RIL An All-Electric Set—Page 655

25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 544

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Vol. 49 APRIL, 1928 No. 4

Television for the Home

Behind a Little Three-Inch-Square Aperture, the Moving Picture from the Radio Studio Appears, While the Watcher, with a Push Button in His Hand, Keeps the Picture Synchronized

GROUPS of people sitting in various homes at Schenectady, N. Y., a few weeks ago, saw the performers in a distant broadcasting studio flit across a tiny screen, and from the loud speaker of a radio set heard them talk.

Television, a laboratory plaything that has interested scientists for several years, had arrived.

A large, square cabinet, built somewhat like the bigger talking-machine models, is the first home receiver for radio-transmitted images. The dials of a receiver protrude from its middle, and above them, at the eye level of the seated spectator, appears a three-inch-square window, behind which is the screen on which the images are formed.

The one great problem that has perplexed television experimenters for years —how to synchronize the transmitter and the receiver—was solved by simply ignoring it. Instead of all the elaborate, and very expensive, equipment necessary to keep the whirling disk of pinholes that paints the image on the receiver screen in absolute step with the corresponding mechanism that transmits the original

The Motor-Driven Pinhole Disk, the Neon Lamp That Reproduces the Image and the Picture Receiver

image, the television receiver for home use has a simple rheostat control on the end of an extension cord that permits the spectator to do the synchronizing himself. If the receiving motor runs a trifle fast or a bit too slow, the picture will begin to get out of focus—to slip off the screen. The effect is much like that at the movie theater, when the "frames" of the moving film and the shutter do not work in unison and you see the bottom half of one frame and the top half of another on the screen. The operator makes a simple adjustment to the projector, and the picture is restored to position; and in the same way a slowing down or speeding up of the television-receiver motor brings the picture back into place.

"It is as simple," explains Dr. E. F. W. Alexanderson, of the General Electric laboratories, who developed the machine, "as learning to drive an automobile."

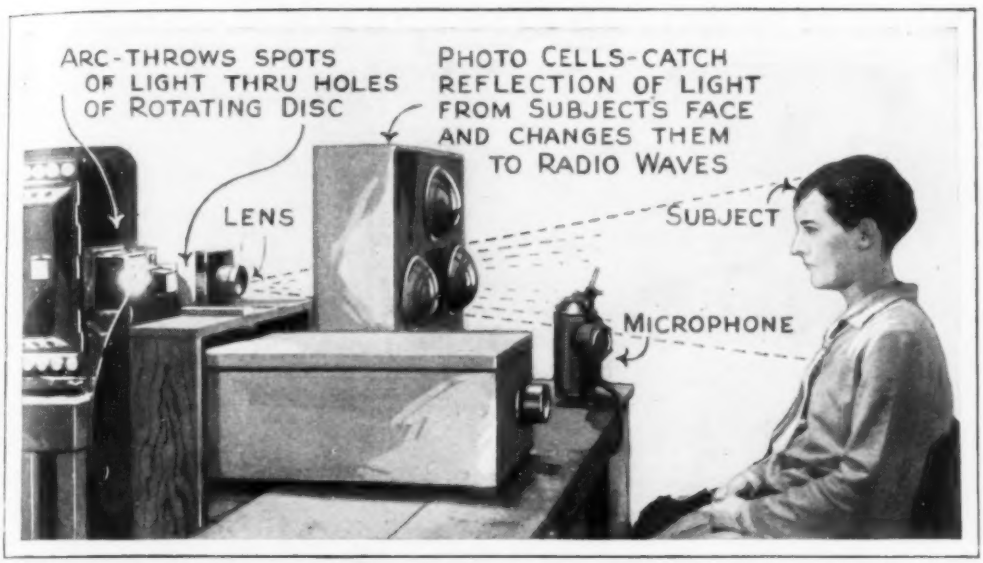
David Saranoff, vice president and general manager of the Radio Corporation of America, predicts that within five years television will be an art and an industry in this country.

Here is how the first practical demonstration in the home worked:

In the studio the performer stands before an ordinary arc light. Between him and the light is a large disk, revolving eighteen times a second, and in the disk are forty-eight holes, arranged in a spiral, so that, in each revolution, successive beams of light are swept across each part of the performer's face. A photo-electric cell is directed toward the performer, and as each light beam is reflected back from his face, it affects the cell, which converts the light into electrical energy.

From there on, the transmission system differs in no important respect from the usual broadcasting outfit. The tiny current wave from the photo cell is magnified and amplified into a powerful signal, which is then dispatched into the air through the antenna on a wavelength of 37.8 meters. The antenna is a new type, the wires arranged in a checkerboard square, each wire being half a wavelength long and so coupled that they are always in phase, eliminating the necessity of antenna tuning. The WGY transmitter, on its usual wavelength of 379.5 meters, was used for the accompanying voice transmission.

In the home there are two receivers,



The Transmitter for Radio Pictures Is a Battery of Sensitive Photo-Electric Cells That Transfer the Reflected Light into Electric Current to Be Broadcast through the Air

one to pick up the voice, on one wavelength, and deliver it, amplified in volume, to the loud speaker. The other, operating on a different wavelength, receives and amplifies the electrical signals produced by the image. Instead of being connected to a loud speaker, the output of this receiver goes to a small "cold light," a neon-gas-filled bulb, which is so sensitive that it can be turned on and off a million times a second, if necessary, with no lingering afterglow, and which has the peculiar property of producing its glow on one side of a targetlike electrode only.

In front of the neon globe, a duplicate of the pinhole disk at the broadcasting station is revolving eighteen times a second, kept in step by the control in the spectator's hands. As its forty-eight apertures sweep in turn across in front of the light, they pass the pulsating light beams, now rising in brilliancy for a high light, and then fading off for a shadow. The disk is twenty-four inches in diameter, and the forty-eight holes each thirty-five millimeters across. The distance between the outer and inner holes of the spiral is calculated to make an image only an inch and a half square, but between the disk and the spectator's window is a magnifying lens that doubles the picture each way, bringing it up to three inches square.

The rate of revolution of the disk—eighteen times per second—produces a corresponding number of images, or two more per second than are seen when movie film is operated at standard speed.

The Moore neon lamp, invented by D. McFarland Moore, an engineer of the Edison lamp works of the General Electric company, gives the picture a distinct pink cast, one of the characteristics of neon which is seen in the new type of signs now in use.

In the demonstration at Schenectady, performers in the studio talked, moved about, lit and smoked cigarets, exhibited their bobs and permanent waves, and performed other stunts. As all the apparatus as yet built has such small receiving screens, no attempt has been made to transmit an entire studio scene, an orchestra playing, or even a full-length portrait of a moving person.

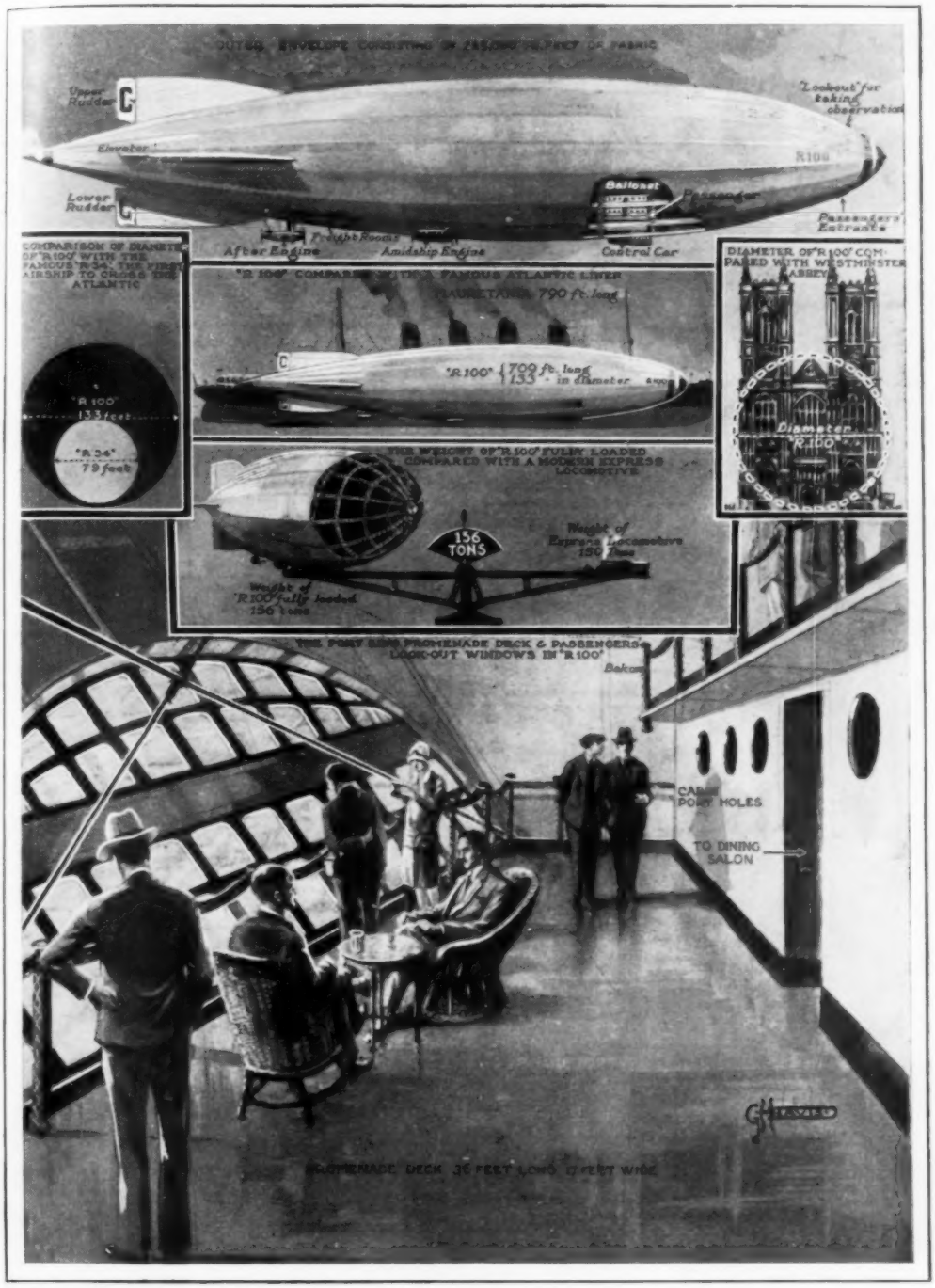
One of the interesting things about the television demonstration is that, when the broadcasting of images becomes a regular feature, anyone will be able to build receivers, for none of the principal features will be covered by basic patents. The revolving disk, the neon lamp and the photo-electric cell are all old inventions. There are patents, of course, on the improved features of late models, but the basic ideas involved all date back before the days when radio pictures were thought of.

MODERN FAIRYLAND ATTRACTS HOTEL CHILDREN

Glimpses of the Stevens Hotel "Fairyland" Where Youngsters May Play While Parents Shop

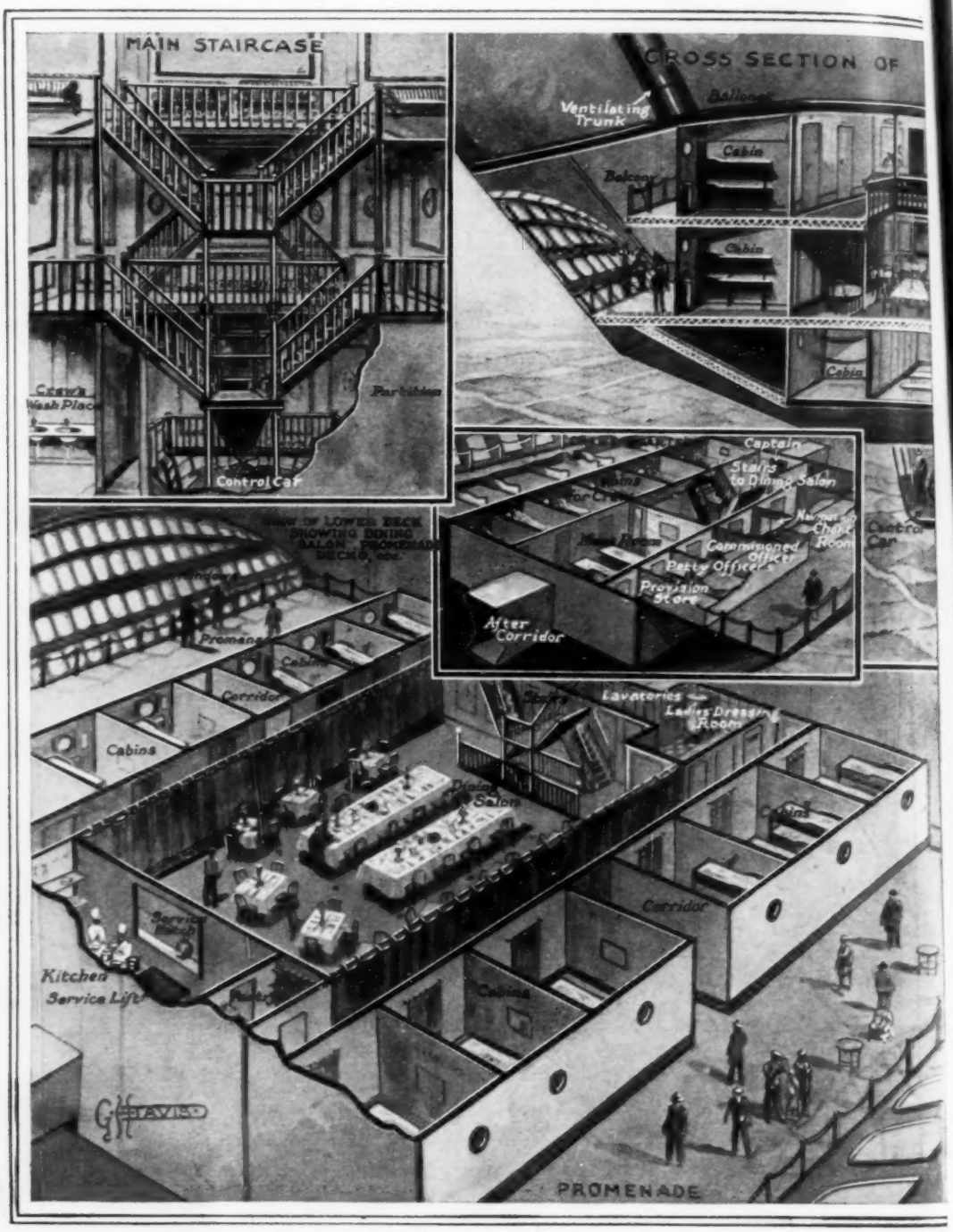
Adults, traveling with their children and stopping at a large Chicago hotel, are not perplexed as to where to leave the youngsters when they go shopping. Two huge playrooms, supervised by a trained young woman, have been provided where children, of any age from two to fifteen, may amuse themselves with toys, games and a wide variety of coasters, slides and other devices usually found in outdoor playgrounds. The service is free to guests of the hotel and a small charge is made for outsiders. From the time this "Fairyland" opened in December to the middle of January of this year, nearly 4,000 children visited it. If children of guests are left in the playroom all day, meals are served to them there without extra charge to their parents. In connection with the recreation facilities, classes in dancing and dramatic art are held. The walls of the rooms are attractively decorated with mural paintings of fairy-story scenes and the cloak room is hidden by a huge shoe.

TRANSATLANTIC FLYING HOTEL NEAR COMPLETION



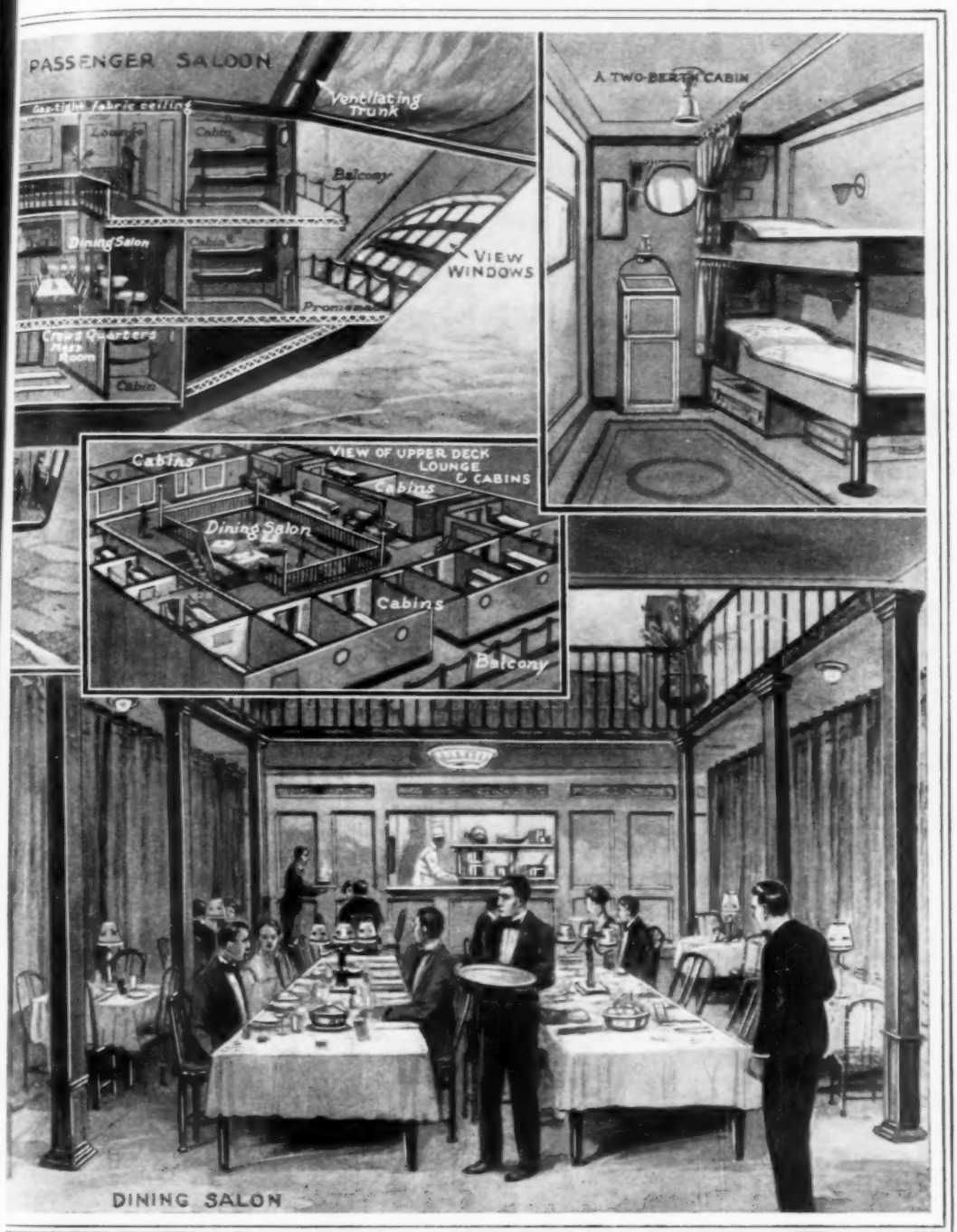
Nearly as Long as the Famous Liner "Mauretania," the "R-100," a Flying Hotel with Accommodations for One Hundred Passengers, Will Take the Air in England Some Time This Spring

LUXURIOUS ZEPPELIN LINER PROMISES NEW ERA



The "R-100," Being Built in England by Commander Burney, R. N., Famous as the War-Time Inventor of the Paravane, Is 709 Feet Long and 133 Feet Wide, Largest Airship Ever Built

IN OCEAN TRAVEL WHEN IT COMES TO U. S. SOON



the United States

Six Engines of 650 Horsepower Each Will Drive the Ship, While the Three-Story Hotel Section, So Light It Weighs But Twenty Tons Loaded, Has All the Comforts of Home

By JOHN T. BRADY

LOOKING ahead fifty years, Roger W. Babson, internationally known statistician, foresees the accomplishment of greater marvels of inventive genius and scientific discovery than any other age in the history of civilization has produced.

"The next half century will see wonders more amazing than Jules Verne or H. G. Wells ever dreamed of become realities," he declares, and he holds out the prospect that the advancement of medical and surgical science in extending man's span of life may make it possible for most of the present generation of middle-aged men and women to live to enjoy them.

The greatest development of the age is coming in the field of aeronautics, he believes, and he anticipates that a way will soon be found to link up passenger-carrying airplanes in trains which will eventually ply between all the large cities of the country and across the Atlantic, and make aerial travel as safe as railroad transportation is now and both speedier and cheaper.

And in the meantime, he expects helicopters to be developed to such a high degree of perfection that a man will be able to ascend into the air from a space no larger than the back yard of his suburban home and make a safe landing on the roof of his place of business.

of the Future

A Powerful Giant of the Electric Age; Huge Stator Winding and Connections with Supports on Inside Frame Structure

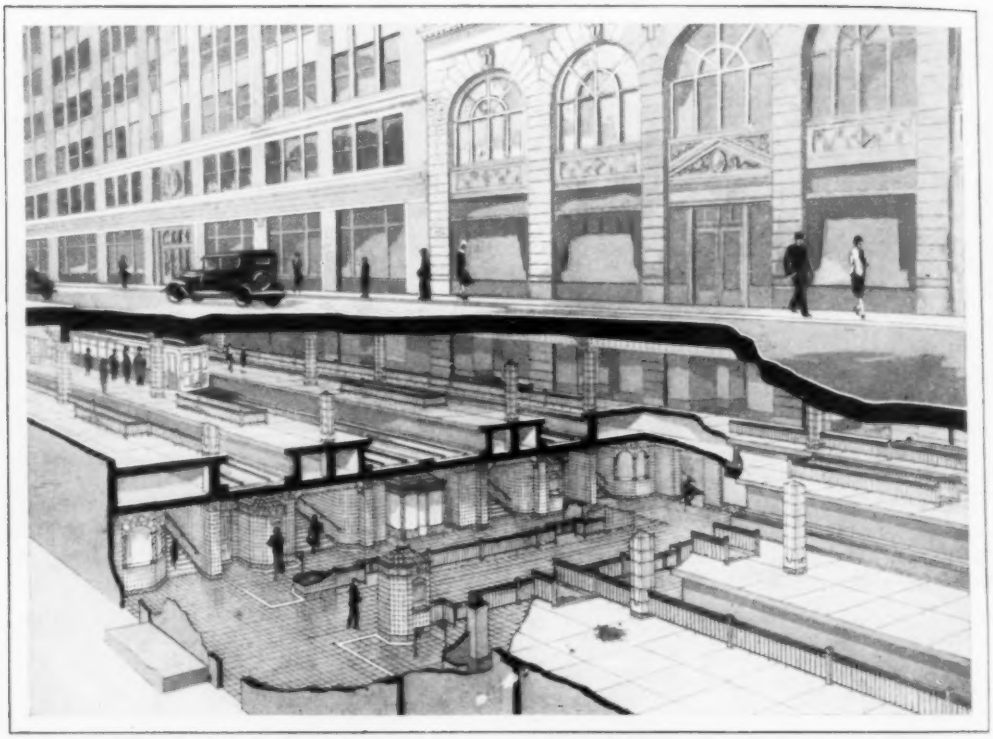
Elimination of the huge airports now required for the safe take-off and landing of an airplane and the minimizing of the danger of fatal accident while traveling by the air route in case the engine of a plane "goes dead," are absolutely essential to the successful progress of commercial aviation, in Mr. Babson's opinion, and will be the outstanding developments to look for in the field of aeronautics in the near future.

But he does not stop there. In fact, some of his predictions as to the future possibilities of other lines of scientific research are even more startling. He visions houses built almost entirely of rubber, lighted by cold light similar to that given off by fireflies and certain fish, and heated in winter and cooled in summer by atomic energy, or some other form of dirt-cheap power derived from sun motors, tide motors or the interior of the earth, and distributed from municipal plants.

Fifty years hence, according to Mr. Babson, the milk bottle will probably be a museum relic, along with the ice wagon, the coal shovel and the ash can, and our milk and butter will be derived from kerosene instead of cows, while most of our other food will be served to us in concentrated or pill form.

By that time wood pulp will be used more extensively than cotton and wool in the making of clothes for both men and women, Mr. Babson maintains, but if one gets an occasional splinter from such clothes there will be many compensations for his wounded feelings, such as television or the sight of distant scenes by radio, for example, and music and color in factories and offices to keep all cheerful.

Furthermore the danger of having one's wooden suit warp out of shape as a result of being soaked by rain will be negligible because Mr. Babson expects that meteorologists will then be able to forecast weather changes weeks in advance and control rainfall by the simple means of pressing a button.



Two-Level Streets May Be Common in the Near Future; in This Plan, Top Surface Is for Automobiles and Pedestrians, with Street Cars and Basement Sidewalks on the Second Level

At first glance, these predictions seem rather fanciful to the layman who gives only casual attention to the progress of scientific investigations. But coming as they do, and in all seriousness, from a man to whom thousands of keen, conservative business men the country over look for counsel, they deserve consideration.

Moreover, Mr. Babson himself says, they are based on a personal critical study of the results of an investigation by his statistical organization to ascertain just what new experiments and developments are being made in various fields of scientific research and to estimate their potential possibilities and ultimate value.

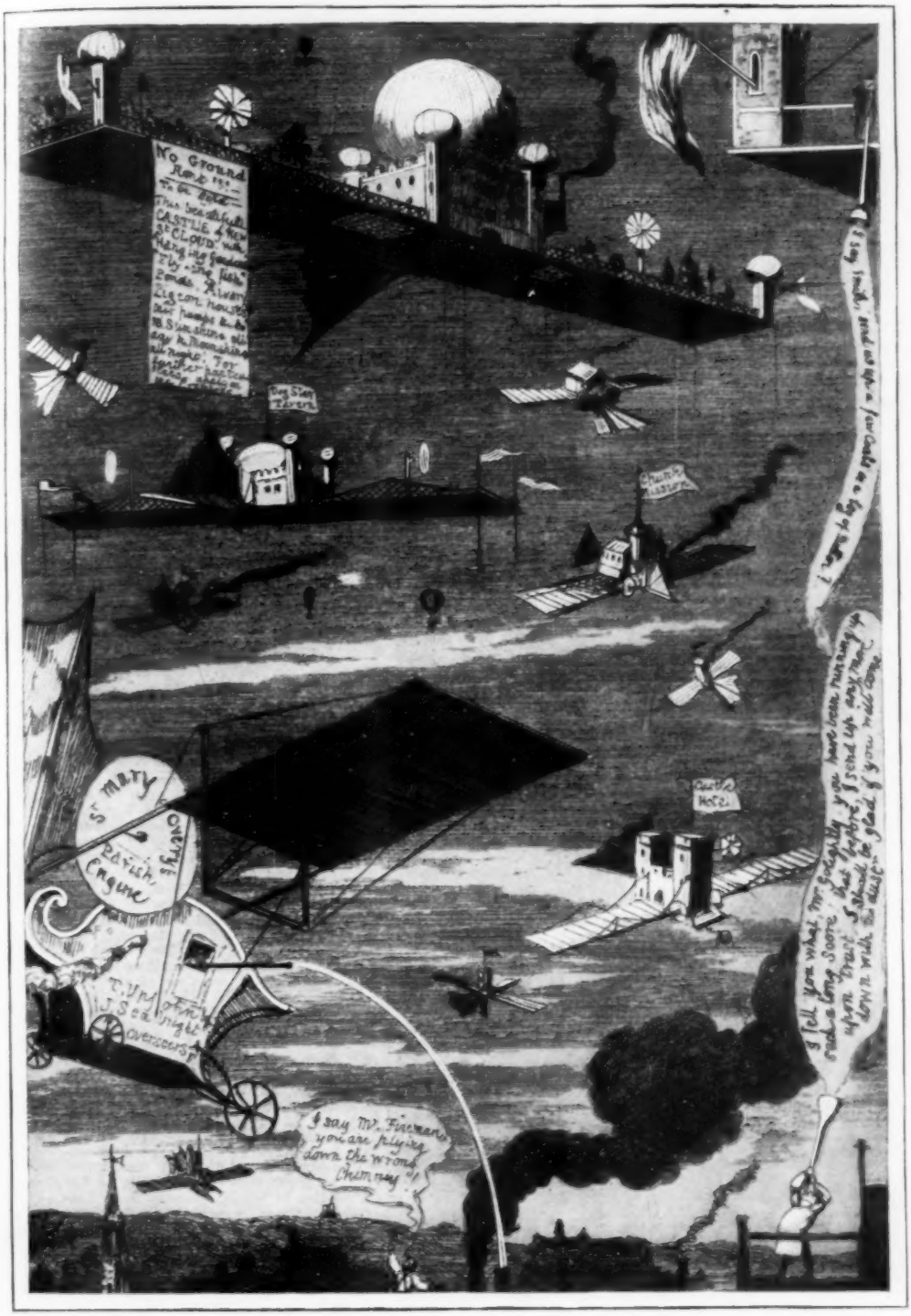
"Cold light is one of the greatest economic needs of the day," he declared, "and, although this is one of the most radical of all inventions being studied at the present time, important and promising work has been done on it during the past year.

"Electricity is only five per cent efficient for lighting purposes today because ninety-five per cent of the energy required to produce a light is wasted in useless heat, but a form of cold light similar to that of the firefly, when it comes, will give twenty times the present light for the same price per kilowatt-hour."

Calling attention to the efforts that scientists are making to tap new sources of heat and power, Mr. Babson stated that he has reports from Italy showing that a factory there is now being run by power from the inside of the earth which comes to the surface in the form of steam and gases. Science has also succeeded in harnessing and utilizing a fraction of the power generated by tidal action, and is constantly seeking ways and means of using the heat from the sun and the energy generated by the revolution of the earth.

"Development of some of these sources of power is to be expected in the next fifty years," he continued, "but they will be insignificant compared with the discovery of how to make radium or use atomic energy. The man who discovers how to make radium will revolutionize industry beyond human dreams.

"For some years now many of the



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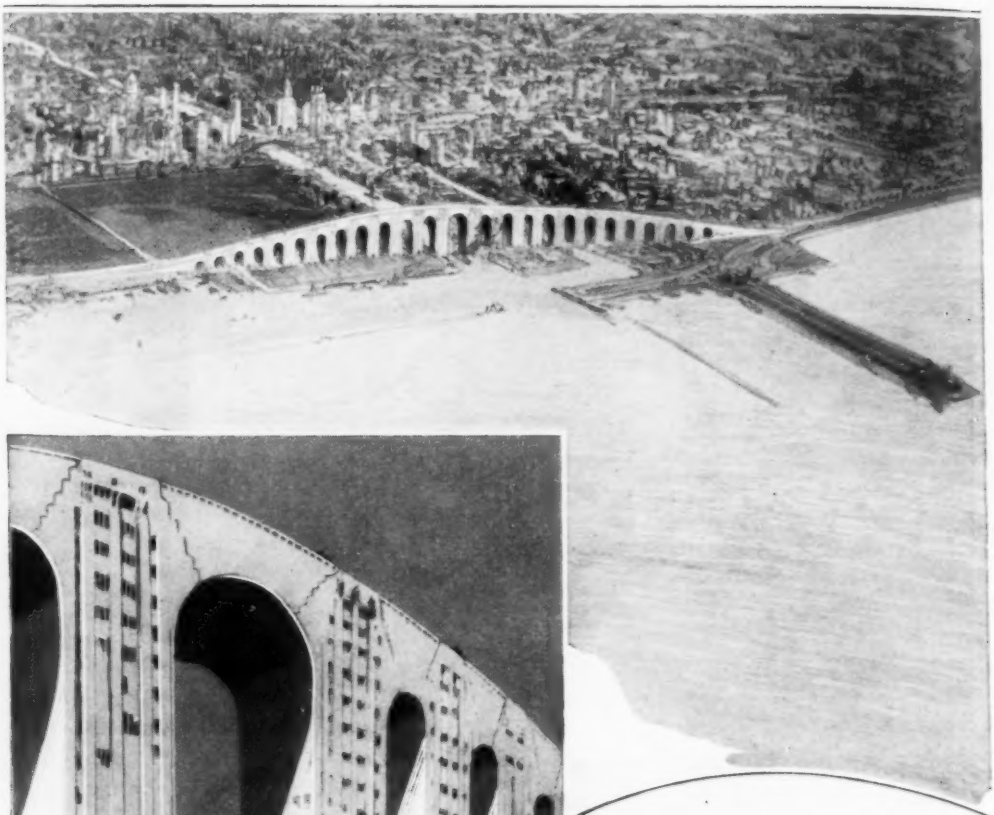
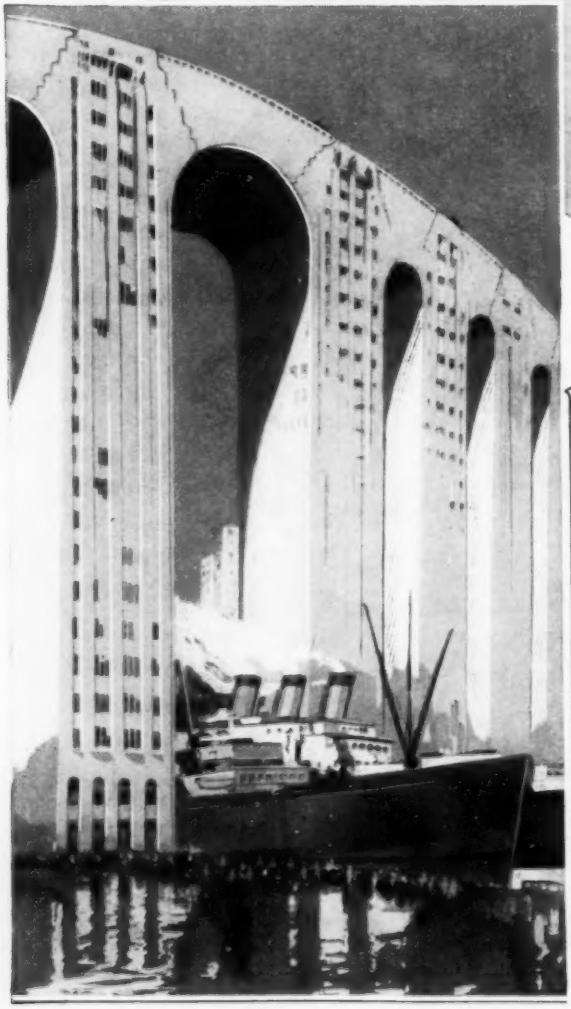
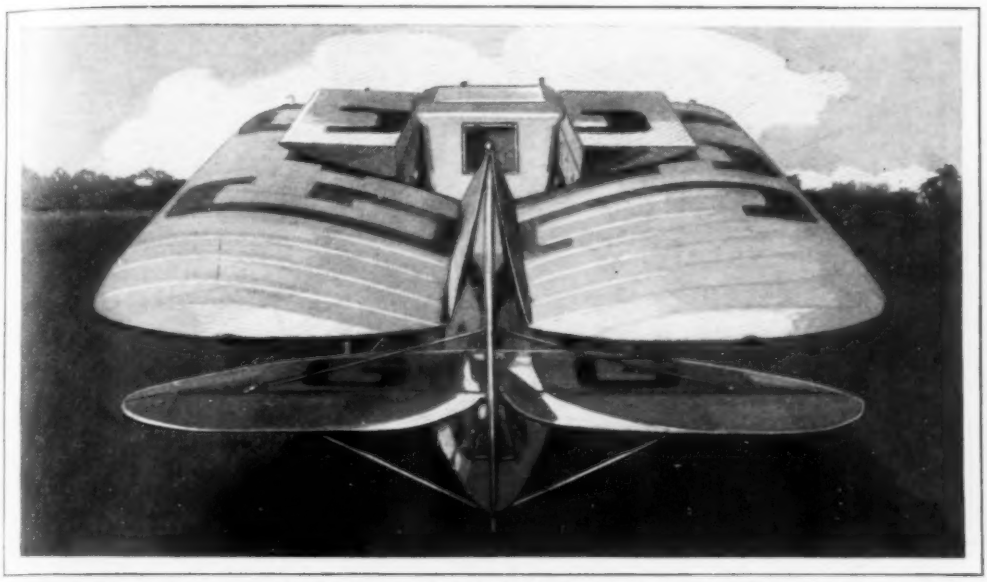
How the Artist George Cruikshank Visioned Aerial Traffic of the Future in 1840; to a Degree Some of His Prophecies, Although Ridiculous Then, Have Come True





A Bridge of Skyscrapers to Link Chicago's North and South Drives; Architect's Drawings of Proposed Plan for Utilizing Piers of Mammoth Viaduct for Building Space; the Skyscrapers Would Be Twenty-Five Stories High and the Roadway on Top of Them, 150 Feet Wide; Persons Occupying Offices in the Piers Would Enter and Leave through the Roofs, Stepping Directly to and from Their Cars or Parking Their Automobiles in Special Garages on One of the Top Floors; the Link Would Be a Great Saver of Time, Making Detours through the "Loop" Unnecessary, and the Arches Would Be Sufficiently High for the Largest Ships to Pass under Them with Abundant Room to Spare; Colored Terra Cotta Would Be Employed, Giving the Effect of an Enormous Rainbow on the Rim of the City; While the Bridge Is Considered an Engineering Possibility, Its Realization Is Held Doubtful, as Part of the Land It Would Occupy Is in Territory from which Office Buildings Have Been Excluded

world's greatest scientists have been studying the structure of the atom, and when they learn the secret of how to release and control the tremendous store



Folding Airplane Wings Permit Housing the Craft in Much Smaller Space Than Is Required by the Full-Spread Ship; This Is a Fairchild Cabin Plane with Folding Wings

of energy that they know is locked up in it, the householder will no longer have to worry through the winter over coal bills or coal strikes.

"Instead of shoveling coal into his furnace, all he will have to do is to take a medicine dropper, and with a drop or two of atomic energy derived from water, he will be able to 'fire up' for a week.

"In practice, however, he won't even do this, for when power can be developed so easily and cheaply, it will be broadcast free of charge for heating and lighting purposes from atomic-energy plants.

"In this connection I see no chance of broadcasting power by radio until some new source of cheap power is developed. I know it is being done in laboratory experiments, but the expense of radio transmission on a large scale is prohibitive at the present cost of producing energy."

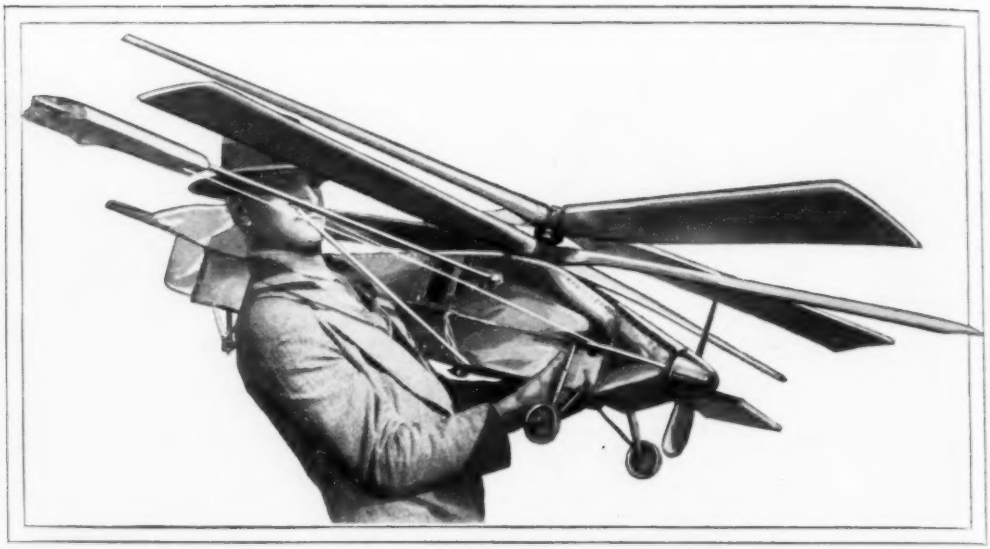
After a source of cheap power is discovered, it will not be long, according to Mr. Babson, until the principal buildings in big cities will be constructed without windows and yet the lighting, ventilation and heating will be better than today.

Referring to the new sources of rubber supply that are being developed, the experiments seeking to produce it synthetically, and to the tremendous increase in the use of it for various purposes, Mr. Babson predicted that in the next fifty years it will become the chief road-building material and will be extensively used as flooring for homes and for lining of office walls.

Flexible glass is now available, he pointed out, but it will in turn give way to unbreakable glass. Alloys will produce metals that won't rust and chemicals will prevent wood from decaying. But there remains the need, for the immediate future, of a substitute for gasoline as a fuel for automobiles. Artificial refrigeration is already putting the ice man out of business, he declared, and he foresees the doom of the electric car for transportation purposes everywhere except underground or on elevated structures.

Basing the idea on the advancement of meteorology in the past few years, and particularly on the discoveries that Abbot and Clayton have made as to how sunspots and variations in solar temperature affect our weather, Mr. Babson declared that long-range weather forecasting should be an accomplished fact within less than fifty years, and it may be possible to make rain or disperse storm clouds or fogs simply by the pressure of a button controlling devices that will set up the necessary disturbances in the atmosphere.

While he regards the airplane as the



As Aircraft Development Goes Forward, the Question of Vertical Ascents and Descents Becomes Increasingly Important; Here Is Valentine Newbauer with Model of "New Era" Plane, to Answer the Problem

greatest scientific development of the present age, Mr. Babson claims that it is still in the experimental stage.

"As I see it," he said, "the airplane industry today is just where the railroad business was when it was thought cog wheels and cog rails were necessary to give the engine traction.

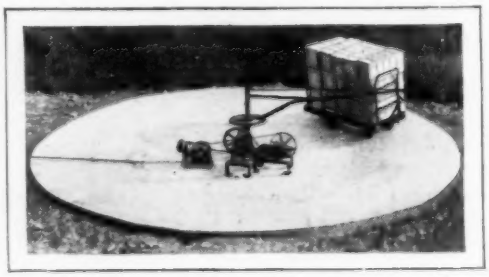
"Of course, the airplane people will tell you that statistics prove that more people die in bed than in airplane accidents, but the fact remains that it took us some time to get over the fear of riding in an automobile, and we have yet to get over our instinctive fear of going up in the air.

"How then are we going to assure people of safety while traveling in airplanes? It seems to me that the only sensible way to do this is to run airplanes in trains. I have a theory that if five or six planes, all operating synchronously, could be linked up in a line, say, at a distance of fifty to a hundred feet apart, then, if one of the engines should go 'dead,' the others would be able to support its weight until the whole train could make a safe landing.

"Running airplanes in trains would reduce the cost of transportation per passenger, and would, I believe, make travel by airplane fully as safe as travel by train, and cheaper and faster."

PROVING GROUND FOR CASTERS PROMOTES BETTER TRUCKS

Following the methods of automobile builders in testing their products under actual working conditions, the manufacturers of a brand of casters and trucks have introduced an efficient proving platform where units are subjected to a wide variety of trials. It is simply a circular concrete platform with holes and bumps in it, and the truck, loaded with varying weights, is rolled around it repeatedly by means of a gear apparatus operated by a small electric motor. At the end of a "run," the casters are carefully examined for signs of wear. Since almost any conditions can be duplicated with the outfit and exact results obtained, the apparatus has been found of great aid in preparing a better product.



Testing Platform for Hand-Truck Casters; a Motor Furnishes the Motive Power for Runs under Load

CASTING GLASS DISK FOR BIG TELESCOPE TRIUMPH FOR U. S.

Viewing the Largest Optical Disk Ever Cast in America When Months of Waiting Were Ended and the Furnace Opened

Scientists experienced a tense moment at the bureau of standards a few weeks ago, when they gathered to watch the lid taken off a huge mold where a big piece of glass had been slowly cooling for the manufacture of a lens for a telescope. The chunk measured seventy inches across and eleven inches thick, and weighed 3,500 pounds. It was the biggest piece of optical glass of its kind successfully cast in the United States. The least imperfection would have meant failure for the task that took months of time and unmeasured anxiety from those who had the work in charge. To prepare the lens, 1,000 pounds of broken glass, 4,600 pounds of sand and chemicals were poured into a pot and melted in a gas-fired furnace. When the mass was molten, it was stirred by hand for six hours and then run into an electrically controlled mold at a temperature of 2,400 degrees Fahrenheit. For nine months, the mass was allowed to cool, the temperature being reduced gradually, at certain periods as slowly as four and one-half degrees a day. Experts have pronounced the piece the most nearly perfect specimen of its weight and size in the world, and its casting is regarded as a triumph for a new process developed by A. N. Finn, a scientist at the bureau. The chunk will be used to make a large mirror for the telescope at Ohio Wesleyan university.

Delivering an Imitation Snowball in Which a Movie Actor, Entering through a Trapdoor, Was Rolled down a Hill

MOVIE MAN ROLLS DOWNHILL IN SNOWBALL

Rolling snowballs is usually child's play, but skilled craftsmen were required to fashion an imitation snow sphere for a motion picture. It had to be constructed so that an actor could enter it through a trapdoor and ride safely down a hill while so concealed. The ball was made of metal, wire and plaster of paris. It was six feet in diameter and very heavy.

PROPELLER DRIVES MOTOR SLED AT HIGH SPEED

Aided by a Strong, Favorable Wind, Propeller Iceboat of This Type Has Reached a Speed of Nearly 150 Miles an Hour; the Passenger Compartment Is Comfortably Furnished

Speed approaching that of army-pursuit planes has been attained on the ice under favorable conditions, with a propeller-driven motor sleigh a Michigan enthusiast has constructed. It is equipped with a nine-cylinder motor, is fifteen feet long, carries six persons in a comfortably upholstered body and is especially efficient as it is streamlined to reduce resistance. To stop the craft, a cast-iron spiked shoe is forced down into the ice by a lever at the driver's side. Because of varying wind conditions, exact computation of the speeds attained has been difficult, but, when the sleigh is going with a strong breeze, it is thought that a rate of nearly 150 miles an hour has been reached.

DETACHABLE HEAD ON BROOM AIDS CLEAN SWEEPING

Push Broom with Detachable Bristles, Showing How the Head Is Fastened and Released

When the bristles on a push broom become worn on one side, the head may be taken off and turned around or a new one substituted. The adjustment is quickly made and the head fits securely to the holder. The arrangement not only makes the broom more efficient but reduces waste.

URGE BEAVER CULTURE FOR FUR AND TO CURB FLOODS

Beaver raising is being encouraged by the department of agriculture as a source of valuable fur and to help in flood prevention. Experiments already show that the animals can be successfully grown under semidomestic conditions, that they are easily tamed and also increase more rapidly than in wild surroundings, even under control and protection. It is pointed out that many acres of land now unused could be adapted to beaver cultivation. On timber land that has been cut over, there is a sufficiently large later growth to support the animals, and the dams they build would help reduce floods and provide a water supply for the dry seasons. The damage the animals did in the past by felling valuable trees and flooding low lands, could be overcome in the future by proper fencing and trapping.

STEAM SHOVEL SPEEDS MAIL OVER MOUNTAIN ROAD

It takes a serious obstacle to prevent the mails from being delivered, and this is well illustrated on a rural route out of Glenwood Springs, Colo. The highway had been closed to ordinary traffic by construction work, but the big steam shovel on the job picked up the mail carrier's car, swung it around the digging and deposited it safely on the other side.

Where the Mail Goes Around with the Steam Shovel; Swinging Carrier's Car Past Repair Obstruction

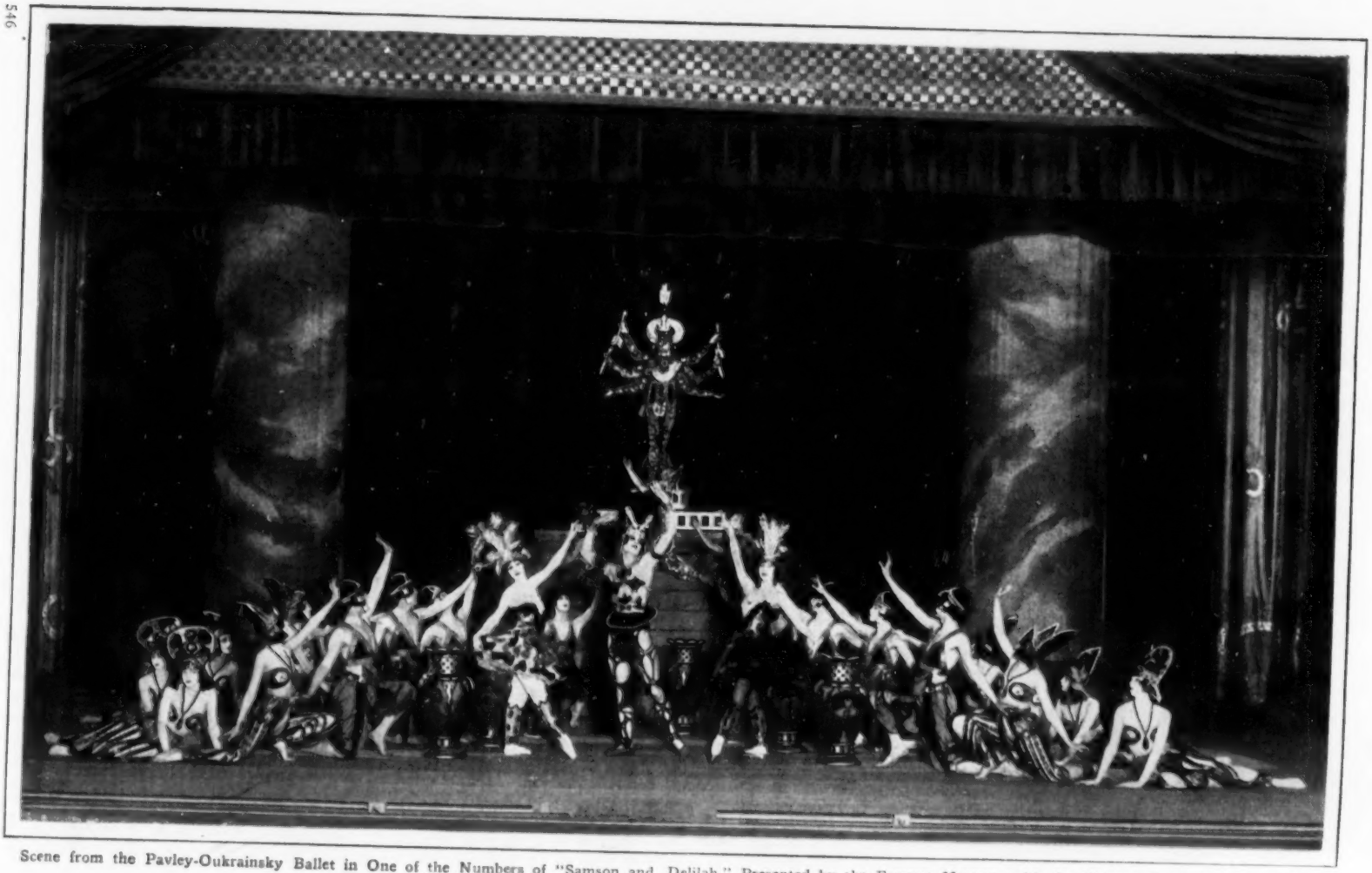
Table Board in Cockpit of Airplane for Writing or for Holding Maps and Paper

FLYING BUSINESS OFFICE AIDS WAR SECRETARY

While on flights in a recently introduced type of plane, Assistant Secretary of War Trubee Davison can do some of his office work, for there is a sliding desk in the cockpit. It does not interfere with the operation of the "joystick" and is useful for holding maps and other papers.

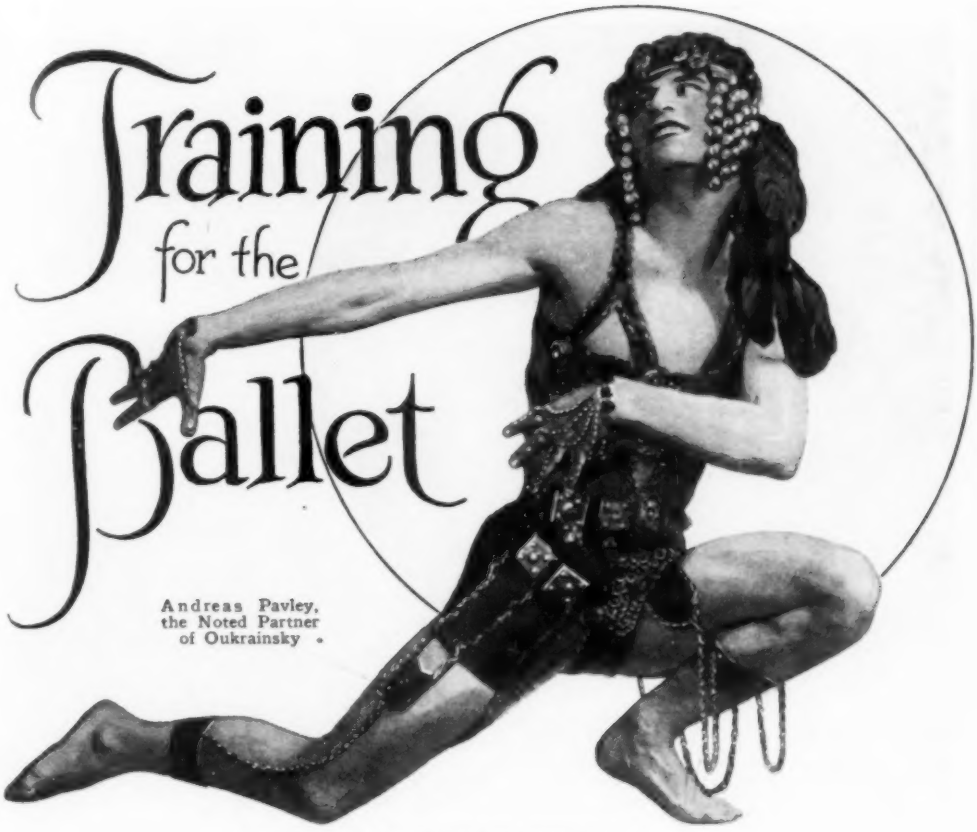
X-RAYS TURN DARK MICE WHITE AND POTATOES BLACK

The hair of mice turns white under sufficient exposure to the X-rays, while potatoes become black, according to the report of Dr. Robert T. Hance of the University of Pittsburgh upon experiments he has conducted with the rays with a view to discovering what further benefits might be derived from them for mankind. He declared that the cause of the color change of the hair lies in the destruction of the organ which furnishes the pigment. At first the hair of dark mice became darker but finally fell out and was replaced with white. The change appeared to be permanent, as no colored hair grew out on mice turned white.



Scene from the Pavley-Oukrainsky Ballet in One of the Numbers of "Samson and Delilah," Presented by the Famous Masters with the Chicago Company; Practically All Their Ballet Girls Are Chicagoans Whom They Have Trained

Training for the Ballet



Andreas Pavley, the Noted Partner of Oukrainsky

By VICTOR RUBIN

FEW movements of the human body appear so spontaneous and free from muscular exertion as those of the classical or ballet dancer. Only the swoop of a bird or the leap of a greyhound can be compared with them in the impression they give of utter ease.

Yet, as a matter of fact, there is just as much physical energy expended in performing a ballet—minute for minute—as in playing football. And if one is not in perfect condition, there is almost as much chance of injury.

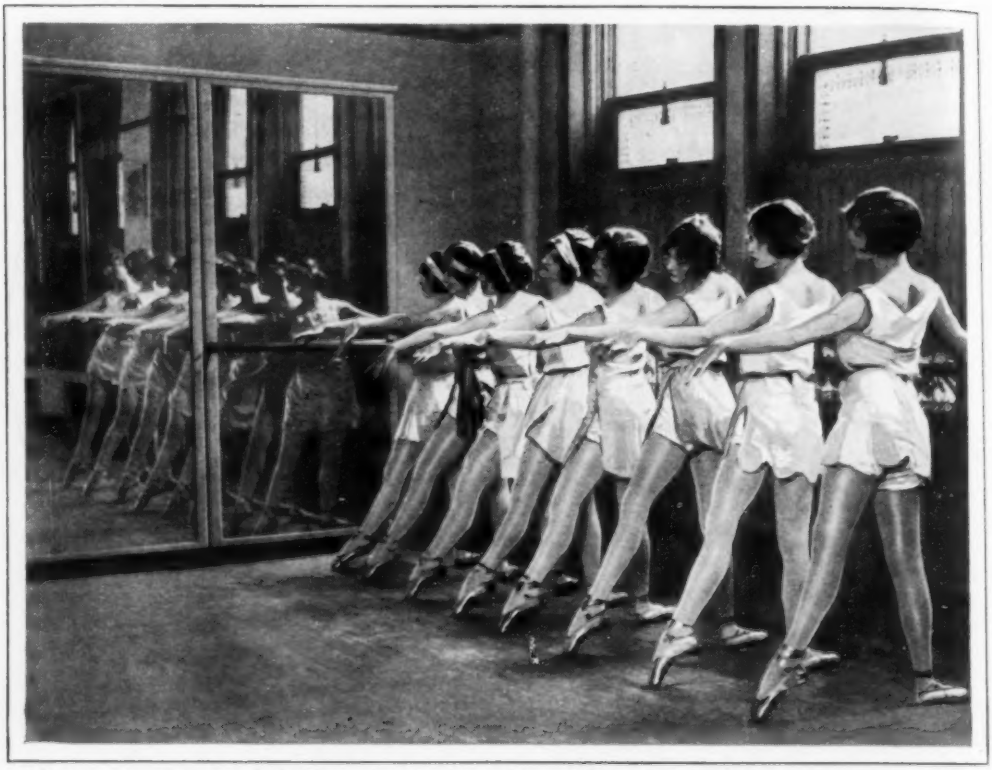
Likewise, every seemingly impromptu step, every kick, every leap, every twist of body and sweep of arms has been carefully worked out and practiced over and over again with far greater thoroughness than any football player devotes to the execution of his formations.

To accomplish those carefree bounds and leaps across the stage—even to hold those graceful postures—requires years of strenuous training under skillful direction.

At least so says Serge Oukrainsky, trainer of ballet dancers. Without such training, he says, the human frame could not stand the tremendous strain thrown upon it. The untrained novice would not merely perform the various evolutions of the dance most awkwardly, but would perhaps tear tendons and ligaments in attempting the most elementary bend, displace joints or, conceivably, break bones.

"Every year I train about 600 pupils. They range in age from little tots of four and five years to women in the thirties. What is the best age to take up dancing? I have found it to be fifteen or sixteen. At that time of life, one's bones and muscles are still supple. Yet one's mind is sufficiently developed to appreciate the forms of art and to understand enough of life, which, after all, is what dancing should seek to express.

