimes during migrations it wanders eastward as far as New England. The male is mostly bright yellow, with a brilliant red head and black wings and tail. The female is olive-green in color. The song is comparable to that of the robin, but is uttered at intervals rather than continuously sustained. There is also a chattering call that suggests the scold of the oriole. Tanagers are expert flycatchers and are very fond of caterpillars. The nest, made of twigs and mosses and lined with rootlets and hairs, is placed on the horizontal branches of a tree from fifteen to twenty feet from the ground. This tanager was one of the birds collected by the Lewis and Clark Expedition.

Bullock's oriole is related to the beautiful



E. R. Warren from National Audubon Society



Alfred M. Bailey from National Audubon Society

Left, the vivid turquoise lazuli bunting, a merry singer; right, Nutall's white-crowned sparrow.



Eliot Porter from National Audubon Society

The long-tailed chat, one of the warblers, whose lovely song is heard, unexpectedly, during the night.

Baltimore oriole of eastern North America. The male is recognized by the black, orange and white plumage; the female is ashy or drab, with yellow tail, and underparts more or less tinged with chrome yellow. The purse-shaped nest, a marvel of skill and industry, is made of interwoven grasses, fibers and strings. It is from five to nine inches deep, and hung by the rim and fastened to the sides of a limb from ten to forty feet from the ground. The lining is of wool and down. The three to six eggs are bluish white, marked with irregular lines around the larger end. While it is true that orioles eat some early cherries and berries, no farmer should begrudge them these, because the chief food of orioles is insects and caterpillars.

The grosbeaks are about the size of robins, and have very large conical beaks. They live in trees, and are noted for their bright colors and fine songs. The western evening grosbeak has a black crown, yellow forehead, black wings with large white patches, a black tail, and the remaining plumage sooty olive-brown. It ranges through the western states from Mexico north into British Columbia. The writer has seen great flocks of these attractive birds as far east as Montreal. They came in early spring and fed on the fruits of the mountain ash and the box elder. The call consists of pure, subdued tones, harsh rattles, high-pitched shrieks and alarm notes. The grosbeak is one of the few American birds that will eat potato beetles.

The Alaskan pine grosbeak, which is a large and handsome finch with rosy red and gray colors and a large, rounded conical beak, breeds in the interior of Alaska, but comes south in winter to British Columbia, Washington and Montana.

The mourning dove is a small member of the dove family, easily recognized by the long pointed tail, the outer feathers of which are snow white. It is of great value because it lives chiefly on weed seeds. The mournful cooing is the love song of the bird.

The beautiful passenger pigeon, once so common in America, is now extinct—a victim of the so-called sporting tendencies of human beings; but the band-tailed pigeon, which is closely related, is somewhat common on the Pacific coast.

The western goldfinch, or "wild canary," is a summer resident and sometimes a roving winter resident of the West. The male is a beautiful clear canary-yellow, with a black crown patch and with some patches of white on the black wings and tail. The female is grayish brown or olive color with buffy or yellowish underparts. Other striking features of this finch are the canary-like song and the undulating flight. It is often called the thistle-bird because it is so fond of thistle seeds. The nest is a lovely structure of fibers and grasses lined with down. It is built in an upright crotch of a tree or bush. If the young fledglings are placed in a cage when ready to fly, the mother bird will feed them until they can eat seed, and she will even enter a room to do so. The writer kept one for eleven years; then it died of old age. In the springtime this captive would put on a new dress of yellow and black and would sing from morning till night. The fact that finches are seed-eating birds makes it possible to keep them in captivity.

The green-backed goldfinch is rather inconspicuous, but displays light patches on

the wings while fluttering through the air. It is found in valleys along the Pacific coast.

The house finch has brownish upper parts; a whitish belly, closely streaked with brown; rosy red forehead and rump; and a reddish throat and breast. This pretty finch is a familiar bird of the West, from Kansas to the Pacific Ocean. It nests in vines about houses. The male bubbles over with song as he goes a-courting. From morning till night, on the wing or off, he sings a bright, cheery song to his demure little mate.

MELLOW MUSICAL YODELING, THE COURTING SONG OF THE CALIFORNIA PURPLE FINCH

The California purple finch ranges from California to British Columbia. It is a sturdy finch, of small size, covered all over with rich crimson or rosy red plumage, which is brightest on the crown. The female is streaked dusky olive above, with whitish underparts streaked with olive. The spring song of this unobtrusive bird is a mellow musical yodeling. It has a wild quality that attracts. The tones are limpid and penetrating, and carry a great distance. During courtship, when he bows and dances before his lady, the finch's song is at its best. It is a medley of great expression and sweetness.

Cassin's purple finch is found west of the Rockies, where it appears during the spring and early summer months. At other times of the year it is likely to be found on the mountains. It responds readily to human attention and is attracted by sunflower plants. The red of the crown is more distinctive than in the California finch.

Two Arctic finches appear occasionally in winter south of British Columbia. The redpoll is a charming little finch with a deep crimson patch on the crown and a pinkish breast. Hepburn's rosy finch is very tame in winter and readily responds to food furnished it.

The lazuli bunting has beautiful bright turquoise-blue upper parts, a brownish breast and a white belly. It is related to the goldfinches, and is very conspicuous because of its colors. The song is bright and beautiful.

Crossbills are finch-like birds that can be recognized by the crossing of the upper and lower bill. This adaptation is of help in picking out seeds from pine cones. The legend is that these birds tried to pull the nails from the Cross, and, in doing so, twisted their bills in such a way that wherever they go they will always bear the symbol of their merciful but unavailing efforts.

The red crossbill, which is irregularly distributed throughout the West, is a bird of the North. The male is red and the female olive-green. While feeding, crossbills give an intermittent cry, or excited titter, which sounds like *tew, tew, tew.*

Warblers are very small active birds which flit about the trees and undergrowth after insects. They have all the colors of the rainbow in bewildering combinations, which differ with age and sex. They are most readily studied during the spring migration, when they visit sunny slopes, orchards and the edges of woods.

The most sociable and best known of the warblers is the yellow warbler, which is yellow, with brownish stripes on the breast of the male. It is seen in parks and on lawns, where its compact cup-shaped nest of plant fibers lined with feathers and down is placed in bushes or trees.

The golden warbler is yellow with a black cap. The male of the Pacific yellow-throated warbler has a black mask through the eye. It is seen around swamps.

The black-throated gray warbler has distinctive black and white and blue-gray coloration; the head, throat and chest are black, with broad white stripes; the underparts are white; and the sides are white, streaked with black. The song is a simple warbler lay which sounds like *zee-ee, zee-ee, ze, ze, ze.*

WARBLERS, A COMBINATION OF BUBBLING SONG AND VIVID PATCHES OF COLOR

The Macgillivray warbler is yellow, with the forehead and neck slate-colored. The lutescent warbler is a small greenish yellow species resembling the yellow warbler in general color, but lacking the brown stripes on the breast. The beautiful Audubon warbler, the most abundant western warbler, was named after the great bird artist, Audubon. It has yellow on the crown, throat, sides of breast, and rump. Townsend's warbler is beautifully marked with orange and black. It is a common migrant in spring. The long-tailed chat sings during the night.

Swallows are small, nearly songless birds with long pointed wings, small bills and big mouths. When they are not sailing through the air they may be seen perched on telegraph wires, fences and barns. When flying they look black and white; when closer at hand they show glossy dark blue or green backs, and whitish or brownish breasts.

The violet-green swallow is white below,

but has a white line passing over the eye from behind and two conspicuous white spots on each side of the rump. The back is a beautiful violet-green color. This is a distinctive western swallow. It is very common in the region from Alaska to Arizona.

The western purple martin is one of the largest swallows, with upper parts a rich glossy purplish black, and wing and tail dull black. It will build a nest of leaves and trash in a birdhouse. Purple martins are sociable birds, and very talkative.

The western nighthawk is one of the last birds to arrive in spring. It is not a hawk, but more closely resembles the swifts. The upper parts are glossy black, mottled with gray; the belly is barred with black and white; and there is a white throat patch bordered below by a blackish chest patch. This bird is seen flying at twilight.

The sparrows are quite small, dull-plumaged birds with striped brown backs. They are much the color of the ground and bushes where they live. The western chipping sparrow is the smallest of the sparrows. It is of warbler size, and has a bright chestnut crown and light gray underparts. It frequently nests in the vines about houses and is very sociable in every way. The nest is made of rootlets and grasses heavily lined with horsehairs. The greenish blue eggs are freely speckled with reddish brown near the larger end. The western vesper sparrow shows white outer tail feathers when flying. It is a fine singer of the fields and open sage. The western savanna sparrow, seen in low wet meadows, resembles the vesper sparrow but lacks the white outer tail feathers.

The rusty song sparrow is a common summer resident west of the Cascades. It is of rusty brown coloration, with heavily spotted underparts. It is a fine songster.

The golden-crowned sparrow is an attractive singer, and is distinguished from the other sparrows by the yellowish patch on the crown. Nutall's sparrow, one of the white-crowned sparrows, is found in bushy places near the coast. Gambel's sparrow, which is very similar, is found east of the Cascades.

The western lark sparrow is a large sparrow found in fields and brushy places. The head is variegated black, white and chestnut, and the fan-shaped tail is broadly tipped with white that is conspicuous in flight. The nest is made of grasses and rootlets, and is usually placed on the ground. The whitish eggs are spotted and scrawled in zigzags and scrolls of browns and purplish blacks.



C. Huber Watson from National Audubon Society

Though their crests look a bit bedraggled, these belted kingfishers are bold, dashing fellows and superb divers.

The Oregon towhee is a large finch-like bird found on the west side of the Cascades. The upper parts are mainly black, with inconspicuous white markings. The Oregon junco, or western snowbird, is seen during the winter and spring. It is of sparrow size, its black head and throat contrasting with the white breast. The white outer tail feathers show when it is flying. This bird is very sociable.

The belted kingfisher is one of the best known of the fish-catching birds. It patrols streams in search of food which is secured near the surface of the water. The kingfisher sits on a dead limb overhanging the water and for a few minutes intently scans the water beneath; then it drops like a stone, diving head first into the stream with a great splash. There is a struggle in the water, but in a few moments the bird rises to the limb with a squirming fish in its great bill.

The interesting nest of the kingfisher is made by burrowing in the bank of a river. At the end of a tunnel five or six feet long it hollows out a chamber and makes a nest of sticks, fish bones, bark and grass. The same nest may be used for several years. The kingfisher is larger than a robin. The back and tail are a pretty bluish gray, and there is a belt of the same color across the white breast. The wings and tail are speckled with white, and on the head there is a dark crest. The bill is large and heavy. The whole manner of the bird is bold and dashing. The cry is a shrill rattle. When the young are large enough to leave the nest they may be seen in a row on a limb where they are being taught the art of fishing.

FROSTY MORNINGS FIND THE WATER OUZEL SINGING FOR JOY

The water ouzel, or American dipper, is at home in a rushing torrent. The size is about that of a robin, but it looks smaller because of the very short tail. The adult is slate-colored all over. The young birds have the under feathers tipped with white, and usually a white throat. The wings of the ouzel are short and rounded, and the plumage is so soft and thick that it can go under water without getting wet. On cold mornings, when all other birds are shivering, the water ouzel is jolly and lively. It flies about in the snow, dives under the ice, comes out at an air hole, and sings joyfully. The nest, on a shelf of rock, is a hut-like structure made of soft green moss. On one side of the nest is a hole for a door. The eggs are pure white. Often the nest may be found near or under a waterfall. It seems a damp place indeed in which to hatch eggs and raise fledglings.

BIRDS OF PREY AND BIRDS OF THE NIGHT

Hawks are well fitted for their work as hunters. They have long wings by which they can fly swiftly; sharp, curved claws made for grasping and holding things; and a hooked beak well adapted to cutting and tearing flesh. The western red-tailed hawk is one of the largest of the hawks, easily recognized by the red tail.

Owls differ from other birds in having eyes that look forward, like ours. They have broad faces which look even wider because of the feathers that stand out around the eyes. Owls are birds of prey and hunt at night. Most American owls have a wide range. Some western owls are not found very far to the east, however.

The pigmy owl is very small, being rather smaller than a robin. It flies about and feeds in the bright sunshine, though it is more common in the evening. The short-eared owl has the same habits.

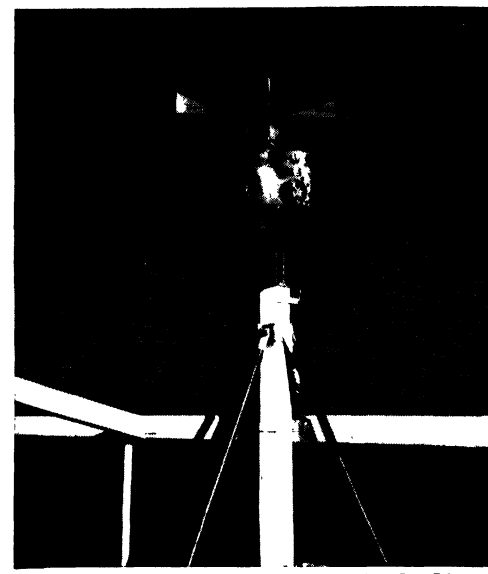
The burrowing owl is distinctly a western bird. It builds its nest at the end of an old burrow or a prairie dog or ground squirrel, or in a similar cavity. It lives on insects and small mammals. It is always bowing and turning from side to side, to greet you.

There are, besides native birds, those that have been introduced from other lands. A species introduced from China, the ring-necked pheasant, has become one of the best-known birds of the Pacific coast, being particularly abundant in California, Oregon and Washington, in the valleys west of the Cascades and in the irrigated districts east of the mountains. It is a frequent nester in vacant lots under weeds or brush piles. The young are able to care for themselves within a few hours after hatching out. The male pheasant is gay in variegated plumage, but the female and young are dull-colored in pale browns and blacks. The male is very noisy during the breeding season, making a peculiar cackling crow both day and night.

The ground cuckoo, or roadrunner, is, as its name implies, a member of the great cuckoo family. It lives on the foothills or in the desert, where the vegetation is cactus, sagebrush or yucca. If it is pursued it runs along the ground quickly and when about to be overtaken makes a quick jump aside into the brush. It is a shy and solitary bird.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 5225.

RADAR, MASTER DETECTIVE



Imperial Oil Limited

A "mirror" antenna mounted high on a ship. The antenna can rise or fall, and is rotated by a motor.

RADAR gets its name from the initials of four words that describe it: *ra*dio *de*tection *a*nd *r*anging. These four words tell us what radar is and what it does. A beam of radio waves is sent out to locate invisible objects. It travels away at the speed of light, but if any object stands in its path, it is reflected, or bounced, back to its source, somewhat as the sound of your voice bounces back if it strikes a cliff. It bounces back at light-speed, and hits a screen within a few millionths of a second after it started off. As one beam after another hits various parts of the object, and bounces back to the screen, we soon get a rough picture of the object on the screen. It is rough, but good enough for many purposes, as we shall soon explain.

The radar beams also tell us how far away the object is. How? We know that radio waves speed through the air at about 186,000 miles each second, as ordinary light-waves do. By using this known fact, we can see that a beam that took a whole second to return to our radar after being sent off into space must have hit some object 93,000 miles away. (Remember the beam must go twice the distance, that is, *to* the object and then *back* to the radar.) Of course we are most often interested in near-by objects —say 20 to 200 miles away. For these it takes only a few millionths of a second to form our usual radar pictures.

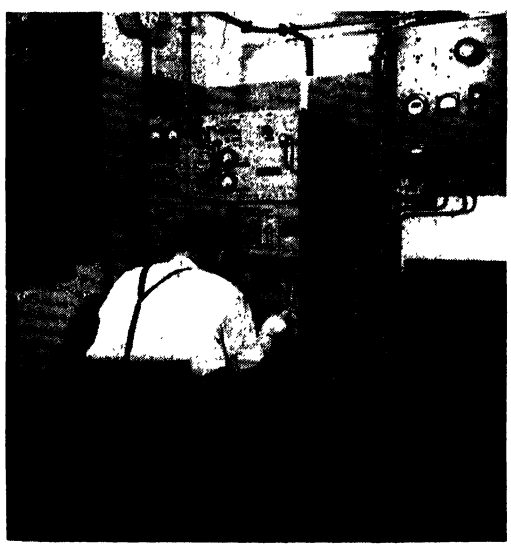
Now, if we know the direction of the beam and can measure the distance of the target from our radar set, we can locate the invisible object accurately. For this reason, the British name for radar is "radiolocation."

The outgoing beam is not a continuous one. The powerful transmitting part of the radar sends out every so often very short chunks of radio beams, known as pulses. The echo is received during the time between the end of one pulse and the beginning of the next. Usually each pulse is one or two millionths of a second in duration, and a few thousand are sent out each second, allowing each pulse-echo plenty of receiving time. The antenna, from which the radio waves are emitted, is rotated around and around, very slowly relative to the speed of the waves. From its position at each instant, the direction of any reflected wave is easily found. We see then that a radar does more than reveal the mere existence of an unseen object. It tells us the direction and the distance. If the object is a mountain and we are in a low-flying airplane it will tell us where not to fly. If we are in a ship at night, it can tell us an iceberg is a few miles away. It can pierce the thickest fog, so that the ship does not have to slow down as much as it would otherwise. The radar will tell the captain whether there is anything in his path, while it is still miles away. Radar is a magic eye that can help us to see through the heavy curtains that are wrapped around us by dark nights and heavy fogs. Before we tell in detail how radar works, let us give something of the history of this wonder child of electronics.

Like its big brother, radio, radar has come from the work of many engineers and scientists. Each part of it needed special research; and as is often the case in science, several groups worked on the same problem at the same time. Many of the pioneers in the early days of radio (including Hertz, the man who first showed the real existence

of radio waves) had discovered that those waves can be reflected by electrically conducting bodies. The great inventor of wireless communication, Marconi, had predicted that the interference with radio waves by ships or icebergs could be used to detect these objects at night or in fog. Also a strange layer in the atmosphere sixty miles above the earth had been found, a layer from which short radio waves bounce, or are reflected, back. The reflecting layer is named, after its discoverers, the Kennelly-Heaviside layer.

Actually, we should point to the first actual recognition of interfering objects by a radio method as the start of radar. This was achieved by Dr. A. H. Taylor and Mr. L. C. Young at the United States Naval Research Laboratory near Washington, D.C., in 1922. These men worked out a definite pattern so that they could tell when a ship passing on the Potomac River reflected the high-frequency radio waves they sent out. By 1939, the United States Navy had thoroughly developed sample radar sets for use on board ships; and, by co-operation with the Navy, the Army Signal Corps had developed aircraft-locating systems for use at short and long distances. Just before the war the United States used a small number of these radar sets to build a warning ring all around the coastline, and also at the Panama Canal and in Hawaii. Indeed, the Japanese planes that attacked Pearl Harbor on December 7, 1941, were discovered by radar when they were still 130 miles away. It was only due to unskilled use of this discovery that American forces on the Hawaiian Islands were so devastatingly surprised.



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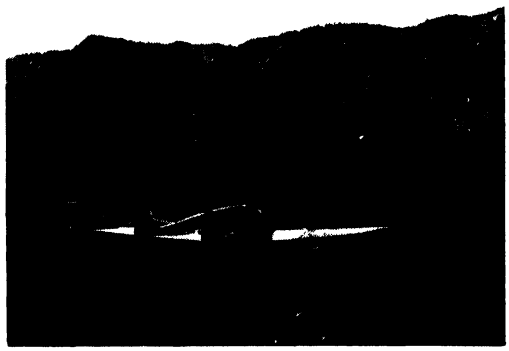
Radar installation in a ship's wheelhouse. The operator is watching the round screen, at lower right.

Radar played a most vital part in the early defense of England. Radio-locators (radars) warned of the approach and location of distant enemy planes. The British were able to cut down airplane-patrolling of their coasts, and to shift their meager forces quickly to the needed places. It has often been said that radar defeated Hitler's air force.

BRITAIN CONTRIBUTES THE MAGNETRON OSCILLATOR TO RADAR DEVELOPMENT

Even before Pearl Harbor, British-American collaboration was active. In 1940 a British mission brought to the United States news of their latest inventions for radar use. These included a new vacuum tube for generating radio waves of frequencies far above any of previous practical use. Very high frequencies are needed in radar, to get accurate directions. At the highest frequencies used, the radio waves are formed into narrow pencils that probe the sky. To do this with sufficient power to get a detectable reflection, new sources of power and new antennas were needed. These extremely high-frequency radio waves are only a few centimeters long. They are known as *microwaves*. Microwaves are important for another reason: the antennas used at lower frequencies were too bulky and heavy for airplanes to carry. Microwaves can be focused and emitted by chair-size equipment.

The new magical electron tube invented by the British was a magnetron oscillator. Such tubes are placed in a magnetic field. The magnetic field is like a merry-go-round for electrons, changing their paths into circles. The merry-go-round path is bigger or smaller according to the size of the field. These tubes were originally invented by Dr. A. W. Hull in the United States in 1921. Their use in microwaves in the high-power pulse radars was made possible by Professor M. L. E. Oliphant of the University of Birmingham, England. The microwave magnetron (sometimes called a cavity magnetron) uses a cylinder of copper, which encloses the cathode. In the thick copper walls are bored cylindrical cavities, spaced regularly around the cathode, and opened at the center so that the cathode can peek into each cavity. You know that electrons are emitted from the cathode when it is



Both photos, Hughes Aircraft Corp.

Above, a plane seems to be heading straight for a mountain and disaster. But radar gives warning in time; and, below, the plane flies over safely.



heated. In the magnetron, electrons whirl about on their magnetic merry-go-round and induce radio oscillations in the cavities. The frequency of these radio oscillations is determined by the size of the cavities.

These tubes are really little transmitting stations contained in a hollow copper shell. For example, they can take 100 kilowatts of power from a proper electrical source and deliver 60 kilowatts of microwave oscillation to the antenna in a millionth of a second. Magnetrons now work at many wave-lengths, from 1 to 15 centimeters, and at powers as high as a thousand kilowatts. (A thousand kilowatts is called a megawatt.) The cavity magnetron that gives high power at short wave-lengths opened a broad field for microwave radar. It made possible coastal defense, airborne gun control, accurate airplane-bombing through darkness and clouds, rapid identification of strange ships and planes, and other electronic wonders of detection, location and automatic control.

The entire American, British and Canadian radio industries were active in the development and production of radar for war. Improvements and new inventions came fast. As enemy countries developed radar, our scientists worked out anti-radar devices.

Radar helped to combat the German submarines that were sinking many Allied ships in the Atlantic. In order to destroy submarines one must detect them. Before radar entered the battle, submarines would rise to the surface at night in order to charge their batteries and get fresh air. They were unseen and therefore safe, except on the brightest moonlit nights. But nighttime is as clear as daytime to radar, and the introduction of this new weapon in 1941 was a great surprise to the Germans. Within a year, however, the German scientists had made a receiver that could pick up the radar beam as it swept the open seas. The enemy could then detect the signal before the radar receiver would "see" the submarine from its faint radar echo.

The Allied scientists then sent radar on a new frequency. By late 1942, a radar using the new magnetron and new methods of treating microwaves was being put into operation. The German receivers were able to detect only the low-frequency pulses of the earliest radar. They tried many devices, but not until late 1944 did they decide that they had better stay under the water all the time! But even the little breathing pipes that they made in order to bring air to vessels lying underseas could be detected by new Allied radar improvements. The war ended with German losses at one U-boat per day, a striking success for the never blinking eye of radar. Radar had other wartime uses, including accurate firing on targets, such as ships, that were too far away to be seen.

LORAN, RADAR'S COUSIN FOR LONG DISTANCES

You may wonder how the airplanes that bombed distant cities found their way to their targets. A close cousin of radar helped in this involved pathfinding. Known as loran (*lo*ng *ra*nge *n*avigation), the cousin is most useful in peace. Loran uses radar pulses but no echoes. Loran transmitters have been set up in many places all over the world, and they send out signals that form a delicate invisible "lace" coating over the earth's surface. Both airplanes and ships can take their bearings on these highly accurate loran signals as easily as on the stars—and much more often, for loran is

useful in any weather and all day and night. It operates at low frequencies. The high-frequency microwaves used in radar do not bounce from the Kennelly-Heaviside layer and hence are limited to the horizon. The low frequencies of loran bouncing down from the sky and rebouncing up again from the earth and down again, continue around the curve of the earth's surface for many hundreds of miles.

ALLIED SCIENTISTS TURN THE TABLES ON ENEMY RADAR

In the hard-fought scientific war one of the keenest battles was that against enemy radar. This was of immediate importance to every Allied airman who might be shot down by a radar-directed German gun.

The principle of our counter-measure device is very simple. A radar can be heard by other sets, and it, in turn, can receive signals of the proper frequency from sources other than itself. And a radar can introduce static into another receiver, or can jam another receiver with false information. Of course the static is not heard but, rather, "seen" on the screen. (This screen face of the tube is called a scope, or radar scope.)

Special receivers that could be tuned to a wide variety of frequencies were used to detect enemy radar signals. Then, not only the frequency but also the location of the enemy radar could be found by using his signals. Jamming of his receiver was accomplished in two ways, called electronic jam and aluminum jam! Electronic jam means the creation of noise in the enemy's receiver by sending out very irregular radio waves of his frequency. This electronic jam appears as a wavy field of grass growing all over the cathode-ray screen. The deeper the grass, the more the echoes are lost in it.

RECEPTION IS JAMMED WITH STRIPS OF TINFOIL

Aluminum jam consists of strips of tinfoil (which is made of aluminum, not tin), the kind that is used to wrap chewing gum. Such foil is an excellent reflector of radio waves. For example, a bundle of 6,000 strips, cut to the right size, and weighing only six ounces, looks like three heavy bombers when seen on a radar screen. The German gunners would fire at the aluminum strips instead of at the tiny planes that dropped them. At other times, the Allied planes dropped much larger amounts, forming a radar "smoke screen" behind which they could go and come as they pleased.



Wide World

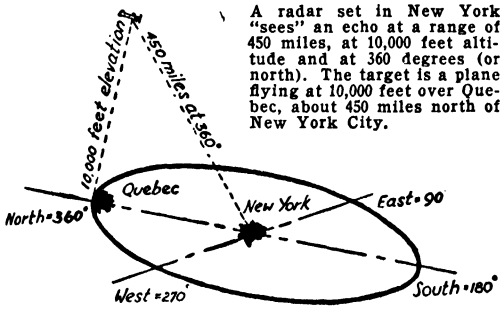
Aluminum "jam" (the streaks) confuses enemy radar.

Counter-radar required new electron tubes. The magnetron again played a big part, but the giant of the new tubes was one called the resnatron. It looks like a water hydrant and runs so hot that a small hydrant is needed to keep it sufficiently cool. It gives more than fifty kilowatts of steady and continuous radio power at a very high frequency (but not so high as microwaves). This one tube, the resnatron, generates as much power as the biggest radio-broadcasting stations did before the war. Truly, the German radars were drowned in jam!

Now let us see in more detail how radar works, how that tiny echo is made to show an immediate and accurate map of the surrounding hidden country. The microsecond chunk of electrical energy that is fed to the oscillator is furnished in very precisely timed form by a device called a modulator. We can say that the modulator delivers a burst of high voltage that turns on the oscillator for a fraction of a moment. Then the modulator turns off the oscillator and keeps it sleeping until just ready for the next burst.

The oscillator, as in any radio transmitter, is an electron tube with connected electrical fixtures. We have seen how vital the magnetron oscillator was to the victory of the Allied nations in the war. Radar can use other kinds of tubes as oscillators, if we are willing to sacrifice radar range and the ability to distinguish two close objects from each other. One special tube is called the lighthouse tube. It has a flat cathode, which is the base of the lighthouse, and a smaller

flat plate, which is the top floor of the lighthouse. In between is placed a wire mesh, which is the grid. Compared with ordinary radio tubes, in which the grid and plate surround a wire cathode, the lighthouse tube can have extremely small spacing between cathode and grid, and between grid and plate.



A radar set in New York "sees" an echo at a range of 450 miles, at 10,000 feet altitude and at 360 degrees (or north). The target is a plane flying at 10,000 feet over Quebec, about 450 miles north of New York City.

Sometimes the spaces are as little as a few thousandths of an inch, and the electrons can leap from the cathode across the plate in a very short time. Because of this, lighthouse tubes are useful at very high frequencies, though not as high usually as the microwave frequencies reached by radar magnetrons.

Another part of the radar is the antenna. In ordinary radio broadcasting, we use a simple antenna that sends out waves in all directions. But in radar, we want to shoot each pulse along a specific direction. Therefore, the radar antenna must be able to form all the microwave energy into a sharp beam. Also, as we saw before, the antenna must be movable so that the whole sky can be seen by this electronic eye. To make matters more complicated, the rolling of a ship or the dips and wobbles of the airplane on which our radar may be mounted must be accounted for, so that all the sky is really searched, not leaving out the tiniest bit. Sometimes the radar antennas are collections of little ordinary radio ones arranged to concentrate the radar energy in one direction at a time. More often the antenna uses a large electrical "mirror" that focuses into a pencil-like beam the radar energy spraying out from the antenna itself. This is like the mirror in an automobile headlight. The rotation of the antenna on its moving platform is really just like the airport beacons that go round and round, sending a beam of light all over the surrounding countryside in a continual sweep. Of course, radar antennas must do more than rotate round and round. They have to rise and fall, too, since they must cover the sky in all directions and at all heights.

Another part of radar that had to be invented by electron-tube scientists is called the transmit-receive box, or TR box. Remember that the radar must receive a reflected radio echo within a millionth of a second after a powerful chunk of energy has been sent out into space. It is most convenient when the same antenna can be used for reception as for transmission. If one antenna is used for both sending and receiving, it is in the correct position for reception when once the transmitted signal is sent. For this it is necessary to disconnect the receiver from the antenna while the great bursts of transmission energy are being fed into space. Otherwise, the supersensitive receiver would be burned out. Also, the transmitter must be disconnected when the received signal is coming in so that all of the echo can go to the receiver. The small volume tube called the TR box does this traffic policeman's job, and it does so in instantaneous responses to a message from police headquarters. In this case, headquarters is just the modulator. When high voltage is applied to the oscillator, the TR box conducts energy from oscillator to antenna; when high voltage is cut off, the TR no longer conducts, and the energy is compelled to take a side road that leads to the receiver.

AN OLD TRICK IS REVIVED, THE "CAT'S WHISKER" OF THE 1920'S

After the radar signal has come back to the radar, old and weakened, it travels through the TR into a series of elements that combine modern radio reception with a very old trick. It uses a crystal detector. You doubtless know that crystals were used in the early days of radio because of their simplicity (and because they were inexpensive). By scratching a sensitive spot on the skin of certain crystals, such as silicon, with a special contacting pin called a "cat's whisker," detectors are obtained that are better than electron tubes at microwave frequencies. The detected signal is amplified many times and changed into a new kind of signal, one that the human eye can understand.

You know that television pictures are reproduced on the flat surface of a long electron tube known as a cathode-ray tube. The rays of electrons that cause the picture to appear follow the same pattern as that picked up by the scanning camera in the

studio. This same device is used in radar, but in radar the moving rays of electrons follow the scanning pattern of the radar antenna!

Radar navigation systems are just as useful in peace as in war. They form a man-made earth-spanning set of lines of latitude and longitude, available to all who have a simple radar receiver tuned to the proper frequency. For safety's sake, radar will perform a thousand tasks. Radars can warn ships' captains of oncoming icebergs, or transport pilots of dangerous towering mountains. Radar can be a sky policeman, watching sky traffic at all heights as it enters and leaves a congested region near a big airport.

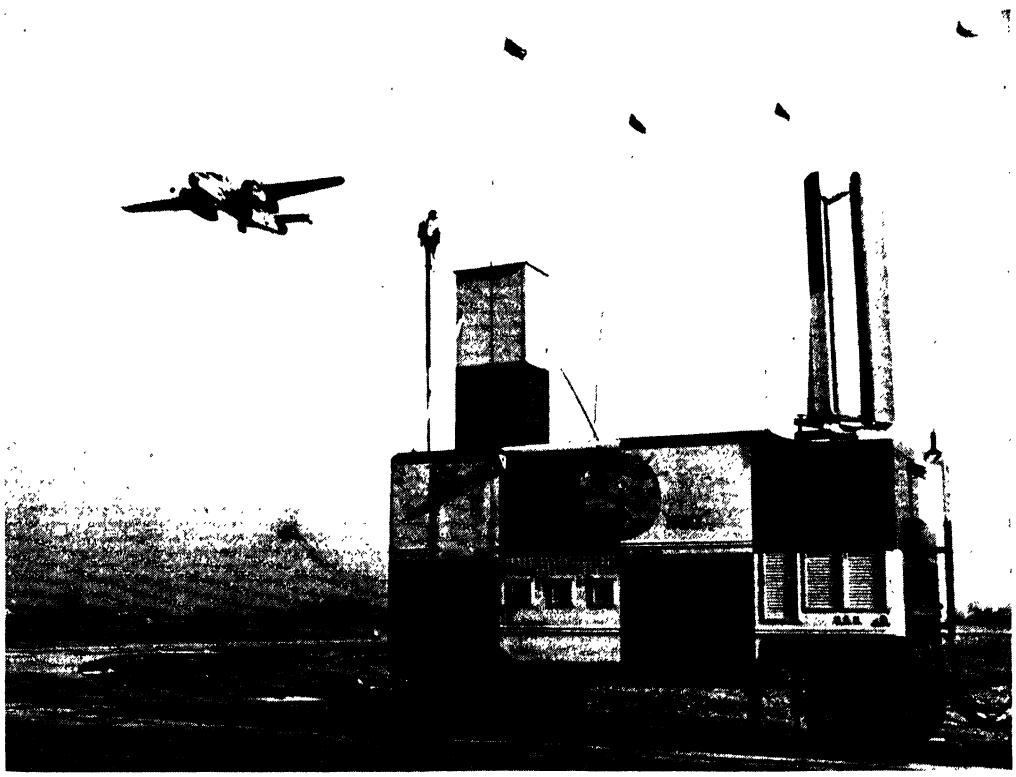
Another radar application is similar to navigation but it is for short ranges. With proper design, radar of this sort can take command of planes as they come in for landing. This is called GCA or Ground Control of Approach.

Radar combines with remote radio control to permit a home station to guide pilotless airplanes, rockets and boats. Wherever the robot craft go, radar will tell their location. This is useful for more than military purposes. It can make possible the use of supersonic rockets (supersonic means faster than the speed of sound) that will carry mail and freight across mountain ranges and oceans at these amazing speeds, without danger to a single human being.

In 1946 scientists sent radar impulses to the moon and they bounced back. This effort may prove to be the first in a series whose aim is the radar-directed use of rockets beyond the earth's atmosphere. These rockets would be especially great aids to astronomers and other scientists who want to know more about the universe.

Radar has advanced the art of electronics in many basic ways. It has opened up the new realm of microwaves, improved television's picture tube, produced powerful new oscillations, and stimulated the design of sensitive receivers. It will be influential in all future work in radio, television, navigation, meteorology, telephone and telegraph service, high-speed aircraft control, and national defense. *By* ROBERT S. COHEN.

THE NEXT STORY OF SCIENCE IS ON PAGE 5177.



Official U. S. Navy photo

A plane glides in to make a perfect landing, guided by Ground Control of Approach radar, housed in the trailer.

TOM BROWN'S SCHOOLDAYS

IN the royal county of Berks, and in that part of it known as the Vale of White Horse, lived Squire Brown, Justice of the Peace for the county. He was a man of strong democratic opinions, and had no prejudices against his fellow-men less blessed than he with worldly wealth.

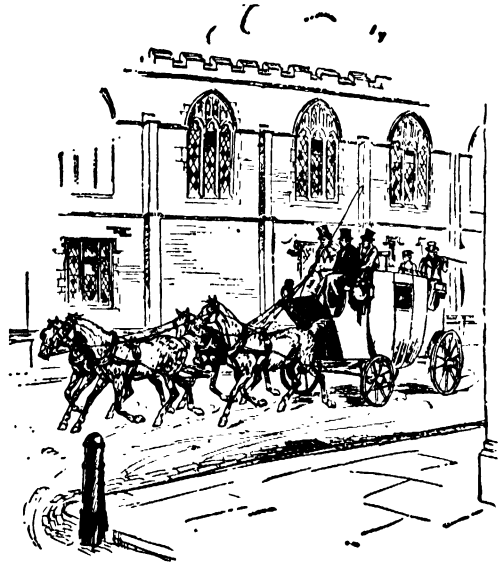
Tom's mother was a very practical country lady. Under the guidance of this alert and sensible woman Tom's character had been shaped in the right direction from his earliest years. His father believed in letting him mingle with the boys of the village, instead of keeping him aloof from them. The squire provided the village boys with a fine cricket pitch, and even supplied them with bats and balls. But Tom's devotion to the game led to his inducing his playmates to stay away from school and play cricket. The village schoolmaster had to complain of this to the squire. Perhaps it was in consequence that Tom was sent off to a private school at the age of nine.

His life at the private school was by no means a pleasant change to him. Tale-bearing, spying and all sorts of petty meanness were regular features of the place, much to Tom's disgust. He, however, imbibed a fair amount of Latin and Greek, but in the holidays was constantly wanting the squire to send him to a public school.

In the middle of his third half-year, in October, 183-, fever broke out in the village, and the boys were sent off at a day's notice to their respective homes. The squire decided to send Tom to the famous school at Rugby, where the headmaster had kindly agreed to let him enter at once for the last six weeks of the term.

Tom's father accompanied him into London to see him off in the tallyho coach for Rugby, and gave him, in his own blunt way, some good advice.

From the old guard of the tallyho Tom heard many tales of life at Rugby and of the pranks played there by the schoolboys. So eager was he to know of the new life into which he was to enter that he plied the guard with question after question. The old fellow not only brushed up his memory, but drew



Drawings by Edward J. Sullivan by permission of Messrs. Macmillan & Co. Ltd., London

The tallyho on the way to Rugby.

a little on his imagination, though all he said was accepted by Tom in perfect faith.

Tom had not time to alight from the coach, as it slowed down at Rugby, before one of the boys came running from the school and jumped up behind. This lad announced to Tom that his name was East, and his aunt, who lived down in Berkshire, had written to him to look out for young Tom Brown.

This was indeed a jolly reception for the lonely traveler. He and East were chums at once, for the lad was of a frank and friendly disposition, and introduced Tom to all his own particular friends forthwith.

Nothing could exceed the new boy's interest in all the features of the famous school. The study room, with its sporting pictures, its cricket bats, fishing-rods and climbing-irons, seemed to him more interesting than Windsor Castle itself. At the dinner table he was a little subdued. But to East's tales of the football field and its numerous accidents he listened as to the battle stories of a veteran. In the big room all the scholars now assembled to answer to their names, and it was with a thrill of pleasure that Tom first responded as a public-school boy.

Tom was in luck's way, for this day of his arrival was signalized by the School-house match, in which East counted himself a tremendous hero to be permitted to play on the School-house side.

TOM'S FIRST GREAT FOOTBALL MATCH, AND HOW HE ACQUITTED HIMSELF

It was indeed a great sight for Tom, this first football match on a grand scale in which he was to take his place. For the School-house team of some fifty boys had to meet and do battle with all the rest of the school.

Such excitement Tom had never witnessed. Nothing approaching the scrimmages had he ever imagined, and in this breathless match he was to have his share. For the ball rolled slowly in behind the School-house goal, not three yards in front of a dozen of the biggest School players-up.

There stood the School-house praeposter, safest of goal-keepers, and Tom Brown by his side. The blood of all the Browns was up. The two rushed in together, and threw themselves on the ball under the very feet of the advancing column. Over them toppled the leaders of the rush, shooting over the back of the praeposter, but falling flat on Tom and knocking all the wind out of his small carcass.

Tom soon recovered from his shock, entering with real zest into the life of the school. Over the fire the boys sat discussing the great match and other adventures of the football field until it was time to go to their rooms and wash up for the singing. Supper-time came in due course at seven o'clock. The meal consisted of bread and cheese and beer, which were all saved for "the singing." Directly afterward the fags went to work to prepare the hall. Each new boy of that term was placed on the table in turn and made to sing a solo, under the penalty of drinking a large mug of salt and water if he resisted or broke down. Tom sang an old West-country song, THE LEATHER BOTTÉL.

NEW FRIENDSHIPS AND WISE GUIDANCE IN THE FIRST TERM

Thus began Tom Brown's life at Rugby, and a more exciting day for his entrance there could not have been chosen. He shared the fun of it with the new boys who had been there from the beginning of the term. The sermon that he heard the doctor preach on the Sunday revealed to him the strong and noble character under whose guidance he had been placed. For every boy in the school was sooner or later bound to come into personal touch with the headmaster. Tom was installed in the third form, but, as he had already been well grounded in grammar, the master considered he had been placed too low. At the end of the term he won his remove to the lower fourth, where all his School-house friends were, so that his delight in being a Rugby boy was now supreme.

Flashman, a fifth-form scholar and a notorious bully, was so unfair and even brutal to the younger lads whom he made to fag for him that Tom and East, on whom the bully had also tried his work, decided to rebel. They maintained a steady opposition to Flashman and his friends.

RULES ARE BROKEN, BUT TOM MENDS HIS WAYS

The result of it was that Tom and East gained the reputation of shirking fag duty. Tom, having broken other rules of the school, particularly one as to fishing from a prohibited part of the river Avon, found himself before the headmaster and in danger of expulsion, unless he undertook to mend his ways. This he did, and was as good as his promise. On his return to school next term he was invited by the wife of the headmaster to take tea with her, and was told he was to have the Gray study, which was a favorite one. She asked him if he would take under his care a new pupil named George Arthur, who was in delicate health and had never before been away from home. Somewhat reluctantly Tom undertook this responsibility, as it would interfere with other private plans of his. Arthur proved a gentle young lad who, in the dormitory that night, unlike most of the boys, knelt by the side of his bed for prayers. He was jeered at in consequence by one of the others, who threw a slipper at him. Tom quickly met the situation by letting the boot he had just pulled off fly at the head of the bully.

"If any fellow wants the other boot," he exclaimed warmly, "he knows how to get it!"

The little scene had an influence on some of the boys in the room, and on Tom most of all. Next morning he began the day by silent prayer at his bedside. And there were others who followed his example.

Arthur was greatly interested in birds and animals, and soon made friends with Martin, one of the school's curious characters, who tamed snakes and kept birds in his study. Together they went exploring in the woods, and Tom had more than once to get them out of scrapes. It was over Arthur, too, that Tom had his last fight in the school, with a bully named Williams, who had promised to thrash little Arthur for some fancied insult. This fight was an epic one—right against might. A description of it we shall give in the words of the book.

THE GREAT FIGHT AT RUGBY

Tom was detained in school a few minutes after the rest, and on coming out into the quadrangle, the first thing he saw was a small ring of boys, applauding Williams, who was holding Arthur by the collar.

"There, you young sneak," said he, giving Arthur a cuff on the head with his other hand, "what made you say that"—

"Hullo!" said Tom, shouldering into the crowd, "you drop that, Williams; you shan't touch him."

"Who'll stop me?" said the Slogger, raising his hand again.

"I," said Tom; and suiting the action to the word, struck the arm which held Arthur's arm so sharply, that the Slogger dropped it with a start, and turned the full current of his wrath on Tom.

"Will you fight?"

"Yes, of course."

"Huzza, there's going to be a fight between Slogger Williams and Tom Brown!"

The news ran like wild-fire about, and many boys who were on their way to tea at their several houses turned back and sought the back of the chapel, where the fights came off.

"Just run and tell East to come and back me," said Tom to a small School-house boy, who was off like a rocket to Harrowell's, just stopping for a moment to poke his head into the School-house hall, where the lower boys were already at tea, and sing out, "Fight! Tom Brown and Slogger Williams."

Up start half the boys at once, leaving bread, eggs, butter, sprats, and all the rest to take care of themselves. The greater part of the remainder follow in a minute, after swallowing their tea, carrying their food in their hands to consume as they go. Three or four only remain, who steal the butter of the more impetuous, and make to themselves an unctuous feast.

In another minute East and Martin tear through the quadrangle carrying a sponge, and arrive at the scene of action just as the combatants are beginning to strip.

Tom felt he had got his work cut out for him, as he stripped off his jacket, waistcoat, and braces. East tied his handkerchief round his waist, rolled up his shirt-sleeves for him: "Now, old boy, don't you open your mouth to say a word, or try to help yourself a bit, we'll do all that; you keep all your breath and strength for the Slogger." Martin meanwhile folded the clothes, and put them under the chapel rails; and now Tom, with East to handle him and Martin to give him a knee, steps out on the turf, and is ready for all that may come; and here is the Slogger, too, all stripped, and thirsting for the fray.

It doesn't look a fair match at first glance: Williams is nearly two inches taller, and probably a long year older than his opponent, and he is very strongly made about the arms and shoulders; "peels well," as the little knot of big fifth-form boys, the amateurs, say; who stand outside the ring of little boys, looking complacently on, but taking no active part in the proceedings. But down below he is not so good by any means: no spring from the loins, and feeblish, not to say shipwrecky, about the knees. Tom, on the contrary, though not half so strong in the arms, is good all over, straight, hard, and springy from neck to ankle, better perhaps in his legs than anywhere. Besides, you can see by the clear white of his eye and fresh



Tom fights it out with a school bully, Williams.

bright look of his skin, that he is in tip-top training, able to do all he knows; while the Slogger looks rather sodden, as if he didn't take much exercise and ate too much tuck. The time-keeper is chosen, a large ring made, and the two stand up opposite one another for a moment, giving us time just to make our little observations.

"If Tom'll only condescend to fight with his head and heels," as East mutters to Martin, "we shall do."

But seemingly he won't, for there he goes in, making play with both hands. Hard

all, is the word; the two stand to one another like men; rally follows rally in quick succession; each fighting as if he thought to finish the whole thing out of hand. "Can't last at this rate," say the knowing ones, while the partisans of each make the air ring with their shouts and counter-shouts of encouragement.

"Take it easy, take it easy—keep away, let him come after you," implores East, as he wipes Tom's face after the first round with wet sponge, while he sits back on Martin's knee, supported by the Madman's long arms, which tremble a little from excitement.

"Time's up," calls the time-keeper.

"There he goes again, hang it all!" growls East as his man is at it again as hard as ever. A very severe round follows, in which Tom gets out and out the worst of it, and is at last hit clean off his legs, and deposited on the grass by a right-hander from the Slogger.

Loud shouts rise from the boys of Slogger's house, and the School-house are silent and vicious, ready to pick quarrels anywhere.

"Two to one in half-crowns on the big 'un," says Rattle, one of the amateurs, a tall fellow, in thunder-and-lightning waistcoat, and puffy, good-natured face.

"Done!" says Groove, another amateur of quieter look, taking out his note-book to enter it—for our friend Rattle sometimes forgets these little things.

Meantime East is freshening up Tom with the sponges for next round, and has set two older boys to rub his hands.

SOUND BOXING ADVICE FOR THE NEXT ROUND

"Tom, old boy," whispers he, "this may be fun for you, but it's death to me. He'll hit all the fight out of you in another five minutes, and then I shall go and drown myself in the island ditch. Feint him—use your legs!—draw him about! he'll lose his wind then in no time, and you can go into him. Hit at his body too, we'll take care of his frontispiece by and by."

Tom felt the wisdom of the counsel, and saw already that he couldn't go in and finish the Slogger off at mere hammer and tongs, so changed his tactics completely in the third round. He now fights cautious, getting away from and parrying the Slogger's lunging hits, instead of trying to counter, and leading his enemy a dance all round the ring after him. "He's funking; go in, Williams," "Catch him up," "Finish him off," scream the small boys of the Slogger party.

"Just what we want," thinks East, chuckling to himself, as he sees Williams, excited by these shouts, and thinking the game in his own hands, blowing himself in his exertions to get to close quarters again, while Tom is keeping away with perfect ease.

They quarter over the ground again and again, Tom always on the defensive. The Slogger pulls up at last for a moment, fairly blown.

TOM'S ARTFUL TACTICS WIND THE SLOGGER

"Now then, Tom," sings out East, dancing with delight. Tom goes in in a twinkling, and hits two heavy body blows, and gets away again before the Slogger can catch his wind; which when he does he rushes with blind fury at Tom, and being skilfully parried and avoided, over-reaches himself and falls on his face, amidst terrific cheers from the School-house boys.

"Double your two to one?" says Groove to Rattle, note-book in hand.

"Stop a bit," says that hero, looking uncomfortably at Williams, who is puffing away on his second's knee, winded enough, but little the worse in any other way.

After another round the Slogger too seems to see that he can't go in and win right off, and has met his match or thereabouts. So he too begins to use his head, and tries to make Tom lose patience and come in before his time. And so the fight sways on, now one, and now the other, getting a trifling pull.

Tom's face begins to look very one-sided—there are queer little bumps on his forehead, and his mouth is bleeding; but East keeps the wet sponge going so scientifically, that he comes up looking as fresh and bright as ever. Williams is only slightly marked in the face, but by the nervous movements of his elbows you can see that Tom's body blows are telling. In fact, half the vice of the Slogger's hitting is neutralized, for he daren't lunge out freely for fear of exposing his sides. It is too interesting by this time for much shouting and the whole ring is very quiet.

"All right, Tommy," whispers East; "hold on's the horse that's to win. We've got the last. Keep your head, old boy."

But where is Arthur all this time? Words cannot paint the poor little fellow's distress. He couldn't muster courage to come up to the ring, but wandered up and down from the great fives'-court to the corner of the chapel rails. Now trying to make up his mind to throw himself between them, and

try to stop them; then thinking of running in and telling his friend Mary, who he knew would instantly report to the Doctor. The stories he had heard of men being killed in prizefights rose up horribly before him.

Once only, when the shouts of "Well done, Brown!" "Huzza for the School-house!" rose higher than ever, he ventured up to the ring, thinking the victory was won. Catching sight of Tom's face in the state I have described, all fear of consequences vanishing out of his mind, he rushed straight off to the matron's room, beseeching her to get the fight stopped, or he should die.

But it's time for us to get back to the close. What is this fierce tumult and confusion? The ring is broken, and high and angry words are being bandied about; "It's all fair,"—"It isn't,"—"No hugging"; the fight is stopped. The combatants, however, sit there quietly, tended by their seconds, while their adherents wrangle in the middle. East can't help shouting challenges to two or three of the other side, though he never leaves Tom for a moment, and plies the sponges as fast as ever.

The fact is, that at the end of the last round, Tom seeing a good opening, had closed with his opponent, and after a moment's struggle had thrown him heavily, by the help of the fall he had learnt from his village rival in the Vale of White Horse. Williams hadn't the ghost of a chance with Tom at wrestling; and the conviction broke at once on the Slogger faction, that if this were allowed their man must be licked. There was a strong feeling in the school against catching hold and throwing, though it was generally ruled all fair within certain limits; so the ring was broken and the fight stopped.

CAN TOM USE HIS SKILL AT WRESTLING?

The School-house are over-ruled—the fight is on again, but there is to be no throwing; and East in high wrath threatens to take his man away after next round (which he don't mean to do, by the way), when suddenly young Brooke comes through the small gate at the end of the chapel. The School-house faction rush to him. "Oh, hurra! now we shall get fair play."

"Please, Brooke, come up, they won't let Tom Brown throw him."

"Throw whom?" says Brooke, coming up to the ring. "Oh! Williams, I see. Nonsense! of course he may throw him if he catches him fairly above the waist."

Now, young Brooke, you're in the sixth, you know and you ought to stop all fights. He looks hard at both boys. "Anything wrong?" says he to East nodding at Tom.

"Not a bit."

"Not beat at all?"

"Bless you, no! heaps of fight in him. Ain't there, Tom?"

Tom looks at Brooke and grins.

"How's he?" nodding at Williams.

"So, so; rather done, I think, since his last fall. He won't stand above two more."

"Time's up!" the boys rise again and face one another. Brooke can't find it in his heart to stop them just yet, so the round goes on, the Slogger waiting for Tom and reserving all his strength to hit him out should he come in for the wrestling dodge, again, for he feels that that must be stopped, or his sponge will soon go up in the air.

LOYAL BILL, THE UNDER-PORTER, WARNS THE BOYS

And now another new comer appears on the field, to wit, the under-porter, with his long brush and great wooden receptacle for dust under his arm. He has been sweeping out the schools.

"You'd better stop, gentlemen," he says; "the Doctor knows that Brown's fighting—he'll be out in a minute."

"You go to Bath, Bill," is all that that excellent servitor gets by his advice. And being a man of his hands, and a staunch upholder of the School-house, can't help stopping to look on for a bit, and see Tom Brown, their pet craftsman, fight a round.

It is grim earnest now, and no mistake. Both boys feel this, and summon every power of head, hand, and eye to their aid. A piece of luck on either side, a foot slipping, a blow getting well home, or another fall, may decide it. Tom works slowly round for an opening; he has all the legs, and can choose his own time; the Slogger waits for the attack, and hopes to finish it by some heavy right-handed blow. As they quarter slowly over the ground, the evening sun comes out from behind a cloud and falls full on Williams's face. Tom darts in; the heavy right-hand is delivered, but only grazes his head. A short rally at close quarters and they close; in another moment the Slogger is thrown again heavily for the third time.

"I'll give you three to two on the little one in half-crowns," said Groove to Rattle.

"No, thank'ee," answer the other, diving his hands further into his coattails.

Just at this stage of the proceedings, the

door of the turret which leads to the Doctor's library suddenly opens, and he steps into the close, and makes straight for the ring, in which Brown and the Slogger are both seated on their seconds' knees for the last time.

"The Doctor! the Doctor!" shouts some small boy who catches sight of him, and the ring melts away in a few seconds, the small boys tearing off, Tom collaring his jacket and waistcoat, and slipping through the little gate by the chapel, and around the corner to Harrowell's with his backers, as lively as need be; Williams and his backers making off not quite so fast across the close; Groove, Rattle, and the other bigger fellows trying to combine dignity and prudence in a comical manner, and walking off fast enough, they hope, not to be recognized, and not fast enough to look like running away.

Young Brooke alone remains on the ground by the time the Doctor gets there, and touches his hat, not without a slight inward qualm.

"Hah! Brooke. I am surprised to see you here. Don't you know that I expect the sixth to stop fighting?"

Brooke felt much more uncomfortable than he had expected, but he was rather a favorite with the Doctor for his openness and plainness of speech; so blurted out, as he walked by the Doctor's side, who had already turned back—

"Yes, sir, generally. But I thought you wished us to exercise a discretion in the matter too—not to interfere too soon."

"But they have been fighting this half-hour and more," said the Doctor.

BROOKE EXPLAINS THE FIGHT TO THE GOOD DOCTOR

"Yes, sir; but neither was hurt. And they're the sort of boys who'll be all the better friends now, which they wouldn't have been if they had been stopped any earlier—before it was so equal."

"Who was fighting with Brown?" said the Doctor.

"Williams, sir, of Thompson's. He is bigger than Brown, and had the best of it at first, but not when you came up, sir. There's a good deal of jealousy between our house and Thompson's, and there would have been more fights if this hadn't been let go on, or if either of them had had much the worst of it."

"Well but, Brooke," said the Doctor, "doesn't this look a little as if you exercised your discretion by only stopping a fight when the School-house boy is getting the worst of it?"

Brooke, it must be confessed, felt rather gravelled.

"Remember," added the Doctor, as he stopped at the turret-door, "this fight is not to go on—you'll see to that. And I expect you to stop all fights in the future at once."



Young Brooke, left alone on the field, faces the displeasure of the head of the school.

"Very well, sir," said young Brooke, touching his hat, and not sorry to see the turret-door close behind the Doctor's back.

Meantime Tom and the staunchest of his adherents had reached Harrowell's, and Sally was bustling about to get them a late tea, while Stumps had been sent off to Tew the butcher, to get a piece of raw beef for Tom's eye, which was to be healed off-hand, so that he might show well in the morning. He was not a bit the worse except a slight difficulty in his vision, a singing in his ears, and a sprained thumb, which he kept in a cold-water bandage, while he drank lots of tea, and listened to the babel of voices talking and speculating of nothing but the fight, and how Williams would have given in after another fall (which he didn't in the least believe), and how on earth the Doctor could have got to know of it,—such bad luck! He couldn't help thinking to himself that he was glad he hadn't won; he liked it better as it was, and felt very friendly to the Slogger. And then poor little Arthur crept in and sat down quietly near him, and kept looking at him and the raw beef with such plaintive

looks, that Tom at last burst out laughing.

"Don't make such eyes, young 'un," said he, "there's nothing the matter."

"Oh but, Tom, are you much hurt? I can't bear thinking it was all for me."

"Not a bit of it, don't flatter yourself. We were sure to have had it out sooner or later."

"Well, but you won't go on, will you? You'll promise me you won't go on?"

"Can't tell about that—all depends on the houses. We're in the hands of our countrymen, you know. Must fight for the Schoolhouse flag, if so be."

. . . . . .

With Tom's loyal words ends our extract from the book, and the story is continued in a shorter form.

Two years after the events recorded, Arthur, who was now sixteen and was an apt and bright scholar, was at the head of the twenty. Both Tom and East were far less successful in their studies, and were none too highly placed in the fifth form. It was a very happy friendship, however, for Tom and East, with their fine, manly characteristics and their physical powers, felt the refining influence of Arthur's gentler nature. They were the better in consequence, while he was sheltered from the buffetings of the school by having such manly chums.

Arthur was one of several scholars who took the fever and had to be sent home until he was recovered. Before going away he said to Tom there was one favor he had to ask of him. It was that he would give up the *vulgus* books and cribs. By that he meant that Tom had not been doing his Latin and Greek exercises honestly, but using translations. Tom looked away at this, and then, catching his friend's gaze, asked why.

"Because—because you're the honest boy at Rugby, and that isn't honest."

THE INFLUENCE OF THE GENTLE ARTHUR ON EAST AND TOM

Arthur soon brought Tom to his way of thinking, and had his promise. East had also been guilty of cribbing, like Tom, but he was now brought to honest study as the result of Tom's promise to Arthur. From that time forward both derived satisfaction and pleasure from their studies which before had been unknown to them.

So two more years passed away, and it was again the end of the summer term. An important cricket match was to take place, and there was a union of old boys. On the slope toward the cricket ground stood three



A Rugby upper classman is carried in triumph, perched high on a dining-hall bench.

of the older scholars. There was one slight of build, with bushy eyebrows and a dry, humorous smile. By his side was another of manly form, almost six feet tall, tanned of face, with curly brown hair and sprouting whiskers, his laughing eyes gleaming below his smart straw hat. He was dressed in a white flannel shirt and trousers with the captain's belt about his waist, and on his feet were yellow cricket shoes. This was our hero, Tom Brown, now nineteen, a praeposter, or monitor, and captain of the eleven. East was he of the bushy eyebrows. The third slight but well-knit and active figure was Arthur, greatly improved physically.

The master of Tom's form came up just then and invited Tom to sup with him. At that meal Tom learned for the first time how the great and noble man who was the headmaster of Rugby had carefully planned for the molding of Tom Brown's character. Tom had fondly supposed his progress was due largely to his own foresight. Now he could understand that it was by choosing him as a protector of Arthur, thus giving him a new sense of responsibility and trusting him, that the great Doctor Arnold had brought out the best of what was in his scholar's nature.

THE NEXT STORY OF FAMOUS BOOKS IS ON PAGE 5543.



Sea, or marsh, pinks. All photos, L. W. Brownell

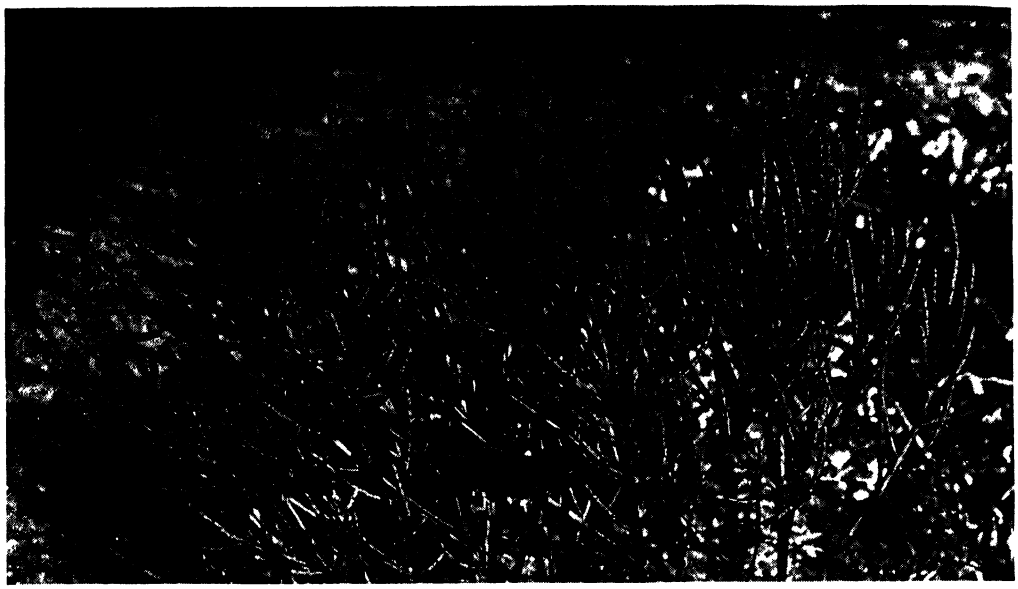
THE FLOWERS OF THE SEASIDE

MANY plants flourish within only a few miles of the seacoast; but there are some so fond of sand and salt water that they naturally grow at the water's edge or in the salt marshes. Some of them, indeed, are half covered at high tide.

Very many of the plants that thus hug the coastwise beaches have one marked trait. This is the interesting fact that their foliage, and often the stem as well, are very simple in outline, and so glossy and smooth as to feel almost greasy. Many are thick, or "fleshy," like the cactus, and some are so swollen as to be like cylinders. This is also a characteristic of plants growing on deserts and saline soils, and is a device for securing as small a surface as possible, so as to prevent the precious water in the tissues of the plant from escaping too rapidly through the pores provided for that purpose in the surface of every leaf. The plant on the sea beach, as well as that on the desert, must be able to grow in sand so hot that one can hardly step barefooted upon it, and through which such rain water as falls quickly seeps away. Therefore, those plants whose foliage can retain such water as may come to it are most able to survive in such unfavorable localities in spite of the attacks of the sun and drought.

But these crisp, fat, watery leaves would be very tempting to browsing animals if they did not have some special protection. Some of them have, as protection, a tart or salty taste. Others are very thoroughly protected with an armor of most surprisingly sharp prickles.

The saltwort, *Salsola kali,* is a striking example of both of these traits. It also has another somewhat common characteristic of sand-loving plants—a long, spindling taproot from which the reclining branches spread in a great circle, forming a huge rosette on the beach. The foliage, to all outward appearance, is merely swollen, fleshy supports for needle-pointed spines that



Bristling glasswort, which appears like a skeleton plant from which the leaves have fallen. Actually they have been reduced to tiny scales on the branches. Green in summer, the glasswort turns fiery red in autumn.

occupy all of the available space. In the axils the fruits are crowded, each having quaint wings flaring horizontally from the apex. The saltwort belongs to that great goosefoot family, which includes the useful vegetables spinach and beets, as well as certain maritime plants.

Not far from the saltwort, in the low grass, where high tides may flood them, stand ranks of a closely related plant, the glasswort. Brittle, smooth, spineless and, to all appearance, leafless, they bristle in the green herbage like skeleton plants from which the leaves have all fallen away. As a matter of fact, the leaves have been reduced to mere scales on the round upright branches. In the axils of the upper ones minute flowers are sunken. In summer the glassworts are green, but as autumn approaches they become brilliant scarlet in color.

The name "samphire," occasionally applied to the glasswort, has been borne much longer by a European plant of rocky shores, whose solid stems and leaves become swollen and juicy. In some seaside places it has been so much gathered for making into a pickle that it is no longer to be found. We might think it is a plant without leaves, for it appears to be merely a much branched and twiggy stem with umbels of yellow flowers. As a matter of fact, the flowers are white, but are very small, and do not show up so strongly as the yellow pistils and footstalks; and the blue-green leaves are so cut up into leaflets which have many lobes that they really look far more like twigs.

To return to our goosefoot family, we find



The lovely rose mallow, or hibiscus, of salt marshes.

in it the orache, a potherb, growing originally on European sea beaches, and now often found in our gardens; and also the fleshy, glaucous sea blite with three-angled leaves, a bushily branched herb, which is at home on sandy or muddy beaches as well as in the salt marshes.

When we leave this family and its queer plants and unattractive flowers, we are relieved to discover more showy maritime vegetation. There is, for instance, a pretty European shrub belonging to the oleaster family, that we sometimes include in our shrubberies, but which is not native to our coasts. It has drooping branches covered with oval or lance-shaped leaves that are dull green above and silvery white beneath. This shrub is called the sea buckthorn, or sallowthorn. Some of its branches are short and end in long spines. It bears orange-colored berries, which are tart.

Other European shrubs sometimes growing into small trees are the tamarisks, with wand-like pink-flowered branches, and the so-called sea hollies. One, which grows on the sand above high water, has a short, thick, branching stem, with broad, roundish leaves that are thick and leathery, and their margins are cut into bold teeth that end in very sharp spines. They are of a gray-green



Fragile sprays of the pale mauve sea lavender.



Joe-pye weed, a hardy plant that thrives in brackish water, growing to a height of more than six feet. The huge flower head is dull purple or old-rose.

tint and have the appearance of a "bloom" upon them.

The pretty furry marshmallow, that is very closely allied to the hollyhock, is sometimes found in our salt marshes, escaped from cultivation. Its root contains a sort of gum or mucilage used in medicine, and from which the marshmallow candy was originally made. The flowers are of a pale rose color and resemble some of the other mallows.

Another European plant that grows about the cliffs and on the edges of fields that may be above them, is the sea campion. This has similar leaves and flowers, but less erect stems than the bladder campion, which has become naturalized in this country. The white petals are somewhat broader.

Another plant that we should recognize if we were abroad is the European seaside convolvulus, because its flowers and leaves are similar in shape to those of our field convolvulus, or small bindweed. Its slender stem runs underground like that of the bind-



A plant to avoid on the beach, the cocklebur; the hooked prickles of the burs cling persistently.

weeds, but is shorter and rarely twines around other plants.

On the European sand dunes grows the fine horned poppy, with bold, glaucous leaves and rich yellow flowers, three or four inches across. This poppy constantly occurs in America as a visitor from abroad, springing up in waste places. The seed vessel is a slender, curved horn, a foot in length.

The sea milkwort, or black saltwort, is a sea-beach succulent plant of both the Old World and the New, blooming early in summer. It is a member of the primrose family. Though its stems are six or eight inches long, we shall not find them reaching that height above the rock, for they are much inclined to trail or to take a half-erect position. The small, oval, stalkless leaves are in pairs, and each pair is at right angles to the pair above or below it. The white, pink or lavender crimson-dotted flowers are without stalks. It is the bell-shaped calyx that is colored, for there are no petals.

In the plumbago, or leadwort family, very closely related to the primroses, is the dainty sea pink, or thrift, introduced from Europe. The name sea, or marsh, pink is also used for several members of the gentian family. The sea lavender is very common in our muddy salt marshes. Here, again, we have the fleshy leaves, large, and spreading in tufts from a thick rootstock. Above them, borne on tall, slender scapes, the widely branching flower heads look like shreds of fog caught on the meadow grasses; for the tiny flowers sit erect in little one-sided spikes on the fragile sprays of the panicle, with hairy, pale lilac petals and calyxes of paper-like sepals. Long after their seeds have ripened,



With the coming of autumn, the pleasing New York aster blooms in the salt marshes, showing flowers with petals of the palest violet color.



Bayberry in bloom. The of bayberry candles is a

the flowers still retain their form and some of their color.

Down in the marshes with the sea lavender several little asters, with slender but fleshy leaves, bloom daily. Another aster with stiff stems and rigid leaves standing out in all directions springs from the sandy beach, and is topped by large and brilliant lilac flowers. Later than these, however, we find in salt marshes a fleshy-leaved form of aster known as the New York aster, which has very pretty blossoms with rays of palest violet.

Near them, at the edge of the marsh, stand the very handsome seaside goldenrods with stout stems, plentifully furnished with shining, fleshy, smooth-edged leaves. The large golden flowers bloom on the upper sides of the down-curving sprays. Of course, both of these belong to the composite family, and so also does the joe-pye weed—a great plant that is common in swamps throughout eastern North America, but is particularly rampant in salt marshes. It grows over six feet high with a strong purplish stem rising through whorls of great long-pointed, toothed leaves. It branches out at the top, thus forming a massive pyramid of dull purple or old-rose flower heads. It is the most striking plant of the marshes even when in fruit.

The quaint name of the highwater shrub, or marsh elder, gives a broad hint as to where it may be found. In fact, its sturdy stems spring up just out of reach of the waves on muddy shores. It keeps its glossy, deeply toothed leaves late in the fall. They are somewhat fleshy, and grow smaller and smaller toward the top, until on the flower-



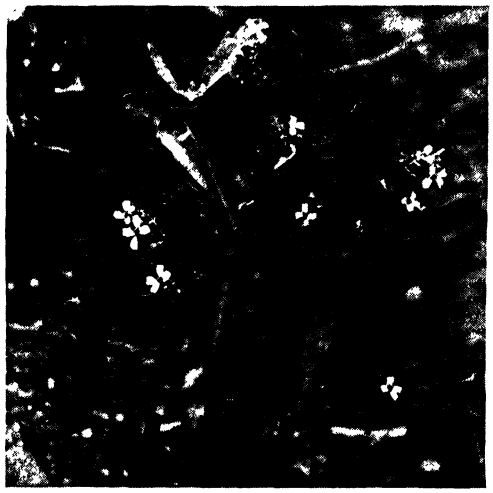
The delicate white flower clusters of the beach plum; its rather acid fruit makes a delicious jam.



delightful spicy fragrance part of Christmas.



Asters are well named, for the Greek word meaning "star." This one, Aster tenuifolius, brightens the salt marshes in autumn, from Massachusetts to Florida.



The sea rocket, an herb, is a member of the mustard family. Its tiny flowers, in the shape of a cross, are found blooming on sandy shores.



Drooping bunches of bearberries, which the Indians called kinnikinnick. Their flaming scarlet color makes them conspicuous on ocean bluffs.

ing branches they are very slender and short, and from their axils droop little heads of green flowers protected by a cup-like circle of bracts. The shrub has a disagreeable, rank odor and looks very much like an overgrown ragweed. This is not surprising, for it is a member of the same family. Another member and one that promptly calls attention to its presence, is the beach cocklebur, which has zigzag branches with unshapely rough green leaves; and firm oval burs clustered in the axils, very completely provided with hooked, hairy prickles, as well as a pair of stout, hooked beaks at one end, by means of which they cling persistently to an animal's coat, or to clothing, thus being transported for some distance, and scattering the seed over a wide territory.

On the beach, on the sand dunes, and even far inland, one sees the rounded bushes of bayberry, or waxberry. Its rigid, dark green, dull, oblong leaves are resinous and very aromatic, in odor a little like the bay or laurel, as we may discover by crushing them. When the leaves fall, one can see the ripened berries, or drupes, clinging closely to the stems. They look very white, but pick one and scratch it a little. You will find that the whiteness can be scraped off, and that the berry is really dark colored and very wrinkled, and the white substance that covers the berry lies thick in these creases. It looks like, and is, vegetable wax, which without doubt acts as a waterproof coating and prevents the rain and snow from injuring the berry as it clings to the stem during the winter. This wax was utilized by early colonists, who boiled great quantities of the berries and made candles from the melted wax that floated to the surface. When blown out, the pale green candles exhale a delicious spicy fragrance. The sweet fern is a near relative.

A very widely distributed plant in the colder regions of the northern world is the bearberry of the heath family. Although it is quite common inland, it grows very often on the bluffs of the northern seacoasts, where its creeping stems gradually overgrow large patches of sand for the comfortable ripening of their bunches of scarlet berries, greatly relished by game birds. The berries and the pale, waxen flower bells before them droop close to the earth under the tufted, tough little spatulate leaves that terminate the trailing branches. The plants furnish a drug and have been used for tanning. Indians used the bearberry in a mixture of leaves and bark they called kinnikinnick, as a tobacco to be smoked alone, or added to the ordinary kind. Kinnikinnick is an Indian word and is another name given to the bearberry itself.

Still another plant of great value to the Indians was the groundnut. Like the bearberry, it is often found far inland, but in moist rather than dry soil. It seems to be particularly prevalent along the coast, just keeping clear of brackish waters. Roadside thickets are wreathed with its far-reaching, twining vines, and fairly smothered with its balls of dull purple and old-rose pea-like

flowers that are curiously twisted and give out a fragrant odor of violets. Its chief interest, however, lies in the dusky skinned squarish tubers, sometimes as big as pecans, that often lie in strings like the beads of a necklace, separated by slender rootstocks. These were a favorite food for the Indians. They taste not unlike potatoes when boiled. They were almost the only food that the Indians, and their white captives, and the missionaries who lived among them, could find in times of famine.

The Indians also liked wild fruits. They ate them fresh, put them into their porridge, and dried them for pemmican. They were especially fond of plums, and doubtless made many excursions to those shores where the beach plums grow, in spring wreathed with small white flowers, and in the fall strung with quantities of puckery, rather acid fruit. We can imagine that the children played with the pits, and we know that their elders gambled with them. Nowadays delicious jam is made from the thin flesh of beach plums.

Near these low shrubs will be found the thick groundsel bushes, or baccharis. In the fall they are whitened by countless tufts of silk-like threads, which grow on the seeds, and cling, like cotton fluff, to passing animals. The fruits are carried on the wings of the wind.

While we are on the shore we shall, of course, become interested in the seaweeds. As they are not flower-bearers, they scarcely come within the bounds of this article. They are plants that live almost entirely in water, reproducing themselves, not by seeds, but by minute spores often too small to be seen without the aid of a microscope. Those that grow attached to the rocks inshore get uncovered at low tide for a few hours at a time, and if the tide did not come back soon they would dry up and die. These seaweeds have no real roots, for what look like roots are only suckers that hold them fast to the surface of the rock; they never penetrate it, and they draw their food entirely from the water through the surface of their fronds. The large ones attached to the shore rocks have thick, leathery fronds of an olive color. The seaweeds are really algae, a very low form of plant life. While the green chlorophyl so necessary to plants is present, it is hidden in many seaweeds by other coloring matter, or pigments, in brown or red.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 5389.



Low tide reveals rockweed, one of the seaweeds called kelp, or brown algae. A brown pigment hides the green chlorophyl. Kelps cling to rocks by means of suckers and are buoyed up in the water by small air bladders.

COTTON STARTS ON ITS LONG JOURNEY



The cotton pickers bring their bags to be weighed. Then the fluffy bolls are loaded into wagons, which trundle off to the gin. The farmer's income from cotton in the United States is more than $800,000,000 a year.



Pictures, courtesy, Bureau of Agricultural Economics, USDA

In season load after load of cotton comes to the gin from the fields. At the gin the fibres are separated from the seeds and baled for shipment to the warehouses. The seeds are sold separately, and used for many purposes.



From Sweet and Knox, On a Mustang Through Texas

An artist's impression of a Texas cotton field about fifty years ago.

HOW COTTON BECOMES CLOTH

COTTON is the most valuable fibre in the world. Its uses are so many that we cannot begin to tell them all. We wear cotton clothing sewed with cotton thread, tie up cotton bags with cotton string, and are sheltered by cotton tents and awnings. We may sleep between cotton sheets, on a cotton mattress, under quilts padded with cotton. The doctor binds a cotton pad over a wound with a cotton bandage. It is also an important source of cellulose of which we tell you elsewhere.

The cotton plant grows in the warmer parts of the world, in North and South America, in Egypt, China, India, Australia, some parts of Asiatic Russia, and on many of the warmer islands of the world. Sometimes it is a plant, sometimes it is a shrub, and in some countries a small tree, which does not die when the cooler weather comes. There are many species, but only three or four are of any great importance.

Though cotton is a native of the tropics, it produces best in temperate climates which are not too cold or too dry. The southern part of the United States produces the most of the finest cotton. India grows a great deal, but it is hard to spin; while Egypt grows a fine quality, but there is too little land in Egypt to grow very much. The other countries do not grow enough for their own use.

The plant as it is found in the United States is an annual; that is, it dies in the fall, and must be planted again in the spring. It belongs to the same family as the hollyhock and grows from two to six feet high. The flower is very much like that of the hollyhock, and is cream-colored when it opens, turns pink the next day, and drops off on the third. It leaves a tiny boll, which grows until it is about the size of a walnut. In it the fibre is tightly packed. When ripe, the boll bursts open, and the snowy white fibre hangs out.

Men, women and children, white and colored, go through the field pulling out this fibre. The fibre clings tightly to the seeds, and must be separated before the cotton can be used. Before the invention of the cotton-gin by Eli Whitney the fibre was separated by hand. This was such slow work that very little was grown. A cotton-gin could do the work of dozens of people, and the amount of cotton grown has increased very greatly. After it has been ginned, the cotton is packed into bales, which weigh about five hundred pounds each, ready to be sent to the



Cotton is a hair covering the seeds. From the flower springs the boll which, on ripening, bursts open and displays the fluffy, white down.

cotton mills, about which we shall tell you in a moment.

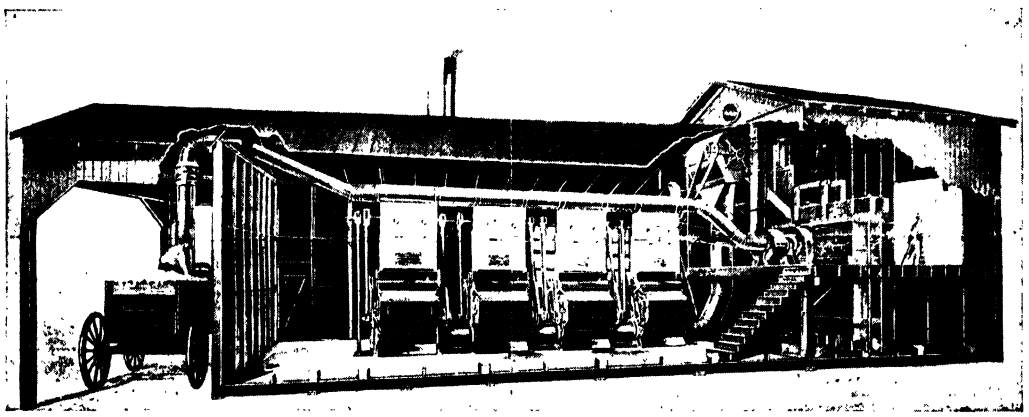
Formerly most of the seeds were thrown away, but it was found that they contain a very valuable oil. Now the hulls are taken off, and the seeds are pressed to remove the oil. Usually the seeds are cooked first. This oil is then refined, and probably you have eaten it with salad many times. It is much used in cooking and also in making soap and paint. The meal from which the oil has been pressed is used as food for cattle and in making fertilizer. The hulls also are fed to cattle.

Though there are hundreds of cotton mills in the United States, they consume about two-thirds of the cotton that is grown in the country. The remainder is sent to all parts of the world. Mills in Europe, Japan, Canada and other countries use much American cotton. On the other hand, some from Egypt is brought to the United States for a special reason. If you have ever looked at a tuft of cotton, you probably saw that it is a mass of tiny fibres tangled together. If these fibres are very short, only coarse yarn and cloth can be made from them; while fine yarn and thin cloth are made only from cotton with a long fibre. The fibre of Egyptian cotton is longer than that of most American cotton, and therefore some Egyptian cotton is brought across the ocean to be used in making knit underwear and hose.

There is a kind of cotton grown in the United States which has a longer fibre than the Egyptian. It is called Sea Island cotton, but it will grow in only a few places. The boll-weevil, a little insect which attacks the cotton plant, has almost stopped the growth of this variety. Cotton somewhat similar, called Pima cotton, is grown on the irrigated lands of the Southwest. The fibres of these cottons are very fine, soft and long.

England was the first important cotton-manufacturing country, and still produces the finest yarn, but the United States spins more. The cotton mills of the United States are not scattered over the whole country. New England formerly led but now the Carolinas lead, both in number of spindles and in activity, that is, the number of hours the spindles run. Massachusetts is third in number of spindles, but since it produces chiefly fine yarn, Georgia and Alabama consume more cotton. Rhode Island, Maine, Tennessee, Virginia, Connecticut and New Hampshire are also important states. Though Canada must import all her cotton there are several factories and millions of dollars are invested in the industry.

The cotton must go through many machines before it becomes cloth. A cotton mill



Pictures, courtesy, U. S. Department of Agriculture

A small one-story cotton gin. The loads of cotton are driven into the shed, beneath a tube called a telescope. The cotton is drawn by suction through the telescope into the tube near the roof, from which it goes to one of the four gins. There teeth draw the cotton through openings too fine for the seeds. The cleaned cotton is baled.

seems to be full of noise and glittering steel, and our pictures tell the story better than we could do in many pages of words. If you will study them, and the descriptions under them, you will begin to see how wonderful a piece of cloth is. The cotton is first twisted into threads called yarn, and these are woven into cloth. The cotton must go through several machines before it becomes yarn, however, for the fibres must be straightened out and laid beside one another.

The colors in cloth may be produced in several different ways. Sometimes the cotton is dyed before it is spun; sometimes the yarn is dyed; and sometimes a pattern is printed on the cloth, like a picture on paper. Stripes are sometimes printed, and sometimes are made by using a few colored threads. Look on the back of the cloth and you can decide whether the stripe was woven or printed. On most printed cloth the color does not come through the cloth, or at least does not show clearly.

Every one of you has seen a spool of thread such as your mother uses. This is made from many fibres of cotton twisted together, and then four, six or more of these are again twisted together to make the tiny thread you see. This will show you how fine a single fibre is. An ordinary thread is composed of hundreds of delicate fibres twisted together.

The fineness of cotton thread is reckoned in figures. On the finest spinning frames, cotton up to 400's (equal to 336,000 yards, or about 190 miles, to the pound) can be spun on to spools without breakages. For experimental purposes a pound of cotton has been spun into 1,000 yards of yarn, but cotton used for the finest goods averages about 95 miles a pound.

Not all the cotton used in the world is manufactured in these great mills. In India much of what is grown there is spun on a simple wheel, and woven into cloth on handlooms very much like those which were used hundreds of years ago. Some of these workmen can make cloth as fine as that made on machines. Muslins from India are famous.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 5217.



Picture, Ewing Galloway, N. Y.

Experts break open the bales and cut out samples, to see whether the lint meets the mill standards. Lint is the name given to the cotton fibres either before or after the seeds have been taken out, at the gin. Linters are short fibres that stick to the seeds in the first ginning, but are taken out in a second ginning.

BY CAMEL, TRAIN AND SHIP

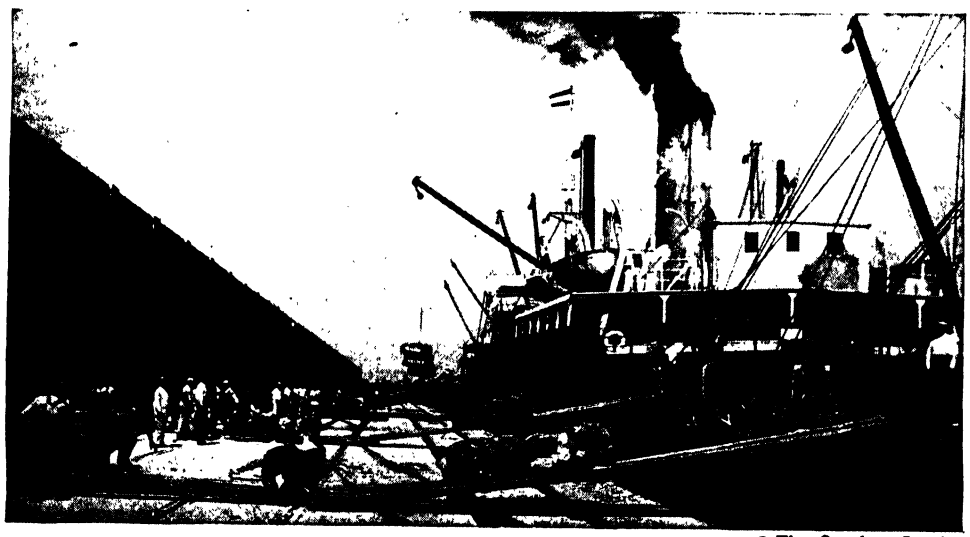


Cotton grown in the Nile Delta, here arriving at Cairo on camels, is the nearest rival to Sea Island lint.



Courtesy, Farm Credit Administration

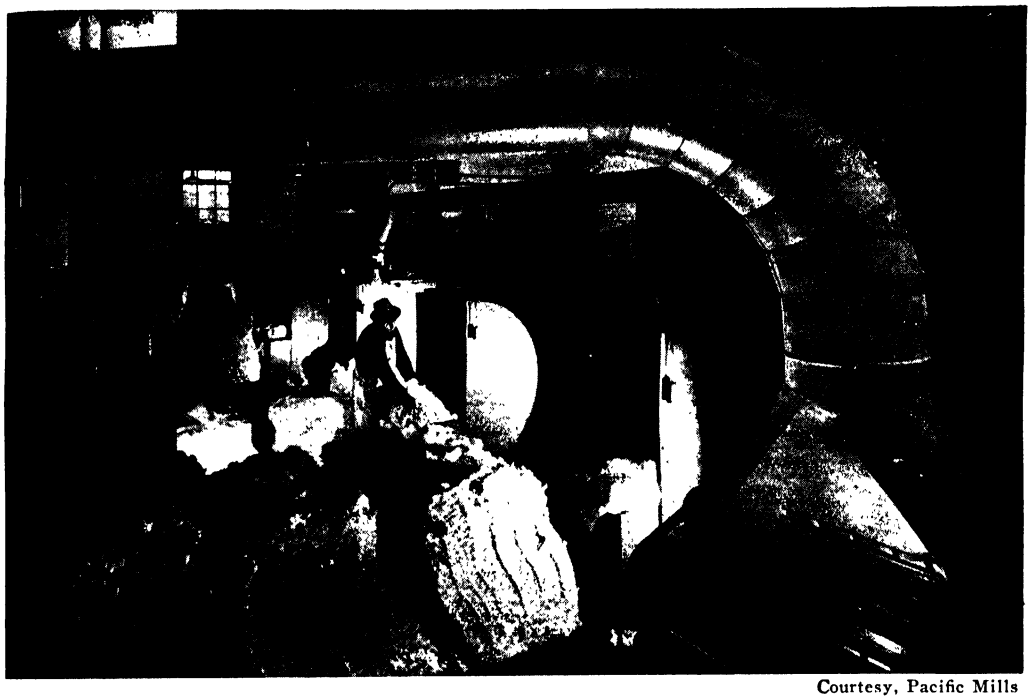
Shipping lint by railroad. Much of the cotton raised in the United States is manufactured in this country.



© The Overbey Studio

Loading cotton for export at Mobile, Alabama. Cotton exports in some years have amounted to $800,000,000.

CLEANING COTTON AT THE MILLS



Courtesy, Pacific Mills

When the bales of lint arrive at the mill, samples are tested for cleanliness, whiteness, length of fibre and strength. The bales go to the opening room, shown above, where the lint is mixed, to get a uniform product. Dirt and bits of leaf are beaten out, leaving the cotton soft and fluffy.



Courtesy, Utica and Mohawk Cotton Mills

In these machines the cotton fibres are given a further beating and suction cleaning, to remove any traces of dirt or leaf. Then the lint passes through rollers from which the fibres come out in layers, called lap, or fleece. Laps are weighed, for they must have even thickness and weight throughout every yard.

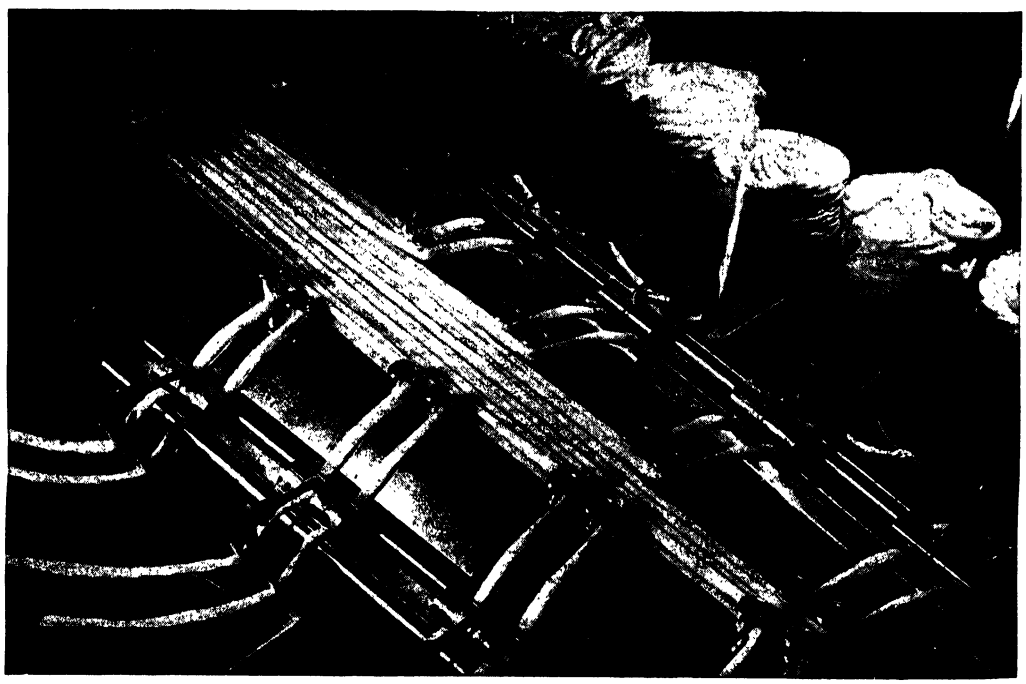


DRAWING THE FIRST STRANDS

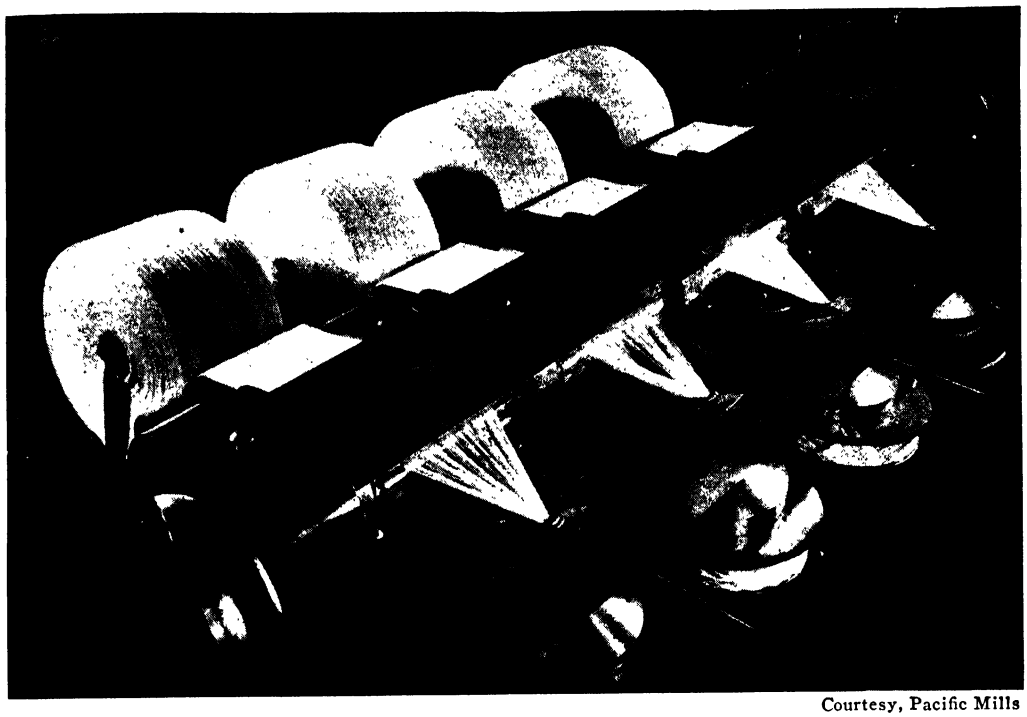
Good yarn is impossible unless carding is well done. On a cylinder, needle-pointed teeth tease out the lap fibres into parallel order, making a fine veil of pure white cotton. This passes through a tube and comes out as a loose strand, or sliver.

Sixteen slivers are fed together into the sliver-lap machine. Rollers rotating at various speeds combine them and draw them out into a single sliver.

Pictures, courtesy, Pacific Mills

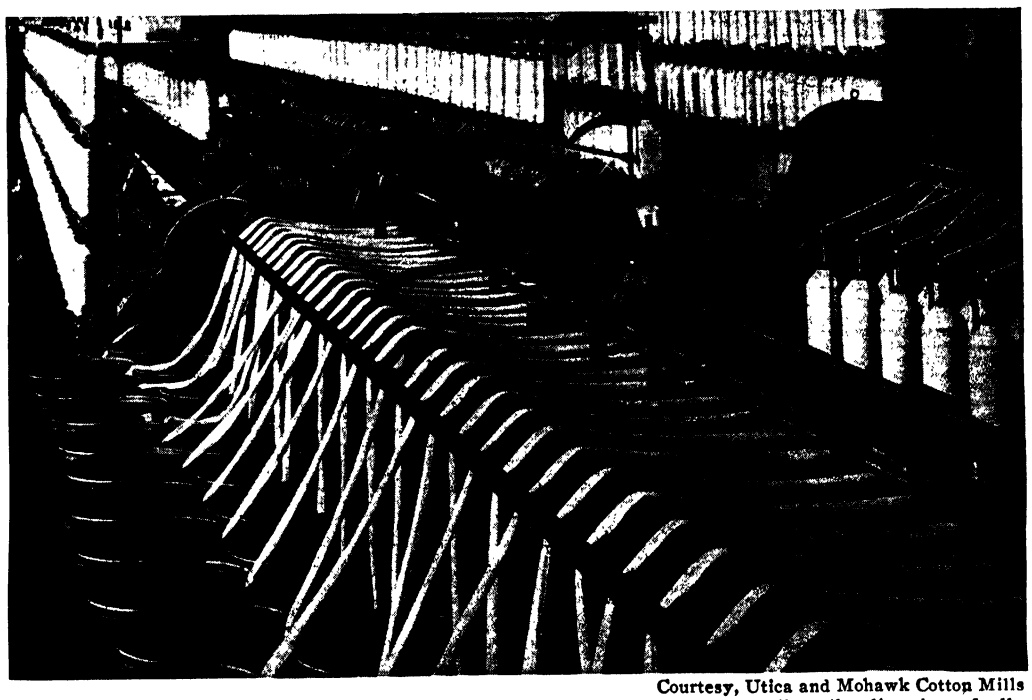


DRAWING FRAMES AND SLUBBERS



Courtesy, Pacific Mills

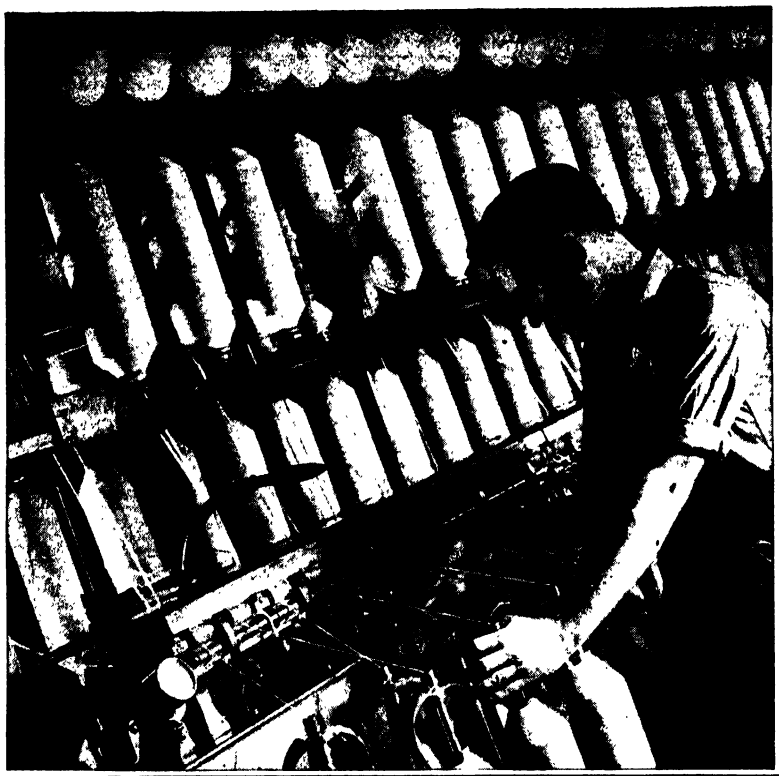
These are drawing frames. They take several slivers and draw them out into one, doing this again and again until 216 slivers may be combined into one, uniform in weight and thickness, with fibres parallel.



Courtesy, Utica and Mohawk Cotton Mills

The sliver comes in cans to the slubbers, where it becomes thread. Passing between rollers, the sliver is gradually drawn out thinner and thinner, being given a slight twist, and then wound on bobbins.

ROVING AND SPINNING FRAMES



Courtesy, Pacific Mills

From the slubbers the bobbins go to the intermediate and then to the roving frame (above, left) where yarn from the two bobbins is fed and comes out as a single lighter strand called roving.

The spinning frames (below) further draw out the yarn, give it a final twist, and wind it on to bobbins. Some of the yarn, called the warp yarn, now goes to the winding, or spooling machines.