"Starting at fifteen, one may become a



Members of a Ballet School, Drilling before the Mirror-Covered Wall, in One of the Simpler Exercises Used to Attain Suppleness and the Graceful Dance Movements

finished artist by eighteen—that is if one already has the necessary physical and mental attributes. While those starting as children unquestionably gain a better physical and technical foundation, they are too young to express the emotions that are dramatized in the dance. And no matter how early they start and how proficient they become mechanically, they rarely develop into real interpreters before they reach eighteen.

"Where do the dancers come from? From all walks of life and from every social level. But, with few exceptions, they are from the cities and from homes where they have had an opportunity to study music and art. And all are of more than average intelligence and ambition.

"Most are school girls, but many are stenographers, clerks and school-teachers. Often they work hard all day at some uncongenial task in some office, and find in dancing the physical release that we all need, to preserve our health and vigor, both physical and mental.

"To them the world of the ballet, which they have viewed from a seat in the theater, means romance—and perhaps a career. And too often they fail to realize that only the hardest kind of physical work, carried on day after day, will lead them to their goal.

"Not everyone who comes here can become a dancer. One must conform to a certain physical type. He must 'point outward.' I mean toe out naturally, his feet must be high-arched, his arms held in relaxed curves. Charlie Chaplin's figure—loose, toes out—expresses it exactly. Charlie has the perfect dancer's physique."

M. Oukrainsky rose gracefully to his feet and illustrated.

"Then, if one has the dancer's physique, he may fit for either classic or floor dancing. These are two entirely different forms, and a person who excels in one cannot excel in the other.

"For classic dancing one must have long, slender muscles. For floor dancing, such as the squatting Cossack dances, one must

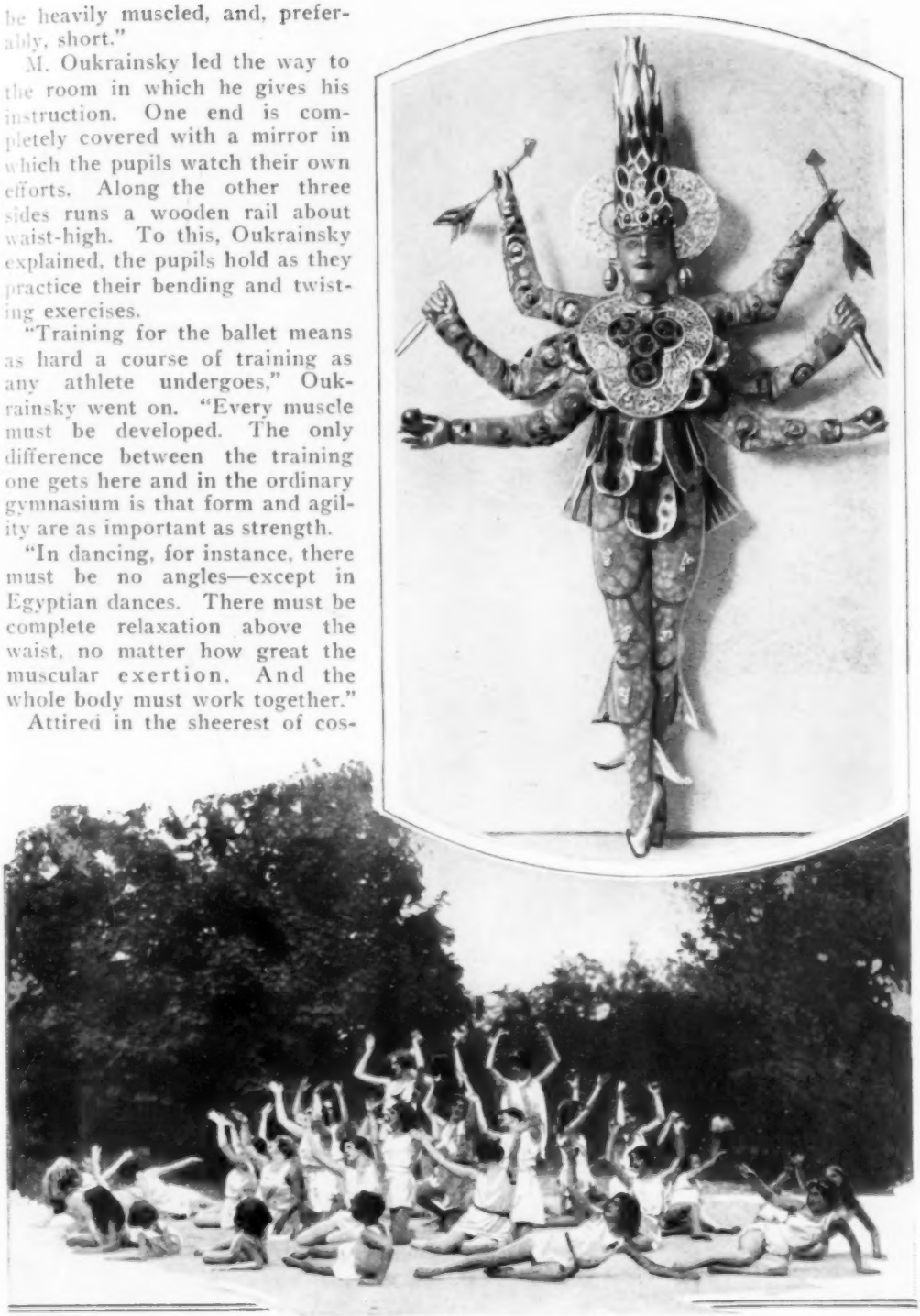
be heavily muscled, and, preferably, short."

M. Oukrainsky led the way to the room in which he gives his instruction. One end is completely covered with a mirror in which the pupils watch their own efforts. Along the other three sides runs a wooden rail about waist-high. To this, Oukrainsky explained, the pupils hold as they practice their bending and twisting exercises.

"Training for the ballet means as hard a course of training as any athlete undergoes," Oukrainsky went on. "Every muscle must be developed. The only difference between the training one gets here and in the ordinary gymnasium is that form and agility are as important as strength.

"In dancing, for instance, there must be no angles—except in Egyptian dances. There must be complete relaxation above the waist, no matter how great the muscular exertion. And the whole body must work together."

Attired in the sheerest of cos-



Serge Oukrainsky, Masked and Costumed as a Pagan God of Many Arms Holding Symbolical Ornaments, and a Class of Ballet Pupils Drilling on the Sands beside Lake Michigan

A Bar to Hold to and a Mirror to Watch One's Steps Are the Chief Training "Props" of the Ballet

tumes, the neophyte begins his training by practicing bends at the rail, holding on to the rail with his hands and bending in such a way that the knee is over the ball of the foot. After this has been done over and over again, come the twists, with the knees still bent—difficult exercises for the abdominal muscles that must be executed gracefully and without the slightest sign of exertion on the face.

The third set of exercises is in the kicking, with the toe pointed down and with the knee always held over the center of the foot. Then come the exercises in passing the feet, one in front of the other backward and forward with such rapidity that they seem to flicker like shadows. Watching them, one understands why the dancer's feet must toe out. If they didn't, the heel of the forward foot would strike the toes of the other foot in passing it.

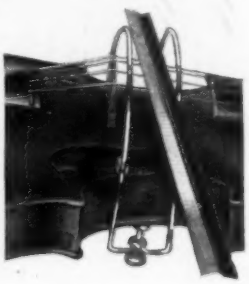
Two hours a day for three years the incessant grind goes on. The rest of the day is devoted to the study of music, the history of dancing and of culture.

"What peoples make the best dancers?" Oukrainsky was asked.

"The Americans and English and the Russians," he replied. "These have the necessary gift of expression as well as physique. They have understanding, intelligence, strength and agility. But above all, perseverance is needed to become a successful ballet artist."

WIRE GUIDING BOW HELPS BEGINNERS PLAY VIOLIN

Many beginners in violin playing have trouble in keeping the bow on the strings at the proper place to insure good tones. This difficulty is said to be overcome with a spring-wire guide that has been patented recently. It is shaped to support the bow regardless of the string that is being played and is held in place with a thumbscrew, bearing on the back. The contact points are covered to prevent scratching.



"PEEP SHOWS" GIVE GLIMPSE OF ARTISTS' LIVES

Glimpses into the lives and works of great artists of the past are afforded in tableau models prepared by Lorado Taft, the sculptor. They are life-like reproductions of actual characters and studio interiors on a small scale and are housed in lighted booths for school or museum use. In the arrangement of details, coloring, costuming and other particulars, great accuracy has been observed so that the displays are helpful as historical references as well as entertaining. One of them shows a morning in Donatello's studio, in 1425. The master is engaged in carving his great figure known as "Il Zuccone" or the "Baldhead," which now decorates the Campanile. His "St. George" and many other well-known works are recognizable. Several of his friends, including Fra Angelico and Cosimo de' Medici have dropped in to see him. Another depicts an interested group before the famous seventeen-foot bronze doors made by Andrea of Pisa for the ancient baptistery in Florence.

Mr. Taft and His Assistant, Miss M. H. Webster, at Work on the Small Figures; a View of the Donatello Studio Group, and, at the Right, Andrea's Doors

The small model in this booth was made by Trygve Rovelstad, who, at the time, was just out of the Elgin, Ill., high school. In the gathering before the doors are Lorenzo Ghiberti, Filippo Brunelleschi and Donatello. The booths are the first of a series Mr. Taft is planning, to present scenes from the history of art in a more vivid and entertaining way than is possible in text books.

TWIN MOTORS ON BUS SIDES GIVE HIGH SPEED

The problem of using street space more economically has resulted in the development of a new type of bus called a twin coach, driven by two engines and having capacity for forty persons and standing room for thirty-five. The new bus resembles a Pullman car in appearance. Curved glass windows at all four corners eliminate the so-called blind spots and make for safer driving and increased observation by the passengers. Persons entering or leaving the new conveyances also are amazed to see the doors swing open automatically, compressed air being used for the purpose. The twin driving units are perhaps the most interesting innovation to the automobile fan. Two fifty-five horespower engines are mounted amidship, one on either side of the bus, each a complete unit with its own radiator, clutch and transmission to one of the rear wheels, and each easily accessible for inspection or repair from both the inside and the outside of the vehicle. These combined engines are capable of driving the busses, which weigh 14,500 pounds without occupants, at a rate of 65 miles per hour and better.

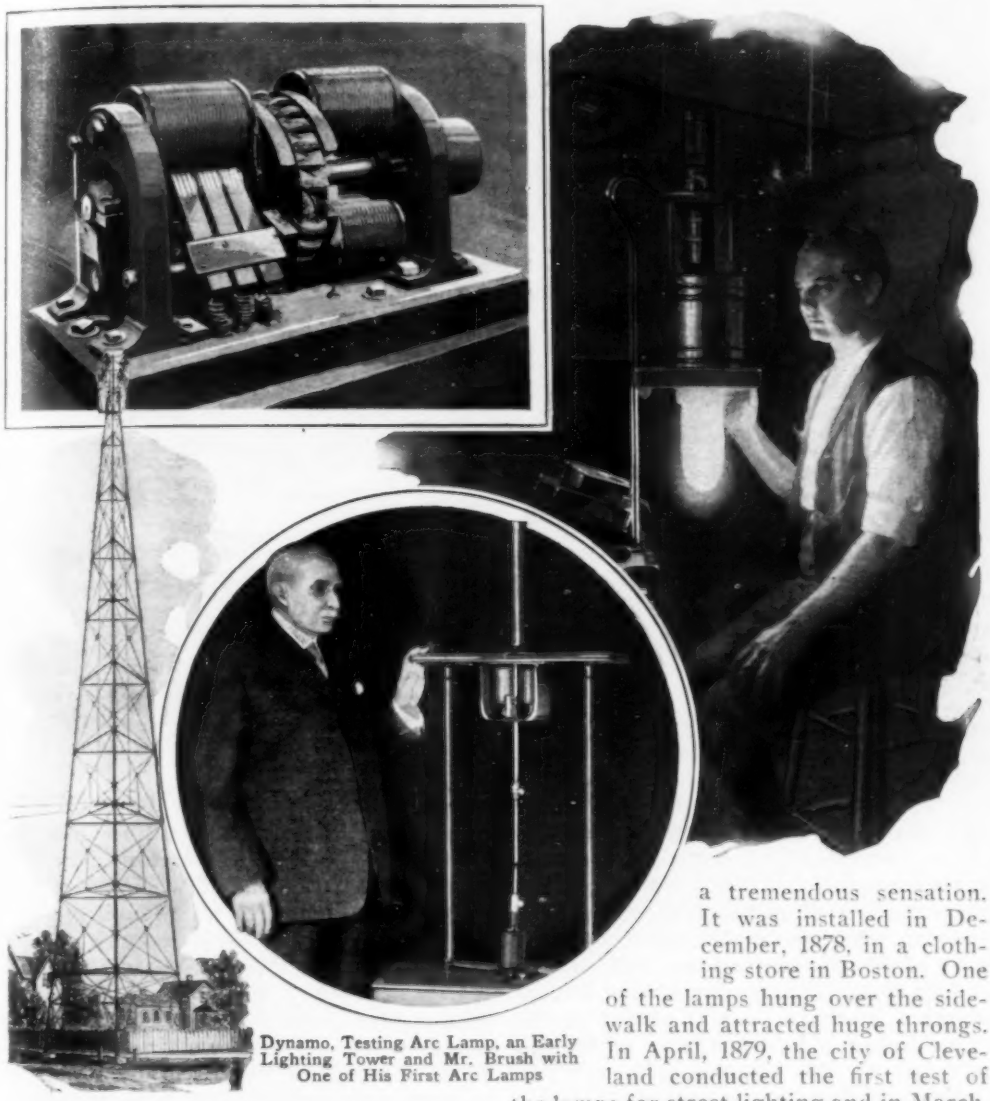
Twin Motor Bus Which Has Two Engines with Controls at Either End and Can Make High Speed with Big Loads

many other novel features. In the new vehicle, all space formerly used for the engine, steering gear and radiator is now used for passengers, affording seating

USE ELECTRIC HEAT TO SPEED OPENING OF FLOWERS

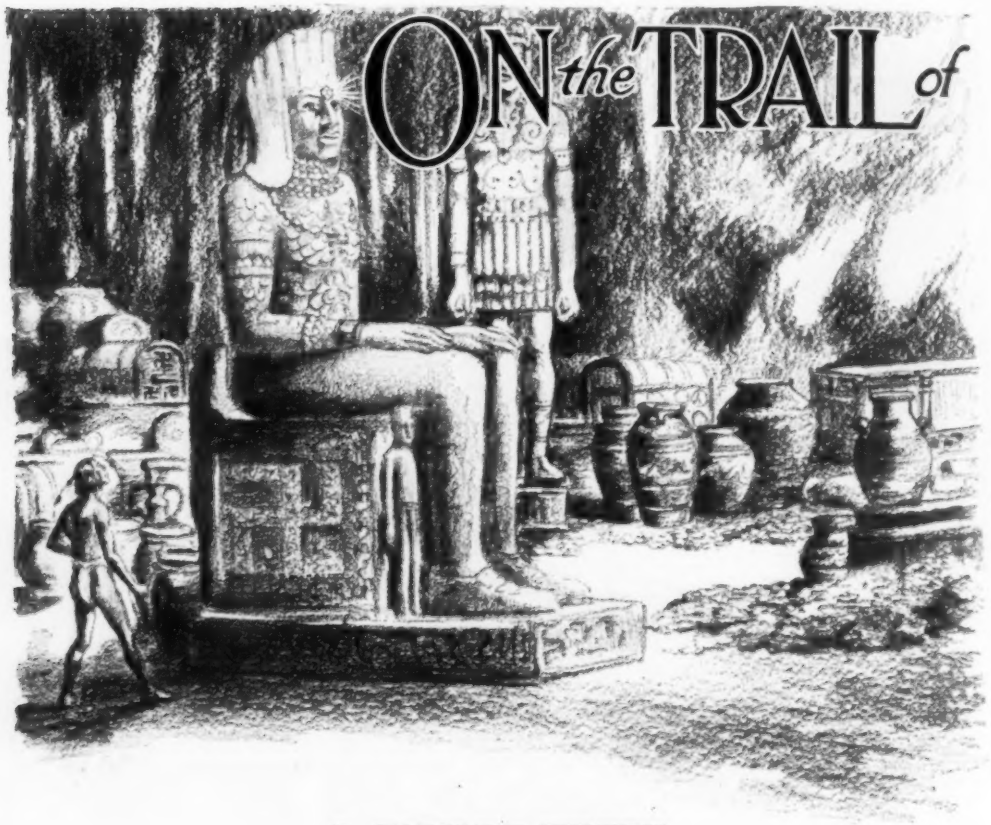
A change in temperature of a degree or two is sufficient to force flowers to open, while more severe applications of heat speed the process, according to F. M. Andrews of Indiana university, who has made a study of the effect of heat on flowers. In his experiments, electricity was used to provide the necessary heat to move the flower segments of crocus and tulip plants. In some cases a resistance wire was wound inside a glass bell jar which could be lowered over the plant, a rheostat being used to vary the temperature. A raise of two degrees, centigrade, was sufficient to open tulips, and a one-degree rise sometimes caused crocus flowers to unfold.

ANNIVERSARY RECALLS ROMANCE OF ARC LIGHT



Dynamo, Testing Arc Lamp, an Early Lighting Tower and Mr. Brush with One of His First Arc Lamps

The fiftieth anniversary of one of the most important events in modern times, the birth of the electric-lighting industry, is to be observed this year. It was in 1878 that Charles F. Brush invented the series arc lamp with its regulating shunt coil, making arc lighting from central stations commercially possible. Edison contributed a climax with the incandescent lamp. These inventions gave a powerful stimulus to development in other fields of electricity. The first electric-light plant proved a tremendous sensation. It was installed in December, 1878, in a clothing store in Boston. One of the lamps hung over the sidewalk and attracted huge throngs. In April, 1879, the city of Cleveland conducted the first test of the lamps for street lighting and in March, 1880, four lamps were hung from the flagstaff of the county courthouse at Wabash, Ind. This marked the first installation of a street-lighting plant by a municipality. When the current was turned on, men fell on their knees in wonder. Farmers were led to believe that the lights would greatly stimulate their crops. No increase was noted, however, but the lights gained favor so rapidly that, by the end of that year, about 6,000 had been installed in various parts of the country.



By HAROLD T. WILKINS

THE mystery of the treasure alleged to be concealed in a cave of the Santa Clara mountains of Mexico, has occupied the attention of generations of treasure hunters. A wonderful story about this cave of Aladdin came from Mexico City in July, 1926. The director of the National museum in that city was visited at his office by an old Indian who offered to lead him to this mysterious cave. The Indian said that he was a charcoal burner and happened to come upon the treasure while seeking shelter from a storm. Entering a long tunnel, which sloped downward, he suddenly found himself in a cave lighted by a ray of light from the roof. The ray, falling on two huge idols, caused them to shine as the sun, and at first terrified him. It was a large cave, went on the Indian, and filled with golden images and armor of gold set with precious stones.

The Indian left the cave and carefully covered the entrance to prevent its rediscovery. He then journeyed to Mexico City to seek aid. The director could not then join the Indian, and when he sought for him some time later, he found the native had since died. It is known that the Incas of Peru used secret, but very potent, poisons to keep inviolate their hiding places of treasure. The director was so impressed by the Indian's air of sincerity that he arranged an expedition to make a thorough search of the Santa Clara mountains. He commissioned a party of explorers to seek for this cave and selected as their leader Maj. John Gillespie, who served on the staff of the 16th division during the World war, and who is to receive a share of the treasure in case it is found.

According to the Indian's thrilling story, the sun, shafting down on the objects in the hidden cave, struck out rays of dazzling brilliance from two magnificent gems serving as the idol's eyes. All around on

HIDDEN TREASURES

the floor of the cave were suits of armor made of gold and studded with precious stones, while numerous gems scintillated and shone with beautiful colors on the walls of the treasure vault. The director believes that the cave is one of several known to have been used by the Aztecs as temples or retreats.

On the top of Sorata, a high mountain of Bolivia, is a lake in which, says Indian tradition, some of the great Inca treasure was thrown, after the slaying of Emperor Atahualpa by the Spanish under Pizarro. Into this lone lake of Orcos, as it is named, an old chronicle says the Indians threw a chain of gold which stretched round the market place of Cuzco, Peru, for the Incas to grasp at in religious ceremonies. This chain was so big that 200 Indians could scarcely carry it.

The region of Pacachanaca, in northern Peru, contains hoards of hidden treasure. Here lived a highly civilized race, known as the Chimus. They were skilled engineers and spanned great gorges and ravines with aqueducts. The Chimus were conquered by the Incas, about 100 years before the coming of the Spaniard. There is a mysterious city of the dead in this country in which a Spaniard found nearly $4,000,000 worth of gold in a mound called the "Toledo." Somewhere in the labyrinth of walls and concealed passages in this dead city is buried an immense treasure, according to an Indian tradition.

Only a year ago, there died the son of an old English squire, C. H. Prodgers, who had a remarkable career as an explorer and hunter of hidden treasure in the inaccessible regions of South America. He took the keenest interest in tales of treasure caches, and spent a very large sum of money hunting them on the slopes of the Andes. On one of his expeditions, he came across a remarkable document relating to a treasure, buried by the Jesuits. It read: "If you find a steep hill all covered with dense forest, the top of which is flat, with long grass growing, from where you can see the river Sacamhaja on three sides, you will discover on the top of it, in the middle of the long grass, a large stone shaped like an egg, so big that 500 Indians were required to place it there.

"If you dig down underneath this stone for five yards, you will find the roof of a large cave, which it took 500 men two and a half years to hollow out. The roof is seventy yards long, and there are two compartments and a long narrow passage leading from the room, on the east side, to the main entrance 200 yards away.

Desert Arabs Searching for Some of the Treasure of the Pharaohs a Cave Buried

"The door is a large iron one, and inside, on the right, you will find an image made of pure gold, three feet high, the eyes of which are two large diamonds. This image was placed there for the good of mankind. You will find, in the first room, thirty-seven large heaps of gold, in the second room, a large box and thirty-seven big heaps of gold.

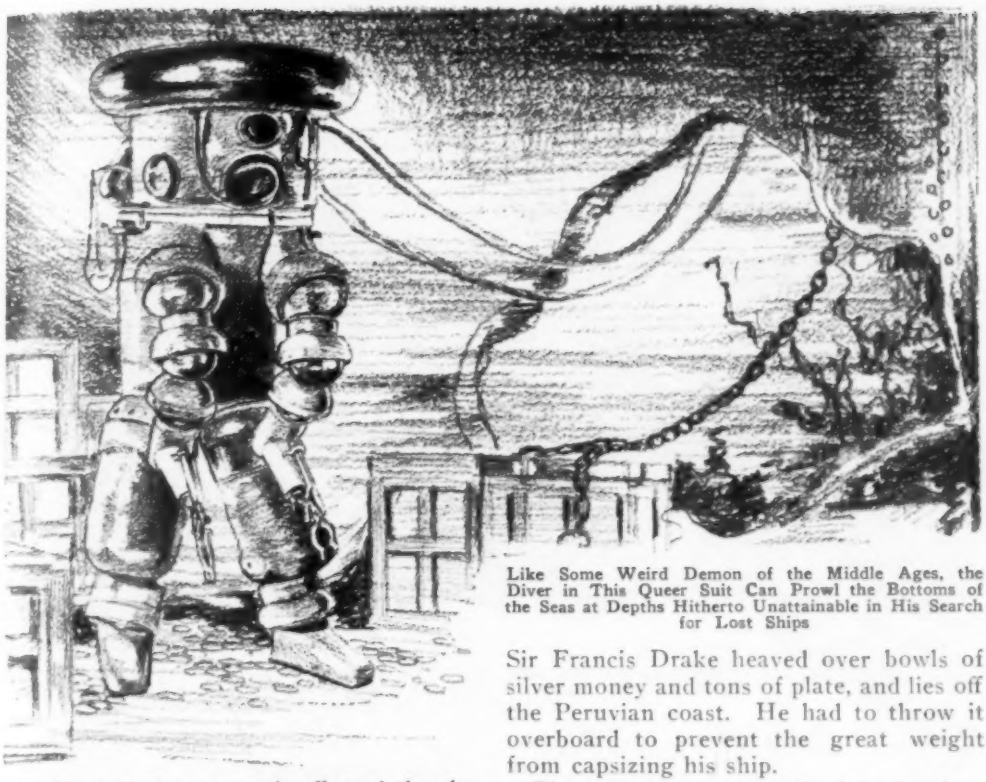
"On entering the second room, you will find, in the right-hand corner, a large box clamped with three iron bars; inside this box is $90,000 in silver money, and thirty-seven big heaps of gold. Distributed in the hollows on either side of the tunnel and the two rooms, are altogether 163 heaps of gold, of which the value has been estimated at $60,000,000.

"Great care must be taken on entering these rooms, as enough poison to kill a regiment has been laid about."

This treasure represents eleven years' accumulated workings of the mines of El Carmen and Tres Titilas, and from the gold and diamond washings carried on, near Santa Cruz, by 2,000 Indians directed by Jesuit fathers. Many expeditions, it may be understood, have been fitted out to search for this rich treasure. The president Malgarejo of Bolivia headed one expedition and another started out from Valparaiso, in 1895; but both failed to find the treasure.

Prodgers found the egg-shaped stone on the top of the hill, and blew it off with dynamite. He then entered the cave but found nothing at the first attempt. Nevertheless, some Indians who were passing the place had dug up silver in a mound near the river, where a previous owner had found $100,000 worth of the metal. At the second attempt, Prodgers and his Indian helpers drilled into the hill, and, ten feet down, came on a cavity which had clearly been made by a mason. They next drilled another hole through a rock and pushed a bamboo pole into the cavity. A horrible smell at once arose, and some of the men, feeling ill, left the cave. Prod-

A Jesuit Father's Map of the Territory Back of the Azangaro Mountains of Peru, Where Fabulous Treasures of the Incas Lie Buried



Like Some Weird Demon of the Middle Ages, the Diver in This Queer Suit Can Prowl the Bottoms of the Seas at Depths Hitherto Unattainable in His Search for Lost Ships

gers himself was so much affected that he had to return to England to recover his health. A third attempt was made in the midst of jaguars, pumas and foxes prowling in the woods around the hill. The Indians were so terrified by the fate of workers in previous years that they would not help, and Prodgers was injured and had to abandon the project for lack of labor to continue it.

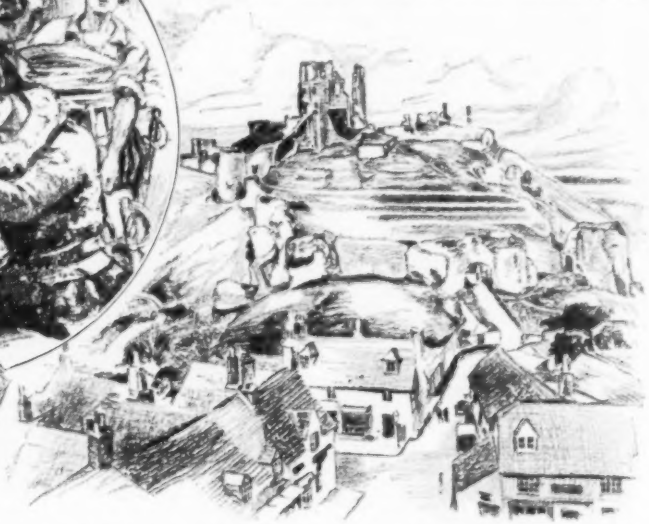
Rich treasure wrecks abound off the South American coast on the west. In the year 1681, a rich treasure ship, bound from Lima to Guayaquil, crashed on a reef named Santa Clara. She was carrying 100,000 pieces of eight and silver plate and ingots.

For more than 280 years, the wreck of a seventy-gun ship, laden with 30,000,000 of Spanish dollars, and consigned by merchants of Lima to King Charles of England, has lain under water, nine miles north-northeast of Point St. Elena.

A steep island, to which there is no landing save by a gully on the northeast side, has excited many longings in the breasts of adventurers since the far-off day when Sir Francis Drake heaved over bowls of silver money and tons of plate, and lies off the Peruvian coast. He had to throw it overboard to prevent the great weight from capsizing his ship.

The numerous romantic islands ringing round the Caribbean sea are the home of the buried-treasure seeker, following on the trail of the buccaneers and pirates, who broke the "Jolly Roger" and the flaming dart and hourglass at their halyard peaks. Cultivators of Tortuga, which lies in the track of the scouting fleets of Uncle Sam's navy, based on Cuba, now and again turn up ancient pieces of eight and doubloons of the seventeenth century in the soil, or find fragments of gold chains and ancient jewelry cast up by the tides on the beaches. There is a haven in this island, called Treasure cove and known to have been used by the old buccaneers of Morgan's days. Somewhere off the Port de la Plata coast of the adjacent island of San Domingo lies an entire table of gold, weighing more than 3,300 pounds. This magic table was being carried by the Spanish governor Bobadilla to the king at Madrid when his ship sank in a hurricane.

Two remarkable treasure wrecks have attracted salvors in African and Australian waters. Lying in a cleft of rocks



The Ruins of Corfe Castle, Dorsetshire, England, in the Deep Well of Which Is Supposed to Lie a Treasure of Silver Plate, Cast There by Order of Lady Bankes, Who Defended the Castle against Cromwell's Army

about thirty yards off a wild coast of boiling breakers and raging surf, is the wreck of the East Indiaman "Grosvenor," which drove ashore in bad weather, off Pondo Land, South Africa. She was carrying $10,000,000 worth of precious stones, bullion and specie, and ivory and a wonderful peacock throne of gold, pearls, rubies and emeralds, from the palace of the Great Mogul, at Delhi, India.

The British admiralty tried to raise the wreck in the eighteenth century, but failed. Then a syndicate, in 1906, hired a dredger from Table bay, and fished up gold and silver coins, a silver brooch and fifteen guns, before bad weather stopped the work. The salvors said the hold and strong room were still intact. In 1920-1922, a new syndicate started to bore a tunnel from the land, which is about 200 yards from the cleft of the rock in which the wreck lies. The wreck still remains unbeaten.

The other rich wreck is that of the "General Grant," an American sailing ship, driven far out of her course by a violent storm, which she met on a voyage from Melbourne to London in 1866. She had $50,000 in gold aboard. Divers who have tried to get at the rich cargo of the "General Grant" have been driven back by raging waves and strong undercurrents.

England has some treasure caches which still remain undiscovered. Corfe castle, Dorsetshire, has a hoard of gold and silver plate at the bottom of a well. Charles I was warring on the English republicans when Lady Bankes of Corfe castle held the fort for him. She put up a plucky fight, but had to surrender. First, how-

Development of the Underwater Cutting Torch Has Opened Up a New Treasure-Hunting Possibility

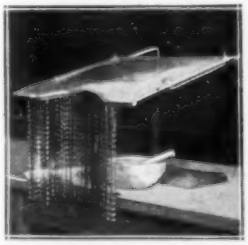
ever, she collected all the gold and silver in the castle and threw it down the deep well. Attempts to raise the treasure have been unsuccessful.

INSTANT HOT-WATER HEATER HELPS SAVE GAS

Suitable for a small installation, such as in a home or office, a water heater now on the market is so adjusted that water and gas are turned on at the same time and the heating is almost instantly accomplished, so that it is not necessary to keep the gas burning long. A pilot light ignites the main flow. A small valve permits regulation of the temperature of the water from lukewarm to boiling, and the heater is said to generate steam within ten seconds after the water has been turned on.

GLASS SHIELD GUARDS CHEMIST FROM EXPLOSIONS

To protect the experimenter with chemicals from fires and explosions, an army officer has devised a glass shield and chain arrangement which is said to be effective. The glass serves both as a protector and as a sort of desk. It is fitted over the pestle or other implement used and has a curved edge against which the operator can stand and so be close to his work. Suspended from the glass are a series of small chains which serve to take up any heat that may be given off or to guard the person from flames.



COLLEGE PAYS HONOR TO MULE IN MEMORIAL TABLET

Trustees of Berea college, Berea, Ky., have authorized the erection of a bronze tablet on a spring house near by, in honor of Rube Baker, a stalwart mountaineer, and "Jenny," his mule. The memorial celebrates the fiftieth anniversary of the completion of a roadside drinking fountain which has proved a source of pleasure and help to thousands of travelers.

It Will Bend but Won't Break; the "No Parking" Sign on Flexible Spring Base

"NO PARKING" SIGN IS FLEXIBLE AND KEEPS UPRIGHT

Anchored "no parking" signs with a heavy spring at the base, to permit them to fly upright again if struck by a car, have been introduced. Besides saving the trouble of frequent replacement, they are less likely to be taken away and can do but little damage to the auto even in the case of a direct collision.

SPREAD SCREW FOR DOORKNOBS WON'T COME LOOSE

Screws falling out or becoming loose in the doorknob are a common cause of trouble, but this difficulty is said to have been overcome in a patented screw, a little longer than the ordinary variety, that will not come loose of itself. The end is slightly split so that when it is driven into position through the spindle, it strikes the opposite side and the points spread out. This burrs the threads so that the screw will remain firmly in position.

Helmet That Dries the Hair without Disturbing a Wave or Other Form of Coiffure

HELMET HELPS TO DRY HAIR WITHOUT MUSSING WAVE

One of the most recent aids for the hair dresser, introduced at a Paris beauty exposition, is a helmet for drying the hair. Used after a permanent wave or other treatment, it is said not to disturb the locks, and to save time and reduce the danger of taking cold. It fits snugly but without discomfort so that it helps keep the hair in order after a treatment.

AUTOS ARE DRIVEN INTO STORE TO SAVE PARKING

Shoppers will be able to drive their cars directly into the store, make their purchases without getting out and then drive away again, through the development of a specially ventilated market. Fumes from the motors are quickly removed by the action of powerful fans, similar to those used in theaters and public buildings. The system helps solve the parking problem and simplifies the delivery question for the merchant, as he can load articles directly into the customer's car. A market of this type already is operated in California.

COAL TO BE TURNED INTO WOOD IF TIMBER SUPPLY FAILS

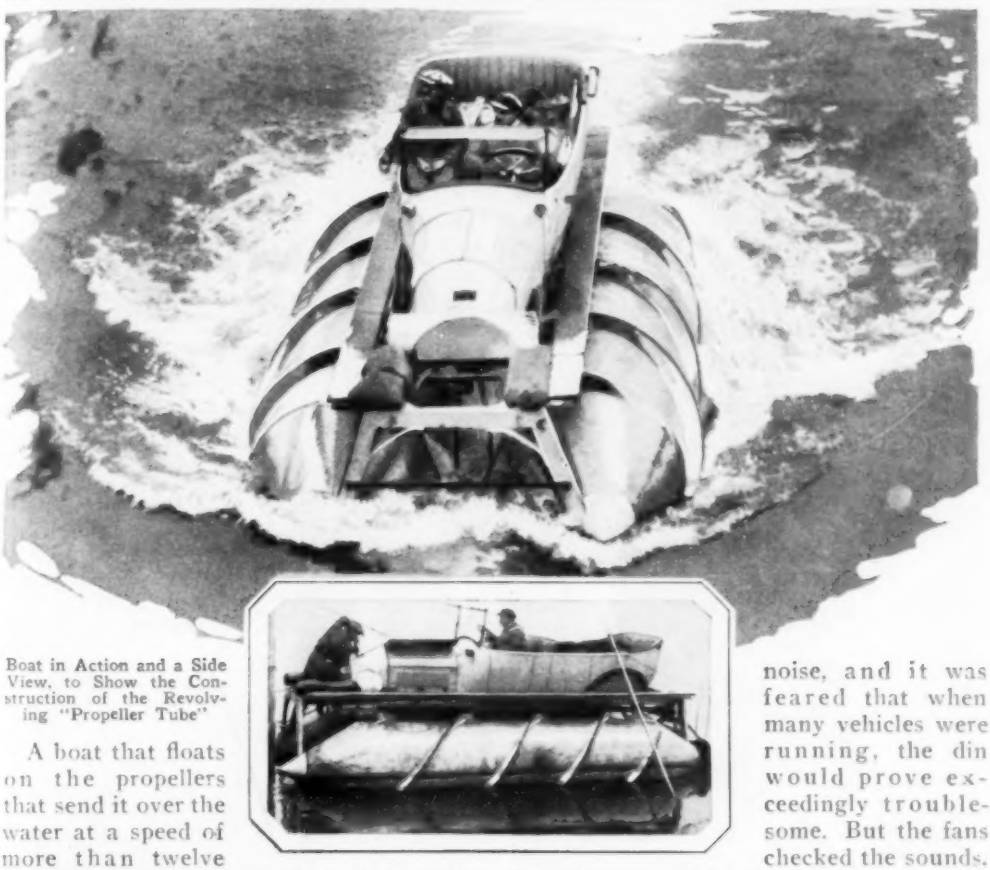
Since coal is largely vegetable matter, scientists will be able to convert it into artificial wood for the manufacture of furniture and many other uses, experts point out. Cellulose or vegetable matter, is now being manufactured into synthetic wood for various purposes. It is durable, hard and heavy, and takes a good polish. A large supply is seen in the tropics where trees and plants now grow in great profusion and are serving no useful purpose.

GIANT BUILDING WOULD HOLD A SMALL CITY

Twenty thousand workers, besides thousands of other persons, visitors and shoppers, will be accommodated in the huge New England building which has been started in Boston. The structure will cost $21,000,000, will occupy 130,000 square feet of ground area and will be twenty-five stories high at the peak, tapering off in the familiar set-back style which has become popular in large American cities. Besides offices, the building will have a big department store to occupy ten acres of floor space, a permanent exhibition hall to display New England industries, and in the sub-basement will be automobile parking space. Elevators will convey the machines to the street level. A steel-supported awning will protect pedestrians from rain on all four sides of the building.

Drawing of the New England Building for Boston; It Will Cost $21,000,000 and Have Space for 20,000 Workers

NOVEL BOAT IS DRIVEN BY TORPEDO-LIKE TUBES



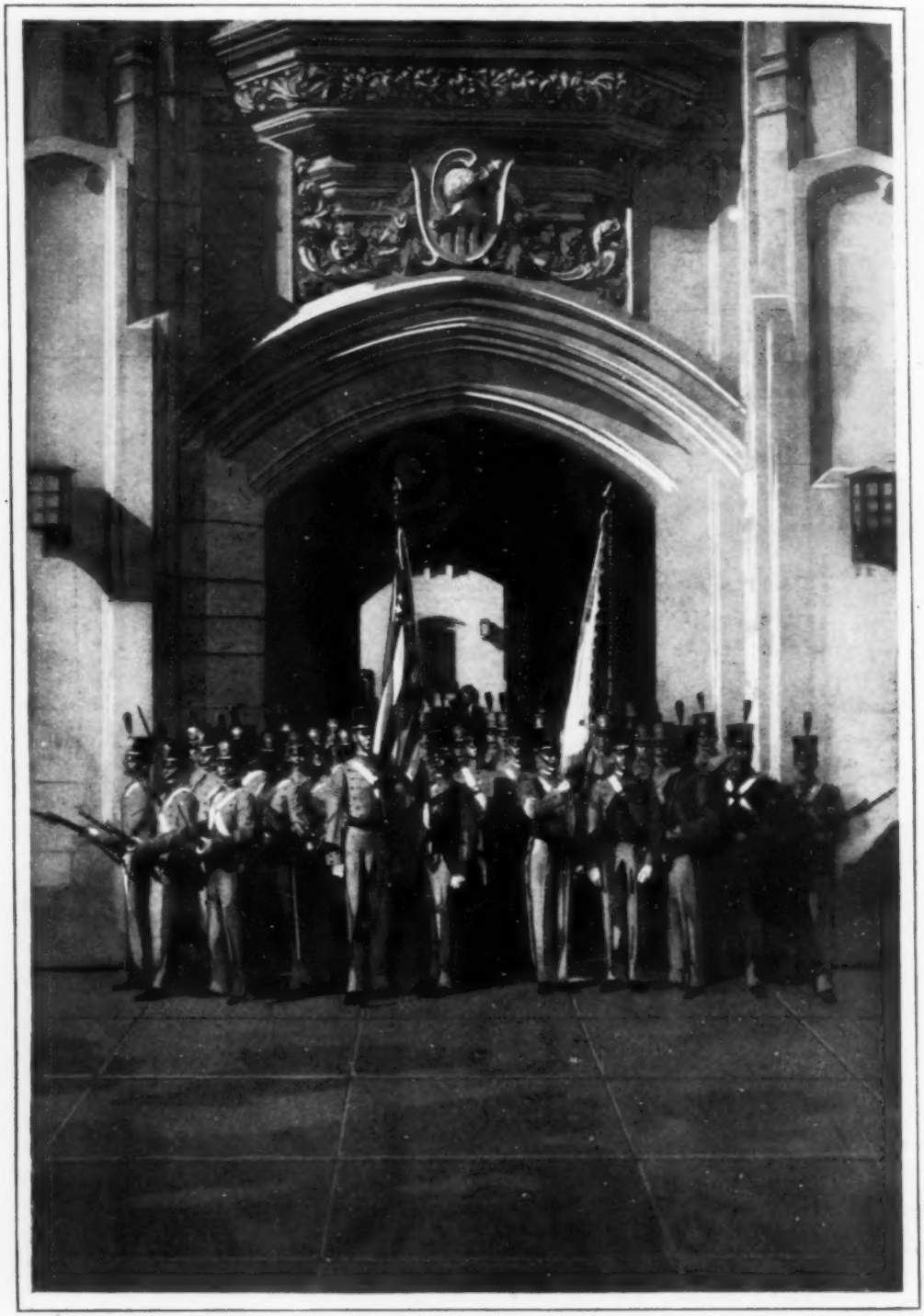
Boat in Action and a Side View, to Show the Construction of the Revolving "Propeller Tube"

A boat that floats on the propellers that send it over the water at a speed of more than twelve miles an hour has appeared in Paris. The floats rotate and propulsion is effected through the screw flanges on the sides of the units. An automobile motor furnishes the power, and the hull of the craft is a car body.

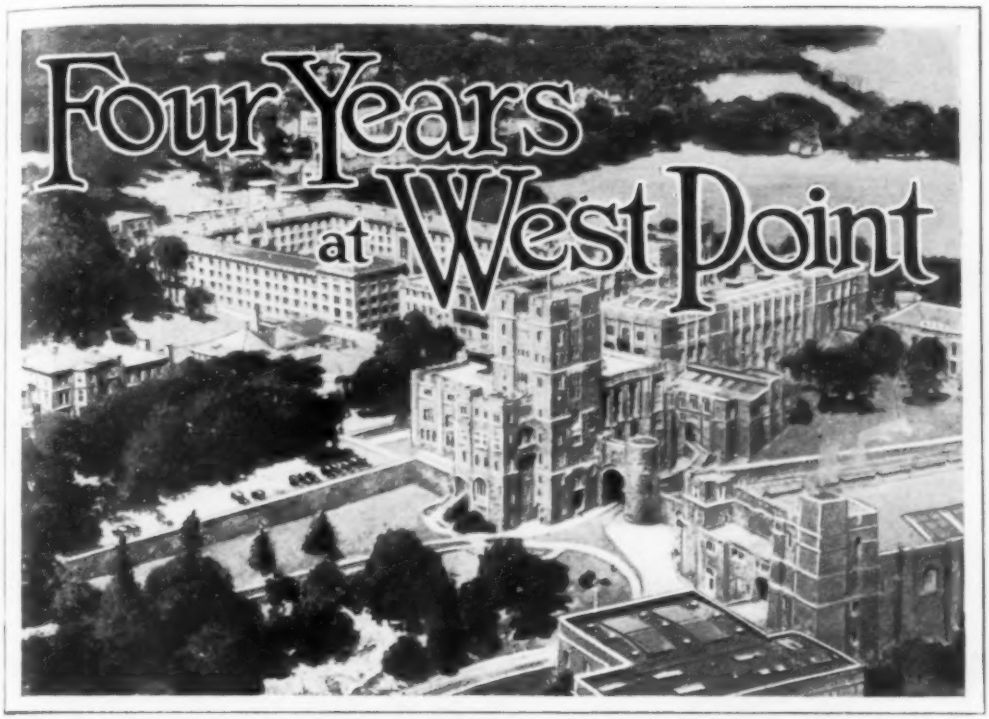
FANS REDUCE ROAR OF TRAFFIC IN VEHICLE TUNNEL

The eighty-four ventilating fans in the Holland vehicular tunnel under the Hudson river not only conquer the menace of poison fumes from the automobiles, but greatly reduce the intensity of sound vibrations, engineers report. The effect is caused by disturbance of the air currents so that the noises are "broken up." On one of the first trips through the passage, when the fans were not running, persons inspecting the tunnel were bothered by the noise, and it was feared that when many vehicles were running, the din would prove exceedingly troublesome. But the fans checked the sounds. It has been found that proper ventilation of auditoriums by circulating the air also has a beneficial effect on the acoustic properties when noises are likely to be echoed in such a way as to prove disturbing. The action of wind currents on sound is easily demonstrated when trying to shout against a stiff breeze or to hear the whistle of a locomotive when the wind is carrying the sound away. Some engineers have thought that further relief from noises in subways and other tunnels might be achieved by insulating the walls with absorbent materials.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.



Like the Sally Port of an Ancient Castle, the Entrance to the West Point Barracks, with the Arms Carved in the Stone Above, Frames the Colors and Armed Cadets



West Point Military Academy from the Air, with the Majestic Hudson in the Background; the Training School for Army Officers Crowns the High Bluffs above Bear Mountain

I—The First and Second Years

EVERY year, in "June week," some 300 or more young lieutenants leave West Point, on the Hudson, for the far-flung army posts of the country, and, about July 1, nearly 400 boys, ranging from seventeen to twenty-two years, arrive to learn how to be army officers.

For four years they are put through one of the most complete drills ever devised to turn raw material into men ready at a moment's notice to take over infantry, artillery, cavalry, machine guns, tanks or go up in the air in planes.

When the new "plebe" reports at the academy, his first job is to deposit $250 at the treasurer's office to cover uniform and equipment. After that the government pays all expenses. With that formality over, he gets an immediate lesson in how to stand, salute and report to a superior officer. Then he is assigned a room and the real grind begins.

For two hot summer months, under direction of a picked detail of first-class men, called the "beast detail," the new cadets are worked over into a perfectly drilled machine, ready to take their place in the cadet corps in the fall. After the summer drill the plebes are taken out for a week's cross-country hike, and then settle down for the regular routine. Reveille sounds each day at 6 a. m., classes are held from 7:55 a. m. to 3 p. m., tattoo orders the students to bed at 9:30 p. m., and at 10, taps ends the day.

There is no vacation at the end of the first year but summer camp on the post, and then the grind resumes, in mathematics, tactics, surveying, English, French and gymnasium work. Tactics covers infantry, artillery, cavalry drill and special branches.

With the second year the ex-plebe, who theretofore had been rigorously excluded from companionship with his elders, enters into the joys of being a yearling. Every Saturday night there is a hop lasting until midnight, and at Christmas he gets his first vacation, while with June week he will get two months' furlough at home. Next month's issue will tell the story of the final two years in the cadet corps.

Courtesy De Mille Picture Corporation

New Arrivals in Civilian Clothes Present a Sharp Contrast to the Well-Drilled Cadets Who Meet Them; the Cadet, Right, Above, Takes Care of His Own Quarters

The Academy Barber Shop Cuts Hair, But the Student Must Do His Own Shaving, Gazing into a Mirror Flanked by Charts That Tell Him What He Must Do with Every Minute of the Day; Right, Field Conditions Are Reproduced in the Dormitory, Where the Embryo Officers Wash Up in the Chilly Dawn in Portable Basins, and Carry Their Water in Capacious Buckets

Courtesy De Mille Picture Corporation

The First Step in Learning How to Drill Others Is to Be Drilled Yourself, and the West Point Cadets Spend Untold Hours Going through Infantry, Cavalry, Artillery and Other Drills Until They Are Letter-Perfect in Each

Third-Class Men Cleaning a Seventy-Five-Millimeter Gun after Target Drill

Three Times Each Day the Entire Corps, Grouped According to Classes, Assembles in the Big Dining Hall for Meals

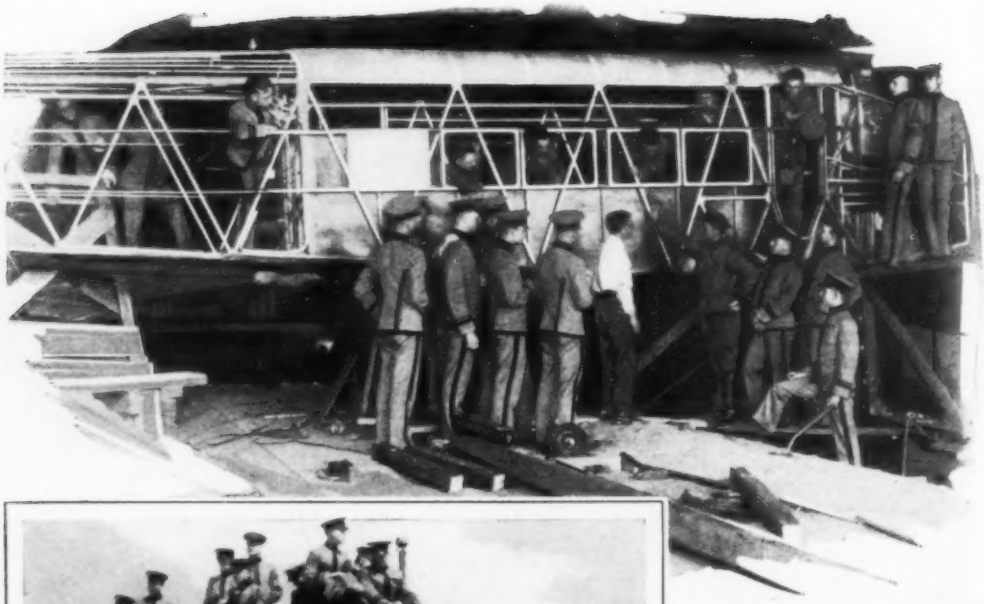
Courtesy Pathe

Hung with American Flags and Famous Battle Banners of the Past, the Cadet Chapel Is One of the Most Beautiful Buildings on the Reservation

Second-Class Men Learning the Intricacies of Machine Guns; the Cadets Are Given a Four-Year Intensive Course in Every Form of Maneuver and Trained to Use Every Type of Arms

Plebes, Who Have Just Turned Yearlings with "June Week," Pitch Their Tents at Camp Clinton, the Summer School on the Post Grounds

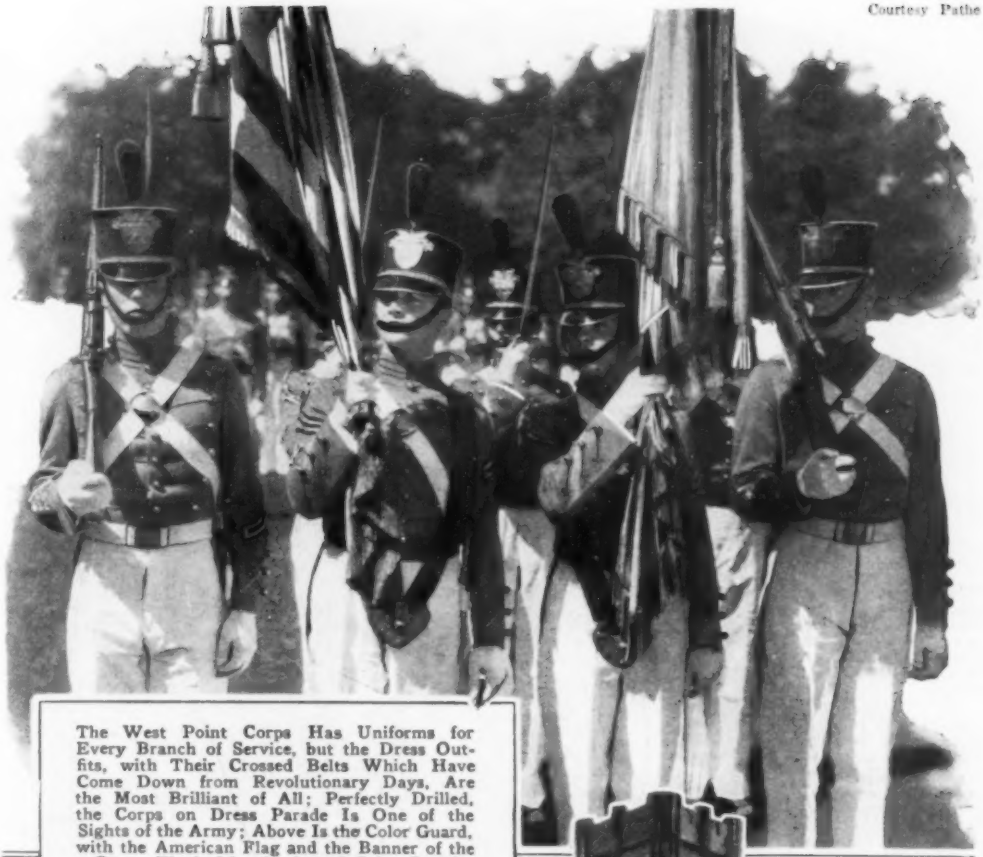
When Summer Comes, the Classes Go on Expeditions to Aviation Fields on Long Island and to the Coast Defenses of New York to Study Flying and Heavy Artillery; Here Is a Group Getting Familiar with One of the Huge Disappearing-Type Coast-Defense Guns Which Guard the Entrance to the Narrows and New York Bay; When the Four-Year Term Ends Cadets Are Allowed to Pick the Service They Prefer to Join



Every Time a New Weapon Is Created Training at West Point Becomes More Complex; Above, a Group of Future Generals Are Learning What an Airplane Looks Like Before the Cover Is Put On, While at the Left They Are Making the Acquaintance of a Large-Size Battle Tank during a Visit to Aberdeen Proving Ground, Where the Entire Corps Is Given a Lesson in Ordnance Testing and Permitted to See the Latest Weapons; Below, Horsemanship, Too, Is Required, and Cavalry Drill Is Regular

Courtesy Metro-Goldwyn-Mayer

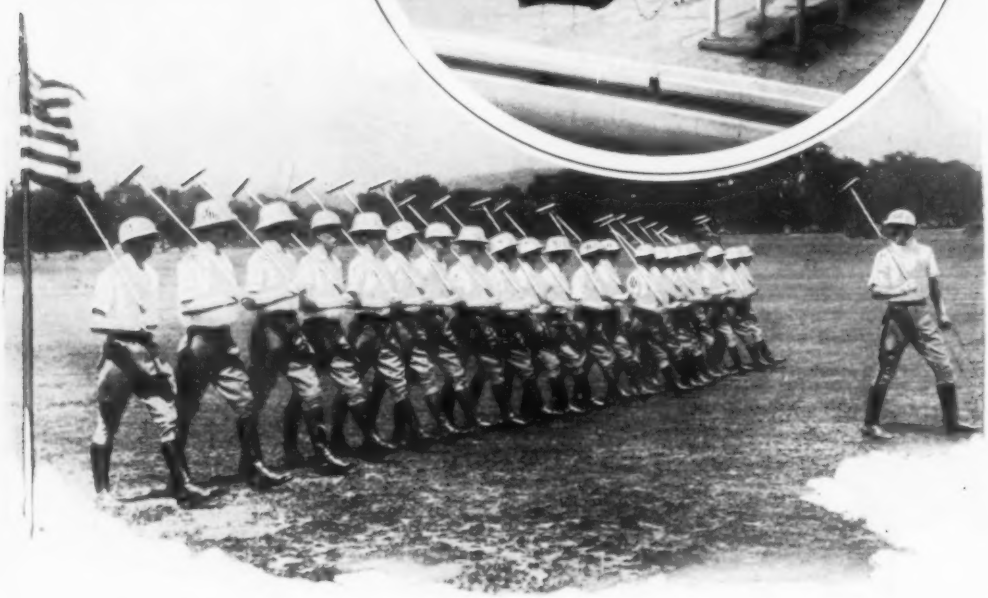
Courtesy Pathe

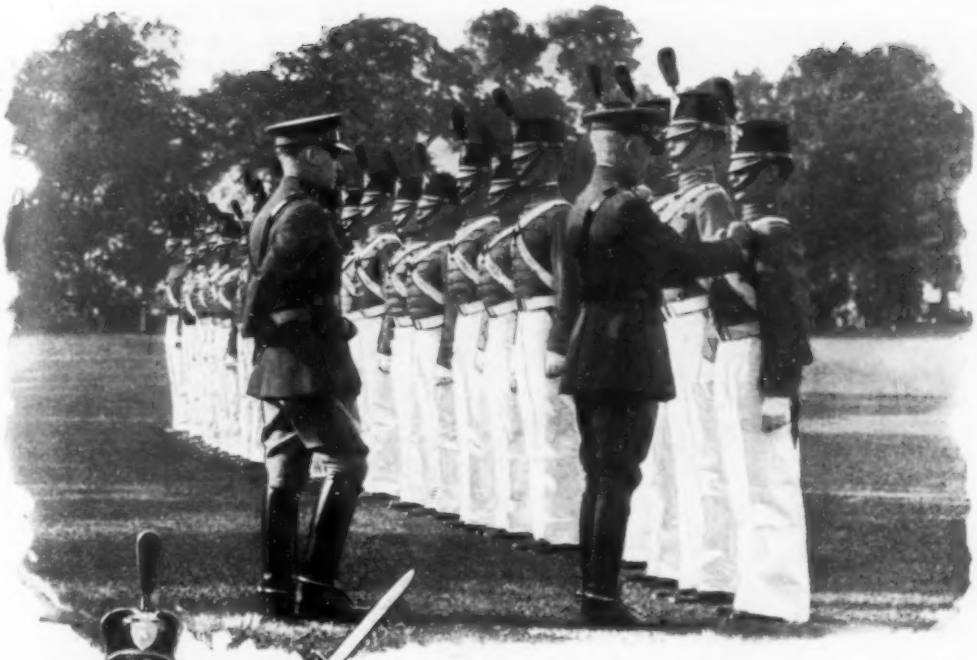


The West Point Corps Has Uniforms for Every Branch of Service, but the Dress Outfits, with Their Crossed Belts Which Have Come Down from Revolutionary Days, Are the Most Brilliant of All; Perfectly Drilled, the Corps on Dress Parade Is One of the Sights of the Army; Above Is the Color Guard, with the American Flag and the Banner of the Corps, Flanked by the Armed Color Guard

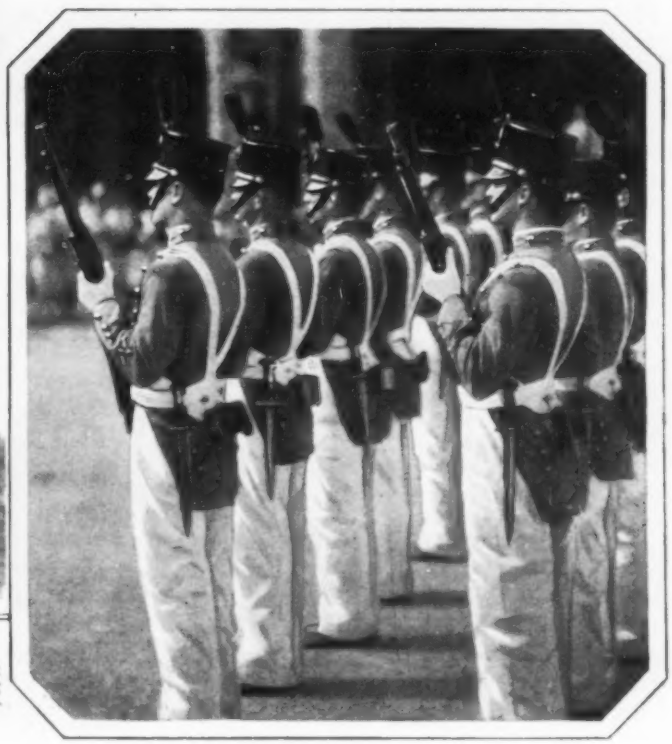
Led by the First Class, the Corps Marches Out from Sunday-Morning Chapel Service; Chapel, in the Fine Building Which Crowns a Hilltop above the Hudson River, Is Compulsory for All Students

They'll Look Different within Six Months, but Each July, when Three to Four Hundred Plebes Are Admitted to Start Their First Drills during the Absence of the Upper Classes, the New Student Officers Present a Ragged Picture Contrasted to the Perfectly Drilled Soldiers Who Induct Them into the Mysteries of Academy Life; at the Right Is a Champion Diver from the Second Class; All Students Are Required to Become Expert Swimmers; Below, Some of the Polo Teams Marching Out for Practice in the Game Which Is the Favorite for Those Planning to Join the Cavalry after Graduation



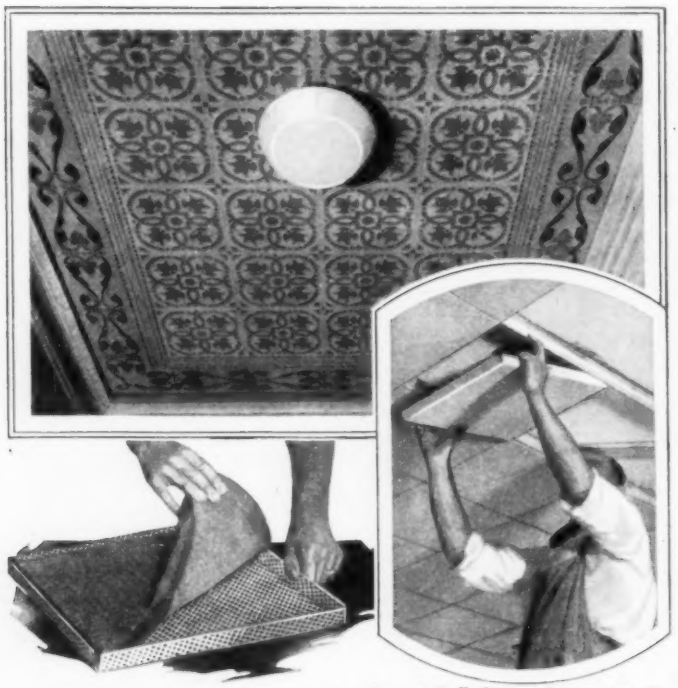


Major General Sladen Bestowing Stars on a Cadet Who Won Highest Honors on His Class Merit Roll, One of the Ceremonies of June Week; Like the Naval Academy at Annapolis, West Point Demands Almost Perfect Scholarship



Courtesy De Mille Picture Corporation

Two Scenes from a Movie of West Point Life; the Corps Presenting Arms, and a Film Star Demonstrating His Ability in the Same Line



Courtesy C. F. Burgess Laboratories, Inc.

Finished Ceiling of the Tile; Installing Units, and Section to Show Structure of the Material

FIRE AND SOUND-PROOF TILE HAVE NOVEL FEATURES

A new type of sound-proofing material for offices and other building interiors has been developed by a Wisconsin company to remove the objections which many forms of sound-deadening materials have had. The new material, called "sanacoustic tile," combines acoustic properties with sanitary and fireproof requirements. The exposed surface is a metal tile, pierced by a multitude of small holes and backed by one inch of noncombustible sound-absorbing material. The metal face may be painted or decorated in any manner, can be washed with water without spoiling its acoustic properties, and can be repainted time and again without lessening its ability to absorb sound waves. Light metal clamp strips are attached to the ceiling, sixteen inches apart, and the tiles, which are sixteen inches square, will lock automatically when they are slid into place.

MAN-MADE GALES NEEDED TO PLAY BIG ORGANS

Millions of pounds of air are blown within the pipe organs of the United States every day to provide music in the nation's churches, theaters and other buildings. Veritable gales of wind are created by powerful blower-type fans to produce the notes. In the modern pipe organ, the fans are constructed with a special motor, mounted as a unit on an absorbent foundation and provided with a flexible air-pipe connection so that not the slightest noise from machinery or other causes will be magnified or travel through the air, disturbing the quietness of a church or similar building.

EARMUFFS ON FELT HELMET PARTLY HIDDEN BY HAT

Attached to a felt-and-elastic helmet of bands that can be quickly slipped on and is almost completely hidden by the hat or cap, earmuffs now on the market have no troublesome steel support to worry about, can be carried in the pocket and fit snugly without slipping. They are made in two sizes, small and large, and are adjustable to fit the wearer, as an elastic forehead band gives considerable flexibility and adds to the comfort.

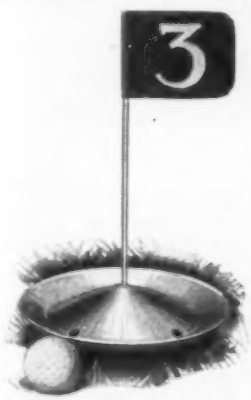
Earmuff Helmet in Place, and as It Appears When the Hat Is Worn; It Cannot Slip Off

PHOTO CELL MORE SENSITIVE TO AID TALKING MOVIES

Improvement in talking motion pictures is anticipated as the result of the development of a photo-electric cell that is said to be twelve times as sensitive as any yet prepared. These cells are the magic little units employed to transmute light vibrations into those of sound so that the film will "talk" as it passes over the screen. The new cells are also said to be much more durable than the older ones, which had a maximum service lifetime of not more than 3,000 hours. The improvement in the cell is obtained by coating the inside of the glass tube with a substance that is so highly sensitive to light that it permits the cell to react at the slightest change in the intensity of illumination.

GOLF SET FOR SMALL LAWN SAVES DIGGING HOLES

Nine holes of golf can be played on a plot of ground as small as forty-five by twenty-five feet and a putting course about 250 feet in total length afforded, with a set recently introduced. Instead of digging holes, special traps are used. These are conical disks suspended on slender metal pins which may be inserted in the turf without damage to it and quickly taken out for a change of position. Each disk is so arranged that a ball trapped under it would fall into a hole, were one there, and thus helpful practice may be gained. Balls that go through the trap would also run over the hole. The outfit is easily set up, gives beneficial training in putting and is specially adapted to lawns and yards too small for tennis or similar games.



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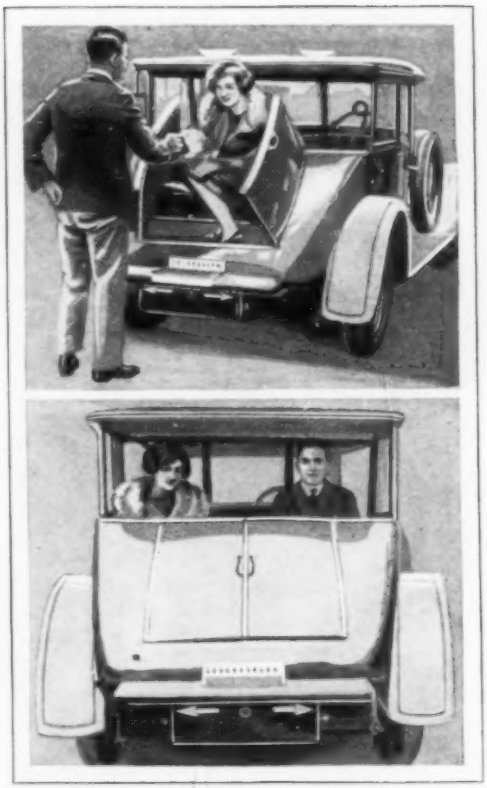


Rear Views of the Observation Auto, Showing the Folding Door and Large Window in Back

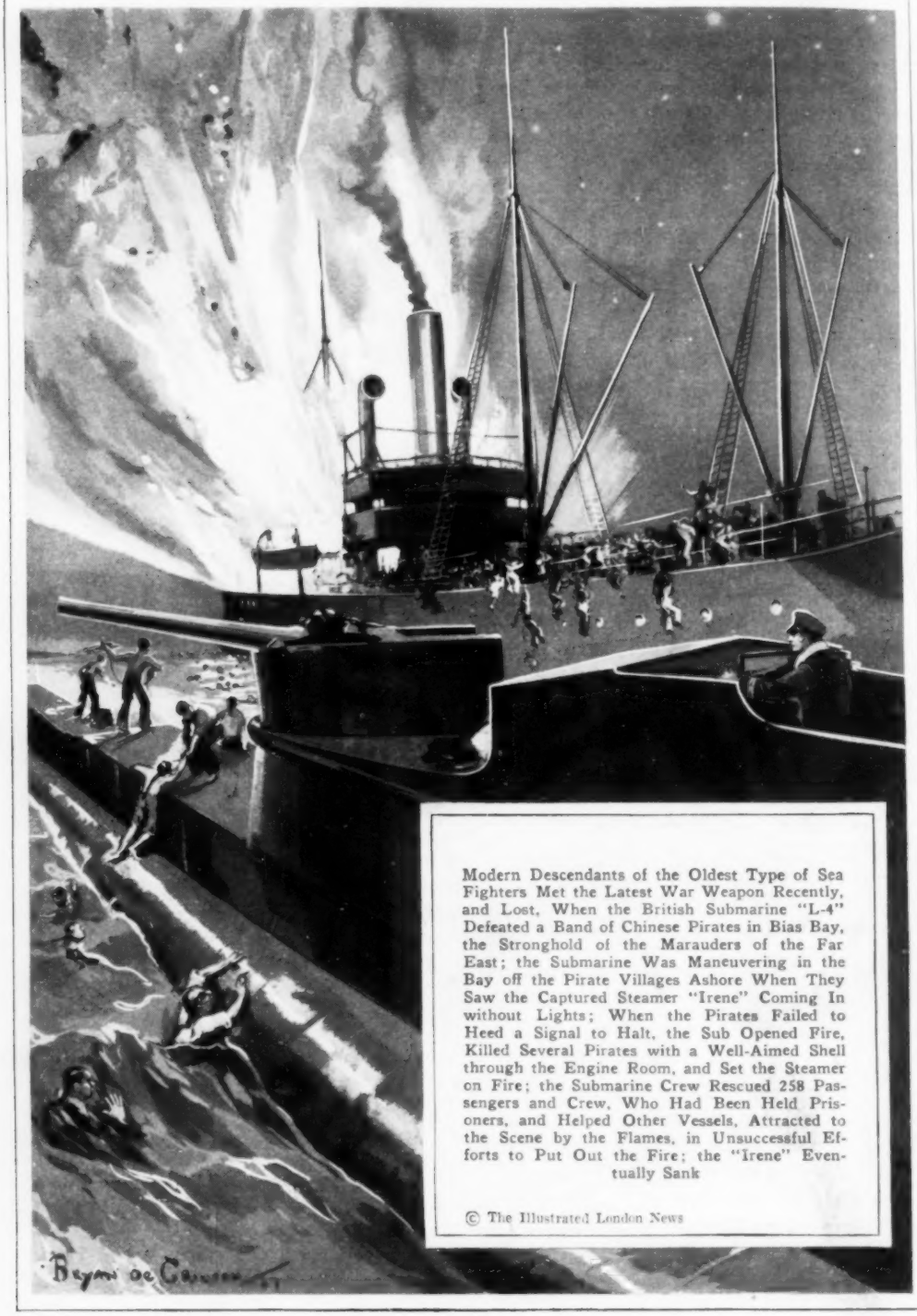
AUTO LIKE OBSERVATION CAR HAS REAR ENTRANCE

Passengers enter and leave from the rear of an observation automobile recently introduced in England and sit with their backs to the driver. The car is modeled somewhat after a railroad observation coach, to afford an unobstructed view.

PADS SAVE WORKERS' KNEES AND PRESERVE CLOTHING

To spare the knees from bruises and soreness and to protect the clothing, pads have been devised for wear when tasks require kneeling. They are made in different styles, a waterproof variety being furnished for such work as laying concrete.

SUBMARINE WINS ITS FIRST BATTLE WITH PIRATES



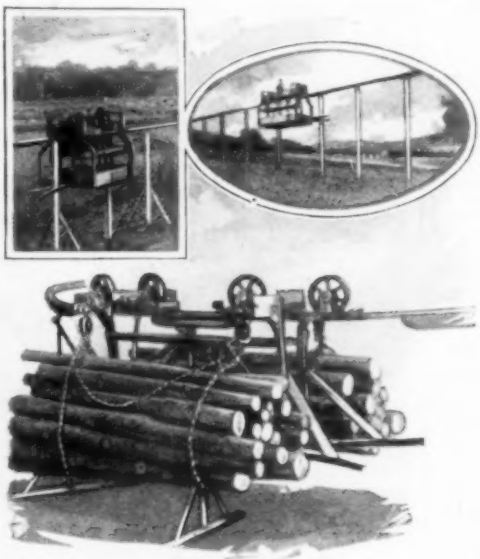
Modern Descendants of the Oldest Type of Sea Fighters Met the Latest War Weapon Recently, and Lost, When the British Submarine "L-4" Defeated a Band of Chinese Pirates in Bias Bay, the Stronghold of the Marauders of the Far East; the Submarine Was Maneuvering in the Bay off the Pirate Villages Ashore When They Saw the Captured Steamer "Irene" Coming In without Lights; When the Pirates Failed to Heed a Signal to Halt, the Sub Opened Fire, Killed Several Pirates with a Well-Aimed Shell through the Engine Room, and Set the Steamer on Fire; the Submarine Crew Rescued 258 Passengers and Crew, Who Had Been Held Prisoners, and Helped Other Vessels, Attracted to the Scene by the Flames, in Unsuccessful Efforts to Put Out the Fire; the "Irene" Eventually Sank

MANY NEW INVENTIONS FOUND OF ANCIENT ORIGIN

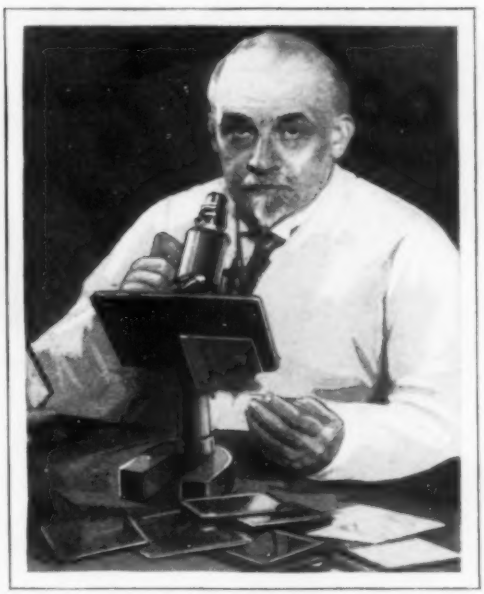
More than 2,500 years ago, the Greeks knew how to spin tops, they had pocket-knives with bronze blades and exquisitely carved ivory handles, and clasp pins, much like the safety pin by which its modern inventor made a fortune, were common. A process for making clear yellow-white glass was announced as a new discovery not long ago, but excavations in Egypt show that the material was known there in the second century B. C. A set of 150 pieces was recovered from the ruins of an ancient city. A sewer system that would compare favorably with any constructed today was laid in Crete some 2,500 years B. C., and you can turn the faucets of a system that was installed in ancient Pompeii. Checkers, dice games, parchesi and many other "modern" sports were known to the ancients, athletes of old threw the discus, had developed styles in running that compare favorably with those of the swiftest sprinters of today and prize fighters wore knuckles instead of gloves.

MONORAIL LINE RUN OVERHEAD TO ESCAPE SNOWDRIFTS

Heavy snows and storms have little effect on a monorail system especially for industrial purposes, as the cars run on an elevated track. The line has been employed to good advantage at mines and timber tracts, but may also be used for carrying passengers. Each car holds about ten tons and the engine is placed on top of the forward car. Cheaper construction is another feature in favor of the system, the cost ranging from $1,500 to $3,000 per mile, depending upon the character of the country traversed.



Two Views of the Monorail Line, and One of the Carriers Showing How a Load Is Balanced



Prof. Oscar Focht Making Microscopic Examination of Lenin's Brain

MYSTERIES OF BRAIN STUDIED AT SPECIAL INSTITUTE

An "institute of brains" has been opened in Moscow for special research into the mysteries of the human nervous system and the brain. One of the aids in use there is a remarkable instrument that divides the brain into five equal sections, and makes a wax impression of it at the same time. After this, the organ is cut into 25,000 to 30,000 thin slices for study under the microscope. The brain of Lenin, the late Russian leader, has been studied in this way and directors of the institute propose to examine the brains of other great persons in Russia after their death. It has been announced that the examination of Lenin's brain indicated that he had great mental powers.

TASSEL FRINGE ON VANITY BOX CONCEALS LIPSTICK

Convenient Vanity Box That Has Space for Coins and Cigarets While Tassel Hides Lipstick

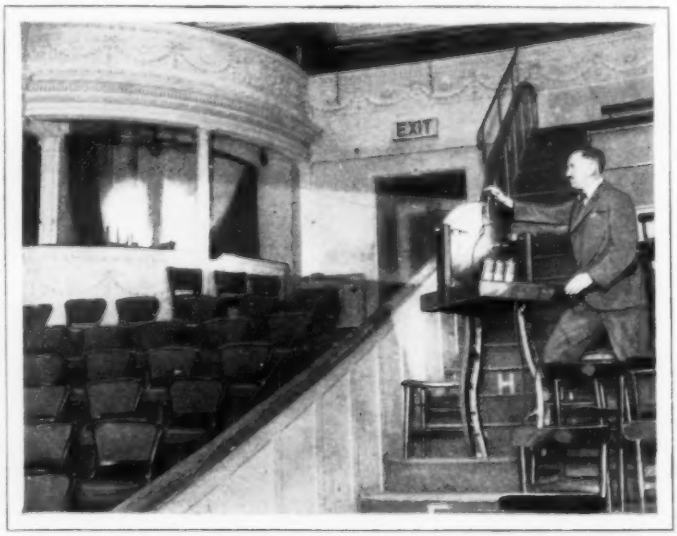
Space for a cigaret and coins is provided in a tube-shaped vanity case. The fringed tassel hides a lipstick and the mirror is at the other end. The article is furnished in different colors.

TURNING GOLD INTO COPPER

Alchemists of old sought a way to make gold from baser materials, but modern scientists are said to be considering the possibility of reversing the process and turning gold into copper and tin, should a serious shortage of the latter metals develop. The task is within the range of scientific possibility, it is said, a rearrangement of the electrons being the essential step in the proceeding. At present, the supplies of gold appear to be abundant, but the sources of tin and copper are being depleted in some parts of the world. If they should become so scarce, and the price consequently high enough to justify some such step as a transmutation process, the application to gold would be considered practical, it is reported, because of its durability and adaptability to many of the purposes for which tin and copper are now used.

CHATTERING OF LIGHT HELPS LOCATE BUILDING ECHO

A beam of light and a beam of sound, projected over the same path, recently located the source of echoes which had disturbed audiences in Albert Hall, London. Every time the visible light beam fell on one of the echo-producing spots, it gave back a chattering noise, and the spot was marked down for treatment. The novel echo finder consisted of a light and an electric spark gap, both mounted in the same bowl-shaped reflector, so that both light and sound were projected on the same path. As the beam of light was played over the dome, ceiling and walls, the only sound came from the spark gap, so long as the walls absorbed the waves properly. But when the light reached one of the echo producers, the sound waves were thrown back. Changing fashions are blamed for the development of some of the echoes heard when large audiences are in the hall. The men's suits, still made of wool, continue to absorb sounds, while the harder-finished silks now used by women, are echo producers.



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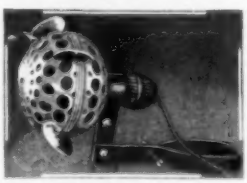
Hunting the Echoes of Albert Hall, London, with a Beam of Light and an Electric Spark

LOCOMOTIVE IS TURNED INTO AUTO TO HAUL LOGS

Steam Locomotive Mounted on Endless Treads, with a Pilot Sled Steered by a Gear Operated from the Front of the Boiler, as Used in the Minnesota Woods

The combination of the little geared locomotives used in the lumber camps—named "Shays" after their inventor—and the treads used on tractors and battle tanks, has produced a new kind of steam engine for the snow-covered north woods. The Shays have vertical cylinders driving horizontal shafts which in turn are geared to the wheels, giving greater tractive force, and to accent this they are commonly mounted on a single four-wheel truck, concentrating all of the weight on the driving wheels. By replacing the latter with treads, the lumber companies have converted the Shays into steam tractors capable of backing the heaviest snowdrifts.

WINDMILL LIGHT FOR AUTOS FLASHES COLOR EFFECTS



Easily attached to the front or rear of the automobile, a light bulb has a spinning globe with colored lenses that revolve rapidly as the car moves, due to the wind pressure against four little "windmill wings" on the exterior. This produces novel color effects and adapts the light to designating special cars, such as ambulances, taxicabs or police vehicles, permits the showing of college or lodge colors, and other displays on patriotic or like occasions. The cover reduces glare, and is rust-proof and self-lubricating.

"SILK" SPUN ON SPIDER FARM

Spiderweb is used extensively for cross lines in microscopes, range finders and other exacting instruments. A single strand is too thick in some cases, and has to be split into four sections. This is done under strong magnifying glasses and usually by women, as their hands are steadier than men's. In England, is a special spider farm conducted by a woman. The insects are raised for their web, which is wound like thread on a card.

¶There are said to be more automobiles than telephones in Maryland.

Wealth

Gold Prospectors, Sheltered behind Their Mosquito Nets, Panning for the Precious Yellow Metal in Alaska

By ORVILLE H. KNEEN

THERE are many counterparts of the storied individual who set forth to find a gold mine. You remember he wandered all over the world. At last, broken and discouraged, he dragged himself home. And there in his own backyard he found the gold for which he had scoured the globe. Wealth of one kind or another has often been found under our feet or close at hand. But would you know a valuable mineral deposit if you were lucky enough to stumble across it?

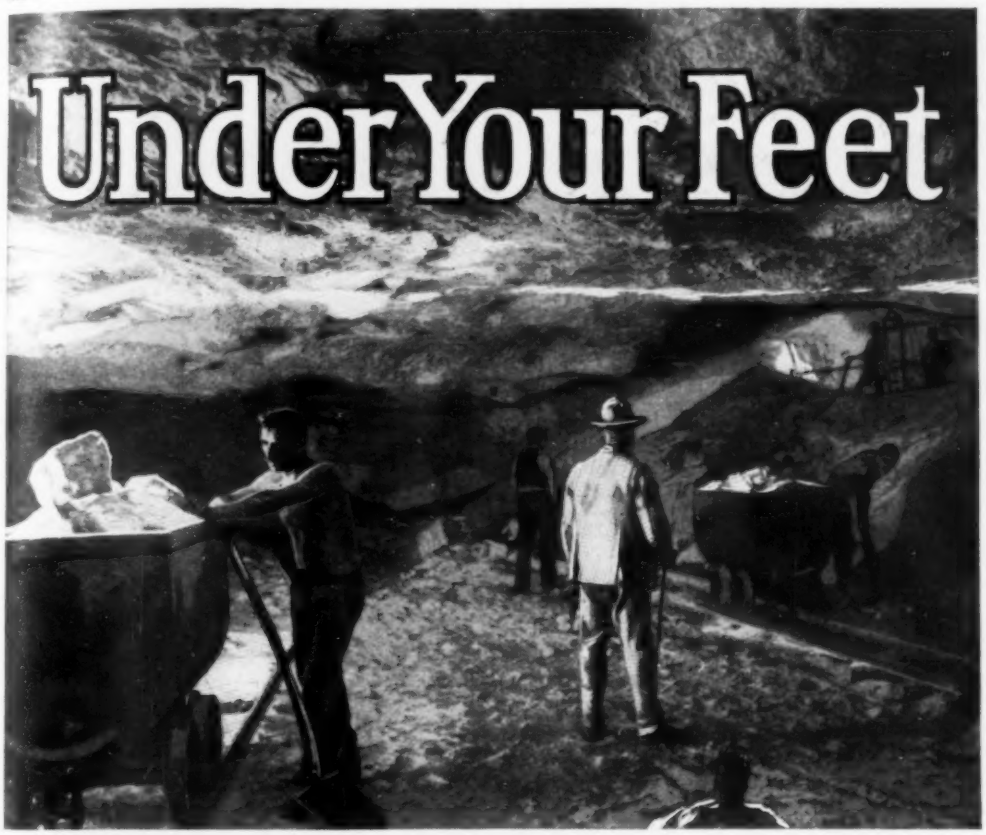
A few weeks ago, for example, a negro in South Australia reported finding some strange earth. When he threw it on a fire it "made a big blaze." Sir Douglas Mawson, noted geologist and explorer, heard of it. He found the strange earth to be part of a huge deposit of saltpeter, which is rarely found in a free state. Valued at $300 to $500 a ton, the beds of nitrate are worth a king's ransom.

Some months ago, Nevada and the country were thrilled with another gold discovery. Two boys were the lucky finders. Digging around a badger hole, within a hundred feet of a camp kitchen, they struck a rich bank of ore. It assayed $78,000 a ton, and in no time at all there was a real old-time gold rush to the Weepah field. But the boys knew gold ore when they saw it. They had lived on lean rations while prospecting for it.

Although the yellow metal is mostly found in well-defined areas, still "gold is where you find it." That applies to other valuable minerals. Did you know that ordinary folks have picked up valuable diamonds, hardest and most precious of minerals, in many different states? The sparklers have been found along the eastern base of the Appalachian range, in Virginia, North and South Carolina, Georgia, Alabama, and along the path of the glacial drift in Wisconsin, Michigan, Indiana and Ohio.

Other valuable gems have been picked

Under Your Feet



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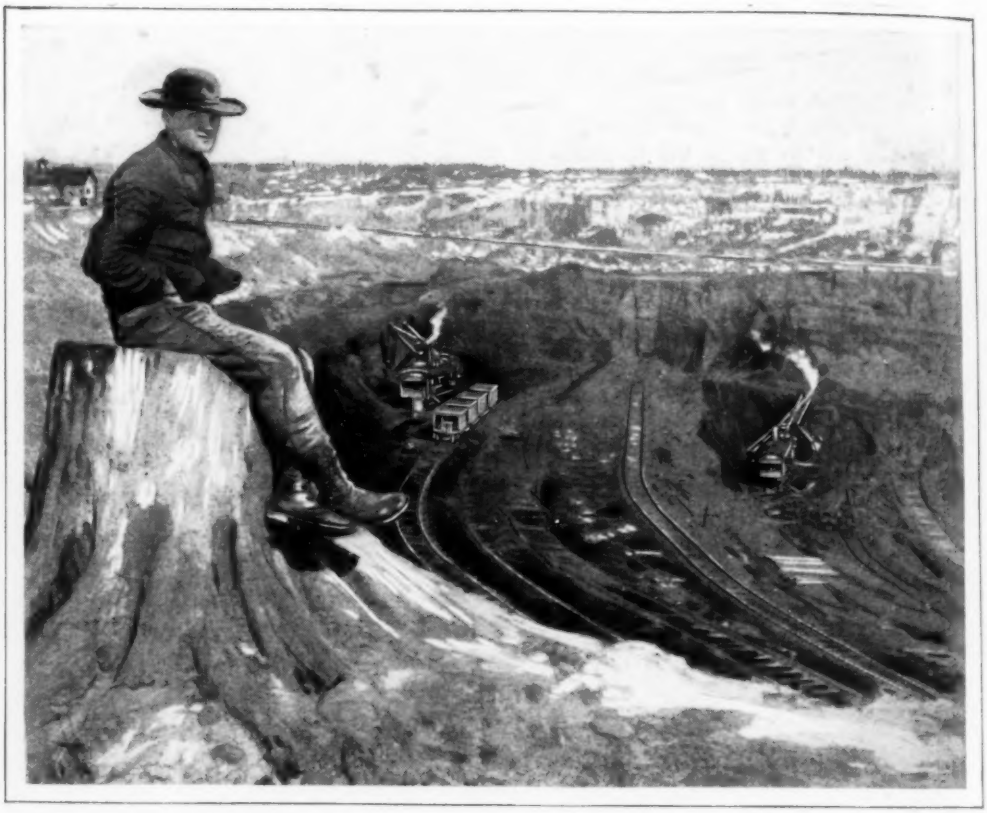
Germany Mines Potash 3,000 Feet Below the Ground; the Photograph Shows the Broad Rooms and High Ceilings Which Are Typical of the Potash Veins

up by keen-eyed people in California, Idaho and Montana. In 1855, a laborer excavating in a street of Manchester, Va., came across the largest crystal ever found in this country. It weighed 23¾ carats, and even in that day brought thousands of pre-war "cartwheels."

Diamonds occur naturally only in volcanic formations. In South Africa, where the world's supply largely originates, they are found only in "pipes." These are shafts of unknown depth, more or less circular, topped off with a mound or "kopje" ten or twelve feet high. These deep chimneys have been filled with the crystal-bearing blue mud. Most of our best stones come from these pipes, believed to be volcanic in origin. South Africa has produced to date over a billion dollars' worth of diamonds. Small diamonds have been found in meteors, such as those which fell years ago in Tennessee.

In Pike county, Arkansas, a crater similar to the South African pipes was found some years ago. A farmer picked up a stone which seemed different from any he had ever seen. His wife was skeptical, but he took it to a jeweler, with another he picked up on the way. They were real gems, of fine quality. A limited supply has come from this and another nearby crater. The largest was six and one-half carats. The big steel-white gems of South Africa bring $2,000 to $3,000 a carat. No other such craters have been found in our land, but they may exist.

In new Transvaal diggings, Dr. Hans Merensky recently observed that gravel carrying diamonds also invariably contained fossil oyster shells. He bought a



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Part of the Burt Open-Pit Mine, One of the Big Ore Producers of the Mesaba Iron Range, in Minnesota; This Mine Has an Output of 10,000 Tons of Iron Ore Daily

strip showing the shells and uncovered one of the richest diamond fields ever found. Keen eyes and judgment have brought many such fortunes. Brazilian fields were found by a card-playing priest, whose opponents used the white crystals as counters.

Black diamonds are scarcer than brilliants, and almost as valuable. They look exactly like sharp-cornered cinders from the ash can, from the size of peas to baseballs. If you find one of the latter size you should be worth $100,000 or so, assuming you start at zero. If very hard and largely free from defects, it would retail for over half a million dollars.

These black diamonds, entirely lacking in luster, serve as tough cutting edges for rock and steel drills; glass, fiber and pearl cutters, marble saws, and so on. So far, the world's output is found by naked natives in the wild interior of Brazil. The "carbonadoes" are mixed with gravel washed down from the mountains. They are never found alongside white gems, but in Pike county, Arkansas, a few have been picked up.

All "pretty stones" are worth investigating. It costs little to find out their value. A large piece of "colored glass" was recently found by an English workman along a railroad track. He gave it to his children to play with. By chance he saw a notice that a sixty-one-carat uncut ruby had been lost out of a passing railway coach. He rushed home, but could not find the stone. At last he uncovered it in a corner. It is said to have belonged to a former Persian ruler, and is of immense value.

Dr. George Kunz, gem expert of Tiffany's, has found and popularized many semiprecious stones formerly unknown and unwanted. Today a single "zircon" has brought $2,000. Fine tourmalines, first identified by Dr. Kunz, bring up to

Placer Mining for Tin in New Zealand; More Than Five-Sixths of the World's Tin Is Found as Rolled Lumps and Grains in Alluvial Gravels, from Which It Can Be Washed

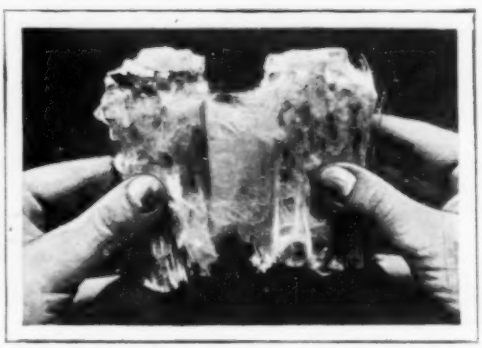
$100 a carat. In fifty years he has seen turquoise, sapphire, amethyst, coral, beryl and other such stones rise to very respectable prices.

Some of the oddest buried treasure in the world is found along the frozen Bering sea. It requires no technical skill to locate or to mine. For ages the natives had caught walruses and had reduced them to bones and gleaming white tusks.

These they tossed out on the dump back of their igloos. The piles accumulated, and they moved on. Then the white man came and eagerly bought ivory tusks, new or fossilized. The Eskimo is unearthing great deposits of the ivory, perfectly preserved. A single recent shipload from the Pribilof islands was worth over $75,000.

An even more everlasting material is asbestos. The curious mineral fibers, often soft and light as thistledown, are woven into fireproof garments and have a wide industrial use. Every steamfitter and engine operator uses it for packing around hot pistons and steam joints, and to retain heat in pipes and boilers. No other mineral has such properties. As a natural result, select high-grade fibers over two inches long have brought several thousand dollars a ton.

So far, these longer fibers, and even those around three-fourths of an inch, selling for $525 a ton, have been mined only in Canada. The immense open-pit mines near Quebec, with their cheap mining, furnish practically all the 250,000 tons imported into this country. In Canada the serpentine rock bearing asbes-



Fibers of Silky Asbestos as They Come from the Serpentine Rock; Two-Inch Fiber Sold for $4,000 a Ton

tos occurs in ranges of small knolls, 100 to 1,000 feet high. Even up there the long fibers are scarce.

Asbestos has been found in Vermont, Wyoming, North and South Carolina, Virginia, Idaho, California and other states. Even Central park, New York, has some scattered veins. The mines at Sall Mountain, Ga., are the only ones being worked south of Quebec. But long seams are to be seen in the Grand canyon of the Colorado, at depths of over 4,000 feet below the rim. Here the fibers are said to be six to eight inches long, of a fine silky texture. But thirty to forty miles of burro packing to the railway renders the working of these seams impracticable for some time to come.

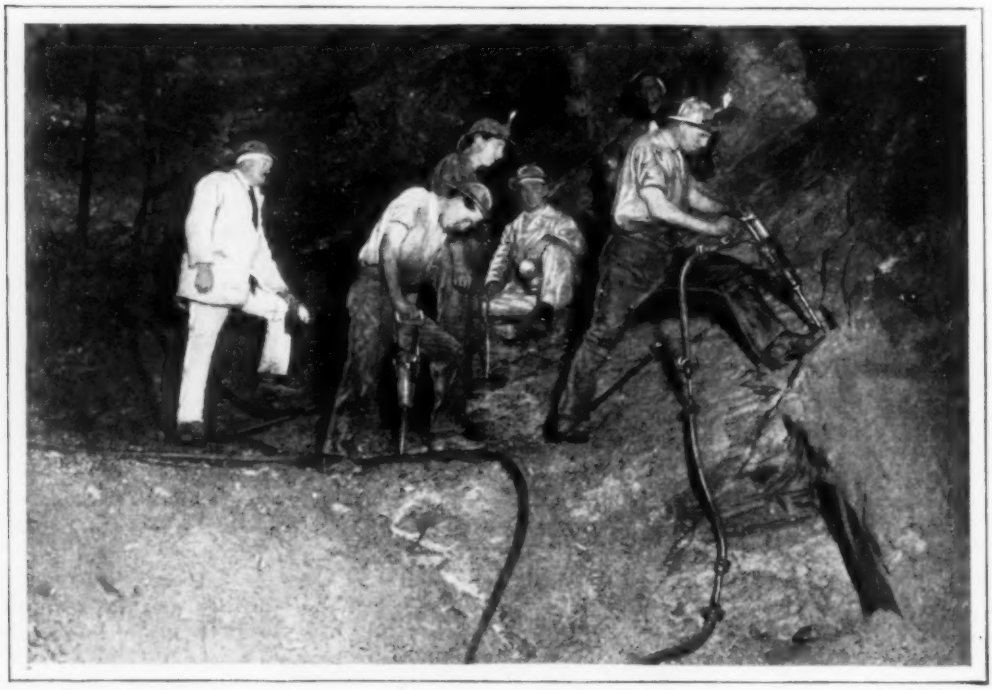
Clay deposits occur in almost every state. Brick of one grade or another can be made from most clays, but higher quality commands much better prices. Location near factory sites and not too far from markets have much to do with the value of clay banks, for clay products are heavy. Fine white porcelain clay, or kaolin, suitable for the best chinaware, is rarely found. Pottery plants and university departments of ceramics will give information as to the uses of clays.

There is an infinite number of valuable minerals, from marble, slate and building stones, coal, iron ore, gypsum, to salt, borax, epsom salts, glass sand and asphalt. Only one locality furnishes slate of quality high enough for use in the manufacture of electrical switchboards.

Many treasures worth fortunes will be uncovered and marketed in years to come. Industry demands increasing quantity and variety of materials. Substitution is common as competition grows ever keener. Cheaper materials constantly replace more expensive ones.

Senator Tasker L. Oddie, of the mining state of Nevada, said recently: "Since the beginning of complete record, in 1880, the total value of output of minerals in the United States is nearly $100,000,000,000. While holding firmly the leadership of the nations in the production of minerals, the United States yet lacks adequate supplies of a few highly essential minerals, such as tin, platinum, potash, nickel, chromium, antimony and nitrates."

Here, then, are some scattering exam-



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Drilling Tin Ore in Cornwall, England, Where the Romans Operated Mines in Caesar's Time; Vast Quantities of Arsenic Are Recovered as a By-Product in Melting the Ore

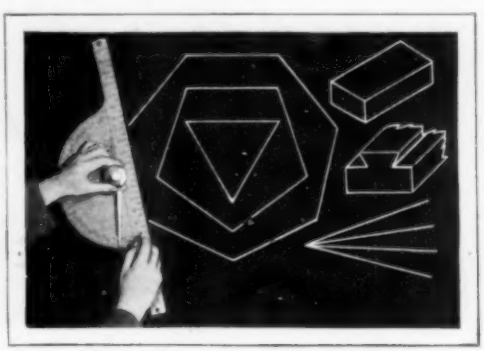
ples of the treasures which lie under our feet, waiting for us to discover and market, and perhaps to find new uses for them. They offer no smoothly paved road to wealth—but a rough path is better than no road at all.

WEIGHING BY RADIO

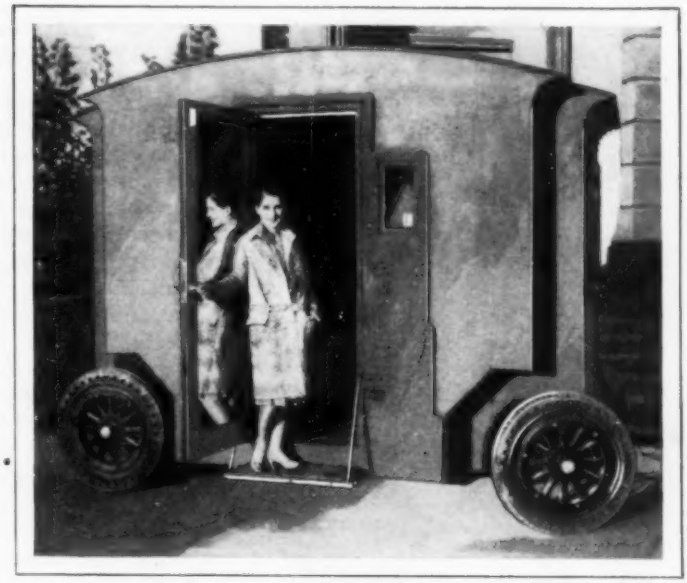
Based on the principles of a radio-receiving set, an apparatus has been developed that accurately weighs such materials as paper, rubber, coated fabrics or other substances that pass through it in a continuous web. An important element in the process is the employment of a tuned radio circuit. The material passes between two parallel metal plates which act as a condenser in the receiving circuit. Variations in the weight of the web, change the capacity of the condenser and affect the response of the circuit. These variations are shown on a meter.

GRAVITY-GUIDE DRAWING RULE PROMOTES ACCURACY

To simplify the task of making accurate drawings on a blackboard, a guide has been introduced that has an arrow pointer, governed by gravity, to assist in the correct formation of angles. The unit is a ruler and protractor scale combined. To draw the angle required, the guide is moved sideways until the arrow points opposite the degree desired. A knob in the center simplifies the handling of the guide, and it can easily be adapted for many special tasks both at the blackboard in schools and at the draftsman's desk.



Arrow on Ruler Falls to Desired Angle Setting When Guide Is Slanted Correctly for Accurate Drawing



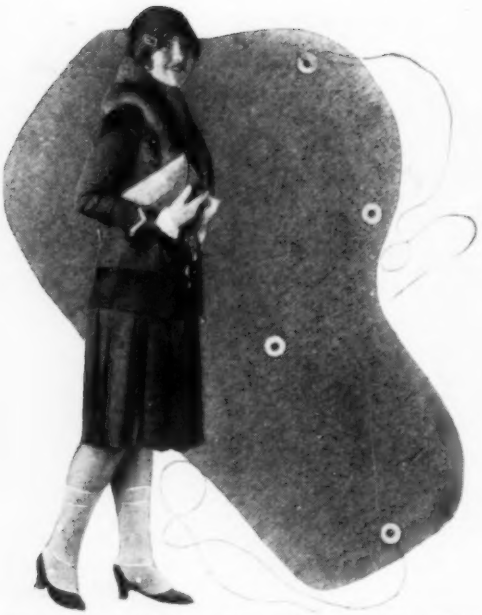
Norma Shearer in the Doorway of Her Portable Dressing Room, Which Saves Time and Trouble While Filming a Picture

DRESSING ROOMS ON WHEELS SERVE MOVIE STARS

Portable dressing rooms have been introduced in the Hollywood studios for the convenience of the stars and to save time on productions. They are mounted on an automobile chassis and are pulled about by a small tractor. Wardrobe space, tables, chairs and an electric refrigerator, are afforded in the traveling rooms.

COIN-IN-SLOT CIGAR VENDER FOILS CHEATING

Two cigars and a box of matches are delivered to the purchaser from a coin-in-the-slot vending machine which is so arranged that it will not work unless the proper coin or coins are deposited. There are slots for quarters, nickels and dimes, but the various coins will not operate the machine if put in the wrong slots and dimes and nickels will be returned.



Paper Spats Adjusted, and in Background a Close View of One of Them, Showing the Form

PAPER SPATS SHIELD STOCKINGS AND KEEP OUT COLD

Paper spats that can be adjusted in a second or two and are almost as durable as cloth have been introduced to protect women's stockings from mud spatters. They guard the shoe and reach up high enough to shield the area most likely to be stained. In addition, they add considerably to the wearers' comfort on cold and wet days.

SMOKE ROBS CITIES OF SUN NEEDED FOR HEALTH

The smoke pall that hangs over the average American city cuts off as much as forty-two per cent of daylight on sunny mornings, and as high as eighteen per cent at noon, according to a survey made by the U. S. public health service. Besides lessening the sunlight that reaches the earth, it also stops a large portion of the ultraviolet rays which are so necessary to good health. The survey, made in several representative cities, showed the most serious losses in winter, and the least in June. The smoke pall is usually heaviest in the early morning and late afternoon, and least in the middle of the day.

OLD MINERS' PAN REPLACED BY CENTRIFUGAL SEPARATOR

To take the place of the familiar pan in separating gold from sand and gravel, a whirling bowl devised by a Nebraska man is operated on the same principle as a cement mixer or a cream separator. A revolving screen removes the coarse gravel before the material is run into the bowl itself. This is fitted with grooves that retain the heavy gold particles as the container turns. The outfit is operated by a small engine and there is a pump to furnish water. A small unit will handle from twenty to thirty tons of material a day.

"GUN" WASHES AND BRUSHES CARS IN TWO MINUTES

Motor busses at an English station are thoroughly washed in a few moments with the aid of a combined brush and water-spray gun. Electric pumps force the water out at a pressure of 3,000 pounds to the square inch and the operator can regulate the stream to form a fine spray or a direct flow, as he desires. The exterior of the car can be cleaned very quickly, and water reaches parts that would be slighted in ordinary washing.

Quick Cleaning for London Busses; Water Is Forced through the "Guns" by Electric Pumps

What Do You Weigh — *Relatively Speaking?*

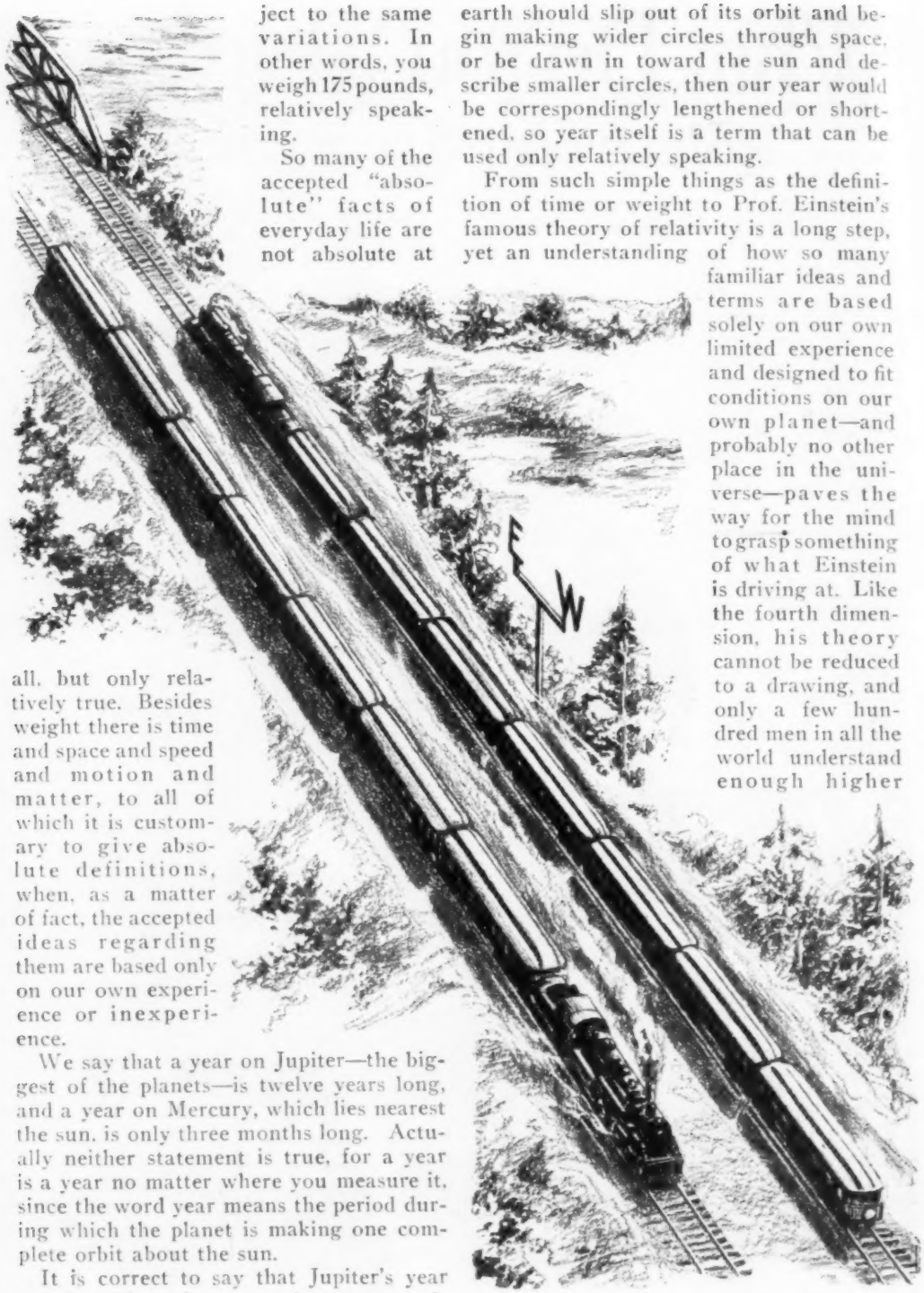
By J. EARLE MILLER

THE great American merchant liner "Leviathan" weighs 59,957 tons—sometimes and under certain conditions.

If the moon happens to be shining directly overhead, she weighs twelve pounds less. If she is crossing the Atlantic westbound she weighs more, and if she is eastward bound for Europe she weighs less. If she is going eastward at eighteen knots she weighs less than when she slows down to ten knots in a fog, but if she is bound westward she weighs less at ten knots than she does at eighteen.

And if you step on the scales in New York and weigh in at 175 pounds and then board the "Leviathan," you immediately become sub-

When the Man in the Moon Shines Down from Overhead on the Nearly 60,000 Tons of the Liner "Leviathan" the Great Ship Loses Twelve Pounds of Its Supposed Weight



Identical Trains, Passing in Opposite Directions, Yet One Weighs Less Than the Other

ject to the same variations. In other words, you weigh 175 pounds, relatively speaking.

So many of the accepted "absolute" facts of everyday life are not absolute at all, but only relatively true. Besides weight there is time and space and speed and motion and matter, to all of which it is customary to give absolute definitions, when, as a matter of fact, the accepted ideas regarding them are based only on our own experience or inexperience.

We say that a year on Jupiter—the biggest of the planets—is twelve years long, and a year on Mercury, which lies nearest the sun, is only three months long. Actually neither statement is true, for a year is a year no matter where you measure it, since the word year means the period during which the planet is making one complete orbit about the sun.

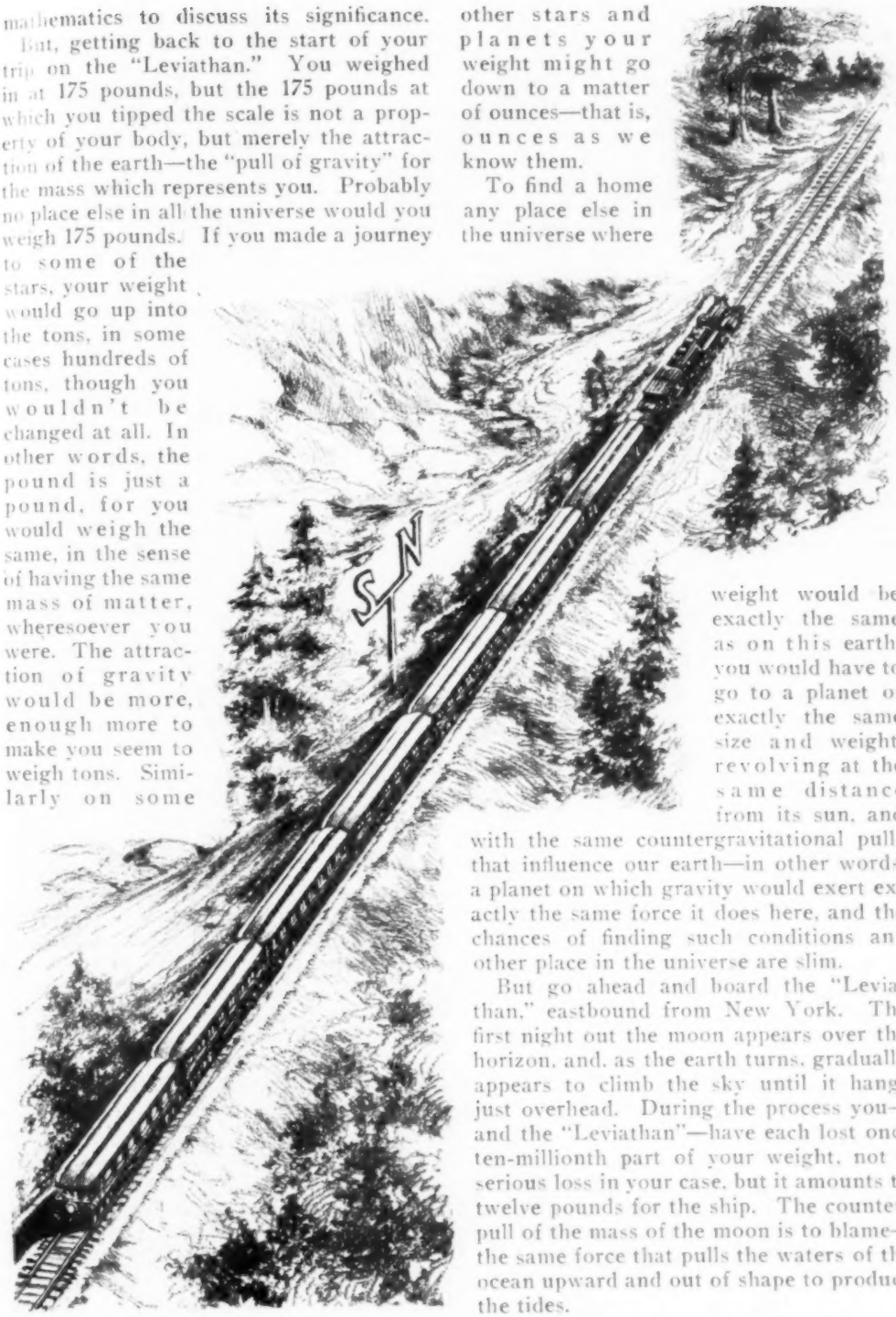
It is correct to say that Jupiter's year equals twelve of ours or that our year is equal to four of Mercury's years. If our earth should slip out of its orbit and begin making wider circles through space, or be drawn in toward the sun and describe smaller circles, then our year would be correspondingly lengthened or shortened, so year itself is a term that can be used only relatively speaking.

From such simple things as the definition of time or weight to Prof. Einstein's famous theory of relativity is a long step, yet an understanding of how so many familiar ideas and terms are based solely on our own limited experience and designed to fit conditions on our own planet—and probably no other place in the universe—paves the way for the mind to grasp something of what Einstein is driving at. Like the fourth dimension, his theory cannot be reduced to a drawing, and only a few hundred men in all the world understand enough higher

mathematics to discuss its significance.

But, getting back to the start of your trip on the "Leviathan." You weighed in at 175 pounds, but the 175 pounds at which you tipped the scale is not a property of your body, but merely the attraction of the earth—the "pull of gravity" for the mass which represents you. Probably no place else in all the universe would you weigh 175 pounds. If you made a journey to some of the stars, your weight would go up into the tons, in some cases hundreds of tons, though you wouldn't be changed at all. In other words, the pound is just a pound, for you would weigh the same, in the sense of having the same mass of matter, wheresoever you were. The attraction of gravity would be more, enough more to make you seem to weigh tons. Similarly on some other stars and planets your weight might go down to a matter of ounces—that is, ounces as we know them.

To find a home any place else in the universe where weight would be exactly the same as on this earth, you would have to go to a planet of exactly the same size and weight, revolving at the same distance from its sun, and with the same countergravitational pulls that influence our earth—in other words, a planet on which gravity would exert exactly the same force it does here, and the chances of finding such conditions any other place in the universe are slim.



Why Does the West Rail of a North and South Railroad Line Get the Most Wear?

But go ahead and board the "Leviathan," eastbound from New York. The first night out the moon appears over the horizon, and, as the earth turns, gradually appears to climb the sky until it hangs just overhead. During the process you—and the "Leviathan"—have each lost one-ten-millionth part of your weight, not a serious loss in your case, but it amounts to twelve pounds for the ship. The counter-pull of the mass of the moon is to blame—the same force that pulls the waters of the ocean upward and out of shape to produce the tides.

It being a clear, moonlight night, the ship is proceeding at full speed, but before

dawn fog blankets the sea and she slows down. Now she weighs more than she did when running with throttle wide open.

A more familiar illustration of the reason for that is the old catch question why a train bound, say, from Chicago to New York, weighs less than the same train, of exactly the same weight when standing still, weighs when westbound from New York to Chicago. You have to go back to centrifugal force, a common phenomenon, for the explanation. In its simplest demonstration centrifugal force is the power that keeps water in a pail when you whirl it over your head, the power that causes objects revolved rapidly to try to fly away from the center, in defiance of the laws of gravity. A flywheel, revolving rapidly, may burst from the strains of centrifugal force, and the pieces will fly high and far. If they could keep the speed at which they started at the moment of bursting they would never come back to earth, but go sailing off through space entirely free from the pull of gravity, and, therefore, having no weight, since weight is not a property of the mass itself but merely the pull exerted by the mass of the earth.

Now, go back to the eastbound train. Standing still, it weighs, let us say, a thousand tons. It pulls out of the Chicago station and starts east, in the same direction in which the earth is revolving. Imagine that, instead of being limited to sixty or seventy miles an hour, its speed could keep on increasing and increasing until, like the bursting flywheel, it reached a speed at which it would overcome the pull of gravity and go hurtling off into space. At the instant it left the rails, it would cease to have any weight, for gravity would have ceased to pull it. But it didn't lose all that thousand tons of weight in one moment. Instead, from the moment it began to move, it was losing weight, more and more as its speed increased, until eventually it had no weight. The loss of weight was a property of increased speed. Standing in the station, the train itself was not moving, but the earth was turning at something over a thousand miles an hour, surface speed, at the equator, and at something less than that in the latitude of Chicago. So the train, while standing still in the station, was actually moving through space at, let us say, about 800 miles an hour. Leaving the station it speeds up to sixty miles an hour, measured on the earth's surface, but its speed through space is sixty miles plus the earth's speed, or 860 miles.

The same train, going west, is moving in the opposite direction to the rotation of the earth, and, the faster it goes westward, the less its actual speed through space. At sixty miles an hour its speed through space has fallen to 740 miles, and its weight has correspondingly increased, since the tendency to fly off into space through complete loss of weight is correspondingly less.

It isn't often that the speed of the earth's rotation has to be taken into account in planning things on earth, but there are some notable examples. One is the fact that the west rail of a north-and-south railroad track has the hardest wear and will, in the normal course of events, give out first. If you have ever stood in a moving street car, railway train or other vehicle, facing at right angles to the direction of movement, you have found yourself putting more weight on the foot toward the rear, than on the forward one. The tendency of your body to remain stationary instead of moving through space with the vehicle, in other words, the inertia of the body, is to blame. When the railroad track runs north and south, the train is affected in the same way, trying to resist the movement of the earth's surface at several hundred miles an hour toward the east, and, consequently, there is more of the train's weight on the west rail than there is on the east. The human body is affected the same way when walking either north or south, but the unbalancing of weight is so slight that it is not noticeable. A train weighing a thousand tons or more, however, is affected sufficiently to shorten the life of the west rails.