Courtesy, Utica and Mohawk Cotton Mills

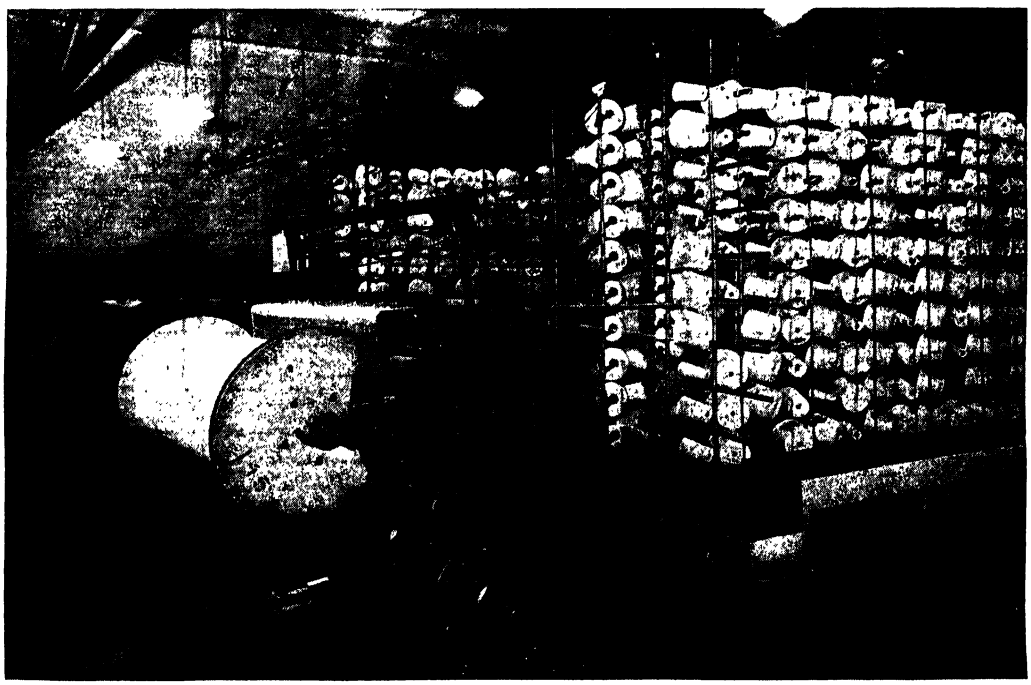


THE THREAD IS MADE READY FOR WEAVING



Courtesy, Pacific Mills

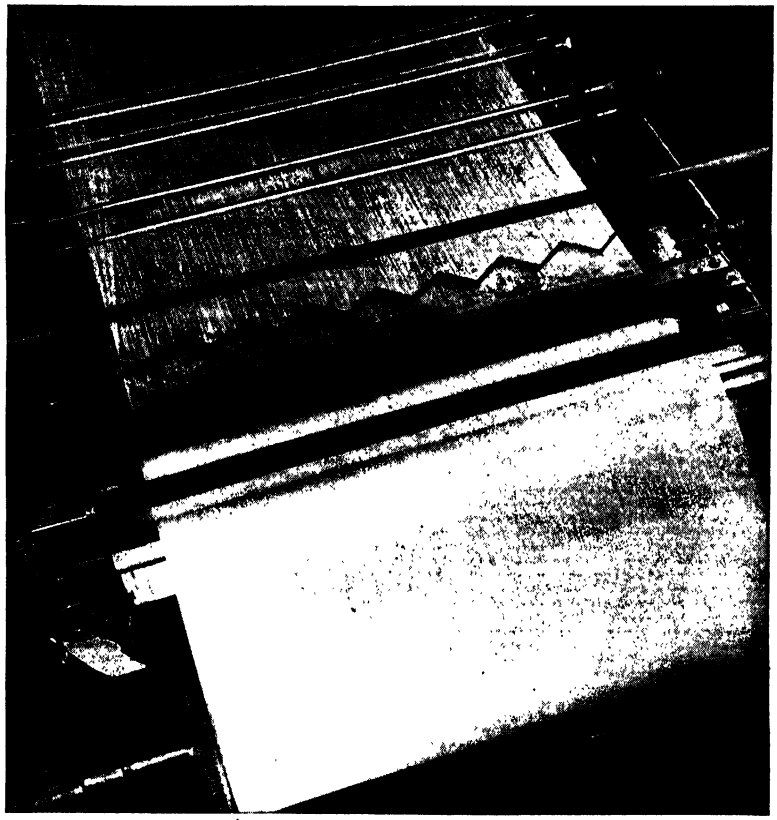
The warp threads are those that run the length of the fabric. After the spinning, some thread, which will be warp thread, is removed from the bobbins on spools, called cones, or cheeses. The end of the thread from one bobbin is tied to the beginning of another; thus a continuous thread thousands of yards long is wound.



Courtesy, Utica and Mohawk Cotton Mills

Hundreds of warp threads, each thousands of yards long, which will run from end to end of the fabric, are arranged parallel and with precise length, and are rewound from the cones (cheeses) on an immense spool called a beam. If a single thread snaps, the whole machine stops running automatically.

SLASHING AND WEAVING



Courtesy, Pacific Mills

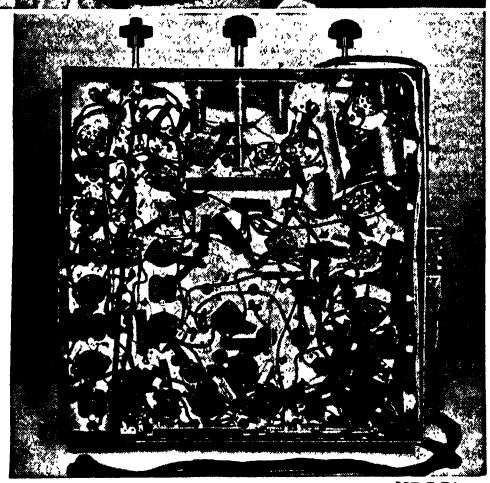
The slasher. Here the warp yarn receives a protective coating of starch, to protect them from chafing during weaving. The starch is removed after weaving.

Weaving. A shuttle carries the filling thread (weft, as it is also called) back and forth through the warp, thus producing the cloth.

Courtesy, Utica and Mohawk Cotton Mills







NBC Photo

Above, a telecast on a home television receiver. Below, part of the receiver has been cut away to show the intricate wiring. Early television screens were not much larger than this page (turned around). Only one or two persons at a time could view the pictures.

TELEVISION

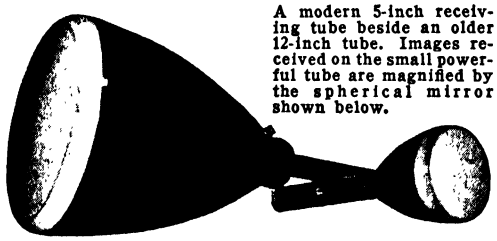
"TELEVISION" means seeing at a distance. And that is what television does —it permits us to "see" things that are far away, just as radio permits us to "hear" sounds far off. Of course we do not see the actual sights or hear the actual sounds. Both television and radio make use of the wonderful electron tube and other devices. Suppose your brother is in a radio studio, listening to a program as it is broadcast, while you are at home listening to the same program coming out of your radio. Are you listening to the same sounds?

No. You are listening to a reproduction, or copy, of the sounds your brother is hearing. Within the station transmitter the actual sound-waves made by the program in the studio have their pattern impressed upon electromagnetic waves, or, as we usually call them, radio waves. These radio waves are broadcast. Think of them as streaming out into the air—not all higgledy-piggledy as a crowd streams out of a theater, but in a sort of dance. The pattern of the dance is set by the sound-waves. These dancing radio waves, or electromagnetic waves, are picked up by your radio; and inside the radio they are changed so you hear sounds coming from your loudspeaker. The sound-waves that strike your ears are copies, or reproductions, of the waves striking the ears of your brother in the studio. The article on Radio (page 5119) tells you how all this is brought about. We review the main steps here, because you should know the ways in which radio and television are alike.

Television uses the electron tube, and other devices, to provide copies, or reproductions, of light. Usually television broadcasting is combined with radio broadcasting, to give telecasting. Then we both see and hear programs, just as in a sound-motion picture film. Television will soon show scenes in color; we shall then see and hear a stage play almost as though we were in the telecasting studio,

even though we may be many miles away.

The uses for this magic-carpet invention are many and various. Perhaps the greatest is for entertainment. We both see and hear the play, see and hear the singer, the fashion show, the parade, the football game. We may soon see the newest motion picture at home, for it too can be televised from the screen. We can see the conductor and his orchestra while we hear them play. Most



A modern 5-inch receiving tube beside an older 12-inch tube. Images received on the small powerful tube are magnified by the spherical mirror shown below.

exciting of all, we shall see great events as they actually happen (for example, a presidential inauguration) without waiting for newsreels to be developed and distributed.

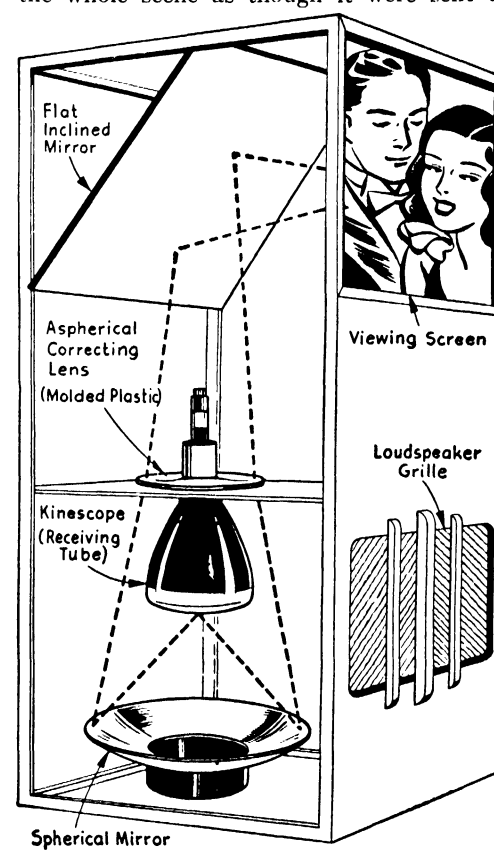
However, we can not be watching a television screen every time an important event comes along. Fortunately this is not necessary. Motion-picture cameras are busily recording the news for us, and a round-up of the day's events can be telecast, so that we may enjoy our newsreel right at home. Films that instruct as well as entertain are also easy to telecast—how to can peaches, how to make a dress, how to repair an electric iron, how to dance, play tennis, paddle a canoe. Television uses and extends the blackboard, the motion picture, the theater and the radio.

The industry is still in its infancy. Engineers and inventors, directors and designers are learning as they work, and improvements are constant. However, the principle of television, which we are now going to describe, remains the same.

THE HEART OF A TELEVISION TRANSMITTER IS A PHOTOCELL

The television transmitter is really a sort of camera, one which changes the picture it "photographs" into electric-current patterns. The main part of a television transmitter, that which changes light into electric current, is a particular kind of photo-electric cell, or photocell. As you know, the photocell is an electronic device with a special surface that produces an electric current proportional to the light shining on it.

Do you wonder how a single television camera can use such a photocell to send all the shades of light and dark from all parts of a televised scene instantly and continuously? The answer is that television breaks the picture up into many little pieces, and sends each piece swiftly and separately. Look at any picture. See how it is made up of many small spots, some dark, some light, with a great number of in-between shades. The pattern of lights and shades in a picture or scene may be compared with the sound-patterns of something you hear. In television, a scene is broken into many thousands of spots. The photocell changes the spots into current which carries the pattern of lights and shades. The receiver in our home changes the current back into light, in proper order and quantity. Just as in the case of the many still pictures of the motion picture, so the separate televised spots are put together so very quickly that our eyes are fooled: we see the whole scene as though it were sent to

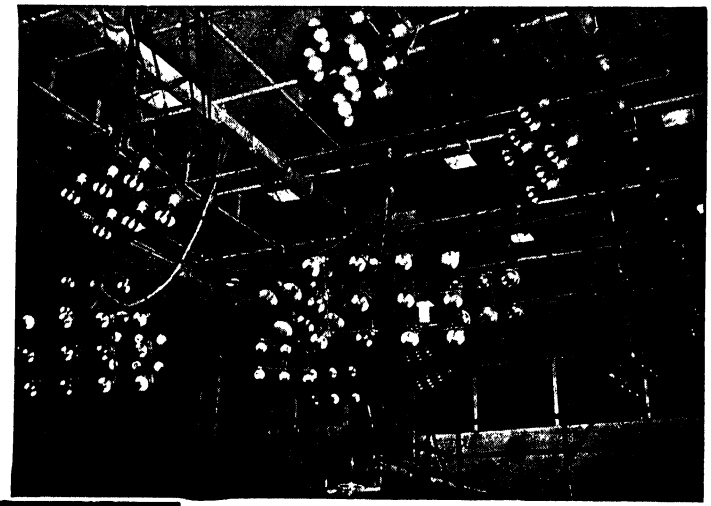


Pictures, RCA Victor

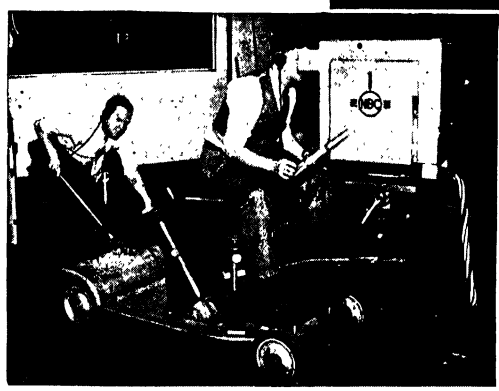
A large-screen set. The picture comes in on the kinescope, is magnified by the spherical mirror, "straightened out" by the correcting lens, and reflected to the screen by the inclined mirror.

our viewing screen as a unit. (See the article on Motion Pictures.)

The action of breaking up the scene into many parts is called *scanning*. It may be done mechanically by a disc which has holes pierced in it, arranged in a spiral. When the scanning disc is spun, a beam of light is guided through the various holes over the object being televised. Every point is covered by its corresponding hole, and the entire scan takes much less time than you need to read this sentence!



The lighting for every television scene must be exactly right. These lights in a television studio can be raised, lowered and swung in every direction to provide the correct illumination for every scene of a telecast.



Pictures, courtesy, National Broadcasting Company

Cameras as well as lights have to be movable. This one, on wheels, is being focused on a studio program. The television camera man is a highly skilled expert.

A more promising and efficient system uses electronic scanning rather than mechanical scanning. One of the electronic scanners was developed by V. K. Zworykin of the Radio Corporation of America. He calls the tube which picks up the scene an iconoscope. The word means image-watcher. The iconoscope is actually part of a camera, the lenses of which can be focused on the scene to be televised. The iconoscope is a large electron tube, looking like a big gourd. Its chief features are a "gun" that shoots electrons, and a plate that is coated on one side with tiny separated droplets of silver and cesium, each smaller than a pinhead and each a miniature photocell. This is called the mosaic plate. Backing up the mosaic plate is a plate of metal, called the signal plate.

So then, light from the scene to be televised enters the camera through the lens, and strikes the mosaic. Wherever light hits a droplet on the mosaic, the cesium sends out electrons, in proportion to the amount of light striking it. As it loses electrons in this way, the mosaic becomes positively charged. This causes action in the metal plate, the signal plate. It captures electrons and soon becomes negatively charged.

Now the electron gun is set to work. It shoots a beam of electrons, thinner than a pencil lead, across the plate horizontally from left to right, then turns back rapidly just as we do in reading, and continues across another line just below the first. This is repeated, again and again, until the whole mosaic—and therefore the whole television-camera picture—is covered, in 441 lines. The electron gun and its electronic controls work so quickly that the picture can be completely covered thirty times in a second.

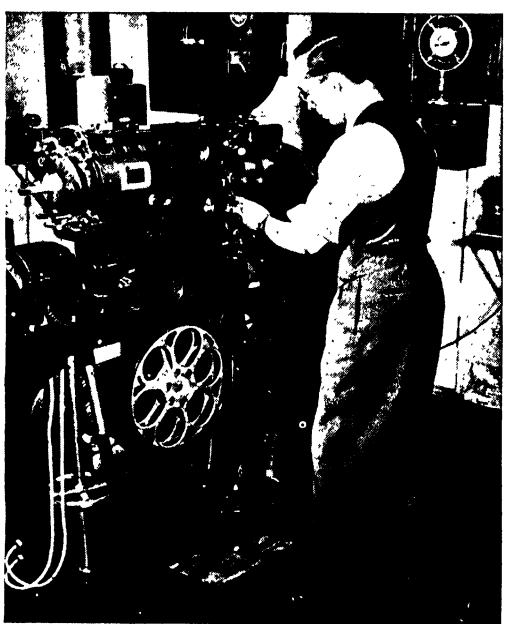
The electrons from the beam have collected on the mosaic-droplets and now the mosaic is once more electrically balanced. But the signal plate is still negatively charged—it has an excess of electrons. These negative charges are released from the iconoscope, sent to the grid of an amplifier electron tube, made much larger, and then sent out into space, to the widespread television audience. (See The Magical Electron Tube for an explanation of the amplifier tube.) At the same time, sound associated with the studio scene is picked up by a regular radio microphone, and its corresponding electrical impluses sent out as radio waves along with the television

A VISIT TO A TELEVISION STUDIO



The camera man "shoots a close-up" of the young actors on Teletruth, a television quiz program.





Photographs, courtesy National Broadcasting Company

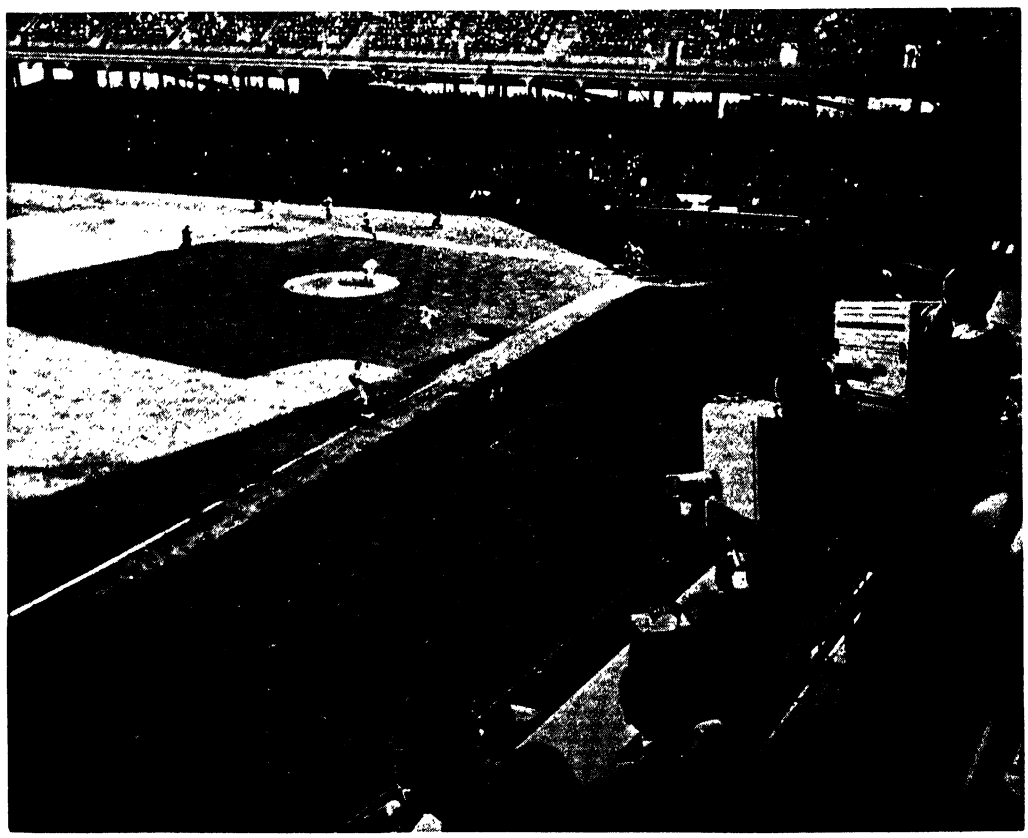
Left, a television sound control room. Right, loading film in a camera for retelecast over a New York station.

impulses. You see and hear the program.

There is another electronic scanner which was developed by P. T. Farnsworth. This is made of two essential parts, called the image dissector and the electron multiplier. Light from the whole scene is focused on a photo-electric cesium-coated plate in the dissector. From every point on this plate, electrons are emitted in proportion to the light striking each point. We have then an image made of electrons, an image which duplicates the light from the televised scene. By means of electric and magnetic forces, every point in the electron image is passed, in turn, through a small hole to the multiplier device. There the electrons hit one of two cesium-covered plates which are placed face to face. Cesium emits several new electrons for each original single electron which hits it, and so the electrons are bounced back and forth between the cesium surfaces until their number has increased many times. We can look upon this as being a means of amplification, which is similar to the electron-tube amplification of the stored charges in the iconoscope described above. When the electrons have been multiplied sufficiently they are drawn off by a wire and led to the transmitting set.

Now the waves (carrying the variations which correspond to the pattern of light in the televised scene) are received in the television receiver. They must be changed back into light, in such a manner that we may see the original picture or pattern or scene. The key device for changing the electric-wave patterns into light is called the cathode-ray tube. The cathode rays are the beams of electrons which are emitted from the electron gun. This tube was developed into a practical television device by V. K. Zworykin, who called his version of it the kinescope.

The kinescope is nearly flat at the larger end, and the flat surface is coated inside with a substance which fluoresces—that is, it gives off light—when bombarded with electrons. In the neck of the kinescope tube is an electron gun, similar to that in the iconoscope. Through this gun pass the television im-



NBC Photo

A baseball game, telecast from Ebbets Field, Brooklyn. Sports events make fine television shows.

pulses which have been received. The tiny beam of electrons strikes the flat end of the tube and moves from left to right at precisely the same speed as the scanning beam in the camera at the transmitting station's studio. Though only a tiny portion of the screen is actually illuminated at one time, this portion continues to glow for a very small fraction of a second after the beam has left it. The beam moves so rapidly that our eyes can not follow it step by step. Instead, we see the whole picture as one, either on the screen itself or else reflected in a mirror from the screen. (Again you should look at the article on Motion Pictures which discusses this "persistence of vision.") The picture size varies in the receiver sets according to the size of the flat screen surface of the kinescope tube.

The greatest limitation of television at the present time is its inability to send its programs very far. They do not go more than about fifty miles. This is due to the fact that the short radio waves used in television travel in a straight line. Since the earth is round, the waves will strike its surface after traveling a short distance, and then continue on into space. Reception is possible only between the transmitter and the point where the waves hit the earth.

From this you can see why it is best to locate television stations on high places like mountain tops and skyscrapers.

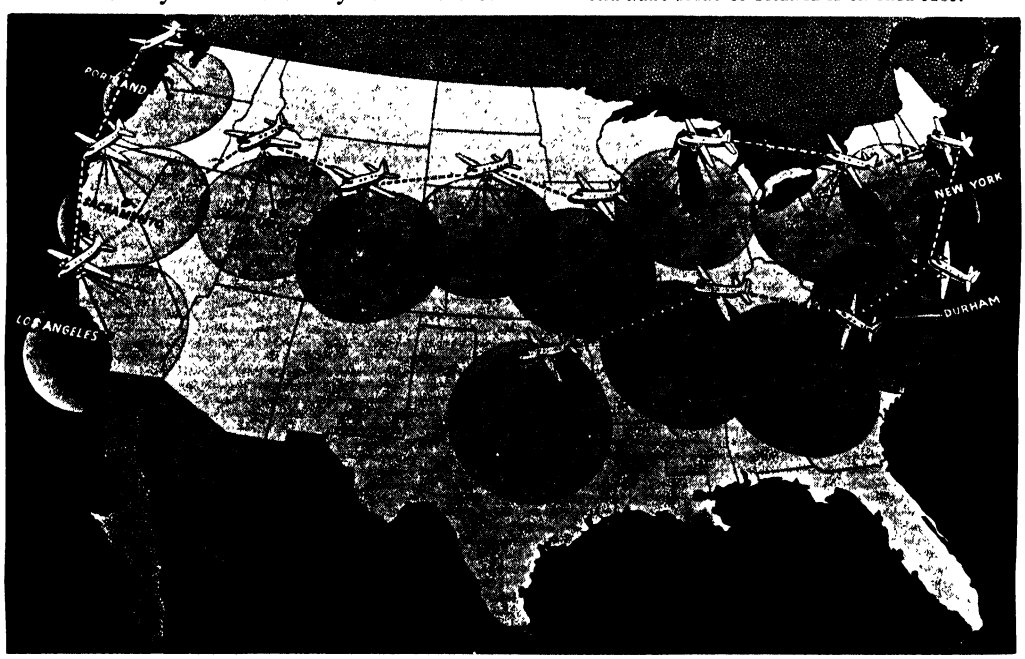
A new idea, still in the experimental stage, is to have airplanes or airships at high altitudes spotted across the country at intervals. Each can relay the program on to the next, and by this means television can cover a larger area.

We have seen how the principal items of television work, and we have listed a few of television's uses. Another thrilling possibility is its use in getting pictures of places where man dare not go. When, for instance, the United States Navy was preparing atomic-bomb experiments, it planned to take close-up pictures by television from pilotless airplanes which were to be steered by radio. Even though the airplane and television transmitter might be destroyed, the picture record would be safe many miles away, having been photographed directly from the screen of a cathode-ray tube at the television receiver.

Perhaps, now that we have bounced radio waves from the moon, using a radar set, we may some day be able to send a radio-controlled rocket ship there—and use television cameras to send back motion pictures of Moonland!

By ROBERT S. COHEN.

THE NEXT STORY OF SCIENCE IS ON PAGE 5285.



Westinghouse

A plan for long-range television. The program would be beamed to a plane, then telecast from relays of planes.



Secretary of National Propaganda, Lisbon

The University of Coimbra. The charming old town of Coimbra was Portugal's capital from 1139 until 1506.

THE STORY OF PORTUGAL

FOUR hundred years ago Portugal was one of the world's great powers. She attained her high position very suddenly by her enterprise in exploration and discovery.

Though her once extensive empire has long since lost Brazil, which had a population greater than the homeland itself, Portugal has today a population of over 18,000,000, made up of nearly 8,000,000 in Europe, and something over 10,000,000 in Africa and the Far East.

Though Portugal in the day of her greatest influence never quite rivaled the power of her neighbor Spain, and for a time was subject to Spain, she has preserved many more of her overseas possessions than Spain has been able to retain of the old Spanish dominions. Like Great Britain, France and Holland, her lands overseas far exceed her European area.

Geographically there is no reason why this Atlantic province should remain distinct when the other states of the peninsula have united. Its mountains are ends of the ranges of Spain; its chief rivers are the useful lower courses of the rivers of Spain, and originally the people inhabiting Portugal were of the same descent as those which occupied Spain. That is, they were of the stock known as Iberians, followed by Celtic tribes, and closely resembled the Asturians and Galicians of northern Spain. Later they were conquered by the Romans, and adopted the Roman language, which, as time went on, was changed, by local usage, into the Portuguese development of the Latin tongue. As in Spain, invasions from the north brought Alans, Suevi and Visigoths, but did not alter the foundations of language laid by the Romans. Then, in 711 A.D., the Arab invasion from Africa placed the land under Mohammedan rule.

Portugal was under Moorish government for over three hundred years, and its southern parts for more than four hundred years. To this day the Portuguese people of the south bear visible traces of a partly African origin, though the artistic culture of the best days of the Moorish civilization is not as evident there as in southern Spain. When Lisbon was finally freed from the Moors, in 1147, a band of English Crusaders helped in its capture. It was a son of the house of Burgundy, Count of Portugal, who was the leader in this achievement. Alfonso I he was called.

Guinea, to the Congo, to Angola; doubled the Cape of Good Hope with Bartholomew Diaz in command; established settlements on the East African coast; reached India under Vasco da Gama, and made Goa the center of their influence in the East; gained the trade of the Persian Gulf; discovered Madagascar and Mauritius; communicated with Ethiopia from the Red Sea; touched at Malacca and established themselves at Timor in the Eastern Archipelago; came into touch with Siam and China, and arrived in Japan.

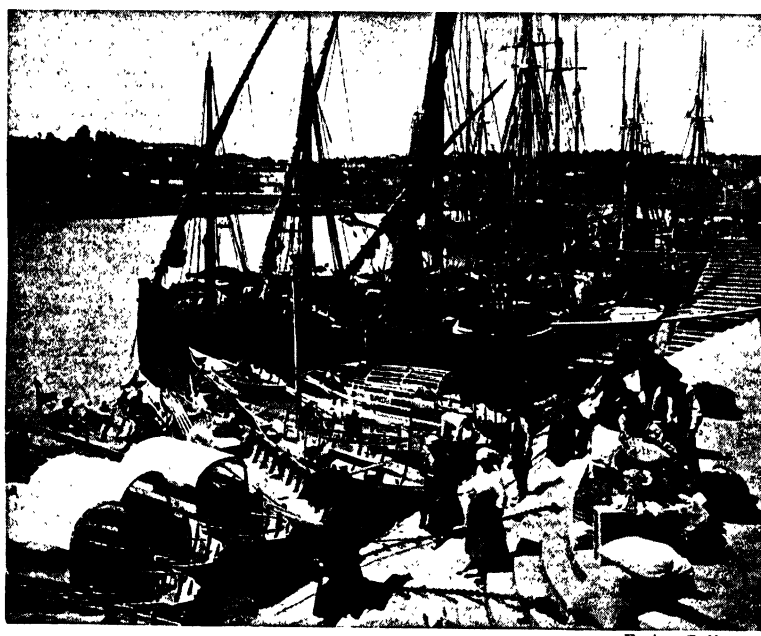
All this, of course, was not done in the time of Henry the Navigator, but his were the wisdom and energy that started his country on the way to being a world power, till she almost rivaled Spain as a nation finding wealth beyond the seas.



Consulate General of Portugal, N. Y.

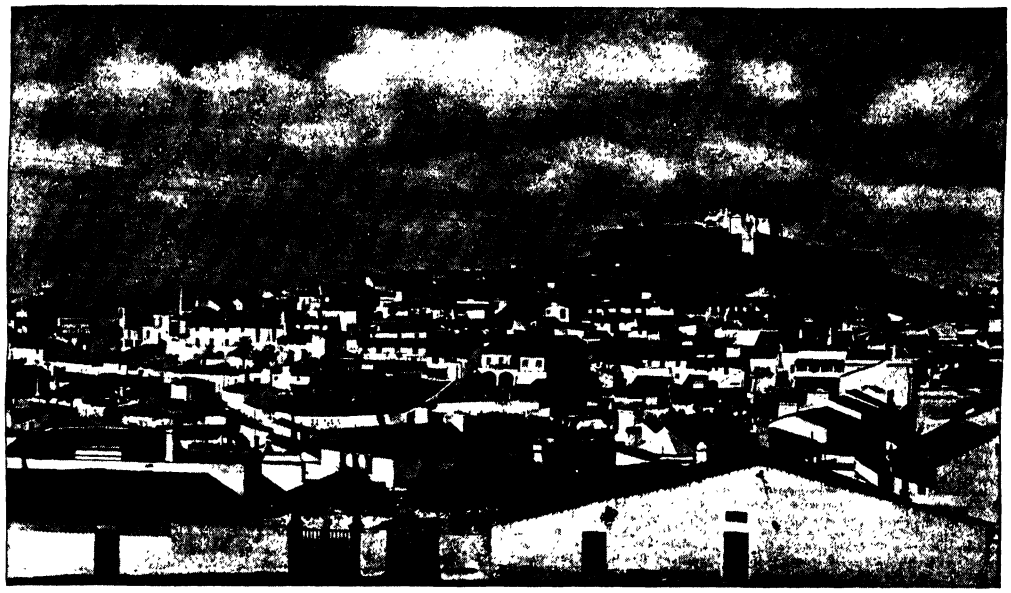
Hills and farm terraces make magnificent scenery along the Douro River.

At first it seemed likely that Spain and Portugal might fight over their discoveries. When Columbus returned from his first voyage, the Pope issued a bull, or decree, by which he gave to Spain all lands discovered west of a line drawn 100 leagues west of the Azores. Portugal, however, was not satisfied with this, and the next year—in 1494—a treaty was made between the two countries. By this treaty it was agreed that a line running from the Arctic to the Antarctic, and 370 leagues west of the Cape Verde Islands, should be drawn on the map, and that all new land discovered west of that line should belong to Spain, and all land east of it to Portugal. The line made by the treaty is the line of which we usually think when we speak of the Papal Line of Demarcation, or the boundary dividing the territories which the Pope believed he had the right to bestow on Spain and Portugal. Neither France nor England paid any attention to the Papal Line of Demarcation, and



Ewing Galloway

A busy scene along the Douro River. Ships bring wine from neighboring districts. Wine of Oporto, or Port wine, is one of the most famous of the products of Portugal.



A Moreira, Porto

This quaint old city of Oporto is walled in with gates as entrance and exit. Note how the houses are clustered around the hill, whose summit was once the fortified citadel.

though Spain sometimes claimed that Brazil was on her side of the line, Portugal would not give up her settlements there.

The fall of Portugal was swifter than her rise. In 1520 she was at the height of her expansion. In 1580 she was annexed to Spain and was kept in the house of bondage for sixty years, an unwilling partner in the wars which broke down the might of Spain itself.

How came that fall about? Like Spain, Portugal crumbled from within. She became narrow and intolerant in religion and in business. She tried to make all her people of one religion, and so destroyed the freedom of the mind. She drove out the Jews, who had been the mainstays of her trade. Her population was too small to provide manhood for her enterprises far away, and she recruited it by starting a great slave trade, which partly Africanized some of her southern provinces. She had wealth, but had become weakened in manhood and in the love of freedom that trebles the power of manhood. So, when, in 1580, eight years before he sent his Armada to conquer England, Philip II turned his eyes to Portugal, he swallowed her at a single gulp. Philip pretended that Portugal was still independent, but that he was her king; but every enemy of the Spanish Empire had now become an enemy of Portugal on all the ocean highways of the world.

When, after sixty years of captivity, the weakening power of Spain gave Portugal a hope of regaining her freedom, she rebelled, and under the Duke of Braganza became an independent kingdom again. In 1703, by the Methuen, or "Port Wine," Treaty, England and Portugal became closely allied commercially, and have remained so ever since. England had formerly imported claret from France; she now extended low tariff duties to Portugal on the heavier port (from Oporto) and was given the same privileges on her own manufactured goods. The alliance has been sustained. During the Peninsular War, Portuguese troops were brigaded with Wellington's men long after Portugal was cleared of the French invaders.

During the advance of Napoleon's men into Portugal in 1807 the royal family of Braganza, as the only means of avoiding capture, retired to the great colony Brazil and remained there until the end of the war, and indeed for some time afterward. When the Portuguese king returned to reign, his son remained in Brazil, and under his sovereignty that country finally asserted its independence. The flight of the royal family to Brazil really caused the separation of Brazil and Portugal. For the first time jealousy entered into their relations, and then Brazil chose to become independent.

The story of Portuguese politics since has been a story of political intrigue, ending in

VARIED SCENES FROM SUNNY PORTUGAL



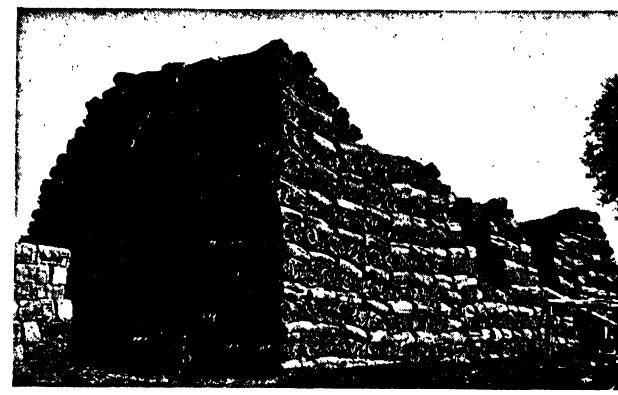
Flower girls at their open-air stand in Minho. Note the native dress on the women in the background.



A fisherman, in picturesque tunic, of Figueiro da Foz, where fishing is important.



A girl of Aveiro gracefully carries her market-basket on her head.



Cork is one of Portugal's exports. Here is a stack ready for shipment.

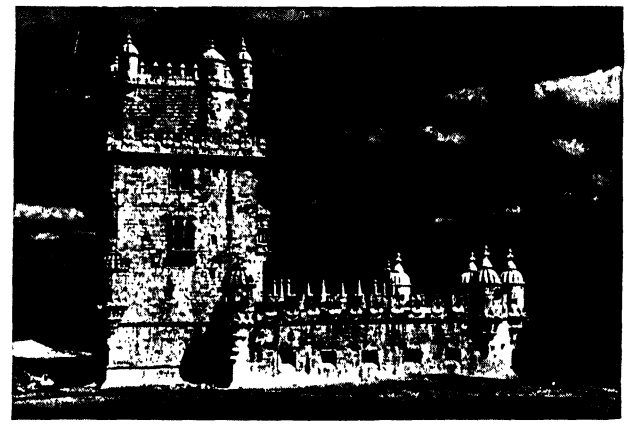




All pictures from Photographic Archives, Portugal

The two-wheeled ox-cart is still to be seen in the Alentejo region. Right, a fisherman of Nazaré in colorful dress.





The majestic basilica (a large rectangular church) at Magra. To the right, an old fortified castle at Belem.

the flight of the last king, Manoel II, after the murder of his father and elder brother, and the proclamation, in 1910, of a republic. This did not prove stable, and several presidents were forced to resign, usually by the army or navy. Since 1933 the government has been a dictatorship. In the first World War Portugal was one of the first nations to declare herself on the side of the Allies, and she sent a small force into the field in France.

In 1939 Portugal assumed a new importance in world affairs. When war broke out in Europe, and the English channel became unsafe for neutral shipping, ships began stopping in Lisbon and transferring goods and passengers by air or rail to many points on the Continent and to Great Britain by air. As the war continued, Lisbon became a strange way station with an international flavor. You would find there men and women from every country, friends and foes and neutrals—most of them waiting to go somewhere else. Portugal remained neutral throughout the war.

With continental Portugal the Azores and Madeira are included in an area of 35,500 square miles. The colonies have still an area of over 810,000 square miles, chiefly in West Africa and East Africa, two solid blocks of territory with over 9,000,000 inhabitants between them. The other overseas possessions include three Indian coast settlements, Goa, Din and Daman. Goa, on the Malabar coast, has, from the days of the earliest discoverers, been the center of Portuguese activity in the East, but its importance has greatly declined. In the eastern part of the East Indian island of Timor a population of over 450,000 remains under Portuguese administration, the rest being under the Dutch. Macao is a small Chinese settlement near Canton, dating from the sixteenth century. It is chiefly busy with the tea trade. The Cape Verde Islands in the Atlantic have a population of about 181,000. Coffee is the chief product. Portuguese Guinea, in West Africa, is entirely inclosed by French Senegambia. The islands of São Tomé and Principe in the Gulf of Guinea have an extraordinarily rich soil, and are famous for their production of cocoa.



All pictures, Photographic Archives, Portugal

A model in filigree work. A ship of the time of Columbus. This type of ship was called a caravel.

As we have already said, throughout its whole length Portugal is the continuation of the features of Spain to the westward, the Spanish mountain ranges and rivers being merely prolonged. Portugal has only one considerable river of her own, the Mondego. The Minho is a frontier stream of the north; the Guadiana, also, to a considerable extent,

in the southeast; but the Douro and the Tagus cross the whole country. They are now, however, navigable far inland. Oporto, three miles from the mouth of the Douro, is reached only by ships of light draft, though it is named as a port. The port beyond the bar is Leixoes. Oporto is the center of the wine trade, which is Portugal's largest business. Lisbon, the capital, on the estuary of the Tagus, has over 700,000 people. It is much more open than Oporto as a port. Both Lisbon and Oporto are finely situated, and both are great manufacturing centers for clothing fabrics for use in Portugal and her colonies. There are no other large cities. Setúbal, in the south, famed for its salt, has about 35,000 people; Braga, north of Oporto, has close to 30,000; Coimbra has 35,000; and Funchal, in Madeira, has about 48,000. These cities have a picturesque charm that interests tourists.

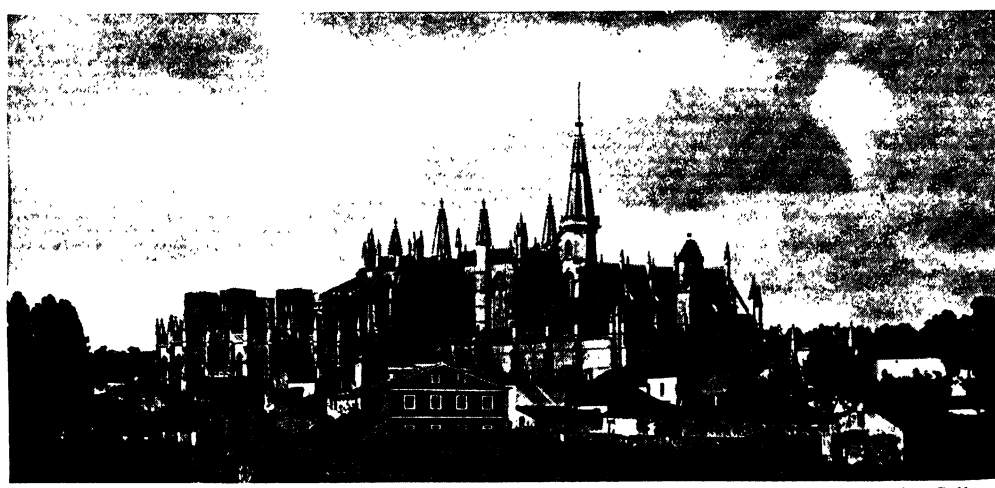


Gateway to the Castello da Pena, perched on Pena peak, and overlooking the city of Cintra.

Portugal is essentially an agricultural country. Though it has mineral wealth, its minerals are little worked except copper, partly through the absence of coal. The climate is healthy, except in the marshy parts of the low-lying southern coast, where malaria is prevalent. There is an abundance of rain, especially in the center and the north, and one effect is a profuse growth of flowers.

The vine and the olive flourish on the hillsides. Corn is grown in the north. There the breeding of oxen and sheep is the chief agricultural interest. Wheat is grown in the central regions. Fruits are abundant —oranges, lemons, figs, grapes, olives, almonds and tomatoes. The fisheries are important, particularly the sardine fishery centering in Setúbal. The exports are wine, cork, fruits, potatoes, onions, cattle, wool, olive oil, salt, copper and sardines. Portugal is an old country, and not one of the most fertile, but it is still productive.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 5290.



Pictures, Ewing Galloway

Once the monastery of Santa Maria da Victoria at Batalha, this building is now a public monument.

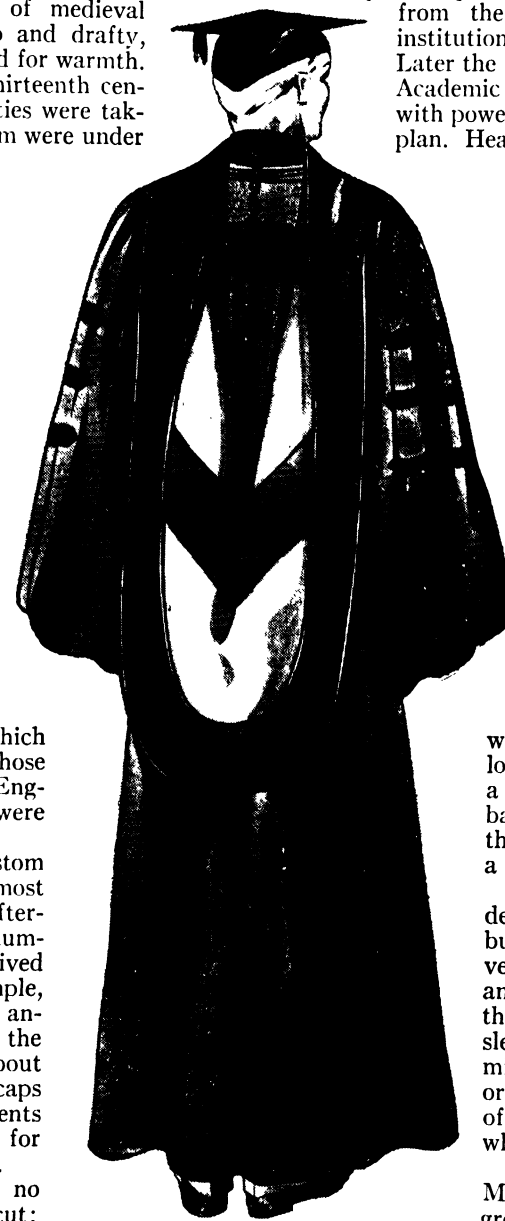
WHAT IS THE HISTORY OF CAPS AND GOWNS?

THE use of the cap and gown at graduation of modern youth from high school, college or university can be traced to the fact that the halls of medieval buildings were damp and drafty, and robes were needed for warmth. In the twelfth and thirteenth centuries, when universities were taking form, most of them were under the jurisdiction of the Church. The first scholars were clerics and they adopted robes not very different from the robes of other clerical orders.

The hood had its origin in the alms bag slung around the necks of the begging friars in the Middle Ages. From these beginnings, academic costume derived its form. Modifications were made to suit the changing needs. Even during colonial times, American colleges used caps and gowns which were patterned on those brought over from England, though some were developed locally.

Gradually the custom of wearing gowns almost disappeared. Years afterward faculties at a number of institutions revived the practice. For example, Harvard at its 250th anniversary in 1886, and the trustees of Yale at about the same time, used caps and gowns. The students at Williams used them for the first time in 1883.

At first there was no uniformity in style or cut; each institution adopted its own patterns. In 1893, delegates from many of the leading institutions met and drew up a simple system, partly borrowed from the practice of European institutions and partly original. Later the Intercollegiate Bureau of Academic Costume was chartered, with power to modify or add to the plan. Headquarters were set up in Albany, New York.



Doctor's gown, showing hood and bell sleeves.

The distinctions set up by the Intercollegiate Code are simple. Gowns for the Bachelor's degree are to be fashioned from "worsted stuff" with semi-stiff yoke, long pleated front and intricate shirring or pleating across the shoulders and back. The Bachelor's gown may be worn either open or closed and is primarily distinguished by its long, pointed sleeves.

The Master's gown has the same yoke effect but is worn open, and the very long sleeve is oblong with a crescent cut out at the base, closed at the end—the forearm comes through a slit near the elbow.

Gowns for the Doctor's degree are also worn open, but they carry broad velvet panels down the front, and three velvet bars on the full, round, bell-shaped sleeves. This velvet trimming may be either black or in the color distinctive of the particular faculty which grants the degree.

Gowns for both the Master's and Doctor's degrees are preferably of silk. Caps may be of serge or

broadcloth, or for the Doctor's outfit only, of velvet; and the tassel of the Doctor's cap is sometimes of gold bullion.

It is the hood that gives color and real meaning to the academic costume. A black cloth shell, of varying size according to degree, and of material to match the gown, is lined with silk in the color or colors of the institution conferring the degree. The hood is then bordered with velvet of the proper width to indicate the degree and in a color signifying the department that the degree represents.

The use of some of these colors goes back into the Middle Ages. White velvet indicates Arts and Letters; Divinity and Theology is indicated by scarlet, a reminder of the Crucifixion; Philosophy is blue, the color of truth; Law is purple, the color of kings who used to make laws; Science is golden yellow, the color of gold, which the old scientists used to attempt to make from baser metals; Medicine is green, the color of the herbs used in healing, which once played so great a part in medical lore.

DO ANY PEOPLE HAVE BLUE BLOOD?

In the old, old days, centuries ago, many people had the belief that there were two sorts of human beings, aristocrats and common people. With this belief went another, that the aristocrats had a superior kind of blood—blue blood. Even in our own time this curious expression still lingers. The truth is, of course, that every human being has both red blood and blue blood. The red blood is in our arteries, while the blue, or, more accurately, the purplish, is in our veins. It is purplish because it is carrying waste matter from the tissues.

The heart receives from the body, through the tubes called veins, blood that has lost oxygen and become charged with carbon dioxide, and is therefore purplish. The heart pumps this purplish blood into the lungs, and, as we breathe, the purplish blood loses its carbon dioxide, gains oxygen, and becomes bright red. This bright red blood goes back to the heart, and is pumped over the body through tubes called arteries. In other words, the same blood has different colors at different stages in its circulation.

WHY DO FISH DIE IN A TANK OF WATER?

It is not the water that keeps the fish alive, but the oxygen in the water, without which no animal, fish or man, can live long. Fish can live in water because they have a special arrangement in their gills by means of which they can extract oxygen from water. But when a fish is placed in a tank of water it may soon use up all the oxygen that is in it, and when that happens, life is no longer possible. The fish, in fact, is drowned, just as much as a man would be under the water. This is the reason why, if we keep fish, we must change the water often in order to supply them with fresh oxygen. Green plants, as you know, take in carbon dioxide and give out oxygen. Therefore green plants growing in a tank of water help somewhat to give the fish living in it a further supply of oxygen. The brilliant colors of the fish, such as goldfish, that are usually kept in aquariums also seem to glimmer more brightly against a background of green.

HOW DO FISH LIVE IN A FROZEN POND?

Ordinary ice, we know, is lighter than water, and therefore it floats. Generally, what we call a frozen pond is a pond of which the surface is frozen. Skaters are perfectly aware of this. They want to know how thick the ice is, for they know that there is liquid water underneath it. So when we speak about fish living in a frozen pond, we mean fish living in liquid water that has a layer of frozen water above it, rather than in a pond of solid ice.

The really serious part of this for the fish is not, as we might think, the coldness of the water they are in, but the question of how that water is to be supplied with enough air for the fish to live. When a pond is not frozen, oxygen from the air above is passing into the surface of the water as fast as it is being used up by the fish and the thousands of other living creatures in the water.

When a pond is frozen, this process is very nearly stopped. There may be gaps in the ice here and there—airholes, such as air-breathing creatures will make in the frozen north—but perhaps there may be none of these. A little oxygen may get through at the edge of the ice, but the best hope for the fish is that there is a supply of new water coming into the pond below the ice from somewhere else, and bringing enough oxygen dissolved in it to keep the fish alive. If the supply of oxygen is kept up in none of these ways, then, when there is no more of it left, the fish will surely die, as must every living creature that is prevented from breathing.

THE NEXT WONDER QUESTIONS ARE ON PAGE 5233.

AN OLD TIME SPELLING BEE*

From THE HOOSIER SCHOOL MASTER

By EDWARD EGGLESTON

EVERY family furnished a candle for the spelling bee. There were yellow dips and white dips, burning, smoking, and flaring. There was laughing, and talking, and giggling, and simpering, and ogling, and flirting, and courting. Ralph Hartsook, the young schoolmaster, thought to himself that what a full-dress party is to Fifth Avenue, a spelling-school is to Hoopole County. It is an occasion which is metaphorically inscribed with this legend: "Choose your partners." Spelling is only a blind in Hoopole County, as is dancing on Fifth Avenue. But as there are some in society who love dancing for its own sake, so in Flat Creek district there were those who loved spelling for its own sake, and who, smelling the battle from afar, had come to try their skill in this tournament, hoping to freshen the laurels they had won in their school-days.

"I 'low," said Mr. Means, speaking as the principal school trustee, "I 'low our friend the Square is jest the man to boss this 'ere consarn to-night. Ef nobody objects, I'll app'int him. Come, Square, don't be bashful. Walk up to the trough, fodder or no fodder, as the man said to his donkey."

The Squire came to the front. Ralph made an inventory of the agglomeration which bore the name of Squire Hawkins as follows:

1. A swallow-tail coat of indefinite age, worn only on state occasions, when its owner was called to figure in his public capacity. Either the Squire had grown too large or the coat too small.

2. A pair of black gloves, the most phenomenal, abnormal and unexpected apparition conceivable in Flat Creek district.

3. A wig of that dirty, waxen color so common to wigs. This one showed a continual inclination to slip off the owner's smooth, bald pate, and the Squire had frequently to adjust it. As his hair had been red, the wig did not accord with his face, and the hair ungrayed was doubly discordant with a countenance shriveled by age.

4. A semicircular row of whiskers hedging the edge of the jaw and chin. These were dyed a frightful dead-black, such a color as belonged to no natural hair or beard that

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Culver Service

An old-time spelling bee. When a contender missed a word he had to sit down.

ever existed. At the roots there was a quarter of an inch of white, giving the whiskers the appearance of having been stuck on.

5. A pair of spectacles with tortoiseshell rim. Wont to slip off.

6. A glass eye, purchased of a peddler, and differing in color from its natural mate, perpetually getting out of focus by turning in or out.

7. A set of false teeth, badly fitted, and given to bobbing up and down.

8. The Squire proper, to whom these patches were loosely attached.

"Ladies and gentlemen," he began, shoving up his spectacles, and sucking his lips over his white teeth to keep them in place, "ladies and gentlemen, young men and maidens, raley I'm obleeged to Mr. Means fer this honor," and the Squire took both hands and turned the top of his head round half an inch. Then he adjusted his spectacles. Whether he was obliged to Mr. Means for the honor of being compared to a donkey was not clear. "I feel in the inmost compartments of my animal spirits a most happifying sense of the success and futility of all my endeavors to sarve the people of Flat Creek deestrick, and the people of Tomkins township, in my weak way and manner." This burst of eloquence was delivered with a constrained air and an apparent sense of a danger that he, Squire Hawkins, might fall to pieces in his weak way and manner, and of the success and futility of all attempts at reconstruction. For by this time the ghastly pupil of the left eye, which was black, was looking away round to the left, while the little blue one on the right twinkled cheerfully toward the front. The front teeth would drop down so that the Squire's mouth was kept nearly closed, and his words whistled through.

"I feel as if I could be grandiloquent on this interesting occasion," twisting his scalp round, "but raley I must forego any such exertions. It is spelling you want. Spelling is the cornerstone, the grand, underlying subterfuge, of a good education. I put the spellin'-book prepared by the great Daniel Webster alongside the Bible. I do, raley. I think I may put it ahead of the Bible. For if it wurn't fer spellin'-books and sich occasions as these, where would the Bible be? I should like to know. The man who got up, who compounded this work of inextricable valoo was a benufactor to the whole human race or any other." Here the spectacles fell off. The Squire replaced them in some confusion, gave the top of his head another twist, and felt of his glass eye, while poor Shocky stared in wonder, and Betsey Short rolled from side to side in the effort to suppress her giggle. Mrs. Means and the other old ladies looked the applause they could not speak.

"I app'int Larkin Lanham and Jeems Buchanan fer captings," said the Squire. And the two young men thus named took a stick and tossed it from hand to hand to decide which should have the "first choice." One tossed the stick to the other, who held it fast just where he happened to catch it. Then the first placed his hand above the second, and so the hands were alternately changed to the top. The one who held the stick last without room for the other to take hold had gained the lot. This was tried three times. As Larkin held the stick twice out of three times, he had the choice. He hesitated a moment. Everybody looked toward tall Jim Phillips. But Larkin was fond of a venture on unknown seas, and so he said, "I take the master," while a buzz of surprise ran round the room, and the captain of the other side, as if he were afraid his opponent would withdraw the choice, retorted quickly, and with a little smack of exultation and defiance in his voice, "And I take Jeems Phillips."

And soon all present, except a few of the old folks, found themselves ranged in opposing hosts, the poor spellers lagging in, with what grace they could, at the foot of the two divisions. The Squire opened his spelling-book and began to give out the words to the two captains, who stood up and spelled against each other. It was not long until Larkin spelled "really" with one l, and had to sit down in confusion, while a murmur of satisfaction ran through the ranks of the opposing forces. His own side bit their lips. The slender figure of the young teacher took the place of the fallen leader, and the excitement made the house very quiet. Ralph dreaded the loss of prestige he would suffer if he should be easily spelled down. He listened carefully to the words which the Squire did not pronounce very distinctly, spelling them with extreme deliberation. This gave him an air of hesitation which disappointed those on his own side. They wanted him to spell with a dashing assurance. But he did not begin a word until he had mentally felt his way through it. After ten minutes of spelling hard words Jeems Buchanan, the captain on the

other side, spelled "atrocious" with an s instead of a c, and subsided, his first choice, Jeems Phillips, coming up against the teacher. This brought the excitement to fever-heat. For though Ralph was chosen first, it was entirely on trust, and most of the company were disappointed. The champion who now stood up against the schoolmaster was a famous speller.

Jim Phillips was a tall, lank, stoop-shouldered fellow who had never distinguished himself in any other pursuit than spelling. Except in this one art of spelling he was of no account. He could not catch well or bat well in ball. He could not throw well enough to make his mark in that famous Western game of bull-pen. He did not succeed well in any study but that of Webster's Elementary. But in that he was—to use the usual Flat Creek locution—in that he was "a hoss." This genius for spelling is in some people a sixth sense, a matter of intuition. Some spellers are born, and not made, and their facility reminds one of the mathematical prodigies that crop out every now and then to bewilder the world. Bud Means, foreseeing that Ralph would be pitted against Jim Phillips, had warned his friend that Jim could "spell like thunder and lightning," and that it "took a powerful smart speller" to beat him, for he knew "a heap of spelling-book." To have "spelled down the master" is next thing to having whipped the biggest bully in Hoopole County, and Jim had "spelled down" the last three masters.

For half an hour the Squire gave out hard words. What a blessed thing our crooked orthography is! Without it there could be no spelling-schools. As Ralph discovered his opponent's mettle he became more and more cautious. He was now satisfied that Jim would eventually beat him. The fellow evidently knew more about the spelling-book than old Noah Webster himself. As he stood there, with his dull face and long sharp nose, his hands behind his back, and his voice spelling infallibly, it seemed to Hartsook that his superiority must lie in his nose. Ralph's cautiousness answered a double purpose; it enabled him to tread surely, and it was mistaken by Jim for weakness. Phillips was now confident that he should carry off the scalp of the fourth schoolmaster before the evening was over. He spelled eagerly, confidently, brilliantly. Stoop-shouldered as he was, he began to straighten up. In the minds of all the company the odds were in his favor. He saw this, and became ambitious to distinguish himself by spelling without giving the matter any thought.

Ralph approached a word as Bull approached a raccoon. He did not take hold until he was sure of his game. When he took hold, it was with a quiet assurance of success. As Ralph spelled in this dogged way for half an hour the hardest words the Squire could find, the excitement steadily rose in all parts of the house, and Ralph's friends even ventured to whisper that "maybe Jim had cotched his match, after all!"

But Phillips never doubted of his success.

"Theodolite," said the Squire.

"T-h-e, the, o-d, od, theod, o, theodo, l-y-t-e, theodolite," spelled the champion.

"Next," said the Squire, nearly losing his teeth in his excitement. Ralph spelled the word slowly and correctly, and the conquered champion sat down in confusion. The excitement was so great for some minutes the spelling was suspended.

"Gewhilliky crickets! Thunder and lightning! Licked him all to smash!" said Bud, rubbing his hands on his knees.

And Betsey Short giggled until her tuck-comb fell out.

Shocky got up and danced with pleasure.

"He's powerful smart, is the master," said old Jack to Mr. Pete Jones. "He'll beat the whole kit and tuck of 'em afore he's through. I knowed he was smart. That's the reason I tuck him," proceeded Mr. Means.

"Yaas, but he don't lick enough. Not nigh," answered Peter Jones. "No lickin', no larnin', says I."

It was now not so hard. The other spellers on the opposite side went down quickly under the hard words which the Squire gave out. The master had mowed down all but a few, his opponents had given up the battle, and all had lost their keen interest in a contest to which there could be but one conclusion, for there were only the poor spellers left. But Ralph Hartsook ran against a stump where he was least expecting it. It was the Squire's custom, when one of the smaller scholars or poorer spellers rose to spell against the master, to give out eight or ten easy words, that they might have some breathing-spell before being slaughtered, and then to give a poser or two which soon settled them. He let them run a little, as a cat does a doomed mouse. There was now but one person left on the

opposite side, and, as she rose in her blue calico dress, Ralph recognized Hannah, the bound girl at old Jack Means's. She had not attended school in the district, and had never spelled in spelling-school before, and was chosen last as an uncertain quantity. The Squire began with easy words of two syllables, from that page of Webster, so well known to all who ever thumbed it, as "baker," from the word that stands at the top of the page. She spelled these words in an absent and uninterested manner. As everybody knew that she would have to go down as soon as this preliminary skirmishing was over, everybody began to get ready to go home, and already there was the buzz of preparation. Young men were timidly asking girls if "they could see them safe home," which was the approved formula, and were trembling in mortal fear of "the mitten." Presently the Squire, thinking it time to close the contest, pulled his scalp forward, adjusted his glass eye, which had been examining his nose long enough, and turned over the leaves of the book to the great words at the place known to spellers as "incomprehensibility," and began to give out those "words of eight syllables with the accent on the sixth." Listless scholars now turned round, and ceased to whisper, in order to be in at the master's final triumph. But to their surprise Hannah spelled these great words with as perfect ease as the master. Still not doubting the result, the Squire turned from place to place and selected all the hard words he could find. The school became utterly quiet, the excitement was too great for the ordinary buzz. Would "Meanses' Hanner" beat the master? beat the master that had laid out Jim Phillips? Everybody's sympathy was now turned to Hannah. Ralph noticed that even Shocky had deserted him, and that his face grew brilliant every time Hannah spelled a word. In fact, Ralph deserted himself. As he saw the fine, timid face of the girl so long oppressed flush and shine with interest; as he looked at the rather low but broad and intelligent brow and the fresh, white complexion and saw the rich, womanly nature coming to the surface under the influence of applause and sympathy—he did not want to beat. If he had not felt that a victory given would insult her, he would have missed intentionally. The bulldog, the stern, relentless setting of the will had gone, he knew not whither. And there had come in its place, as he looked in that face, a something which he did not understand. You did not, gentle reader, the first time it came to you.

The Squire was puzzled. He had given out all the hard words in the book. He again pulled the top of his head forward. Then he wiped his spectacles and put them on. Then out of the depths of his pocket he fished up a list of words just coming into use in those days—words not in the spelling-book. He regarded the paper attentively with his blue right eye. His black left eye meanwhile fixed itself in such a stare on Mirandy Means that she shuddered and hid her eyes in her red silk handkerchief.

"Daguerreotype," sniffed the Squire. It was Ralph's turn.

"D-a-u, dau——"

"Next."

And Hannah spelled it right.

Such a buzz followed that Betsey Short's giggle could not be heard, but Shocky shouted: "Hanner beat! my Hanner spelled down the master!" And Ralph went over and congratulated her.

HOW THE FRENCH REACHED MOSCOW

It is a fine thing for an army in a foreign country, which has marched and starved and thirsted for many weeks, to see at last a great city raising its spires in the air and sending the smoke from thousands of chimneys into the sky.

Such a sight as this met the Grand Army of Napoleon in Russia. After desperate battles, after heroic marches through the most wild and desolate country, thirsty, hungry, wounded and weary, the French soldiers at last beheld the magnificence of Moscow flashing and sparkling in the air.

No Russian army disputed their approach. They marched toward this great city, which was crammed with merchandise, provisions and wealth, as if it were their own Paris. Not a shot was fired. Not a soldier was to be seen.

The truth is that, as Napoleon approached the city at one end, the Russian soldiers were marching out at the other.

The French soldiers could not understand

the silence. The city was deadly still. Street after street was traveled through and nothing happened. The bands of their army played "The Victory Is Ours," but no one came to listen or to sing. The soldiers looked up at the windows of the houses, half expecting shots to be fired at them; not a face stared out. They began to feel frightened.

In an hour's time the awful, the terrible, the indescribable horrors of plunder had begun. Can you not imagine what it must be when thousands of starving and thirsty soldiers are turned loose in a rich city filled with unarmed men and women?

Soon, very soon, the splendid city of Moscow was filled with terror. Shrieks of "Murder!" rose from every street. People were seen running wildly, with blood upon their faces, crying, "Murder, murder!" with the soldiers in pursuit.

Nothing was sacred—not even the holy women who give their lives to the poor. Churches were plundered. Treasures of art were destroyed. Sacred things were thrown to the fire. A mad and drunken soldiery went hither and thither, bursting into private houses, running up the stairs, entering the rooms of the sick, the dying and the dead, stealing and murdering.

Suddenly a cloud of smoke rolled upward into the darkening sky, and a thin tongue of scarlet flame licked through it, dancing in a shower of sparks. Then the same thing occurred in another quarter of the city, then in another. The smoke rolled upward, the flames shot through the clouds.

"Our soldiers are setting fire to the places they have sacked," thought the French generals. "We shall have to be careful. Tomorrow we will see to it. Let us go to the theatre to-night."

But it was not the French soldiers. It was the Russian people. The citizens were burning their own city, the sacred city of Moscow. They held no arms; they could neither resist the French nor avenge the dreadful things done to their wives and children; but they could still defeat the French.

While the work of murder went on, the flames crept forward. The soldiers drank—the city burned.

In a very short time great districts were nothing more than gigantic bonfires. Churches and palaces quivered in sheets of flame. The noise was like a whirlwind. The heat was like a furnace. In streets far from the blaze the stones became so hot that they burned leather soles. The gutters were filled with leaping floods of molten copper and lead, streaming from the roofs. French soldiers sought to check the conflagration.

For four nights they toiled—four nights in which no lamps or candles were needed, so vivid was the light of the victorious flames. Shrieks of "Murder!" still issued from the houses. Women and children still ran screaming from their butchers. Old men were still beaten to their knees in the streets. But louder than their shrieks roared the great fire; and fiercer than the French were the scorching flames which leaped from roof to roof, from street to street, from square to square, like a tempest of fire.

A wind blew hard on the flames and fanned them as a blacksmith fans his furnace. The noise was deafening. The heat singed the hair on the face, cracked the lips and suffocated the lungs. On and on came the fire. With bellow-like thunder the mighty roof of a cathedral crashed down, and up whirled a black mass of smoke, pierced presently by a thousand tongues of scarlet fire.

Glass melted and ran with streams of lead through the streets. Trees burned away like matches. Houses of wood vanished in one lick of the red flames. On and on. No one could stop it now. The wind blew victory to the flames and they consumed it.

Then Napoleon began his retreat.

Suddenly in the midst of the clamor there came a bursting roar, which shook every stone in the city and deafened the ears of the people. The great arsenal had exploded. People went mad from that shock. Palace walls were split as an ax splits a log.

Outside Moscow Napoleon was marching away with his army, back over the thousands of desolate miles he had already come. He turned at the sound of the great explosion and looked with wrath at the smoking ruin, the funeral pyre of his hope.

In Moscow he had reckoned to find provisions for his troops, so that he might advance again, from victory to victory.

Now he was retreating from a heap of cinders. Fire had defeated him.

He turned his head and continued the retreat. The way was long. No cities broke its monotony. And there on that long path, waiting to destroy him, was Winter, White Winter, the other wing of the destroying angel, Flame and Snow.

THE STORY OF THE WILLOW-PATTERN PLATE

ON certain old china there is a painting in blue which is known as the willow pattern, and willow-pattern plate is perhaps the most famous china in the world. And it really comes from China, or so did the first plate, for the story is Chinese. This is the story.

A beautiful Chinese girl named Koong-Shee fell in love with her father's secretary Chang, who was a poor man. But the father of Koong-Shee wanted her to marry a rich man, and because she would not give up Chang her father sent her away to a little house at the end of the garden. Outside Koong-Shee's window was a willow tree, and just beyond a fruit tree, and Koong-Shee sat all day watching it bloom. She was very lonely and unhappy, until one day Chang wrote and asked her to fly with him.



Chang dared not post the letter lest it should fall into the hands of Koong-Shee's father, but he found a coconut shell, fixed a sail to it, and putting his letter inside the shell, dropped it into the lake, and watched it sail across to where Koong-Shee sat watching. Koong-Shee read the letter and sent back her answer. She said she would go if her lover were brave enough to come and fetch her. Chang went boldly up to the little house and took her away. They had to cross the bridge to get out of the garden, and when they were halfway across Koong-Shee's father saw them, and hurried after them. Koong-Shee went first with her distaff, Chang followed carrying her jewel-box, and behind them ran the father with a whip. But the father did not catch them, and they escaped to a little house on the other side of the lake, where they lived happily. But the rich man who had wanted to marry Koong-Shee was so angry that one day he set fire to the pretty little house, and Koong-Shee and Chang were killed.

The Chinese artist, whoever he was, made a lovely pattern from this sad tale—and the angry father pursues Koong-Shee and Chang across the bridge eternally.

THE NEXT STORIES ARE ON PAGE 5439.

EXPLORERS OF AFRICA



From an old print

Prince Henry of Portugal, called the Navigator, a fifteenth century patron of Portuguese explorers.

UP to a comparatively short time ago, the civilized nations of the earth knew comparatively little about the African continent. It is true that great civilizations flourished from time to time in the valley of the Nile and along the northern coastal areas of Africa. Yet most of the continent remained mysterious and legendary—it was truly the Dark Continent. To-day, this is no longer true. The secrets of Africa have been revealed one by one by a gallant host of explorers, of many different nations. We shall tell you something of their exploits in the pages that follow.

The first African explorations of which history tells us were made by the Phœnicians, an adventurous people who dwelt on the western shores of Asia Minor. They worked their trading ships along the coast of northern Africa, past the Strait of Gibraltar and for some distance down the western coast. They set up a number of colonies and trading posts. The most famous of these colonies, Carthage, became the rival of Rome for the mastery of the ancient world.

The Greek historian Herodotus tells us that, in the seventh century B.C., an expedition made up of Phœnicians was sent on a voyage of discovery by Necho, a Pharaoh (ruler) of Egypt. These Phœnicians are said to have sailed completely around the African continent, taking three years for the purpose. Since Herodotus is sometimes quite inaccurate, many scholars do not believe his story of Necho's expedition.

It is generally believed that the Carthaginian Hanno's account of his travels is more truthful. Hanno, who lived in the sixth century B.C., sailed down the west coast of Africa for a considerable distance. He tells us that he often heard the throbbing sound of drums coming from the depths of the tropical jungle. He tells of broad rivers in which he saw hundreds of crocodiles and "river horses" (hippopotamuses). He describes in detail a giant ape, as large as a man and far more powerful (the gorilla). Many learned men after Hanno's time laughed at his "wild tales." We now know that his tales were not so wild, after all.

By the year 30 B.C., the Romans had won control of almost all of North Africa. They did not do much to further men's knowledge of the Dark Continent. They established a number of settlements along the northern fringe of the Sahara; but that great desert proved to be an impassable barrier.

The Guide to Geography, a work of the second century A.D. by the astronomer Ptolemy, gives us some idea of what the Romans knew about Africa in the great days of the Roman Empire. The northern coast of Africa, from the Strait of Gibraltar to the Isthmus of Suez, was well known. Ptolemy had heard of a great river in the west (probably the Niger). He knew of Abyssinia (Ethiopia) and he had heard of certain lakes that lay to the southwest of Abyssinia. He had the idea that the Nile River arose in certain underground channels beneath the mysterious Mountains of the Moon (probably the Ruwenzori Mountains). He thought that the extreme southern part of Africa was joined to southeastern Asia.

In the seventh century A.D., almost all of northern Africa was conquered by the fierce Arab followers of the prophet Mohammed.

The Arabs had been accustomed to undertake long journeys on their camels across the sandy wastes of Arabia, their homeland. The Sahara, therefore, was not the barrier to them that it had been to the Romans.

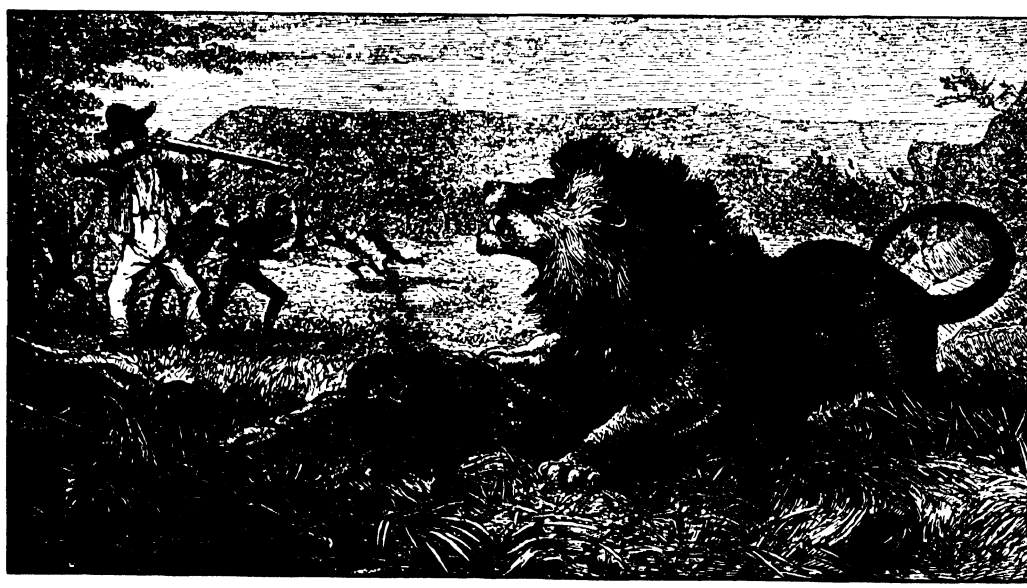
Mounted on their camels, they would set out to explore the mysteries of the great northern desert. By the tenth century, they had crossed the Sahara from the north to the south. By the fourteenth, they had penetrated deep into the Sudan, south of the Sahara. Their explorations were checked at last, however, by the dense forests that stretch almost completely across the continent south of the Sudan.

In the early years of the fifteenth century, a Portuguese prince turned the minds of Europeans to the great continent that lay to the south. This prince was Henry the Navigator (1394-1460), the son of King John I of Portugal. Henry had fought against the Moors in northern Africa; he was filled with the desire to learn as much as possible about the Dark Continent. He sent out a number of expeditions on voyages of discovery down the western coast of Africa. Progress was slow but sure. By 1460, the year of Henry's death, the Portuguese had reached Sierra Leone, within ten degrees of the Equator; they had carefully charted the coast up to that point.

These explorations continued after the death of Henry. In the year 1488, the Portuguese Bartholomew Diaz sailed around the southernmost part of the continent and then up the east coast for several hundred miles. In 1497, Vasco da Gama, another Portuguese, also rounded the southern tip of Africa and reached Mombasa, on the east coast. From here, he sailed out into the Indian Ocean and in May, 1498, arrived at Calicut, in India. We tell you about Henry the Navigator, Bartholomew Diaz and Vasco da Gama in the chapter called Men Who Made the World Known. (See page 79.)

The Portuguese, French, English and Dutch established settlements along the east and west coasts of Africa, and these coastal regions became fairly well known. Slaves, ivory, gold and spices came out of the interior of Africa in a steady stream. The European traders, however, generally showed little interest in the lands that lay beyond their own settlements. To be sure, a certain amount of exploration was carried on from the sixteenth century to the nineteenth by missionaries who sought to convert the natives and by traders who sought to enslave them. However, the contributions made in this way to the knowledge of the continent were not very great.

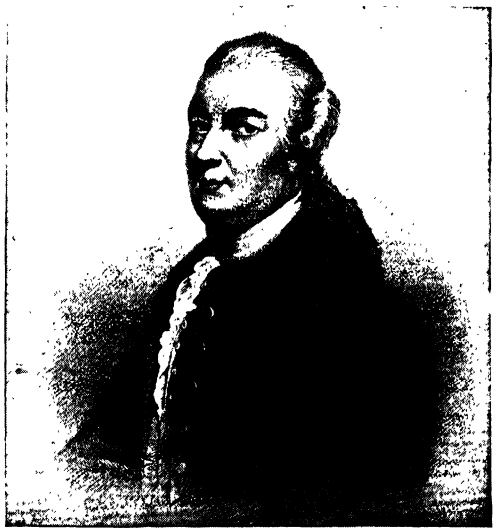
It was not until toward the end of the eighteenth century that the exploration of the Dark Continent was taken up again in earnest. The pioneer in this period was the enterprising James Bruce (1730-94), a Scot-



A dramatic incident in the career of the great African explorer, David Livingstone. While working as a missionary in South Africa, Livingstone was attacked by a lion that he had wounded but not disabled. The explorer was badly hurt; fortunately, a companion of Livingstone killed the lion with a single shot.

tish wine merchant, diplomat and traveler. He became interested in one of the great mysteries of Africa—the source of the Nile River. He was certain that he would find it in Abyssinia.

Bruce had many exciting adventures in that inhospitable land. At last, in 1770, he succeeded in following to its source a river that he thought was the Nile; it was really



James Bruce, Scottish traveler, a pioneer in African exploration. He traveled extensively in Ethiopia and discovered the source of the Blue Nile.

the Blue Nile, a tributary of the great river. Returning to England, he wrote five immense volumes about his discovery. It is interesting to note that Bruce, who had risked his life often in the course of his Abyssinian expedition, died in his own home as the result of an accidental fall downstairs.

Bruce's expedition aroused great interest in England. In 1788 a society known as the African Association was founded in London for the purpose of exploring the interior of Africa. In 1795, a young Scottish surgeon, Mungo Park (1771-1806), was sent out by this society to explore the course of the Niger River. He made his way to the interior of the continent by way of the Gambia River, on the west coast. He reached the Niger and followed the course of the river for a considerable distance.

Ten years later he set out on another expedition to the Niger. This time, he was determined to follow the course of the river to its mouth. He traveled along its banks for many miles; then his party embarked in canoes. Park did not reach his goal. While



David Livingstone, one of the greatest of all African explorers. We owe much of our present knowledge of Africa to his never ceasing travels.

trying to escape from hostile natives, he was drowned in the rapids of the river, several hundred miles from the Gulf of Guinea, into which it flows.

In 1830, two brothers, Richard and John Lander, succeeded at last in reaching the mouth—or rather, one of the mouths—of the Niger. You see, the river spreads out in a vast delta before it empties its waters into the Gulf of Guinea. This malarious delta covers an area of 14,000 square miles.

Other daring explorers were busily at work in the first half of the nineteenth century. They entered the continent from every side—from Tripoli, on the north; from Senegal, the Gold Coast and Angola, on the west; from Mozambique, on the east. The Senegal, Gambia and Rio Grande rivers, in West Africa, were followed up to their sources. The lofty mountains of Kilimanjaro and Kenya were discovered. Europeans penetrated for the first time to the shores of Lake Chad, in the Sudan. They visited the native city of Timbuktu, on the Niger—a fabulous sort of place, about which there were many marvelous stories, some false, some true.

We now come to one of the greatest figures in the history of African exploration—the Scottish doctor, missionary and traveler David Livingstone (1813-73). Livingstone had to work hard in a cotton mill as a boy, but he studied his books at every opportunity. He became a fine Latin and Greek scholar and a skillful doctor. While a very



The dramatic meeting of Livingstone and Stanley at Ujiji, on the banks of Lake Tanganyika. Stanley had been commissioned by an American newspaper to find Livingstone, who had not been heard from for a long time.

young man, he had made up his mind to become a missionary. It was as a missionary and doctor that he went to Africa in 1840.

For a number of years, Livingstone worked among the natives of South Africa, and he made many converts to Christianity. At that time, lions roamed freely over the plains; they attacked the cattle and terrified the natives. One day, Livingstone, who was traveling with a white companion, came upon a huge lion that was stalking a herd of cattle. He fired two bullets at the animal and wounded it.

Enraged, the lion charged; it pounced upon Livingstone and crushed his left shoulder between its powerful jaws. Fortunately, it released its prey in order to attack the other man, who dropped the animal with a well-aimed shot. Livingstone never fully recovered from his terrible wound. Yet, in spite of the fact that he was hardly ever free from suffering, he became one of the most wonderful travelers of all time.

He had heard from the natives that there was a large lake north of the Kalahari Desert, in southwest Africa. In 1849, he crossed that area from south to north and at last discovered Lake Ngami. He then began a long series of explorations; by 1856, he had crossed the continent from east to west and then from west to east. In the course of his travels, he discovered the mighty Victoria Falls, on the Zambezi River. This cataract, one of the great natural wonders of the world, is almost twice as high as our own Niagara.

Livingstone returned to England in 1856 for a much needed rest. In 1858, he went back to his work of winning new converts and exploring the unknown territories of the African continent. There began another series of travels which lasted until 1864. He discovered one of Africa's greatest lakes, the Nyasa, which is some 350 miles long; he thoroughly explored the Zambezi, Shire and Rovuma rivers.

In 1864, Livingstone again returned to England. In the following year, he set out for Africa again on what proved to be his last great expedition; it was his aim to explore the extensive regions that lie to the west of lakes Tanganyika and Nyasa. Livingstone discovered two more lakes—Bangweulu and Moero. Proceeding to the Congo Basin, he came to a great river that flowed northward from its source. Livingstone was convinced that this river was the Nile and that the secret of the river's source was discovered at last. As we shall see, the great explorer was quite mistaken.

For several years the outer world had had no word from Livingstone and it was feared that he had met with some terrible misfor-

tune. In January, 1871, an expedition under Henry Morton Stanley was sent out by the New York World, a famous newspaper, to find the explorer. Nine months later, at Ujiji, on the shores of Lake Tanganyika, Stanley came upon Livingstone, who was suffering from fever and was half starved. When Stanley greeted this man whom he had traveled thousands of miles to find, he could not think of words to express his joy. His greeting was in the stiffly formal "parlor" language of the day, "Doctor Livingstone, I presume?"

Livingstone was brought back to health.





Sir Samuel Baker, English explorer and author, and his wife. Lady Baker accompanied Sir Samuel on the journey that resulted in the discovery of Lake Albert, one of the principal sources of the Nile River, in 1864.

The two men now went on a great journey together around the northern end of Lake Tanganyika, the longest lake in the world. Then they separated. Livingstone went on to explore the southern end of the lake, while Stanley returned to civilization.

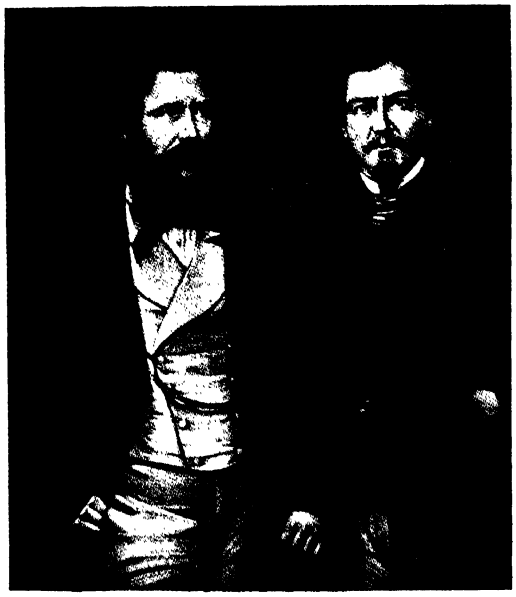
Livingstone's wanderings were almost at an end. In the year 1873, he died by the shores of Lake Bangweulu, which he had discovered. His faithful native followers preserved the body in salt and carried it to the coast, hundreds of miles away. From there it was brought to England. In April, 1874, Livingstone was laid at rest in Westminster Abbey, where lie the bones of many of England's greatest men.

Henry Morton Stanley (1841-1904), the rescuer of Livingstone, won undying fame as an African explorer. His name was originally John Rowlands; he was born in Wales. He was a poor orphan lad; much of his childhood was spent in what the English call a workhouse—a sort of combined poorhouse and orphanage. In 1857, he sailed as a cabin boy in a vessel bound for New Orleans. Here he was adopted by a merchant, and he took the name of this kind man.

Stanley fought in the Civil War, first for the Confederates and then for the North. Later, he became a newspaper correspondent. It was on a special commission from the New York World, as we have seen, that he set out to find Livingstone.

In 1874, Stanley was put at the head of an African expedition that was financed by the New York Herald and the London Daily Telegraph. He reached the island of Zanzibar, off the east coast of Africa, in the autumn of 1874. Crossing over to the mainland, he headed for the northwest. At last he reached Lake Victoria, which had been discovered in 1858 by the Englishman Speke.

Proceeding westward, Stanley reached the source of the river that Livingstone had thought was the Nile. Stanley proposed to find out whether or not Livingstone was right by following the river to its mouth. He succeeded in doing so, but only after almost superhuman efforts. The river proved to be the Congo, a mighty stream that winds its way for almost 3,000 miles through dense tropical forests and at last empties into the Atlantic Ocean. When Stanley arrived at the mouth of the Congo, in the year 1877, he had crossed equatorial Africa from the east to the west. The expedition had taken three



John Hanning Speke (left) and James Augustus Grant, who helped to discover the sources of the Nile River. Speke discovered Lake Victoria in 1858.

years in all and it had cost many lives.

Stanley returned to the Congo district in 1879, in the interests of the Belgian king, Leopold II. He opened up to navigation many of the Congo's tributaries and he set up trading posts in many different places. This was the start of the Congo Free State, about which we tell you elsewhere in The Book of Knowledge.

In 1887, Stanley made a fourth trip to Africa with a relief expedition in search of Emin Pasha. This remarkable man, a Silesian Jew whose name was originally Edward Schnitzer, had become converted to the Mohammedan religion and had become a Turkish citizen under the name of Emin Pasha. A remarkable scholar, he had remained in the wilds of Africa for many years, studying native languages and customs, as well as animal, insect and plant life.

He had not been heard from for a long time when the relief expedition was organized. Stanley found Emin Pasha at last near Lake Albert in April, 1888, and the two made their way together to the east coast. In the course of this journey, Stanley discovered the Ruwenzori Mountains, which lie to the south of Lake Albert.

Stanley became a British subject again and spent the last years of his life in England. He became a member of the British Parliament and was knighted for his many services to mankind. When he died, in 1904, he was buried in Westminster Abbey.

In the meantime, one of the great mysteries of the African continent had been solved. In 1856, Sir Richard Francis Burton and John Hanning Speke had been sent by the Royal Geographic Society of London to find the source of the great Nile River. After many exciting adventures, they separated. Speke, traveling with his own party, discovered Lake Victoria in 1858.

In 1862, Speke returned to Lake Victoria with another companion, James Augustus Grant, and continued the exploration of the lake. When the two men came upon a river flowing northwest from Lake Victoria, they felt that they had discovered the Nile's source at last, and we now know that they were right. They explored the newly discovered river for a part of its course. Later, Sir Samuel Baker and several others completed the work of exploration.

THE PROBLEM OF THE NILE'S SOURCES IS SOLVED AT LAST

By 1876, it was known that the waters of Lake Victoria are connected with Lake Albert by a short river, called the Victoria or Somerset Nile, and that the tributary of the Nile known as the White Nile flows out of Lake Albert. Lake Victoria and Lake Albert, therefore, are twin reservoirs which supply much of the water that irrigates the fertile Nile Valley. A problem that had puzzled men from the time of the Pharaohs of Egypt was solved at last.

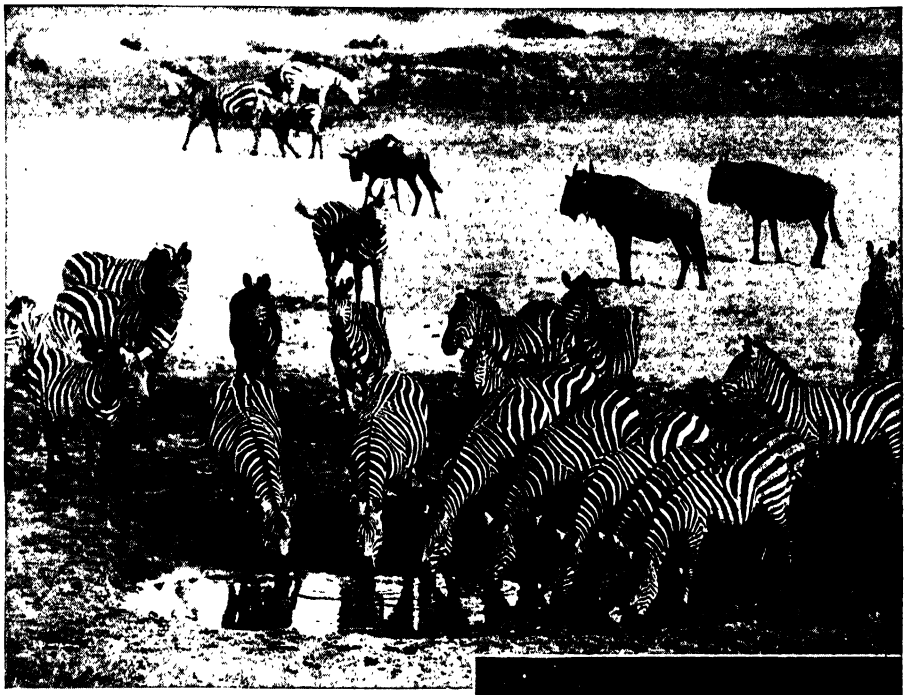
A new era now dawned. It was an era of filling in gaps, of surveying and of map-making. Hundreds of men and dozens of expeditions penetrated into the interior of the continent from every side. Many countries took part—England, France, Germany, Austria, Belgium, Portugal and Egypt. After World War I (1914-18), the airplane proved to be of immense value in the work of surveying and charting.

AFRICA IS NO LONGER KNOWN AS THE "DARK CONTINENT"

This work is not yet at an end, by any means. Yet the veil of mystery that covered Africa in the past has already been lifted. Map-makers can now indicate accurately Africa's mountain ranges, rivers, lakes, swamp lands, plains and tropical forests. They do not find it necessary to leave great blank spaces in their maps, or to rely on their imaginations to fill in the blanks. Dark Africa is dark no longer.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 5248.

NO TWO ARE MARKED ALIKE



Common Zebra and Wildebeeste on the Ol Garari River in the Southern Game Reserve, British East Africa.





It is hard for a giraffe to straddle down to the surface of water, and accordingly he never drinks at a deep-set pool. He has no vocal cords and uses some sort of "giraffe deaf and dumb" language.

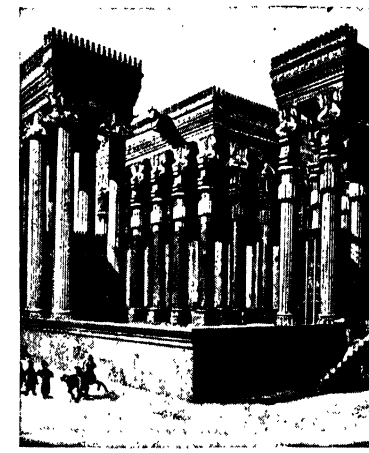
Photos copyrighted by Martin Johnson and Blaney Percival; from Camera Trails in Africa, by Martin Johnson, copyright, 1924, by The Century Company.



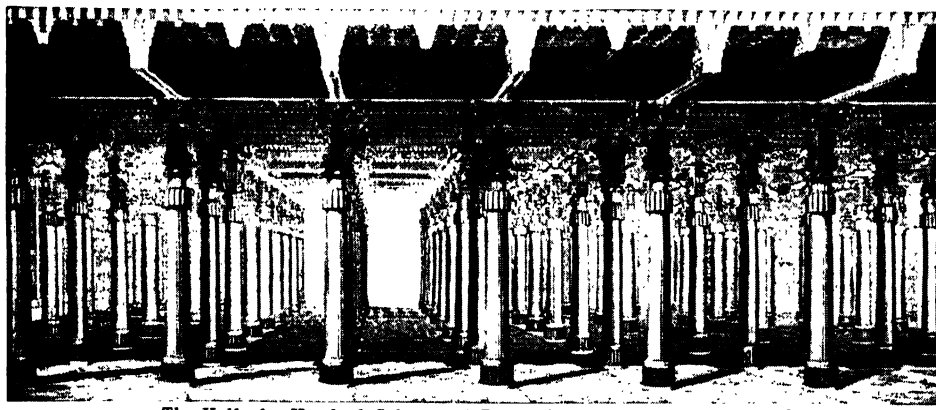
Reliefs on the wall of the Temple of Dendera.



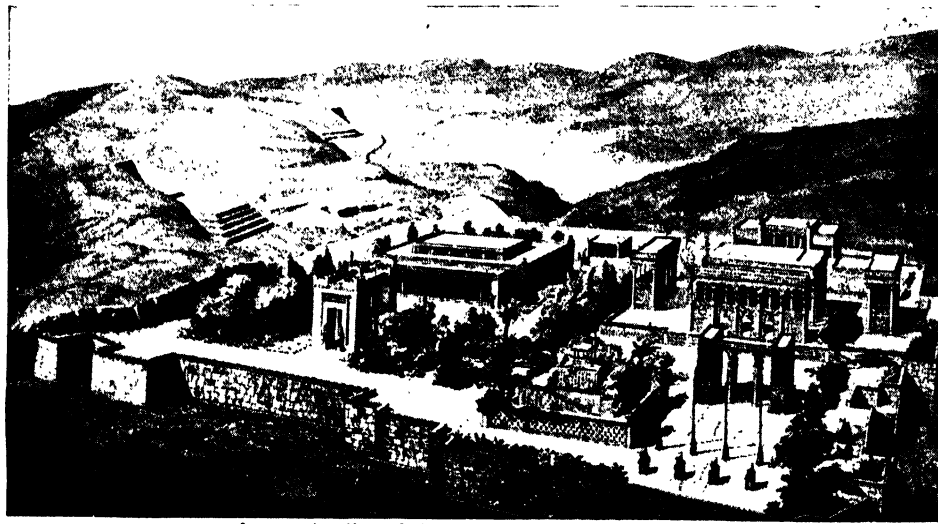
Column in the Temple of Dendera.



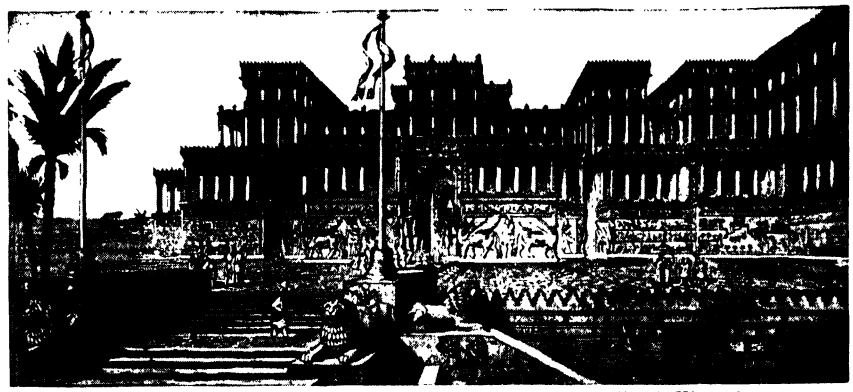
The Hypostyle Hall of Xerxes at Persepolis as it probably was.



The Hall of a Hundred Columns at Persepolis as it may have appeared.

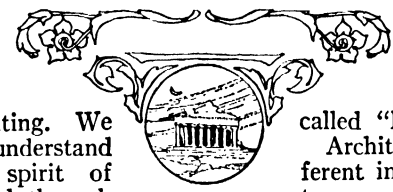


A reconstruction of the group of palaces at Persepolis.



A reconstruction of the Assyrian Palace of Sennacherib at Nineveh.

THE BUILDINGS OF THE OLD WORLD



WE have been reading and thinking of the art of the world, its sculpture and painting. We have been trying to understand something of the spirit of beauty that has lived through the ages, free and uncaptured, and is now just as mysterious and powerful as when the first cave-man made his first drawing on the rocky wall of his cave.

And now we turn to another kind of inspired work, Architecture. At once we know that here is something more than art, though art has had its share in its workings.

The architecture of the world has been created: by religion, and the need of temples and churches; by tribal life, ruled over by kings, and the need for palaces; by the growth of organized society, and the need of public speaking places; by the development of domestic life, and the need for homes. For one or another of these reasons most of the great buildings of the world have been built.

It is something more than the instinct of beauty and the need for some building which has raised the piles of ancient Egypt, of Greece and Rome, of medieval Europe. Into them went something of the mysterious force that makes a country and its native people different from another. This is the reason why architecture can be truly called "history in stone."

Architecture as an art is different in this way from sculpture as an art. Statuary is statuary all the world over, whether of Parian marble or Purbeck marble, of bronze or stone. For the human form, with which statuary mostly deals, is, broadly speaking, the same all the world over. No such limitations apply to the art of building. A temple, hall or palace may be in any style, in any form. Architecture varies from one continent to another. It is affected by soil and climate, by the amount of sunshine, by the material at hand, and, above all, by the shape of thought, as one might say, of the people producing it—their religion, their beauty instinct, and the work of those who have gone before.

If we think for a few minutes we shall see that the subject of architecture has many approaches, many points of attack; and we shall begin to understand why the sight or picture of a great building has always moved us profoundly. A mass of stones, big or little, put together by men's hands—why should anything so apparently simple be so wonderful? We shall never know till we under-

stand the secret of life itself, and the working of the human mind, and what the Bible calls "the travail of the soul." But we go on trying to know. The power of beauty over us is happily so great that we shall take every chance of looking at lovely things—great buildings, great statuary, great pictures—and find them an increasing joy. And in so doing we shall build palaces for ourselves wherein our hearts may dwell secure.

The magnificent architecture of the world had its beginning in the first rude dwellings made by prehistoric men when they abandoned their caves. They were formed of masses of stones crudely put together, with stone slabs on the top for a roof. The first builders of the world were pleased and proud when they had made something satisfactory that resembled Nature's houses—caves. And for an indefinite period they were content with these dwellings. Therefore, when we hear of the great buildings of any powerful empire of the remote past we must remember that countless generations had passed before the art of construction had advanced to such a degree as to make temple-building possible.

PRIMITIVE BUILDINGS WHICH SERVE AS LINKS WITH THE PAST

There are remains of these early rude huts in various parts of Europe. Some very interesting ones are in Brittany. Curious beehive-shaped huts can still be seen on Lewis in the islands of the Hebrides, in Wales, and in Cornwall, England; and at Stonehenge are fragments of one of the earliest temples in Europe. It consisted of a huge circle of massive pillars, placed equal distances apart, with heavy horizontal stones, set in an unbroken round, roofing the space between the pillars. Other sets of enormous masses of stone lay inside the circle, flanking the slab on which sacrifices were placed in the time of the Druids.

All the races of the world, developing at different times, passed through this stage of primitive building. The first peoples to produce anything that might be called architecture were the Egyptians and the Chaldeans. It has generally been understood that the most ancient buildings of all were made by the early Egyptians. But we to-day are living in a marvelous age, when the past is being reconstructed before our eyes. Recently loads of rubbish were dug out of the oldest temple on earth, which was discovered near Ur of the Chaldees, in Mesopotamia. This was the birthplace of Abraham, and was already an ancient city when he set out across the Syrian desert to find a home.

The temple was built some five thousand years before the birth of Christ. Until another, still more ancient, is dug out of the mounds of buried cities like Ur, it has the honor of being the oldest in the world, and it is the forerunner of the famous temples of Chaldean history.

THE ANCIENT STORY LYING BURIED IN THE EARTH

We are indebted to archæologists and excavators for nearly all our information about the buildings of Chaldea, or early Babylon, or Assyria. Little was known about them, for they were buried for many centuries under mounds of earth until excavations began about the middle of the nineteenth century. From the ruins and fragments unearthed the shape and plan of actual buildings have been reconstructed, helping us to form a good idea of their size and shape.

The "land between the two rivers," the plain of the Tigris and Euphrates, was soft and marshy, and that was why palaces and temples were built on huge platforms and terraces, and rose to several stories. There was little or no stone, no timber; consequently brick and masses of sun-dried clay were used.

Most of the buildings unearthed belong to one of three great periods. First there was the Babylonian, or Chaldean, time—from about 4000 B.C. to 1300 B.C. Then came the conquest of Babylonia by the Assyrians, and that era lasted from 1300 until 538 B.C., when Assyria in turn was conquered by the Persians. The style of architecture that ran through these eras was almost unchanged; the Persians merely added a richness of their own to the power of their predecessors.

The chief buildings of ancient Babylonia were temples, palaces, and curious pyramidal towers called *ziggurats*, or "holy mountains." The Chaldean priest-astronomers used to make their observations from the summit of these towers. One of them, which, according to Babylonian records, was rebuilt by Nebuchadnezzar, has been excavated. It was a huge erection, built in ascending stages, the last of which carried a temple to Nebo.