When the Germans fired their long-range cannon on Paris, they had to make very intricate calculations to allow for the changing position of Paris during the minutes the shell was in flight. If a shell, fired from east to west, had a muzzle velocity equal to the speed of the earth's rotation in the latitude in which it was fired, it would, in effect, be standing still in space waiting for its target to come along beneath it. If the German gun, instead

of being used on earth, had been moved to the moon, its range, instead of being seventy-five miles, would have been 2,250 miles, or one-quarter of the moon's circumference. If the gunner used an elevation of about four degrees, he could fire a shell entirely around the moon and hit himself in the back, according to calculations by Dr. F. E. Wright of the Carnegie institution.

The reason lies in the fact that the moon, with a much smaller mass, has but about one-sixth of the earth's gravitational pull, in fact the moon is too weak to even hold an atmosphere on its surface. An ordinary seventy-five-millimeter field-gun, with a range of five to eight miles on earth, would shoot 230 to 280 miles on the moon. If the familiar craters of the moon are really of volcanic origin, Dr. Wright points out, the moon's weak gravitational force, together with the absence of wind and water to corrode, explains their peculiarly rugged and clean-chiseled appearance, for all the material thrown out by the volcanic explosion would be hurled so far away that none could fall back into the pit. Put in the familiar terms of weight the stone and iron and other material expelled from the craters would weigh but about one-sixth what the same material would weigh on our earth, though actually its structure would be the same.

If the Man a Little More Than Seven Miles from the Pole, and the Flyer at the Equator, Both Stop for One Day, What Is Their Relative Speed?

Time is another of the familiar facts that is only relatively true. One interpretation of a mathematical equation is that time varies with speed. Carried to its logical conclusion, the idea means that a perfectly accurate clock, if traveling through space with the speed of light, would not show that any time had elapsed. The argument by which higher science arrives at the result is, to the lay mind, fantastic, but some of the other logical conclusions are not so hard to reconcile with facts that we accept without difficulty.

Take the old trick question regarding the age of the man, born in Chicago, who, some time during his life, moves to New York, and dies there. Obviously there is a discrepancy of an hour between his apparent and his actual age, for, if he dies at noon in New York, it is only 11 o'clock in Chicago, and hence he is really one hour younger than his apparent age, based on New York time. Or reverse the process and he is one hour older.

Now take the case of a person who makes a trip around the world. If he goes in one direction he loses a day, and if he goes in the other he gains a day. In a normal year of 365 days the circumnavigator who goes west with the sun gains a day in mid-Pacific and actually lives 366 days in the year, while the eastbound traveler loses a day in the same place, and so has 364 days that year. Carrying the example farther, if the traveler in his lifetime makes 365 round trips around the world, always in the same direction, his apparent age at the time of death must actually be one year wrong—he is either one year older or one year younger.

Even the passenger in an automobile going west or east is slowing down or speeding up time, living faster or slower, as the case may be. If he drives westward and crosses from one time zone into another during the day he is living slower, for he crowds twenty-five hours into a twenty-four-hour day, and if he travels east, he lives faster, for his day is but twenty-three hours long.

That is easily understood, but when the mind travels along the pathway toward Einstein's relativity the theory becomes more complex. For example, time moves more slowly in a moving automobile than in one standing still, for time varies with speed. Outside of the realms of higher mathematics that concept is almost impossible of explanation. The best way is to admit we have no conception of what time really is, and cannot possibly describe it.

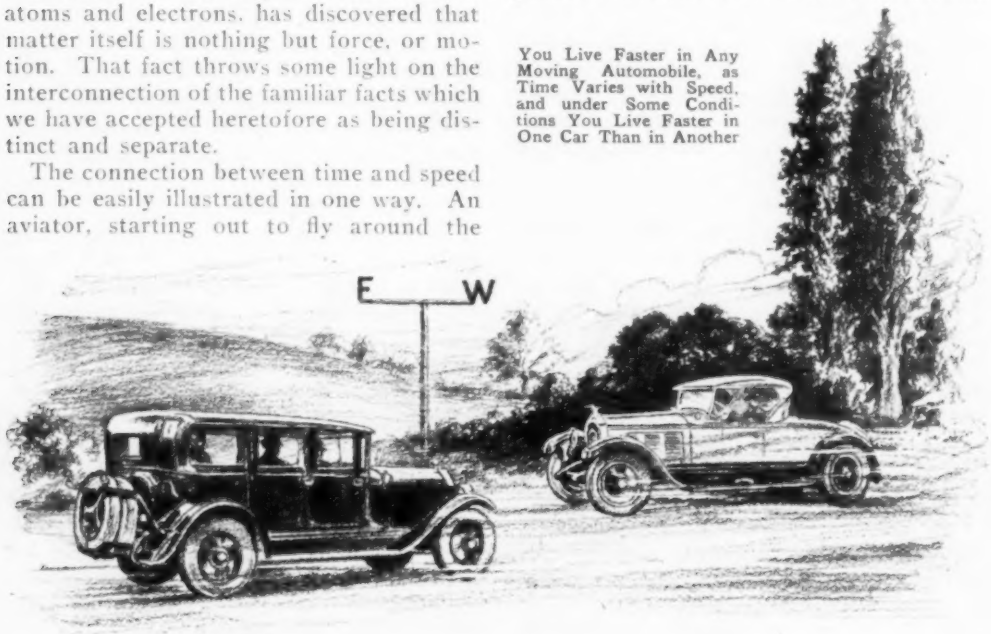
The trouble is that the purely relative definitions of time, space, motion and matter that have been accepted for everyday use, within the limitations of our own experience and own world, fail to take into consideration the necessities of the entire universe. That one of the four might possibly be converted into one of the others, is not reckoned on, for they are usually considered as separate things.

Science, in reducing the elements to atoms and electrons, has discovered that matter itself is nothing but force, or motion. That fact throws some light on the interconnection of the familiar facts which we have accepted heretofore as being distinct and separate.

The connection between time and speed can be easily illustrated in one way. An aviator, starting out to fly around the earth, following the equator, and wanting to complete the journey in one day, would have to attain an average speed of more than 1,000 miles an hour. A pedestrian, standing slightly more than seven miles from the North Pole, could walk around the world in one day by averaging a mile an hour. But imagine the aviator at the equator remaining in his camp and the pedestrian near the pole sitting in his igloo for twenty-four hours. The one has moved through space at the speed of more than a thousand miles an hour and the other at the speed of a mile an hour, as the earth rotated on its axis, yet both have traveled for the same time at the same apparent speed, since neither moved.

Going back, finally, to the problem of weight and gravitation. Newton's theory of the attraction of the earth for the apple was so sensible that everyone accepts it without question. Yet no one has ever seen this force, and no apparatus has ever been invented that will reveal any attraction. Gravitation is just a name for one of our sensations. Einstein himself, in one of his lectures, told a story that set forth how ignorant science is of the actual nature of this attraction.

He proposed that the audience imagine a man inclosed in a perfectly dark cage, poised, motionless, far out in interstellar



You Live Faster in Any Moving Automobile, as Time Varies with Speed, and under Some Conditions You Live Faster in One Car Than in Another

space. The man would not weigh anything and he could move freely about the cage from side to side or from top to bottom, since there would be no attraction to hold him down, or, if he desired, he could simply float in the cage without touching it. Next imagine that, unknown to him, a cable is attached to the top of the cage and some strong force begins pulling on the cable, drawing the cage swiftly upward, the force being so steady and noiseless that it would remain unsuspected by the man.

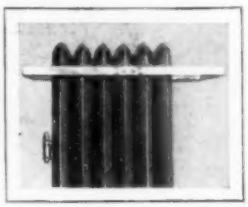
What would his sensations be? He would suddenly find himself drawn against the bottom of the cage, and only by a strong effort could he jump momentarily free of it. An outside onlooker could see that the bottom of the cage was being drawn upward toward the man, but the latter would never suspect this. For all we know, Einstein explained, the apparent attraction of the earth, which we call gravitation and which expresses itself as weight, may be merely a new and undiscovered form of motion.

© Twenty Wacker Drive Building Corp.

Architect's Drawing of the Proposed Home for Chicago's Civic Opera Company, to Cost, with the Land, $20,000,000

FOLDING DRIER FOR RADIATOR LATEST TRAVELING AID

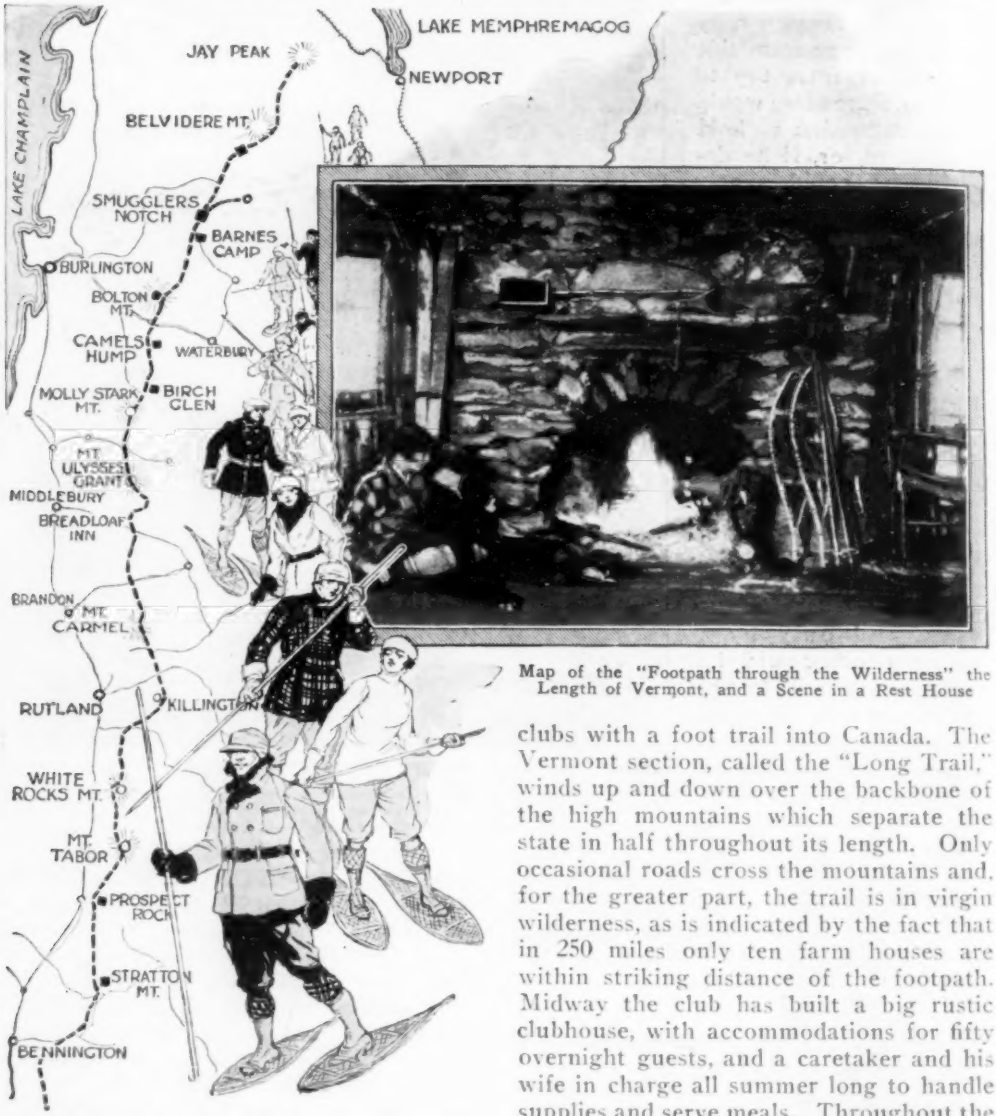
Drying a small washing by the radiator is simplified with a folding rack invented by a woman. It consists of an arrangement of rods which are easily attached to the radiator and hold the garments so as to prevent scorching or soiling. The rack folds up in small space when not in use, for convenient carrying.



FORTY-TWO-STORY STRUCTURE TO HOUSE OPERA

Construction has begun on a permanent home for grand opera in Chicago. With the land, it will cost about $20,000,000 and will include a smaller theater, besides stores and offices. The main structure will be twenty-one stories high. In the center will be a tower with twenty-one additional stories, 550 feet high, and the equivalent of two and three stories will go below the street level. The opera house will have 3,600 seats and thirty-six boxes. A feature will be an "omnibus" box for men unaccompanied by women. Stage facilities will be arranged to permit more rapid changes of scenes than are possible with existing equipment. The prompter's box will also accommodate the men who control the lights, so that there will be greater co-operation between them.

MOUNTAIN CLUB BUILDS FOOTPATH IN WILDERNESS



Map of the "Footpath through the Wilderness" the Length of Vermont, and a Scene in a Rest House

A footpath through the wilderness, including nearly 250 miles of forest trail, has been completed in the Green mountains of Vermont by the Green Mountain club as the first link in a chain of hikers' paths that will reach down through the White mountains and the Appalachian range as far as northern Georgia. The first section, stretching from within a few miles of the Canadian line down the length of Vermont to the Massachusetts line, is being connected by Montreal trampers' clubs with a foot trail into Canada. The Vermont section, called the "Long Trail," winds up and down over the backbone of the high mountains which separate the state in half throughout its length. Only occasional roads cross the mountains and, for the greater part, the trail is in virgin wilderness, as is indicated by the fact that in 250 miles only ten farm houses are within striking distance of the footpath. Midway the club has built a big rustic clubhouse, with accommodations for fifty overnight guests, and a caretaker and his wife in charge all summer long to handle supplies and serve meals. Throughout the trail, at intervals of six to eight miles, are shelter houses, with bunks.

FIREPROOF LINOLEUM

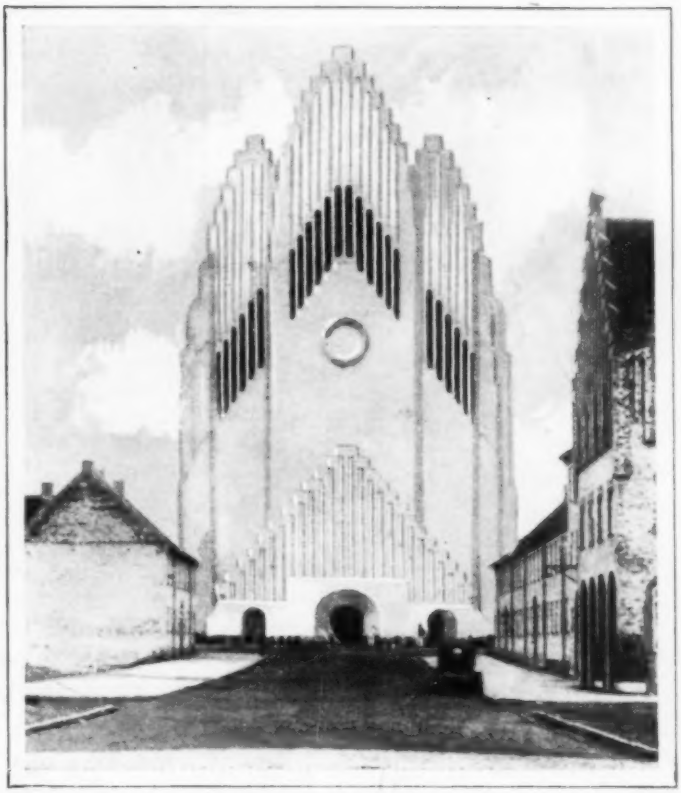
Introduction of a kind of linoleum that is almost incombustible, cheap, easy to handle and durable, has been announced in England. When it is heated to a high temperature, a chemical in it gives off a gas which stays close to the floor, cuts off the air supply and so smothers the blaze.

ARE MICE SMARTER THAN MEN?

The brain of a mouse constitutes five per cent of its body; the brain of a human being but two per cent. Are mice smarter? Interesting findings concerning the relative intelligence of different kinds of animals have been made by Prof. George H. Parker, of Harvard university. He declares that, at night, a mouse is often sharper than a human being, but its daytime intelligence cannot be compared with that of a person. Sea anemones, jellyfish, coral animals, starfish and sea urchins have no "minds" at all, the professor concludes, after many experiments with these creatures. Dogs are better at obeying orders than cats but the cat more often gets what it wants. However, the two cannot be fairly compared, Prof. Parker says, as each outshines the other in some particular. It is likewise impossible to establish a definite scale of animal intelligence, although the chimpanzee is the most intelligent and the chicken among the least.

TRANSIT AND LEVEL COMBINED TO AID BUILDERS

Greater simplicity in adjustment is the chief feature of a transit-level that has been devised, especially for surveys on buildings and sites. It can be changed from a level to a transit or vice versa without lifting or fixing any parts. This eliminates the danger of dropping the telescope or replacing it in reverse.



Architecture Takes a Lesson from the Pipe Organ; Front of Odd Church Recently Completed in Denmark

CHURCH SHAPED LIKE ORGAN BUILT IN DENMARK

Danish architects have introduced a novelty in church architecture in a structure that resembles a huge pipe organ. In place of the usual steeple effect, the front is made up of tall, cylindrical forms like those of the organ. The arrangement also permits changes in design of the windows.

ARTIFICIAL DAYLIGHT FOR BIRDS BENEFITS ZOO SPECIMENS

Special artificial lighting has been introduced at the London zoological gardens for the benefit of tropical birds that do not thrive well in the natural light of gloomy winter days and are injured by too bright a glare from ordinary lamps. The illumination provides a mild, diffused glow that not only helps the birds but makes it possible to take photographs of the specimens with greater ease.

Close View of the Trimmer, Showing the Block-and-Tackle Rig and Cutter as Though in Use

BLOCK-AND-TACKLE TRIMMER EASES PRUNING TREES

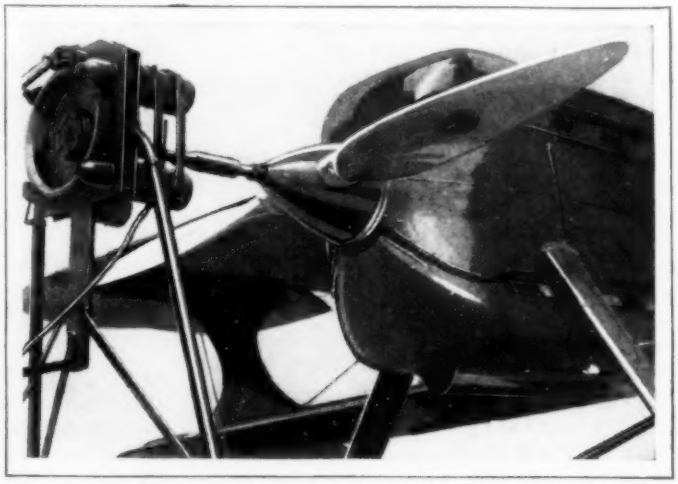
The principle of the block and tackle is adapted to a tree trimmer now on the market, with the result that time and labor are saved and the quality of work generally improved. Both hands are kept on the pole, making it easier to guide, and cutting is done with much less effort. The blade is pulled down by moving a sliding grip to which the tackle rope is attached. As soon as the limb is severed, a spring jerks the blade and the grip back to working position again. It is estimated that at least twenty per cent more power is afforded with this rig, as compared with the usual lever outfit. It is also lighter and quicker in action.

FANS FOR DRYING CORN IN CRIB LATEST AID TO FARMER

Powerful little ventilating fans have been adapted to the drying of seed corn, an outfit now developed being simple to install and considered practical for large raisers of the crop. Unit heaters are employed, and warm air blown through the corn, or the grain may be carried through a tunnel and the air blown around it. When heaters are not used, the drying can be accomplished by fans only. They are arranged to distribute air under the grain through pipes on the floor of the crib. Farmers are coming to realize more and more the importance of proper ventilation in barns where stock is kept. It has been demonstrated that a cow needs sixty cubic feet of air per minute to keep it in a healthy condition, a horse needs 4,200 cubic feet per hour and a hog, 1,500. Bees also require a regular air supply.

TWENTY-FOUR CYLINDER PLANE HAS RADIATORS IN WINGS

Special design was necessary in constructing one of the large airplanes for the Schneider cup races, particularly because of the cooling problem, and, for that reason, radiators were built in the wings to cool them and the motor as well. The engine had twenty-four cylinders and was made to develop a speed of more than 300 miles an hour.



View of the Radiator-Winged Plane at the Starter; Water in the Wings Helps Cool Radiators and the Motor

Chauncey McGovern Studying the Photo-Micrograph of a Human Hair, Which Helped to Prove That a Man Who Had Confessed a Double Murder Was Innocent, and Fixed the Crime on Another Person

TRUE STORIES of the MANHUNTERS

(The All-Seeing Eye)

By H. H. DUNN

A NEW and powerful force has joined the side of the law in the war on crime.

It has been established that the camera lens sees clearly that which the human eye, even when aided by the most modern of microscopes, fails to distinguish and that the photographic negative will record facts which the human mind does not grasp through any of the five senses. The result of this discovery is the camera detective, a man versed not only in the technicalities, but in the chemistry of photography to such an extent that he can make documents, handwriting, typewriting, fingerprints, even footprints, human hair, and other by-products of the so-called "perfect crimes," reveal not only what was done, but how the crime was committed.

Far different from the "handwriting expert," the "fingerprint reader" or any other previous form of scientific detective is this new mechanical sleuth. He never depends on his own eye, or even the eye of the latest development in microscopes, to establish a fact; he lets the lens of the camera, searching slowly and deeply among the evidence, carry to a specially prepared film the record which every criminal leaves somewhere in his activities. He uses no high-speed lenses, no complicated camera, no costly plate or film, no expensive paper. He can do his work, completely, competently and perfectly, in his own home with a $25 outfit, and he can present his evidence in such form that a jury will be convinced of its accuracy and truth.

A few months ago there arrived in San Francisco an aged clock repairer, who laid before the authorities a document he claimed to have found, with other papers, in a grandfather's clock he had bought in a small town in Georgia. As the district attorney read this paper, his mouth opened and his eyes bulged, for it purported to dispose of an estate valued at $330,000,000,

for which one will had been probated and the property distributed some time before. This alleged will was of later date; the signature, compared with that on the will

Proved to Have Been Written after Other Writing on the Same Sheet. This Photo-Micrograph Foiled a Fraud

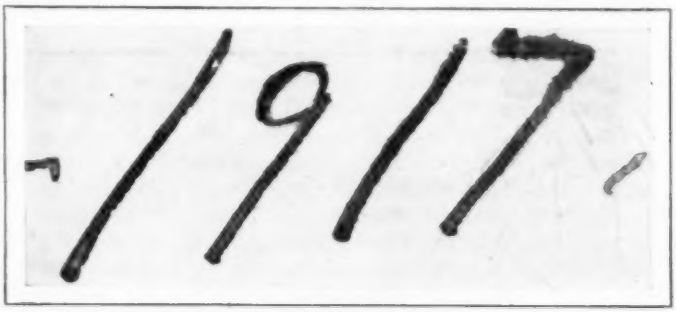
which had been officially recognized, seemed absolutely genuine.

But in San Francisco is the man who developed the camera as a detective, the man to whom city and county authorities turn when in doubt. He is responsible for decisions, made through the lens, on which more than half a billion dollars in litigation have been disposed of, both in and out of courts. His name is Chauncey McGovern, and it should be said that he looks less like the typical plain-clothes sleuth than it is possible to imagine.

McGovern put the newly found will in front of an ordinary camera, with a slow lens, and in the plateholder placed what is known as a process film, one which requires a long time for exposure, but brings out details invisible to the human eye or to the microscope, when an enlargement is made. First of all, the camera told the operator that the paper had been cut from a larger sheet, by revealing irregularities in the edge which the eye would not notice. Next the lens said that the paper was very old, of a peculiar kind, formerly used in legal documents in the southern states, but not manufactured today. The date of the paper was roughly fixed at fifty years ago.

Then, the enlargement, a huge square three or four feet in each dimension, revealed that the paper had been folded before the writing on it had been done. The creases were visible to the lens, as were also the minute overflow of ink from the letters, where the latter were written across one of the folds, so that the sizing, or surface, of the paper had been broken and the ink admitted to the fiber. At last came the most remarkable information of all. Beneath the present writing on the paper appeared, dim and gray, but imbedded in the very fiber of the old document, other letters, which had been erased with an acid, before the will had been written. These gray letters appeared everywhere except under the signature. In other words, the paper had been a letter, signed by the man who accumulated and left the vast estate. From it had been removed the original writing, and the new will substituted, leaving the genuine signature. Presentation of the facts to the proponents of the alleged will caused a speedy withdrawal of their claims.

An elderly man, carrying a rifle on his arm, surrendered to the sheriff of a California county, confessing that he "must have killed his two brothers." His story was that he lived with his brothers, all



The Camera's Eye Discovered This Date Had Been Altered from 1919 and the Other Figures Redrawn over Smaller Digits

elderly men, in a house in the mountains; that a friend, who lived some five miles

The Camera Speaks All Languages; Here Is a Note, Written in Chinese on a Playing Card, with Samples of the Author's Writing in English

away, had come in with a gallon of moonshine the night before; that they had drunk the moonshine, and that he had gone to bed intoxicated. In the morning, when he awoke, he found his own rifle, with one cartridge discharged, in his arm, and his two brothers shot to death in the next room.

The authorities rounded up the distant visitor as a witness. This man denied having been at the house, so McGovern took his little camera and his process films, and proved, by tracks in the earth, that a horse belonging to this fourth man had been at the three brothers' house recently. On a brush in the house he found black hair. All three of the brothers had white hair. The jail barber, where the fourth man was held merely as witness, cut the latter's hair. The camera compared the hairs, enlarging them until each was more than an inch in thickness on the print. Those found on the brush were proved identical with those from the head of the suspect.

One of the bottles from which the four had been drinking was filled with black ink, covered with fingerprint powder and a photograph made. Fingerprints of the suspect were taken and photographed. But the prints on the bottle were in white on a black background; those of the suspect were in black on a white background. The camera solved the problem and made them comparable. Making a positive of the black prints, McGovern printed from it, and had both sets of fingerprints in white, proving them identical. Thus the camera removed from an aged man the terrible belief that he had murdered his own brothers.

A Chinese man, twenty-four years old, appeared from the Orient at San Francisco, demanding admittance as an American citizen. He was held at the immigration station. He claimed that he was born in Arizona, of a Chinese father and a Mexican mother; that, when he was four years old, he had been sent to his father's people in China, and that this was his first return to his native land. He presented a photograph of what purported to be himself as a child of four, and one of himself at present, made in China the day before his departure. He also had his passport of nineteen years before. The camera detective took these two photographs and enlarged them equally, until he had the two faces four feet square. Their identity was so obvious that the young man was admitted without the delay of an appeal to Washington.

The elimination of colors plays a prominent part in this new mechanical detective work. Faint ink marks are brought out hard and black; soiled paper made white, so that contrasts become brilliant, and creases, fingerprints, grease spots and

other ordinarily invisible identification signs are made plain.

There appears to be no end to the variety of work which the camera can do. A few months ago there appeared in a

The Firing Pin of Every Weapon Prints Its Own Individual Mark on the Cartridge for Future Identification

western city what might be called a "wave" of anonymous letters, all attacking the character of one woman, a bride of a short time. These letters were received, at the rate of one a month, by more than fifty women prominent in the society of the city. In each group of letters received by each woman, each letter was mailed from a different city, ranging from the Canadian border to the Gulf of Mexico and from the Atlantic to the Pacific. Each letter in each group was written in a different style of penmanship—some perpendicular, some backhand, some slanting, some with almost microscopic letters, some very large, some carelessly written, some with the greatest care. It was, in short, the most puzzling anonymous-letter-writing case which has appeared in American crime annals for many years.

After some six of these letters had been received by each of the more than fifty women, the object of their attacks and her husband appealed to the camera detective. One by one, the women who had received the letters came forward, until McGovern had some 500 of them in all the forms of writing adopted by the sender. Grouping these styles of penmanship, he reduced them to ten varieties. Then, going through the process described above, he made huge enlargements of one of each style.

These revealed, by peculiarities in the shadings, in the straight lines and in the forming of the most used vowels, such as "e," "i" and "o," that, while different pens had been used, the same hand had done all the writing. Photographic examination of the notes further showed that the same kind of paper had been employed for all, though the envelopes were different both in size and in quality. The object of the attacks suspected three women, social enemies. Samples of their writing were obtained, and the camera at once absolved them.

Then the young bride was asked to save carefully all the handwritten communications she received for one month. She did so, and among them were five notes regarding social affairs from a woman employed in the society department of a newspaper. These were written in one uniform style of penmanship, but the camera told that it was from the same hand that had penned the anonymous letters. Confronting this woman with the facts as bared by the negative brought a confession.

A marauder entering the office of a San Francisco manufacturer by night wore gloves, thinking to foil detection by leaving no fingerprints. He did, however, step in a dusty place on the floor, and then on the top of a desk to reach for certain records he wished to destroy. The camera saw that one footprint, compared it with the footprints made by shoes found

Bullets, Too, May Be Identified by the Camera and Traced to the Gun That Fired Them

in the home of a discharged employe of the factory, and the subject confessed.

"And it all can be done with a simple, cheap camera," says McGovern, "any camera, in fact, which has a ground glass in the back, on which accurate focusing may be done. The speed of the lens is immaterial, if time enough is given, a process

negative used, caustic-soda developer employed, and the fingerprint, hair, document, letter, footprint or photograph enlarged to the point at which the lens tells that which the eye and even the microscope cannot see. Today, with this inexorable mechanical investigator, no one can so disguise his handwriting—or even his typewriting—that the camera cannot tell the truth about it."

HOT SPRINGS HATCH CHICKENS IN SPECIAL INCUBATORS

Water flowing from hot springs near Thermopolis, Wyo., is to be led into specially constructed incubators for hatching chickens, it has been announced. The water remains at a temperature of from 135 to 150 degrees Fahrenheit the year around, and methods have been worked out for cooling it and keeping it at the proper heat for brooder purposes. It is also planned to use the water in hothouses for the cultivation of plants and vegetables. In one of the largest springs in this district, more than 18,000,000 gallons of hot water flow out every twenty-four hours.

SPEEDOMETER KEEPS A RECORD TO PREVENT DISPUTES

A motorcycle patrolman of Cleveland, Ohio, and an associate have devised a speedometer which promises to simplify the work of arresting violators of traffic laws and will also be a benefit to the drivers of cars, since it is adaptable both to motorcycles and to automobiles. Its distinguishing feature is that, besides registering the rate of a cycle while overtaking an auto and the speed of the car, these records are preserved for later consultation, so that all doubt and guesswork are eliminated. The instrument works automatically after a button is pressed, and the user need not watch it. For reference by a driver in case of an automobile accident, it would prove extremely valuable, as it would show just how fast the car had been going before the mishap took place.

Two Views of Model of Combination Craft with Double Propellers for Which High Speed Is Anticipated

BOAT AND AIRPLANE COMBINED TO MAKE HIGH SPEED

Principles of air and water navigation have been combined in a craft a western inventor has planned to develop high speed at a minimum expense. His boat is to be run by a screw propeller and also by an air propeller. In addition, it has a monoplane wing which may be folded back when the craft is docked. Steering will be done by the joint action of an air and water rudder. A speed of 100 miles an hour is expected without difficulty, the inventor believing that the wing and air propeller combined, with attendant decreasing of the weight upon the water, will give the desired effect. The water propeller is of a special cup-type that the maker of the craft has devised.

¶Last year, more than 1,000 automobiles crashed into trains.

FREAKS OF TORNADOES AND HOW TO DODGE THEM

Dust Storm about Base of Tornado, Photographed at Three Miles

Unusual Tornado Funnel; It Appears Largest at the Base

Top Photo © N. Y. Times

Huge Tornado Cloud Above and Below; One of the Strangest Ever Photographed

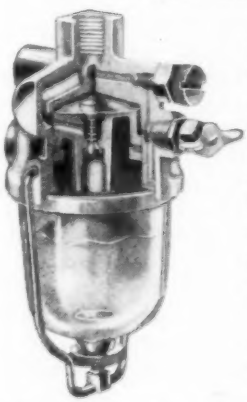
A tornado does not blow a building to pieces. It creates a partial vacuum so that the air confined in the structure bursts out, tearing the building into fragments. S. D. Flora, Kansas section chief for the United States weather bureau, is authority for this. But the suction force of a tornado is not as great as popularly believed. He says it has not sufficient power to lift up a person who is lying flat on the ground, although it may roll him about. Conditions in the great Mississippi valley region are particularly adapted for tornadoes. They form when a layer of cold air overlies a layer of warm air filled with moisture. They are most likely to occur in May and June. The action of the tornado is similar to the suction and whirling motion of water as it drains from a bathtub. Currents of air in the cloud do not move parallel to the ground, but either upward or downward. The destructive force is greater in the center. Tornadoes usually take place in the afternoon or early evening, following a warm, sticky morning, in which the lower air has been thoroughly heated. Few happen at night. That tornadoes do not cause more damage is because they cut such a narrow swath through the country. Rarely is a tornado more than two city blocks in width, generally much less. It is possible to outrun a tornado either with an automobile or train, as they ordinarily advance at from thirty to forty miles an hour, occasionally reaching a speed of sixty miles. A tornado develops as soon as the funnel can be seen hanging distinctly from the cloud, whether it reaches the ground or not. The funnels usually drop from low-hanging clouds. The greatest danger, Flora says, is not from the wind itself, but from the flying objects which the force of the storm whirls around with unbelievable velocity. If you ever find yourself in the path of a

tornado and want to flee, the best direction would be to the northwest, as the usual course is from southwest to northeast. But a better plan would be to lie down on the open ground, grab a root, or anything that is handy, to prevent being rolled by the wind, and trust to luck that no flying objects hit you. Flora says that, if you seek safety from a tornado in a basement, it is best to crouch down in the southwest corner, as debris is less likely to fall there.

BEAM OF LIGHT AS "POLICEMAN" HELPS CURB SMOKE

By means of a vacuum tube and a beam of light, engineers are able to measure accurately the density of the smoke pouring from chimneys and so more easily detect violations of anti-smoke ordinances. A photo-electric cell is a basic unit in the outfit. A beam of light is directed upon it through the chimney. When smoke becomes sufficiently dense to hide the light, the cell is actuated to cause an electric relay to function and a recording meter registers in the engine room. Thus, the attendants can see that too much smoke is being made without going outside and steps can be taken to curb it.

AUTO PROTECTOR STOPS MOTOR WHEN OIL FAILS



Efficient protection against burned-out bearings, and other troubles resulting from attempting to run an automobile without lubricating oil, is afforded in an attachment which stops the car when the oil is exhausted. It is connected with the vacuum tank at the top and functions through a valve which shuts off the gasoline when the oil pressure fails. An emergency screw permits the driver to obtain gasoline sufficient for driving to the nearest service station, should the shut-off occur while he is on the highway.

Portable Bandsaw Outfit Ready for Use; It Weighs But 135 Pounds and Is Easily Moved About

PORTABLE ELECTRIC BANDSAW FOR HOME OR SHOP

For factory or home-workshop use, a portable bandsaw, operated with current from a lighting socket, weighs but 135 pounds and has a seven-foot blade that cuts either metal or wood. Work is supported by a tilting table, eighteen inches square, and the drive is so arranged that maximum speed can be attained in two seconds after turning the current on.

GOLF-BALL HOLDER ON OUTSIDE OF BAG SAVES OPENING FLAP

Golf balls are held in plain view, and can be removed without opening the bag or unfastening a flap, in a holder fitted into the wall of the bag. Springs keep the spheres in position and, when one is wanted, it is a simple and easy matter to push the retainers aside or lift them and pull out the ball.

Harnessing the

Printing a Newspaper in Paris in 1878 on a Press Operated by a Solar Engine; the Group of Mirrors Focused the Sun's Heat on Water in a Copper Tube in Their Center

By RENE BACHE

THE classic experiment of frying a July egg on the sidewalk affords a beautiful illustration of the efficiency of the sun as a heater.

Discovery of means whereby the giant luminary could be put to work for mechanical and other utilitarian purposes would elevate civilization to a new and relatively exalted plane.

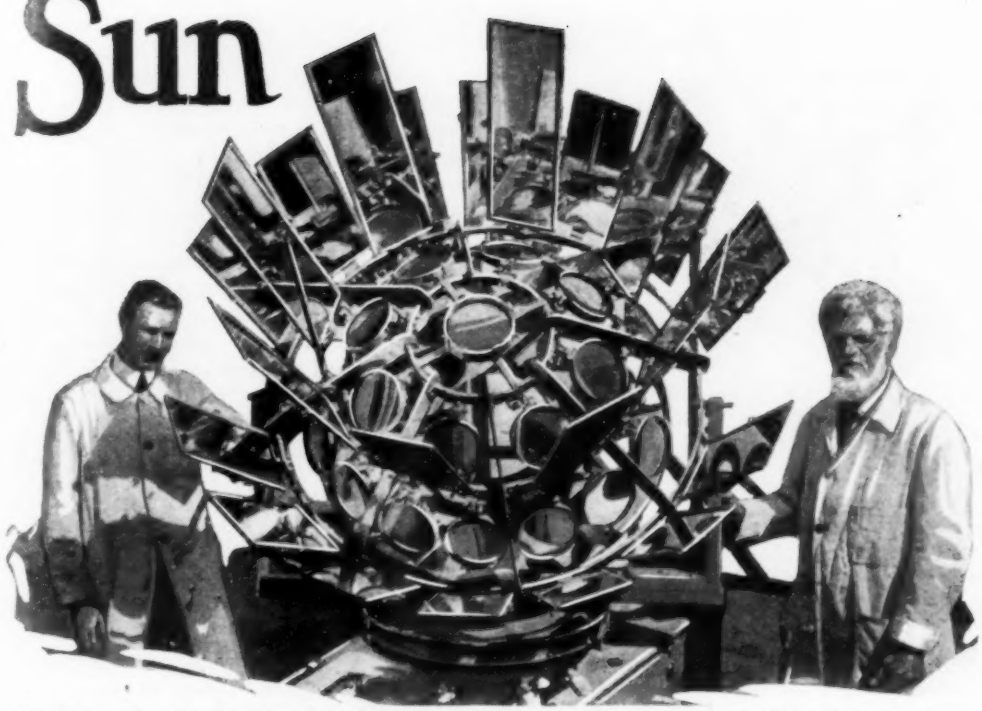
Such possibilities appeal strongly to the imagination. But why not drop speculation, just for the moment, and take a look at what has already been accomplished, in a practical way, toward a solution of the problem?

Large-scale mechanical plants, now operated in deserts of northern Africa, have proved economically efficient. In such regions, which have the advantage of cloudlessness and unfailing sunshine, there is exceptional opportunity for the employment of sun-driven machinery. Dr. C. G. Abbot, of the Smithsonian Institution, says: "In time, manufacturing will to a great extent follow the sun." The deserts may yet become great industrial areas.

Let us stick, however, to actual facts. In Tunisia and other French possessions of northern Africa, there is scarcity of water that is fit to drink, and solar distilling machines are in common use. Soldiers on the march are provided with portable apparatus of the kind, light enough to be carried on a man's back. It consists of a little boiler, a concave mirror, and a coil of tubing in a water jacket for a condenser. The sun's rays, concentrated by the mirror upon the boiler, will heat a quart of water and keep it boiling. One machine will supply four men, its output being two gallons per day.

In many parts of the world no safe drinking water is to be obtained, and resort must be had to distillation. At Salinas, in Chile, a large-scale contrivance for the purpose is a pentroof of glass with an area of 51,200 square feet, erected over a large, shallow water tank. The water, evaporated by the sun, is condensed on the relatively cool glass, trickles down its slopes, and drips from the lower edges into gutters which carry it to receptacles

Sun



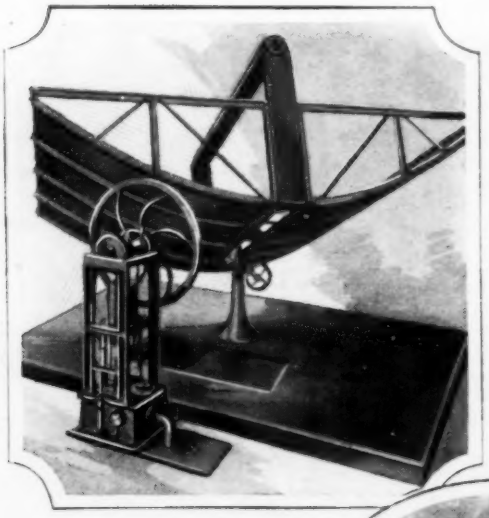
The Moreau Sun Furnace, One of the Many Mirror Devices Designed to Collect the Heat of the Sun from a Fairly Large Area and Focus It in One Spot to Do Useful Work

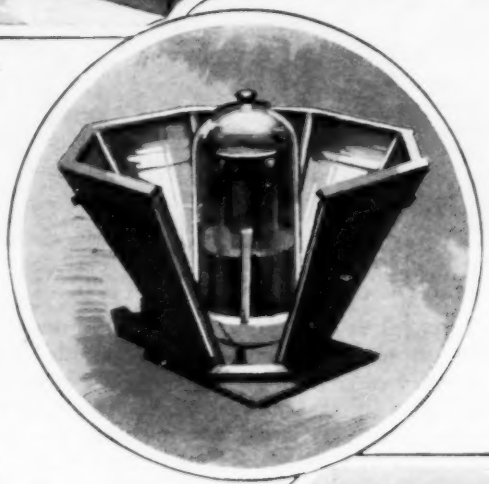
suitably placed. The apparatus yields 5,000 gallons of distilled water a day, or four-fifths of a pint for every square foot of glass. Allowing for interest on the money invested, the water costs less than a cent a gallon, the chief item of expense being breakage of glass by whirlwinds.

The present generation may expect to see sunshine cookers in common use by housewives. It is no mere imaginative idea, inasmuch as cookers have already proved their practical value. They are extensively utilized in Egypt, in the African Karoo, and in the Punjab of India, for baking and other culinary purposes; teakwood boxes, insulated, blackened inside, and fitted with double-glass tops. These sun ovens, which have the advantage of eliminating cost of fuel, afford temperatures of from 240 to 275 degrees Fahrenheit.

The first solar cooker was invented, in 1870, by an Englishman named Adams, a civil official at Bombay. It had the shape of an inverted eight-sided pyramid, hollow, lined with mirrors, and containing a cylindrical copper vessel. The sun's rays, reflected by the mirrors, were concentrated upon the copper vessel, which had a glass cover to retain the heat. The contrivance served admirably for roasting and stewing, and prepared a ration for seven men in two hours. If the steam was retained, the result was a boil or stew; if allowed to escape, it was a bake.

Not long ago, Dr. Abbot, who makes the study of the sun his special business, devised a solar cooker that operates on an entirely new principle. It bakes a loaf of bread or roasts a piece of meat as well as any gas range. A half cylinder of iron, lined with mirror glass, catches the sun's rays and concentrates them upon a metal tube which is the half cylinder's axis. The tube contains oil, which, expanded and made lighter by the heat, ascends through the tube. The latter is continued to form a loop outside the half cylinder, making it an endless arrangement. Descending through the loop, the oil cools. But the sun's heat, forcing the oil up through the part of the tube inside the half cylinder, compels cooled oil to follow it, else there would be a vacuum. Thus, while the sun





shines, there is a continuous circulation of oil up and around. The loop passes through a box that contains an oven. Heat from the oil, as it runs through, warms the oven and does the cooking. With this apparatus Dr. Abbot cooked meals on the summit of Mount Whitney, amid everlasting snows. He found that it cooked much faster at that lofty elevation, because the sun's rays, having a less thickness of atmosphere through which to penetrate, were much hotter.

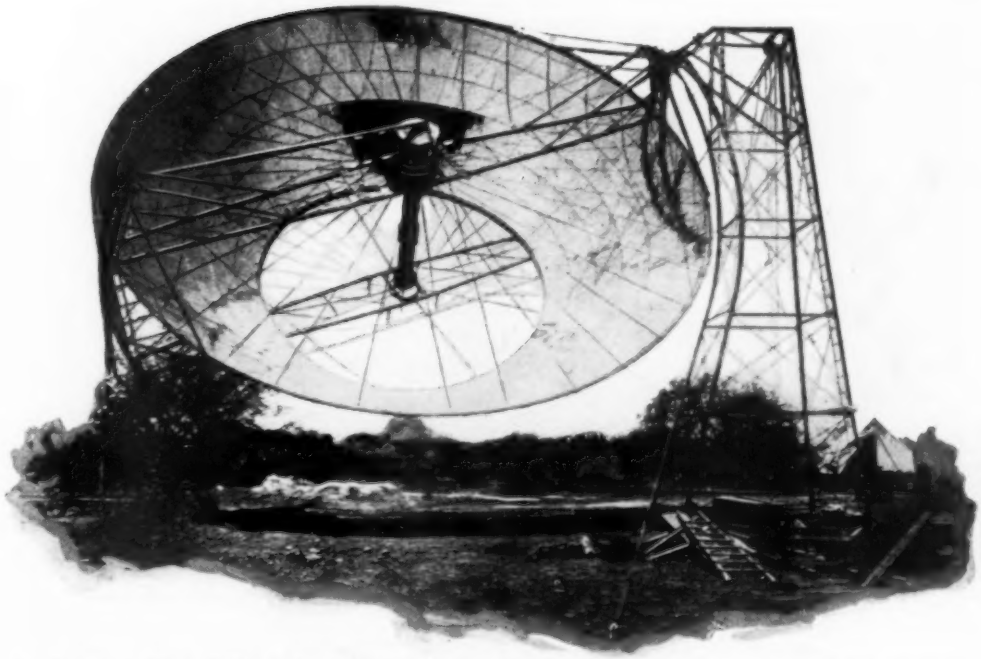
In southern California, where the sun shines practically every day in the year, many thousands of private dwellings are supplied with hot water for all domestic uses from roof tanks wherein it is raised nearly to boiling temperature by the solar rays. Such a tank, fixed on a sloping roof with suitable exposure, is kept filled by a pump operated by a small engine or by a windmill. It is insulated, bottomed with sheet copper, painted black, covered with double glass, and contains a coil of black-painted pipe which connects with the piping system of the house.

The inmates of a dwelling thus equipped draw hot water from the tank, as it is wanted, for bathing, washing, or other purposes, just as they would from an ordinary household boiler. There is always plenty of it, and, when days happen to be cloudy, it will stay hot for thirty-six hours. In view of the efficiency of the apparatus, it seems extraordinary that water-heating tanks of the kind are almost unknown outside of southern California.

There is a recently patented invention which employs this device with improvements. Distributing hot water to the kitchen, the laundry, the bathroom and other parts of the house, it has pipe connection with a gas water heater in the basement, which, when the sun fails to shine, can take up the job.

In Death Valley, an important industry is the mining of magnesium salts, which lie in beds like clean white snowdrifts along the flanks of the mountains. Powerful streams of water are used to wash the stuff into sluices, from which it passes into settling tanks.

Two Sun Furnaces and, Below, a Sundial and Noon Gun, the Latter Being Fired by Rays Focused on the Touch Hole by a Lens



An Enormous Mirror Reflector Set Up at Pasadena to Pump Water for Irrigation; Practical Sun Furnaces Are Being Used in Many California Homes to Heat Water for Household Use

To purify the salts, they are dissolved in water raised to high temperature by great solar heaters, copper coils under sheets of glass set at an angle for maximum exposure to the sun's rays.

John Ericsson, the famous engineer and inventor, built a number of "sun motors," as he called them. His last achievement in this line, which he exhibited in 1883, employed the principle now so successfully illustrated by the large-scale Shuman-Boys solar plants operated in the Nile valley, to pump water for irrigation. It was a trough with a curved bottom lined with mirror glass, which reflected the sun's rays toward and upon a cylindrical boiler placed lengthwise of the trough. By this means steam was generated which ran a small engine. It was never put to any practical use. But five years earlier, in 1878, at the Paris exposition, a Frenchman named Pifre used a solar engine of his own invention to run a printing press, issuing therefrom a little daily newspaper which he called the Sun Journal. It worked admirably. A mirror-lined reflector in the shape of a hollow cone, eleven feet four inches in diameter, concentrated the sun's rays upon a boiler which had a capacity of eleven gallons. It was the first successful solar engine.

Pifre's idea was copied on a magnified scale in the construction of a huge apparatus set up at Pasadena, Calif., in 1900. The wheellike mirror-reflector, in the shape of a flat cone, had a diameter of thirty-three and a half feet, and, turning to face the sun, concentrated the rays upon a boiler which held 100 gallons. The machine was designed to pump water for irrigation. It developed four horsepower and lifted 1,400 gallons per minute. As an experiment it was very interesting, but the cost of operation was too high to make its use economically feasible.

The Shuman-Boys apparatus has proved so successful that several outfits of the kind are now operated in the Nile valley, and others have been installed for irrigating purposes by the French government in Tunisia.

Such an outfit occupies several acres of ground. Trough-shaped reflectors, 220 feet in length, concentrate the sun's rays upon tubular boilers which run through the troughs. The latter, resting upon steel cradles supported by a framework of cast iron, are heeled over toward the east in

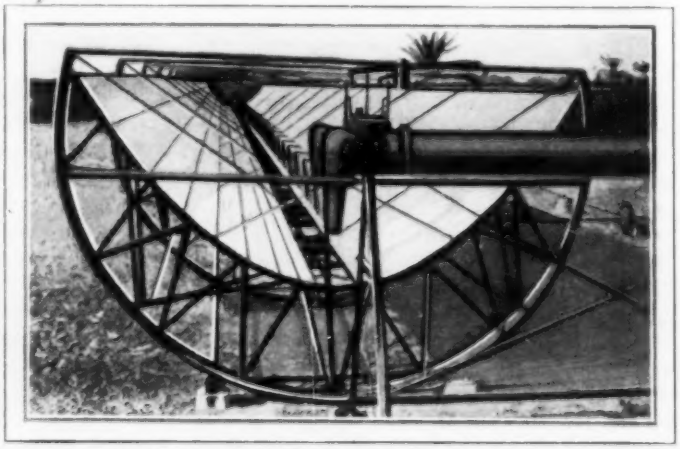
Rear View of the Moreau Sun Furnace, Showing the Heat Tubes on Which the Sun's Rays Are Focused

the morning and toward the west in the evening. Steam generated for operating machinery represents sixty-odd horsepower for each acre occupied by the plant.

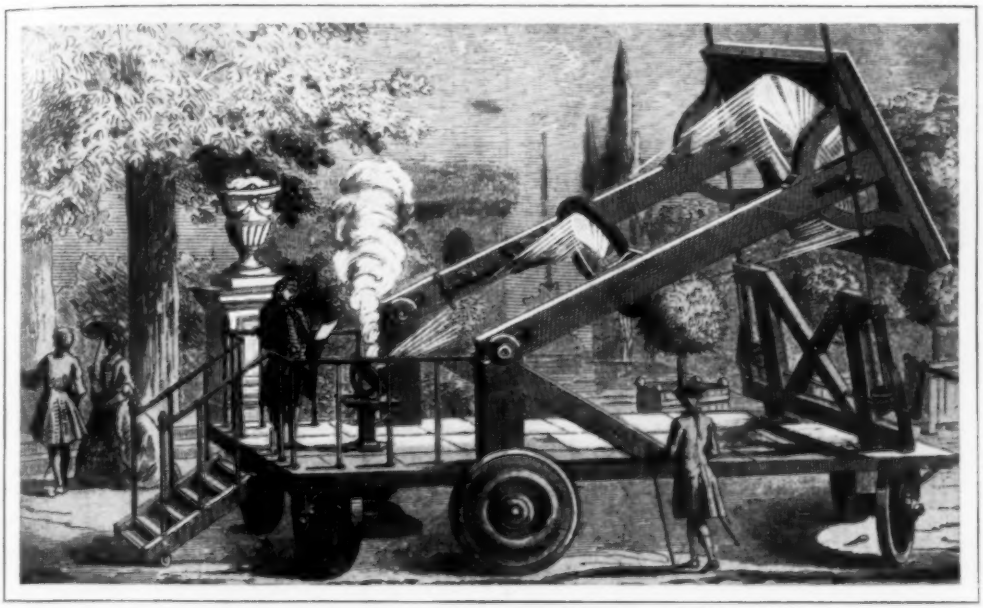
The economic practicability of sun power in desert regions is thus satisfactorily proved. Can it be doubted that from this beginning will eventually come developments most important to the world's progress? Scientists in every civilized country are busy with the problem, which has engaged attention at least as long ago as the thirteenth century, when the monkish philosopher Roger Bacon put his brain to work on it.

Near the end of the eighteenth century, a French physicist, named Bernieres, built a really remarkable contrivance which employed two enormous lenses, one of them seven feet in diameter, and the other with a diameter half as great. The larger lens concentrated the sun's rays upon the smaller one, by which they were brought to a focus. The duplex arrangement, of great weight, was mounted on a wheeled platform, the lenses being held in frames sustained by a pair of pivoted arms which, by turning a crank, could be lifted or lowered to correspond to the angle of the sun. The wheels at the corners of the platform were turnable in any direction, so that the affair, on a sunshiny day, could be made to face the solar luminary, the focused rays generating a temperature high enough, it was said, to "make iron run like water."

Such heat, however, is of small account compared with that claimed to be produced by the recently invented machine of Marcel Moreau, a San Franciscan. He calls it a "sun furnace," and declares that it will melt or vaporize any substance known in nature, not excepting the diamond. Twenty-two mirrors are arranged about a common center in such wise as to receive and reflect toward that center a great quantity of sunshine. The rays reflected by the mirrors are directed upon twenty-three lenses set in a movable hemispherical frame which is pivoted on a rotating base. All the rays that pass through the lenses are concentrated at a single focus, wherein a chunk of platinum or a piece of brick is quickly consumed. Producing temperatures up to 15,000 de-



One of the Trough-Shaped Reflectors of a Shuman-Boys Solar Heating Plant near Cairo, Egypt



Giant "Burning Glass" Constructed by Bernieres, a French Physicist, in the Latter Part of the Eighteenth Century to Demonstrate How Power Could Be Obtained from the Sun

grees, it is a useful apparatus, if only for scientific purposes, says the inventor.

The possibilities of solar electrical developments have yet to be explored. Solar energy may be converted into electrical power. A Frenchman, Jules Guillot, residing at Vichy, has constructed an arrangement of mirrors, nine feet square, by means of which he is able to gather enough energy to produce electricity for lighting and heating his flat. The sun, while it shines, loads storage batteries with a surplus for use at night.

A vivid notion of the heat carried by a sunbeam is obtained by experiment with a lens, which, though but an inch in diameter, will concentrate enough rays to set wood aflame in a very brief time. Dr. Abbot estimates that midsummer sunshine falling upon twenty square feet of surface represents an amount of energy equal to one horsepower and that an acre is equivalent to 2,200 horsepower.

COLORS HELP SOLVE PROBLEMS THAT BAFFLE ENGINEERS

Engineering problems that have perplexed skilled mathematicians are solved with comparative ease, it is reported, on an electrical apparatus that makes interesting use of color. A celluloid model of a steel part to be studied is adjusted in the machine and stress applied at different parts. The shadow of the unit, when passed through a series of lenses upon a screen, appears in shades of gray, but the application of strain causes the color to change to green and other tones. Where the stress is the greatest, the hue will be the darkest in the shadow. By these tests the examiners are able to determine where the heaviest loads will fall on the real units, so that they can be built accordingly.

TRAY CLAMPED ON CARD TABLE SAVES SPACE AND TROUBLE

Placing cigar trays or glasses on top of the card table usually interferes with the game and is likely to damage the surface. This difficulty has been eliminated in a convenient holder that is clamped to the table edge. It is made in a variety of finishes and, being out of the way, there is little risk of spilling ashes or liquids.

Setting One of the Guns for Target Practice on Old Bridge Which Was Destroyed in North Carolina

CONCRETE BRIDGE AS TARGET TESTS GUNNERS' SKILL

"War" was declared on a 1,000-foot concrete bridge in North Carolina recently for the double purpose of giving army marksmen target practice and to remove the structure to make way for a dam across the Peedee river. Bombing planes and artillery did the wrecking, some of the guns from a distance of two miles.

STEAM AND GAS COMBINED TO DRIVE LOCOMOTIVE

Principles of the steam and internal-combustion engine have been combined in a locomotive built in England. The steam is used for starting, for overloads and for auxiliaries such as brakes and train heating, while the internal combustion is used for continuous working. There are eight cylinders, four on the outside and four between the frames. The principle of operation is to admit steam from the boiler to one side of the pistons, then take up the drive with power from the gas combustion. This gives a double-acting engine with steam at one end of the cylinder and gas explosion at the other.

"ELECTRIC SUN" IN CEILING REDUCES HEATING COST

By means of electric heat reflectors placed in the lower part of the ceiling, a Danish engineer has developed an efficient method for heating auditoriums and other large rooms with high walls. The chief features of the system are said to be economy and greater healthfulness, as the heat is communicated more directly to persons inside instead of heating the air and reducing its humidity. As soon as the current is turned on, occupants are said to feel an agreeable warmth like that of sunbeams on a fresh spring day without the sense of suffocation which sometimes attends the heating of a room by steam or hot air.

PORTABLE ROTOR STREET BRUSH SAVES TIME AND TROUBLE

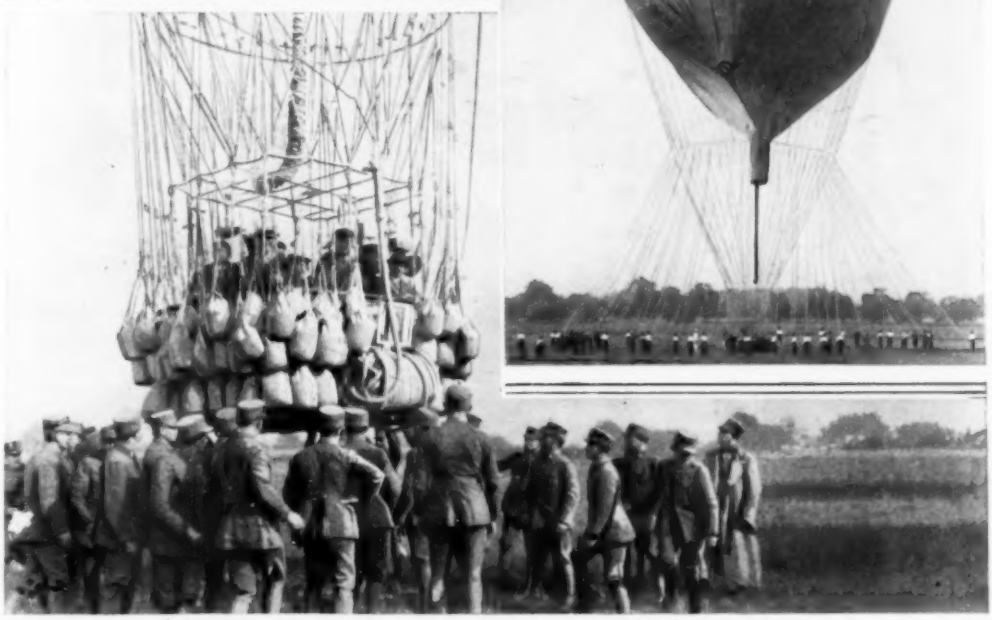
Fashioned after the design of the larger motorized units, a portable street-cleaning brush, introduced in Germany, sweeps dirt into a holder as it is pushed along, saving labor and greatly increasing the operator's efficiency. With it, one man can clean two or three times as much space as with a broom, the manufacturers claim.