THE CITY WALL WITH A HUNDRED GATES OF BRONZE

Towers of all kinds were a favorite feature of Babylonian architecture, and in that flat land they must have rewarded the kings who had them built. In the city of Babylon, girdled by its enormous wall that was broken by one hundred bronze gates, there were two hundred and fifty towers. It must have been a very wonderful city, with its palaces and temples and towers—one of them doubtless the Tower of Babel, so richly described in the Bible. The crowning glory was Nebuchadnezzar's palace, the famous Hanging Gardens of which were raised on a series of arches some seventy feet high.

It is interesting to know that these early peoples, being dependent for building on small things like bricks, soon evolved the form of the curved arch; while in the not-very-distant land of Egypt, where great masses of stone were found, big enough to go across wide openings, arches were unnecessary, and therefore almost unknown.

THE GRANDEUR OF BABYLON FOUR THOUSAND YEARS AGO

For this same reason—lack of material—the columns, which give great natural dignity and beauty to a building, were absent from Babylonian architecture. But another kind of dignity was attained by means of the great mass formation of the temples and palaces, the enormous stepped platforms from which, by narrowing stages, the buildings climbed up.

This architecture was more imposing than beautiful, and gave an idea of strength, of lion-like power. Somewhere about 2000 B.C. Babylon was at the height of her grandeur. But a city built only of baked mud and bricks, with just a little stone here and there, could not, in the nature of things, endure many centuries. "And Babylon shall become heaps," said the prophet. Fortunately for us, enough has been dug out of these heaps to help us, with a little imagination, to reconstruct the marvelous past of this queen of ancient cities.

A PLATFORM THAT TOOK TEN THOUSAND MEN TWELVE YEARS TO BUILD

Nineveh usurped the place of Babylon in importance under the Assyrian conquest, and her kings seemed to take a delight in building new palaces, leaving the old temples to suffice for themselves. The excavated palace of Sargon at Khorsabad, the most important, gives some idea of the monarch's sense of grandeur. It covered about twenty-five acres, and stood on a great platform fifty feet high, made of bricks faced with cut stone. We know that these buildings of the Old World were raised by forced labor—even in the days of medieval Europe. The thousands of prisoners-of-war who formed part of the booty of any Eastern campaign were flung into the builder's service. It has been estimated that one of these Assyrian palace platforms took ten thousand men twelve years to construct.

We think of this palace of Sargon in amazement, with its system of corridors and quadrangles, its seven hundred rooms, its principal court with three entrances guarded by great towers, where man-headed, winged animals twelve feet high were set in pairs as sentries. These monstrous creatures—lions or bulls—now stand in the Assyrian Hall of the British Museum in London. They are awe-inspiring there, but they must have been terror-inspiring when set in place by the palace portals, high above the plain. So did the bloodthirsty, fighting Assyrian kings try to show their grandeur in their buildings. When scholars reconstruct their buildings we seem to have a perfect social history of the time. We know of the kings' tyranny because of the labor necessary to build these palaces; we know of their vainglory from the subjects of the frescoes on the walls; we know the people were of no account because of the humble dwellings of ordinary citizens.

THE WONDERFUL PALACE OF PERSEPOLIS AND ITS HUNDRED COLUMNS

When the Persians under Cyrus and Cambyses (525 B.C.) became the masters of the Orient, they combined the architecture of Assyria and Egypt. Their greatest skill centred in the palaces and tombs of Susa and Persepolis. Some of the tombs were cut out of the rock, like that of Darius; others were set on pyramidal, stepped platforms, like that of Cyrus. Although Persepolis was by nature set on a platform, they still kept to the idea of the Assyrian royal builders. The platform of the famous palace, or group of palaces, at Persepolis was partly hewed out of rock and partly built. Stone was handy, and another kind of architecture was the result.

Here is something else of the Old World for us to ponder—a palace that had an approach of shallow steps some twenty feet wide, which horsemen could ascend, and a great entrance with piers of shining, glazed brick, and the Assyrian man-headed bulls as guard. Within this palace at Persepolis was the famous Hall of the Hundred Columns, a wonderful place with its cedar roof upheld by the hundred columns, thirty-seven feet high, of whose ranks one solitary shaft now stands. It is a pity that Alexander the Great could find nothing better to do than to burn the Hall of the Hundred Columns, along with other places, when he conquered Persia.

The Persians made everything glorious in color and grouping. The palaces of Susa and Persepolis were like kings in their glory, set with glazed bricks that shone in blue and green and yellow. On page 3876 we read of their decorative art applied to their architecture, of the frieze of archers which the Louvre treasures for the whole world.

Jewish architecture shows the influence of Egyptian, Assyrian, Greek and Roman. It has no independent national style. Its greatest achievement is the Temple of Jehovah, in Jerusalem, built three times over on the original plan of Solomon and finally destroyed by the Romans.

THE MASSIVE TOMBS OF EGYPT THAT WERE BUILT FOR ETERNITY

Fortunately for the world, Egyptian architecture, because of its nature, the material used, and the climate of the country, has proved more enduring than that of the Eastern empires.

We have seen that the whole spirit of the Egyptians' art and architecture was deathlessness, duration. Their skill centred in the tombs, which they built, not for time, but for eternity. It was an architecture of religion, very different from that of Assyria and Persia. Kingship and godhead and priesthood were very much mixed up in the character of the monarchs of early Egypt. Palaces were of little interest to them. Their temples, and their tombs—where their bodies would be preserved through long ages until the spirit came to life again—were of absorbing interest; and on them this strange nation, almost unchanged in its four thousand years of life, spent its austere beauty, its solemnity and its ponderous architecture.

THE SECRET OF THE STRENGTH OF THE OLD EGYPTIAN BUILDINGS

The Nile, the life-giving river of Egypt, was the centre of the people's national existence, and on its banks were built their great temples and tombs. Stone and granite were plentiful. They were quarried in huge blocks. The Egyptian builders were single-minded in their productions. They were not trying to be clever. They wanted their buildings to last forever: every line, every detail, was subjected to this idea. In this way they were greater artists, greater architects, than they knew.

The chief characteristics of their architecture can be traced to three causes: their passion for duration, their climate and the material they worked with.

The buildings were conceived on a simple plan. The outer surface of the outer wall in almost every case inclined inward a little. The inner surface made a perpendicular line, so that a wall cut through would seem, looking at its thickness, something like a buttress. Thus the Egyptians contrived to build a wall that no ordinary earthquake and no ordinary enemy attacks could shake down. In no two temples or pyramids was the angle of inclination the same. The builders had no rule: they had only an absorbing idea.

The Egyptian climate was partly the cause of the unbroken lines of their massive walls. In that land of eternal sunshine there was no need to set windows in a temple. A sufficient amount of light came in through the door, or through slits high in the wall near the roof, or sometimes through a kind of clerestory, as in one of the halls at Karnak. The blind appearance of the walls has a good deal to do with the severity and secrecy peculiar to these buildings. The sense of rhythm necessary to keep a wall from looking "dead" was supplied by the repetitive lines of the frescoes and sculptures.

THE GREAT COLUMNS WHICH SUPPORT THE HEAVY ROOFS OF STONE

The material used set the style of Egyptian buildings, a style marked by columns and square-headed openings, which were roofed—trabeated is the technical word—with unbroken slabs of stone or granite. The habit of roofing their halls with slabs of stone led to the necessity of placing columns at intervals to support the slabs.

The columns evolved by the Egyptians are very interesting, and they develop as the architecture develops, with little change, during the long course of its life. And by these columns the interiors of massive buildings were kept alive, so to speak. For a building that has good columns, or good repetitive lines, possesses the peculiar quality that we have spoken of before—a rhythmic quality akin to the steady break of waves on the shore and to the throbbing pulse of great poetry.

The earliest columns were in obvious imitation of flower forms, grooved to imitate bunches of stems, with something like a lotus flower for the capital. This design—combined with a great sturdiness of size, as we should imagine—became simplified and amplified at the same time. Before the architecture of Egypt ceased her builders had produced some of the most beautiful columns the world possesses. Some of them remind us of the Doric column, which the Greeks carried to perfection.

As their skill in architecture grew and their temples rose, their immense architectural statuary likewise grew. They seemed to know that something was needed to connect their gaunt temples with the footways of men. It became a habit with them to form approaches of long avenues of the mysterious creatures to whom the family name of sphinx has been given. The bodies were always bodies of lions, and the heads were, according to some inscrutable decree, either those of human beings or those of birds or of rams. We all know about the Great Sphinx, the chief of these, huge beyond thought, which was partly chiseled out of the rock, and partly put together, like a building. The desert, perhaps alone knowing why this monstrous thing was set there, had kept its secret in its own fashion, covering it with sand for centuries. In 1816 the sand was cleared away, and the inscription revealed that the Sphinx had been built about four thousand years before Christ.

THE AMAZING PYRAMID BUILT TO HIDE THE BODY OF A KING

Near the Great Sphinx, at Gizeh, are the equally famous three great pyramids, the oldest Egyptian tombs, so far as we know. The chief of these, known as the Great Pyramid of Khufu (or Cheops), a king of the Fourth Dynasty, has, like the Sphinx, passed into the world's everyday speech as a symbol of unreasonable size and mystery and of eternal duration. It seems strange that a building, a solid mass of granite and stone 482 feet high, should have been constructed solely to hide the body of one king.

It is built of limestone on a plateau of rock leveled to receive it, and was finished on the outside, like its two neighbors, with a coating of polished stone. It contained three chambers and an elaborate system of inclined passages. The other two pyramids differ in arrangement and size, but not in construction.

Tombs of varying sizes and forms mark, like Time's sentinels, the slow passage of the thirty dynasties of Egyptian monarchs down the four thousand years of the nation's life. Some of them took the form of pyramids like those at Gizeh; some were rock-hewn, in the vertical cliffs of the west bank of the Nile Valley, like the group at Beni-Hassan, and show by their columns and general plan that a sense of art was developing along the lines of architecture. A later group of royal tombs, near ancient Thebes, were constructed in another manner, corridors being burrowed into the rock, leading to a succession of chambers, in the innermost of which the sarcophagus was placed. One of these was the tomb of Tutankhamen, and we know from that sepulchre what a wealth of art was spent on the burial of an ordinary king whom history has not greatly distinguished.

THE SPLENDID TOMB OF AN ARCHITECT OF THE PYRAMIDS

The tombs of important private persons were of another character, and generally known as *mastabas*. They were peculiar rectangular mounds of masonry, the outer walls sloping inward in characteristic fashion. Three chambers were generally arranged for in the interior. In the innermost the sarcophagus was placed. A very famous mastaba, beautifully decorated in relief, was built at Sakkâra, near Gizeh, for the body of a great personage called Thi, who was the architect of some of the pyramids.

Generally speaking, Egyptian temples belong to the later half of the country's history. They appear more like huge royal chapels than public places of worship, and were marked by something of the same secrecy that was part of the scheme of the tomb. Only the king and

his priests might penetrate into the sanctuary. A considerable number of temples were built along the Nile banks, the most important ones at Thebes.

ONE OF THE CHIEF GLORIES OF EGYPTIAN ARCHITECTURE

They were all built, with variations, on the same plan. To enter, one passed down an avenue of sphinxes and in between the entrance *pylons*—huge towers with sloping walls and a giant obelisk in front of each. From the entrance one passed into the outer court, with double columns on three sides, open to the sky. Then into the Hypostyle Hall. This part of the temple has been called the chief glory of Egyptian architecture. It was roofed in, and set thickly with columns of varying beauty according to the period of the temple, and most beautifully decorated. The centre rows of these columns ran up higher than the rest, and thus formed a kind of clerestory as light came through barred stone windows set between the upper parts of the high centre columns, and lighted the hall below just as a clerestory gives light to a church or cathedral. Beyond the Hypostyle Hall lay the sanctuary and other chambers connected with priestly offices. Round the temple building ran a monstrous projecting wall as high as the highest hall.

On their obelisks—immense monoliths, square at the base and tapering to the top—the Egyptians spent a great deal of time and labor. The Roman emperors carried a great many away when they conquered Egypt, and there are about a dozen still to be seen in Rome. Cleopatra's Needle, on the Thames Embankment, in London, was one of two obelisks set in front of a temple at Heliopolis, built about 1500 B.C.

The most wonderful of all the Egyptian buildings is the Great Temple of Amen-Re, the chief of the group at Karnak and Luxor. It was begun by the king about 2466 B.C., and after a long lapse was added to by first one pharaoh and then another. Thus the erection covered many hundred years. Upon it the greatest architectural and sculptural art of Egypt was spent. The Hypostyle Hall alone might stand for a monument of grandeur of this extraordinary nation.

Another temple to Amen-Re was built in the side of the rock at Deir-el-Bahari by the great Queen Hatshepsut who lived about 1500 B.C. She had a wonderful sense of beauty, and the columns of her temple, standing in tiers on terraces, and decorated in colored relief, must have been very arresting.

THE ANCIENT TEMPLES THAT STAND ON THE BANKS OF THE NILE

Temples of all periods, with bewildering names, still stand on the Nile banks at Abydos, Edfu, Abu-Simbel and other places. One of the greater ones, the temple of Isis, at Philæ, built about 300 B.C., is submerged by the river part of the year, so that only the upper portion of the wonderful columns can be seen.

It would seem that the architecture of the Old World was passing through great stages. Babylon and Assyria made it lion-like, fierce and strong; Egypt made it, above all things, colossal and enduring. To Greece it was left to make architecture supremely beautiful, of such unquestionable proportions as to be a standard for all succeeding peoples.

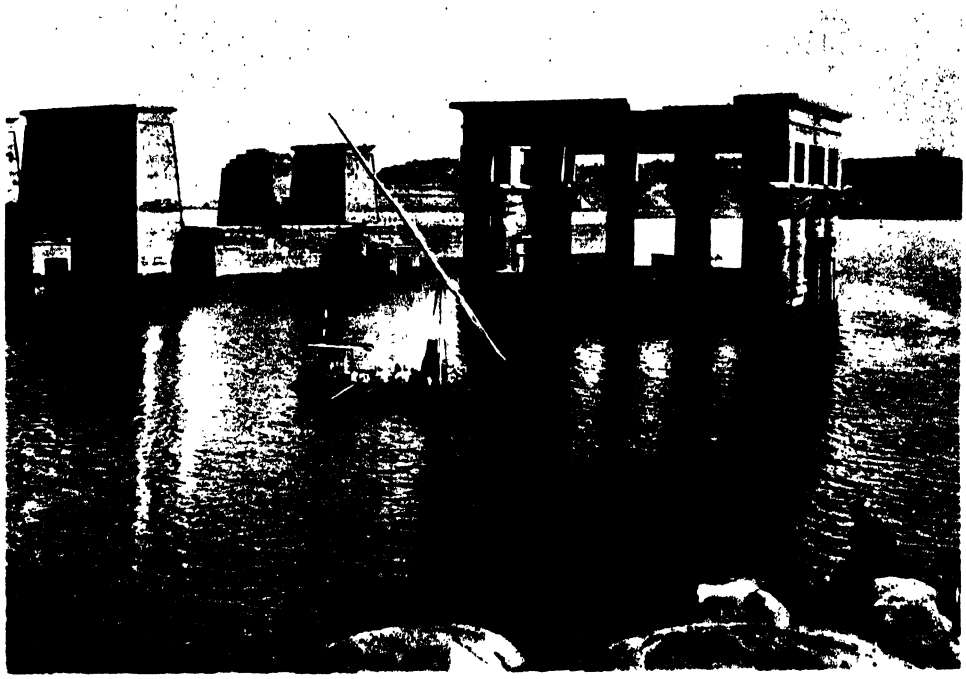
Greek architecture was not entirely the work of the Greeks as we know them. It did not spring up complete, evolved on its own shores out of nothing. An earlier people began it—the people of the Ægean civilization; and when it began to develop in the hands of the Greeks, two influences were brought to bear upon it. The effect of Egypt is traceable in the kind of architecture called Doric, because of the style of column used, and that of Assyria in the kind of architecture, called, for the same reason, Ionic.

We know from our chapters on painting and sculpture how, long before what we know as the empire of the Greeks arose, a happy, beauty-loving people were living in Greece and the islands of the Ægean Sea. The architecture they evolved—a simple, rude style—is known as Pelasgic, or Primitive. Its most interesting examples are shown in the remains of what is called the *Tholos,* or Treasury, of Atreus, a curious, beehive-shaped erection; the Palace; the Gate of the Lions; and the city wall at Mycenæ. Then there is the palace at Tiryns, and the Minoan palace at Knossos, Crete, lately excavated. This home of King Minos is the oldest of the Pelasgic buildings, dating from about 3000 B.C., with additions at later times.

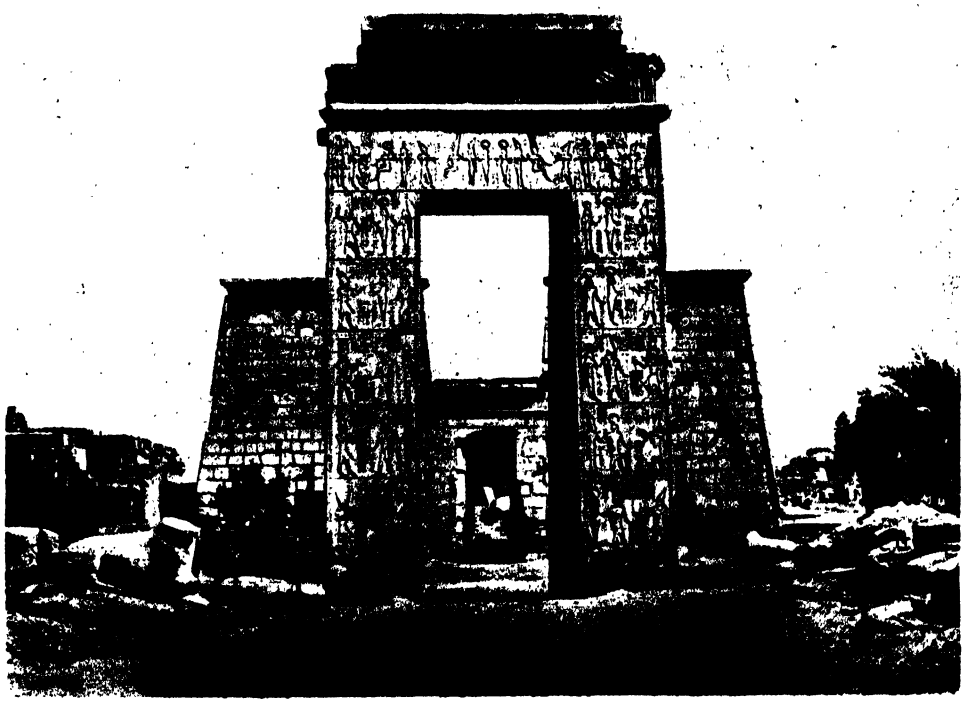
When the Greeks became masters of the Ægean, from this rude beginning their architecture began to grow.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 5341.

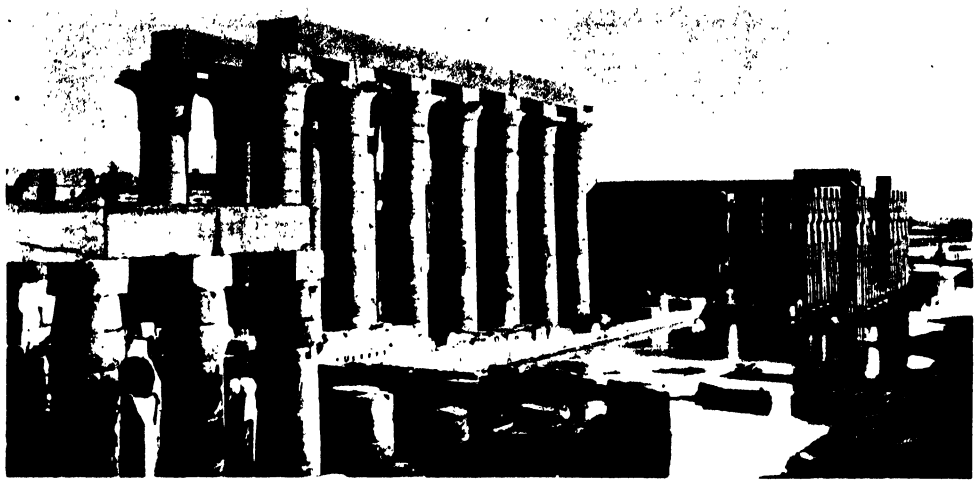
BUILDINGS OF THE OLD WORLD



THE TEMPLE AT PHILÆ, NOW DROWNED FOR PART OF THE YEAR BY THE WATERS OF THE NILE



THE GREAT PYLON AT THE END OF THE AVENUE OF SPHINXES AT KARNAK



THE IMPRESSIVE TEMPLE OF LUXOR



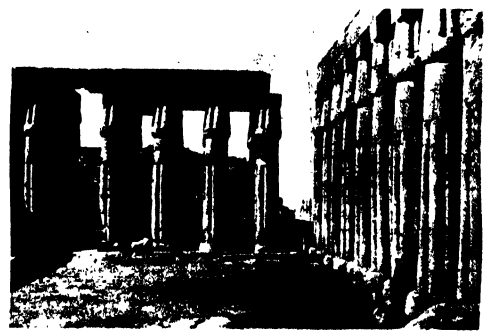
THE SECOND PYRAMID OF GIZEH, WITH ITS ORIGINAL LIMESTONE TOP



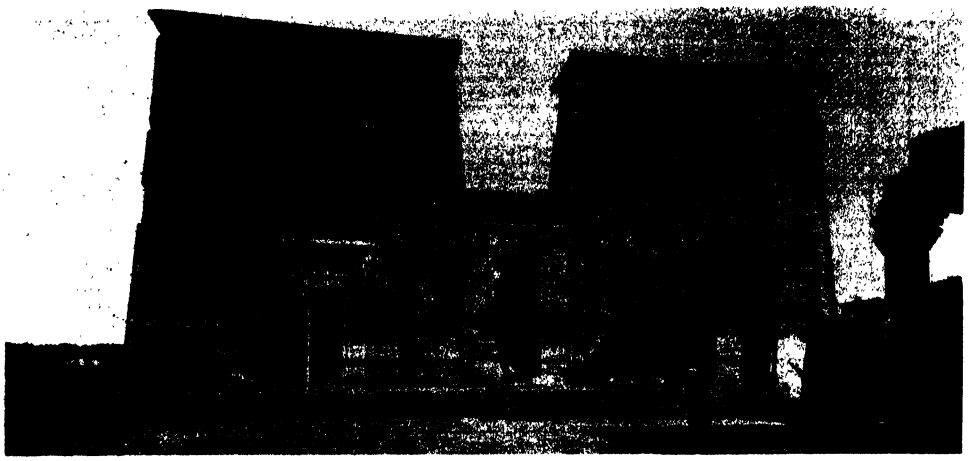
THE STEP PYRAMID AT SAKKÂRA, BELIEVED TO BE THE OLDEST OF ALL



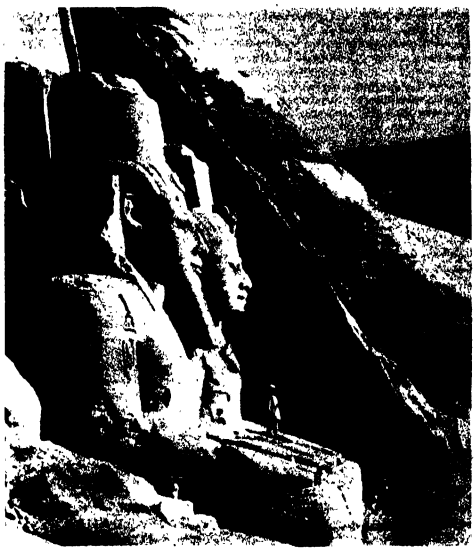
THE FAMOUS ROCK TEMPLE AT ABU-SIMBEL



THE SPLENDID COLUMNS OF THE TEMPLE OF LUXOR



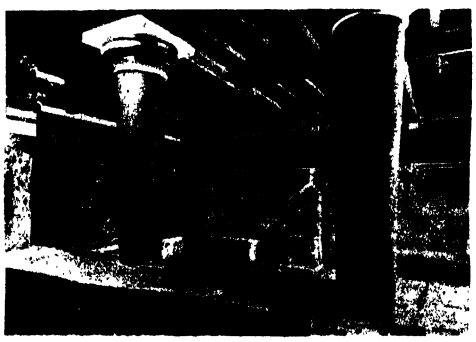
THE DOUBLE PYLON OF THE TEMPLE OF ISIS AT PHILÆ



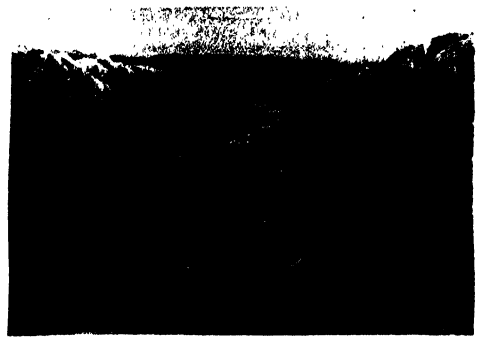
THE STATUES OF RAMESES AT THE ENTRANCE TO THE ROCK TEMPLE AT ABU-SIMBEL



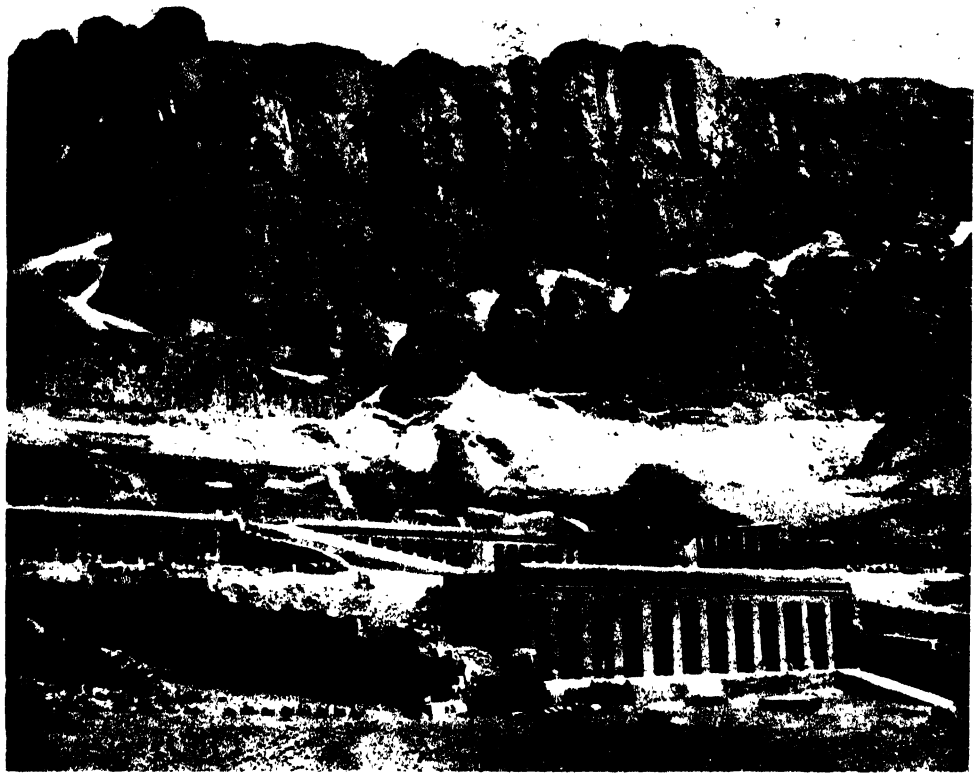
THE FORECOURT OF THE TEMPLE OF ISIS AT PHILÆ



THE THRONE ROOM IN THE MINOAN PALACE AT KNOSSOS, IN CRETE



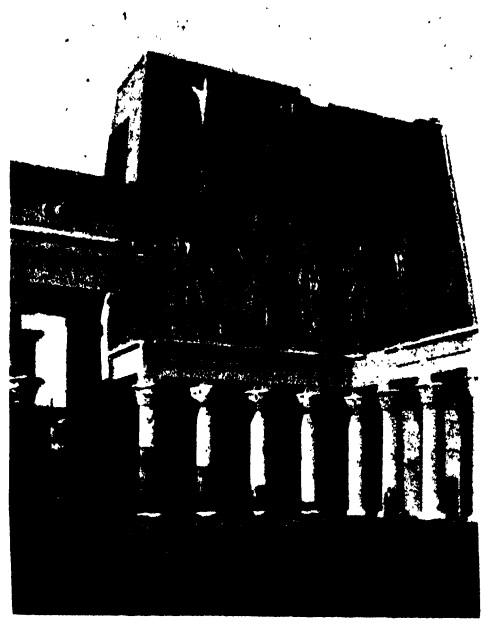
THE TOMB OR TREASURY OF ATREUS AT MYCENÆ, IN GREECE



THE ROCK TEMPLE OF AMEN AT DER-EL-BAHARI ON THE NILE



COLUMNS OF THE HYPOSTYLE HALL AT KARNAK



THE GREAT PYLON OF THE TEMPLE OF EDFU

The pictures on these pages are reproduced by courtesy of Messrs. Chapman and Hall, Mansell, McLeish, and others.



A PIECE OF ROPE

ITS BEGINNINGS AS A PLANT AND HOW IT IS PREPARED FOR OUR USE

THERE is a baby rope in the cages of most song birds. If we look in the seed pot we shall find rape seed, mustard seed and, perhaps, hempseed. It is the hempseed that is the baby rope. If we were to sow some of those seeds, we should find that they would grow, in rich, damp soil, fed

Courtesy, Plymouth Cordage Co.

THIS IS HOW THE FIBER PLANTS LOOK



Harvesting hemp. The word "hemp" is often used incorrectly to mean all the plant fibers used for rope, but true hemp is a tall, Asiatic herb, with the scientific name of Cannabis sativa.



Photos above, courtesy, Plymouth Cordage Co.

The henequen plant, as the leaves and its scientific name—Agave fourcroydes—show, is closely related to the sisal plant. In Java, especially, a smooth white rope is made from henequen fibers.



Courtesy, Plymouth Cordage Co.

The true sisal plant has long, sharp, sword-like leaves, and has the scientific name of Agave sisalana. Its fiber is used especially for binding twine.



Courtesy, United Fruit Company

Abaca, which yields the best rope fibers. While it is often called Manila "hemp," abaca's scientific name is Musa textilis and it is not a true hemp.

PREPARING THE FIBERS



The leaf stalks of an abaca plant have been cut, and here the worker is stripping the sheafs containing the fiber. The sheafs will next be stripped by hand or machine to obtain the fiber itself.



Pictures above, courtesy, Plymouth Cordage Co.

Huge hanks, or bundles, of fiber being hung to dry in the sun. They have been stripped from the sheaf and washed. When all the lines on a drying field are full, it looks like the scene shown below.



British Information Services

On a vast field, the fibers are spread out for a final drying and bleaching in the sun. If there is not too much moisture in the air, the fibers will dry in about twelve hours. The chief world source of abaca, or "Manila hemp," is the Philippine Islands, although the plant also thrives in the East Indies and Central America.

by the hot sun, into great plants. The true hemp is a native of Asia, but it has been naturalized in Europe and America. It sometimes reaches a height of twenty feet, but is generally lower. The numerous flowers are yellowish green, and the whole plant is so handsome that it is occasionally grown for ornament. Hemp is grown to some extent in nearly all European countries, and in Russia, China, India and Persia. Some is grown in the United States, but not so much as formerly on account of the greater use of abaca, often called Manila hemp, of which we shall speak presently.

Upon the stalk of the hemp grows a bark made up of fibers. If we want fine fiber to make cloth, we pluck up the plant as soon as it has flowered. If we want coarser fiber for the making of sails, we let it grow a little longer. If we want the coarsest of all —for strings and cords and ropes—we let the hemp grow as long as it will. The plant is prepared for use in much the same way as flax. It is "retted," or allowed to rot on the ground, until the fibers separate easily. The fibers are then removed from the remainder of the stalks by beating and combing, and packed into bales.

There are various other plant fibers from which rope is made. Some brown ropes that are never tarred, and are much lighter than hempen ropes, are made from the husk of the coconut and are called coir ropes. They are not common and are used chiefly in the East. Then there is a fine rope, used in the driving of machinery, that is made of cotton. Such ropes are often used in place of leather belting, and for some purposes they are much more satisfactory. Jute, coming from India, makes an inferior kind of rope. But the most wonderful rope is made from a plant named abaca, a relative of the banana, more generally called Manila hemp, though it is not really hemp at all. It grows chiefly in the Philippine Islands, and the islanders receive several million dollars a year for it. On the whole it is the most satisfactory material for rope.

Abaca grows best on the slopes of volcanic mountains, and the plants are two or three years of age before they are of use. They are then tall, from fifteen to twenty-five feet high, and look like trees. The stalk, about fifteen feet long and a foot or more in diameter, is made up of overlapping layers of leaf stems, whose leaves fan out at the



British Information Services

After drying in the open air, the fiber is brought to brushing sheds. The machine consists of a rotating drum with beaters attached, which remove dust and tow. The fiber is then baled, ready for export.

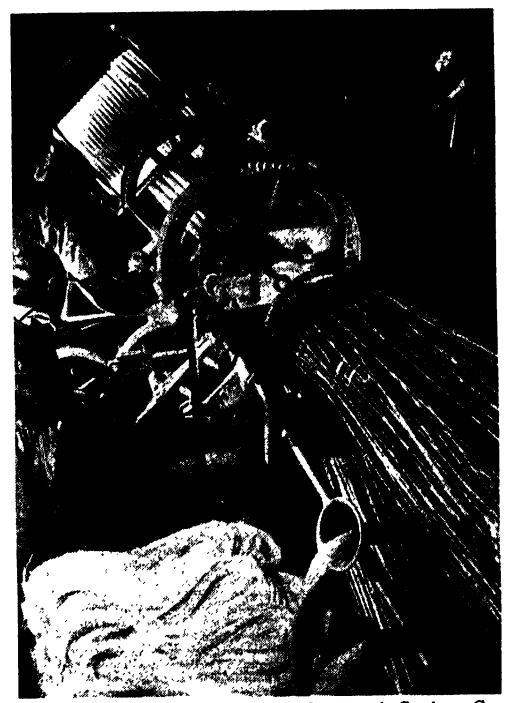
FROM SLIVER TO STRAND



In the rope-making factory, the clean fibers are oiled so that they will withstand internal friction. Then they must be laid absolutely parallel and the ends staggered. Next, as shown here, the fibers are drawn into continuous "slivers." Each sliver must be of exactly the right weight for the yarn to be spun.



Yarn, spun from the sliver, must have sufficient twist to prevent individual fibers from slipping.



All pictures, courtesy, Plymouth Cordage Co.

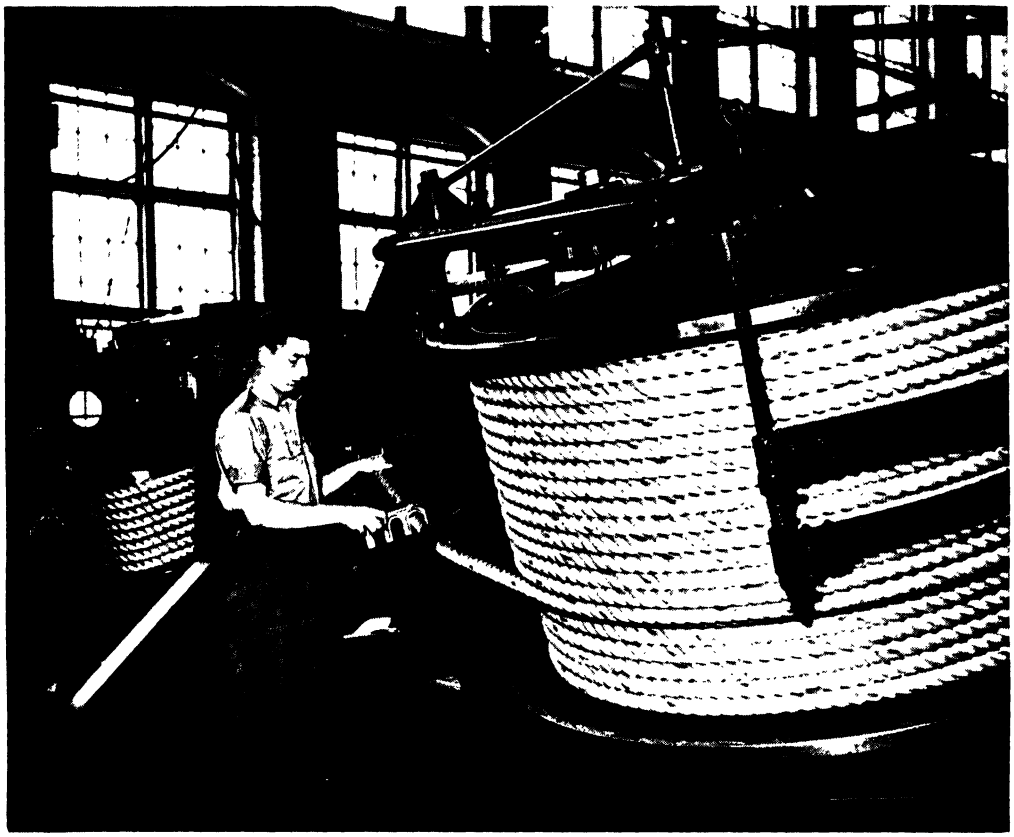
Making strands from the yarn—each strand must have an exact number of yarns and the right amount of twist.

top. The useful fiber is in the outer bark of these leaf stems. The plant is cut just before flowering, and the layers of stems are stripped off and dried. Two natives working together will cut and scrape about twenty-five pounds of fiber in a day. A machine has been invented to do this work, but hand labor is still common. The quality of the fiber may be affected by handling, and great care must be taken in cleaning and drying it.

Next in importance to abaca as a rope fiber is henequen, usually called sisal. The henequen is a plant resembling the cactus, and the fiber is obtained from the leaves. The plant is grown principally in the state of Yucatan, in Mexico, and in Cuba, Africa and Java. The intensive cultivation and scientific cleaning methods used in the island of Java produce a fine, white, smooth rope. Most sisal is yollowish or greenish in color.

Years ago ropes were made almost entirely by hand, but machinery is used today, as in most other industries. The making of rope is an elaborate process in which wonderful machines are used. The fiber enters the factory in bales. After being combed out so that all the fibers lie one way, some of these are twisted tightly into yarn, and then several yarns make a single strand. Then as many strands as are necessary are twisted together to form rope. The thickness of a strand depends entirely on the number of threads that are twisted together. Usually a rope is made of three strands, and any cordage over an inch in circumference is called a rope, or a hawser. Anything smaller is called cord, twine or line. Three or more ropes twisted together into one make a cable.

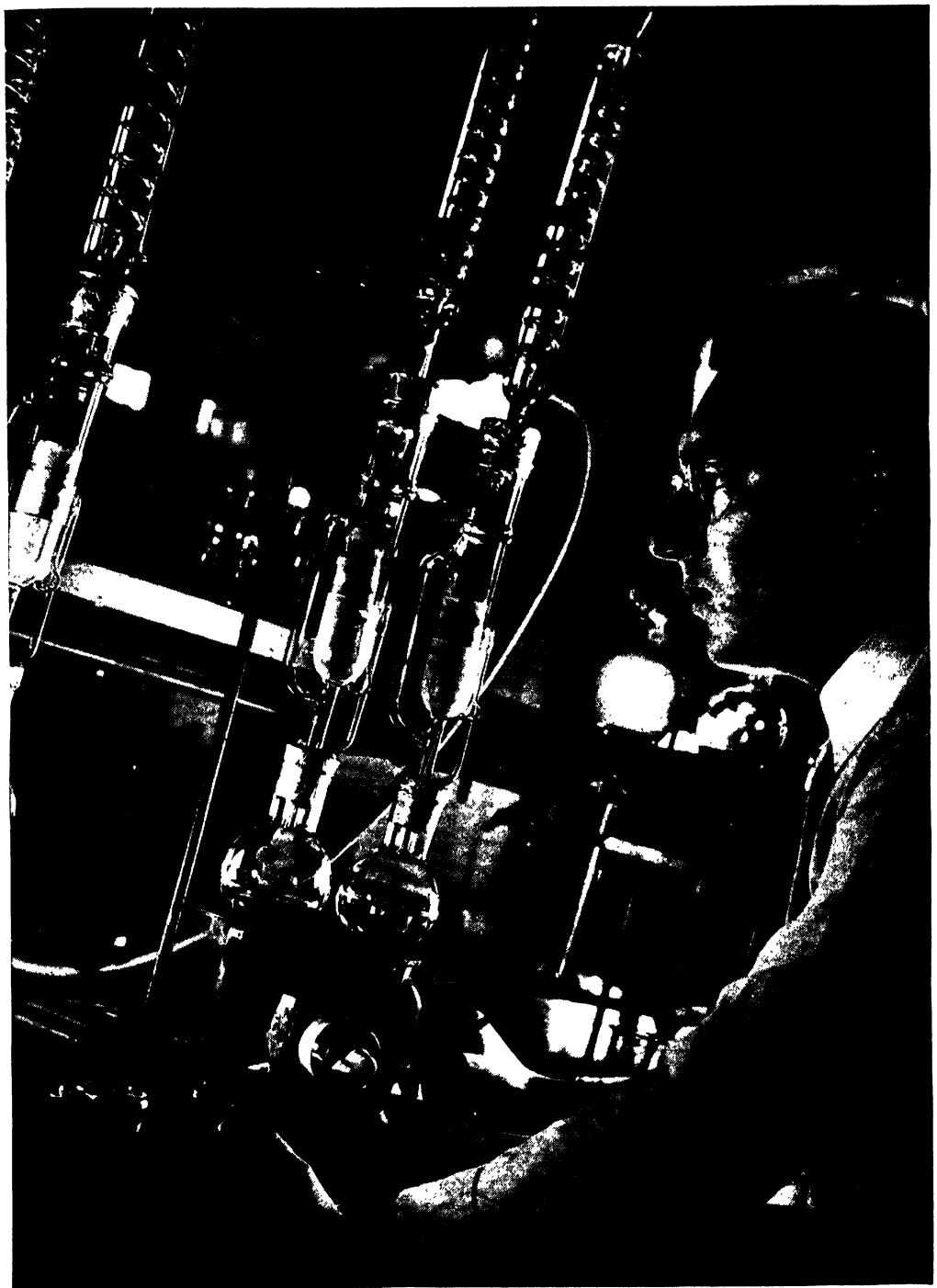
It is wonderful to think that short pieces of fiber twisted together can be made to cling



Columbian Rope Company

This circular machine lays three strands into a complete rope. The operator is checking the rope's diameter, in this case more than one inch, so it is a true rope, or hawser. Is it not remarkable that such slender rope can hold a big ocean liner like the Queen Elizabeth safely tied in her berth at a pier?

LABORATORY IN A CORDAGE PLANT



Courtesy, Plymouth Cordage Co.

Today rope is being made not only from plant fibers but also from synthetic, or man-made, fibers, which chemists, in their laboratories, have shown how to make from coal, air and water. Nylon, for instance, is used for tow-line and for mountain-climbing rope. Special kinds of cordage may also be made from glass fibers, resistant to heat.

so tenaciously that a cable made up of them will keep in check such a ship as the America, or the Queen Mary, and prevent it from breaking away from the quay where it is moored. A Manila rope only an inch thick needs a pull equal to about four tons in order to break it.

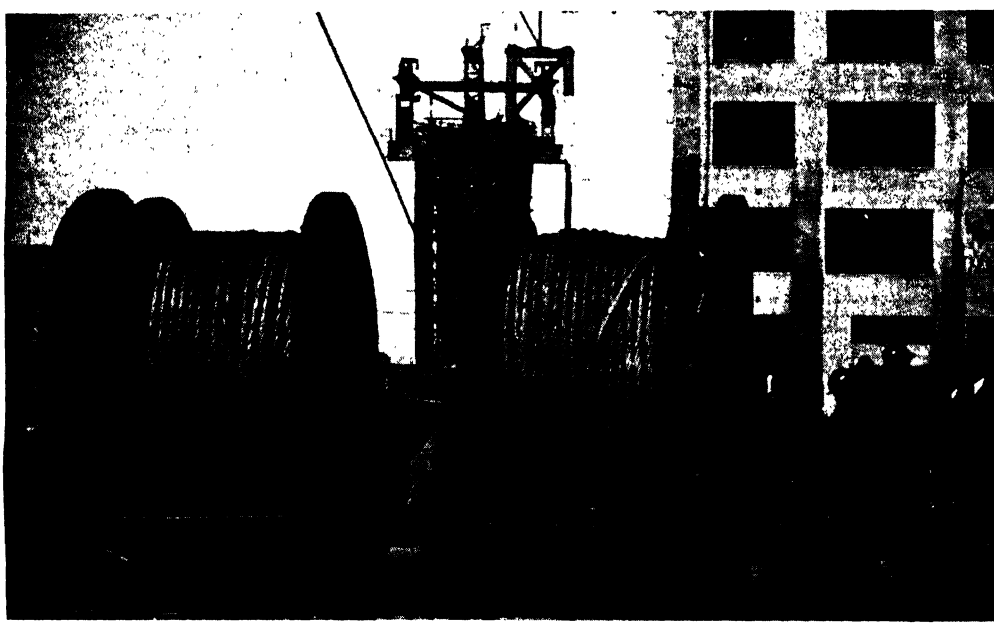
These are the principal plant fibers from which our useful ropes and cords are made. More rope is made of Manila fiber than all others combined, since it is stronger, more durable and resists salt water better. Sisal fiber is injured by salt water, but much of the rope used on farms is made from it. The principal use of sisal, however, is for binding twine, used by the self-binding reapers in the grain fields. Some of the fiber of the *Phormium,* or New Zealand flax, is used in this country. Though it is not so strong as Manila, its appearance is something like it, and sometimes it is mixed with Manila by unscrupulous manufacturers. Rope made from the true hemp is still used on shipboard to some extent, but is almost always impregnated with tar, to prevent injury from water. The fiber is also used to fill seams.

Eastern monarchs, when they wanted a particularly strong rope in days gone by, would have one made of human hair, and such a rope is extraordinarily tenacious. There is one in a London museum, several inches thick and several thousand feet long, that was made for a mikado of Japan. It weighs two tons.

More than a hundred years ago the manufacture of ropes from wire began in a small way, and this is a flourishing industry in Great Britain and the United States. These wire ropes are generally made from the finest steel wire. Several wires are twisted together to make a strand, and several strands are twisted into a rope. Generally there are more strands in a wire rope than in one made from hemp. Sometimes several hundred wires are used in making one rope. These wires are often wound around a core of fiber. Such ropes are very strong and are used for hoisting and for bracing. Flagpoles and other tall spars are often braced with wire ropes. A wire rope a little less than one inch in diameter has about the same strength as a Manila rope two and three-quarter inches in diameter. The cables that hold a suspension bridge are made of thousands of strands of steel wire, squeezed into a round shape by a press, and clamped tightly.

However, even though ropes made from steel wire are used more often today where enormous strength is needed, the ropes of plant fibers remain very useful to man.

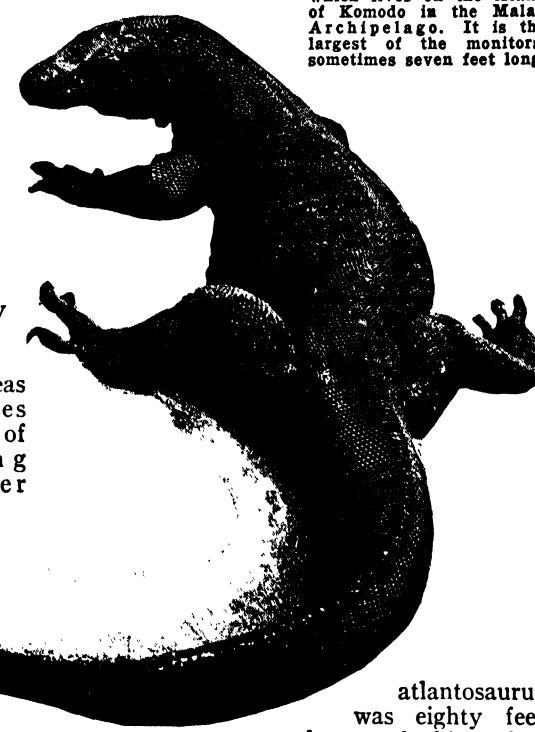
THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 5307.



Construction Methods, N. Y.

Steel-wire rope is almost incredibly strong. That shown here, two and a quarter inches in diameter, was used for suspending the catwalks when the San Francisco-Oakland Bay Bridge was constructed.

THE MARVELOUS REPTILE FAMILY



A powerful monitor lizard which lives on the island of Komodo in the Malay Archipelago. It is the largest of the monitors, sometimes seven feet long.

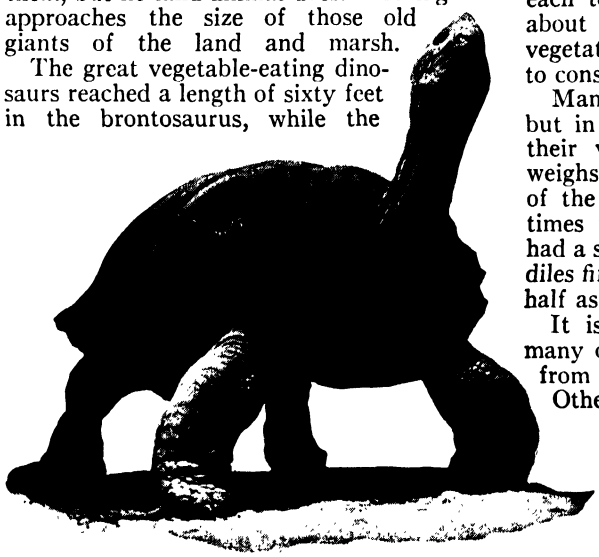
THE face of the earth has been largely remodeled since reptiles began to lay their eggs and rear their young on land. Mountains frown where valleys smiled; seas roll where dry land was, old lakes are high and dry on the brows of hills; field and meadow bring forth crops where once ran river and ocean; and cities have risen in the parched throats of dead volcanoes since the reptiles grew great and the greatest of them perished, leaving us a scant posterity.

Once they filled all the places now occupied by the natural orders existing today. They lived on land, they lived in rivers and lakes and on the sea. They crowded the air with pterodactyls, some with wings twenty-five feet from tip to tip. In actual bulk the whale still outrivals them, but no land animal does. Nothing approaches the size of those old giants of the land and marsh.

The great vegetable-eating dinosaurs reached a length of sixty feet in the brontosaurus, while the atlantosaurus was eighty feet long and thirty feet high. These dinosaurs must have weighed from twenty to thirty tons, as against the five tons of a fine modern elephant. For each ton of flesh and bone they possessed about an ounce of brains. They consumed vegetation, and flesh-eating dinosaurs arose to consume them in turn.

Many species of reptiles remained small, but in every direction there arose titans of their various orders. Our leathery turtle weighs well on toward a ton, but one animal of the kind in those days had a head five times the size of our biggest type. Egypt had a snake forty feet long; India had crocodiles fifty feet long, and Australia had lizards half as great.

It is believed by some authorities that many of these great reptiles may have died from some diseases prevalent at this time. Other authorities attribute the extinction of



Both pictures, New York Zoological Society

The giant land tortoise of the Galapagos Islands, off the coast of Ecuador. Galapagos is the Spanish word for tortoise, and the islands were named for this reptile.

the dinosaurs to great climatic changes or to the mammals which existed at the close of the Age of Reptiles and may have fed on the eggs of dinosaurs.

Of all the host of lordly forms to which the reptile world gave rise, but four orders survive. We have the crocodiles, the tortoises and turtles, the lizards and snakes, and the ancient lizard-like tuatara.

These orders are broken up into many groups, so that we have over a score of crocodile species, upward of 1,800 species of lizards, and about as many snakes. But altogether the reptile species do not much exceed 3,500, a number which excels only the amphibians among backboned creatures and is insignificant compared with the mammals, birds and fishes.

Like all other reptiles, the crocodiles and alligators are cold-blooded. Their temperature rises and falls with that of the surrounding air, so they can not exist in less than subtropical heat. But in favorable conditions they may be expected in every tropical and subtropical river or lake where man or other agency has not exterminated them.

The rough covering of the crocodile is a masterpiece of plate and mail. Imbedded in the skin are bones, and on these are plates of horn. The animals are extremely supple, though, owing to the formation of certain vertebrae in the neck, they are unable to turn the head, a fact to which many a man has owed his life.

The great body, which may be twenty feet long and more, and may go on growing for perhaps two centuries, is carried on lizard-like legs. The limbs are, of course, for walking on land and at the bottom of the water. The huge, powerful tail serves to drive the animal through the water. It serves also as a weapon.

A blow from that mighty tail, which can be swung with furious force and amazing speed to and fro, suffices to knock a man or a big deer off his feet. But it is in the water that most havoc is wrought by this reptile. Here it is assisted by as strange a contrivance as is to be found in nature.

The nostrils are mounted high at the tip of the snout. They open, not into the mouth, but actually into the windpipe. A corresponding modification of the fleshy parts of the mouth shuts off the throat from the breathing apparatus, and valves close or open the nostrils.

The result is efficiency perfected. A victim is seized and pulled under the water, and held there till it drowns. But all the time it struggles, its captor his its mouth wide open and is breathing calmly. The nostrils open above the water; the distended mouth permits no fluid to enter the throat.

When the prey is dead, then the reptile has to dismember it. Its teeth are adapted to grasping and rending, not to mastication, or to biting cleanly, like those of lion or wolf. The crocodile seizes a mouthful of flesh, and gives one or two great convulsive wrenches from side to side, and so effects a parting, and then gulps the unchewed piece.

Generally speaking, no waking man need fear one of these reptiles on land. But in the water the voracious fury of the crocodile is the very stuff of which nightmares are made. Though no figures can be gathered, it has been said that more deaths are caused in Africa by crocodiles than by any other wild beast. In 1923, C. F. M. Swynnerton, game warden of Tanganyika Territory, exhibited before a London gathering of scientists the contents of the stomach of a crocodile which he had killed. There were many quills of a porcupine not completely digested; 11 heavy brass arm rings, such as natives wear; 3 coiled-wire armlets; a glass-bead necklace; 14 arm and leg bones; 3 spinal columns; 18 stones of various sizes, and a length of fiber cord which had bound some bundle borne on the head of a native who had become a meal for the crocodile.

The crocodile family is divided into at least three groups: the caymans of South and Central America, the alligators of North America and of certain Chinese rivers, and the crocodiles which are common to Africa, Asia, Australia and North and South America. They are widespread in warm regions.



New York Zoological Society

A creature out of a nightmare—the ferocious Nile crocodile, worshiped in ancient Egypt.

It must have been the cayman that the first white men in the New World saw. They called it *el lagarto*, which is the Spanish name for lizard, and the name be-

came changed in time to alligator.

Caymans and alligators are more closely related to each other than to crocodiles, though the Chinese alligator is nearer in design to the cayman of South America than is the alligator of North America. Both kinds are broader and shorter in the head than the crocodiles, and specialization seems to have gone farther in the cayman than in any other species, for here the bony plates are united into an undivided armor, extending in one species to form a sheath for the legs.

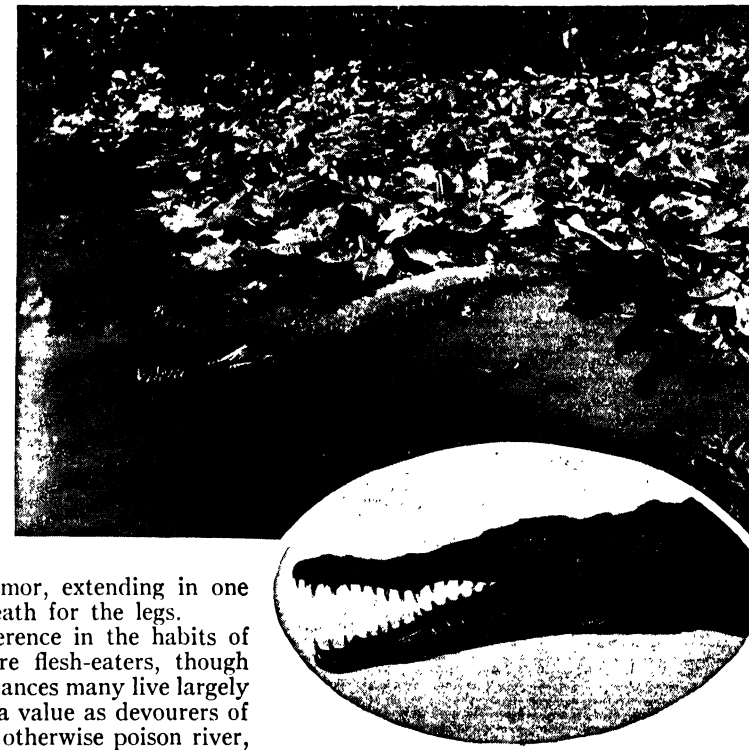
There is little difference in the habits of these reptiles. All are flesh-eaters, though from force of circumstances many live largely on fish, and all have a value as devourers of carrion, which would otherwise poison river, lake and stream. All migrate when home waters dry up, but where streams merely run low the reptiles bury themselves in the mud and wait for damper days to return.

All are egg-layers. The numbers of eggs vary from twenty to one hundred. Some crocodiles dig deep pits in the sand, lay their eggs there, cover over the hole, and keep watch, even brooding on the spot till the young are near hatching. Low barks from within the eggs tell of dawning life, and then the mother excavates the sand which covers her brood. The babies escape from the goose-sized, hard-shelled egg by means of a cutting implement on the end of the snout, resembling the egg tooth of a baby bird.

The caymans and the alligators lay their eggs in heaps of decaying vegetation and leave the heat of the mass to effect incubation, like the brush turkeys.

There is one crocodile which has so short a head as to be called the short-nosed crocodile; and there is the opposite extreme in the long-nosed crocodile of West Africa, whose slender snout enables it to catch fish, frogs and birds with swift dexterity. This animal is eighteen feet long, and sometimes longer.

Two crocodiles which interest us are the Nile and the estuarine crocodiles. The first



Both pictures, New York Zoological Society

Beware of those snapping jaws! If you look closely at the insert you can see how the crocodiles' nostrils open high at the tip of the snout. The teeth can only rip and tear, not grind food. The crocodile in the top picture is a gavial, often found in the rivers of India.

is a monster which the Egyptians worshiped. They tamed it, kept it in tanks at the temples, especially at Thebes, and when death overtook it they preserved it, in mummy form, as a holy relic. Crocodiles are objects of veneration in India today.

The taming consists, of course, in feeding the creatures so well that they have no need to forage for themselves at the cost of human life. But, on the other hand, there are known places where crocodiles have dwelt for generation, taking constant toll of human life, yet were spared, from religious fears, by the natives.

The Nile crocodile is not quite the giant of the family, for estuarine crocodiles ranging up beyond twenty-eight feet have been killed. The estuarine crocodile is the great traveler of the family. It is feared and detested in Indian waters; it is a scourge of the Ceylon coast; it is loathed and fought in Australian seas. With such size and strength this crocodile is capable of terrible feats. Largest of all crocodiles is the gavial, India's

famous river crocodile. Its long and relatively slender muzzle makes it specially efficient as a fish-catcher; but though men treasure it in the inland reaches, it does kill human beings. A gavial once attained a length of fifty feet.

The gavial is a very ancient animal; but a reptile still more ancient is the tuatara of New Zealand. Though lizard-like in outline, this reptile is as widely separated from modern lizards as lizards are from turtles. It is called the beaked lizard because of two enlarged teeth at the anterior end of the upper jaw. In fossil relatives of the tuatara this beak is very large.

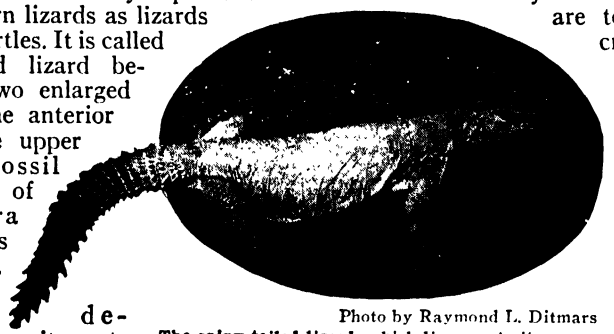
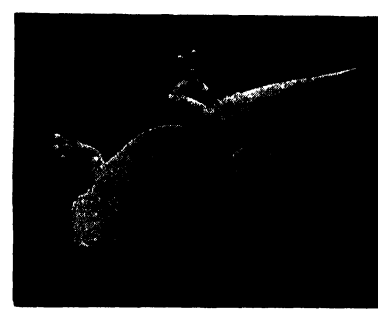


Photo by Raymond L. Ditmars
The spiny-tailed lizard, which lives up to its name.

With the technical details of its anatomy we can not deal except that in the tuatara's skull is an opening, and in it what appears to be a fairly developed eye. The organ is now covered over with pigmentation which prevents the passage of light. Scientists believe that ages ago this lizard (or its ancestors) could see out of the top of its head.

Long ago the ancestor of the tuatara and the modern lizard lived side by side. They differed from each other chiefly in the structure of their skulls. Modern lizards have departed much more from their ancestral type of structure than has the tuatara.

Perhaps the most primitive of modern lizards are the geckos—little soft-skinned creatures, usually with great friction pads on their toes. A book is needed to do justice to the geckos alone in Africa, India and Australasia. Three hundred species are known, and three or four inhabit human homes, where they are famous hunters of insects. All are fine climbers, though the structure of the feet differs. In the best-known, friction pads beneath the feet give an unfailing grip, no matter what position the gecko assumes, up the window-panes, across the ceiling, wherever fly or spider, beetle or cricket is to be discovered and munched.



New York Zoological Society
A gecko photographed from beneath, through glass, to show the friction pads on the feet.

In the East the gecko is feared by natives. It is said to poison food wherever its foot touches, and is called the father of leprosy. The truth is that it is perfectly harmless, whether it be one of the species that keeps to the cellar, one that keeps to the roof, or a third, which dwells in chinks and crannies of the walls of the house. It is amusing, valuable, becomes a capital pet, and is to be objected to only when its numbers are too many and its night cries too lusty.

One of the many remarkable forms is the fringed gecko. This species has a fringe which is simply an expansion of the skin along both sides of its body. Here the ribs themselves, six or seven on each side, are prolonged to form supports for the membrane. The whole apparatus works like a fan, folding up when the reptile is at rest, expanding when its little owner flits by its aid from tree to tree.

The flying lizards number upward of a score of species, and alone of reptiles seem to have tried to regain the mastery of the air which the old pterodactyls gained and lost. In the group to which they belong, the agamoid lizards, are other freakish developments of frills.

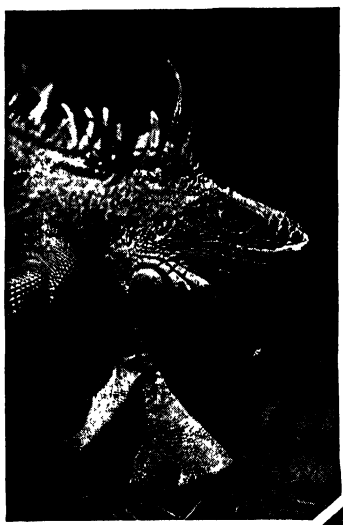
The frilled lizard is a formidable-looking little ruffian between two and three feet long, with a frill springing from the throat and neck, opening and closing at will, and expanded when the creature is angered.

Even more alarming in suggestion, though guiltless of offense, is Australia's moloch, or spiny lizard. It is only eight inches long, but Nature has packed into it a more ingeniously terrible armament of spines and prickles than into anything that lives outside the cactus family. The spiny tails, lizards of the Old World, have tails thickly beset with horny prickles.

In old times fancy played with horror round the basilisks, a harmless group of lizards belonging to the great iguana family. The basilisk was supposed to strike dead any

who beheld it, man or animal, even snakes; and its fiery breath was so potent that it scorched the vegetation of its habitat. The fact is that the helmeted basilisk, with its newt-like frill and its horny helmet is fearful only in appearance; in habit and nature it is the most harmless of lizards.

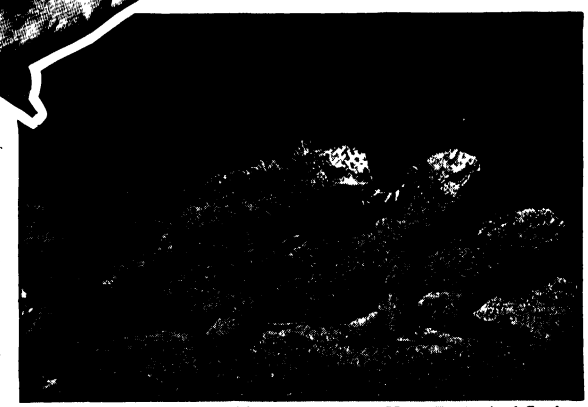
So far we have been thinking of land lizards, but now we turn our eyes seaward and find the sea lizard of the Galapagos Islands, cutting a dash in the waves, and banqueting on seaweed—a giant lizard, four and a half feet long. Keeping to the soil of the same islands is another lizard of note, the land iguana, which, weighing over ten pounds, is yet a foot less than its sea cousin. This is a strangely lazy beast, which will stay and nap in the midst of a walk, and dig its burrow with the limbs on one side of the body till tired, then rest them and work with the other pair.



An iguana with an especially hideous head. It has a crest of spines and a large dewlap.

This tiny desert iguana looks like a jeweled brooch. Almost all the iguanas are New World lizards.





All pictures, New York Zoological Society

These marine iguanas seem to be playing leapfrog. Though their mask-like faces are unpleasant, they are harmless creatures.

Other queer iguanas are the rhinoceros iguana, whose large horn on the snout suggests the name, and the ring-tailed iguana of the West Indies, remarkable for a big, dilatable throat pouch, a ridge of prickles down the back, and a tail ringed with formidable little spines.

Lizards must be dainty food to some animals, or there would not be this elaborate system of defenses againt hungry jaws. The horned lizard, to take another example, is armored with defenses not unlike those of the moloch, yet it is only the size of a well-developed toad. The scheme of the girdle-tailed lizards is less fantastic in pattern, but the mail of horny prickles is enough to safeguard it from attack.

Then at a step we reach lizards which have no more armament than little snakes. These are the so-called slowworm group, of which in Europe there is the typical slowworm, or blindworm; while the Old World and the New generally have a relative in the so-called glass-snake. The use of the word "worm" in this connection is a harking-back to old times when snakes were called worms. Even the supposed dragons sometimes went by this name.

Our glass-snake, then, is simply a much modified lizard which has lost its limbs. Like the slowworm, it is harmless, and is, of course, without poison. It can not withdraw its tongue into a sheath, as snakes can; and also unlike them, it has the lower jaw in one solid piece of bone, instead of in two halves united by a ligament.

There is, however, one type of lizard which is poisonous. That is the gila monster of the Western desert. There are two species of this hated lizard, and both somewhat resemble our glass-snake in internal structure, though they retain all four limbs, and are brightly arrayed in colors. Their poison is injected through grooved teeth when they bite, by the same method as that of some snakes. The venom of these lizards is potent enough to kill little animals, such as guinea pigs, and to cause serious inconvenience to human beings.

It is fortunate that poison has never been added to the great group of lizards called

All pictures, New York Zoological Society



An alligator teju lizard. It does resemble an alligator, only its tail is very much longer in proportion to the size of the body. These lizards are about a yard long, and are found in the American tropics, often in deserts.

A pair of Australian monitor lizards. Their heads remind one of a snake; and they also have snake-like tongues which can be drawn back into a sheath of muscles in the mouth.



From its appearance, it would be hard to guess that the glass-snake is really a lizard. It has lost its limbs and has a smoother skin than the skin of most lizards.

Gila monsters of the Western desert. These lizards are poisonous, and inject venom when they bite as does a snake.

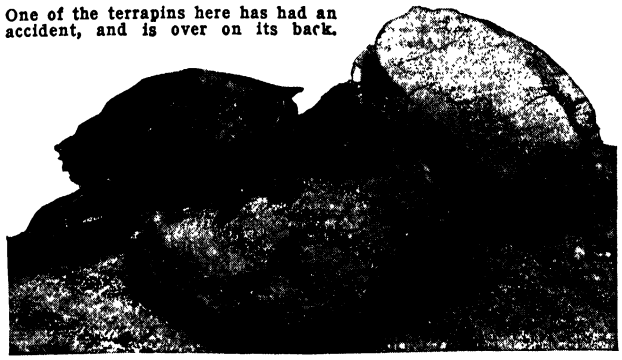


monitors, for here we have creatures measuring as much as seven feet long, and very powerfully built. They have a snake-like tongue, which is received, serpent-wise, into a sheath of muscles in the mouth. Some twenty species are distributed over southern Asia, Africa and the Australian regions. The water monitor, a giant of this group, common to India and Australia, is equally at home on land, in the trees, and in the water, be it river or sea. The largest monitor lizards are found on the island of Komodo, in the Malay Archipelago.

America has no monitors, but has developed a family closely resembling them in the teju lizards. Of these, the teguexins, handsome tropical lizards, a yard long, are the most notable. They never take to water, and are harmless unless attacked.

The amphisbaenas are extraordinary lizards which are worm-like in outline. They have no hind legs. They burrow in the earth as worms do and can move backward and forward with equal facility. There are many other lizards with which naturalists are acquainted as friends and pets, notably the green lizard, a European which some of us have kept from time to time; the viviparous lizard, which carries its eggs in its body till they hatch and produce the young alive; the wall lizards of southern Europe and elsewhere, which are perfectly at home in banks and walls where the sun shines. There is the sand lizard, too, a creature of sand bank,

One of the terrapins here has had an accident, and is over on its back.



This picture of a terrapin, taken through the glass of an aquarium, shows the plates of armor on the under side of the creature.



All pictures, New York Zoological Society

dry heath and dusty hedge, common to all the warmer parts of Europe.

Then there is the great array of skinks—a marvelously varied assembly—some with short, blunt tails; some with tails; some shaped like four-legged snakes; or gigantic caterpillars with all but the first and last pair of feet and legs removed, and with a great stretch of unsupported body intervening.

But even they have no more grotesque form than the members of the next family, the chameleons. Here are creatures incredibly slow in all but the action of the long sticky tongue, which shoots forth to a distance of eight inches and more to catch an insect, out and back again, with fly attached, in the forty-fifth part of a second.

That is all the speed a chameleon possesses. With its extraordinary feet it clings to a branch and anchors itself further by its grasping tail-tip, and there it stands with eyes swiveling independently. It changes color to suit its surroundings. This feat is not peculiar to chameleons; lizards, frogs and fish have the same gift, but not in the same measure.



Chameleons, sluggish, color-changing—with lightning-swift tongues.

Skinks. They are about six inches long, the bodies flat below.



In the turtles and tortoises we have creatures locked up in fortresses of bone of widely differing designs. Some of the turtles take to the sea and some of the tortoises keep to the land, while others of their family are at home in pond and lake. All are egg-layers. Many are flesh-eaters, but the majority are

vegetarians, especially among the tortoises. Beneath the bony covering exist ribs; and the rigidity of the covering renders it necessary for the limbs and neck to be used to aid breathing. Movements of these force the air from the throat down the windpipe, the nostrils closing valves to prevent its escape by any other passage than to the primitive spongy lungs. Naturalists have tabulated some forty species of land tortoises, widely distributed and including perhaps the longest-lived of all animals, some of them centuries old. One of the best-known of American varieties is the Brazilian tortoise, two feet long, eater of herbage and windfall fruits, and, in spite of its great shell, itself a meal for puma and jaguar, which uprear the shell and tear the flesh out with their claws.

Leopard-tortoises, brown, radiated and starred tortoises are in the same group, named for their patterns, handsome in their way and big, but insignificant in comparison with the giant tortoises of islands in the Indian and South Pacific oceans. There are in this assembly tortoises fifty-five inches long and weighing over five hundred pounds, creatures on whose back a man may ride. All of them are vegetable-feeders. Their natural life-span is often exceptionally long.

America has its tortoises, and some of them are familiar in our summer gardens, where they eat lettuce, grass and clover, but never beetles. Perhaps the strangest of these land tortoises are the hinged tortoises of Africa and the box tortoises of America. When the reptile draws in its head and legs, movable sections of the shell cover the openings.

The safety which retreat to water confers has made the pond turtles less dependent than these on such defenses, and it is notable that the upper and lower halves of the shell are united only by a strip of bone.

Terrapin is only another name for water turtles, and is given to a great number of species which frequent estuaries and the higher reaches of rivers. They are well represented in America as well as in Asia and warmer Europe, and are famous in the New World as a form of food for the table, and for many wonderful shell patterns. A European species, the Iberian terrapin, is noteworthy as a sort of rival to the hermit crab with its associated sea-anemone. The terrapin in the water becomes covered with a dense growth of algae and so steals on its prey, disguised as a rotting log.

But the pond turtles do not equal the size of the sea turtles, which, keeping entirely to the sea for a living, have grown to greatness in the midst of unfailing plenty. In this group, as in the sea mammals, the fore limbs have been converted into paddles; and all members of the group are great swimmers. They leave the water only to lay their eggs.

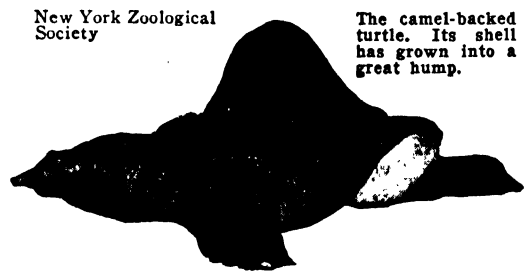
Then they exhibit caution and cunning. The sight of a human will keep them off shore, and the females will retain their eggs for a long time rather than face risk. Landing in the still of night, they march inland to some point high enough to escape flood and high tide, dig deep pits in the sand and there lay their eggs. Then they return to the sea, but not by the way they came in, as if to lead astray any who should follow them to their nurseries. The young turtles, when hatched from the eggs, scratch their way out of the sand and may be seen with their mouths full of grit as they march to the water. Instinct is strong and overmastering with them. No matter what barrier is interposed, no matter how many times they may be diverted or even turned round and forced in an opposite direction, they make for the sea as a magnetic needle points to the north.

The green turtle, which is caught for the well-known soup, is a reptile weighing as much as the giant tortoises. The leathery turtle, so named from the fact that its bony exterior is covered with a leathery shield, attains a length of six feet and weighs a thousand pounds.

The hawksbill turtle, a smaller species, ranging up to some three and a half feet, is the one which yields the tortoise-shell of commerce. Real tortoise-shell brings a very good price on the market.

Sea turtles are very tenacious of life. They live to great ages; they are so built that they can endure great hardship amazingly. In the next story of Animal Life we shall tell the strange tale of the serpents.

New York Zoological Society



The camel-backed turtle. Its shell has grown into a great hump.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 5409.



Westinghouse

Summer's heat or winter's cold are kept out of this lad's bedroom by the air-conditioning unit in the window.

WHAT IS AIR CONDITIONING?

NOBODY has ever thought of a way to regulate the warmth or coldness, dryness or humidity of air outdoors. The most we can do is to find out what the weather is going to be like, and then prepare for it. Indoors, it is quite a different matter. By means of a process called air conditioning we can clean the air, give it just the right amount of moisture (humidity), and keep it as warm or as cool as we like.

Air conditioning is used, not only in houses, offices and public buildings, but also in busses, railway cars, airplanes and ships; in mines thousands of feet beneath the surface of the earth; and in places where perishable products are stored. It has a wide variety of uses in industry, where it helps to control and improve the quality of products that are being manufactured. Properly conditioned air is a great aid to the health and comfort and endurance of people who work or live indoors or in enclosed places.

There are two general types of air-conditioning systems. For a large place with many different rooms or spaces to be conditioned, there is the central-station type. In this system all the apparatus is put in one room, such as a basement, and the conditioned air is carried through ducts, or pipes, to all parts of the building.

Then there is the unitary type. This can be used to condition the air in a single room or other enclosed space, such as a bus. These units are very small and compact, so that they take up very little space. They are installed with not much more trouble and expense than a modern automatic refrigerator requires.

Sometimes air conditioning is wanted for two or three rooms and not for a whole

building. Then the unitary type is installed in one room, and the conditioned air is circulated through the others by pipes.

To understand just what air conditioning is and does, we must first know what air is, and what it does. Air is made up chiefly of a mixture of two gases—oxygen and nitrogen. It has very small quantities of some other gases, and some water vapor. Air also contains a number of impurities, such as dust, soot and smoke. Too much of these impurities in the air we breathe interferes with the life-giving oxygen that we need, and may injure our health in various ways.

THE WARMER THE AIR, THE MORE MOISTURE IT CAN HOLD

Air varies widely in the amount of humidity or moisture, it contains. Sometimes air is practically dry; sometimes it is so saturated with moisture that it will hold no more. The amount of moisture that the air can hold depends upon the temperature. At 32 degrees F. (freezing point), a pound of air will hold about 1/4000 of a pound of water vapor. At 100 degrees, a pound of air will hold more than 1/400 of a pound of water vapor—about ten times as much.

When any gas is heated it expands. We can imagine the molecules separating farther apart as the air gets warmer, and making more room for the water vapor, and drawing closer together when the air is chilled, so that the water is squeezed out. In fact, something very much like that does happen, and the water vapor is formed into tiny drops, making a cloud or mist. If the chilling is very sudden or extreme, the mist is formed into larger drops, or into snowflakes or hail. These are too heavy to be supported by the air and we have rain or snow falling to the earth.

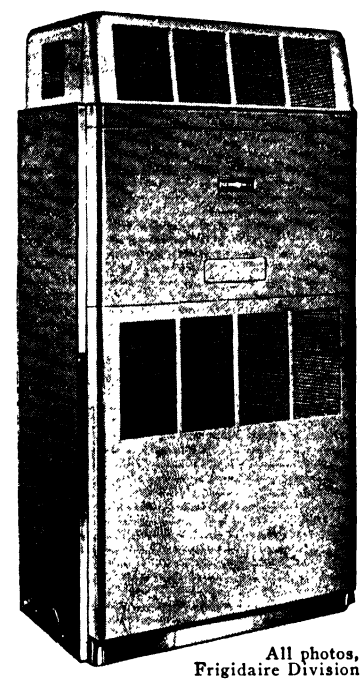
TAKING MOISTURE OUT OF THE AIR IS THE DIFFICULT TRICK

One of the most important things that an air-conditioning system does is to keep the air from getting too moist or too dry. Of course, it is quite easy to add moisture to the air in a room, as we can heat, or even boil, some water and get plenty of evaporation. To take moisture out is more difficult. An air-conditioning system has devices that chill the air and carry away the water that is forced out of it. But of course we do not always want chilled air, so other ingenious devices control the temperature at the same time.

As a rule, the most comfortable indoor temperature is about seventy-five degrees, and the most comfortable degree of humidity is 40 to 50 per cent of what saturated air would be at that temperature. In some special cases both temperature and humidity can be varied to suit conditions. For example, in some factories where the conditions are steamy, the humidity in the incoming air need not be as high as 40 per cent. In other places, where there is dry heat present, the humidity can be raised to overcome the dryness.

The mechanical parts of an air-conditioning system usually include the following. First, an apparatus for cleaning the air. Cleaning may be done by passing the air through a water spray, or through air filters. It may be done by electricity; this is called electrostatic precipitation.

After the air is cleaned it is drawn into a chamber where the moisture is taken out and the proper amount of moisture put back in. A device called an eliminator carries away the free water. A reheater adds heat



All photos, Frigidaire Division

The outside of a "packaged" unit, designed to regulate the temperature and humidity of the air in a store.

when more is required. There are, of course, the ducts or outlets through which the air is distributed, and a fan to propel the air.

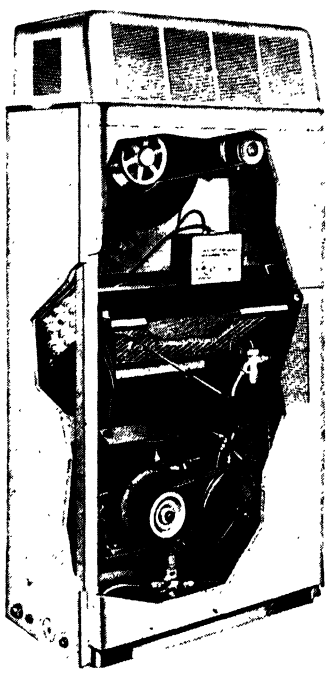
We have all become accustomed to the comfort of conditioned air in theaters, restaurants, offices and even in private houses. Not many people, however, realize what changes air conditioning has brought about in various industries, by increasing the efficiency of production and by improving the quality of the products.

Dr. Willis Carrier, an outstanding pioneer in air conditioning, has said that the textile industry was really the birthplace of the term "air conditioning." For many years, the people who worked in textile mills, spinning and weaving wool, cotton, silk, and, later, other fibers, noticed that on days when the weather was damp the fibers were easy to handle. In hot, dry weather, on the other hand, the fibers became brittle and less pliable. The fibers in the yarns would not twist tightly together, and there was more breakage. There was also a great deal more lint and dust in the mills on the dry days.

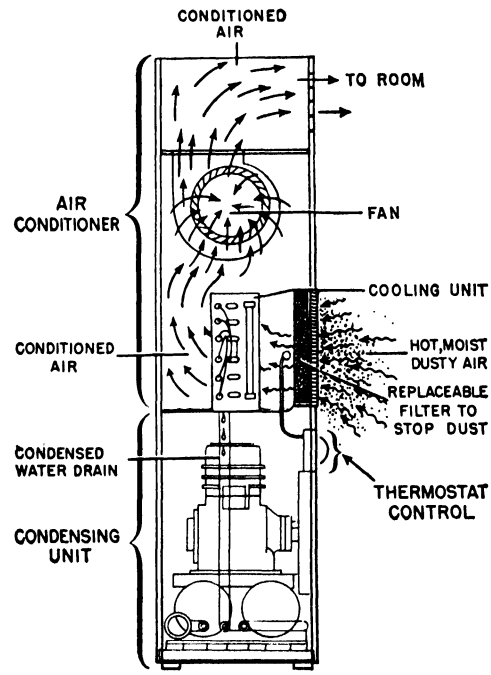
It was discovered that if the fibers were moistened this brittleness, and the static electricity generated by friction in the dry fibers, would be greatly reduced. It was extremely difficult, however, to control the dampening of the fibers. Then it was found that if the air in the mill was moist or humid, the fibers would absorb the moisture from the air, just as they did on days that were damp or rainy.

This led to the invention of means to humidify the air within the mills, and at the same time to control the temperature and to clean all of the dust and impurities out of the air. To do this, all the windows of the mills had to be kept shut, so that the only air that entered the building came through the air-conditioning system.

This made a great improvement in the quality of the yarns and the woven cloth. It also produced a cleaner product. It was also discovered that the steady, even temperature permitted the intricately and deli-



The packaged unit cut away to show the mechanism inside. Conditioned air comes out at the top.



A diagram of the same unit. Ordinary air is drawn in at the center, where dust and excess heat and moisture are removed. Conditioned air is sucked upward.

cately adjusted spinning and weaving machinery to run more smoothly, and the speed of the machines could be greatly increased. In addition, doing away with the dust, excessive heat and dryness made a remarkable improvement in the health, comfort and efficiency of the people who worked in the mills.

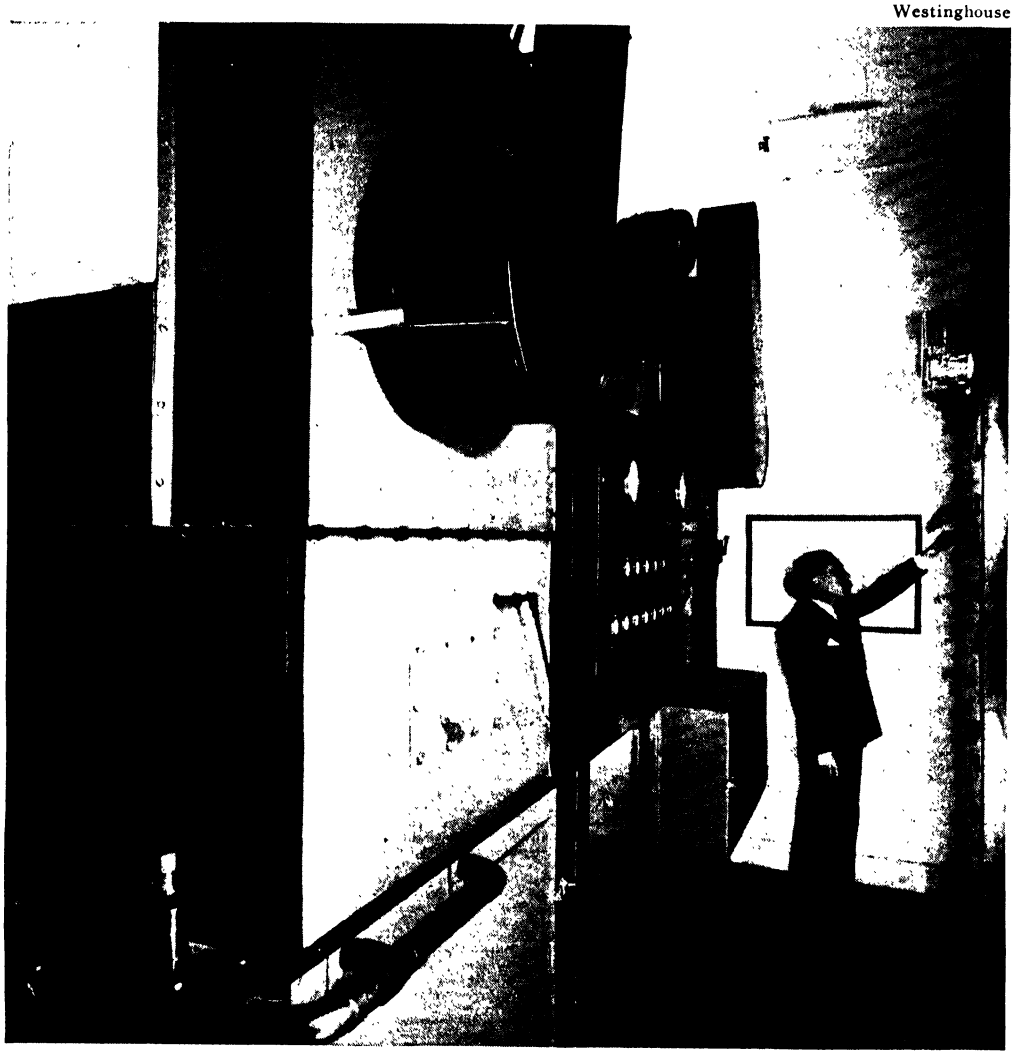
Since that time air conditioning has been introduced into such widely different industries as paper-making, printing, candy-making, and tobacco factories. Leather goods, food products, rubber manufacturing, oil refining, machine shops, and factories where optical instruments and instruments of all kinds are made, cameras, photographic supplies, chemical supplies and medicines are also among the industries that have made use of air conditioning. It is also useful in very deep mines, where the temperature is normally too high to work in for long, and even in blast furnaces, to cut down excessive moisture in the air that is blown into the furnace. There are probably more than a hundred different kinds of industries where air conditioning has made wonderful changes for the better. We benefit, in turn, by a host of better products.

By E. C. McDOWELL.

THE NEXT WONDER QUESTIONS ARE ON PAGE 5416.

A "refrigerated heat" unit, which can heat or cool the air in a two-story building.

Westinghouse





Poetry of the Eighteenth Century: Part I

Illustrated by William Sharp

Solitude

By ALEXANDER POPE (1688-1744)

This poem was written when Pope was 12 years old.

HAPPY the man, whose wish and care
A few paternal acres bound,
Content to breathe his native air
In his own ground.

Whose herds with milk, whose fields with bread,
Whose flocks supply him with attire;
Whose trees in summer yield him shade,
In winter, fire.

Blest, who can unconcernedly find
Hours, days, and years slide soft away
In health of body, peace of mind;
Quiet by day.

Sound sleep by night; study and ease
Together mixed, sweet recreation,
And innocence, which most does please
With meditation.

Thus let me live, unseen, unknown;
Thus unlamented let me die,
Steal from the world, and not a stone
Tell where I lie.

From An Essay on Criticism

By ALEXANDER POPE (1688-1744)

A LITTLE learning is a dangerous thing;
Drink deep, or taste not the Pierian spring:
There shallow draughts intoxicate the brain,
And drinking largely sobers us again.
Fired at first sight with what the Muse imparts,
In fearless youth we tempt the heights of Arts,
While from the bounded level of our mind
Short views we take, nor see the lengths behind;
But more advanced, behold with strange surprise
New distant scenes of endless science rise!
So pleased at first the towering Alps we try,
Mount o'er the vales, and seem to tread the sky,
The eternal snows appear already past,
And the first clouds and mountains seem the last;
But, those attained, we tremble to survey
The growing labors of the lengthened way,
The increasing prospects tire our wandering eyes,
Hills peep o'er hills, and Alps on Alps arise!

The Sluggard

By ISAAC WATTS
(1674-1748)

'TIS the voice of a sluggard; I heard him complain,
"You have waked me too soon; I must slumber again";
As the door on its hinges, so he on his bed
Turns his sides, and his shoulders, and his heavy head.

"A little more sleep, and a little more slumber";
Thus he wastes half his days, and his hours without number;
And when he gets up, he sits folding his hands
Or walks about saunt'ring, or trifling he stands.

I passed by his garden, and saw the wild brier,
The thorn and the thistle grow broader and higher;
The clothes that hang on him are turning to rags;
And his money still wastes till he starves or he begs.

I made him a visit, still hoping to find
That he took better care for improving his mind;
He told me his dreams, talked of eating and drinking,
But he scarce reads his Bible, and never loves thinking.

Said I then to my heart, "Here's a lesson
for me;
That man's but a picture of what I might be;
But thanks to my friends for their care in
my breeding,
Who taught me betimes to love working and
reading."

Light Shining Out of Darkness

By WILLIAM COWPER
(1731-1800)

GOD moves in a mysterious way
His wonders to perform;
He plants His footsteps in the sea,
And rides upon the storm.

Deep in unfathomable mines,
With never-failing skill,
He treasures up His bright designs,
And works His sovereign will.

Ye fearful saints, fresh courage take;
The clouds ye so much dread
Are big with mercy, and shall break
In blessings on your head.

Judge not the Lord by feeble sense,
But trust Him for His grace;
Behind a frowning providence
He hides a smiling face.

His purposes will ripen fast,
Unfolding every hour;
The bud may have a bitter taste,
But sweet will be the flower.

Blind unbelief is sure to err,
And scan his work in vain;
God is his own interpreter,
And He will make it plain.

Charlie Is My Darling

By CAROLINA, LADY NAIRNE
(1766-1845)

'TWAS on a Monday morning,
Right early in the year,
When Charlie came to our town,
The young Chevalier.

O Charlie is my darling,
My darling, my darling—
O Charlie is my darling,
The young Chevalier!

As he cam' marching up the street,
The pipes played loud and clear,
And a' the folk cam' running out
To meet the Chevalier.

Wi' Hieland bonnets on their heads,
And claymores bright and clear,
They cam' to fight for Scotland's right,
And the young Chevalier.

They've left their bonnie Hieland hills,
Their wives and bairnies dear,
To draw the sword for Scotland's lord,
The young Chevalier.

O, there were mony beating hearts,
And mony a hope and fear,
And mony were the prayers put up
For the young Chevalier.

O Charlie is my darling,
My darling, my darling—
O Charlie is my darling,
The young Chevalier!





On a Favorite Cat, Drowned in a Tub of Gold Fishes

By THOMAS GRAY (1716-1771)

Thomas Gray is best known for his ELEGY IN A COUNTRY CHURCHYARD. He also wrote lighter verse, of which this is a charming example.

'Twas on a lofty vase's side,
Where China's gayest art had dyed
The azure flowers that blow;
Demurest of the tabby kind,
The pensive Selima reclined,
Gazed on the lake below.

Her conscious tail her joy declared;
The fair round face, the snowy beard,
The velvet of her paws,
Her coat, that with the tortoise vies,
Her ears of jet, and emerald eyes,
She saw; and purred applause.

Still had she gazed; but 'midst the tide
Two angel forms were seen to glide,
The Genii of the stream:
Their scaly armor's Tyrian hue
Through richest purple to the view
Betrayed a golden gleam.

The hapless Nymph with wonder saw:
A whisker first and then a claw,
With many an ardent wish,
She stretched in vain to reach the prize.
What female heart can gold despise?
What Cat's averse to fish?

Presumptuous Maid! with looks intent
Again she stretched, again she bent,
Nor knew the gulf between.
(Malignant Fate sat by, and smiled.)
The slippery verge her feet beguiled,
She tumbled headlong in.

Eight times emerging from the flood
She mewed to every watery god,
Some speedy aid to send.
No Dolphin came, no Nereid stirred:
Nor cruel *Tom*, nor *Susan* heard.
A Favorite has no friend!

From hence, ye Beauties undeceived,
Know, one false step is ne'er retrieved,
And be with caution bold.
Not all that tempts your wandering eyes
And heedless hearts, is lawful prize;
Nor all that glisters, gold.

A-Hunting We Will Go

From DON QUIXOTE IN ENGLAND

By HENRY FIELDING (1707-1754)

THE dusky night rides down the sky,
And ushers in the morn;
The hounds all join in glorious cry,
The huntsman winds his horn.
And a-hunting we will go.

The wife around her husband throws
Her arms to make him stay;
"My dear, it rains, it hails, it blows;
You cannot hunt today."
Yet a-hunting we will go.

Away they fly to 'scape the rout,
Their steeds they soundly switch;
Some are thrown in, and some thrown out,
And some thrown in the ditch.
Yet a-hunting we will go.

Sly Reynard now like lightning flies,
And sweeps across the vale;
And when the hounds too near he spies,
He drops his bushy tail.
Then a-hunting we will go.

Fond Echo seems to like the sport,
And join the jovial cry;
The woods, the hills, the sound retort,
And music fills the sky,
When a-hunting we do go.

Ye jovial hunters, in the morn
Prepare then for the chase;
Rise at the sounding of the horn
And health with sport embrace,
When a-hunting we do go.

On the Prospect of Planting Arts and Learning in America

By GEORGE BERKELEY (1685-1753)

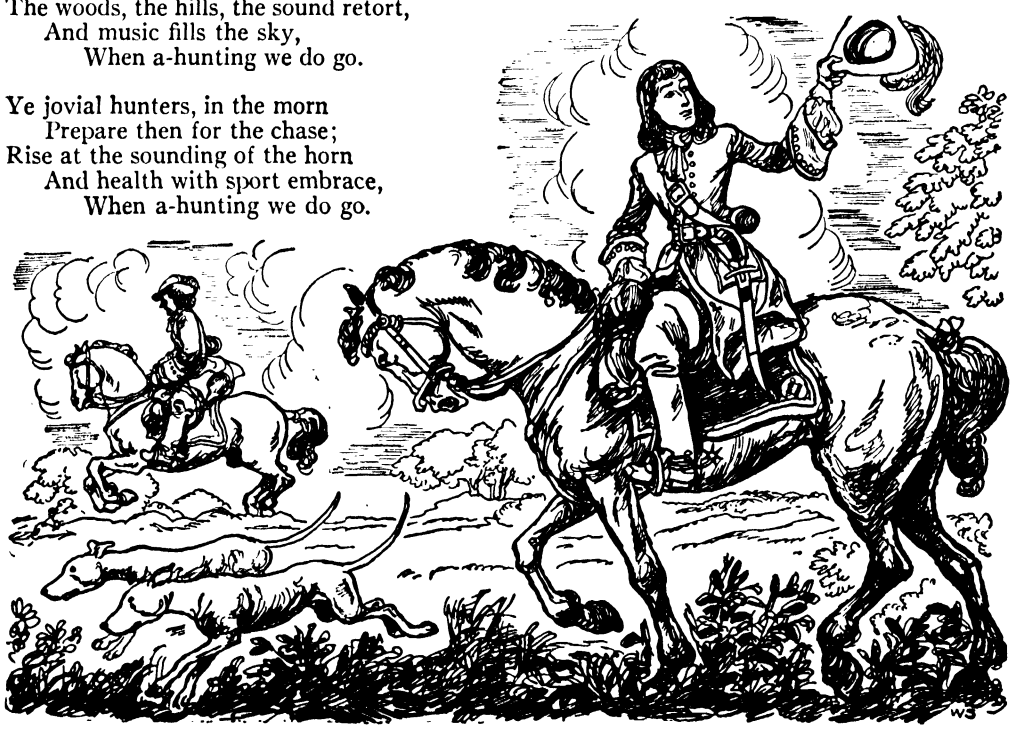
THE MUSE, disgusted at an age and clime
Barren of every glorious theme,
In distant lands now waits a better time,
Producing subjects worthy fame:

In happy climes the seat of innocence,
Where nature guides and virtue rules,
Where men shall not impose for truth and sense,
The pedantry of courts and schools:

There shall be sung another golden age,
The rise of empire and of arts,
The good and great inspiring epic rage,
The wisest heads and noblest hearts.

Not such as Europe breeds in her decay;
Such as she bred when fresh and young,
When heavenly flame did animate her clay,
By future poets shall be sung.

Westward the course of empire takes its way;
The four first acts already past,
A fifth shall close the drama with the day;
Time's noblest offspring is the last.





The Nightingale and Glow-Worm

By WILLIAM COWPER (1731-1800)

A NIGHTINGALE, that all day long
Had cheered the village with his song,
Nor yet at eve his note suspended,
Nor yet when eventide was ended,
Began to feel, as well he might,
The keen demands of appetite;
When, looking eagerly around,
He spied far off, upon the ground,
A something shining in the dark,
And knew the glow-worm by his spark;
So, stooping down from hawthorn top,
He thought to put him in his crop.
The worm, aware of his intent,
Harangued him thus, right eloquent:
"Did you admire my lamp," quoth he,
"As much as I your minstrelsy,
You would abhor to do me wrong,
As much as I to spoil your song;
For 'twas the self-same Power Divine
Taught you to sing, and me to shine;
That you with music, I with light,
Might beautify and cheer the night."
The songster heard his short oration,
And warbling out his approbation,
Released him, as my story tells,
And found a supper somewhere else.

Will You No Come Back Again?

A lament by an unknown poet for Bonny Prince Charlie, the Young Pretender.

ROYAL Charlie's now awa,
Safely owre the friendly main;
Mony a heart will break in twa,
Should he ne'er come back again.
Will you no come back again?
Will you no come back again?
Better lo'ed you'll never be,
And will you no come back again?

Sweet the laverock's note and lang,
Lilting wildly up the glen;
And aye the o'erword o' the sang
Is "Will he no come back again?"
Will he no come back again?
Will he no come back again?
Better lo'ed he'll never be,
And will he no come back again?

To A Lady

By JOHN GAY (1685-1732)

WHEN I some antique Jar behold,
Or white, or blue, or specked with gold,
Vessels so pure and so refined
Appear the types of woman-kind:
Are they not valued for their beauty,
Too fair, too fine for household duty?
With flowers and gold and azure dyed,
Of every house the grace and pride?
How white, how polished is their skin,
And valued most when only seen!
She who before was highest prized
Is for a crack or flaw despised;
I grant they're frail, yet they're so rare,
The treasure cannot cost too dear!
But Man is made of coarser stuff,
And serves convenience well enough;
He's a strong earthen vessel made,
For drudging, labor, toil and trade;
And when wives lose their other self,
With ease they bear the loss of Delf.