Operated like a Carpet Sweeper But Does a Thorough Job on the Streets; Dirt Is Swept into the Holder Just Back of the Wheels and Is Easily Emptied

© Henry Miller

PROBE MYSTERY OF UPPER AIR IN BIG BALLOON

A flying observatory station for investigation of the upper air and its effects upon men and motors, has been introduced in Germany in the form of a huge free balloon which can carry several persons. It has a diameter of more than 283 feet and is over 158 feet high when

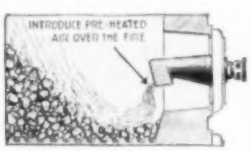


Close View of the Huge Basket of the Balloon and a Distant Perspective of the Entire Bag; This Enormous Air Observatory Station Is Over 158 Feet High

but a fifty-per-cent charge of gas has been admitted. It is adapted to use with hydrogen and an ingenious method has been worked out for reducing the likelihood of fires from leaks of the hydrogen or other causes when engines are being tested in the balloon. The gas enters a sort of chimney shaft and escapes from the top of the balloon so that it is as far away as possible from the basket. The big bag is to be used in tests on the air pressure at high altitudes, moisture, temperature and radiation conditions, while a ten-horsepower engine is run to observe how it performs high in the air. On a trial trip, it carried seven persons.

CARBURETOR FOR FURNACE FIRE HELPS SAVE COAL

Saving of coal and a marked reduction of soot are claimed for a carburetor unit for hot-air, steam or hot-water furnaces. Its essential function is to provide a supply of preheated air over the fire so that



there will be more complete combustion of the gases that ordinarily pass out to form smoke and soot. The carburetor is not difficult to install and also reduces ashes and clinkers.

How

By CHARLES PHELPS CUSHING

WHAT are the prime necessities when you go fishing? Many will name a fishpole and a line, a sinker and a hook, and a can of bait. Some would be tempted to add, perhaps, a "jug beside you in the wilderness," a bird in the tree tops singing or an umbrella for protection from the glaring sun. For as you get older you crave more comforts than in the days when you were a barefoot kid in overalls and hickory shirt, with a frazzle-brimmed farmer-boy straw hat—the good old days when the biggest ones always got away.

But the typical American method is only one way, though a good one, to go fishing. There are as many other methods prevalent in this curious wide world of ours as there are "ways to skin a cat." An Indian up in British Columbia would discard bait and hook and line and save only the fishpole to make a gaff of it. An Eskimo might, just as likely, throw away everything but the line, and make a noose of that to snare or lasso his prey through a hole in the ice.

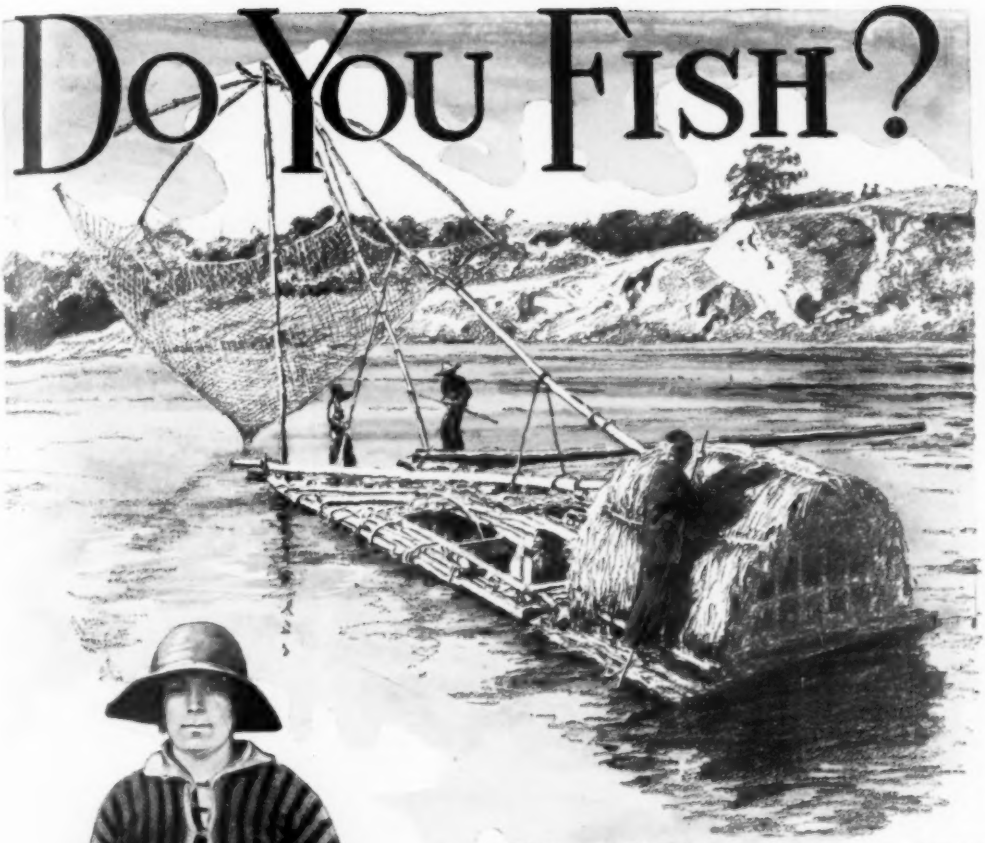
A youngster living alongside the Mississippi, where catfish are the chief catch, might take the jug, empty it, then cork it tightly and cast it adrift on the current with a hook and line tied to its handle; then follow its drifting in a skiff—the method of fishing which he calls "juggin' fer cats."

A Japanese or a Chinaman, just as likely, wouldn't dream of having his bird singing to him from a tree. The Oriental makes his bird—a cormorant—do the fishing for him. Around the bird's neck he places a ring. When the unhappy fowl darts after a fish, snatches it in his bill and tries to swallow it, he finds that he can't—the ring around his neck won't let him. The fisherman then makes him disgorge the catch.

Even the umbrella isn't everywhere put to the same use as you and I might put it. In England and France a popular method is to hang an open umbrella from the fishpole; the shadow it casts upon the water is helpful to attract the fish to where the bait is suspended, right beneath.

Indeed, there are so many different ways

Do You Fish?

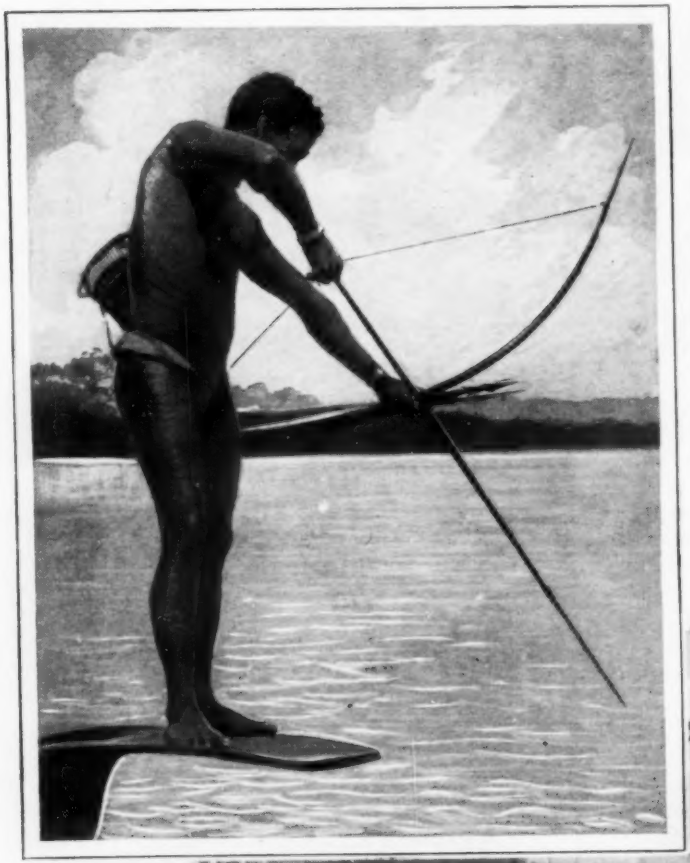


Fishermen of Indo-China Use a Dip Net on a Bamboo Barge, While the Oyster Women of France, Left, Fish with a Rake

© N. Y. Times

to go fishing that we have room here to mention only a small number of them. The whaler, with a miniature cannon, shoots a harpoon into the side of his prey and then reels it in with a power windlass. After that, in lieu of "stringing him," he blows the great fish up with air, like a motor-car tire, so it will tow easily.

In the northwest, there are folks who do most of their fishing with wheels, somewhat resembling the model of an old-fashioned water-power grist-mill wheel. In the Andaman isles, the commonest method of fishing is with a bow and arrow. Of traps and spears you've heard often, and need only a passing reminder. But do you know about the barbed fork, shaped like old Neptune's, which is the favorite method of some British seaside fishermen? They call this system "butt-pricking." Or do you know the style among inland Missouri lads when they go



out to a creek after a mess of crayfish? A pole, a line and some bait are used—but no hooks. On the end of his string, the young angler ties a hunk of liver or "dog meat." He holds his pole in the left hand, a homemade dip net in the right. When he feels a nibble on his line, he scoops the net swiftly upward and gets Mr. "Crawdad" out before that miniature fresh-water edition of a lobster has time to unfasten his meat hooks from the meat and scuttle away.

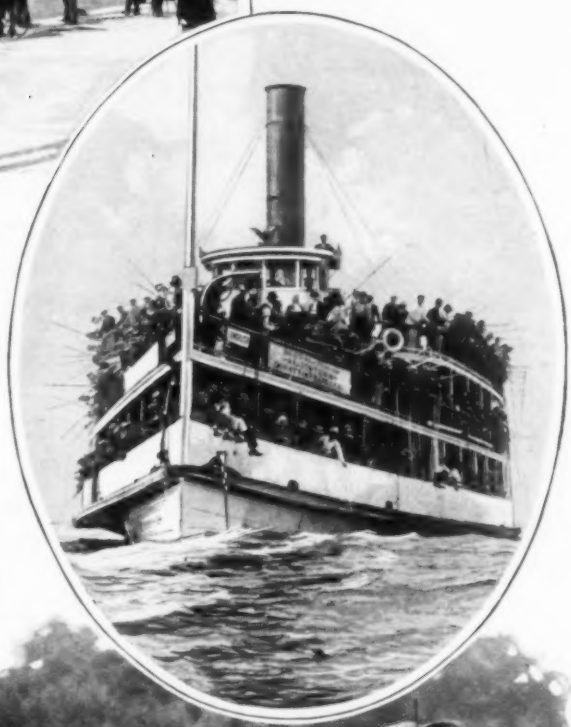
Upper Photo © Ewing Galloway

Poised on the Springboard-Like Bowsprit of His Hollow Canoe, the Native of the Andaman Islands Does His Fishing with a Bow and Arrow; Reed Fish-Trap Makers of Naples at Work, Below

The Fishing Competition for the Championship of the River Seine Anglers in Paris Is Opened with a Flourish, When a Bugler Sounds the Signal for All the Devotees of Rod and Line to Start Baiting Their Hooks

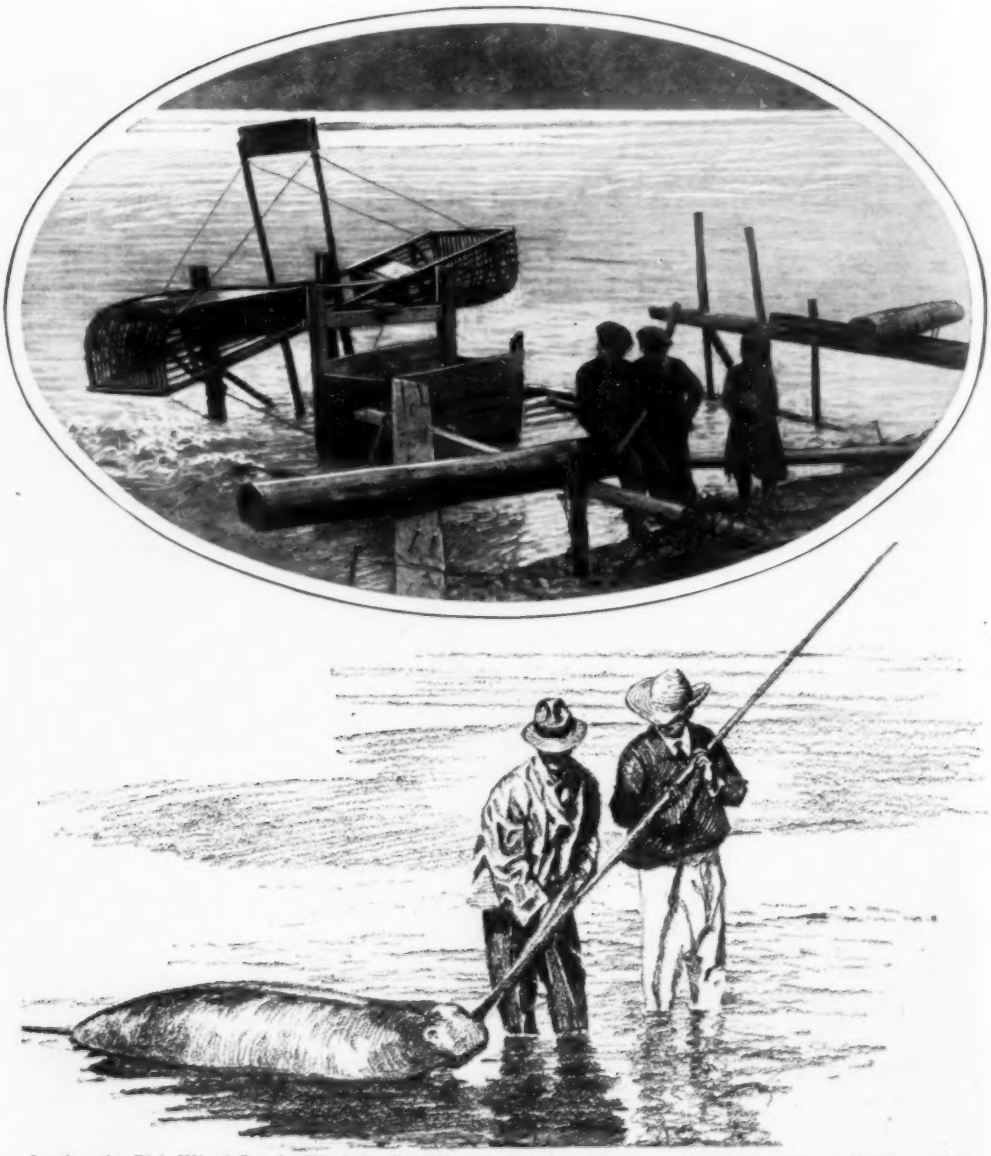
Most of us Americans prefer to do our fishing usually in solitude. Not so in the case of some of the fishermen of the great cities. The season in Paris, for example, opens upon the banks of the Seine with a military blare of trumpets as its signal—the greatest "eclat" in the world to effect the capture of a few measly little porgies.

New Yorkers, who live and work in high-storied apartment houses and skyscraping office buildings, often do their fishing, likewise, in layers. Many big



© Keystone

Bottom, Highgate Fishermen, in England, Hang Umbrellas on Their Rods Because the Fish Flock to the Shadow; New Yorkers, Center, Go Fishing in Tiers, Just as They Live



Letting the Fish Wheel Do the Work Is One Way of Catching Salmon on the Copper River; Below, a Manatee, or Sea Cow, Getting Prodded Around off the Coast of Florida

fishing boats put out to sea every day in the season with eager fishermen crowding the rails of several decks. The moment the anchor drops at a fishing bank off the New Jersey coast, a sound like a sudden spatter of hail stones on the water greets the amazed voyager's ears—and from all tiers of decks he sees scores of lines radiating. Another great to-do follows, naturally, when anyone hooks a fish. For at least two or three other fishermen's lines are likely to be fouled with the one which has landed the prize.

Chicago is another city which deserves mention as a national headquarters for one of the curiosities of angling. Nearly any day in summer you can find a group of earnest shirt-sleeved sportsmen casting from a platform into a little lake of the city park system. These eager fishermen you learn next—to your amazement—would likely drop dead of heart failure

(just as a Parisian might if he ever pulled a fish up out of the Seine) should any bass or pickerel in that little lake strike on their line. No! These fishermen are practicing only to improve their skill as bait casters or to win prizes in the casting tournaments held there.

BUTTERFLY WINGS TELL STORY OF WANING ICE AGE

In the patterns and changing colors of butterfly wings, is inscribed a graphic record of changing conditions on the earth's surface, according to a western naturalist. He declares that, as the climate grows colder, the wing colors are less brilliant and the present trend away from the days of the glaciers, has been marked by increasing brilliance of the hues. He asserts that it would be possible to predict what the patterns will be, on the wings of certain species of butterflies, 10,000 years from now.

TABLE AND FIRE SCREEN IN ONE SAVES HOUSE SPACE

A card table that serves as a fire screen when not needed for a game, has been introduced, to save space and afford extra usefulness. It has folding legs, like the ordinary tables of this kind and is simply set in sturdy bracket-shaped legs when it is to be adapted as a screen.

Fire Screen in Position for Placing before Grate, and in Use as a Card Table

Sliding Tower with Its Winding Bamboo Dragon in Which Riders Shoot to the Bottom

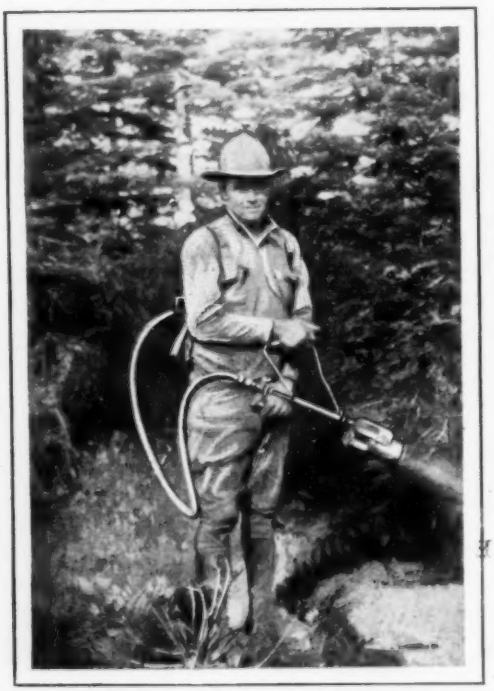
SLIDE DOWN BAMBOO DRAGON GIVES RIDER THRILLS

One of the latest amusement devices at a western park is a spiral dragon made of bamboo. The rider sits on a leather cushion and shoots from the top to the bottom, a distance of 382 feet, in about twelve seconds. The spiral adds to the enjoyment of the ride, and, since the chute is entirely inclosed, there is little hazard.

DYNAMOS ARE TESTED BY RADIO TO REVEAL HIDDEN DEFECTS

Imperfections in dynamos are plainly revealed by a radio test. The unit is converted into a broadcasting station by sending a 200,000-cycle current through it, then picking up the waves on a receiving set. If the dynamo is in perfect condition, a loud buzzing is heard and there is a high reading on a milliammeter, but if it is defective, the buzzing is more subdued and a much lower reading is recorded.

GASOLINE "GUN" FOR BACKFIRES HELPS PROTECT FORESTS



To Speed the Starting of Backfires; Blow Gun That Shoots Gasoline on Forest Brush

Fighting fire with fire is a familiar method of combating forest and other blazes, and to aid in starting the backfires that sometimes prevent the spread of the main conflagration, the forest service in California has been using a gasoline spray gun. The liquid is sprayed out with air pressure and ignited, forming a blowtorch which is effective in rapidly igniting brush and other growths. One man can easily operate the outfit, which holds a supply of fuel sufficient for extensive operations.

WINTER STORMS GROW FASTER BY NIGHT THAN DAY

Why the winter cyclones, or circular storms which move in regular order across the United States from the southwest to the northeast, grow larger by night than they are by day, and also increase in size and intensity as they proceed up over New England and out to sea, was explained recently by Dr. W. J. Humphreys, meteorological physicist of the U. S. weather bureau, in an address before a scientific meeting at Nashville, Tenn. The storms consist of a swirl between cold air from the north on the northwestern side of the cyclonic disturbance, and warm humid air from the south on the southeastern side of the storm area. The southern side, because of its moisture content, is cloudy, while the northern side is clear. As the storm moves northeastward, the clear side tends to become still colder, while the southern side loses but little heat, owing to continuous condensation of the moisture. As the difference in temperature between the two sides increases, the difference in air pressure, and hence the force of the winds, also grows, with the result that the storm expands and grows more severe. At night, the cool, clear section of the storm grows colder through loss of heat by radiation, while the warm side again changes little in temperature, and there is still further increase in intensity. In the daytime the warm side again suffers little change, while the cool side picks up heat rapidly, with consequent contraction of the storm area.

FLOWERS CUT IN SHEET METAL RIVAL NATURAL BLOOMS

Realistic flowers are being fashioned from sheet metal by an English craftswoman. She carefully sketches the blossom she is to reproduce, then cuts out the pattern, twisting leaves and petals until they conform to the shape of the original.

Making Sketches for the Flowers, and Some of the Finished Pieces Cut from Sheet Metal

After the flower is fabricated it is painted with realistic colors.

¶Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

HEALTH MENACED BY DARK HOUSES EXPERT SAYS

Dark, dingy buildings that prevent the light from reaching down to the sidewalks of the cities are worse than higher ones with bright, light-reflecting surfaces, in the opinion of an eastern expert. He declares that light and not height ought to be the chief concern of the zoning authorities. A coating of soot is worse than ten extra stories, he says, as a dirty building "sops up the light," preventing it from reaching those who need it. Plentiful supplies of clean fresh air are necessary for health in the city, he realizes, but points out that sunlight is one of the most efficient of all cleansers and lack of it means danger to health.

Living Quarters and a Bookstore in Auto; the Traveling Home Has Running Water and Other Conveniences

BOOKSTORE HOME ON WHEELS HAS MANY COMFORTS

Besides carrying his stock of books, an automobile operated by a California man has living accommodations for himself and his wife. There are two berths, a sink with running water, gas stove, ice box, radio and other conveniences of a permanent dwelling. The books are displayed for sale by lowering shelves at the sides, are securely protected from dust and damage, and there is a special case for rare volumes and first editions. The outfit was planned for a six months' tour.

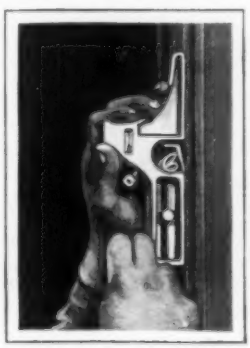
WRITING IN THE DARK IS EASY WITH FLASHLIGHT PENCIL

A slight push on the end of a pencil, recently introduced, lights a small lamp at the tip so that the user can easily write in the dark. Batteries for the light, and extra leads, are carried in the pencil barrel.

SIGNAL WARNS OF PUNCTURES TO PROLONG TIRE LIFE

If the automobile tires are punctured or air leaks out to a harmfully low pressure point, a light signal flashes on the dash so that the driver can remedy the difficulty and prevent undue damage to the tires. This is possible with an attachment devised by a Nevada man. The instrument is simply a pressure indicator set within the inner end of the valve stem.

RABBET PLANE WITH MARKER HELPS IN SETTING LOCKS

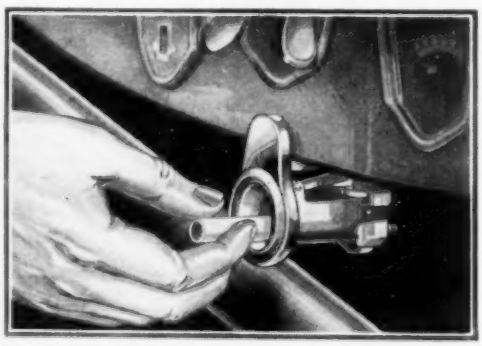


For setting hinges and locks, and other purposes, a combined rabbet and router plane with a gauge and marker, is especially adapted to fine and intricate work. The bit is adjustable up and down and has a range of half an inch below the bottom surface. The gauge is also suitable for a handy square.

VENDING MACHINE TO SELL PIE, SANDWICHES AND CANDY

Slot Machine That Sells Dime Lunches and Gives Buyer a Choice of Different Kinds

A vending machine, which gives the purchaser a choice of as many as twenty-five items, has been invented primarily to sell package lunches, though it can also supply sandwiches, cuts of pie, packages of candy or similar articles. A basic patent has been granted on the idea of delivering the merchandise through the center of a circular machine, by which the various items can be revolved to bring any desired one to the delivery point. In operation, the customer turns a knob to revolve the wheel until the desired package is brought to a window marked by an arrow. He then inserts his dime in the slot and presses a lever, which releases the package and causes it to drop to the delivery opening. A safety door covers the aperture through which the packages leave the wheel, making it impossible to rob the machine by inserting a rod or wire, and the coin mechanism is so carefully adjusted that it not only rejects slugs but even returns badly worn dimes. The machine can be completely disassembled within a few seconds by unlocking two locks. To load it, it is only necessary to operate the front lock. The coins are dropped into a locked removable bank, two of which come with each machine, and the attendant merely changes the bank, without access to the money.



Cigar Lighter Which Requires No Extension Cord to Raise It to the Lips

ETHER WAVES USED IN RADIO TO HELP TREAT DISEASE

Medical science is reported at the threshold of another victory in the announcement that ether waves which have been harnessed for radio, may prove beneficial in the treatment of various diseases, particularly pneumonia. It has been noticed that operators exposed to the waves experienced a sudden rise in body temperature. Doctors believe that the waves may therefore be utilized to restore normal temperature to a person who has been suffering from such a malady as pneumonia, when the patient is in danger of a collapse after the crisis through failure of the body to retain its normal heat.

SELF-LIGHTER FOR AUTO DASH HAS NO EXTENSION CORD

A cigar and cigaret lighter that ignites the tobacco without raising the lighter to the lips is the newest accessory for the automobile instrument board. It eliminates the usual extension cord. The "smoke" is simply pushed into the lighter tube, left for a moment, and then withdrawn, lighted. It cannot fall out for, in entering, it raises a small hinged door, the weight of which holds the cigar or cigaret in place. Lifting of the door closes an electric switch to the heating element, and when the smoke is withdrawn, the door drops, stopping the flow of current. The device is arranged to be clamped onto the lower edge of the instrument board, so that no holes need be drilled.

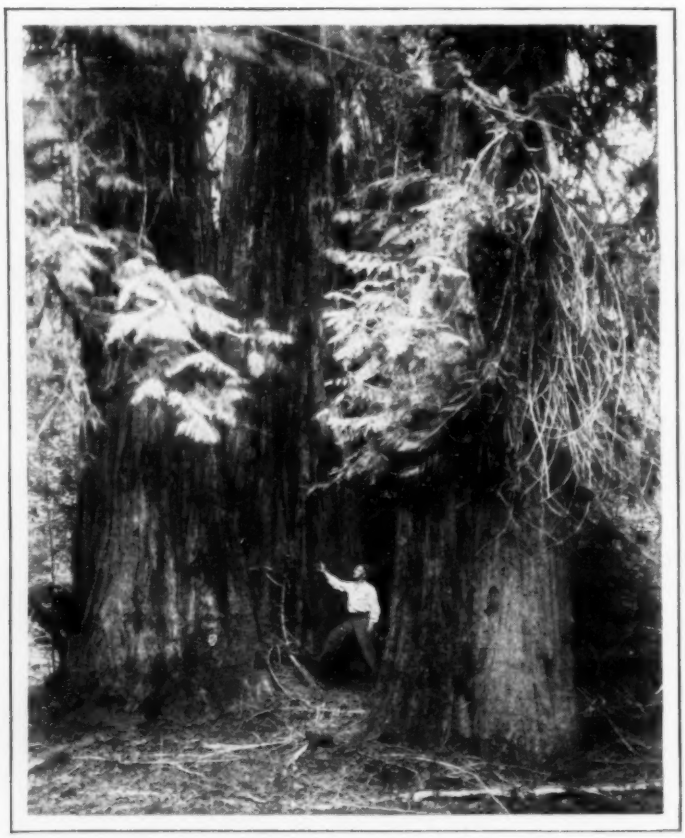
Our last Virgin Wilderness

SLOWLY but surely, civilization moves westward. The Indian and buffalo and the wild game had to go. The forests fell to the ax and saw of the lumberman. Now the world looks to the setting sun where lies "America's last virgin wilderness."

Here, in the state of Washington, untouched by man, remains the wilderness as it was hundreds of years ago. And why?

First come nature's natural barriers; a series of immense towering mountain ranges which cut this area off from the outside world. In fact, every barrier which nature could oppose to the oncoming host of civilization is here. There also is a regular fortress of worthless, unmarketable timber, trees warped into knotty, gnarly, fantastic growths, wondrous to look upon, but so twisted and dwarfed by storms as to be useless to the

Forest Rangers Testing a New Rail Motor Car, Equipped to Fight Forest Fires in the Virgin Timber of Washington; the Powerful Pumps Draw the Water from the Nearest Stream



Courtesy of Ashael Curtis

A Stand of Big Cedars in the Olympic Forest Preserve; Many of the Trees Are 200 to 300 Feet High

lumberman. These trees of the upper slopes act as sentinels and guardians of the wonderful forest growth hidden in the shadowy valleys just beyond.

Another reason for the isolation is the great precipitation. Such a rainfall is hard to understand without an explanation as to the natural causes. The Olympic range rises almost abruptly close to the shores of the Pacific ocean. The moisture-laden clouds, rolling in from the sea and driven by a steady west wind or heavy gales, hit this range, with its snow caps and glaciers, at 8,000 feet elevation. The cloud moisture is then condensed and precipitated in the form of a heavy rain to deluge the great forest area and undergrowth, which quickly absorbs the water, the rivers carrying the surplus. The maximum rainfall in this area of western Washington is 250 inches per year, while the minimum in eastern Washington is sixteen inches per year.

Theodore Roosevelt was one of the first to recognize the wonderful value of this spot and he set it aside as a national monument, an area of fifty-five square miles, to be a home for the preservation of the wild elk of the region. Today there are over 7,000 of these animals roaming within its boundaries.

In 1921 an unusual tornado swept over this forest area, tearing down its giant trees and stacking them high on one another like boxes of immense loose toothpicks. The summer weather dried out the dead branches of the fallen timber and a fire hazard was present of immense proportions. The government and state authorities realized the danger and through the forest rangers' service a guard has been kept day and night ever since. There are three entrances to this vast area. These are at Lake Crescent, Lake Quinault and the Dosewallips. Here armed guards are stationed day and night. Automobiles are stopped, every passenger must get out and register and give full name and address; then they are given a signed permit to enter the forest reserve. A large sticker is pasted on the windshield which reads, "no smoking," and informs the passengers that no fires are allowed except at points designated by big signs and under the immediate supervision of guards.

The forest-fire service has equipment peculiar to its calling. Last season they used a new super fire engine, a big auto truck with flanged wheels, made to run on any railway track. It carries three lines of hose from a master pump, throwing water to a height of eighty feet and pumping 300 gallons a minute from any near-by stream. Through a system of

five pumps and canvas bags, water can be relayed for a distance of two miles. Where railway tracks are not available, auto trucks equipped with fire-fighting pumps and water tanks, are used. Larger tanks situated at various points, are provided for refilling the truck tanks when needed. To reach forest fires where auto trucks are unavailable, a smaller portable pump is used. One weighs seventy pounds, with straps attached to the pump base. A man packs this on his back to a stream where it is set up and put in operation. Co-operative lookouts are stationed at all the highest points, particularly overlooking the entire Soleduck Burn. Airplane observation is carried on only during the hot, dry periods.

Upon leaving the forest area, armed guards stop you again and your party is checked out. It must be the same as you checked in. Here your permit is stamped "canceled" and, before you depart, though you do not know it, a ranger has filed his report upon you.

TOY CANNON THAT SHOOTS GAS ELIMINATES DANGER

Safety is the outstanding feature of a toy cannon that produces a loud report and gives youngsters much amusement with practically no risk. The "shell" is merely a charge of a carbide compound and ignition is accomplished by a spark from a flint on the hammer.

It Makes a Loud Report, but Shoots No Bullets; Toy Cannon That Explodes a Charge of Gas

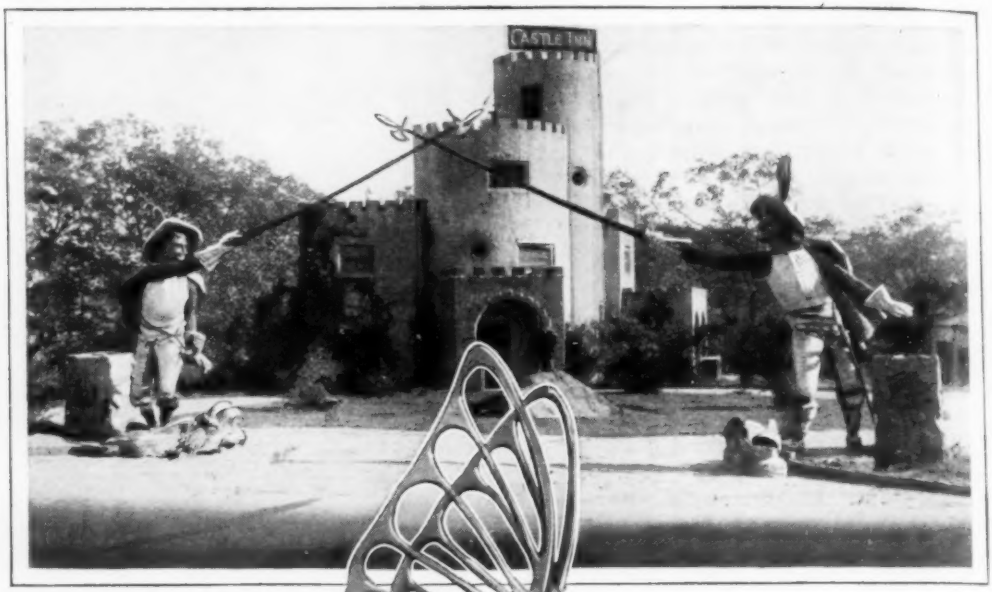
Where Night Sometimes Comes at Noon; Trafalgar Square, London, as It Appears in a Dense Fog

LONDON NIGHTS AT NOONDAY DURING HEAVY FOGS

Dense fogs, hovering over London, frequently plunge the city into a darkness almost as deep as that of night. How completely the light of the sun is obscured, is shown by the accompanying photograph of Trafalgar square. In the foreground is the Edith Cavell memorial statue with illuminated buildings in the background, all completely lighted as though for night, but the time was nearly noon. This particular fog was most intense over the central part of the city and lasted all day.

¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

FREE-HAND SCULPTURE IN REINFORCED CONCRETE



Cavaliers in Molded Concrete Guarding the Entrance to a New York Roadside Restaurant; the Figures Are So Large That the Cars of Customers Drive under the Crossed Spears

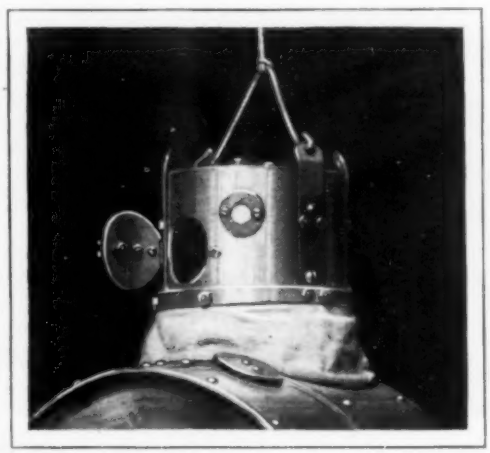
Samples of Ornamental Statuary Produced by a New York Man Who Molds the Wet Concrete to Shape over a Steel and Woven-Wire Framework, Finishing It as the Material Sets

FLEXIBLE SPRING STRIP HOLDS CASEMENT WINDOWS OPEN

A simple check to hold casement windows or doors open in any position has been invented by a Utah man. It has no setscrews, and there is nothing to tighten or loosen when the window or door is to be opened or closed. A small brass plate, shaped somewhat like half a hinge, with two eyes for a pin, is attached to the window frame. A strip of thin spring brass, six to ten inches long, for different-size windows, with a loop bent in one end, is hinged to the plate. Two U-shaped brass strips are screwed to the window, the flexible strip passing under them. As the strip is bent when the window is opened, the pressure against the holder nearest the frame will keep it securely in any desired position.

CHAMBER TO FREE SEA VICTIMS TRAPPED IN SUNKEN BOATS

To rescue persons trapped in sunken submarines or other craft, a chamber device has been proposed that can be lowered by almost any vessel equipped to handle buoys or that has derricks or cranes for loading cargo. It is intended to rest securely on the hull of the wreck and when the water is pumped out of the lower chamber in the unit, men enter from a compartment above, open a hole in the sunken vessel and effect the rescue of persons inside. Water is forced out by pumps run by electric motors or by compressed-air engines, and a special skirting at the base of the chamber keeps water from entering. The legs of the device are equipped with rubber-tired wheels, so that the chamber can be easily turned to best fit the hull. Lights and observation windows in the compartments are arranged to aid in the operations.



Model of Proposed Submarine Rescue Chamber, Showing Upper Compartment for the Crew

Generating Gas for Cooking a Camp Meal by Blowing with a Chemical Set

CAMPERS GENERATE GAS SUPPLY BY BLOWING ON CHEMICAL

Travelers may have their own private supply of gas for lighting and cooking in an apparatus a German inventor has devised. The gas is generated simply by blowing through rubber tubes upon special chemicals held in a lamp.

FIRST GAS LIGHT A CURIOSITY PEOPLE PAID TO SEE

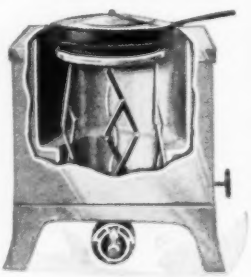
When the first gas lights were introduced in Baltimore, in 1816, they were placed on exhibit in the museum there and crowds paid admission to see them. Newspaper accounts described them as marvelous "lights without oil, tallow, wick or smoke." The exhibit proved so successful that a gas company was formed the next year, and the streets of the city were soon lighted by the lamps. This was one of the first commercial installations in the United States.

Sun Shades and Snow Sculpture Present an Odd Contrast, but the Bright Sun in the Swiss Mountains and the Glare Make an Umbrella Welcome; the Mammoth Was Fashioned by Visitors at Arosa

SNOW SCULPTURE IS FEATURE OF WINTER SPORTS

One of the events at the opening of winter sports in Arosa, Switzerland, was an exhibition of snow sculpture. Among the models displayed was that of a huge mammoth, fashioned with realistic skill even to the long tusks.

ELECTRIC RANGE OF ALUMINUM COOKS WHOLE MEAL AT ONCE



Operated from a lighting socket, an electric range of aluminum weighs but thirty-five pounds and is so arranged that an entire meal may be cooked at one time. A special feature is that the holders for the utensils may be lowered far into the stove as in a fireless cooker, and are elevated, if desired, by an extension bracket. There are few crevices to collect dirt, a three-point switch gives as many degrees of heat and there is a thermometer to show the exact temperature within the range.

HOW SMALL SILVER CRYSTALS MAKE PHOTOS POSSIBLE

The minute crystals of silver, which coat the sensitive surface of a photographic film and make picture taking possible, are so small, according to Dr. C. E. K. Mees, director of the Eastman Research laboratory at Rochester, N. Y., that a single square inch of kodak film contains more individual crystals than there are people living in the entire world. Talking before a scientific convention recently, Dr. Mees described how, in his laboratory, workers had isolated single crystals under the microscope to study their behavior and the arrangement of the atoms which constitute the crystal. The sizes and shapes of crystals vary in different kinds of film. In the fast negative film which goes into the movie camera, there is a great range of sizes, which enables the cameraman to obtain his wide gradations in shades. The positive film, which is projected in the theater, has grains more nearly of one

size, and this gives the projected picture life and sparkle. The laboratory also found that the sensitiveness of films was not all due to the grains of silver bromide, but was in some way partly creditable to the presence of small grains or specks of some other substance, which turned out to be impurities in the gelatin of which the film coating is made. The impurities came from the plants eaten by the animals whose skins yielded the gelatin. The compound contains a trace of sulphur, and this, it was found, reacts with the silver bromide to form specks.

NEW HYDROGEN PROCESS EXTENDS FIELDS OF WELDING

Metal sheets as thin as paper and alloys containing chromium, aluminum and other elements that usually oxidize or produce fluxes, can now be welded with a hydrogen unit developed by the General Electric company. Metals hitherto unweldable can now be melted and fused without difficulty, since the atomic hydrogen employed reduces the oxides that might otherwise form on the surface. A stream of hydrogen is passed between the arc of two electrodes, the molecules are broken into atoms which combine again, and, in so doing, liberate an enormous amount of heat which affords a more effective welding temperature.

Hydrogen Welding Outfit Which Can Be Used on Many Alloys and Thin Sheets

Airplane-Coaster Ride That Gives Many of the Thrills of Real Flying; Cars Are Propelled by Electricity

RIDE ON AIRPLANE COASTER GIVES MANY THRILLS

Patrons of amusement parks can now enjoy many of the thrills of riding in airplanes, without attendant risks, in an overhead monorail coaster line recently introduced. The cars are built like planes and each is driven by a propeller. The track twists, dips and turns to afford variety in the ride and the entire line may be assembled in a narrow space. Power is furnished from electric motors and operation is automatic, the cars starting when an overhead brake is released while the propellers stop as soon as the "planes" reach a dead section at the finish point. The action of the propeller, and the flexible supports give the approximate effect of flying.

¶Lightning sometimes paralyzes fish for several days.

Close View of the Hook, and How Easily It Is Connected with Only a Little Slack

IMPROVED HOOK FOR LOGGERS EASILY CONNECTED

Only a slight bit of slack in the line is needed to unfasten a new hook for logging operations and it can be connected in a fraction of a time required with the ordinary apparatus. Features of the unit are an eyelet and slot or crotch, into which the other member is easily fitted.

BETTER AQUARIUM LIGHTING TO IMPROVE DISPLAY

Visitors at the John G. Shedd aquarium, now under construction in Chicago, will have a better view of the tanks as a result of the improved lighting system that is to be installed. Instead of having the illumination directed from above or from behind the pools, it will strike the fish on the side from which the spectators are looking. This is expected to be of special benefit on dark days. The lighting is to be achieved by special construction of the skylights, and the natural illumination will be supplemented by electric reflectors, placed over the water but out of the view of the public, when the days are cloudy. The aquarium will cost about $3,000,000.

COAST GUARD SETS NEW RECORD IN SAVING LIVES

During the last fiscal year, the United States coast guard saved 3,313 persons from drowning, while 14,496 were warned of danger and directed to safety. The guard went to the assistance of ships on 2,791 occasions, the value of the vessels saved totaling $37,801,357. Nearly 450 ships, representing fifteen different nations, are known to have been guided by the ice-patrol service, which advises of the presence of icebergs in the shipping lanes. This information is communicated daily by radio, when the ice is considered to be of particular menace.

PORTABLE TRIPOD AUTO JACK AFFORDS HIGH LIFT

Both sides of the car are raised at once and to a considerable height with a portable tripod jack introduced in Germany. Its front leg is slotted, the raising hook being rigidly fastened to a threaded shaft, and the footplate at the bottom of the leg adjusts itself to any angle. The shaft is raised with a crank and worm drive, and the outfit weighs but a few pounds.

Portable Jack in Use; Raising Is Done with a Crank and Worm; Car Can Be Lifted to Steep Angle

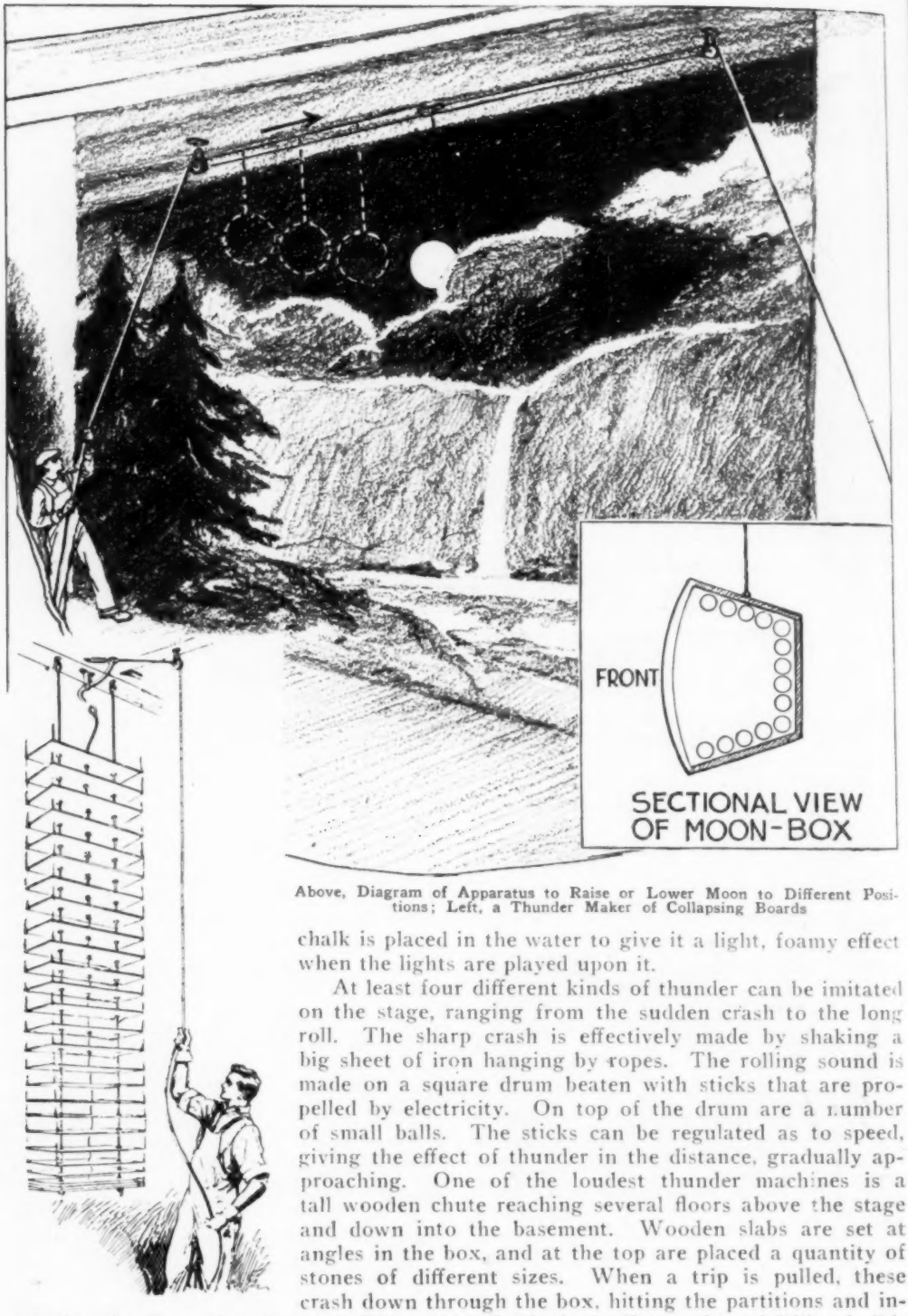
Scenic Wonders of the Stage

Showing How the Fire Effects Are Produced in "Die Walkure"; Steam from Pipes around the Stage Is Illuminated by Red Light Projected from the Wings

THERE is a sudden crash and bang of falling scenery, then the rattle of a cowbell. In an instant, the stage is plunged in darkness. Samson has just pushed over the temple in the last act of "Samson and Delilah" on the stage of the Auditorium theater in Chicago. The cowbell was not directly connected with the spectacle, but it played an important part, for it gave the electrician the signal to pull out everything on the board for a total "black out." Above the din of the falling properties, the bell could be more distinctly heard than almost any other kind of warning.

The scenery, the temple's massive pillars and other units really fall, but the pieces are so skillfully constructed that they are not broken and do no damage, nor is there any danger for the actors below. This is but one of the interesting stage effects developed for the opera and illustrates the high degree of mechanical exactness necessary for the successful production of a play. In "Die Walkure," a god walks about touching the rocks and, as he does so, steam and "flame" spurt out. The secret is explained by men who are hidden in the wings where they are working a steam valve and red lights. The steam is real, and the men, synchronizing the valve to a split second to accompany the movements of the actor, cause the vapor to burst out and the red light gives the appearance of flame. "Brunhilde" falls asleep in an apparent wall of fire, produced by the steam and the spotlights.

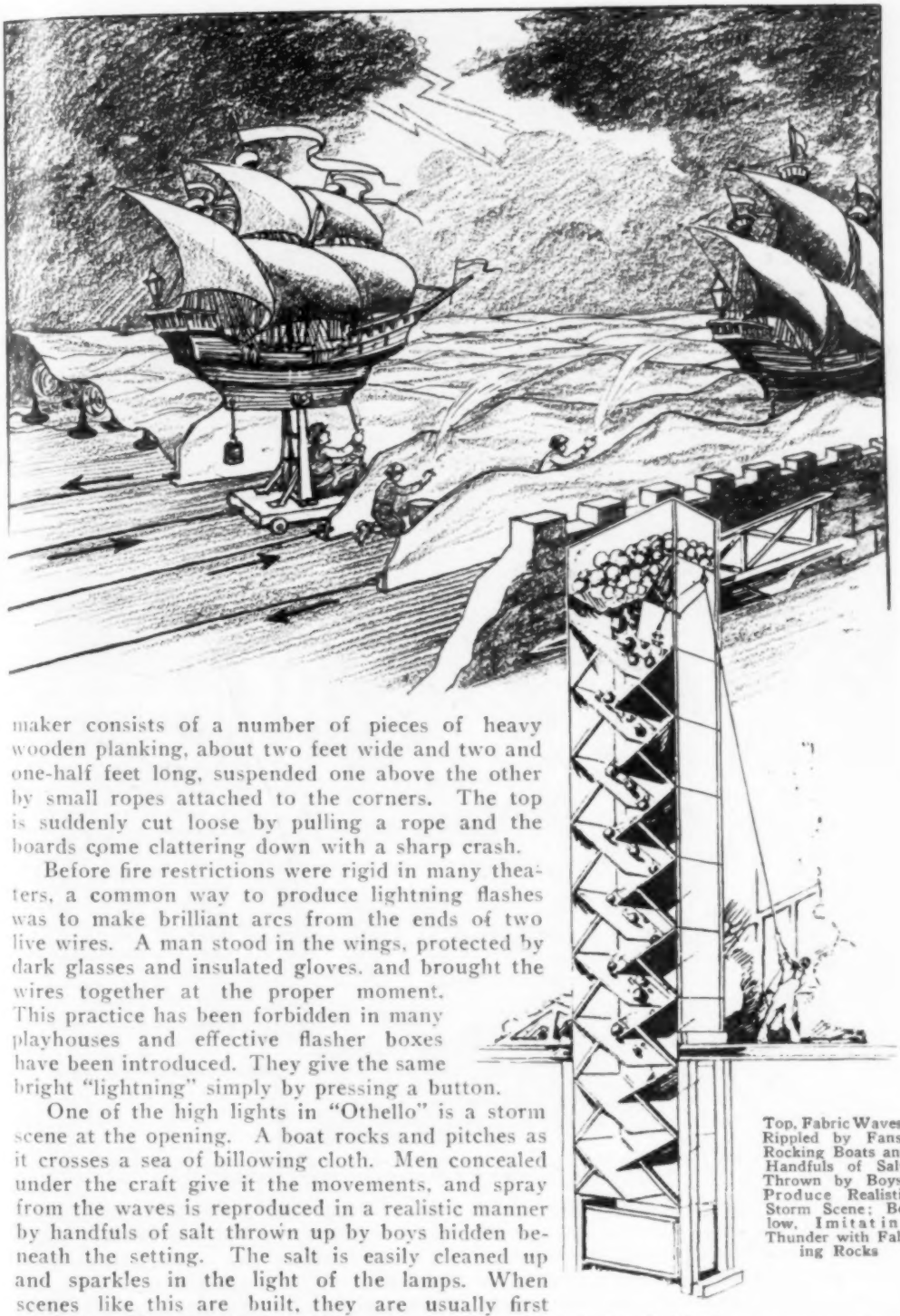
Moving-cloud and rippling-water effects are produced on the stage by means of a rotating lens in front of a strong light. Cloud and water pictures, painted on the glass, are thrown upon the backdrop as the lens moves, and the motions of the shadows are made more realistic by having one disk move faster than the other, thus showing some clouds hurrying past the others. In the Chicago Civic Opera company's production of "Dinorah" real water is used for the waterfall. The supply is pumped back and used again and



Above, Diagram of Apparatus to Raise or Lower Moon to Different Positions; Left, a Thunder Maker of Collapsing Boards

chalk is placed in the water to give it a light, foamy effect when the lights are played upon it.

At least four different kinds of thunder can be imitated on the stage, ranging from the sudden crash to the long roll. The sharp crash is effectively made by shaking a big sheet of iron hanging by ropes. The rolling sound is made on a square drum beaten with sticks that are propelled by electricity. On top of the drum are a number of small balls. The sticks can be regulated as to speed, giving the effect of thunder in the distance, gradually approaching. One of the loudest thunder machines is a tall wooden chute reaching several floors above the stage and down into the basement. Wooden slabs are set at angles in the box, and at the top are placed a quantity of stones of different sizes. When a trip is pulled, these crash down through the box, hitting the partitions and increasing the din as they descend. This noise effectively duplicates that of falling buildings and is a splendid imitation of a long thunder crash. Another loud thunder

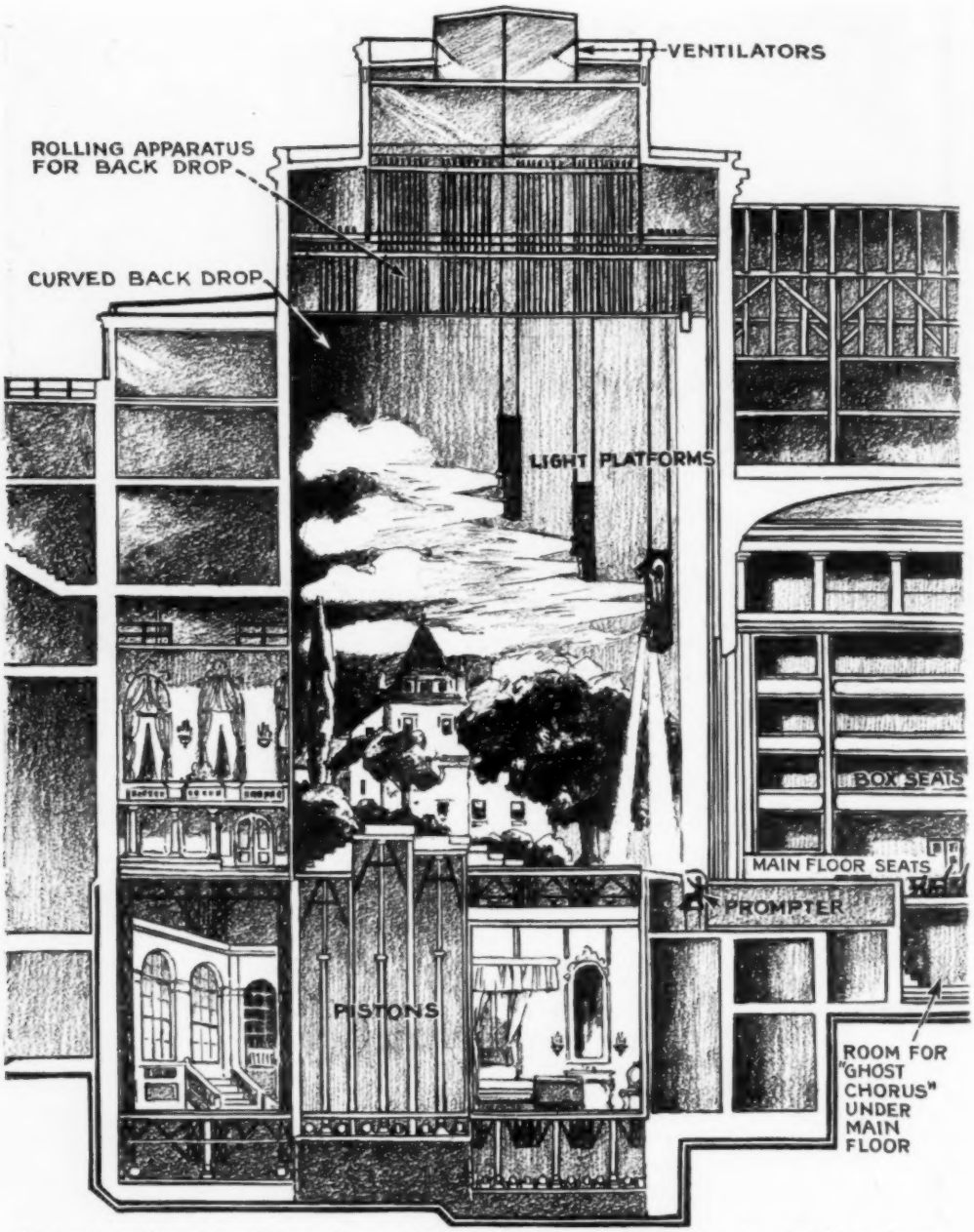


Top, Fabric Waves, Rippled by Fans, Rocking Boats and Handfuls of Salt, Thrown by Boys, Produce Realistic Storm Scene; Below, Imitating Thunder with Falling Rocks

maker consists of a number of pieces of heavy wooden planking, about two feet wide and two and one-half feet long, suspended one above the other by small ropes attached to the corners. The top is suddenly cut loose by pulling a rope and the boards come clattering down with a sharp crash.

Before fire restrictions were rigid in many theaters, a common way to produce lightning flashes was to make brilliant arcs from the ends of two live wires. A man stood in the wings, protected by dark glasses and insulated gloves, and brought the wires together at the proper moment. This practice has been forbidden in many playhouses and effective flasher boxes have been introduced. They give the same bright "lightning" simply by pressing a button.

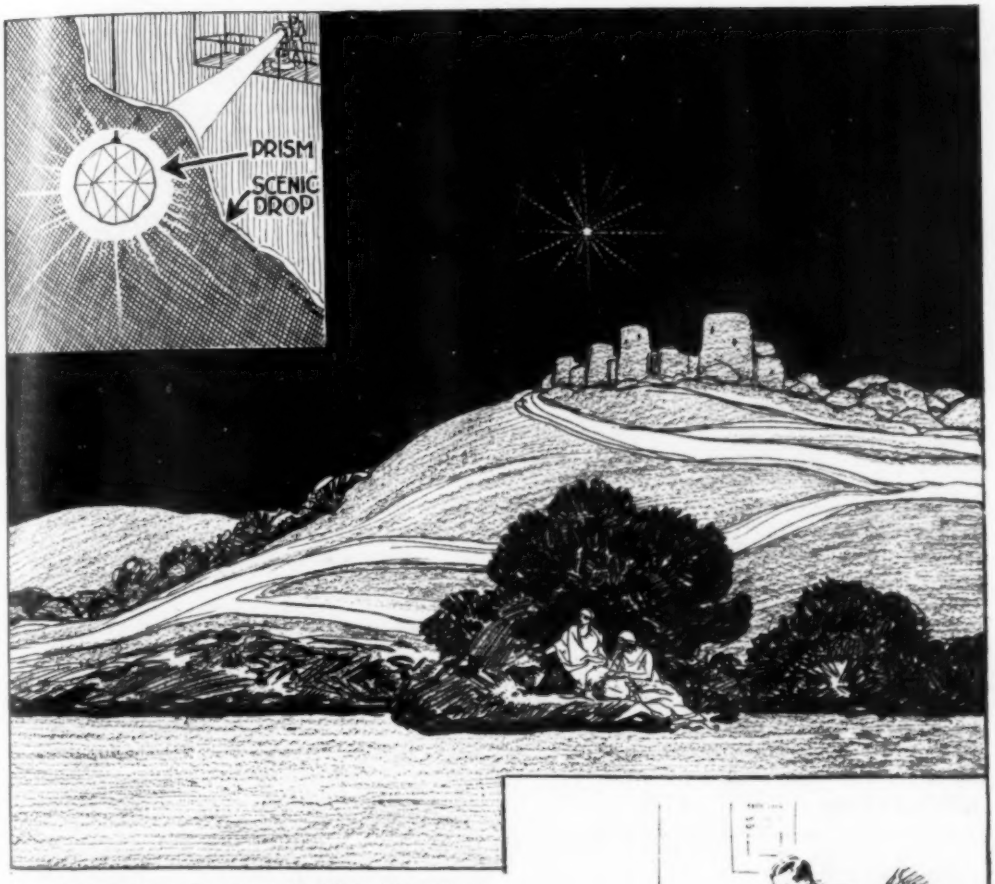
One of the high lights in "Othello" is a storm scene at the opening. A boat rocks and pitches as it crosses a sea of billowing cloth. Men concealed under the craft give it the movements, and spray from the waves is reproduced in a realistic manner by handfuls of salt thrown up by boys hidden beneath the setting. The salt is easily cleaned up and sparkles in the light of the lamps. When scenes like this are built, they are usually first worked out in miniature, and numerous rehearsals with the finished set are necessary so that all movements will be done in proper agreement and the lighting effects pro-



Sectional Drawing of New Theater Stage in Germany; Whole Sets Can Be Lifted into Position on Pistons for Quick Changes of Scenery and Many Novel Effects Obtained

duced at the right time. During these trials, the technical director and chief electrician usually sit in the audience and issue orders through a special telephone set to workers on the stage, who wear headphones.

Opera has no monopoly on scenic effects, for special "trick" sets are needed for scores of productions every year. Often the success or failure of a show depends largely upon its mechanical equipment, for the plot may hinge on the accurate working of some piece of stage scenery. Producers testify that audiences



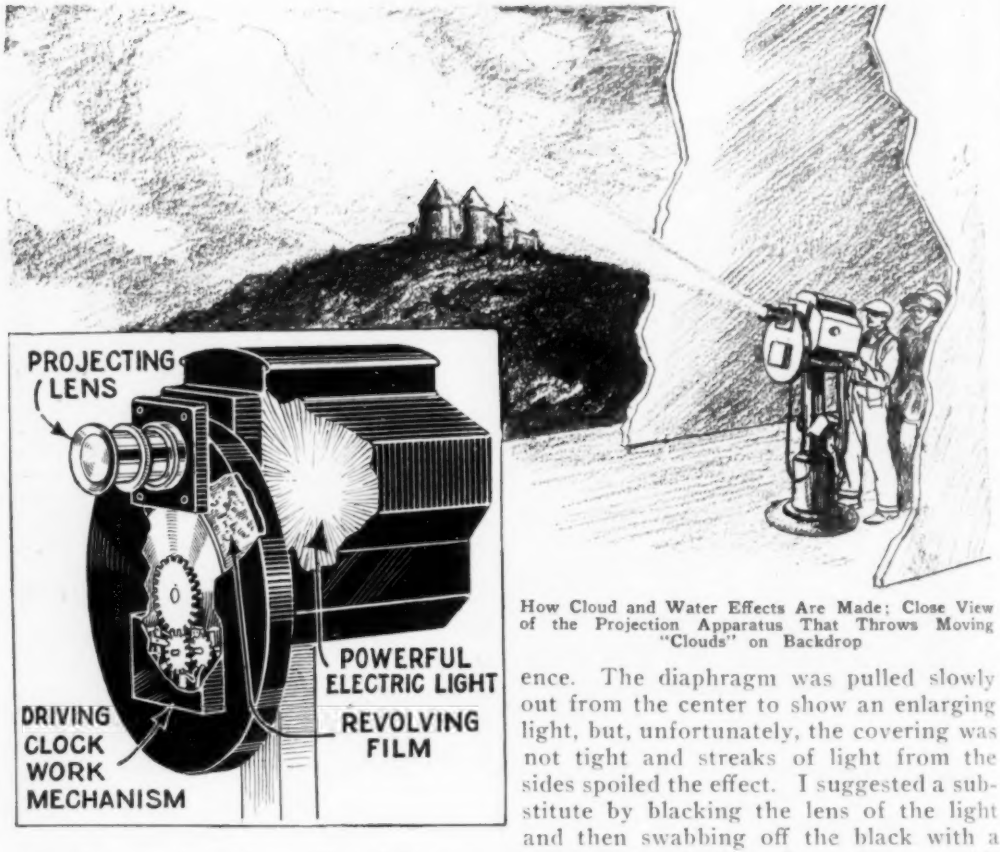
Beautiful Sparkling Star Made by Light Directed on Glass Prism, and Another Thunder Machine; Balls Are Shaken on Drum by Sticks Within

many times react more favorably to a simple and relatively inexpensive surprise act, involving a trick set, than they do to an elaborate number without this appeal. Inventors of stage devices are often called upon for aid in putting life into a show that seems headed for failure, and as "play doctors" they earn recognition as consulting specialists to the owner and producer of the play.

Esten Burleigh Beeler is the inventor of the "flying balloon," popular a few years ago. It was worked by a derrick backstage and carried an actor in a basket far over the heads of the audience, then drew the balloon back and disappeared. The idea for this act was conceived in watching a group of stage hands playing with a derrick that had been used as part of a quarry scene in another show. They

were using it to swing one of their number from one box to another before rehearsal. This novelty proved such a popular success that it was playing in seventeen theaters at one time.

Soapsuds and a rubber sponge gave Beeler another inspiration. He was toying with a sponge while bathing one day. The articles were new then and the chains of bubbles that oozed out when the rubber was squeezed soon filled the tub and



How Cloud and Water Effects Are Made; Close View of the Projection Apparatus That Throws Moving "Clouds" on Backdrop

poured over the sides. The sight gave the idea for a stage waterfall of bubbles. A series of fans were arranged to produce bubbles from separate tanks, blowing 3,000,000 bubbles a second to form a realistic cataract. The act recently brought $1,000 a week from a vaudeville circuit and the apparatus was also adapted to demonstrate the quality of different kinds of soaps.

Mr. Beeler has been a show doctor and inventor of stage sets for more than thirty years. Often the simplest tricks are the most effective, he says, and the most important moments of a show are the entrances and exits. "Years ago, I was a general errand boy and helper for Lincoln J. Carter," he related; "we were playing the old standby, 'The Heart of Chicago,' which featured, among other things, the approach of a locomotive. The illusion was produced by fitting a collapsing diaphragm over a headlight to represent the movement of the engine toward the audience. The diaphragm was pulled slowly out from the center to show an enlarging light, but, unfortunately, the covering was not tight and streaks of light from the sides spoiled the effect. I suggested a substitute by blacking the lens of the light and then swabbing off the black with a cotton-covered stick. I stood to one side where I could not be seen and worked the stick rapidly, beginning at the center and wiping outward. This gave the effect desired."

In recent times, the use of hydraulic and electrically lifted stages and parts of stages has widened the possibilities of scenic display and quick changes. In a German theater, whole settings can be arranged on separate stages dropped or raised above the main platform and then quickly swung into place when wanted, saving long delays.

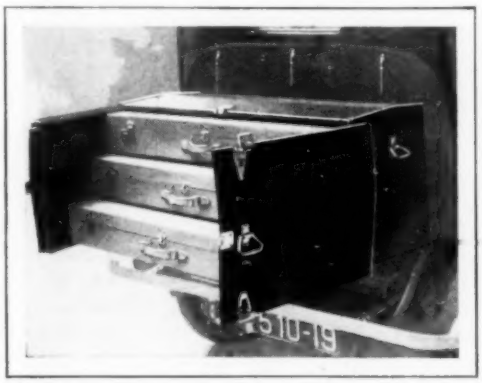
HUGE OBSERVATORY IS BUILT TO BE TAKEN DOWN

Designed so that it can be taken apart and returned to the United States at some future date, a big astronomical observatory recently was completed by the University of Michigan on a flat hilltop just outside of Bloemfontein, Orange Free

State. The fifty-six-foot dome, weighing fifty tons, was fabricated in Pittsburgh, assembled there for inspection, then taken down, shipped to South Africa and re-erected. It is built unusually light, as observatory domes go, to save shipping charges, and to make possible its eventual removal to another site, the entire structure is bolted together, instead of being riveted. There are more than 20,000 bolts in the structure, 9,000 being used to attach the galvanized iron roof. The dome houses a twenty-seven-inch refracting telescope, the largest in the southern hemisphere and the largest ever sent on a temporary expedition. The telescope was planned by the late Prof. W. J. Hussey to be used to study double stars in the southern hemisphere, and after his death, Robert P. Lamont, of Chicago, who had financed the building of the instrument, permitted the university to carry out Dr. Hussey's plans. Dr. R. A. Rossiter and two assistants, Messrs. Jessup and Donner, all of Michigan, are to be in charge. The new observatory has an international flavor, for, besides being an American institution erected on British soil, the actual building was carried out by a Swedish foreman and a crew of Kafir laborers.

AUTO TRUNK HAS SUITCASES THAT SERVE AS DRAWERS

For auto tourists, a luggage trunk, introduced in France, has three drawers, each of which is a separate suitcase and may be taken out and used as a special carrier. The trunk has generous capacity and can be closed tightly to keep out dust.



Auto Luggage Carrier Open, to Show the Suitcase Drawers That May Be Removed and Used Separately

© Keystone

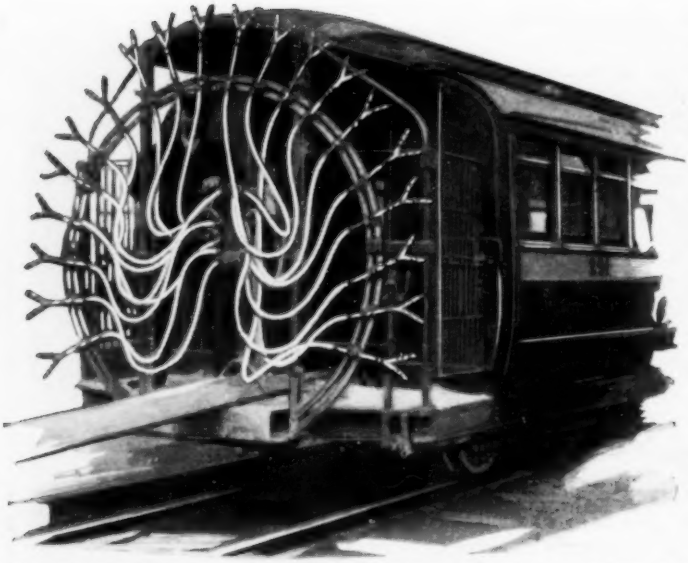
Miss Henry with Two of Her Inventions; She Has Obtained Forty-Three Patents

"LADY EDISON" INVENTOR HAS FORTY-THREE PATENTS

Because of her success in the field of invention, Miss Beulah Louise Henry, a descendant of Patrick Henry, has won the title of "Lady Edison." She holds forty-three patents on articles ranging from valves to dolls. Ideas come to her, she says, while visiting or dining with friends, and she usually visualizes the completed invention, working out the details later.

MOTOR FUEL TO CUT GAS PERIL SOUGHT FOR SAFER DRIVING

Especially suitable to high-compression motors, a fuel being developed by a research organization is regarded as a distinct improvement in that the amount of poisonous gas produced in combustion, is reduced to a minimum. Its performance is said to be due to a chemical process that changes the character of the fuel and to the influence of a new combustible compound. According to some investigators, the presence of so much poisonous gas in the air from automobiles is detrimental to the health and may partly explain many automobile accidents.



To Remove the Soot from the Sides and Top of Tunnels; the Cleaner Car with Its "Spiderweb" Adjusted for Work

"SPIDERWEB" CLEANS TUNNELS ON EUROPEAN RAILROADS

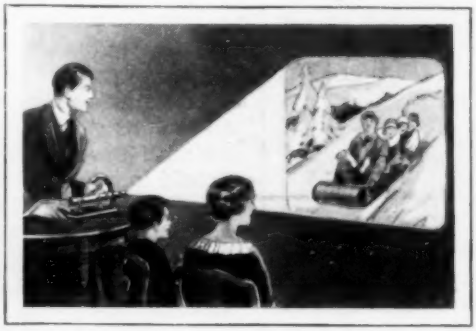
To keep the sides and the top of tunnels free from accumulations of smoke and soot, a curious web-shaped cleaner is used on some of the European railroads. It is adjusted at one end of a special car, its "arms" being so evenly distributed that all parts of the inner surface are reached as the cleaner passes through.

QUAKE INQUIRY TO PROTECT MISSISSIPPI VALLEY

An investigation of the possibility of future serious earthquakes in the Mississippi valley is proposed by Comm. Nicholas H. Heck, of the U. S. coast and geodetic survey. Addressing a scientific meeting recently, Comm. Heck said the slight earthquake felt near New Madrid, Mo., during the serious flood last year and the light shock in the same region on April 9, 1917, demonstrated the necessity of a thorough study of the Mississippi and Ohio valley earthquake zones on account of the danger to many populous cities of the middle west. New Madrid, he said, was the center of an earthquake or rather group of three earthquakes, which was ranged among the twenty greatest quakes of all history. The three occurred in December, 1811, and January and February, 1812, a vast area settling and another huge expanse rising as unconsolidated material in the earth readjusted itself. It was this series of quakes that produced the famous Reelfoot lake in northwestern Tennessee, not far from the Kentucky border. The Carnegie institution, of Washington, in co-operation with various state organizations and the federal government, has been investigating earthquake conditions in California, as is now proposed for the middle west.

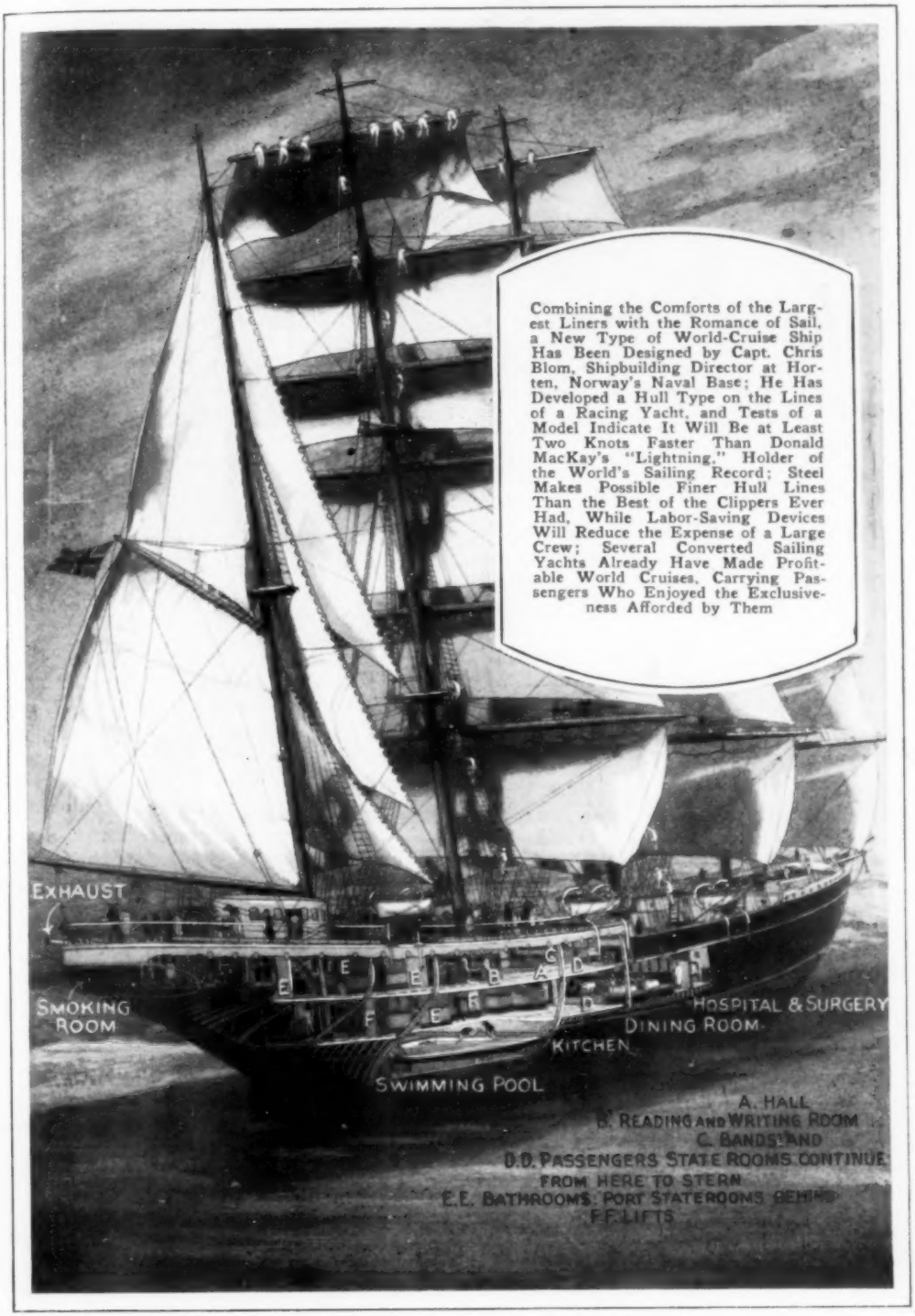
FLASHLIGHT TO PROJECT FILMS AIDS LECTURERS

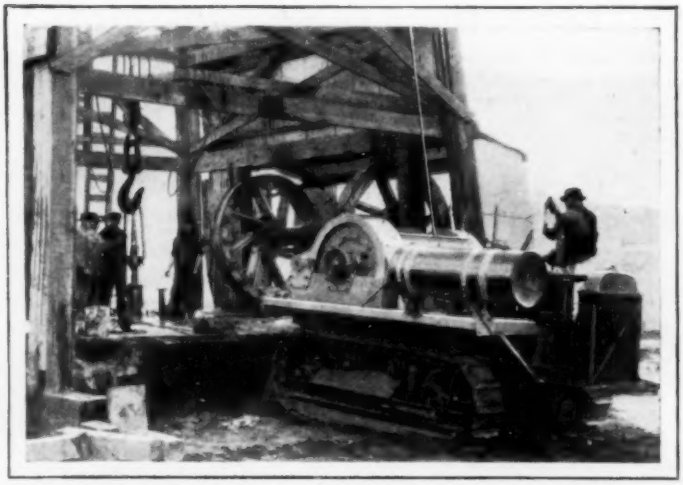
As a substitute for glass stereopticon slides, film strips may now be shown on a screen from a flashlight projector, and this method has been made simpler still by a camera which enables the operator to make his own negative rolls. A length of the film which will give as many pictures as would thirty pounds of glass slides, weighs hardly an ounce. The rolls can be printed directly on positive film for use in the projector. With this outfit, travelers may have a convenient record of their trip to show their friends and the apparatus is especially serviceable to lecturers, etc.



Showing Screen Pictures from the Flashlight Projector; Film Is Used Instead of Glass, Saving Weight

SAILING LINER TO BRING BACK OCEAN'S THRILLS





Hauling Tubing Out of Oil Well with Aid of Tractor; These Portable Power Plants Are Being Used Extensively

TRACTOR TO DRILL OIL WELL REDUCES COST

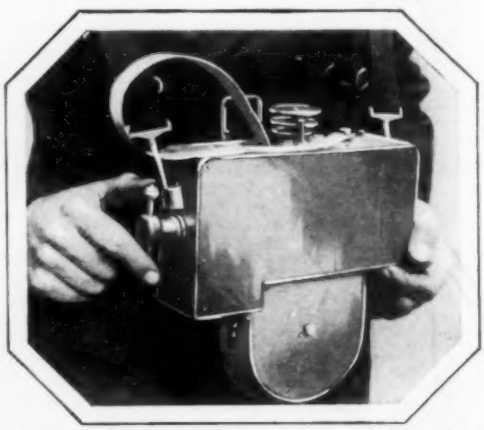
Portable power plants in the form of tractors with endless treads have been introduced in the Texas oil fields for drilling and other operations. On some wells they are said to have cut the cost nearly one third. In the accompanying photograph the tractor is removing 3,200 feet of tubing which had become filled with water. The work required only an hour and a half.

PRIZES FOR SAFER AIRPLANES TO STIMULATE FLYING

The Daniel Guggenheim foundation for the promotion of aeronautics has set aside $150,000 in prizes to be awarded for planes which most satisfactorily meet certain requirements for safety in the air. Following are the tests which aircraft must satisfy: The plane must maintain level and controlled flight at a speed not greater than thirty-five miles an hour and must be able to glide for three minutes with the power switched off and at a speed of not more than thirty-eight miles an hour. It must come to a stop within 100 feet of the spot where it first touches the ground in landing. A steady glide must be made over an obstruction thirty feet high and the plane must come to a stop within 300 feet of the base of the obstruction. It must clear a thirty-five-foot-high obstacle from a starting point 500 feet away. With power off, the ship must glide at an angle between eight and sixteen degrees at a speed of not more than forty-five miles an hour. In normal flight, at a speed of forty-five to 100 miles an hour, the pilot should be able to remove both hands from the controls for at least five minutes to demonstrate the ability of the plane to right itself from wind gusts. If the engine fails, the plane must assume a gently gliding position and make an easy landing. Three independent controls must be placed on the ship; it must be able to take off and land on a plot 500 feet square, surrounded by a twenty-five-foot obstruction, and must taxi against a strong wind.

TICKET MACHINE ON AUTO BUS EASES CONDUCTOR'S TASK

Six-wheeled auto busses, recently introduced in London, carry machines for quickly issuing tickets and transfers, saving the conductor the work of distributing them by the hand method. Each bus has a capacity of sixty-two passengers.



Ticket and Transfer Dispenser Used on London Auto Bus; It Saves Conductor Trouble of Handling Punch

¶The banana was once called the "apple of paradise" and "Adam's fig."

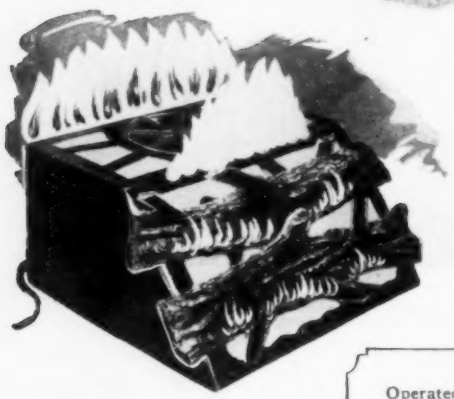
CHARACTER SECRET IN MOUTH, NOT THE EYES

Observe How the Mouth in the Lower Photos Gives the Dominant Expression; the Bottom Pictures Were Formed from Those Above by Transposing the Mouths

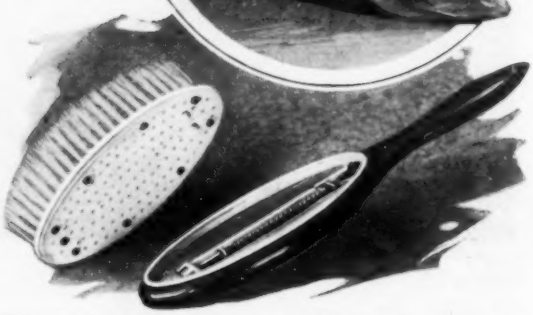
The mouth, not the eyes, is the chief factor which determines the facial expression, according to Dr. Knight Dunlap, of Johns Hopkins university. His findings have been made by taking a large number of photographs of men and women while they were registering different emotions, then making composite pictures by fitting the mouth of one mood to the eyes in another. In almost every instance, the expression of the mouth dominated, giving that mood to the entire face. For instance, a resentful expression of the lips seemed stronger than a cheerful look in the eyes. The photographs were shown to a psychology class of fifty, and four-fifths of the students identified the composites on the basis of the original photograph from which the mouth was taken. To induce the subjects to register the emotions desired, interesting methods were employed. A clever story was told to induce a smile, a pistol was unexpectedly discharged to cause alarm, and for disgust, the fumes of chemical compounds of an unpleasant nature were released near the sitter's nose. Grief was produced by putting the subject into a hypnotic state and then conveying the idea of personal bereavement. No trace of this emotion was left after the subject had been awakened from the hypnotic trance. According to the investigator, the eyeball itself cannot express emotion although the muscles and tissues around it may be moved in such a manner as to register moods.

New Ways to Avoid

With This Covering, Furniture May Be Fumigated in the Home; Gases Are Drawn Off with Vacuum Cleaner

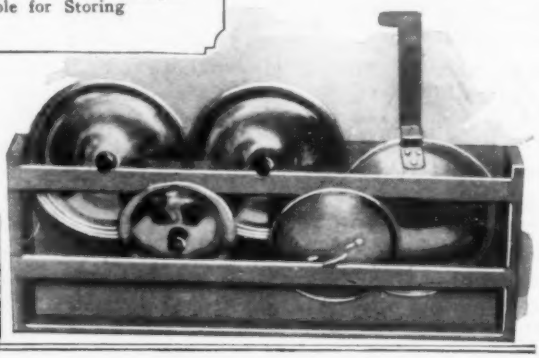


Operated from a Lighting Socket, an Imitation Log-Fire Set Produces Realistic Flickering Effects; It Is Collapsible for Storing



For Quick and Thorough Cleaning, the Bristles of This Hairbrush Are Mounted on Aluminum Plate Easily Detached from Handle

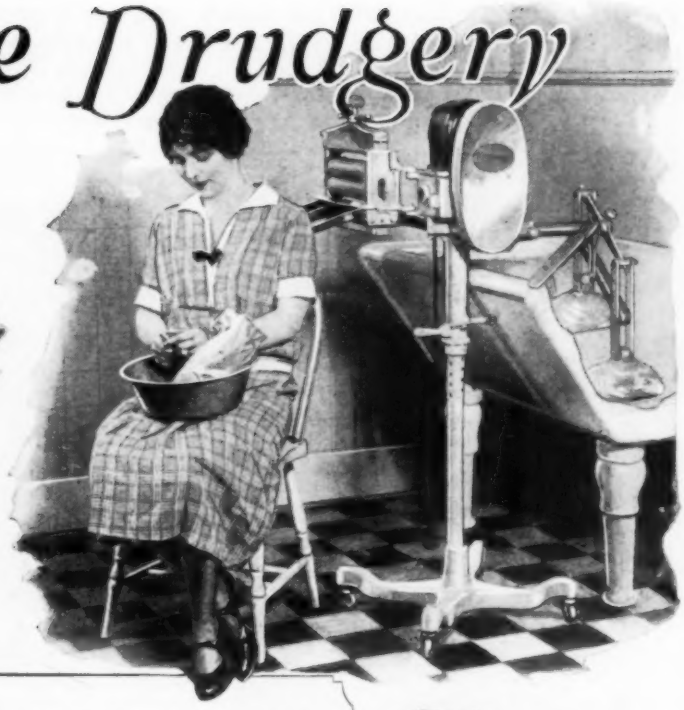
To Replace the Ordinary Cap, Spring Stopper Keeps Gas in Ginger Ale and Other Liquids



This Handy Rack in Which to Store Pan Covers Saves Time and Lightens Work by Eliminating Unnecessary Steps

Home Drudgery

For Opening Fruit Jars and Other Containers, This Efficient Wrench Is Adapted to Different Sizes and, on the End, Has a Bottle Opener; Wrench Is Constructed to Hold the Cover Firmly



Portable Electric Unit That Makes a Washing Machine Out of the Laundry Tub; the Cups Plunge Up and Down to Remove Dirt

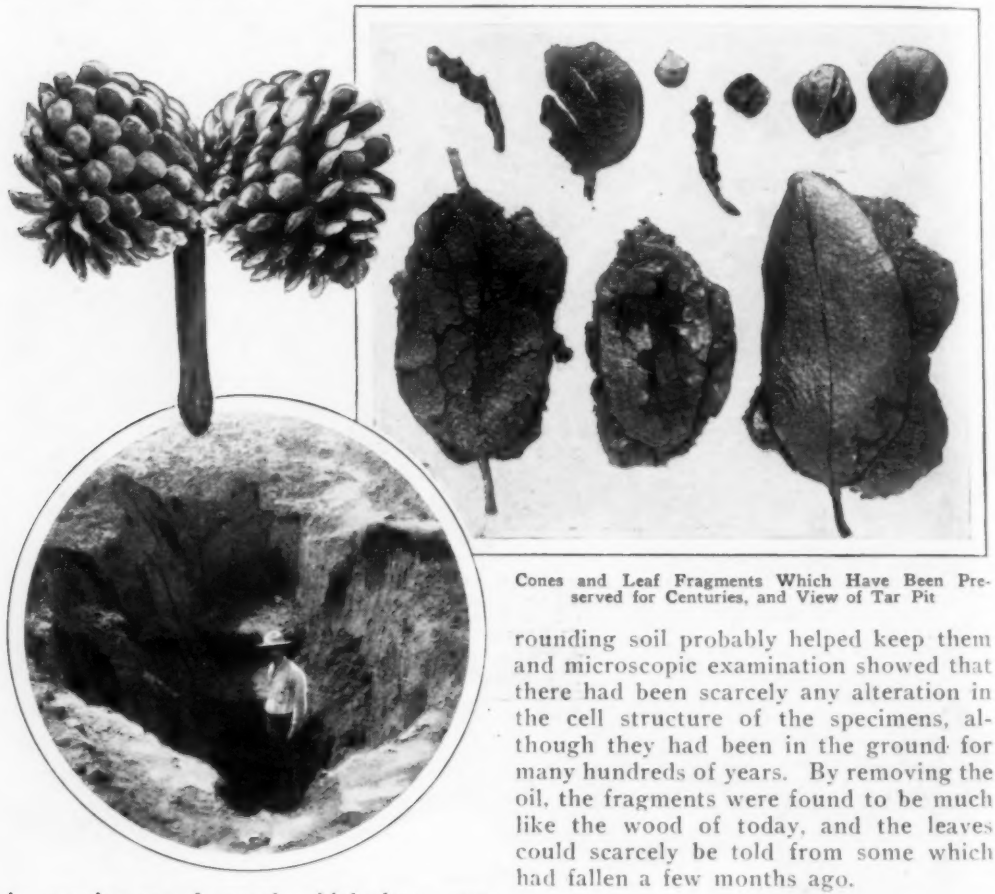
Combination Cutting Board and Bread Box Saves Extra Handling of the Loaf

This Strainer Lid May Also Be Used as an Extra Bottom, in Order to Prevent the Burning of Food

At Left, a Leak-Proof Cap That Makes a Shaker Out of a Milk Bottle; Right, Self-Timing Electric Egg Cooker Which Shuts Off the Current Automatically

WOOD KEPT THROUGH THE AGES IN NATURE'S LABORATORY

Scientists of the University of California have uncovered an apparent mystery in specimens of wood which have remained in excellent state of preservation for some 25,000 years. They were found thirty miles off the Pacific coast on Santa Cruz island and are remnants of an ancient fir forest. The fragments were not petrified nor had they been kept in oil or any substance so far as could be determined, but they were in good condition, as were cones, leaves and seeds. Apparently, they had been saturated with water at one time, hence the theory that they had been preserved in absolutely dry soil, had to be discarded. In the opinion of Prof. R. W. Chaney, who found them, some chemical substance, not now known, may have been formed about the specimens or have protected them from decay. In the natural tar pits near Los Angeles and Santa Barbara, remains of other ancient trees and plants also have been found. In this case, the oily nature of the surrounding soil probably helped keep them and microscopic examination showed that there had been scarcely any alteration in the cell structure of the specimens, although they had been in the ground for many hundreds of years. By removing the oil, the fragments were found to be much like the wood of today, and the leaves could scarcely be told from some which had fallen a few months ago.



Cones and Leaf Fragments Which Have Been Preserved for Centuries, and View of Tar Pit

SAW-BLADE HOLDER UTILIZES BROKEN PIECES

Hacksaw and other blades which may be broken in short lengths, can be further used in a rigid holder that takes blades not over half an inch wide. It has a convenient handle grip, keeps the blade from wabbling and buckling and is adapted to a wide variety of tasks.

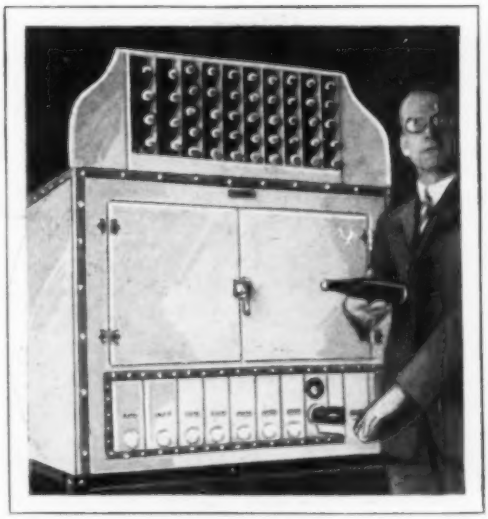
Saw Blade Fitted in Holder Which Is Adapted to the Further Use of Broken Pieces

DESIGN LONG-RANGE BULLET WITH ELECTRIC SPARK

With the aid of an electric spark, army ordnance experts have designed a .30-caliber rifle bullet that has a range of 5,700 yards instead of 3,500 yards, the limit of the old shape. The new projectile has a long, pointed nose and a "boat-tail" rear end. Its form was decided upon after photographic studies of a moving bullet. The investigators at first were in a difficulty, for no camera could be found that would work quickly enough to show the bullet in flight without blurring. The missile traveled at a speed of 32,400 inches per second and even if the lens were opened but 1-32,400 of a second, the bullet would travel an inch in that period, and so appear blurred on the finished photograph. The problem was finally solved by employing an electric spark. Its instantaneous light "stopped" the bullet in its flight so that a clear picture resulted. The photographs showed the air "bow wave" and the "wake," or partial vacuum at the rear of the bullet, and from these data, one was devised that had less resistance to the air.

ELECTRIC STOVE COOKS MEAL AND HEATS WATER

Operated with current from the house-lighting system, an electric stove now on the market will cook an entire meal at once and will heat a small quantity of water at the same time. By means of the regulating device, the current can be shut off or turned on at any time so that the housewife may leave the kitchen, and the stove will attend to almost all the cooking after the food has been placed in it. With the range is furnished a special set of dishes for preparing the meal and practically any cooking operation can be performed on the unit, which is compact, easily cared for and operated at small cost. The photograph shows the gauge and faucet of the water compartment.



Cooler for Bottled Drinks Which Uses Ice or Refrigerating Coils; It Holds Large Supplies

BOTTLE COOLER AND DISPENSER SIMPLIFIES SERVING DRINKS

For cooling food and bottled beverages, a cabinet recently introduced has ten magazines from which the bottles are quickly dispensed. A feature of the unit is that it may be used with ice or with artificial refrigeration coils, the interchange being easily accomplished.

FRAME STRAIGHTENER FOR AUTO CUTS REPAIR COSTS

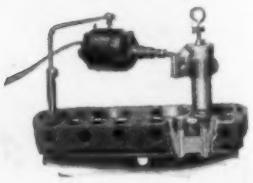
More than ninety per cent of all twisted or bent automobile frames can be straightened without removing the body or motor and usually without the application of heat, it is said, with a simple apparatus introduced to save the garage and repair man labor and to increase their profits. The outfit is of steel, weighs less than sixty pounds and can be adapted to any size of passenger-car, bus or truck frame. More than twenty tons' pressure can be exerted with the unit, which functions through clamps and is operated by pushing and pulling devices.

Advertising Figure Constructed of Brick, to Show the Decorative Possibilities of the Material

DUMMY MAN MADE OF BRICK ADVERTISES FACTORY

To attract the attention of the public to his product, an eastern brick manufacturer has constructed a dummy man of the material at a conspicuous point. The design illustrates the decorative possibilities of brick, was fashioned at little cost and requires no upkeep expense.

GRINDER FOR AUTO-VALVE SEAT SAVES HAND WORK



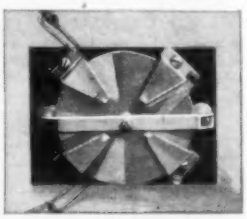
Economy and improved workmanship are claimed for a motor-driven grinder to recondition the automobile-valve seats. It is simple to use, the motor being attached to a swinging support inserted in a valve guide at either end of the block, and power is transmitted through a flexible shaft to the grinder head, which operates eccentrically, taking the high part of the seat first and removing but a few thousandths of an inch of the metal so that the valuable hardened surface is retained. A somewhat similar unit for grinding the face of the valves has also been introduced.

STEEL FOR PINS AND NEEDLES TOTALS MANY TONS YEARLY

Small articles account for two-fifths of the steel used in the manufacturing industries of the United States. Pins alone require steel at the rate of 1,400 tons a year, while 400 tons go to the making of needles. Scissors consume 500 tons and pens call for an allotment of 375 tons. Although belts are more widely worn, the making of suspender buckles calls for 250 tons of steel yearly and loose-leaf notebooks require 3,000 tons for the clasps and trimmings. The prevalence of bobbed hair has increased the demand for clippers, some 500,000 being turned out each year and consuming over sixty tons of steel.

MOTOR OPERATED BY RADIO OR STATIC FROM AIR

Resembling a spiderweb tuning coil, a tiny motor, designed by a Washington inventor, is run by connecting it to a radio antenna and ground after the set has been disconnected. It behaves differently in response to varying atmospheric conditions.



© Harris & Ewing

For instance, if the air is charged with electrical disturbances, the mechanism is speeded up, giving credence to the theory that static, in being harnessed in this manner, might become a blessing instead of a trouble. The inventor is now at work on a motor of larger power which he hopes to run by radio. Impetus to this line of endeavor has been given by the discovery of scientists that at any specified elevation above the earth, there exists a definite electrical potential between that level and the surface of the ground.

Easy Juggling Tricks

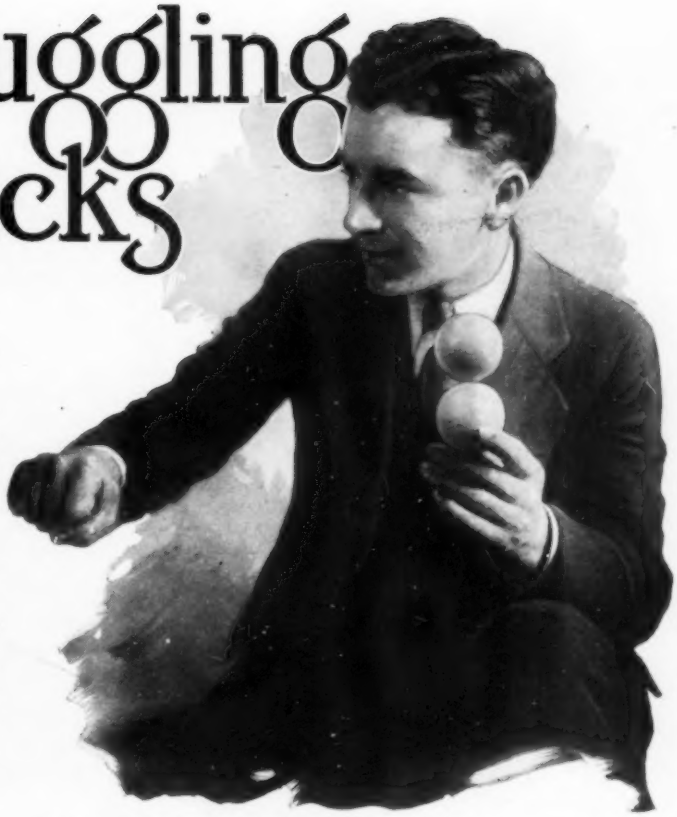
By SAM BROWN

JUGGLING is perhaps the oldest form of entertaining known to the world, superseding even the venerable feats of black magic performed by ancient fakirs.

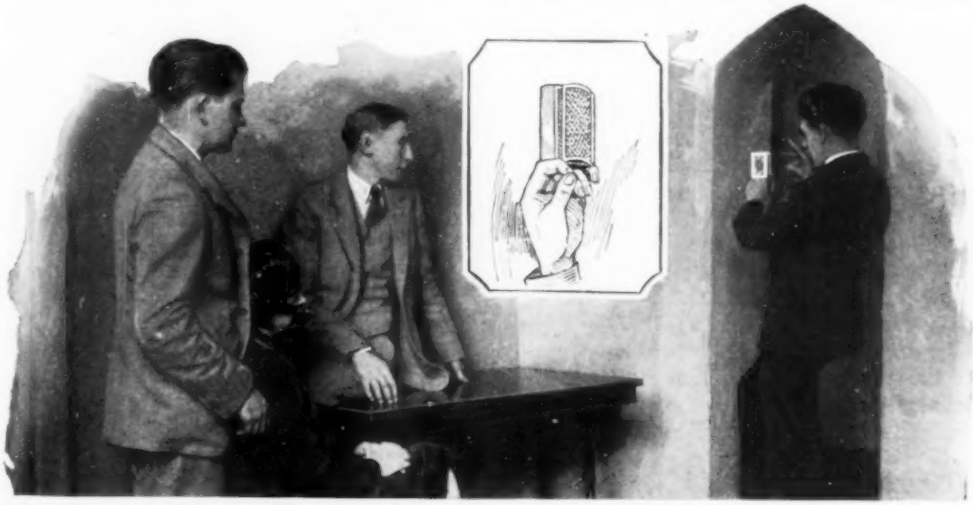
If your voice refuses to warble sweetly some barber-shop ballad and your funny stories fall flat, then you can still take a role in the whirl of social life by doing some little feat in juggling. Not obtrusively or with ostentation, but in the natural order of events.

Just listen:

Imagine you have a deck of cards in your hands, and that "stunts" are in order. What can you do that is entertaining and a little different? Well, why not show the audience the marvelous power you have over cards by balancing the entire deck on the knuckles of your left hand, as shown in



It Is an Easy Matter, if You Have a Small Piece of Beeswax, to Balance Two Billiard Balls in One Hand



Here Is a Simple Method of Juggling an Entire Pack of Cards Upright on the Knuckles of One Fist; the Inset Shows the Trick in Shifting the Last Card to Hold the Deck Against

the illustration. Sure, that's fine, but how do you do it? Simple! You merely slip the last card in the pack into the position shown, doing this under cover of the rest of the pack, and—lo!—your audience will be sitting back in amazement. Try it!

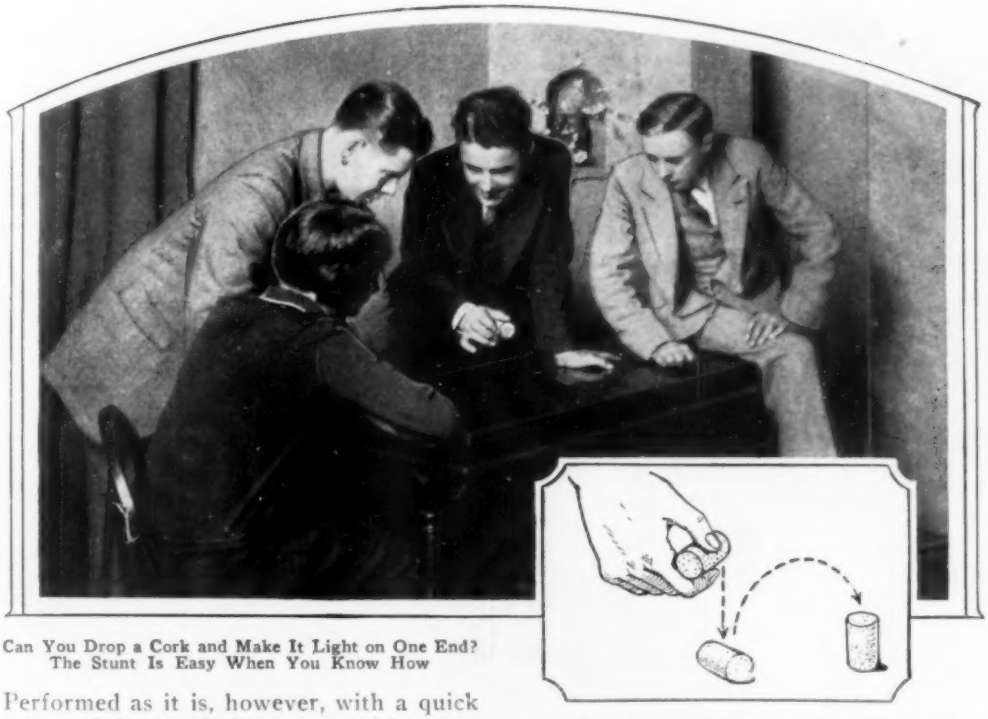
Again, when someone asks you for a match, light it for him in the manner shown. When the match is pulled out it comes away lighted, and your friend is somewhat surprised to find that this novel way of lighting a match leaves your hand perfectly free from burns of any kind.

Did you ever see the professional juggler balance two billiard balls, one on top of the other, and wonder how it was done? The professional usually does this with a set of ingeniously faked balls, but you can easily duplicate the effect by using a tiny piece of beeswax. This you have stuck on the thumb nail of your left hand at the beginning of the trick. It is a simple matter to roll one of the balls over your thumb nail, allowing the wax to adhere to the surface of the ball. If the other ball is balanced on the waxed one, using the wax as a base, you will find that a fairly steady hand is all that is necessary to turn the trick. The wax, which is quite invisible, can be wiped off later and the balls handed to the audience.

Everybody is more or less informed about the wonderful parchment of which our paper money is made, but not many have heard that it is so tough that it can break a match or even a light pencil when applied under proper conditions.

In doing this trick the performer has a spectator hold the match, as shown in the center picture on this page; one hand at each end. The performer takes the folded bill, as shown, and with a single blow cleanly parts the match. The secret is simple. As the performer's hand descends he extends the index finger, as shown, and it is this finger and not the bill that really breaks the match.

A Trick Way of Lighting a Match, Top, and, Center and Bottom, the Secret of Breaking Matches with Dollar Bills



Can You Drop a Cork and Make It Light on One End? The Stunt Is Easy When You Know How

Performed as it is, however, with a quick sweep of the hand, the movement is never detected and the illusion is perfect.

Prohibition rather put the long, untapered cork out of existence, but if you can secure a cork of this type you have the full equipment for an interesting little experiment in juggling. Give the cork to a spectator and request him to drop it on the table so that it will stand on end. The average person tries to do the trick by dropping the cork very lightly on end, but due to the great elasticity of cork, this manner of dropping only causes it to rebound and fall on its side.

And now for the secret, which is quite simple. The cork is dropped from a height of about four inches. Now, if a cork dropped on its end rebounds and falls on its side, then the same cork dropped on its side will rebound and fall on its—. "Right you are!" as the Englishman would say. That's just exactly how you do it.

Another stunt worked on the same principle as the preceding one is the "Dropped Card" experiment. This effect is usually presented in the guise of a game of skill, the performer betting that he can drop more cards on a magazine which is placed on the floor than any other person present. The spectators try first. Here again, the average person will fail, simply because he drops the cards edge down, as shown on the next page, and cards precipitated in this manner will invariably sail away from the magazine. You can make a perfect score by dropping the cards face down, as also shown.

One with a handkerchief? Certainly! You see an aspiring young juggler commanding a frail, fluffy handkerchief to stand erect in his right hand. Of course, the audience does not see the fine piece of thin wire which is wrapped up and attached to one corner of the "hanky" at the beginning of the experiment. When the performer wishes to show the effect, he need only bring forth the magic silk, straighten the wire, pose dramatically—and there you are!

Another effect with a handkerchief, and one which is a little masterpiece all in itself, is the "Serpent Silk." Learn this one.

Remarking that the skin of a certain snake which lived in China ninety-nine years ago still retains the power of life when properly handled, the performer takes a dark silk handkerchief from his pocket. "This is the snake!" He next ties

The Wrong and the Right Way of Dropping Playing Cards So They Will Fall within a Small Circle

a knot in the center of the handkerchief. The knot finished, he makes a few gentle swishes to imitate the actions of a snake, holding the silk in his left hand. Presently the lowermost end of the handkerchief is seen to curl upward, finally emerging through the knot and thus untying itself entirely.

Sounds good, doesn't it? And it's all very simple. The handkerchief is first prepared by having a five-foot length of fine black thread tied to one corner. The handkerchief with its thread attached is in your pocket at the beginning of the effect. When you take it out, the thread naturally comes with it and the free end falls to the floor. Stand on that end. Since the thread and its background (your suit) are both of dark material, the thread is invisible, even three feet away.

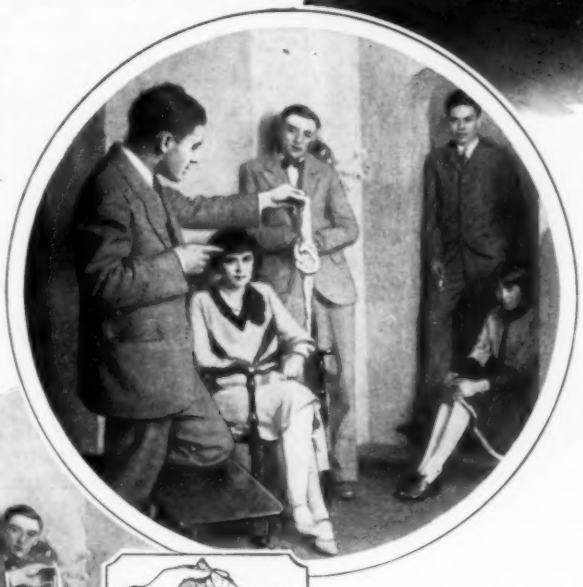
Hold the handkerchief in your left hand with the threaded end hanging down. Still keeping your left hand uppermost, grasp the threaded end in your right hand and tie an ordinary single knot as shown in the sketch, taking the thread through with the knot as shown by the dotted line.

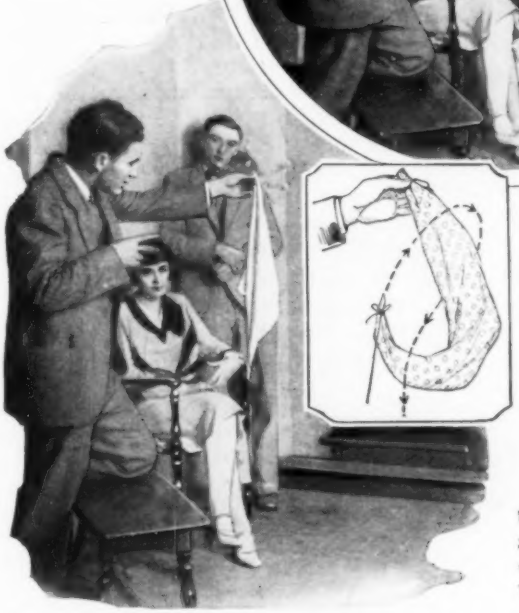
Do not pull the knot too tight, but let it hang loosely in the center of the handkerchief. Now, if you will move your left hand (holding the handkerchief) in an upward direction, either fast or slow, the snake will untie itself. Honest!

Cigarets and soft felt hats are both quite common properties, but the sight of a cigaret balancing its frail white length upright on a felt hat is something quite unusual.

The "nigger in the woodpile" in this effect is an ordinary straight pin. This you have stuck in the lining of the hat previous to showing the effect. When you wish to perform, remove the pin from the lining, jab it through the crown of the hat and up into the cigaret which will then stand erect in a manner quaintly mystifying.

Thread, pins and needles are the stand-by of the amateur juggler, along with a bit of beeswax. The things that can be done with their aid are often astounding. For example, the same thread used to operate the handkerchief snake will serve to make the snake appear as if by magic out of the air.





The Handkerchief Snake Comes to Life, and, Top, an Easy Way of Making a Handkerchief Stand Up

At one moment the performer's hand is empty, and the next instant he has snatched a large silk handkerchief out of space and is ready to stage the snake stunt.

All that is necessary is to lay the handkerchief down, after tying the thread to one corner, lay the length of the thread across the cloth, fold the corners in until you have a bundle three or four inches wide and the length of the diagonal of the handkerchief. Now start rolling, beginning at the corner at which the thread is attached. When you have rolled the handkerchief up in a small cylinder the rest of the thread, three or four feet long, is left dangling from the package. Tie a large loop in the end, insert the roll under the coat lapel, and allow the thread to hang down, as it will be invisible against one's dark suit. When you want to produce the handkerchief, slip the thumb of the left hand through the loop in the thread, and get

the thumb of the right hand behind the cord. Now extend the right hand quickly out and upward into the air, at the same time jerking the left hand down to the side. The thread, sliding between the right thumb and forefinger, will jerk the handkerchief out from under the lapel, unroll it, and, so quickly the eye cannot see from where it appeared, a fully opened handkerchief appears in the right hand.

Blast Furnace Modeled to Scale in Silver as Steel-Mill Safety Trophy

SILVER BLAST FURNACE GIVEN AS SAFETY TROPHY

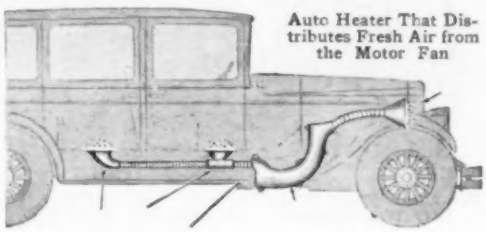
A miniature blast furnace, executed in sterling silver and correct to every minute detail, is the central figure of the safety trophy for the plants of the Carnegie steel corporation. Against the background of the furnace rises a bronze figure of Vulcan, the patron god of metal workers, and on either side are seated a steel worker and his wife and baby. The trophy is mounted on a bronze plinth carrying nine plates for the names of winning plants, and, between two plates bearing the words "Safety Trophy," a tenth plate for the name of the final winner, in whose custody the trophy will remain. Since the Carnegie company started its safety work, in 1911, there has been a reduction of eighty-six per cent in accidents involving loss of time.

SALT IN PLANE MOTOR'S VALVES AIDS LINDY'S SUCCESS

Salted valves on Col. Charles Lindbergh's plane, "The Spirit of St. Louis," were one of the secrets of his success, according to engineers. The salt was inside the stems, which were bored out, filled and sealed in the process of manufacture. The advantage of this arrangement, according to claims made for the units, was that the intense heat at the valve head was relieved somewhat by being distributed through the salt to the cooler stem, which was about twice the thickness of the average automobile valve stem.

AUTO HEATER GIVES FRESH AIR FROM MOTOR FAN

Supplies of fresh, warm air are said to be assured at all times from an automobile-heating installation now on the market. Circulation is maintained by the motor fan and fresh air is afforded whether the winter covering over the radiator is open or closed. The main heating unit is of cast aluminum which is placed about a joint-free section of the exhaust pipe, preventing the leakage of fumes into the warming system. The radiators are of aluminum and bronze and may be installed in the front, rear or both compartments. Absence of moving parts simplifies the operation of the heater which is controlled by shutters of the butterfly type.



Auto Heater That Distributes Fresh Air from the Motor Fan

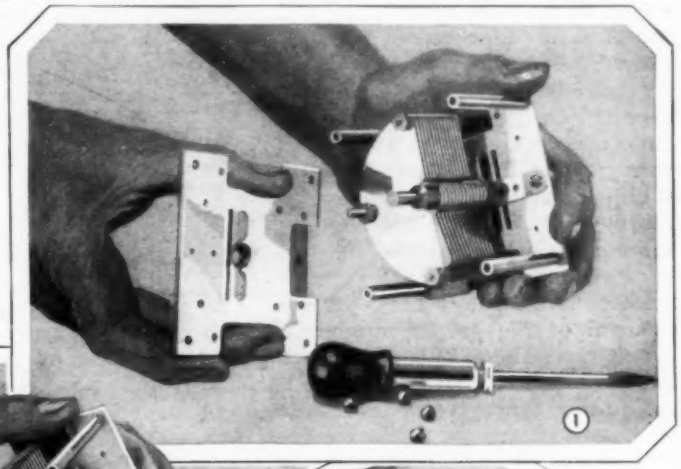
Remodeling Variable Condensers

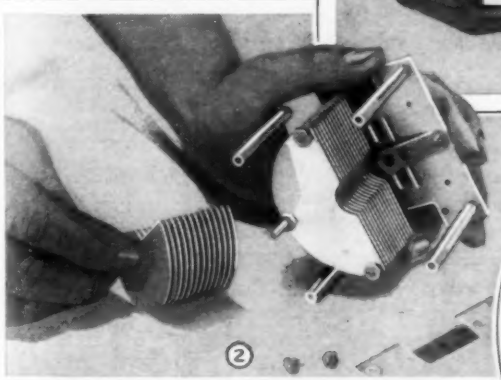
By LAWRENCE B. ROBBINS

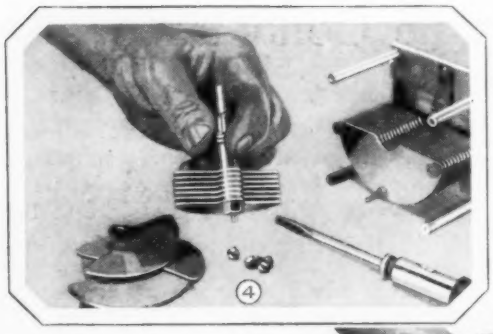
THERE are probably very few radio-set builders but what have from one to half a dozen variable condensers knocking about the workbench. And yet, when a new hookup calls for a condenser of a particular capacity or of a certain number of plates, he finds he has none to conform to the specifications. Consequently he buys a new one, not realizing that practically any condenser may be reduced in capacity by removing some of the stator and rotor plates. Some makes have enough room left on the rotor shaft and stator bolts so that one or two plates may be added to increase the capacity.