Hymn

By JOSEPH ADDISON (1672-1719)

THE spacious firmament on high,
With all the blue ethereal sky,
And spangled heavens, a shining frame,
Their great Original proclaim.
The unwearied Sun from day to day
Does his Creator's power display;
And publishes to every land
The work of an Almighty hand.

Soon as the evening shades prevail,
The Moon takes up the wondrous tale;
And nightly to the listening Earth
Repeats the story of her birth:
Whilst all the stars that round her burn,
And all the planets in their turn,
Confirm the tidings as they roll,
And spread the truth from pole to pole.

What though in solemn silence all
Move round the dark terrestrial ball;
What though nor real voice nor sound
Amidst their radiant orbs be found?
In Reason's ear they all rejoice,
And utter forth a glorious voice;
Forever singing as they shine,
"The Hand that made us is divine."

On a Certain Lady at Court

By ALEXANDER POPE (1688-1744)

I KNOW the thing that's most uncommon
(Envy, be silent, and attend!):
I know a reasonable woman,
Handsome and witty, yet a friend.
Not warped by passion, awed by rumor,
Not grave through pride, or gay through folly,
An equal mixture of good humor,
And sensible soft melancholy.
"Has she no faults then (Envy says), Sir?"
Yes, she has one, I must aver:
When all the world conspires to praise her,
The woman's deaf, and does not hear.

A Letter

To Lady Margaret Holles-Harley, when a child

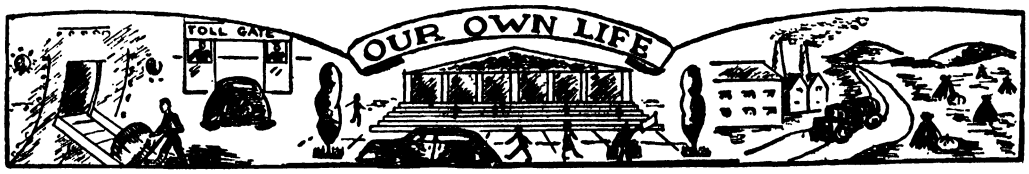
By MATTHEW PRIOR (1664-1721)

MY noble, lovely, little Peggy,
Let this my First Epistle beg ye,
At dawn of morn, and close of even,
To lift your heart and hands to Heaven.
In double duty say your prayer:
Our Father first, then *Notre Père.*
And, dearest child along the day,
In every thing you do and say,
Obey and please my lord and lady,
So God shall love and angels aid ye.

If to these precepts you attend,
No second letter need I send,
And so I rest your constant friend.

THE NEXT POEMS ARE ON PAGE 5417.





ECONOMICS *in the* WORLD'S LIFE

ECONOMICS is the practical science dealing with the satisfaction of human wants. The word economics comes from two ancient Greek words meaning household possessions and managing. The study of economics, the study of our human wants and their satisfaction, is based upon two fundamental truths. The first of these truths is that our wants are unlimited. We are somehow never fully satisfied. No sooner is one want satisfied than another appears. Take yourself, for example. At some time or other haven't you wanted, say, a new ball and bat for Christmas, telling your parents that such a present would make you perfectly happy? Then, perhaps even before New Year's, you found yourself thinking that you could really play good ball if only you had a new ball suit or a pair of spiked shoes. Well, we are all that way, always wanting something we do not have.

The second great truth is that nature makes us struggle for most of the things we need or want. Your father or mother must work in order to earn the money with which to buy the clothes you wear, the food you eat and the things with which you play. When you grow up you, too, will have to work if you hope to satisfy your wants.

From the earliest times man's chief concern, all his life, has been to supply his daily needs. As a result of this struggle to make a living, our ancestors passed through several economic stages. Their passage from one stage to another was very gradual in some cases, and more rapid in others.

Man lived in the first stage for perhaps thousands of years. The people in some parts of the world remained in this condition much longer than did others. For example, some of the American Indians were in this stage when the civilized white men first landed in America. In the first stage, wants were met by taking fish from the lakes and streams, wild animals from the forests. The people owned no personal property as we think of it today. Most of them had no permanent home and engaged in neither trade nor commerce. Depending as they did entirely upon the raw materials of nature, they would suffer a period of starvation and then enjoy a period of plenty; and so their



Courtesy, American Museum of Natural History, New York

The American Indians lived in the Hunting and Fishing Stage longer than most peoples. Here they hunt buffalo.



Culver Service

In the Pastoral Stage man began to tame and herd wild animals; they provided food, clothing and some tools.

life would be lived. This is called the Hunting and Fishing Stage.

With advancing civilization and with increasing wants, man gradually began to domesticate wild animals. The Old Testament describes a people in this economic stage, surrounded by their flocks of sheep and herds of cattle. This is called the Pastoral Stage. Pastoral means feeding, grazing. The word pasture comes from the same Latin root.

In the next period, the Agricultural Stage, man began to own land and slaves; and he learned how to raise a number of crops. So wealth began. The English, for example, following the Norman conquest, advanced rapidly in the art of farming, and some of them built up large agricultural estates.

With the growth of trade and commerce following the Crusades in the Middle Ages, agriculture came to be somewhat less important in many sections of civilized Europe. Men became skilled in making things with their hands, and selling these things—cloth of various kinds, shoes, furniture and so on. This period is called the Handicraft Stage.

If some day you go to England, you will find that in London many of the ancient street names remain, indicating the trades of the people living there in the years of the Handicraft Stage. For example, you will see such names as Mason's Avenue, Ironmonger's Row and Shoe Lane.

You and I live in the Industrial Stage of the world's life. The Industrial Stage became firmly established as a result of the Industrial Revolution which made it possible, through many inventions, to do by machinery work that had always been done by human and animal labor.

This revolution (or change) took place in England between 1750 and 1850; it spread to many parts of the civilized world, including the United States. Among the most important inventions were Hargreave's spinning jenny, Cartwright's power loom, Whitney's cotton-gin, to separate the seed from the raw cotton—and probably the most important of all, Watt's steam engine.

The results of these great inventions changed the way of living for millions, and the change kept spreading, and is still spreading. More things could be made, at less labor and less cost. The modern Factory System came into existence. Trade and commerce were extended to far parts of the earth. Then men discovered that they could accomplish more by Division of Labor, about which we shall soon speak. We said that economics is concerned with the satisfaction of human wants. Things which satisfy these wants are called Goods. The bread we eat, the clothes we wear, the air we breathe, are all goods.

There are two kinds of goods. Those which exist in great quantity relative to the demand are called Free Goods. Air, water and sunshine are examples of free goods. Not only are they exceedingly useful but, in fact, necessary to life itself. Yet under ordinary conditions we do not pay for them, since they exist in abundance and may be had for the taking.

Those goods which do not exist in sufficient quantities to meet the demand are called Economic Goods. Unfortunately, most of the things that satisfy our wants are of this kind; they are scarce and require effort to make them, or money to pay for them.

Useful services, even though they are not materials, or things, are classed as economic goods. The policeman, the minister, the operator of a bus, and the teacher, all render services which are just as much economic in character as those of the carpenter or shoemaker.

What is wealth? We commonly talk of wealth as meaning riches, the possession of much property. A poor man is one who has few things, or little wealth, while a rich man is one who has many things, or much wealth.

But in economics we use the word without reference to quantity. In general we consider wealth as a group or collection of economic goods. Wealth consists of all tangible

things which satisfy human wants, which can be transferred or exchanged, and which, because they are limited in supply, have value.

The study of economics is so much concerned with wealth that it is often defined, though not quite truly, as the science of wealth.

To repeat, *wealth is a group of economic goods. It is limited in supply, transferable and useful in satisfying human desires.* Study this definition carefully. Sometimes very injurious things are produced and bought and sold. Often goods of inferior quality are made for a poor market. Economics studies the best means of increasing the quantity of goods and commodities in their distribution. It is the business of art and education to see that the wealth produced is good in kind, and such as will make people happy, comfortable and cultured. In the same way, when we study engineering we are concerned solely with the making of machines, and not with the quality of the goods the machine will be employed to manufacture. A good loom may be employed to weave a poor cloth, but that is not the fault of the loom. So economics, when it deals with producing or exchanging commodities, treats them all as wealth.

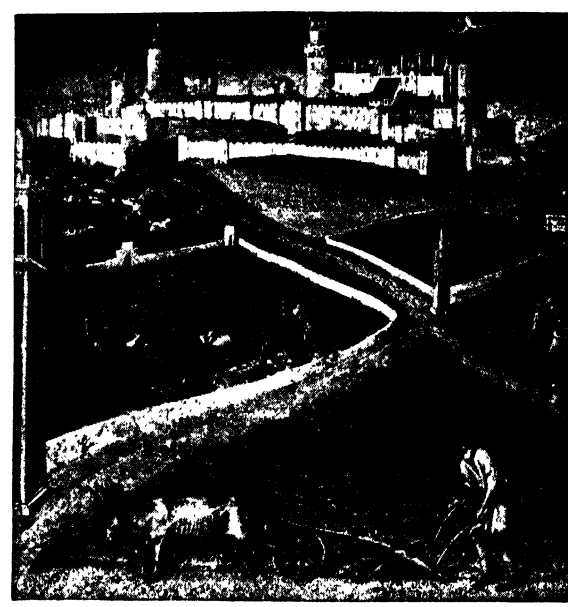
It is very important, if the greatest happiness is to be secured for the greatest number of people, that we should understand the laws governing the production and distribution of wealth. If we do not understand these laws, we are likely to make big mistakes and to bring suffering on others. Strange as it seems, even nations have, by not understanding economics, made great mistakes in government which have made millions poorer than they should have been. The study of economics, too, is becoming increasingly important because getting a living is growing more and more complicated.

Getting a living was very easy to understand in the past, up to about 150 years ago. Few machines had then been invented and the things made were for the most part manufactured from beginning to end by individual workers. In making a suit of clothes, one man cut and fitted and sewed and made buttonholes. He performed every process in the whole operation. The same thing was true of almost every occupation. The greater part of trade was carried on near home, and people knew what was to become of the food they were raising and of the things they were making.

Now all that has changed as a result of the Industrial Revolution. The machine takes the place of human labor in many steps. And since machines can usually work faster than human beings, there is a great increase in the kinds and quantities of things produced. Things can be cheaply purchased which formerly were made at home—soap, for instance. Workers specialize. To this specialization the economist gives the name Division of Labor; it has four forms.

1. *Occupational Division of Labor.* Long before the Industrial Revolution, individuals and families began to specialize in particular occupations. One family would concentrate on farming; another on the making of shoes; another on grinding grain for making flour; another made clothes and so on. Then an exchange of products took place, so that everyone had all the necessities of life. As a result of this occupational division of labor, things were not only made better but also made more cheaply, since concentration on one job increases skill in that job and speed in getting it done. Thus more articles can be made in a single day, or week. This means a smaller cost for labor on each article.

2. *Division of Labor within an Industry.* Then occupations began to be broken down into parts, especially after industry left the home and concentrated in factories. For



Man began to use tools to help him in the Agricultural Stage.

instance, in the clothing industry, one concern would specialize in men's suits, another in hats, another in socks, and still others devoted themselves to making women's dresses, suits, hats and so on. Likewise, specialization developed in professions. For instance,



A cobbler (shoemaker) of olden times, making shoes by hand. He performed every step in the process himself.

nowadays one doctor looks after our eyes, another after our ears, another after our stomach and still another sets the bone if we fall and break an arm.

3. *Specialization by Task.* Still using the clothing industry as an example, we find that a large number of workers are employed in the making of different parts of a man's suit. One does the measuring, another, the cutting, another, the sewing, another makes the button holes, and others sew on the buttons.

4. *Territorial Division of Labor.* When heavy machinery began to be used in England, in the second half of the eighteenth century, another change took place. Coal was needed to run the machinery. It was wise to build factories where coal was abundant, so that the fuel would not have to be hauled for long distances. The areas without coal engaged in agriculture and bought iron, cotton and woolens from the manufacturing districts. For various reasons other districts specialized in different trades. For example, Belfast, in Northern Ireland, made linens, because flax was grown near by. In the United States, the steel industry developed in places near coal, yet close enough to waterways so that iron ore could be brought cheaply to the coal for smelting. In Alabama, coal and iron are found close together; that is an ideal situation. Cotton mills are found in the southern states, where cotton is grown.

5. *International Division of Labor.* There is a division of labor not only between persons, between trades and between districts, but also between nations. This arises for exactly those reasons which cause different trades within a country to be carried on in different parts of it. A country may specialize in an industry because of certain natural resources or climate. China's silk industry grew, for example, because the climate was just right for mulberry trees to thrive, and silkworms eat mulberry leaves. The people of a country may develop a special skill, and so an industry will grow there —as, for instance, watchmaking in Switzerland and lace-making in Belgium.

For these reasons, the nations of the earth are becoming more and more dependent on each other. To encourage this specialization, and the exchange of goods between countries, two great meetings attended by representatives of many nations were held in 1944. One was at Bretton Woods, New Hampshire, to make plans for post-war trade and commerce, and the other at Dumbarton Oaks, Virginia, to plan for a lasting peace.

All wise men know that specialization between nations is good only in time of peace. In wartime, each nation must strive to satisfy the needs of its people without looking outside its borders (or the borders of its Allies).

Adam Smith, an Englishman, laid the foundation for our modern study of economics. His great book, THE WEALTH OF NATIONS, was published in 1776. It describes three advantages arising from the division of labor:

1. The increase in dexterity and skill of each particular workman; 2. the saving in time because a workman no longer has to pass from one job to another; 3. stimulation of the invention of machines to do certain things.

As to the first of these, every child has experience. To become expert in swimming or in playing the piano, we must give much time to practicing. The constant practice of a particular thing makes it become second nature. Thus the person devoted solely to

one occupation is far more useful than if he were a jack-of-all-trades.

As to the saving of time in going from one thing to another, if the worker has to make the whole of an article, or to employ different processes and materials, there is necessarily much time wasted in laying down one job, or one tool, and taking up another, and clearing up after one job and preparing for a different kind of work.

A BOY WHO LOVED TO PLAY MADE POSSIBLE AN IMPROVEMENT ON THE STEAM ENGINE

To illustrate how the division of labor leads to invention, Adam Smith told the following story, of a boy who worked at a steam engine:

"A boy was constantly employed to open and shut alternately the communication between the boiler and the cylinder, according as the piston either ascended or descended.

"One of those boys, who loved to play with his companions, observed that, by tying a string from the handle of the valve which opened this communication to another part of the machine, the valve would open and shut without his assistance, and leave him at liberty to divert himself with his playfellows.

"One of the greatest improvements that has been made upon this machine since its invention was made in this manner—the discovery of a boy who wanted to save his own labor."

Adam Smith is even more right on this point now than when he told this story. Nowadays in great manufacturing establishments there are machines to do almost every part of the work quickly and with a minimum of attention from the operator.

Along with the great advantages we have seen resulting from the division of labor, there are some results that are far less desirable. One of the chief of these is the monotony which comes with doing one particular task, or watching a machine do one small task, day after day and year after year, maybe for a lifetime.

Such tedious work produces a deadening effect upon both mind and body, and may cause an individual to lose interest in the job. Such concentration can not help but destroy pride in master workmanship.

The remedy for the monotony is to be found in shorter hours of labor, which give the individual a chance for recreation or for some form of individual work or hobby.

It is true that hours of labor have, in general, grown shorter as the machine age has grown older. (This does not take into account such occasions as wartime, when people must work long hours.)

Before we leave this study of economics and wealth let us once more remind ourselves of the relation of wealth to life.



Courtesy, Boeing Aircraft Company

Making airplanes in sections speeds production. Later the various parts are put together on a long line.

The word wealth has a most interesting origin. The Anglo-Saxon word *wela* meant "well-being" (weal), and was changed later into the Middle English *welthe*, which afterward became our modern word wealth. So while the science of economics usually relates to the study of wealth as commodities which have value in exchange, whatever their purpose, or whether they are good or bad, we should always remember the earliest meaning of wealth. It was with such thoughts in his mind that John Ruskin wrote, in 1862:

> "There is no wealth but life, life including all its powers of love, of joy, and of admiration. That country is richest which nourishes the greatest number of noble and happy human beings; that man is richest who, having perfected the functions of his own life to the utmost, has also the widest helpful influence, both personal and by means of his possessions, over the lives of others."

By GRAEME O'GERAN.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 5357.



The Swiss schoolmaster, Johann Pestalozzi, whose ideas about education have helped to form our schools.

The MEN WHO GAVE US OUR SCHOOLS

THE American author, Oliver Wendell Holmes, once wrote: "A child's education should begin at least a hundred years before he is born." This seems like a joke, but Holmes meant that it has taken many years, in fact, many hundreds of years, to give us the schools we have today. Here we shall speak of some of the men who have done most to help in the education of children in Europe and America.

Long ago, in the early days of civilization, children did not go to school. There were no schools at that time. Boys were taught either by their families or by their priests to live according to the rules of the tribe. Girls were taught practical things, such as cooking and growing crops and making clothes. As civilization advanced education advanced also, especially for boys. Homer, in the ILIAD and the ODYSSEY, describes how the youth of ancient Greece learned arts and crafts and prepared for adult life.

In a military Greek state like Sparta the whole training for boys was in the arts of war and the life of a soldier. Athens, however, became the great center and example of Greek civilization and culture. In families which were free and could afford it, the boys were taught by tutors, but singly, and not in classes. From the ages of about seven to fourteen they learned reading, writing, and perhaps arithmetic, and also music. From twelve to eighteen they had gymnastic training, in which they learned wrestling, boxing, running and other athletic skills. Some of the tutors were philosophers; that is, they studied and taught various ideas based upon wide knowledge. Certain of these men thought and taught so well that they have become famous for all time, and we study and use their teachings today. One of these was Socrates.

Socrates, like many of these teachers, had no schoolhouse or classroom. He gathered

young men in the market-place and other public places, and taught them to think about what they should believe and what they should do. He had a special method, which has been called, after him, the "Socratic method." He would ask a young man, for example, whether he thought slavery was a good thing; and when the young man gave an opinion Socrates would ask why he gave that answer. Socrates kept on asking questions until his pupils had to think deeply about and examine all their ideas and beliefs —about the gods, about themselves, about life in Athens and about how things should be run. In this way many of them came to change their beliefs and their ways of doing things. Other people in Athens, who did not want any changes, became angry; and finally they put Socrates to death, saying that he was a bad influence in the state.

A FAMOUS PUPIL OF SOCRATES WAS PLATO WHO FOUNDED THE ACADEMY AT ATHENS

But the work of Socrates went on, and one of his pupils became even more famous. This was Plato, one of the greatest philosophers who ever lived. He started what was called the Academy. This was an outdoor school, where the pupils met the teacher at a certain athletic field; and Plato and his students often walked about while he taught them his philosophy. His teaching was about God and about people, about how to run the government and society, and how to live well and happily. By this time the people of Athens had become wiser, and Plato was honored instead of being put to death. One of his pupils became almost more famous than he had been: that pupil was named Aristotle.

PLATO'S ILLUSTRIOUS PUPIL, THE GREAT ARISTOTLE, FOUNDED THE LYCEUM

Aristotle also started a school, which was called the Lyceum, but he was more interested in learning from nature than in just thinking things out. He carefully studied and learned everything he could about the earth, sun and stars, about plants, animals and men. He tried to base all his beliefs on the facts that he had learned, and in this way he studied and taught in the spirit of modern science. He, too, had a famous pupil, a boy who became a powerful king and conqueror, Alexander the Great. It is said that Alexander, when he was marching across the countries conquering most of the civilized world, used to send to his former teacher specimens of all new plants and animals which he found in other countries so that Aristotle could study and classify them. It is interesting to remember that the two chief centers of learning in the Hellenistic world, that part of the world influenced by Greek teachings, were at Athens and at Alexandria, in Egypt, which was named after Alexander the Great.

THE ROMAN EDUCATOR, QUINTILIAN TRAINED BOYS TO BECOME ORATORS

In the third and second centuries B.C., Greece and all the other Mediterranean countries were conquered by Rome. The Romans were at first rather stern people, a little like the Spartans, and they taught their boys chiefly war and agriculture. But gradually the culture and teaching of the conquered Greeks became popular, and Roman youths often had Greek slaves as their tutors. Among the Romans who wrote and taught ideas about education were the stern old censor Cato, the great orator Cicero and the philosopher Seneca. But the most famous Roman leader of education was Quintilian. He is said to have been the first man who kept a public school. He received payment from the Emperor. He chiefly trained boys to become orators, since that was the best way to gain success in public life in those times. He taught that learning of all kinds was useful to an orator. He wrote about education, beginning with a child's earliest years. Another Roman writer, Juvenal, called Quintilian a "white crow," because he became rich as a teacher, while almost all the other schoolmasters were poorly paid.

HOW THE CHRISTIAN MONKS PRESERVED LEARNING DURING THE DARK AGES

Gradually the Roman Empire began to crumble away, and in the fifth and sixth centuries A.D. great armies of barbarians from northern Europe and from Asia swept over the Empire, destroying a great part of the ancient civilization. Because of this, the period of history which followed is often known as the Dark Ages. The chief influence at this time, which gradually rebuilt and transformed Europe, was the Christian Church. Modern civilization and learning owes a debt of gratitude to St. Benedict, who, at Monte Cassino in Italy, founded the first of the many monasteries which were established all over Europe, and which preserved and handed on some of the ancient culture, together with the application of the Christian teachings.

By the year 800, Charlemagne, the powerful king of the Franks, was hailed as the head of the new Holy Roman Empire, and

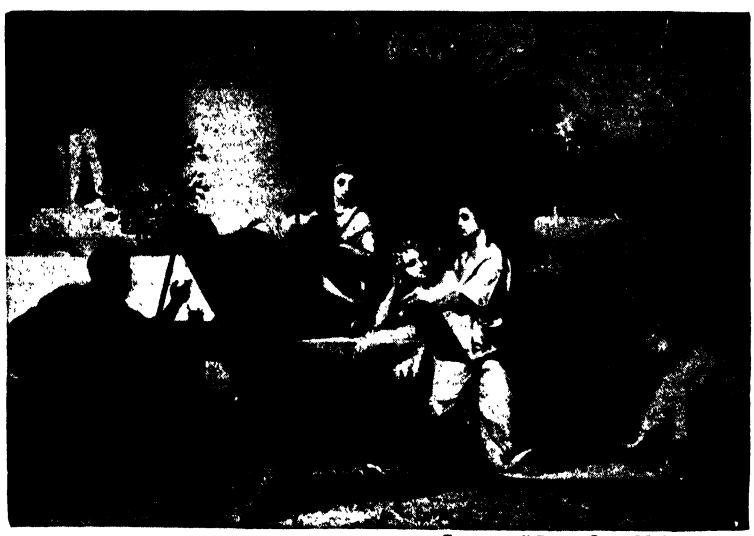
he held sway over most of Europe. Although he himself had received very little schooling, he valued education highly; and at Aachen, in what is now Germany, he established a court school. As teachers, he sought to get the most learned men in Europe, and the most famous of these was the Englishman Alcuin. Alcuin came from York in England, where he had taught at the cathedral school. He helped to make Charlemagne's efforts a great success, to bring back a revival of learning in Europe, and to build up a fine library at the monastery of Tours in France. Not only the sons of nobles but also some poor boys attended the school at Aachen.

After the death of Charlemagne there was less unity in Europe and education suffered. Schooling was largely limited to religion—at cathedral and monastery schools—while the trade-guild schools which grew up were chiefly professional. By the twelfth and thirteenth centuries, however, universities were growing up in the chief cities, and many of these are still the leading centers of learning in Europe. The universities of Paris, Oxford, Cambridge, Prague and Vienna are examples. Brilliant scholars arose in many lands.

An early Christian writer, St. Augustine, had combined the teachings of Plato with Christianity in his writings. Now in Spain there were scholars like the Arab Averroës, and the Jewish philosopher Maimonides, who revived an interest in Aristotle. Through leading Christian writers including Albertus Magnus and Thomas Aquinas, the philosophy of Arisotle was combined with Christian religious beliefs and was widely taught in the universities. The chief professions taught in the universities were law and medicine. By the end of what are called the Middle Ages —from the fall of the Roman Empire to about the time of Columbus—there were as many as eighty great universities in Europe.

Following the Middle Ages came a period known as the Renaissance, which is the French word for rebirth, and refers to the great revival of Greek and Roman learning and culture. One of the first leaders in Italy in Renaissance learning was Petrarch. Another, with a very Roman name, Aeneas Sylvius Piccolomini, wrote a book, THE LIBERAL EDUCATION, in 1475, combining the ideals of Christian training with the new culture. A great schoolmaster of this time was Vittorino da Feltre, who put the Renaissance principles into practice, together with the Christian traditions. His school at Mantua in Italy was made so attractive to the pupils that it was known as "The Pleasant House." Sports and games were joined with study, an appreciation of the beautiful was taught as well as high standards for leadership in the state and the Church. The boys had a form of self-government and had practical studies to fit them for a useful life. It is no wonder that Vittorino is sometimes called "the first modern schoolmaster."

The most famous figure of the Renaissance, however, was a brilliant scholar and writer named Erasmus, who was born in Holland in 1466 and lived until 1536. He studied for the Church, and in Paris, Oxford and Italy devoted himself to a knowledge of languages and of Greek and Roman literature. He became an international person, known to the intellectual leaders in all the European countries. He wrote satires like THE PRAISE OF FOLLY against the stupidities, superstitions and abuses in the Church



Gramstorff Bros., Inc., Malden, Mass.

The great Greek teacher and philosopher, Socrates, instructing one of his pupils. Plato, Socrates' most illustrious pupil, became the teacher of the great Aristotle.

and in the everyday life of his time. His scholarship showed itself in fine editions and translations of the New Testament, the early Christian writers and the great Roman authors like Terence, Seneca, Cicero and others. He also wrote METHODS OF STUDY and LIBERAL EDUCATION FOR CHILDREN, urging that the Christian and Renaissance learning be given to all—to women as well as to men—and that schools should teach carefulness and accuracy in all subjects, and education be made a pleasant and practical training for life. The influence of Erasmus and his writings was to help in awakening Europe to new, broader fields of thought.

Renaissance learning was also known as Humanism, since it taught the value of all human life and learning in contrast to the chiefly religious education of the Middle Ages. Erasmus was a Humanist, as were two distinguished scholars in England who were friends of his. These were Sir Thomas More, who wrote UTOPIA, a description of an ideal world; and John Colet, a fine schoolmaster, who founded St. Paul's School in London about 1508.



Plato and Aristotle as Raphael pictured them.

After the Renaissance, which was a sort of revolution in learning, there came the religious revolution that is called the Reformation. It is sometimes called the Protestant Revolt, since people who protested against conditions in the Catholic Church broke away from that Church and from the leadership of the Pope. The first and most famous of the Protestant leaders was a monk named Martin Luther. By his writings and preaching he persuaded many of his fellow-countrymen in Germany to follow his teachings. Luther translated the Bible into fine German, so that all could read it, and wrote some beautiful German hymns. He insisted that all children should have an education, and that this should be under the control of the state. As the Reformation spread it became a political as well as a religious movement, and many of the kings and princes of northern Europe freed themselves from the Catholic emperor as well as from the Pope.

The Catholic Church now took vigorous action to remove abuses and to oppose this loss of her membership in many countries. A system of schools was established by a new religious order of priests, the Society of Jesus, who became known as the Jesuits. They developed an educational plan called the "System of Studies" (or *Ratio Studiorum* in Latin). This was a careful arrangement of all the school subjects, and was very efficient in its method of teaching. It insisted on a full explanation by the teacher of everything in the lesson and on frequent repetitions and reviews, so that everything would be well learned. Since the Jesuits were a widespread but unified organization, they conducted all their schools in the same way, and became an important part of European education and of Catholic education everywhere.

An important school teacher at this time was Comenius (Latin form of his name, Komensky: these latinized names were frequently used). Comenius came from Moravia, in modern Czechoslovakia. He was a devout Protestant and suffered persecution for his religion. He developed remarkable educational methods. His GATE OF LANGUAGES UNLOCKED was a book which taught Latin and Greek starting with simple words, referring to familiar objects in easy sentences, progressing to more difficult words and sentences. His *Orbis Pictus,* or WORLD IN PICTURES, was the first children's picture book of which we have any record. The textbooks of Comenius were translated into many European and Asiatic languages and were very widely used. Comenius himself was invited by the governments of England and Sweden to draw up a scheme for the management of their schools.

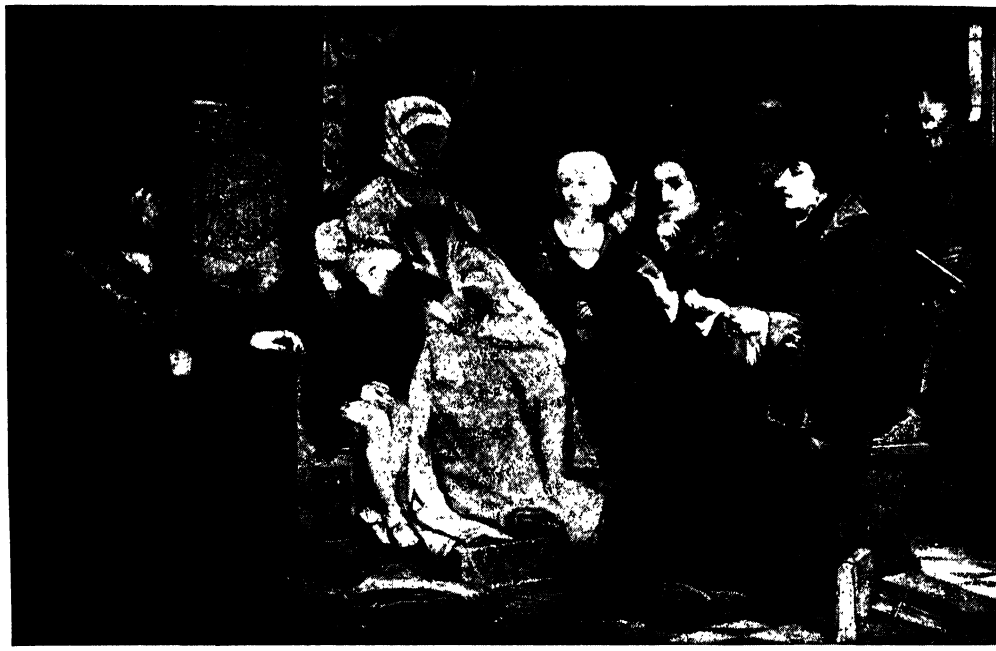


Photo by Augustin Rischgitz

When Europe rediscovered ancient Greek and Roman learning in the Renaissance, one of the great scholars was the Dutchman, Desiderius Erasmus. Here he is pictured teaching the young prince who became Emperor Charles V.

French writers such as Rabelais, Montaigne and Voltaire had written in favor of fuller personal freedom and of removing education from the bonds of tradition and religion. But no writer of the times went so far or had so much influence as the French philosopher, Jean Jacques Rousseau (1712-78). He taught "education according to nature" and said that a child's natural tendencies should be allowed to develop in close contact with nature, which would lead to a simple happy life. His book EMILE is a description of this educational idea, and it had a very wide influence. It encouraged more "naturalness" in the school, and a trend away from the old rules, regulations and formalities.

One reader of Rousseau's EMILE was a man in Switzerland named Pestalozzi, (1746-1827), who brought up his own child according to the teachings of that book. In this way he learned its defects as well as its advantages, and he took up school teaching to put his own ideas into practice. He felt that the teacher must study the psychology of the child and help the child to develop in every way. He wrote two books, LEONARD AND GERTRUDE and HOW GERTRUDE TEACHES HER CHILDREN, showing how a wise and good mother could benefit not only her child but her whole community as well. This expressed the belief of Pestalozzi that education is one of the greatest forces for the reform and welfare of society as a whole.

Among the many educators who were strongly influenced by Pestalozzi were two men in Germany. Johann Friedrich Herbart (1776-1841) developed these new theories still further in his writings; and Friedrich Wilhelm Froebel (1782-1852) carried them on in a wide field of actual teaching. But Froebel's fame is linked with his attention to the earliest years of a child's life. He gave the name of kindergarten (children's garden) to his schools for little children. These leaders in "psychological" education stressed the unfolding of all the child's abilities and the development of a complete personality.

At the time when these leaders were active in Europe, education in the United States was given great impetus through an American leader, Horace Mann. American education in its organization had remained to a large degree local since its colonial beginnings. Thomas Jefferson had wanted education for everyone as a necessary part of American life. Yet during the early part of the nineteenth century, the interest in schools and colleges died down, to some degree. This

was largely due to the decline of the religious enthusiasm which had founded so many of the early schools and colleges. Individualism and the pursuit of wealth absorbed people's attention.

HORACE MANN POINTED OUT THE FAULTS IN THE SCHOOLS OF THE UNITED STATES

It remained for another force, the state, to give a renewal of progress and development to the schools. This came about through the work of such outstanding individuals as Horace Mann (1796-1859). As secretary of the state board of education in Massachusetts, Mann conducted a crusade for improvement of the schools. In his twelve annual reports, in his public addresses and writings and in every manifestation of his vigorous mind and personality, he criticized the schools as they were. He pointed out their faults and inefficiency and made known the educational progress in Europe—with which he was familiar by both study and travel. He ended by rousing not only his state, but the whole nation as well, to activity for improvement of the schools. Mann encouraged the abolition of small district schools in favor of the better-supported, better-taught, better-equipped and more centralized town schools. He called for better preparation of teachers, a longer school term, school libraries, a fuller curriculum and improved methods of teaching. During his later years, when president of Antioch College, he told his students: "You should be ashamed to die before you have won some victory for humanity." His own work had accomplished a true victory for education in the United States.

But Horace Mann was not the only distinguished figure in American educational reform. Henry Barnard (1811-1900) accomplished a similar work in the neighboring state of Connecticut. He was later president of St. John's College, Annapolis, Maryland, and then became the first United States Commissioner of Education, in which position he laid the foundations for the later useful work of the Bureau of Education. As editor of the AMERICAN JOURNAL OF EDUCATION, he contributed, perhaps, his greatest service to the cause of improving the nation's schools.

JOHN DEWEY, A POWERFUL INFLUENCE IN MODERN EDUCATION

John Dewey (1859-) has become, since the beginning of this century, one of the outstanding figures in American philosophy and education. As director of the School of Education at the University of Chicago,



Jean Jacques Rousseau, French philosopher, taught that education should be more simple and natural.

and in the Department of Philosophy at Columbia University, he has advanced ideas that have been widely accepted by teachers and educational leaders throughout the United States. Dewey believes in practical education through experience, in learning how to do things, and not merely learning about things. He holds that thought is an instrument of response and behavior rather than of knowledge alone. Dewey and his followers feel that the demands of our modern industrial society require an education which will aid children to take their place as useful citizens when school years are over.

Meanwhile, a different view of education has been set forth by President Robert Maynard Hutchins of the University of Chicago. One of the youngest university presidents ever to take office in the United States—he did so at the age of thirty—Robert Hutchins has attracted wide attention by the changes which he proposes. Education should bring "a moral, spiritual and intellectual revolution throughout the world." University training, he says, ought to concentrate on fewer subjects and higher standards. The four-year college course should begin, he believes, with what is ordinarily the third year of high school. Every child, whether rich or poor, should receive a liberal education. President Hutchins thinks that the views of John Dewey neglect

the highest values of education. Professor Dewey answers that Mr. Hutchins' ideas are too idealistic and impractical. But the distinguished American historian, Charles Beard, in his book AMERICA IN MIDPASSAGE, says that these views should be combined.

Other influential leaders in the United States have been Dr. William Heard Kilpatrick, who taught at Teachers College, Columbia University, and advocated views similar to those of John Dewey; and Carleton Wolsey Washburne, a pioneer of "progressive" schools.



Friedrich Froebel, who invented the "kindergarten" or children's garden.

"Progressive" education seeks to give the pupil a larger share in the classroom activity. Instead of receiving instruction merely from the teacher, the child "learns by doing." The pupils co-operate in doing the work themselves, with the teacher acting as a guide. For example, the children may decide, with the teacher's guidance, that they would like to know more about China. They divide the work, one group contributing information about China's history, others taking up its geography, art, government and so on. Thus while they are still in school, the children learn how to work together democratically, and each does his share for the benefit of the whole group. Combined with the best of the older teaching methods, these new "progressive" methods add interest and practical experience to school education.



Photo from Ewing Galloway

An outstanding leader of education in the United States was the great reformer of schools, Horace Mann.

Women have also taken their place as important leaders in the educational world. In Italy Maria Montessori opened her *Case dei Bambini* (Children's Houses) to train handicapped and backward children. She based her methods on freedom, interest and sense training. Because of the startling results, these Children's Houses became world-famous.

Helen Parkhurst, a Wisconsin educator, acquired her early experience as teacher in a rural school where forty pupils were divided into eight grades. To keep everyone busy, she got the older students to help the younger ones, and also built up a library, garden and playroom. Later she was an instructor in high schools and in a teachers' college.

In 1914 she journeyed to the University of Rome to study with Maria Montessori, and upon her return to America she developed Madame Montessori's methods in the United States. In 1919 she worked at a school for crippled boys—using a new plan of education which she had started. Her success with the plan led her to carry it on to the Dalton High School in Massachusetts.

Miss Parkhurst called her training program the Dalton Plan. Freedom and co-operation were its outstanding principles. The child was led to consider himself a member of a community and was given the responsibility for certain jobs. The teacher was a source of friendly advice and help, but was not a director. So the children were allowed to carry their tasks to a finish with freedom of time and method, but with the knowledge that the tasks must be performed. This was not merely school—it was everyday living brought into the classroom.

We have seen how in Roman times Quintilian, the teacher and scholar of education, was called a "white crow," meaning some one unusual, because he became rich through his work. Those who have given us our schools have seldom acquired wealth. In most cases they have been led by a devotion to children and children's welfare. They have felt, too, that the right training of the young, in fitting them for adult life is one of the most important things that can be done to help society. Next to their parents, many men and women owe the greatest debt of gratitude to those teachers who have guided their way toward successful living. For these men and women education has proven its worth.



Culver Service

Returning from his wonderful voyage around the world, Francis Drake is knighted by Queen Elizabeth on board Drake's ship, the Golden Hind. This voyage did much to inspire England's later sea power and her world empire.

THE ELIZABETHAN SEA-DOGS

THE sixteenth century was a great and stirring period in world history. Great times breed great men, and England was blessed with ocean warriors such as the world has rarely seen. In the years from 1532 to 1580, less than half a century, were born eight men whose names will never die. Sir John Hawkins, Sir Martin Frobisher, Sir Humphrey Gilbert, Sir Francis Drake, Sir Richard Grenville, Sir Walter Raleigh, Captain John Smith and Henry Hudson were the great sailors who may be said to have founded the British Empire.

These heroes did not fear the terrible Spaniards. They did not fear the sea and its storms and icebergs. They did not fear enterprises in lands where the people were strange and savage and all the conditions appalling. But they did fear the unreal: they were afraid of imaginary perils which never, never were. All these grand fellows doing such marvels in their tiny rotten ships were convinced of the existence of demons, witches and supernatural monsters. A navy of Spanish war galleons could not have stayed the course of Francis Drake, but an army of saints could not have made him disbelieve in witchcraft on the seas and on the land.

It is not cowardly to acknowledge fears; it is heroic to overcome them, and that is what all these wonder men did. The witches of which Shakespeare writes in MACBETH; the enchantments of Prospero in THE TEMPEST;

> ". . . the Cannibals that each other eat,
> The Anthropophagi, and men whose heads
> Do grow beneath their shoulders,"

of whom Othello discourses, were as real to

Elizabethan scholars and men of action as electrons and atomic bombs are to us.

In point of time Sir John Hawkins was the first of the great mariners of the Elizabethan Age. He was born in 1532 at Plymouth, Devonshire. His taste for the sea came naturally, for his forefathers had been shipowners and captains. His first daring adventure came when he sailed down the African coast, robbed some Portuguese slavers, and then smuggled the captured blacks into the Spanish colonies in the New World. This was a challenge to Spain; and it is small wonder that two ships Hawkins sent to trade in Seville were seized by the Spaniards.

HOW SIR JOHN HAWKINS WAS ATTACKED BY A SPANISH FLEET AND HOW HE ESCAPED

But Elizabeth lent him a ship, and his friends came to his aid. He repeated his voyage to the African and American coasts. On his third attempt his cousin, Francis Drake, was with him in the ship Judith. Hawkins boldly sailed into Vera Cruz, the port of Mexico, and claimed he had been driven in by bad weather. The Spaniards pretended to believe him, but when their strong fleet arrived they attacked Hawkins. Only two of the English ships escaped—the Judith and Hawkins' own vessel, the Minion. For some years Hawkins remained at home, but he sent out several expeditions. With the danger of a Spanish attack approaching, he was created a rear-admiral, and fought against the Great Armada.

Elizabeth knighted him for his services and gave other proofs of her favor. In 1590 she sent him out to catch the Spanish treasure fleet off the coast of Portugal. He missed the flotilla and had to return empty-handed. Then occurred one of the amusing clashes which endeared the Queen to her rough-and-ready seaman. Hawkins told Elizabeth that he had failed, and in his own defense quoted from the Bible: "Paul doth plant, Apollo doth water, but God giveth the increase." Elizabeth looked at him in amazement, then burst into laughter and exclaimed: "This fool went out a sailor, but has come home a divine!"

Five years later this staunch old sea-dog accompanied Drake on a treasure-hunting expedition to the West Indies. This met with little success; and from it Sir John Hawkins never returned, for he died at sea off Puerto Rico that same year, 1595.

Before we leave Sir John Hawkins we must recall that it was he, not Sir Walter Raleigh, who brought the potato to England from Virginia. What Raleigh did was to cultivate potatoes regularly for the first time in England and Ireland.

Sir Martin Frobisher was the next hardy son of the sea who "followed the gleam" of adventure. He was born in Yorkshire in 1535. When Martin was about ten years of age his uncle, Sir John York, sent him on a voyage to Guinea. That was the beginning of an adventurous life.

Frobisher's ambition was to find the Northwest Passage to China and India. For years he met with discouraging rebuffs, but in 1576 the Earl of Warwick came to his assistance. With two tiny barks and a pinnace Frobisher sailed for the ice-bound seas. The pinnace was lost and one of the little ships deserted, but Frobisher continued on his way. He reached the bay that now bears his name, and later landed at Butcher's Island, where natives captured five of his men. All he brought back from this trip was a lump of ore supposed to contain gold, and the tusk of a narwhal. The tusk he presented to Queen Elizabeth, who was delighted with her present. In those days a narwhal tusk was supposed to have magic properties. The gold-speckled ore encouraged the Queen to give more help to Frobisher. He headed two more expeditions to the Far North. But besides some geographical knowledge little was gained. His next years were spent in the service of his queen. For his part in the defeat of the Armada he was knighted.

Many a sailor looks forward to the day when he will be able to settle down on land. Sir Martin Frobisher was no exception. But he was not satisfied with placid country life. When Sir Walter Raleigh offered him command of a fleet fitted out to harry the Spanish treasure ships, Frobisher went gladly. And he returned with a rich prize. He was wounded at Fort Crozon and died at Plymouth in 1594.

THE MAN WHO FOUNDED ENGLAND'S OVERSEAS EMPIRE BY CLAIMING NEWFOUNDLAND

The gallant Sir Humphrey Gilbert, courtier, man of law, warrior and admirable legal administrator, was the next hero. He and Raleigh were sons of the same mother, who had been twice married. Gilbert was the elder by thirteen years, having been born in 1539, while Raleigh came into the world in 1552. They were poor Devonshire gentry of decayed fortunes, but both had an admirable university education, and Gilbert, for-

saking law for arms, rendered notable services in many directions before fulfilling his heart's desire to try to found an English colony "in Cathay."

Raleigh was with his brother in the company, but ill fortune, dissension and a disastrous encounter with a strong force of Spanish off Cape Verde sent the expedition home in ruin. Gilbert spent six years in poverty, and complained that he had to sell the clothes off his wife's back.

In 1583, with four little craft, he steered west again, and at the end of seven weeks entered the harbor of St. John's, Newfoundland. With enthusiasm Gilbert claimed the new land in the name of the Queen. (Actually Henry VII had already bought it for a paltry ten pounds from John Cabot, who discovered it back in 1497.) Thus, the British Empire was founded.

Gilbert turned homeward on August 20, with only two ships left. In a gale which capsized the smaller vessel the ten-ton Squirrel, he himself was lost with all hands on September 9th.

It was the peerless Drake who was the greatest hero of them all. To sap the Spaniard's strength, to sink his ships, to seize his wealth, to make the ocean safe for English craft—this was the mission to which he consecrated himself.

Drake was born in Devonshire in the year 1540; but most of his childhood was spent in Kent. The father had a sort of minor chaplaincy in the navy, and his home, when not at sea, was an old hulk on a dock. There young Francis drank deep of the traditions of the sea, and as a mere stripling was apprenticed to the owner of a craft trading to France and Holland, who at his death left Drake the little ship.

In this Drake traded on his own account till the threat of Spain to seize all English ships in the Channel caused him to sell out and join his uncle, John Hawkins, in an expedition to a port on the Spanish Main. The English, storm-beaten and in distress, were promised friendship by outnumbering Spaniards in port, but they were treacherously attacked and forced to flee with only two of their five ships saved. It is strange to note that on this expedition the English cargo was flesh and blood, a consignment of Negro slaves brought from Africa for sale to the Spaniards. Hawkins was the first English sailor to engage in this unholy traffic.

We hear no more of Drake in the hideous traffic in human lives. He was a merciful and God-fearing man. But Drake, though so cheery and gay-hearted, had all the gloomy superstitions of his time. He believed strange lands and strange seas to be the abode of demons. He thought fog and mist were the direct work of Satan against him. He believed in sorcery and enchantments, as did most of the bright minds of that age of genius and credulity.

But these beliefs never deterred this man



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Sir Humphrey Gilbert in Newfoundland, where England's empire began.

of stout heart and great courage; no fears of the unearthly deflected him from his pursuit of the Spaniards who were "ruling the waves" in those days. He had a practical way of dealing with the Spaniards. Such a method we see in his amazing adventure, with two small vessels and seventy-five young men, on what we now call the Isthmus of Panama.

There he attacked the great Spanish town of Nombre de Dios, the port into which the Spaniards poured their treasure of gold and silver and precious stones from the New World mines for transport to Spain. One fine night in the summer of 1572 Drake and two boatloads of men suddenly fell on the town, threw its guns into the sands, dashed into the citadel, and burst open a store of silver bars which reached to the roof. Drake, however, led the way toward another repository where gold untold was guarded.

The alarm was general now, and the English were heavily outnumbered. A great storm broke, ruining their armament, and Drake fell, weak from a wound in the thigh. Still he urged on his men, "I have brought you to the mouth of the Treasure House of the World; blame nobody but yourselves if you go away empty."

The seamen replied that his life was dearer to them than all the wealth of the Indies—for they still thought of America as India. They bore him away to safety, and in a few weeks he was up and doing, planning to waylay the mule train which crossed the isthmus with treasure for the city he had nearly looted.

It was on this march that, balked by tropical vegetation, he ascended a high tree to look out. It was a moment of magic in his life. There he saw the Atlantic at his back, and before him the wide Pacific Ocean; and he "besought Almighty God of His goodness to grant him life and leave to sail once in an English ship in that sea." Then he took from the caravan what gold and silver and precious stones he could, in such quantity that two tons which it was impossible to carry away had to be buried on the spot.

THE WONDERFUL AND DARING VOYAGE OF FRANCIS DRAKE AROUND THE WORLD

Drake's magnificent voyage round the world (1577-80) began, we remember, simply in a foray against the Spaniards, with a view to injuring their shipping and decreasing their treasure; and what was intended to be an out-and-home cruise became a world voyage by accident.

After beating his way through the Strait of Magellan—a voyage only some 370 miles long, but occupying three weeks of constant anxiety and terror—he emerged into the Pacific. He was now caught by a storm which blew him more than 600 miles to the southeast of Cape Horn, the southernmost point of South America.

And so the storm led Drake to the great discovery that America did not extend to the South Pole, but that there was a seaway from the Atlantic into the Pacific without the necessity of facing the terrors of the Magellan Strait, "the haunt of demons."

Drake fought and pillaged ships so astonishingly along the Pacific seaboard that he felt it unwise to return by the way he had come, lest he should meet inconveniently powerful Spanish ships on the way back. He therefore lightheartedly attempted to find and sail that Northwest Passage around the top of America which other gallant men had been trying to find.

That failing, he cheerfully faced a voyage home across the Pacific, a trip of twenty thousand miles in a sort of fishing-smack well gunned and manned. And he did the voyage without mishap, by way of China and the Cape of Good Hope—the first English keel in those waters, and himself the first captain to sail round the world. He brought home treasure enough to ransom kings.

QUEEN ELIZABETH'S ANSWER TO COMMANDS SENT BY THE KING OF SPAIN

Boys and girls who are studying Latin will be interested in the following little story about Drake. Before the sailing of the Armada from Spain, the Spanish king sent this letter in Latin to Elizabeth: *"Te veto ne pergas bello defendere Belgas; Quae Dracus eripuit nunc restituantur oportet; Quas pater evertit jubeo te condere cellas; Religio Papae fac restituatur ad unguem."* Freely translated, these lines mean: "I forbid you to interfere to defend the Netherlands in this war. It is fitting that what Drake seized should now be restored. I order you to rebuild the chapels that your father overthrew. See to it that the religion of the Pope be restored to the last jot."