It is really a very simple matter to tear down a variable condenser; the accompanying photos were taken during the process of reducing the capacity of a standard make of condenser, and, by following them in numerical order, the general method of reconstruction can be easily observed. This particular condenser was built up of 27 plates and rated at .0005 mfd. A .0003-mfd. unit was required, and it was estimated that one of 13 plates would about fill the bill. Accordingly seven each of the stator and rotor plates had to be removed to approximate the desired capacity. But if the manufacturer rates his condensers at so many plates for a given capacity the problem is greatly simplified.

Photo No. 1 shows the first step; the four screws holding the faceplate to the stator pillar posts were removed and the plate gently pulled off. As a precaution always work gently on any condenser so as not to spring the plates or the frame out of line, because a bent plate will always cause trouble which care in disassembling and assembling will prevent. Any pigtail connections will, of course, have to be removed before taking off the faceplate to allow it to be pulled clear of the frame. When the plate is off, inspect the rotor shaft and bearing for grease, and, if any is found, remove it with gasoline or alco-







hol. Place all screws, bolts, nuts and minor parts in a small box so that none will be lost.

The next step is shown in photo No. 2. Here the rotor plates are turned until they are entirely out of mesh, so that the rotor unit can then be pulled from its front bearing. The condenser in question had a wiping contact from the rotor shaft to a spring on the front plate; the spring and shaft were thoroughly cleaned with alcohol before reassembling them.

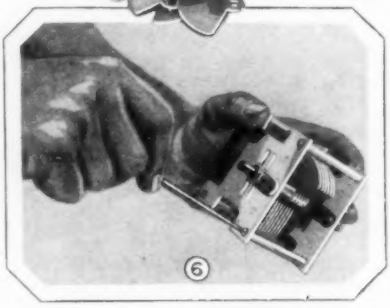
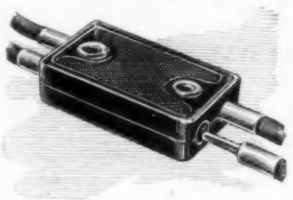


Photo No. 3 shows the removal of the proper number of rotor plates, the dial end of the shaft being held in a vise with a small piece of lead around it for protection in removing the retaining nut, bearing against the contact spring, with a wrench. This allowed the plates to be pulled off, one at a time, with their respective separator washers. After the required plates were taken off, the washers were put back on the shaft, with two or three additional ones to make up for the thickness of the plates removed. A little experimenting was necessary here because the plates and washers must make a compact unit when the retaining nut is threaded down on the shaft. The plates were lined up parallel by pressing the straight edges down on the bench as the nut was tightened.

The completely assembled rotor unit is shown in photo No. 4. The stator plates were removed by pulling off the pillar posts with their separators in the same manner. The required seven plates were left on and then the posts built up with the remaining separators and a few additional ones to make up for the plates removed. Washers for this purpose may be obtained from any radio-supply store for a few cents. Photo No. 5 shows the rotor reinstated in its bearing, with the plates partly meshed. The assembly is completed in photo No. 6, which shows the faceplate being replaced and screwed in position. This brings the rotor in alinement once more, and the plates should be properly separated as in the original unit. If the plates scrape or the spacing between them is not even, adjust the stator-plate pillar posts so that these plates will be changed with relation to the rotor, a slight turn on the nuts at either end accomplishing this. If your condenser had a pigtail contact, this should be reset or soldered in place after the condenser has been entirely reassembled and the plate distance adjusted. If a condenser has room for adding one or two plates the procedure is similar for increasing the capacity. Most condenser plates are of standard pattern, and may be picked up at supply stores, or oversize plates can be cut to match with a fine saw, smoothing all rough edges with a file. If a plate is bent in cutting, it can be straightened by pressing between two smooth pieces of board in a vise.

Extension-Cord Connector



Loud-speaker extension cords can be conveniently connected by the use of the connector shown. A pair of cord tips can be inserted at each end, and the cord can readily be detached.

Selecting the Correct Gridleak

In order that the vacuum-tube detector may work at its highest efficiency, it is necessary that the gridleak should be of proper value, and remain constant under all conditions, both operating and climatic. Otherwise there is much loss of energy and distortion. For the standard 201-A tubes, in average use, the gridleak should have a value from 2 to 5 megohms and for weak DX-signals from 5 to 9 megohms. For the 200-A type detector tube the range is from 1 to 3 megohms, and for DX-signals from 2 to 5 megohms. Since the B or plate voltage has something to do with the value of the gridleak, it is, of course, necessary to raise the value of the gridleak as the B-battery is increased. Most of the modern gridleaks have been improved to a point where they are now quite stable, and once the correct value for the particular tube is found the gridleak may be left permanently in the circuit. It is handy to have leaks of several values to experiment with.

Unit Prevents "Motorboating"

Owners of resistance-coupled receivers are well aware of the difficulty encountered when they attempt to hook up a B-eliminator to a set of this type. The put-put sound, generally called "motorboating," ruins reception. For the past year engineers have tried to correct this trouble and several good methods have been adopted. The unit shown in the photo is one of the best remedies for this type of trouble. To install it, remove the grid resistor in the middle stage, that is, the fourth resistor from the input end of the amplifier, and insert the resistor fastened to the flexible wires on the unit, which is then mounted on the baseboard or subpanel by means of the screws projecting from the bottom.

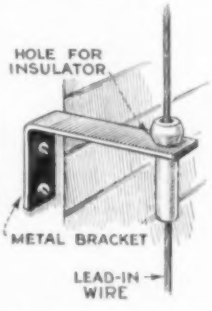
Left, A-Supply Unit with Cord and Switch; Right, B-Battery Eliminator

New Units Eliminate Batteries

The two units shown in the photo are designed to eliminate both A and B-batteries and are said to supply permanent full-strength power, both A and B, to operate sets employing from five to eight tubes, including the power tube. The units are of the dry type and said to be noiseless in operation; the maximum output of the A-unit is 2½ amp. at 6 volts. A receptacle is provided on the front panel for plugging in the B-supply so that both units may be operated with one light-socket connection. There is a convenient switch on the cord of the A-unit which controls both sources of power supply; the switch on the set is left on at all times.

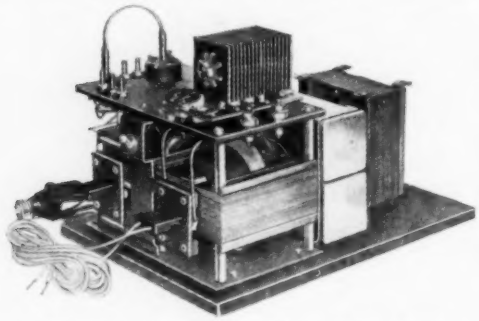
Stand-Off Insulator for Aerial Lead-In Prevents Swaying

A well-installed aerial should always be provided with some means of keeping the lead-in wire away from the building and preventing swaying in high winds. A simple extension mounting for supporting a porcelain insulator is shown in the sketch. A 5/16-in. hole is drilled in the metal bracket, the porcelain insulator inserted and the lead-in wire threaded through it. —B. Hoopes, East Berlin, Pa.



A-Power Unit for Set Builders

This A-power unit can be assembled in from half an hour to an hour by anyone who can solder eight simple connections. No knowledge of radio is necessary to do the job, as the various parts are all



Completed Unit Shown without Metal Cover

plainly marked for position. This new device, now available to all, makes possible an efficient, dry, low-priced substitute for the A-battery. No tubes are required, no electrolytic action is employed, there are no acids, alkalies or liquids, and no moving parts. One of the features of the unit is the special type of dry condensers used. They have a capacity of 1,500 mfd. and are crowded into a space 2 by 2 by 8 in. in dimensions. The tests show the unit to be without hum, when a pair of headphones are connected directly across the output; this is an unusually critical test and assures the user a source of silent A-power for sets employing up to eight tubes, one of which may be a power tube. The knocked-down unit is complete to the last screw, and a metal cover comes with it.

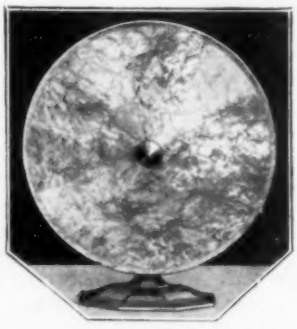
Directional Short-Wave Radio Telegraphy

The usual system of radio transmission creates a series of electrical waves that radiate in all directions, and by means of these waves readable signals are sent out. This is fairly well understood by the average person today, but the new system of "beam" or directional transmission is not so well known. This system confines the waves in a path or beam, similar to the rays of a searchlight when focused on a distant point. Experiments along this line were successfully conducted in 1922 by Signor Marconi, and short waves were found to be best for this particular type of transmission. The aerial employed in the beam method differs from that used in the long-wave transmission in this:

The usual antenna consists of horizontal wires suspended between two or more high masts. The aerial for the new system consists of two units; all wires are suspended vertically from horizontal supports fastened to the crossarms of five masts, each wire being weighted to hold it taut. One unit consisting of 16 vertically suspended wires faces the station with which it is intended to communicate; the other, of 53 vertically suspended wires, is called the "reflector," and is arranged in a semicircle behind the first unit. The waves transmitted from the 16-wire unit proceed outward in the same manner as in the usual system, in all directions, but the waves that would ordinarily escape in the direction opposite to the receiving station and be lost in radiation are prevented from doing so by the network of reflector wires at the rear, which redirect this energy forward in the path of the main aerial unit. At the receiving station the same type of two-unit aerial is used, the reflector wires intercepting the energy of the advancing wave, and reflecting it to the "collector" or main aerial unit, thus increasing the strength of the signals.

Speaker Employs Pyralin Cone

One of the new cone speakers lately introduced employs a cone of pearl pyralin. It stands 19 in. high and the cone is 17 in. in diameter. The material being

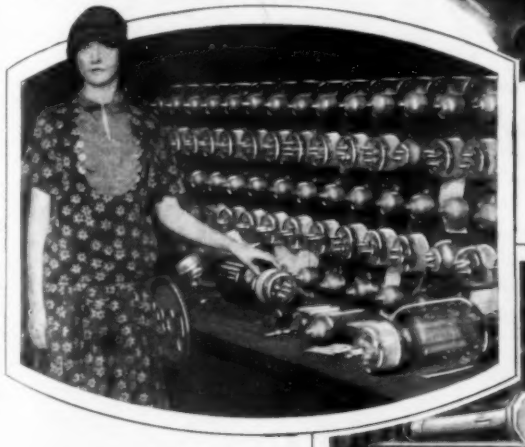


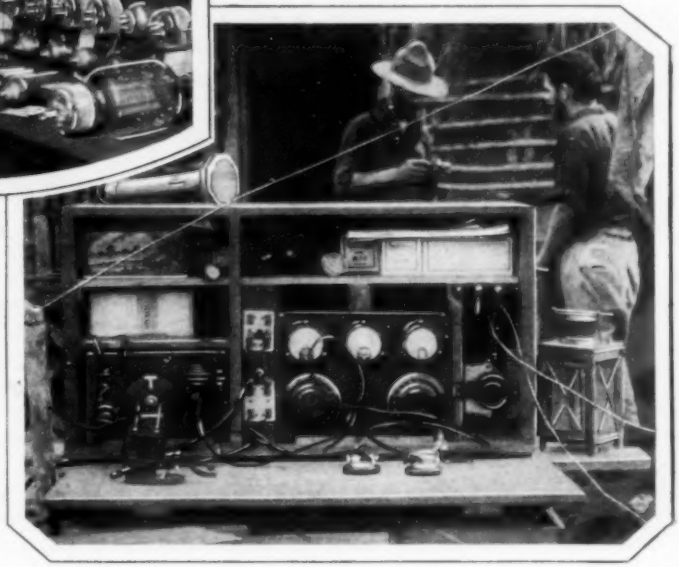
uniform in texture, it is claimed the cone has no vibrating period of its own and responds to all notes with equal efficiency, and, unaffected by moisture, heat or cold, it is said to be ideal for speakers of this type. The speakers are available in a variety of colors, the mother-of-pearl effect being quite apparent in the photo.

Facts and Fads for Radio Fans

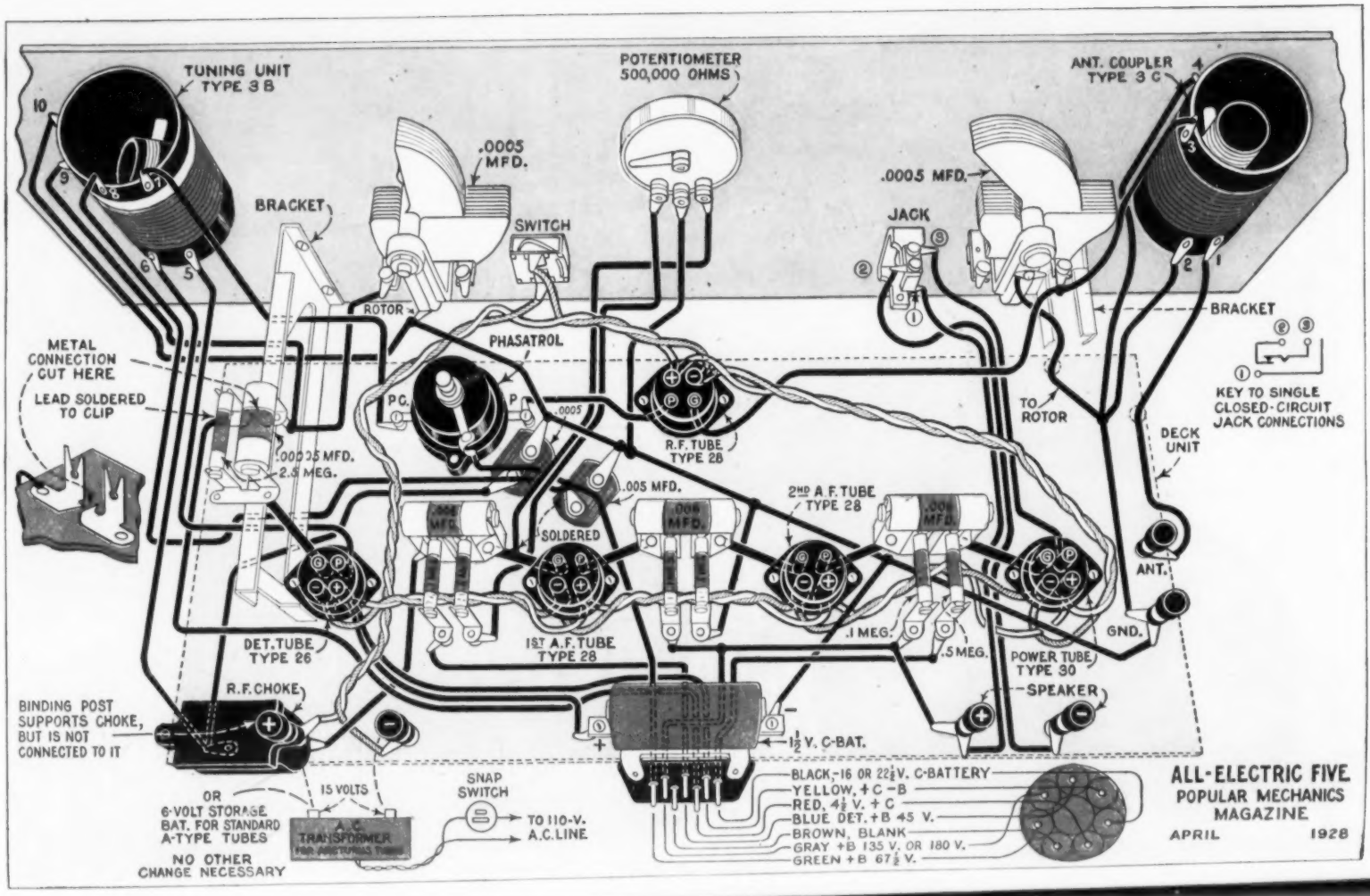
Bernays Johnson Conducting an Interesting Demonstration of Apparently Reversing the Force of Gravity by Radio Energy; the Metal Plate Is Forced against the Operator's Hand Instead of Falling to the Table

James Cantwell Instructing Miss Edith Nelson How to Operate the New Coin-in-the-Slot Radio Receivers Recently Installed in the Hotel Sherman, Chicago; the Instrument Is Designed to Operate Thirty Minutes for Each Quarter Deposited; after Dropping the Coin, the Set May Be Tuned to Any Station Desired





Above, Transmitting Tubes Ready for Final Factory Tests; These Tubes Are Somewhat Larger Than the Familiar Receiving Tubes as Demonstrated by the Comparative Size of the Young Lady Shown in the Photo; Right, Comm. G. M. Dyott's Radio Apparatus, Including Dry-Battery-Powered Transmitter, in Use on His River of Doubt Expedition; Similar Equipment Will Be Carried on His Patagonia-Panama Exploration Trip


TUNING UNIT
TYPE 38
POTENTIOMETER
500,000 OHMS
ANT. COUPLER
TYPE 3 C
.0005
MFD.
.0005 MFD.
BRACKET
SWITCH
JACK
ROTOR
PHASATROL
BRACKET
METAL
CONNECTION
CUT HERE
LEAD SOLDERED
TO CLIP
P.C.
P
.0005
R.F. TUBE
TYPE 28
TO
ROTOR
KEY TO SINGLE
CLOSED-CIRCUIT
JACK CONNECTIONS
DECK
UNIT
.00025 MFD.
2.5 MEG.
.005 MFD.
2ND A.F. TUBE
TYPE 28
.006
MFD.
SOLDERED
ANT.
GND.
DET. TUBE
TYPE 26
1ST A.F. TUBE
TYPE 28
.1 MEG.
.5 MEG.
POWER TUBE
TYPE 30
SPEAKER
R.F. CHOKE
BINDING POST
SUPPORTS CHOKE,
BUT IS NOT
CONNECTED TO IT
1½ V. C-BAT.
OR
6-VOLT STORAGE
BAT. FOR STANDARD
A-TYPE TUBES
NO OTHER
CHANGE NECESSARY
15 VOLTS
A.C.
TRANSFORMER
SNAP
SWITCH
TO 110-V.
A.C. LINE
BLACK, -16 OR 22½ V. C-BATTERY
YELLOW, +C -B
RED, 4½ V. +C
BLUE DET. +B 45 V.
BROWN, BLANK
GRAY +B 135 V. OR 180 V.
GREEN +B 67½ V.
ALL-ELECTRIC FIVE
POPULAR MECHANICS
MAGAZINE
APRIL 1928

The Convertible All-Electric Five

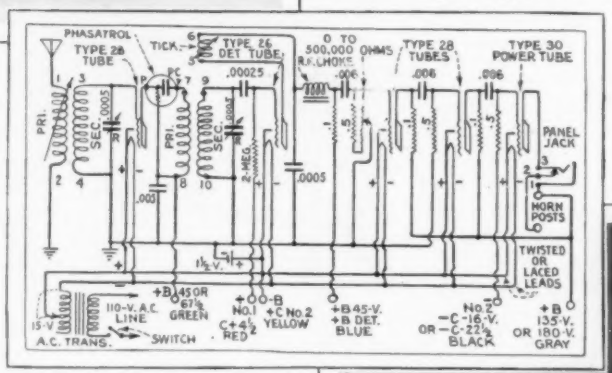
by Frank L. Brittin

ALL-electric or light-socket operated sets are now a chief topic of conversation among radio fans, and there are a number of very good a.c. tubes available for these receivers. Many who would like to try out these tubes hesitate, however, because most of the circuits look complicated. But here is a set so simple that even the average ten-year-old boy can build it; in fact, it is partly built before you start.

Designed, built and thoroughly tested in our own laboratory, this set combines several unusual features that we believe will be of interest to anyone who wishes to try out the latest development in all-electric sets at a reasonable price for parts. Equally efficient on either the new a.c. or standard d.c. tubes, the set tunes sharply, has excellent tone and plenty of volume and range. Although designed for the a.c. tubes specified, ordinary tubes also fit the sockets, an A-battery may be substituted for the 15-volt transformer and the set so operated without making any change in the circuit, and either a B-eliminator or three 45-volt B-batteries used in either case. As in most all-electric sets, the C-batteries are not considered as batteries, and will usually be found hidden in some inconspicuous location of the set, and need be replaced only about once a year.

The a.c. tubes used look exactly like the standard ones; are of the heater type and contain four elements: the heater, the cathode, the grid and the plate. Only four prongs are required for the connections; therefore, the tubes can be inserted in standard UX-type sockets. The tubes will operate satisfactorily at any point between 12 and 18 volts. However, the 15-volt a.c. supply recommended should be maintained as closely as possible to obtain the best results. Step-down transformers such as used for operating toy trains may be employed, but the transformer especially designed for the tubes is preferable. They sell at $5 and are provided with a means of compensating for differences in line voltages.

The current required for each tube is but .35 amp., so that ordinary flexible rubber-covered hookup wire may be used for the filament wiring. The tubes are wired in parallel in the usual manner, except that the wires are twisted to eliminate any possibility of hum. Note that the circuit is a standard type, consisting of one stage of tuned r.f., regenerative detector and three stages of resistance-coupled audio amplification, the only difference being that all grounds are eliminated from the

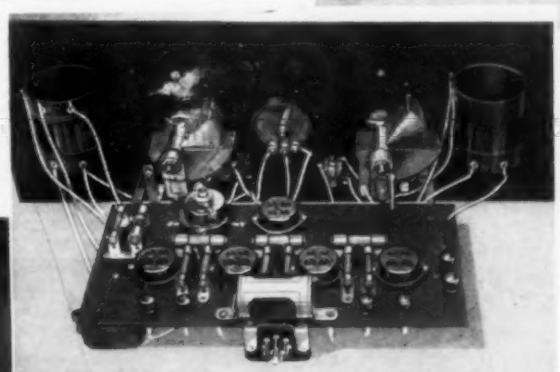


Above, Pointing Out Condenser to Be Shifted to Clip at Right, Photo Shows Deck with Mounting Brackets in Position; Right, Schematic Diagram; Below, Deck Held in Vise Prevents Damage to Instruments While Drilling for Brackets and Balancing Device

The wiring diagram (page 654) tells the wiring story very clearly, the wires under the subpanel or "deck" being as if the deck was made of glass instead of bakelite. This deck or subpanel unit comes with the sockets, resistors and cartridge-type condensers already mounted, and the wide black lines show the connecting strips that are also a part of the unit. The only change required is in the grid condenser and gridleak at the extreme left and pointed out in the upper photo on this page, the position of the two being reversed. To this end, it is necessary to sever the front-support clip, so that the gridleak will not be shunted across the condenser, and to take the front gridleak connection to the positive 4½-volt C-battery, for the positive grid bias necessary for the detector tube. The sketch at the left of the deck shows the connection cut, the cutting being done with a sharp three-cornered file or hacksaw, and one edge turned up to insure separation. The balancing device, shown at front and to the right of this unit, is for balancing the r.f. stage, and, when once

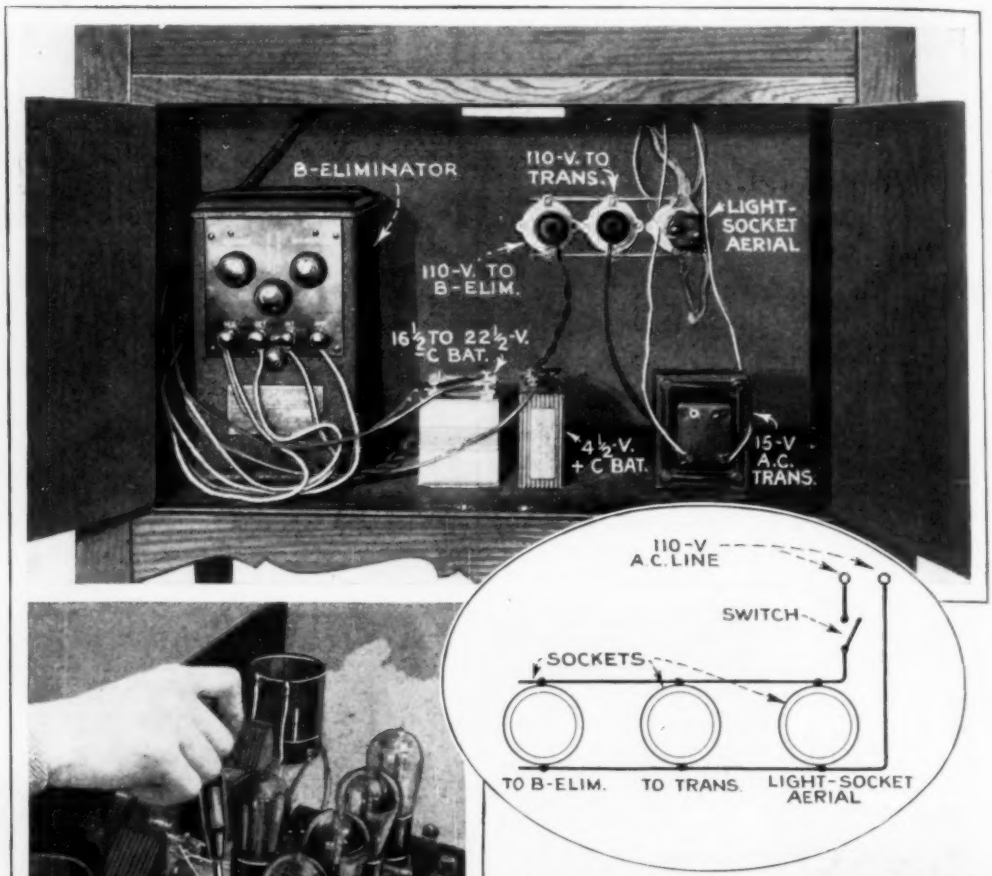
filament circuit; all grid returns, except from the power tube, are grounded, and the necessary biases, excepting the detector, secured by connecting the bias potential to ground. A positive bias of 4½ to 9 volts is applied to the grid of the detector tube through either a 2, 3 or 5-meg. gridleak, the best value to be found on trial. The negative lead of the 4½-volt C-battery can be connected either to the B-negative post or to the ground. The power tube is biased in the usual manner, 16½ volts negative, with a 135-volt B-plate voltage, and if 180 volts B-voltage is used, the negative C-bias should be 22½ volts. It is not practical to use a rheostat with a.c. tubes, but with standard tubes in the set, a 3 or 6-ohm combination switch-rheostat may be employed instead of the panel switch specified.

adjusted, which should be done when the set is ready for operation, needs no further attention. The deck is provided with a row of holes along the edge at the rear for binding posts. The two for the 15-volt filament supply are mounted at the left, one marked positive, acting as a mounting support for one side of the choke coil underneath. This post is not connected electrically to the coil. The connection to the coil, on this side, is from the lower lug, and the black wire leading from it goes to the resistor and .006-mfd. condenser. The lead from the binding-post lug goes to the white twisted filament lead indicated as positive. When the 15-volt a.c. transformer and a.c. tubes are used, there are no polarity values. The 1½-volt C-battery, of the round flashlight type, is mounted at the right in the center by means of two small brass angles. The connector-plug receptacle is mounted directly under this C-battery, and the speaker, ground and aerial posts at the right. The subpanel brackets are mounted so as to leave room between the front panel and the deck for the two variable condensers. The tuning unit and antenna coupler are not marked with the terminal numbers shown in the diagram. Therefore, place the shaft of the rotor coil through the front panel at the rear and screw on the nut in front, holding the coil in the position shown. The rotors must be next to the bottom of each of the large coils; now number each terminal in the rotation shown in the simplified diagram.



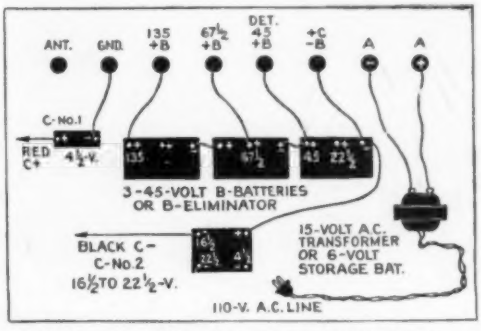
Above, Mounting Clips for Small C-Battery; Left, Rear View of Completed Set; Below, Attaching Cable Plug

When the set is hooked up and the tubes in position, each in the proper socket indicated for its particular type, the set is ready for test and balancing. Connect the 15-volt transformer to the set with long flexible leads, so that it can be placed from 2 to 3 ft. away from the set. The snap switch is connected in one side of the 110-volt a.c. supply line; the small power switch on the front panel of the



Top, Interior View of Lower Console Compartment; Below, Wiring Diagram for Socket Bank; Left, Adjusting Balancing Device

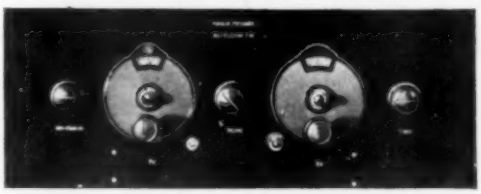
set is then turned on and left in the on-position, and the set is operated by turning on the snap switch in the 110-volt line. If a B-eliminator is used with the a.c. tubes, the power switch on the front panel can be used to operate both units by taking it out of the filament line. Splice and solder the negative filament line together again and run twisted lampcord leads from the supply directly to the switch on the set. Two or three ordinary porcelain lamp sockets may be used in the manner shown in the insert sketch on this page; these may be mounted inside the lower compartment of the console, or, if a cabinet is used, they may be placed behind the table, out of sight. The sockets are wired in parallel and the set switch connected in one side of the 110-volt line, the other side of the line going direct to the other side of the bank of sockets.



Hookup for Either Batteries or B-Eliminator

The B-eliminator and 15-volt a.c. transformer are then plugged into their sockets and the third socket is used for one of the new type light-socket aerial plugs. This type of antenna gives excellent results and eliminates the outside aerial.

The balancing device is adjusted by means of a screw in the center of the unit. Before attempting to tune in a station, turn the adjusting screw in a clockwise direction as far as it will go. Then turn on the 110-volt switch. Several seconds will elapse before the tubes heat up to the operating point, when a hiss will be heard in the loud speaker; then rotate the condenser dials, in step, until a station is heard. When a good clear signal is obtained, turn the adjustment screw slowly back in a counterclockwise direction until the station comes in with maximum volume without oscillation, and leave it at this point. The rotors of the tuning unit and the antenna coupler are set to the point of greatest selectivity and need not be changed except for distant reception or when extra-sharp tuning is necessary. If standard B-batteries and ordinary tubes are used, the panel switch is left wired as shown, controlling the A-battery; if a B-eliminator and standard tubes, with trickle charger and storage battery, are

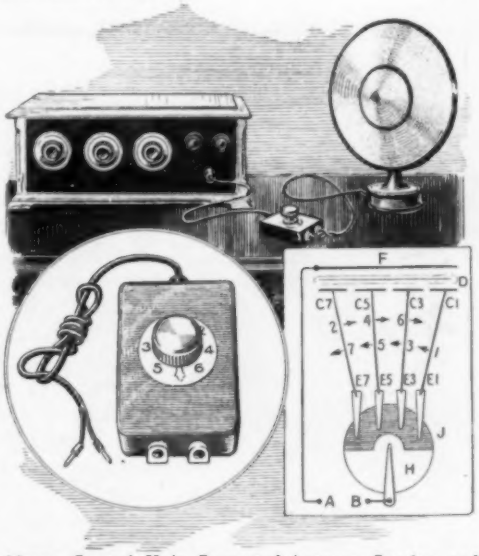


Front View of the Panel, Showing the Neat Layout of the Dials

employed, one of the new relays may be used so that the panel switch will operate the entire installation.

The material list for the set, specifying each part used in the original model together with the price of each item, is available to all without charge. A postcard will bring it.

Carefully prepared blueprints of the simplified wiring diagram and full-size drilling templates have been made and may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents to cover cost and mailing. Specify blueprint No. 131.



Above, Control Unit Connected between Speaker and Set; Below, Control Dial and Condenser Arrangement

Variable Tone Control

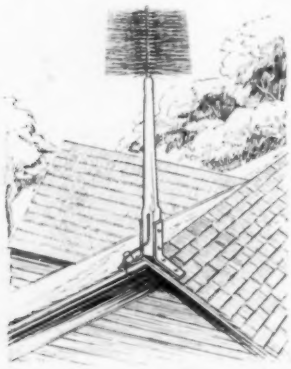
Designed to enable the radio owner to adjust the tone to the most agreeable quality, this unit has several novel features. By means of an arrangement of condenser capacities and a fantail, or commutator-type, switch, seven different capacities, ranging from .005 to .035 mfd., are obtained. The arrangement of the capacities is shown in the insert, A and B being the two terminals of the device; F the plate of the condenser bank that is common to all four condensers, and D the insulator or dielectric between the plates. As the switch is moved from zero to the numbered positions, the capacities are shunted across the transformer winding or the loud-speaker terminals.

Avoid Spilling Electrolyte on Storage Battery

When transferring a storage-battery hydrometer from one cell to another, be sure not to spill any of the electrolyte on the top of the battery for in such a case there will be a loss of acid and this may also provide a path for electrical leakage between terminals. Always keep the top of the battery clean and dry. This is done by first wiping it off with a rag moistened with ammonia or vinegar, and then with a rag saturated with plain water, after which a dry rag is used to remove the water

Aerial Is Designed like Brush

A new aerial looking very much like an oversize wire brush has recently made its appearance on the market. The design is based on the idea that electrical energy is most naturally and easily attracted to sensitive wire points. This multi-point antenna has a thousand such points, to receive signals from all directions, and it is claimed to be less affected by static and highly selective.



Radio-Announcer Outfit

The announcer outfit shown in the illustration is designed to enable radio and phonograph dealers to make announcements through the amplifier and speaker of radio sets or phonographs. It consists of a high-powered microphone and a control box having a cord with an adapter for slipping over the prongs of the detector tube in the set. There are three pin jacks in the side of the control box to receive the microphone cord, and two additional pin jacks to receive the terminals of a magnetic pick-up for playing phonograph records. The control box is also provided with a volume control, and a three-position key-type switch for changing from radio or voice to phonograph.

Rotation of B-Batteries

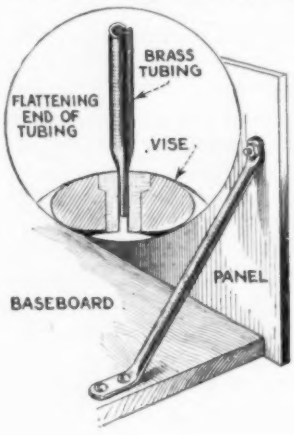
The B-battery used to supply detector plate voltage is usually the first to become exhausted, because of the greater plate-current draw of the detector circuit in a receiver not equipped with a power tube. This battery or section of a battery will drop down to the low-voltage limit before the other batteries, and therefore it is a good idea to disconnect the batteries and rearrange them, placing the one having a low reading on the amplifier side, and using the battery which previously was the second one, for the first. When this too has become exhausted, rearrange the batteries again, using the third battery, in case there are three, for the detector voltage. By this practice the drain on the batteries is more evenly distributed, and it will be found that the period of their service can be increased from ten to twenty per cent.

Soldering Connections to Iron

Anyone who has attempted to solder a connection to a piece of iron has found the operation very difficult, as in the case of a receiver diaphragm for instance. Ordinary flux is useless for doing such a job, but if a few grains of copper sulphate are rubbed over the cleaned metal surface to be soldered and then the flux applied, the solder will readily adhere.

Panel Brackets Made from Brass Tubing

If suitable commercial panel brackets are not at hand, excellent substitutes may be made from pieces of brass tubing, as shown in the illustration. After cutting the tubing to the required length, the ends are flattened in the vise for a length of about ¾ in. The ends should be trimmed and rounded off with a file; the holes for the mounting screws are then drilled in each end. Make a pair exactly alike and after drilling the ends, bend them so that both angles are the same; the bending is done in the vise with the aid of a 45° bevel square; the tube is of ¼in. diameter.

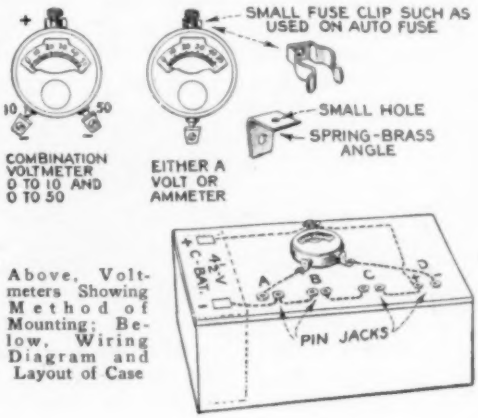


Helpful Hints from Radio Experts

THESE valuable kinks have been written especially for Popular Mechanics Magazine by prominent radio experts. They represent not merely ideas, but practical advice from the best technicians in the profession on methods that will help make your set more efficient in operation, more convenient to handle or easier to build.

Building an Inexpensive Test Set

Requiring a small portable test set for repair work, I built this one at a very small cost, which covers almost any kind of testing both for the amateur and trouble shooter. The illustration is self-explanatory and requires but little comment. The double-reading voltmeter at the left is for general-purpose testing; the volt or ammeter at the right, prepared for mounting in the same manner, is only utilized where higher voltages or ammeter readings are necessary, in which case it is wired to suit the requirements of the test. The wiring for the double-reading voltmeter fastened to the top of the case is shown below. The case should be deep enough to contain a standard 4½-volt C-battery unit at one end as shown. Small midget jacks, of the type designed to take phone tips, are mounted in pairs on the top of the case at the points indicated, and the wiring completed. Flexible test leads terminating in phone tips, plugged into the jacks D, provide a means of checking the condition of B-batteries by a direct reading from the voltmeter, one 45-volt B-battery unit being tested at a time. Now by plugging a pair of headphones in the jacks C and plugging the test leads in jacks B, I can test for open circuits in transformers, loud speakers or any unit of high resistance by listening for the click in the phones. When the test leads are plugged in the jacks A, the 10-volt side of the meter is in series with the 4½-volt C-battery, and will give an accu-

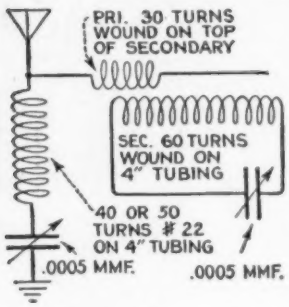


Above, Voltmeters Showing Method of Mounting; Below, Wiring Diagram and Layout of Case

rate test on the condition of filament circuits, rheostats, shorted condensers and open or shorted coils.—H. G. Nebe, chief engineer, Station WSMB, New Orleans, Louisiana.

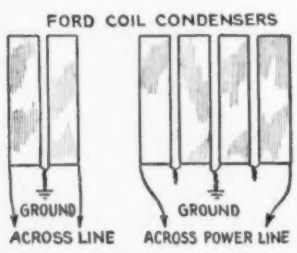
Simple Wave Trap

I have been experimenting with wave traps and have finally hit on a simple one that any amateur can make at a very small cost. The diagram tells the entire story, so very little comment is necessary. The 4-in. tubing may be a section of mailing tube or bakelite tubing, as the builder prefers, No. 22 cotton-covered magnet wire being used for all three coils.—C. R. Yarger, chief radio operator, Station KFNF, Shenandoah, Iowa.



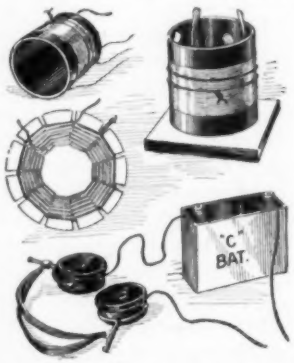
Eliminating Power-Line Hum

Noise in the set is frequently traced to some motor, such as an electric fan, washing machine or a general commutator hum from the power line itself. Such noises may often be eliminated by placing condensers of large capacity across the line. These are expensive, but serviceable units may be built up from discarded Ford coils, which can often be had for the asking at a garage or service station. The coil boxes are opened and the condensers removed, care being taken not to break the lead wires. For an electric-fan or washing-machine motor, two of these condensers are usually sufficient. The condensers are connected in series and a center tap is taken off and grounded as shown at left. The two outside ends are connected across the supply line or motor that is suspected of causing the noise. If two condensers are not sufficient, the size of the condenser bank is increased and tapped to ground as shown at the right, until the proper number to eliminate the noise is found. The condensers should be connected in series, then placed together and held with a heavy rubber band. It is a good plan to test the condensers for a short circuit before using them, as very often a coil is discarded because of a defective condenser.—H. R. Wallin, radio operator, S.S. "Cornelia," Brooklyn, N. Y.



Suppressing Excessive Oscillation

The sketch gives a few helpful hints that may not be known to the average radio fan. I have found them useful and am glad to pass them on to others. To suppress excessive oscillation in a superheterodyne receiver, wind two or three turns of wire in the form of a closed circuit around the outside of the first or second and, in extreme cases, both intermediate-frequency transformers, as shown at the top. The same method may remedy similar oscillation in tuned r.f. circuits employing either solenoid or spiderweb coils. The simple testing outfit below consists of a pair of phones and a 4½-volt C-battery connected in series. With this simple combination, coils may be checked for open circuits, and general continuity tests made in any circuit. If the circuit is complete, a distinct click will be heard through the headphones.—E. L. Watkins, radio engineer, Trego Radio Manufacturing company, Kansas City, Mo.



¶Popular Mechanics radio department offers its information service free to all readers of our magazine. We will be glad to help you with your radio problems and will promptly answer all inquiries directed to this department.

General Care of Tubes

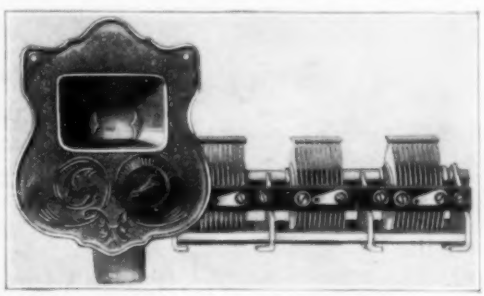
Always treat radio tubes with care; never tap them severely or put them down with a jar. Dropping a tube nearly always ruins it even if the glass does not break or the filament still lights. Keep the ends of the tube tips clean with fine sandpaper or emery cloth to prevent corrosion, which sets up a high electrical resistance and reduces the efficiency of the receiver considerably. It should be remembered that tubes are the most important factor in a radio receiver and should always be kept in good condition.

A Wiring Kink

When wiring sets from blueprints or diagrams it is a great help, as each wire is placed in position and soldered, to mark it off on the diagram with a colored pencil. In this way, if the work is interrupted, you need not trace the wires in the set to see where you left off. It is generally best to run all filament wiring first, next the grid wiring, keeping all grid leads as short as possible, and then the leads for the plate circuit.

Ganged Condensers and Drum Dial in One Unit

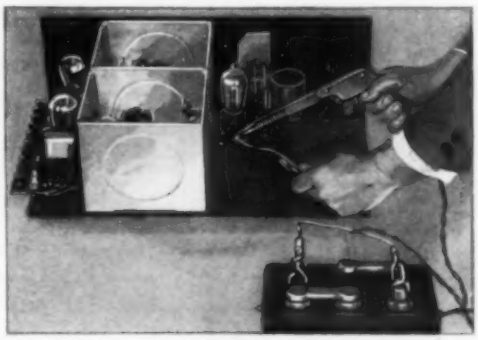
A three-ganged condenser combined with a drum-dial control and neat escutcheon for the front panel, all in one unit, is one of the latest devices offered to the radio-set builder. The escutcheon shield is made of bronze, and the drum dial, of pressed steel, is calibrated from 0 to 100. The drum action is smooth and powerful and no backlash is encountered, due to the friction drive employed. The variable condensers used are of .00035-mfd. capacity, balanced and ganged on one shaft; the condensers and drive mechanism are all assembled at the factory so the unit is ready for instant installation on the subpanel of the receiving set.



Three-Ganged Condenser, Showing Drum Dial and Escutcheon in Position Ready for Mounting

Soldering "Gun" Operates on Battery

The portable soldering iron having the appearance of a gun operates from any 6-volt storage battery, and solves the problem of soldering in unhandy positions and in locations where it would be almost impossible to use an iron of the ordinary type. The point is heated instantly when the trigger switch is pulled; there are no coils to burn out, and the energy required is adequately supplied by the battery. No current is wasted, as the iron is heated only during the actual soldering operation. The tool is designed primarily for work on cars and radio sets.



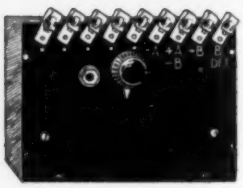
Soldering Gun in Use, Showing Connections to Storage Battery at Lower Right

Proper Testing of Condensers

Simply touching the tips of the headphone test set to the two sides of a condenser and listening for the "click" does not provide a reliable test, for the click will be heard whether the condenser is short-circuited or not. The condenser must be charged by connecting it for an instant across the terminals of a 6-volt battery, then, after waiting a second or two, it is discharged through the phones. A click will be heard if the condenser has held the charge. A surer test is to connect a voltmeter in series with dry cells; if the needle deflects when the circuit is completed through the condenser, the latter is shorted.

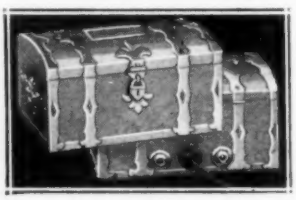
Dashboard Radio Receiver

Designed to be attached to the dashboard of an automobile, the compact 4-tube receiver shown in the drawing is said to give satisfactory loud-speaker reception, using only a small antenna, strung inside the top of the car. The car battery supplies the filament current, while the B-batteries are stored under a seat. The receiver itself is contained in a case, only 3½ in. deep, and has two bolts to permit attachment to the dash.



Output Transformer Made Like Treasure Chest

An output transformer, having the appearance of a cigaret container in the shape and design of a treasure box, is now available. It is finished either in antique bronze, silver or brass, and in a walnut shade so as to harmonize with the cabinet or other furnishings. The case conceals a standard output transformer, and the unit may be placed at any point near the set. It is designed to be connected between the output of the receiver and the loud speaker.



Overheating a Storage Battery Shortens Its Life

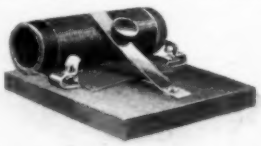
Overheating of a storage battery may be caused by too heavy a rate of charging, by insufficient electrolyte or by internal short circuits in the cells. The plates become buckled or broken and this may in turn cause the insulators to break, permitting adjacent plates to touch each other, which also causes a short circuit. Besides warping the plates, overheating may cause the material on the plates to shed and drop away from the grids. Furthermore, overheating causes the electrolyte to get hot, which results in excessive sulphation of plates and also causes the electrolyte to evaporate quickly.

Adjusting Grid Bias of Vacuum Tubes

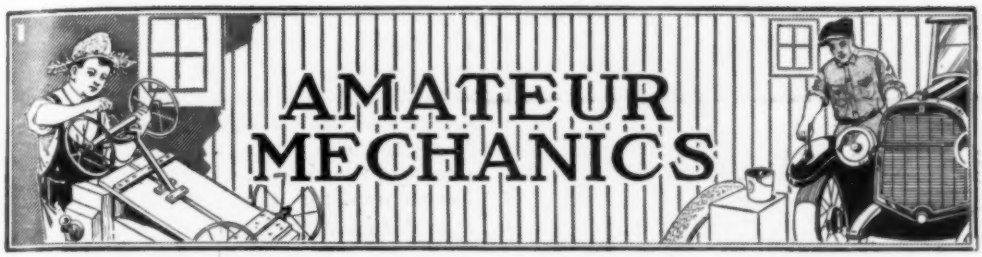
The most satisfactory method of adjusting the grid bias is to insert a 0 to 10-reading milliammeter in the plate line to the tube. The plate and grid voltages are then adjusted so that, when the receiver is set in operation, the milliammeter needle will not fluctuate, even when strong signals are reproduced. If the needle deflects toward zero when a specially strong signal is reproduced, the C-voltage on the grid is too high, and if it deflects in the opposite direction, the C-voltage is too low. When the grid and plate voltages are correct, there should be no appreciable fluctuation of the needle, when a station is tuned in or out. Ordinarily, it will be found that the use of correct C-voltages as recommended by manufacturers will give satisfactory results. However, to adjust the C-voltage accurately, connect a variable resistance in series with the C-battery and the grid of the tube.

Simple Device Aids Selectivity

The simple tuning device shown in the illustration is designed to be used between the radio set and aerial to obtain closer tuning of the set. Available at a very low price, the unit may be used with any set employing an aerial, and can be installed by a novice. It consists of a coil of enameled wire wound on a short length of tubing, a slider arm and fixed condenser. Two Fahnestock clips are provided for the connections.



¶Interference from X-ray machines may be confined to a limited range by proper installation and careful shielding.



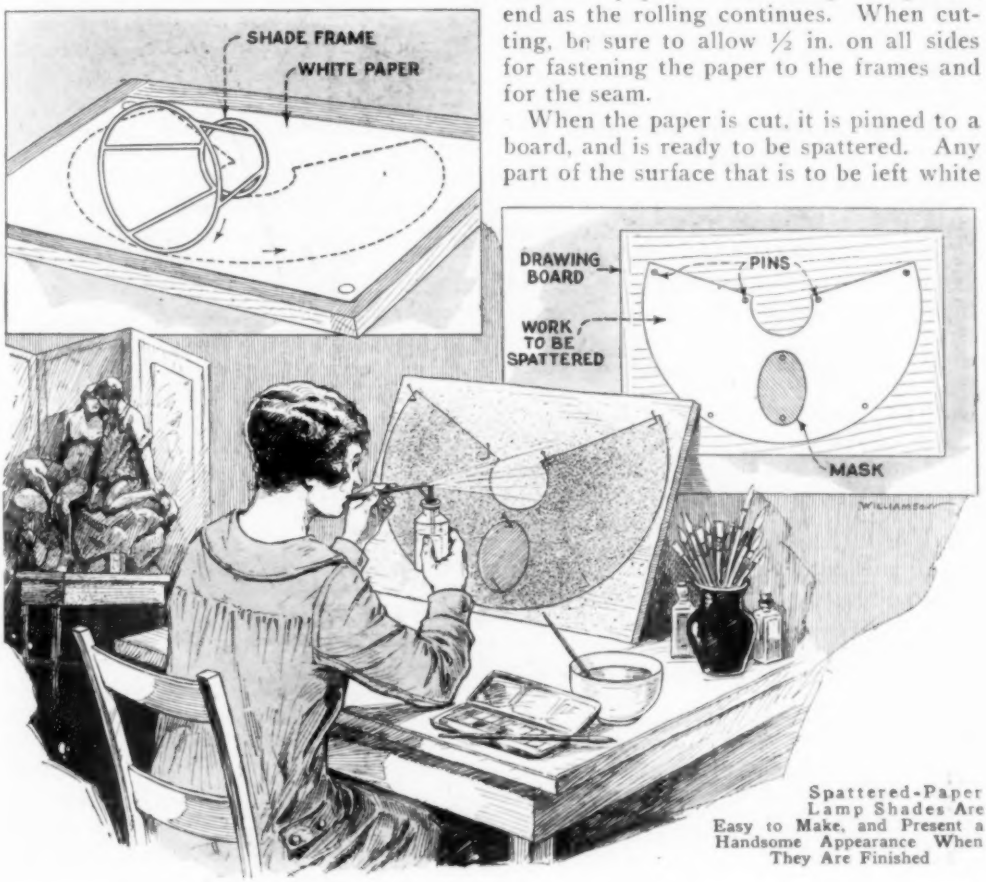
Making Spattered-Paper Lamp Shades

By HAROLD JACKSON

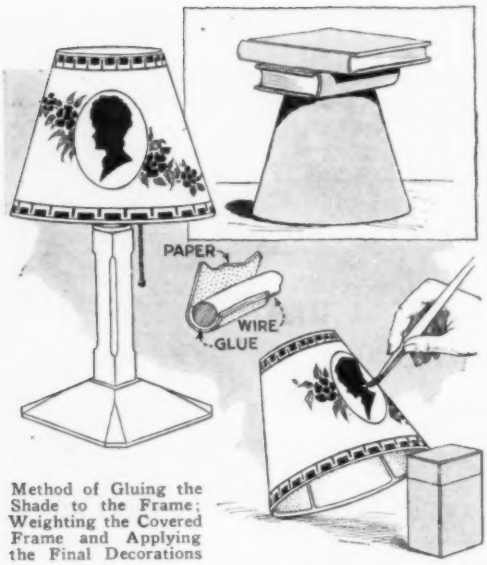
SPATTERED-paper lamp shades are easy to make, durable and very attractive. They consist of a wire frame covered with strong white paper which has been spattered with bright water colors until the surface is almost completely filled with myriads of tiny dots. They are usually decorated by painting some floral or scenic design on them in black or dark water color.

The wire frames can be obtained in a variety of shapes and sizes in almost any town or they can be made at home. Strong white drawing paper is the best material to use for covering the frames. A perfect fit is obtained by rolling the frame over the paper and marking along each end as the rolling continues. When cutting, be sure to allow ½ in. on all sides for fastening the paper to the frames and for the seam.

When the paper is cut, it is pinned to a board, and is ready to be spattered. Any part of the surface that is to be left white



Spattered-Paper Lamp Shades Are Easy to Make, and Present a Handsome Appearance When They Are Finished



Method of Gluing the Shade to the Frame; Weighting the Covered Frame and Applying the Final Decorations

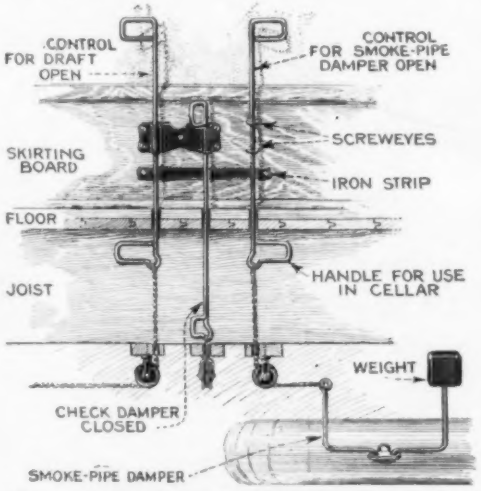
is masked with a piece of paper cut to the desired shape. The board is placed on its edge and the paper spattered with water color thinned to liquid form. The spattering is best done with a fixative atomizer. An old toothbrush and knife can be used if no atomizer is available. The spattering is continued until the surface is almost completely covered.

When the water color is dry, the edges of the paper segment are brought together and firmly glued. The wire frame is placed inside the cone thus formed, and thick glue spread on the top and bottom wires. The edges of the paper are then turned in over the wires and the shade placed on a table and weighted down until the glue is perfectly dry. When dry, the edges of the paper inside the shade are trimmed off with a knife. This method of fastening the paper to the frame will result in a very neat job.

The shade is now ready to receive its final decorating and varnishing. Silhouettes painted on the shades with black india ink show up very nicely whether the lamp is lighted or not. Almost any design looks good if carefully arranged. Landscapes, sea scenes, birds, flowers, girls' heads, etc., can be used to decorate the shades. When this work has been completed, the entire shade is given a coat of clear varnish. This can be applied with a fixative atomizer or, if this is not available, with a soft brush.

Controlling Furnace Dampers

The check and draft dampers of most home furnaces are controlled by means of chains attached to them and run over pulleys and up through the floor to a bracket on the baseboard in the room above. It is often convenient to work these dampers from the basement but this is usually impossible if the chains are securely fastened above. The simple arrangement shown in the illustration provides control of the dampers from either the furnace room or from the usual place above. When the chains are down as far as they will go so that the dampers are closed, the upper ends of the chains should just pass the pulleys as indicated. The ends of the chains are attached to lengths of galvanized-iron wire, or light iron rods, about ⅛ or 3/16 in. in diameter. One end of each wire is first bent into a ring for a finger grip. This ring should be formed so that it will stand out from the wall. The wires are then pushed down through the chain bracket and the holes in the floor, until the rings rest on the bracket. Enough wire is left below the floor to reach the ends of the chains and to be bent as indicated to form small handles. The wire not needed is cut off and the chains attached to the handles. The dampers can then be manipulated either from below or above by push-

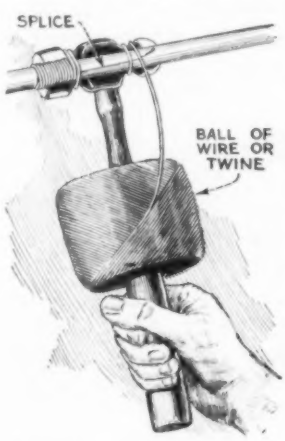


Method of Controlling Furnace Dampers from Positions Above and Below

ing and pulling the wires. In order to hold the dampers in the open position, it may be necessary to fasten an iron strip to the baseboard either above or below the chain bracket, so as to hold the wires firmly. There is spring enough in the lengths of wire to permit them to be moved up and down, and still hold the dampers in any position desired. If there is a choke damper in the smoke pipe, it may be similarly controlled. A stiff wire is run through the handle of the choke damper, securely fastened to it and then bent at right angles about 4 in. from either end. To one arm thus formed a weight is attached and a chain is fastened to the other arm. The chain is run over pulleys to a control wire passing through the floor, similar to those on the check and draft dampers. However, as there are usually only two channels in the chain bracket on the baseboard, means must be provided to hold this last wire in any position. A couple of screweyes, driven into the baseboard, and the iron strip, previously mentioned, work well. If the old chain bracket is not suitable for the other wires, screweyes will be found satisfactory here too.

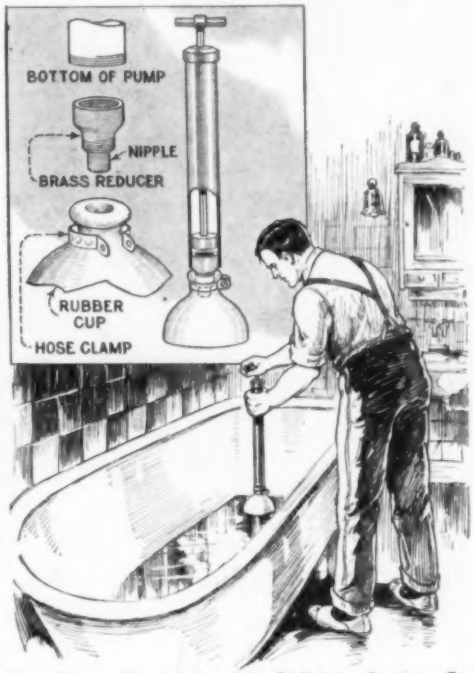
Ball-Peen Hammer Used for Winding Wire Tightly

In splicing two pieces of wood together, using wire binding, a smooth job can be done in a very workmanlike manner as follows: A tight, even winding will be obtained by slipping the ball of wire over the end of a ball-peen hammer, as in the sketch, and passing the wire around the head of the hammer and the object being spliced, in the manner shown. The greater number of turns around the hammer, the greater the tension, while, inversely, fewer turns will lessen the strain.—Robert Gregg, New York City.