To these lines Elizabeth wrote the short answer: *"Ad Graecas, bone rex, fiant mandata kalendas."* This means: "Good king, your order will be carried out at the Greek kalends." By which Elizabeth meant "Never."

Drake lived to play the foremost part in

the defeat of the Armada, and to "singe the King of Spain's beard," as he used to call his desperate operations, wherever a hostile fighting ship could be found to face him.

After Drake had seen the Spanish Armada in full flight he was so jubilant that he sent a merry dispatch to Queen Elizabeth. It contained the word "cantharides." That word is the scientific name of an insect called familiarly the Spanish fly. The Queen saw the joke and was mightily pleased with the joker.

Drake's career ended on the scene of one of his greatest exploits, in the sea off Nombre de Dios, where he was seized with fever, sickened, and on January 28, 1596, died.

He had been mainly instrumental in saving England from Spain, in making the seas safe for the English ships. A single capture of his from the East Indies had opened English eyes to the value of the East, and prompted the formation of the East India Trading Company, which led to English mastery of India and its riches.



From a treetop in Panama, Sir Francis Drake first sees the Pacific Ocean, which he later explored and crossed.

HOW THE GOLDEN HIND WAS PRESERVED AS A REMINDER OF DRAKE'S GREAT VOYAGE

In one respect Drake was more fortunate than some of his great contemporaries. He was in high honor with Queen Elizabeth, and his countrymen followed the royal example. On his return home from his epoch-making voyage round the world the Queen thought fit to order his ship, the Golden Hind, to be preserved as a "monument of his own and his country's glory." But after about a hundred years the famous vessel was broken up.

We come now to a tale that stirs the blood of all those who admire courage. Sir Richard Grenville was the leading figure. A Cornishman, born about 1541, Grenville was the son of a man who sailed and sank ships for England, and himself followed suit in perhaps the most dramatic fight ever seen on the ocean. A proud, fierce man he was, of the sort necessary for the ungenerous age, when one ship often had to multiply itself by the skill and valor of its captain and crew into the might of a dozen.

Grenville played a part in the pioneer voyages, as his charter said, "for the discovery of sundry rich and unknown lands"; he was associated with Gilbert and Raleigh; and he sought, without finding, the lost colony sent by Raleigh. On the way home he showed his exceptional mettle, his astonishing audacity.

Grenville captured a Spanish ship which had been sent to capture him. Having fought her to a standstill, he set out to take possession. He had no boats with which to board her, so he and his men made use of a raft of old sea chests, which fell to pieces just as they reached the enemy; but they brought the Spaniard home.

The fight of fights, however, was that which followed a swoop by fifty-three Spanish ships upon a little English fleet of sixteen ships which were taking in water at Flores in the Azores, and had a tragic toll of sick men aboard. Lord Howard, the admiral, rightly decided to retire when he saw himself so heavily outnumbered, and gave orders to Grenville to follow him.

Either Grenville could not, or he would not. At any rate, in the Revenge, in which Drake had helped to defeat the Armada,

Grenville passed out into the enemy midst, and was becalmed, the wind taken from his sails by the towering ships of Spain.

No matter how the figures be minimized, twenty of those fifty-three Spaniards were warships and fifteen of them fought with the little Revenge. All the evening and all the night this one small ship fought till she had but twenty men left, most of them wounded. Among the wounded was Grenville.

He told the master gunner to sink the ship, and the master gunner said, "Aye, aye." But there were some who had wives and children, and they pleaded that, after such a fight as the world had never seen till now, they might yield. The dying Grenville mournfully consented and he died captive upon a hostile deck, while the little Revenge went down to be lost evermore in the sea. The story of that fearful engagement is recorded for all time in the grand ballad Tennyson wrote.

WALTER RALEIGH, SCHOLAR, POET AND ADVENTURER

We should keep a warm place in our hearts for the memory of Sir Walter Raleigh—warrior, explorer, historian and poet. Raleigh was born in Devonshire in 1552. The little Walter loved to haunt the beach at Budleigh, there to feast his mind on stories of strange lands and strange peoples across the wide waters, poured into his willing ears by sailors who were resting in the little town.

Born to an adventurous life, Raleigh had talent for scholarship also, and we find him, when only sixteen years of age, a student at Oxford University, after he had done well at the schools round about his home. He stayed for a year at Oxford and then, at seventeen, he started upon his career of daring.

He went to France, where he fought in the Huguenot army and saw several battles. He remained abroad five years. He followed up his experiences in France by making a voyage with Sir Humphrey Gilbert, and by taking a part, it is believed, in the wars in the Low Countries. He was therefore a well-trained soldier when he went to Ireland in 1580 to help to put down a revolt. When the Irish patriots were conquered, Raleigh executed every one of them.

During this campaign Raleigh became the friend of Edmund Spenser, the great poet, and afterward succeeded in having him introduced at the English court. Meanwhile Raleigh, though he had once or twice appeared at the court of Elizabeth, had not yet been recognized there. After the Irish



Culver Service

Drake attacks the Spanish treasure ship. Such feats he called "singeing the beard of the king of Spain."

adventure, however, he was sent to London with a report of the battle. There the Earl of Leicester, who was at this time a favorite of Queen Elizabeth, befriended him, and he was soon greatly favored by the Queen.

Queen Elizabeth was at this time nearly fifty years of age; Raleigh was not yet thirty. He was tall and handsome, with dark, luxuriant hair and a smooth complexion. He was graceful and active, and a man of great physical power, known to be as brave as a lion; he was a charming poet, a man of much learning, and gifted with fiery eloquence. He had courtly manners, and was always well dressed in the rich fashion of the time.

THE HONORS THAT CAME TO RALEIGH THROUGH THE QUEEN'S FAVOR

What wonder, then, that he should win the heart of the Queen? The legend of their first meeting is well known. The Queen, on leaving her palace, found a muddy puddle lying before her, or so the story goes. Raleigh, who saw her distress, instantly stripped off the rich velvet cloak which he wore and spread it before her, so that she walked dry-shod over the mud. Very soon Raleigh became prime favorite of the Queen, and she showed him many favors. She allowed him to levy taxes upon wines and woolen cloths; she made him warden of the royal mines in Cornwall and Lord Lieutenant of that county. She knighted him, and he was elected a member of Parliament. For five years Raleigh had no rival at court, and in this time he acquired great riches, and as liberally as they came he spent them on the great ventures of the time.

In 1584 he fitted out, at his own cost, an expedition to explore the American coast north of Florida. The Queen agreed to the plan, though she could not bear to let Raleigh himself go. The sailors of his fleet had good fortune, and took possession for Raleigh of a great area of land which Queen Elizabeth, the "Virgin Queen," herself named Virginia.

The next year Raleigh sent out a strong fleet with people who were to settle down in the new land—the first colonists ever sent out by England. They settled on Roanoke Island, now in North Carolina. Raleigh's scheme gave England the real foundation of her colonial empire. The venture was not a success. Several ships were sent out. One hundred men remained for a year and then were brought home. Next, 15 men were left, but they disappeared. After that a party of 150 colonists, of whom 25 were women and children, was dispatched. The governor left them on the island of Roanoke while he went back to England for supplies. It was four years before he could return, and then he found the island deserted. The whole party, including his little granddaughter, the first white child born of English parents in the country, had disappeared, and were never heard of again.



Raleigh lays down his cloak in the street so that Queen Elizabeth need not walk in the mud.

Raleigh then gave up the effort. It had cost him $200,000 out of his own pocket, a sum equal to about a million dollars at the present day, and, so far as he was concerned the scheme was a failure. But it gave the people of Great Britain a new idea. The importance of overseas possessions began to be realized, and there grew up the idea of a large fleet of ships, both for trade and for war, which made that country the great naval power that it eventually became.

A cloud now appeared upon the horizon. A new court favorite appeared in the person of the Earl of Essex, and Raleigh, who could not tolerate a rival in the favor of his sovereign, quitted the court and went to Ireland. His visit was important to Ireland. The Queen had given him an estate there, and in his garden in the town of Youghal,

of which he was for some time mayor, he planted the first potatoes ever grown in that country. These had been brought from America, with some tobacco, by some of the men whom he had sent to the New World. Potatoes have proved of immense importance to the whole of Europe, but to no country are they more vital as food than to Ireland. Ralph Lane, governor of Virginia, and Sir Francis Drake brought back the first tobacco seen in England. Lane was the first English smoker, but Raleigh made smoking popular. The first tobacco ever grown in England was in the garden of Lord Burghley, in the Strand.

THE THREAT OF SPANISH INVASION BROUGHT RALEIGH BACK TO POWER FOR A TIME

The coming of the King of Spain's great Armada soon recalled Raleigh from Ireland. He had already taken steps for the defense of his country, but he was too late to take part in the battle. It is said that the flagship of the British fleet had been built from designs that Raleigh made. Gradually Raleigh recovered his lost position at court, and persuaded the Queen to fit out a fleet to attack the Spaniards. She would not let him go, but his valiant cousin, Sir Richard Grenville, went, and, as we have seen, his little ship, the Revenge, left to itself, fought a marvelous battle against the whole Spanish fleet.

Raleigh now fitted out, largely at his own cost, another and larger fleet for the same purpose, and was allowed by the Queen to go out with it to a certain point, to start it well on its way. When he returned to London he was immediately cast into the Tower. The reason was that, while enjoying the favor of the Queen, he had dared to fall in love with Elizabeth Throgmorton, one of the Queen's maids of honor. The jealous old queen kept him a close prisoner for six months, treating the unfortunate Elizabeth Throgmorton in the same way.

Raleigh's imprisonment was ended in a strange way. The fleet which he had sent out brought home a richly laden prize. So great was the disorder among the dishonest people of the port that Raleigh had to be released from prison to go down to Dartmouth to keep order while the affairs of the prize ship were settled. For this he was given his liberty and $180,000, only $10,000 more than he had spent on the expedition. He quietly married the lady of his love, and settled down at Sherborne, in Dorsetshire, where he had an estate.

But his active mind was soon busy with larger schemes than house-building and tree-planting. There were many rumors of a city of fabulous wealth in South America. Prevented from going himself, Raleigh sent out a ship to seek this city of silver and gold, and though from this he got no definite news, he was sufficiently satisfied to set out in search of it himself. He reached the island of Trinidad at the mouth of the river, where he left his ships and in small boats went up the Orinoco River and along some of its tributaries, fighting against tremendous currents and against sickness and privation. He was compelled to turn back, but brought with him quartz containing gold, and also the first piece of mahogany ever seen in England.

When he got back, his enemies declared that the whole story of his exploration was false. To prove his case he wrote a splendid book called THE DISCOVERY OF GUIANA. He drew maps showing his route, and long after his death all his statements were proved to be true.

THE QUEEN'S FAVOR AND THE JEALOUSY OF ESSEX KEPT RALEIGH FROM THE SEA

Raleigh's next exploit was in an expedition against Cadiz. He was not the leader, but it was upon his advice that the two leaders acted, and the action was a great triumph for his military genius. In another naval action, under Lord Essex, he again distinguished himself. Indeed, had it not been that the Queen was at first so fond of him that she would not let him go out on the earlier expeditions, Raleigh's career on the sea might have been the greatest of the age. Raleigh's success in the second action made Essex, his old enemy, jealous. Essex never forgave him, and after many intrigues he declared that Raleigh had tried to have him murdered—a story that proved to be utterly false.

Essex was eventually executed for rebellion, but Raleigh's enemies remained many and powerful. They had their way at last when, in 1603, Elizabeth died and James VI of Scotland became King James I of England. Raleigh's enemies pretended to James that Raleigh had tried to prevent him from coming to the English throne, and James removed him from all his offices. Soon Raleigh was brought to trial on a charge of treason and conspiracy. Raleigh behaved magnificently, with the eloquence of a scholar and an orator, and with the dignity and firmness of a hero; but he was con-

demned to death despite his heroic defense.

The trial created a great impression. Many men had been offended by his haughty ways, but at this trial they remembered what he had done for the honor and glory of the country. One who had hated him said: "When the trial began, I would have gone a hundred miles to see Raleigh hanged; before the trial closed, I would have gone a thousand miles to save his life."

Raleigh was taken back to the Tower, but the King dared not carry out the sentence of death. He left Raleigh to languish in prison. His wife and family were allowed to live there, too, on paying $1,000 a year. Here Raleigh was visited by the great scientists, poets and scholars of the day, some of whom were, like himself, prisoners in the Tower. His best friend, however, was Prince Henry, the eldest son of King James, a fine young prince. The prince loved Raleigh and declared: "No man but my father could keep such a bird in such a cage."

THE WRITINGS AND EXPERIMENTS WHICH SIR WALTER RALEIGH DID WHILE IN PRISON

For the guidance of the prince, Raleigh wrote some notable works on politics and statesmanship, and began his famous HISTORY OF THE WORLD. This ran to 1,300 pages before the young prince died, and Raleigh then lost heart and left it unfinished. In it is some of his noblest writing, but it was so frank that the King had it suppressed, because he said it spoke "too saucily of kings."

Raleigh had in the Tower a little laboratory which he made out of a poultry house, and in this he conducted many scientific experiments. He found out how to get pure salt from sea water—an art of which we hear little more until three hundred years afterward. For thirteen years he was kept prisoner.

In 1616 he was released to go an another treasure-hunting expedition up the Orinoco. He was allowed to leave prison on the condition that he should bring back to England at least half a ton of gold ore similar to the piece he had previously brought. "It is very difficult," answered Raleigh, "for any man to find the same acre of ground again in a country desolate and overgrown which he hath seen but once, and that sixteen years since." Still, he was willing to try.

His crew was composed for the most part of bad characters, and the expedition was a hopeless failure, dogged by storms and sickness. From the first, misfortune crowded upon the new venture. Raleigh was held back for months in Plymouth harbor by the need of money to provision his ships. This difficulty was overcome and he set sail, only to be forced by storm to take shelter and refit his ships in Cork harbor.



The Bettmann Archive
Sir Walter Raleigh seizing Berreo, Trinidad Island.

Finally he sailed, but one of his captains left him at the Canary Islands and went home with a lying tale which was afterward used against him. He encountered terrible storms, and sickness broke out in the fleet. Several of his officers died, among them his friend and servant John Talbot, who had shared his imprisonment in the Tower.

We can picture the white-haired, gallant old man as he walked to and fro on the deck of his little ship, making observations which afterward helped other men to avoid some of the dangers he had run. He reached the coast of South America in November, and prepared to ascend the Orinoco. But he was so ill that he was unable to undertake the hardships of the voyage up the river, and was compelled to intrust the leadership to the captain of his own ship—Captain Kemyss. The result was failure. Near the mine the party was met by armed Spaniards, and Raleigh's son was killed. The Spaniards

were beaten, but the men became mutinous. Kemyss could only lead them back again, and after he had met Raleigh and given his report he killed himself. He could not bear the thought of failure.

Raleigh scarcely dared to think of returning home empty-handed. He thought that he would, as in the old days, capture some Spanish treasure ships. "They do not call men pirates who capture millions of money," he argued, in the manner of the times. But the men would not follow him, and he had to return home penniless.

There had been some fighting between his men and the Spaniards. As there was peace at this time between England and Spain, this fighting was declared to be a crime worthy of death. Indeed, James had promised the King of Spain that if Raleigh landed at any place to which Spain laid claim as her own, he should be executed. James knew that Spain claimed both the shores of the Orinoco as well as every other place in South America, and therefore Raleigh's death had been determined on even before he had turned his ship's head toward home. So Raleigh was again cast into the Tower, and finally led forth to execution at Westminster on October 29, 1618.

THE POEM THAT SHOWS RALEIGH'S STEADFAST FAITH

On the last night of his life he may well have conned the lines of one of his own poems, written long before he could have guessed the terrible fate which was to befall him. The poem is called THE CONCLUSION.

> Even such is Time, that takes in trust
> Our youth, our joys, our all we have,
> And pays us but with earth and dust;
> Who in the dark and silent grave,
> When we have wandered all our ways,
> Shuts up the story of our days;
> But from this earth, this grave, this dust,
> My God shall raise me up, I trust.

As he laid his head on the block someone said that he ought to kneel with his head toward the east. "What matter," said Raleigh, "how the head lie so the heart be right?"

So perished one of the greatest men of the great days of Elizabeth. He was not a perfect man: he had grave faults, but they were the faults of his time. With all his failings, he was a hero and a scholar of the highest type. In happier days he might have become famous throughout the world for science, literature and poetry. With a queen less anxious to keep him at court, he might have become immortal as an explorer and an admiral. As it was, he left a record for gallantry and learning equaled by very few men of any country.

Raleigh's effort to colonize the New World had failed. The development of Virginia was due to Captain John Smith, a son of Lincolnshire, who was born at Willoughby in 1580. At sixteen he was a soldier of fortune in the French army, then in the Low Countries.

With manhood, and after serious study at home, he returned to Europe and experienced adventures which seem fitter in fiction and poetry than in actual history. He was thrown overboard from a pilgrim ship, rescued and sold into slavery by a pirate, and then became a soldier against the Turks, three of whose champions he defeated single-handed in sight of their army. He was a prisoner of war and was again sold into slavery, to escape once more, reach Morocco and an English ship, and so at last to come home, aged twenty-five.

All this is wondrous strange, and we have only his word that it is true. The importance of John Smith to the world is that he went out in 1606 to Virginia expecting to find gold, but found only poverty, discontent and incompetence. How he gradually enforced his splendid will, diverted the colonists from begging and stealing to habits of industry and thrift; the legend of how he was saved from assassination by Princess Pocahontas, and became the official head and guiding spirit of the colony—all this and more are part of the history of Virginia.

Smith explored more than three thousand miles of coastline, by sea and river; he prepared the first authentic maps of New England; he housed his followers and gave them their first church and their first fortress; and, returning to England, he sent out other colonists, aided them from home, developed fisheries, and generally acted as godfather to the new ventures. A very great and able man was Captain John Smith, and Virginia does well to honor his memory. He died in 1631, and lies in the Church of St. Sepulchre in London.

HENRY HUDSON SOUGHT IN VAIN THE NORTHWEST PASSAGE AROUND AMERICA

One other hero of those spacious days can be noted. He was Henry Hudson, sometimes called Hendrik Hudson. Hendrik is the Dutch form of Henry, and this man sailed at times in Dutch ships. But he was an Englishman; that he may have been the

grandson of a London alderman is possible; that he was a gifted mariner by 1607 is certain, for in that year, accompanied by his little son John, he began the first of his four famous voyages in quest of Eldorado, the golden land.

We can not trace his origin, owing to the many different ways in which people of his name spelled it in those times: Hudson, Herson, Hoddesdon, Hogeson, and so forth. But he became a historical character with the 1607 voyage, which was none other than a proposal to sail "to the Pole."

In the Hopewell, a little ship of sixty tons, Hudson sailed out of the Thames on April 19, 1607. This vessel was not new by any means, for Sir Martin Frobisher had sailed in her on his last voyage some twenty-nine years before. The crew was made up of a boy and eleven men. Hudson set his course toward Greenland, and then swung northeast. Great ice-fields confronted the tiny craft, but her commander was not daunted. North and north he sailed, in and out among the ice-floes, until he reached latitude 81° 50″ off the coast of Spitsbergen. This was a great achievement, for it was the most northerly point yet reached by an explorer in the frozen regions of the North.

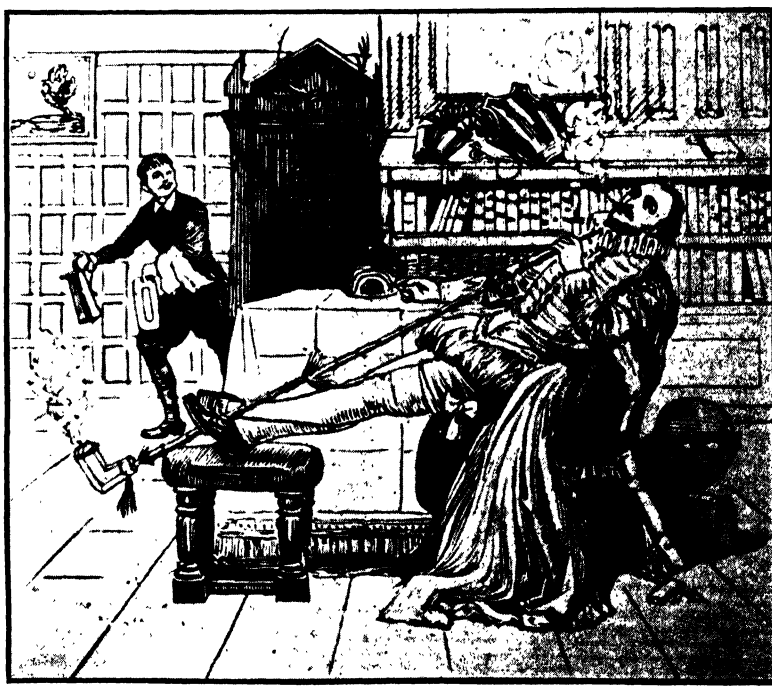
But beyond this Hudson could not go because the Arctic seas seemed to be solid with ice against which the small wooden ship would make no headway. The Hopewell turned south again, for Hudson thought that perhaps he might find a passage into Davis Strait by sailing around the north of Greenland. On this trip many schools of whales were seen. Later, when this news was told in England, whalers set out for the fishing ground at once, and met with great success. But Hudson could not get round the north of Greenland.

He failed, as he was bound to fail. He failed again when he sought the Northeast Passage, and a third time when, deserted by Dutch companions, he was unable to force a way by the north and west; but he did explore Nova Scotia, the Chesapeake and Delaware bays and the great river which bears his name.

His most tragic failure of all was in 1611, when, after wintering amid frightful privation and misery in frozen Hudson Bay, he was turned adrift, with his son and a few men, in a little open boat by a cowardly and mutinous crew, and drifted away to a miserable death.

In a sense, all his voyages were failures, yet they were signally productive, for they each carried knowledge a little farther than before, and they inspired high-hearted emulation in many a follower. His name lives in a river, in a bay and in a territory of immense size which has become a source of great natural wealth. He did not live in vain, and in his death he kindled a great beacon light.

Such, then, were the men who cleared the seas and planted the first colonies in lands that were to become homes for millions. The spirit of adventure had enlarged the world.



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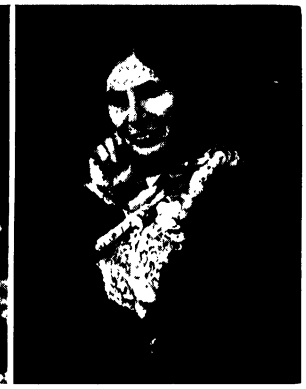
As Sir Walter Raleigh sat at home smoking some of the tobacco he had brought from Virginia, the servant, thinking that his master was on fire, doused him with water.



International News
Jane Addams.



Lockheed Corporation
Amelia Earhart.



American Red Cross
Clara Barton.

WOMEN IN THE UNITED STATES

PERHAPS you may ask: "Why should we have an article on Women in the United States? And not on Men in the United States?"

You can very soon answer that question yourself by reflecting that it would take many books for even a brief sketch of all the men well known to history who have helped to make America great and honored. We have in THE BOOK OF KNOWLEDGE a number of articles about the most famous American men—statesmen, soldiers, scientists, inventors, authors and artists.

We tell you of renowned American women, too—writers, astronomers, painters and others. But the list of well-known women in any land or any past period of history is only a fraction as long as the roll call of famous men. Women came late to the hall of fame.

A few years ago, many doors were closed to women in schools and in employment. This article will tell you about some of the spirited and brave women who opened the doors for their sex; and we shall mention also a few women of high achievement in many different fields of labor.

Our forefathers believed that women's place was in the home. Most of them did not even think it was necessary for girls to be educated. In the beginning of our country's history, the law in America, like that in most civilized countries at that time, gave the married woman no right to possess property. Her husband owned all she inherited or earned. She had no right to make a contract, or be the legal guardian of her own children. Of course, she could not vote.

No women came with the brave settlers to Jamestown, Virginia, in 1607. A few years later the Virginia Company brought to the lonely men ninety "young, handsome, honestly educated maids of honest life and courage." A man could become a suitor for one of these girls if he could pay the company 120 pounds of the best tobacco leaf. These "tobacco leaf" brides, who left their families and their native lands to share the hardships and dangers of the New World, helped to clear the wilderness. They were the first of the long line of hardy women who took part in the building of America.

As the colonies from Virginia to New England developed, gifted and ambitious women leaders appeared. Even in those early days, when women were looked upon by men as mentally inferior creatures, they were colonial dames who were tavern-keepers, shopkeepers, nurses, school teachers, writers and plantation-owners who managed great properties.

Margaret Brent is one of these. She came to Maryland from England in 1638, bringing with her a number of settlers to work on her plantation. This remarkable woman won distinction as a financier and has been called the first American suffragette. Her kinsman, Governor Leonard Calvert, had such confidence in her business sense that he made Mistress Brent the sole executor of his estate. Shrewd and far-sighted, she quelled a budding rebellion in Maryland's small army by

selling some of the colony's cattle in order to meet the arrears of the soldier's salaries. Lord Baltimore, proprietor of Maryland, reprimanded her for this act, but the Assembly supported the courageous woman, saying she had been the savior of Maryland. At a later date she actually appeared before the Assembly to insist as "His Lordship's attorney I be given a voice and a vote in the house." This the shocked and indignant Assembly denied her.

COLONIAL WOMEN WERE OFTEN AS AMBITIOUS AND COURAGEOUS AS THEIR MEN-FOLK

Elizabeth Poole in 1637 bought and settled a tract of land around what is now Taunton, Massachusetts. In the year 1701, seventeen-year-old Elizabeth Haddon came alone from England to look after her father's great property. Haddonfield, New Jersey, was named for her. Ten years later, in 1711, Madame Mary Ferree, the widow of a French Huguenot, came to Pennsylvania where she cultivated a 2,500-acre tract.

One of the most famous women of colonial America is Anne Hutchinson. Of English birth, she settled with her husband, John Hutchinson, in Boston in 1634. Witty, bold-spirited, of brilliant and independent intellect, Anne Hutchinson was the first woman to champion freedom of thought and speech in the New World. Mistress Hutchinson held weekly meetings to which only women were admitted. It was rumored that Mrs. Hutchinson was saying at these meetings that church and state ought to be separated in Massachusetts. At that time, when the clergy was the governing body, such ideas—especially coming from a woman — were scandalous. Mrs. Hutchinson was summoned before the court and condemned to banishment. With her family she set forth into the wilderness and made her way to Rhode Island, where Roger Williams had founded a settlement in which freedom of thought and speech were welcomed. After the death of her husband, Mrs. Hutchinson moved to a new home on Long Island Sound, near what is now New Rochelle. There she and her family, except one daughter, were murdered by Indians.

During the first half of the eighteenth century in America, young girls in prosperous homes spent their time learning polite manners, and needlework, playing the spinet, riding in sleighs or gliding through the stately minuet. Yet there were some ambitious, serious young women even in those days. Such a one was Eliza Lucas. Eliza's father, George Lucas, a British army officer, purchased a plantation in South Carolina about the year 1737. To the new home he came with his wife and two daughters. Hardly had the family become accustomed to the strange land when George Lucas was ordered to join his regiment. Later he became governor of Antigua, in the West Indies. Since Mrs. Lucas was in delicate health, Eliza, the elder daughter, took complete charge of the home and plantation, though she was only seventeen years old. Later she managed three plantations belonging to her father in South Carolina.

This ambitious girl decided to experiment with agriculture. Indigo, an Eastern plant which furnishes a blue dye, was being grown in the West Indies. It had been tried in the southern colonies, but without success. Eliza sent to her father in Antigua for some seeds, and she persevered until she learned how to make the plant grow in South Carolina. Now she had a fine money-making crop. But she wanted more than her own profit. Eliza saw the possibilities of a great industry. Therefore, in 1744, she devoted her entire crop to making seed. This she gave to the neighboring farmers. In a few years Eliza Lucas saw her dream come true. Indigo became one of the chief crops of South Carolina and brought much wealth to the colony.

IN REVOLUTIONARY AND PIONEER DAYS WOMEN, TOO, FOUGHT AND DIED FOR FREEDOM

When the colonists determined to become independent of England, no sacrifice was too great for the women that would help to win the war. They wove, they spun, they cared for their homes, they plowed the fields and fought the Indians, while their men went to fight for freedom. Some there were, like Deborah Simpson and Molly Pitcher, who actually went into battle. Others nursed the wounded, sewed, knitted and brought food to the army. We tell you about some of the famous women of revolutionary times — Martha Washington, Abigail Adams and Dolly Madison—in the chapter beginning on page 2807.

In 1775, one year before the Declaration of Independence, the Wilderness Road leading from the lower Appalachians to the rich land of the Mississippi Valley was opened. By pack horse, on foot, in covered wagons, women of America accompanied their families to the uncharted western wilds. These mothers of the frontier, in their huge sunbonnets and faded gowns, toiled from morn-

ing to night, and did without comfort and many necessities. The pioneer wife was often cook, nurse, teacher and even doctor. She spun the wool, wove the cloth and dyed it and made the garments for the whole family. She helped to plow. Often there was barely food enough. And many times the wife and mother had to handle a gun to fight off Indians. Some names of pioneer women are remembered—Rebecca Boone, wife of Daniel Boone, Elizabeth Zane, Mrs. Hosea and Mrs. Jesse Cook. They and all the others helped to build America.

For many years after the Revolution it was still not thought necessary for girls to have much education. They were taught reading, writing, a little arithmetic, a smattering of geography. If the family was wealthy the daughter went to a young ladies finishing school where she learned French, drawing and music. There was no high school for girls in all America when Emma C. Hart was born in Berlin, Connecticut, in 1787. She struggled hard for her own education and for the most part was self-taught. This clever girl became teacher in the village school when she was only sixteen. Before she was twenty she was principal of an academy for girls in Middlebury, Vermont. Here she met and married Dr. James Willard.

In 1821 Emma Willard started a seminary for girls at Waterford, New York, for which she received state aid. Here she introduced new methods of teaching and subjects which women had not studied before. Her ideas for the education of women won the approval of such men as Governor Clinton of New York, and the school was moved to Troy, where, as the Emma Willard School, it is still an important center of learning. Mrs. Willard died in 1870.

IN EARLY AMERICA WOMEN HAD TO STRUGGLE FOR THE RIGHT TO BE EDUCATED

Another famous teacher who fought all her life for higher education for her sex was Mary Lyon. She was born in Buckland, Massachusetts, in 1797. Like Emma Willard, she became a teacher in a little village school when she was still a young girl. She made up her mind that women who were poor like herself ought to have an opportunity for an education; she dreamed of a school for what she called the "adult female youth in the common walks of life." Friends came to her assistance; and Mount Holyoke Seminary, the first institution for the higher education of women in America, was opened in 1837. It was poor at first. Mary Lyon as principal drew a salary of only $200 a year, and for a long time the students did most of the housework themselves. The school rapidly became famous and in 1888 changed its name to Mount Holyoke College. When Mary Lyon died in 1849 she was buried in the grounds of the school.

Lucretia Coffin was a Quaker, born on the little island of Nantucket, off Cape Cod, Massachusetts, in 1793. She was educated at a Quaker school near Poughkeepsie, where she became a teacher at the age of sixteen. Here she met James Mott, whom she married in 1818. Both Lucretia and James Mott were deeply interested in the abolition of slavery. Mrs. Mott, a gifted public speaker, traveled through the North, the South and the West to preach against slavery, and people came from miles around to listen to this tender-voiced woman who spoke so earnestly. In 1840 she and her husband were sent as delegates to an anti-slavery convention in London, England. Here, to her astonishment, she found the doors closed because of the old prejudice that "women belong at home." Thus the whole question of women's rights was raised in her mind. Lucretia Mott, in her gentle but indignant manner, discussed this burning issue with a fellow delegate, Elizabeth Cady Stanton, who had also been shut out of the meeting.

EARLY IN AMERICAN HISTORY WOMEN ASKED FOR POLITICAL LIBERTIES

The result of the indignation of Lucretia Mott and Elizabeth Cady Stanton was the first woman's rights convention, held at Seneca Falls, New York, in 1848. From that convention grew the wide movement through which women have gained the right to vote in the United States and in most of the other civilized countries of the world. Lucretia Mott died in 1880, at the age of eighty-seven, before women were allowed to vote in any country.

Elizabeth Cady Stanton (1815-1902) was born in Johnstown, New York. Her father, Daniel Cady, was a member of the House of Representatives when Elizabeth was a little girl. She was educated at the Emma Willard School in Troy. When she was about twenty-five she married a lawyer, Henry Brewster Stanton, a prominent abolitionist, and it was on their wedding trip to London that the young people met Lucretia Mott. As an outcome of this meeting and the woman's rights convention held at Seneca Falls, the Women's Suffrage Association was

formed. Mrs. Stanton was made president of the association, a position which she held for many years. She succeeded in having a law passed in the New York Legislature which gave married women a right to hold property in their own name. Elizabeth Stanton, Lucretia Mott and another famous woman suffragist, Susan B. Anthony, were leaders among many who braved the prejudice of the centuries and spent courageous lives fighting for the rights of women.

Two other women leaders of the nineteenth century became famous at the time of the Civil War. They were Mary Livermore and Clara Barton. Both were born in the year 1821 in Massachusetts, both became teachers, both labored for the relief of soldiers during the Civil War. Mary Livermore, after some years of teaching, married a clergyman. She and her husband worked together for the freedom of the slaves. When the Civil War came, Mary joined the United States Sanitary Commission, which did the kind of work accomplished today by the Red Cross and other welfare agencies. She organized women's aid societies for securing food, bandages and other supplies for the fighting men. Like many other women leaders of the time, Mary Livermore was an earnest temperance worker and a suffragist.

CLARA BARTON, THE WOMAN WHO FOUNDED THE AMERICAN RED CROSS

Clara Barton (1821-1912) went into the hospitals and even on the battlefields to nurse the wounded soldiers. After the war she set up an agency for finding missing men. During the Franco-Prussian war (1870-71), Clara Barton went to Europe and joined the Red Cross and once more labored for the wounded and the needy. She spent the rest of her life in the service of the Red Cross which she founded in the United States.

On page 4579 we tell you of Dorothea Dix, another great-hearted American woman who served in the Civil War hospitals.

Until about a hundred years ago, no woman could earn a degree in medicine. In fact, no American medical college would open its doors to a female student. It took great courage for the first women students to brave the abuse and ridicule they met when they tried to break into this profession. Elizabeth Blackwell, the first woman doctor in the United States, possessed this courage.

Born in Bristol, England, in 1821, Elizabeth Blackwell came to live in the United States when she was eleven years old. She dreamed of being a doctor, and it was a hard disappointment when the Philadelphia Medical School refused her admission. However, two physicians allowed her to study with them, and in 1847 she entered the Medical College at Geneva, New York. She graduated with high honors and continued her studies in the hospitals of Paris and London. This pioneer woman doctor practiced successfully in New York and in London, where she died in 1910.

MARY BAKER EDDY FOUNDS A NEW RELIGIOUS FAITH

One American woman, Mary Baker Eddy (1821-1910), founded a new religious faith, Christian Science, which has spread to many countries of the world. There are now about 3,000 Christian Science churches, some with very large congregations. Mary Baker was born on a farm near Concord, Massachusetts. She was married young to George W. Glover, but her husband died in the first year of their marriage. For some years she was an invalid, until, through meditation, she found faith, and through it, health. She began to teach others; and she embodied her teachings in a book, SCIENCE AND HEALTH WITH KEY TO THE SCRIPTURES. In 1875 she married Asa Gilbert Eddy.

Mrs. Eddy founded in Boston a church which is now known as the First Church of Christ Scientist. From this "mother church," Christian Science developed.

As the nineteenth century drew to a close, women in the United States were enjoying a freedom their grandmothers could never have imagined. They were admitted to many schools of higher learning; they had won legal rights, and in a few states they could even vote! Part of their hard-won independence came from the fact that thousands of women were needed to work in spinning and knitting and weaving mills and other factories, and in business offices. They were not earning pay equal to that of men, and in general it may be said that they still do not have complete earning equality with men. But by 1900 thousands were supporting themselves.

During this time—from the Civil War to 1900—America's population was growing enormously. Immigrants from Europe were pouring into the country, eager to make a new life in this "land of opportunity." Cities grew like weeds, and crowded slums sprang up.

The women of our country were not long in seeing that if democracy were to work.

the problems of poverty and ignorance must be solved. Jane Addams (1860-1935) blazed the trail in social work. She was born to a wealthy, privileged family in Cedarville, Ohio, and she attended Rockford College, then traveled in the United States and Europe. She was appalled by the misery that she saw among the poor, and she determined to "mitigate the suffering of the world." She devoted her life to this end. In 1889 she secured a building in the poorest industrial section of Chicago and named it Hull House. She furnished it comfortably and invited to it the poor of the neighborhood. Here Jane Addams was friend and neighbor to all those who were troubled and needed help. In Hull House she started a nursery where working mothers could leave their children for the day. There were young people's clubs, drawing classes, concerts, reading and sewing circles. This new kind of settlement house became the model and inspiration for similar centers in other large cities. The activities of this great-hearted woman did not stop with the organization of Hull House. In 1910 she became vitally interested in world peace and devoted years of her life to the cause. Her labors were recognized when she shared the Nobel Peace Prize in 1931 with Nicholas Murray Butler, president of Columbia University.

A WONDERFUL WOMAN AND HER DEVOTED TEACHER

Helen Keller (1880-) has been an inspiration to all the world. Until she was two years old, this little girl was like any other healthy, happy baby. Then a dreadful fever came which burned away her sight and her hearing. The once bright, happy child was shut away from the world of beauty, the sight of her parents' faces, the songs of birds and the voices of her playmates. She was in a prison. At times the unfortunate child would burst into uncontrolled fits of tantrums to break her prison bars. Her parents heard of the wonderful work that had been done at the Perkins Institute in Boston for another child afflicted in the same way. They sent there for a teacher, and Anne Sullivan came to be the teacher, the playmate and lifelong friend of Helen Keller. When she was ten years old, Helen learned to speak by feeling the vibrations of this wonderful teacher's throat; and with Miss Sullivan as her companion she went to school, and to Radcliffe College.

On page 5224 we tell you about the Hall of Fame in New York City, where Great Americans are honored. When the Hall of Fame was erected, and the first great Americans were selected for honor, in 1910, not a single woman was among them. Since that time, the following women have been chosen to have a place in the hall: Maria Mitchell, Emma Willard, Mary Lyon, Harriet Beecher Stowe, Frances E. Willard, Charlotte Cushman and Alice Freeman Palmer.

We have already spoken of Emma Willard and Mary Lyon. Maria Mitchell (1818-89) was an astronomer. She was born in Nantucket, Massachusetts, the daughter of an astronomer, and had her first lessons in the science of the heavens through assisting her father. She taught school, and later was a librarian for twenty years, but during all that time carried on her studies in astronomy. She discovered a comet and several nebulae, and she did much valuable work in navigation aids. For twenty-three years she taught astronomy and was director of the observatory at Vassar.

THE LITTLE LADY WHO HELPED TO START A BIG WAR

Harriet Beecher Stowe (1811-96), the author of UNCLE TOM'S CABIN, was born in Litchfield, Connecticut, daughter of Dr. Lyman Beecher, noted preacher, and sister of Henry Ward Beecher, who also became a famous preacher. We tell you about Harriet Beecher Stowe in the story of American Literature. Countless millions have read UNCLE TOM'S CABIN. The book, published in 1852, had been written to show the abuses of slavery. It so inflamed readers in the North that, we are told, it was a powerful influence in bringing on the Civil War.

Frances Elizabeth Willard (1839-98) was an educator and a lifelong worker in the cause of temperance. She was born at Churchville, New York. She founded the Woman's Christian Temperance Union.

Charlotte Cushman (1816-76) was an actress who excelled in tragedy. The part of Lady Macbeth was one of her most successful rôles.

Alice Freeman (1855-1902) was born in Colesville, New York, and educated at the University of Michigan. She was for some years a teacher, and in 1882 she became president of Wellesley College. Under her brilliant administration the college became famous for its high standards in scholarship. In 1887 she married George Herbert Palmer, and from 1892 she was dean of women of the University of Chicago.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 5377.

Anderson, Marian (1908-). She was born in Philadelphia and educated in the public schools there. As a child she began singing in her church choir; and when she was still in her teens the congregation helped to raise funds for her to continue study. She had private lessons in Philadelphia and New York, and later went to the Chicago College of Music and abroad. In 1925 she won a contest against 300 other singers. But it was in Europe, where she sang from 1926 to 1935, that her magnificent voice first won wide acclaim. Since then she has become probably the most popular concert singer in America, and is considered one of the world's great contraltos. In 1939 she was awarded the Spingarn Medal for "highest achievement by a Negro."

Barrymore, Ethel (1879-). She was born in Philadelphia and educated at the Convent of Notre Dame there. With her brothers, Lionel and John, to become famous themselves, she began to act almost as soon as she could talk. The first real performance came when she was only twelve, in a play with her uncle, John Drew. Other engagements followed while she was still in her teens, among them rôles with Sir Henry Irving, in London. In 1901 she was starred in the play CAPTAIN JINKS; and her beauty and haunting voice have kept her among the foremost American actresses ever since.

Beaux, Cecilia (1863-1942). She was born in Philadelphia and studied under William Sartain and in Paris. She won fame as an artist while still very young and excelled in her portraits of women and children. The lovely portrait of Ernesta is in the Metropolitan Museum in New York; and the Girl with a Cat is in the Luxembourg Museum in Paris. Other paintings are in many of the important galleries in America and abroad. Her numerous honors include the gold medals of the American Academy of Arts and Letters, the Carnegie Institute and the National Academy of Design.

Berry, Martha McChesney (1866-1942). She was born near Rome, Georgia, and educated in private schools in America and abroad. Her family was wealthy, but as a young girl she became interested in the underprivileged mountain children near her home in northern Georgia. They were eager for "book-larnin'" and so she opened a little one-room school. It was the first of a number of such schools and the beginning of her life-work. When she had used her personal fortune she was helped by such wealthy men as Henry Ford. The twenty-sixth annual award for "distinguished service to humanity" was voted her in 1939 by the National Institute of Social Sciences.

Cannon, Annie Jump (1863-1941). She was born in Dover, Delaware, and educated at Wellesley College. From 1897 on, she was associated with the Harvard Observatory and became the leading authority on the classification of stars according to their spectra (color-bands). Her greatest work, of enormous value to all astronomers, is a nine-volume catalog which gives the positions, magnitudes and spectral types of almost 250,000 of the brighter stars. Among other important contributions to astronomy, she discovered five new stars and wrote several outstanding books in her field.

Catt, Carrie Chapman (1859-1947). She was born Carrie Lane in Ripon, Wisconsin; and studied law at Iowa State College. This was an unusual thing to do; there were very few women lawyers for fifty years after that day. She was teacher, principal and superintendent of schools in Mason City, Iowa, but left teaching to work for woman suffrage (the right to vote). She married Leo Chapman in 1884. After his death she married George W. Catt.

Comstock, Anna Botsford (1854-1930). She was born at Otto, New York, graduated from Cornell University and studied art at the Cooper Union in New York City. She won distinction both as a naturalist and as a wood-engraver; and for many years was at Cornell as a professor of nature study. She also worked with her husband, John Henry Comstock, who was an outstanding entomologist (authority on insects). From 1917-32 she was editor of NATURE STUDY REVIEW; and she also wrote a number of books, among them HANDBOOK OF NATURE STUDY and THE PET BOOK.

Earhart, Amelia (Mrs. George Palmer Putnam) (1898-1937). She was born in Atchison, Kansas, educated in public schools of the Middle West and studied science for a time at Columbia University. Flying caught her imagination at an early age, and she learned to fly while still a young girl, in California. However, to earn her living she taught school and then turned to social-service work. She was doing this in Boston, in 1928, when she was asked to go as a passenger on a flight across the Atlantic. She seized the opportunity, and thus became the first woman to cross that ocean by air, from Newfoundland to Wales. Her greatest flight, which proved that women could fly as well as men, was in 1932, when she flew alone from Newfoundland to Ireland. She was lost flying over the Pacific in July, 1937.

Gilbreth, Lillian Evelyn Moller (1878-). She was born in Oakland, California, and holds degrees in science, engineering, law and philosophy from the universities of California, Michigan and Brown, and from Rutgers and Hunter colleges. With her husband, Frank Bunker Gilbreth, she made many studies in efficiency engineering, and found ways to make factory work (also work in the home) less laborious and more efficient. The Gilbreths did this by making improvements in machines, and in factory and home design; and they showed how to cut down waste motion and fatigue. Dr. Gilbreth is professor at Purdue University and lecturer at Bryn Mawr College; and she is an honorary member of several scientific and engineering societies.

Hale, Sarah Josepha Buell (1788-1879). She was born in Newport, New Hampshire. Her husband died when she was a young woman, leaving her with five small children. Thereafter she supported her family by literary

work. For more than forty years she was editor of GODEY'S LADY'S BOOK, the magazine she helped to make famous. She also wrote a number of books, among them POEMS FOR OUR CHILDREN, containing the beloved MARY'S LAMB. Her efforts for the higher education of women were untiring.

Homer, Louise Dilworth Beatty (1871-1947). She was born in Pittsburgh, Pennsylvania, and began the study of singing in Philadelphia and Boston. In Boston her teacher in musical theory was Sidney Homer, the composer. They were married in 1895 and then went to Paris, where Louise continued her studies. Her first appearance in opera came in 1898, in Vichy, France. Other successful engagements followed in Europe. She joined the Metropolitan Opera Company in 1900, and remained one of its outstanding contraltos for twenty years. Among memorable rôles was the Witch in HANSEL AND GRETEL.

Marlowe, Julia (Mrs. E. H. Sothern) (1866-). She was born Sarah Frances Frost in Cumberlandshire, England, and came with her parents to the United States in 1871. Her later childhood was spent in Cincinnati, Ohio, where she made her first dramatic appearance in a children's opera company at the age of twelve. Four years later she began serious study for the stage; and in 1888, in Boston, was starred. Her playing of Shakespearian rôles became especially popular, and in 1904 she joined the company of E. H. Sothern, himself a famous actor. They remained in almost continuous association and were married in 1913. The Sothern and Marlowe productions of Shakespeare are considered outstanding in the history of the theater.

Rankin, Jeanette (1880-). She was born on a ranch near Missoula, Montana, and was educated at the University of Montana and at the School of Philanthropy, New York. Her first work was in social service in Seattle, Washington, and then in 1910 she became active in the movement for woman suffrage. As chairman of the Montana State Suffrage Committee, she helped to win the right for women to vote in that state in 1914. In 1917 she was elected to the House of Representatives and became the first woman in Congress, before women had won the right to vote throughout the country. (The Nineteenth Amendment was not passed until 1920.) After 1919 she continued to work for legislation for women. In 1941-45 she again served as a Representative.

Sabin, Florence Rena (1871-). She was born in Central City, Colorado, studied at Smith College and received her medical degree from Johns Hopkins University in 1900. She has honorary degrees from more than a dozen universities. Her contributions to medicine have placed her high on the list of American scientists. She was the first woman appointed to the staff of the Rockefeller Institute for Medical Research.

Schumann Heink, Ernestine (1861-1936). She was born in Lieben, near Prague, in present-day Czechoslovakia, and was educated at the Ursuline Convent in Prague. She first sang in the convent choir at the age of eleven, and study of singing was continued under famous teachers in Austria and Germany. Her first public appearance was made at the age of fifteen, in Beethoven's NINTH SYMPHONY. First appearances in opera came in 1878, in Dresden; 1887, in Berlin; and 1892, in London. With the exception of 1904, she sang regularly at the famous Bayreuth Festivals from 1896-1906. Her greatest rôles were in the operas by Wagner. She came to the United States in 1898, singing first in Chicago and later, at various times, with the Metropolitan Opera Company. She became a United States citizen in 1908.

Seibert, Florence Barbara (1897-). She was born in Easton, Pennsylvania, and educated at Goucher College, where her interest in physiological chemistry (the chemistry of the body) began. Her chief activity is research on the prevention and cure of tuberculosis. She worked with the Sprague Memorial Institute of Chicago, and since 1924 has been associated with the Henry Phipps Institute of the University of Pennsylvania. Both of these institutions are devoted to the fight against tuberculosis. Dr. Seibert has written a number of scientific papers and among many honors, received the First Achievement Award of the American Association of University Women.

Szold, Henrietta (1860-1945). She was born in Baltimore, educated there and began teaching school there. From 1892, for almost 25 years, she was editorial secretary of the Jewish Publication Society. A visit to Palestine, in 1909, where she was appalled by the prevalence of disease, resulted in the founding of a Zionist women's medical organization, later named Hadassah. Under her leadership, enormous strides were made in the prevention of disease and other kinds of social work. She died honored by the great almost all over the world.

Thomas, Martha Carey (1857-1934). She was born in Baltimore, Maryland, educated at Cornell University, Johns Hopkins University, Zurich, and the Sorbonne in Paris. She helped to organize Bryn Mawr College for women and became its first president. She lectured and wrote extensively in behalf of higher education for women. In 1910 she founded a graduate school of social study at Bryn Mawr.

Van Rennselaer, Martha (1864-1932). She was born in Randolph, New York, and educated at the Chamberlain Institute there. She taught school for some years in her state and then served as a county school commissioner. As this position brought her into contact with farm families, she became interested in education for farm women. In association with Cornell University, a reading course for farm homes was developed under her direction into a vast extension service available to all homes in the state. In 1911 she became professor of home economics at Cornell; and in 1925, director of the newly established New York State College of Home Economics.

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