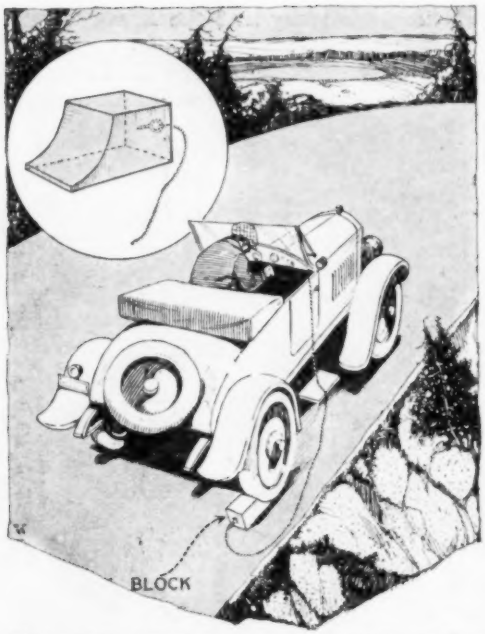
Putting Efficiency into the Drain Cleaner

Under normal conditions the hand suction drain cleaner will remove an obstruction without much trouble. But if it does not, because the drain is clogged too tightly the emergency can be met in the following manner: Unscrew an automobile pump cylinder from its base and clean the bottom opening and edge with emery paper. Attach a brass reducing coupling, the large end of which will make a snug fit inside of the pump tube and the other a tight fit inside of the small end of the usual rubber suction cup. Sweat the coupling into the pump with solder to make an air-tight joint. Cut out the bottom of the recess in the top of the cup so that the opening goes clear through. Insert the small end of the coupling and clamp it tightly with a pipe clamp. This completes the drain cleaner, and almost any obstruction can be removed by a few strokes of the piston. —L. B. Robbins, Harwich, Mass.



Auto Pump Combined with Ordinary Suction Cup Easily Removes Stubborn Obstructions in Drain Pipe

¶Black stains from eggs on silverware will disappear at once by rubbing with salt; so it is a good idea to keep a salt cellar handy on the kitchen sink.



Block-and-Cord Equipment for Autos to Permit Easy Starting on Steep Grades

Block and Cord for Parking on Hills

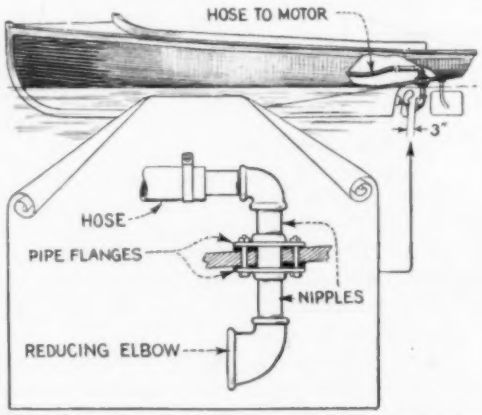
Every motorist who has had occasion to change a tire or make repairs while parked on a steep hill, knows that stopping and getting under way again often is difficult and sometimes dangerous. The conventional practice is to block the wheels with a rock, perhaps leaving the rock in the road for other motorists to bruise tires on. The writer has solved this problem by the use of the block-and-cord equipment shown in the illustration. With this, I can stop on a steep hill and block the car so that there is no possibility of its backing down. When ready to leave, I start in low gear and take the block with me. To avoid the possibility of scratching the car when putting the block in, I cover it with a few scraps of old carpet. It may bump the side but no damage will result.—J. E. Hoag, Los Angeles, Calif.

Keeping Putty in Good Condition

When mixing putty, use a large-bladed putty knife and mix a considerable quantity of the material at once, as it improves with age. As linseed oil is added, pound the mass on a mixing board to eliminate excessive moisture. This also toughens the product and renders it more elastic. Do not make it too dry. When thoroughly mixed, put the putty in a can or jar, which can be tightly sealed, and cover with water so that it will keep indefinitely. To keep putty overnight or for a number of days when it is being used, wrap it in an oil-soaked paper at the end of each day's work. It will always be found fresh and soft the next morning. A mass of putty that has been allowed to harden can usually be renewed in the following way: Break up the mass into small pieces with a hatchet or chisel. Put them into an iron kettle with enough water to thoroughly cover them and place over the fire to boil, stirring constantly. Add a little raw linseed oil when hot. The putty will quickly absorb the oil, after which the water can be poured off, the putty removed and easily worked into shape, and it will then be found to be as good as new.—L. B. Robbins, Harwich, Mass.

Water-Circulation System for Motorboats

A good system of water circulation for motorboats used in fresh water is shown in the drawing. It forces the water through the engine jacket, insures proper cooling, and does not entail the troubles experienced with plunger or rotary pumps ordinarily used. It consists of a few pipe nipples, a reducing elbow, a couple of pipe flanges, another elbow, a length of hose and some bolts. The detail of the illustration shows the arrangement clearly, the intake being located just behind the propeller, which forces



Propeller Used to Force Water through Circulation System of Motorboat

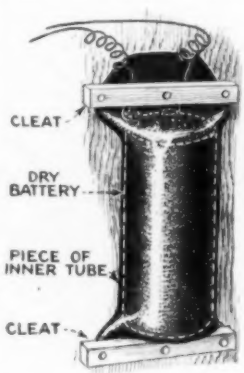
the water through the system. The hose is connected to the motor, and the water, after passing through the motor jacket, is discharged overboard.—K. M. Moreland, Monterey, La.

Rubber Cement Fastens Tracing Paper

When a large drawing is to be traced only in a certain portion, it may mean that thumbtacks are needed to hold the tracing paper in place, and then small holes will be left in the drawing, which is, of course, not desirable. Instead of tacks, rubber cement will serve the purpose, as it does not leave any marks or stains on the drawing. Squeeze out a little of the cement at points around the portions to be traced, on both the drawing and the tracing. Spread the cement smoothly and allow it to dry. Then lay the tracing paper on the drawing and press it down firmly. Make the tracing and remove the paper. The dried cement will gradually peel off and curl up and can then be dusted away. No marks will be left.

Practical Method of Hanging Dry Cells

Finding a good location for a dry cell is sometimes a puzzling job. A method of hanging, which avoids the necessity of nailing up cumbersome supports, is shown in the drawing. The end of a short piece of old inner tube is securely tacked to the wall with a cleat. Dropping the cell with the wires connected into this container and cleating it at the top completes the job. By drawing the tube up snugly before nailing the top cleat, the cell will be held securely. This arrangement takes little space and provides adequate protection.



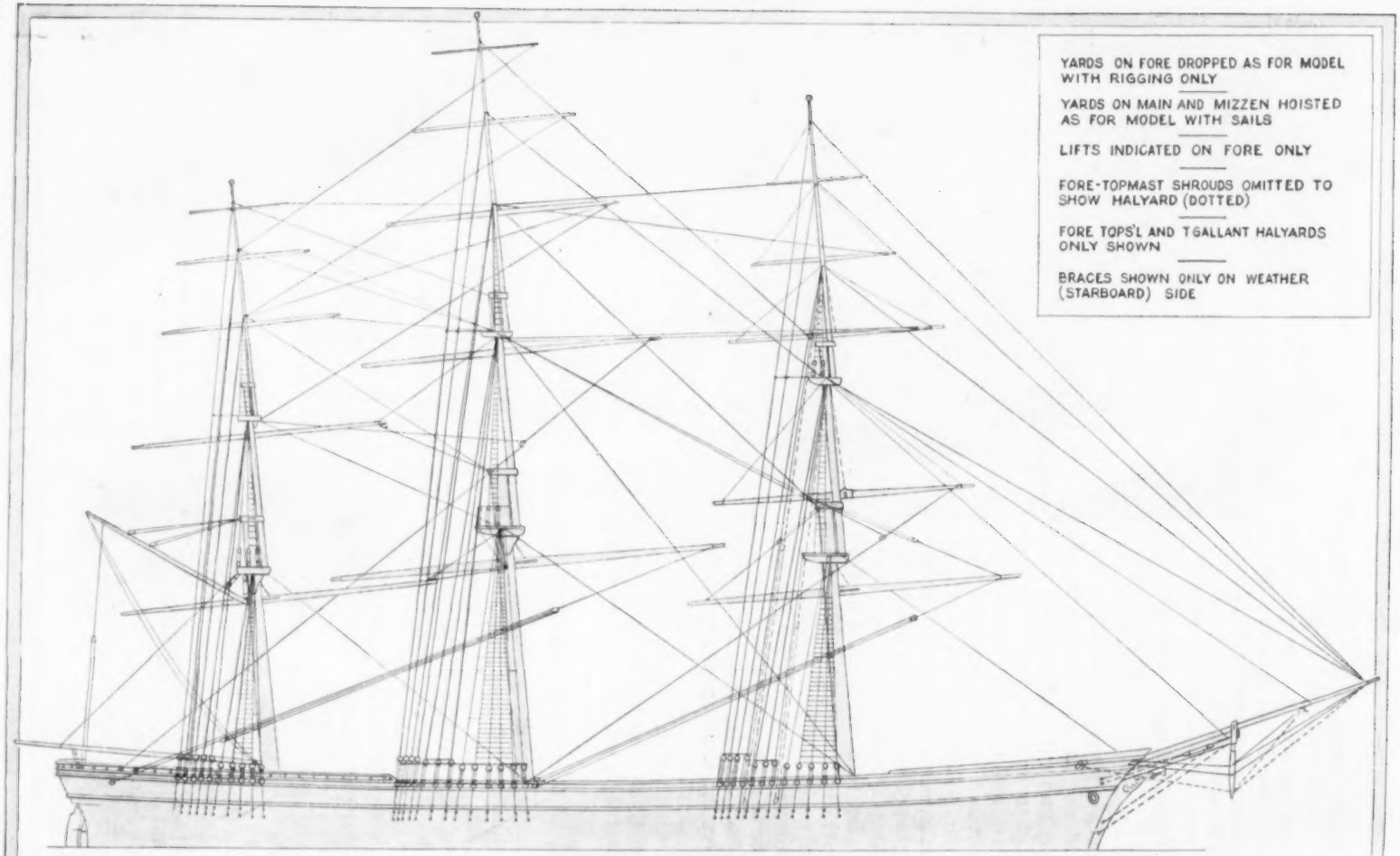
Wood Box for Farm Kitchen

Wood Box for the Farm Kitchen

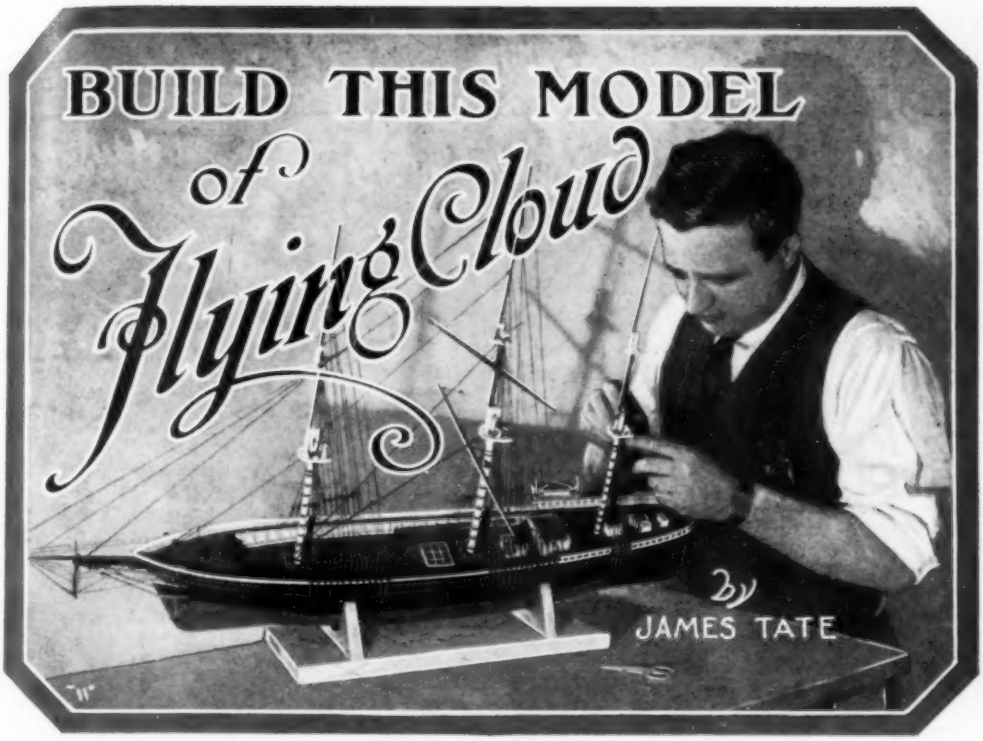
Considerable dirt is brought into the house on the boots of those carrying the daily supply of wood into the farm kitchen. However, the trouble can easily be prevented by installing a wood box of the kind shown in the drawing. Besides, it is handier for those whose duty it is to fill it. It is built partly in and partly outside of the house, ship-lap, 2-ply building paper and siding being used in its construction. The drawing shows how it is made and gives the dimensions. A piece of old inner tube is tacked along the top over the hinges to prevent rain from dripping in.—P. H. Ashby, Alberta, Can.

Blackening Shoes without Dye

Suede-leather shoes can be blackened without the use of dye by rubbing some pulverized charcoal into the leather with a soft cloth or a piece of felt. The felt will work better if it is not too thick. This method will save many pairs of shoes that are too good to throw away. If a little care is taken in the application of the charcoal, the finish will be permanent.



GENERAL RIGGING PLAN



THE job of fitting the standing rigging is now in order. This rigging supports the masts, as distinguished from the running rigging for handling the yards and sails. The masts are supported athwartships by ropes called shrouds, and in a fore-and-aft direction by stays on the forward side and backstays on the after side. It is best to rig the main and maintopmast first, so that the fore shrouds will not interfere with the fitting of the stays of these masts later on.

You will need three sizes of rigging line, one hank each of heavy, medium and fine. The heavy is known as No. 18, nine-ply white-brown Jacquard cord, the medium No. 25, six-ply, and the fine No. 80, six-ply; all are obtainable from ship-model supply houses. These are linen cords, and nothing else should be used for rigging; cotton shrinks and stretches too much with changes in the atmosphere. Get also a spool of black linen button thread, one spool each of No. 30, 36 and 60 cotton, one spool of No. 28 black-iron wire and one of No. 32 tinned-steel wire. Since all the standing rigging is black, it will be necessary to stain or dye the linen cord, and for this either black dye or aniline black dissolved in alcohol can be used. When the dye is set, draw the cord through a cake of paraffin or beeswax, and wipe it down with a cloth. This moisture-proofs the cord. Two shrouds are formed on one side of

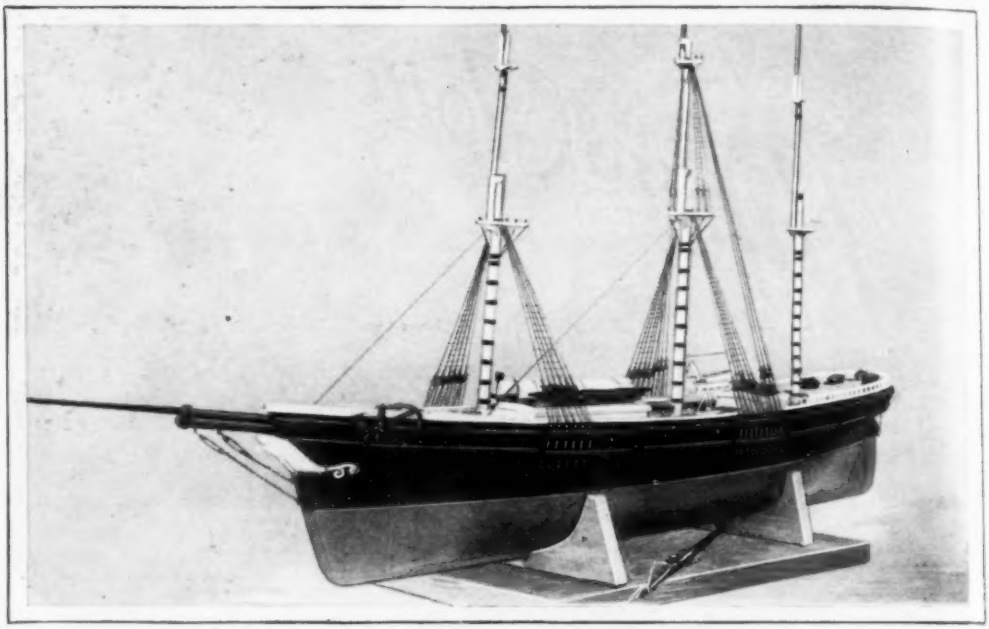
SHIP-MODEL PRIZES

FEW hobbies enable the amateur to produce such beautiful work with so few tools and such inexpensive material as ship-model building. To encourage such a worth-while and pleasant pastime, Popular Mechanics Magazine offers the following awards for the best models of the "Flying Cloud" made from this series of articles, the first of which appeared in the Dec., 1927, issue.

First, $100 cash and gold medal.
Second, $50 cash and silver medal.
Third, $25 cash and bronze medal.
Five awards, $10 cash and bronze medal.
Five awards, $5 cash and bronze medal.
Bronze medals also will be awarded for excellence in workmanship.

The contest is open to everyone, regardless of age or sex. The conditions are very simple, and full details will be supplied to every reader addressing the Editor, Amateur Mechanics department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago.

the mast from one length of cord by passing it through the lubber's hole in the manner shown in Fig. 100, bringing it down again through the same hole and seizing it together as indicated. The shrouds are tightened, or set up, by means of deadeyes and lanyards. For the lower shrouds on all masts use the coarse cord, 3/16-in. deadeyes and waxed button-thread lanyards. Lead the forward shroud on each side down even with the center line of the mast, Fig. 101; make a mark in the channel and drill right through both channels for the No. 28 black wire. A deadeye is fastened in a wire eye as shown (Fig. 100), the wire is passed through the holes in the channels, then a small eye is formed on the end of the wire ½ in. below the channel and this end fastened to the hull with a "lill." These small pins will be found to drive perfectly if a leading hole is made with a fine needle drill and the point of the pin is cut off. A backing link, made of the same wire, should go over the end of the wire "chainplate," as indicated at A, Fig. 100, but it will be found much easier to form chainplate and backing link in one piece, as shown at B and C. A deadeye is turned into the end of the shroud as shown, making the distance between the two deadeyes 1 in. It will be easier, however, to serve the turned-up end of the shroud as one wraps a baseball-bat handle, than to make



three separate lashings as shown. Make the turned-up end ½ in. long, and serve with No. 60 cotton. Get a tube of LePage's glue, squeeze a little out into a saucer, dilute it with an equal quantity of water and apply to the serving with a small brush. Follow this procedure with all knots and lashings, and they will not open up when the ends are cut short. Put on the forward starboard shrouds first, then the forward port pair, then the next pair aft on the starboard side, and so on. Keep the upper deadeyes in a straight line, as in Fig. 101, and space the deadeyes evenly along the channels. The manner of fitting the lanyards is shown in Fig. 101; be sure to keep the odd hole in the upper deadeye at the top and in the lower deadeye at the bottom. On the starboard side, the knot on the inside is back of the forward hole and the lanyard is rove aft; on the port, the knot is at the after hole and the lanyard is rove forward. Make the turned-up ends of the shrouds all the same length, and keep them at the right, looking inboard. When the shrouds are finally set up, tuck the end of the lanyard between the parts of the shroud as shown,

pull tight, apply a touch of glue, and, when dry, cut off close.

A good pair of tweezers is indispensable when setting up the lanyards and for similar work around the rigging. Be careful to keep all the masts perfectly in line when setting up, tightening and slackening the shrouds on each side until they are so. There are six shrouds on each side on fore and main, and five on the mizzen. The odd shroud on the mizzen can go straight over, forward of the lower mast. It is best to have the topmasts in place when fitting the lower shrouds. After all the shrouds have been placed on the main and set up, lash them all together just under the top, so that they will line as nearly even as possible, then set up the mainstay. This is double, of the coarse cord, passed around the masthead to make a loop like the maintopmast stay in Fig. 107, and set up to eyepins driven into the tops of the fore bitts. The upper ends of the fore, main and mizzen stays go between the crosstrees, but the upper ends of the fore, main and mizzen-topmast stays go outside the crosstrees.

Next set up the maintopmast shrouds, three on each side, from the crosstrees to the topmast head, using the medium cord,

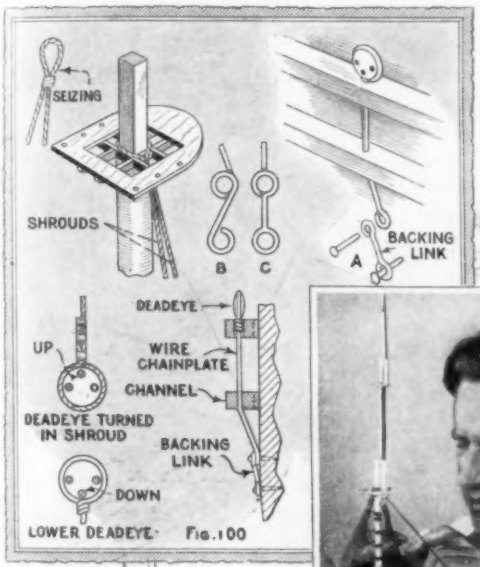


Fig. 100

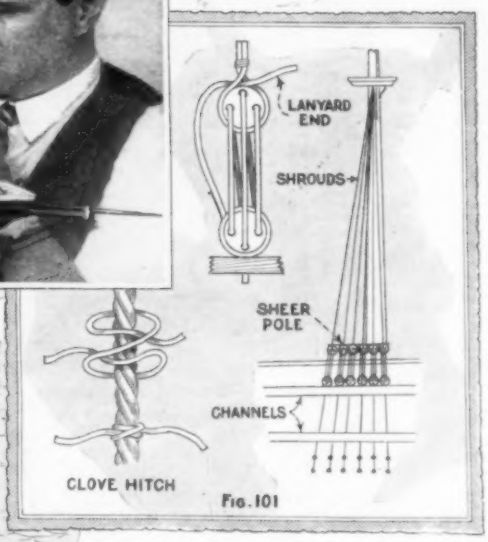


Fig. 101

⅛-in. deadeyes and No. 60 cotton lanyards. These are fitted in exactly the same manner as the lower ones, but

the distance between the deadeyes is ½ in. The futtock shrouds are of the No. 32 wire, fitted as in Figs. 102 and 105, and painted black. With these in place, fit the topmast backstays, three on each side (see Fig. 106), and finally the single topmast stay, all of the medium cord. Note that the upper deadeyes for the backstays are a trifle higher than those on the shrouds. The maintopmast stay is doubled and goes to a cleat on the foremast 1 in. above deck. (See Fig. 107.)

It is well to "rattle down" the lower and topmast shrouds before setting up the backstays. The ratlines are the ropes that cross the shrouds to form ladders. Lash a sheer pole, made from a heavy pin, across the tops of the deadeyes, Fig. 101, tie one end of a length of No. 30 cotton to the eye of a needle, and 3/16 in. above the sheer pole, clove hitch the cotton to the next to the last shroud aft. Carry it across four shrouds, hitching to each one, cut off, and hitch on another, 3/16 in. above the first. Carry every fifth ratline across all six shrouds. Rattling down must be done carefully if it is to look right and it is a rather tedious job, but practice soon develops a technique that makes it comparatively simple. Where the shrouds converge, a simple overhand knot may be used instead of the clove hitch, but the latter is the better lower down. Leave the ends of all the cottons long, secure all knots with thin glue, then, when this is dry, cut the knots off close with a pair of manicure scissors. The ratlines on the topmast shrouds are No. 36 cotton.

The fore and mizzen are then rigged in the same way. The ratlines on the mizzen run across three shrouds, every

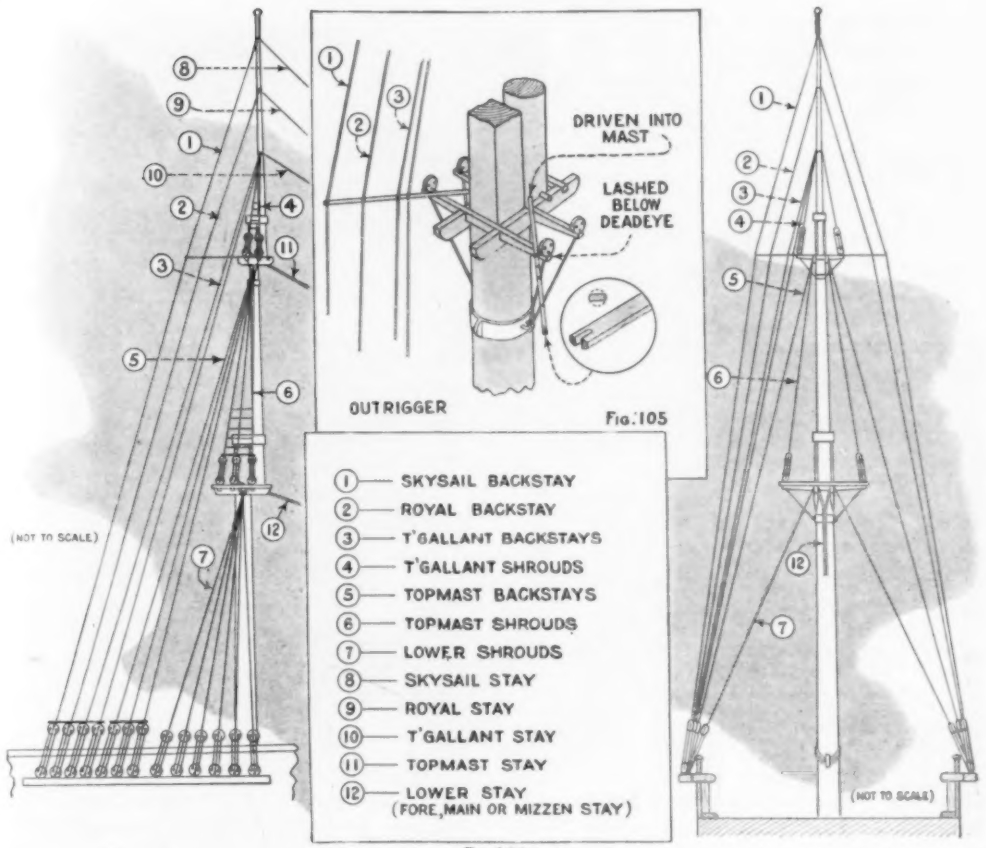


Fig. 106

fifth one, as before, being carried clear across. The doubled forestay, of coarse cord, runs down to two eyepins behind the knee on the foc's'le deck, as in Fig. 107, and the doubled mizzen stay to a cleat on the mainmast. The foretopmast stay runs doubled down to the bowsprit. Just above the bee seat the parts are seized together, then each "leg" is carried through a hole in the bee seat (see Fig. 110), a ⅛-in. block is turned in the end, a similar block is hooked to an eyepin straight aft on the bow, and the stay set up with this tackle, on each side.

Two other stays go to the foretopmast, the jibstay and outer-jib stay, Nos. 4 and 5 in Figs. 108, 110 and 112. The single jibstay, medium cord, goes down through a hole in the jibboom at the first stop or shoulder, down under the upper hook on the starboard side of the dolphin striker, and it is set up to an eyepin in the bow, under the cathead and between the moldings. The single outer-jib (see Fig. 110) stay, medium cord, goes through a hole at the outer stop on the jibboom, under the upper port hook on the dolphin striker, and to a similar eyepin on the port side. To keep the dolphin striker from swinging sidewise as these are set up, it is well to fit the whisker boom first. This is a 2⅞-in. length of 1/16-in. brass wire, driven through a hole in the bowsprit cap as in Fig. 110. File the ends flat and drill No. 60 holes through them, as in the insert, Fig. 110. File flat and drill three more holes on each side, ¼ in. apart, and fit the boom in place. Fit the guys, of 20 or 22-link chain, and the stays then can be fitted without the dolphin striker swinging. Paint boom and guys black.

The next step is to set up the topgallant shrouds, backstays and stays, using the medium cord on the fore and main, and the fine on the mizzen. There are two shrouds on each side, set up with ⅛-in.

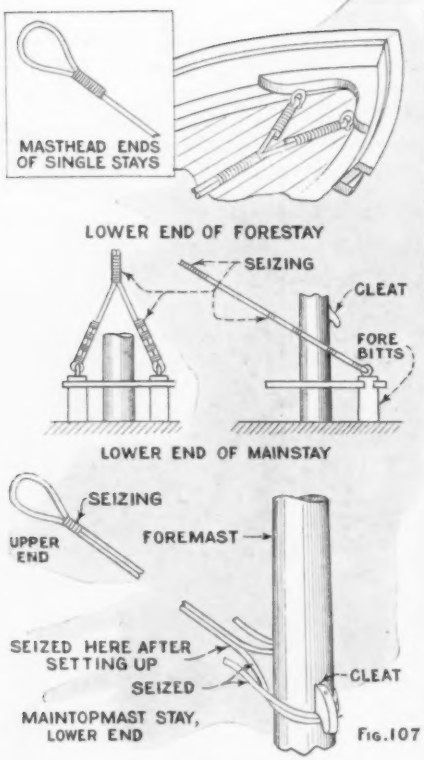


Fig. 107

deadeyes. Use No. 60 cotton for the ratlines, and rattle down before fitting backstays. The topgallant stays are single, and the way they lead is shown in Fig. 108. Where stays run to a masthead, an easy way of fitting them is shown in Fig. 109. Knot the end of the cord, pass it up through a hole in the crosstree, then through an eyepin at the masthead and up to its mast. If the mast cap is of metal, set the eyepin as at B. Be careful in setting up stays and backstays that the upper

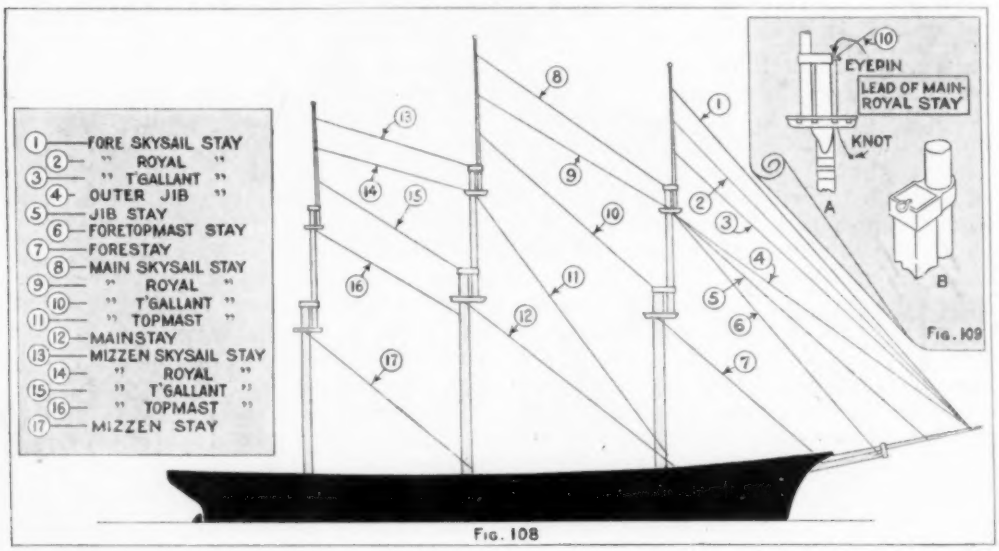


Fig. 108

Fig. 109

masts are not bent back or forward out of a straight line with the lower masts. By judicious handling of the rigging, the masts may be made to assume any rake necessary.

The foretopgallant stay goes down through an eye at the outer end of the jibboom, under the lower starboard hook on the dolphin striker (No. 3 in Figs. 108 and

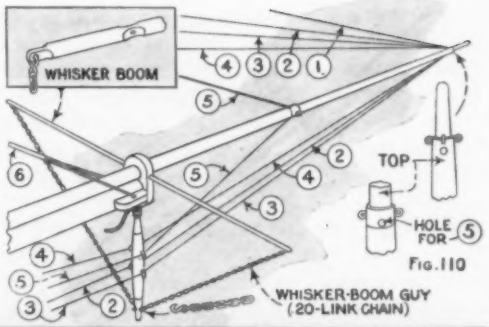


Fig. 110

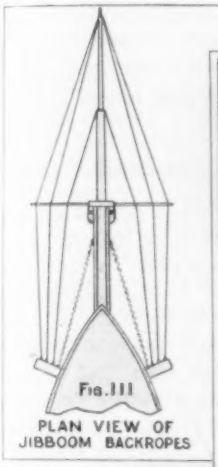
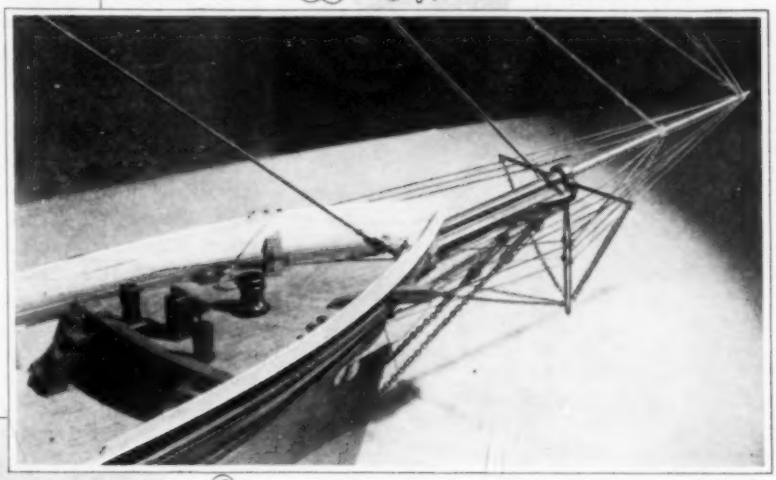


Fig. 111
PLAN VIEW OF JIBBOOM BACKROPES



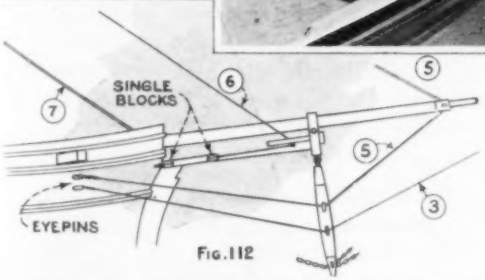


Fig. 112

110) and up to an eyepin in the bow just below the jibstay. The foreroyal stay, No. 2, leads in the same way under the lower port hook on the dolphin striker to an eyepin in the bow under the flying-jib stay. The foreskysail stay, No. 1, is seized to the royal stay just under the jibboom. All the last three stays are of the fine cord.

The jibboom backropes, Fig. 111, are of the fine cord or the button thread, and are rove, as indicated, from the jibboom through the holes in the whisker boom, and set up to eyepins in the forward sides of the catheads. This completes the head standing rigging.

The topgallant backstays on fore and main, two on each side, are of the medium cord. On the mizzen there is one topgallant backstay on each side, of fine cord. The royal and skysail stays and backstays, on all masts, are of the fine cord. When fitting single backstays, as on the royal and skysail masts, the neatest way to do it is to open the cord by untwisting in the middle of the length, slip the eye thus formed over the mast and down to the shoulder, then apply a touch of thin glue and seize the cord on each side of the mast, as indicated in Fig. 104. The masthead ends of single stays are treated as in the detail, Fig. 107.

Lash sheer poles made of stout pins to the backstays as in Fig. 106, and paint black. Lash smaller ones to topmast and t'gallant shrouds. The outriggers for the t'gallant, royal and skysail backstays, detailed in Fig. 105, are made from $\frac{1}{16}$-in. wire, filed down flat on two sides. Those at fore and maintopmast crosstrees are 2 in. long, pointed at one end, slipped under the shrouds and into the t'gallant masts, then lashed to the after deadeyes. Before fastening in place, set them in po-

sition, mark where the backstays will cross them, then file small notches in the outboard sides of the outriggers to retain the backstays. The notches for the backstays should be so placed that the stays will have to be pulled back a trifle to enter them. The skysail backstays fit into notches filed in the ends. (See Figs. 105 and 106.) The mizzen outriggers are 1¼ in. long. Paint the parts on top of the crosstrees white and the outer parts black, lash the backstays in the notches with a single turn of No. 60 cotton, and apply a touch of glue to each notch and knot.

Study all the drawings and directions carefully before starting to work, and be sure of each step in advance. Some may prefer to set up the lower rigging on the mizzen first, as this makes it easier to fit the mizzen stay. If the deck house has been fitted so that it can be lifted out, it will be found a help to remove it while fitting the main and maintopmast stays.

A blueprint of the general rigging plan is available, price 25 cents postpaid, from the Amateur Mechanics department, and will be found of help while rigging.

(To Be Continued Next Month)

Short Length of Tape Prevents Danger of Baby Climbing and Falling from High Chair

Preventing Baby Falling from High Chair

We have been experiencing considerable trouble from our fifteen-month-old girl climbing up in the high chair and sitting on the tray. A number of times she almost fell, and it was necessary to find some method of preventing this. By attaching a string or tape just below the seat and making a loop to slip over the foot so as to prevent too much movement, but at the same time permit enough for comfort, we successfully overcame the trouble and can now leave her in the chair and feel sure that she will not fall out.—F. A. Inman, Grand Rapids, Mich.

Washing Chintz without Loss of Gloss

The proper way to wash chintz so that it will not lose its gloss is as follows: Boil 2 lb. of rice in 2 gal. of water. When cool enough to immerse the hands, plunge the chintz into the mixture, rubbing it with the rice and water until the dirt has disappeared. Then boil a like quantity of rice again in the same amount of water and drain the water from the rice. This is the rinsing water. The chintz should be dried as flat as possible and ironing of this material should be done with a medium-heated iron.—L. H. Georger, Buffalo, N. Y.

Razor-Blade Knife

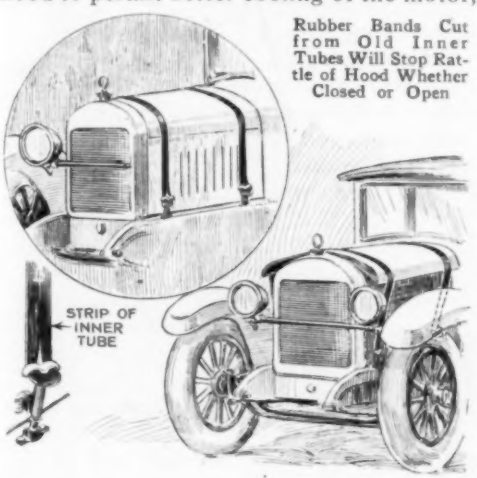
It is sometimes necessary to cut paper by means of a sharp knife. An ordinary safety razor can be used for this purpose, as shown. In the absence of a special holder, the razor is taken apart and the blade is inserted so that it is held by the center and one end pin. Of course, one must be careful when using the blade in this way. Being flexible and brittle, it is likely to break off if too much pressure is applied, and this means the possibility of cutting one's fingers severely. Do not attempt to use this knife on cardboard, as this will surely damage it. The blade is only suitable for use with thin paper, cloth, and the like.—Lindley Pyle, St. Louis, Mo.

Non-Slipping Diving Board

Here is a way to add safety to your diving board and fun to your swim. Make sure that the diving board is thoroughly dry; then apply two coats of white lead and oil, giving each coat enough time to dry. Dissolve a good quantity of white lead in varnish. This mixture should be thick and sticky, and drier should be added in the proportion of one-half cupful to each gallon of paint. Paint the board with this mixture. When nearly set, sprinkle clean silica sand over the surface. Get a rolling pin or a pipe and roll the sand in well, adding sand until the surface will take no more. Then leave it to dry. The result will be a spring or diving board which will never be slippery.—W. H. Leach, Cleveland, Ohio.

Rubber Bands for Hood Straps

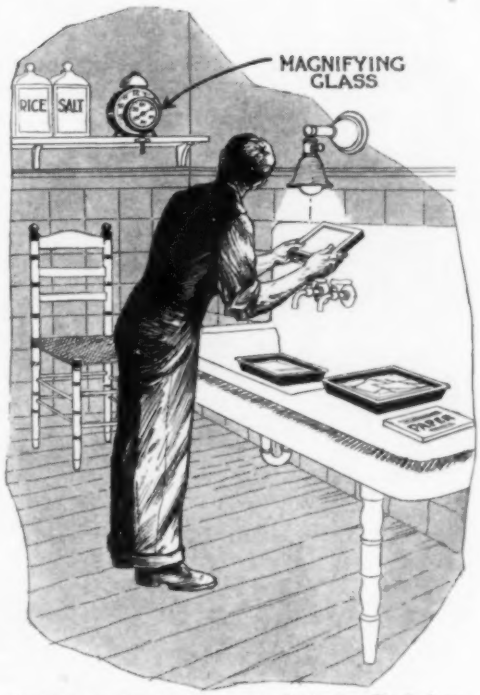
Auto hoods on light cars and trucks often develop an annoying rattle which is difficult to overcome. Two long bands cut from an old inner tube and stretched over the hood, as shown in the insert, will remedy the rattle. If the bands are cut evenly and placed symmetrically on the hood, they will not detract from its appearance. It is often desirable to open the sides of the hood to permit better cooling of the motor,



Rubber Bands Cut from Old Inner Tubes Will Stop Rattle of Hood Whether Closed or Open

and then the rubber bands will hold the hood in the open position.

¶Chamois skin may be cleaned by soaking it in soda and water, and then in soapsuds.



Reading the Second Hand and Dial of a Clock from a Distance by Means of a Magnifying Glass

Reading Second Hand of Clock at a Distance

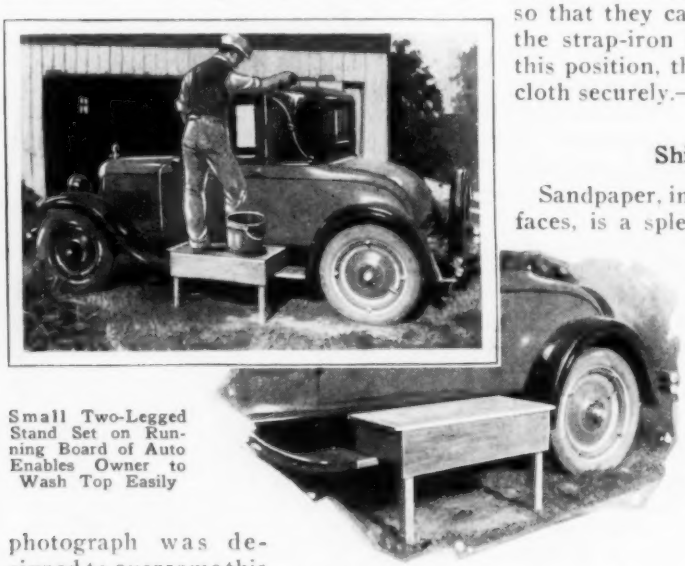
A few seconds more or less means much in the exposure of sensitive paper to artificial light in photography. When it is inconvenient to have a watch or a clock near enough to be easily seen, the idea shown in the accompanying drawing can be used to advantage. In front on an ordinary alarm clock and at the proper focusing distance, a reading glass is attached to magnify the second hand and the dial. In the home where this is used the clock is kept in its accustomed place on a shelf and the glass is attached to the edge of the shelf. In this way the second hand can even be seen quite easily from the other side of the room.—Harry Moore, Hamilton, Ontario, Can.

Using Oil Stain

When staining hardwoods, pour the quantity of oil to be used into a separate container and add to it approximately one-eighth of the amount in varnish. This mixture provides a good undercoat, if the article is to be given a wax finish.

Platform for Washing Auto Top

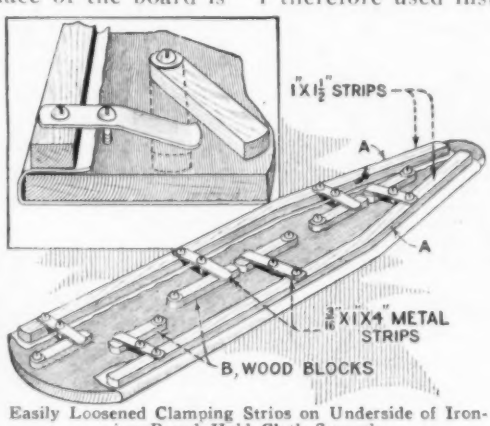
When the auto owner washes his car, he finds it rather difficult to reach the center of the top. The platform shown in the photograph was designed to overcome this difficulty as well as make the job easier generally. It is about 3 ft. long, 15 in. wide and 20 in. high, being like a table with the exception that it has only two legs. The back part of the stand rests on the running board of the car and the top is about 7 in. higher than the running board.—Irvin L. Oakes, Pleasant Hill, Ohio.



Small Two-Legged Stand Set on Running Board of Auto Enables Owner to Wash Top Easily

Cloth Clamp for Ironing Board

A positive device for holding the ironing cloth tight to the surface of the board is shown in the accompanying drawing. It consists of two clamps attached to the underside of the board. The clamps are two strips, A, of 1 by 1½-in. material, cut to follow the outer edge of the board. Six 4-in. strips of 3/16-in. strap iron are slightly bent, as shown in the detail, and are drilled for two screws, one near the center and the other near the unbent end. The clips are attached to the clamping strips and to the board, as indicated, and wooden blocks, B, are attached to the board with screws so that they can be swung directly under the strap-iron clips. With the blocks in this position, the clamping strips hold the cloth securely.—W. Mitchell, Rogers, Neb.



Easily Loosened Clamping Strips on Underside of Ironing Board Hold Cloth Securely

Ship-Model Kinks

Sandpaper, in addition to smoothing surfaces, is a splendid medium for reducing and shaping small objects that cannot be satisfactorily handled with ordinary tools. For instance, spars and masts, after being roughly formed with a block plane, may be quickly brought to size and shape by drawing them back and forth through a fold of sandpaper held in one hand, or they may be laid on an even surface and rubbed with a sandpaper block. I have found small ½ and ¼-in. pins excellent for fastening parts that are too small for the use of ordinary brads. They do not split the wood and have good holding power for their size. In driving larger pins, they are much less likely to bend if the shank of the pin is grasped firmly with the thumb and forefinger while they are being driven in. I tried to get round wooden toothpicks for belaying pins, but could find only the flat variety; I therefore used insulated copper wire of suitable size, removing the insulation. In making deadeyes from black-celluloid knitting needles, I used a small miter box and a small backsaw. I first cut the groove for the end of the shroud, the thumb and finger forming a shoulder to keep the needle in the proper position. The needle is revolved

while the groove is being cut, and is then cut off to the desired size. The deadeyes are placed in a small vise while the holes for the lanyards are made with a fine hand drill. By this method I made all the deadeyes for the "Halve Maen" in two hours.—F. G. Semple, Ottawa, Can.

Cleaning Gasoline Lamp

I am living in a rural district and use a gasoline lamp with which I have always had more or less trouble, due to the generators clogging with carbon or dirt. I tried various methods of cleaning them but with no avail, until I thought of putting them into a fire and raising them to a blue heat, which burnt the dirt out of the generator, thus making it serviceable again.—M. S. Holmes, Hamden, Conn.

Chicken Shelters Made from Auto Hoods

An ideal chicken shelter can be made from an old auto hood. A farmer near Geneva, Nebr., utilized this idea and has a large number of coops of this kind on his place. Any garage or dump heap usually yields several hoods. The ends are fitted with boards which are cleated together on the inside. The exact size and shape of the ends vary, depending on the make of the car from which the hoods are taken. Nails driven through the edges of the sheet metal into the wooden ends will hold them tightly in place. The coops are always set to face the southeast so that rain and wind will not come in through the ventilator slits. If desired, these may be closed entirely by bolting or wiring a piece of heavy cardboard on the inside.

Raft Made from Inner Tubes and Saplings Has Considerable Buoyancy

Raft Made from Inner Tubes

Often it is desired to use a raft for fishing when a boat is not available or cannot be used owing to weeds. In such cases a raft of the kind shown herewith will be found handy. It consists of three or more inner tubes which are inflated and lashed to a framework made from saplings. Three 5-in. inner tubes, overinflated about 50 per cent, will afford a buoyancy of approximately 250 lb. A pole or paddle is used to propel the raft. While such a water craft is not very speedy, it will at least carry the fisherman about.

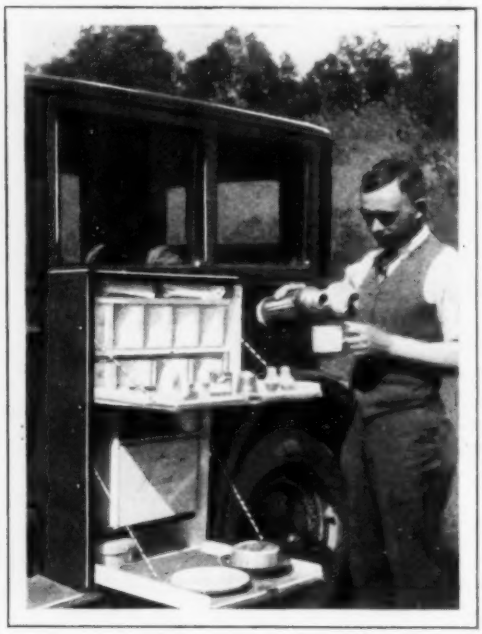
Another Use of the Vacuum Cleaner

Combination stoves are used in many homes today and their upkeep may be either a pleasure or a hard job. Cleaning out the stove can be done without a particle of dust in the kitchen if the vacuum cleaner is used. It takes less time by this method than brushing, is also more pleasant, as the job of cleaning a combination stove usually is quite dirty.

Auto "Kitchen" for the Tourist

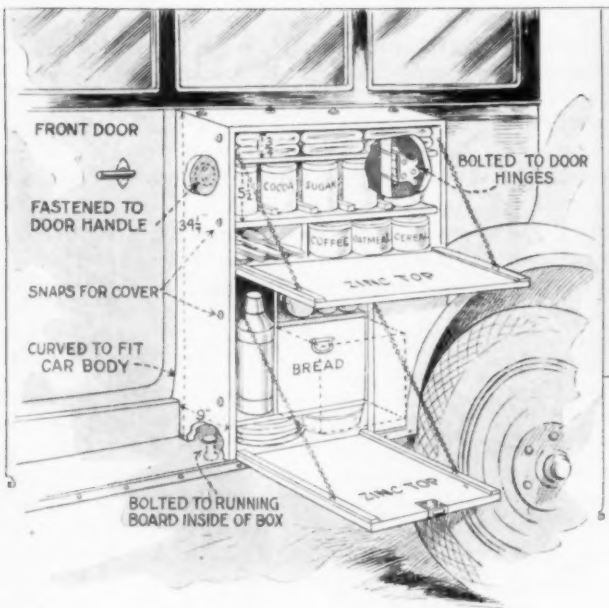
By M. GOODFRIEND

AS a watchmaker, my occupation forces me to seek frequent outdoor recreation, such as camping and fishing. Having a great deal of camping equipment to haul along each time, and finding it more or less difficult and inconvenient to pack foodstuffs properly, I devised the running-board "kitchen" shown in the accompanying illustration and photos. It is arranged to accommodate various containers of coffee, oatmeal, sugar, bread, butter, etc., each of these being held in place securely.



The kitchen is merely a large wooden box or cabinet, which is bolted to the running board, extends to the lower edge of the rear-door window, and is exactly as wide as the running board. In my case, the dimensions were 34¼ in. in height and 9 in. in width, ¾-in. lumber being used for the sides and ½-in. stock for the shelves and partitions. The front side is made in two sections, both of which are hinged at their bottom edge so that they can be let down to form a table top, lengths of ordinary furnace chain being provided to hold them horizontally for this use. It is a good idea to tack thin sheet zinc on the inside of these sections, so that spilled liquids can be wiped off more easily, enabling one to keep the kitchen sanitary without much trouble.

As can be readily seen from one of the



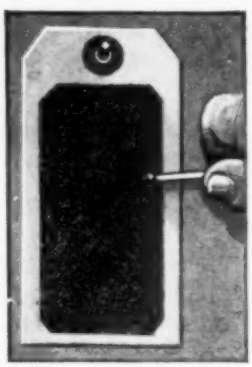
Tourist's Auto "Kitchen," Attached to Running Board, Carries All Foodstuffs, Pans and Cooking Utensils, as Well as Table Ware and Necessary Linen, and Is Provided with a Dust and Rain-Proof Cover; Top Photo at the Left Shows How the Hinged Sides Provide Ample Table Space

photos and the drawing, the top shelf is used for napkins and towels, the second for cans of staple provisions and the third shelf for more cans and for spoons, knives and forks. A bread box and a vacuum bottle are kept in the lower compartment, and below these is a place for frying pans. Besides bolting the box to the running board, as indicated, an additional support is provided by fastening the top part of the box to the handle and the hinge of the rear door. The door handle should extend inside of the box. In order to exclude rain and dust, I made a cover from auto-top material, using snaps and eyelets to hold the cover in place. The cost of the whole arrangement did not exceed $5, and I have found it to be a great convenience on camping trips, as there is a place for every item and no foodstuffs have to be carried inside of the car, which is somewhat objectionable.

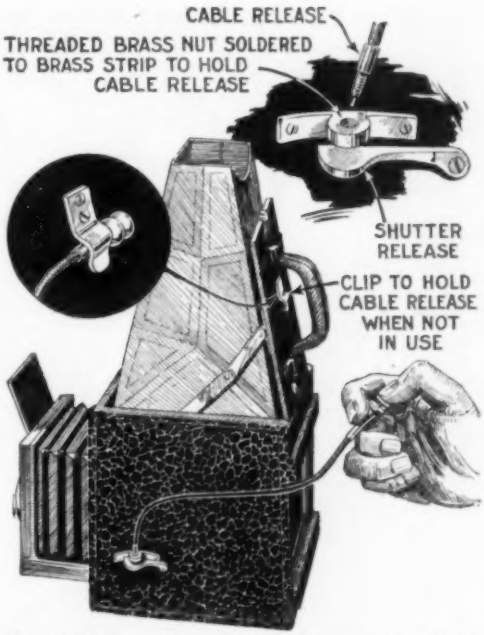
Electric Iron Thaws Frozen Pipe

Last winter my electric iron and an extension cord proved more efficient than a plumber's candle in thawing out a frozen water pipe, the heat from the iron being steady, moderate and yet sufficient to do the trick. The iron was located far enough away from the frozen place to work gradually without bursting the pipe. The water trickled in fifteen minutes and ran freely in thirty minutes.—Hilda Ellyson Allen, Onawa, Iowa.

Match Striker from Shipping Tag



Nimble fingers and decorative talent can produce artistic match strikers, but one which is just as serviceable and durable can be made by gluing a piece of emery cloth or sandpaper to a heavy shipping tag, as shown. The metal eyelet of the tag makes it last much longer than an ordinary unreinforced piece of cardboard tacked on the wall.



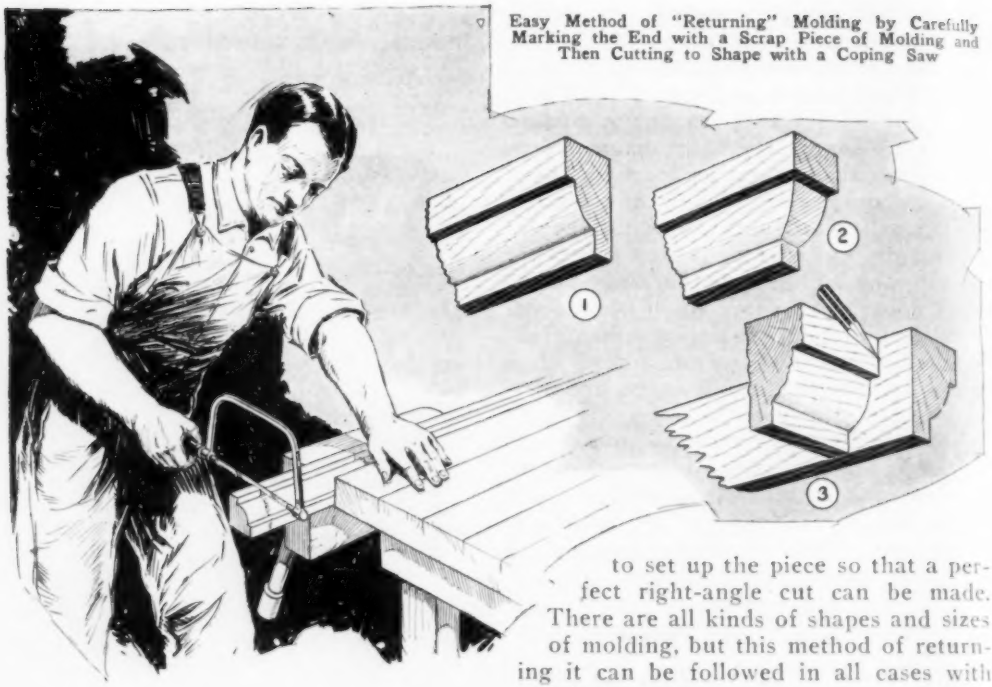
Method of Equipping a Graflex Camera with a Cable Shutter Release

Cable Shutter Release Fitted to Camera

Photographers, both amateur and professional, who use Graflex or reflecting-view types of cameras, frequently have need for a cable shutter release, as, for instance, when overexposures are made from a tripod; when operating the camera in positions where the use of the trigger release is inconvenient or awkward, and especially in making photographs with the aid of an automatic timer so that the photographer might also be in the picture. To meet the trouble without discarding the regular trigger release, apply the cable shutter release as indicated in the accompanying drawing. This does the job perfectly and does not interfere with the use of the trigger shutter when the employment of the latter is preferable.

Transferring Colored Prints from Comics

Rub the print you wish to transfer with common household paraffin, then place a white sheet over the colored comic and rub the paper with a spoon or any smooth object. The result will be an exact reproduction. With a little practice good results will be obtained.—H. V. Smith, Wauseon, Ohio.



Easy Method of "Returning" Molding by Carefully Marking the End with a Scrap Piece of Molding and Then Cutting to Shape with a Coping Saw

How to "Return" Molding

It is often necessary on small pieces of furniture that are decorated with moldings, to saw the ends of the latter to correspond to the contour of the face. This is known as "returning" the molding, and although most professional woodworkers know how to do this, it is sometimes a puzzling task for the amateur. A simple method is shown in the accompanying drawing. Fig. 1 shows the end of a piece of molding which is to be returned, and Fig. 2 the same end after this has been accomplished by means of a small coping saw.

The end to be returned is first carefully marked with a pencil, tracing along the edge of a short scrap piece of the same kind of molding, which is cut off exactly square so that it can be set at right angles against the back side of the first piece, as shown in Fig. 3. After the pencil mark has been made plainly, the piece to be cut is placed in a vise, and a coping saw is used to make the cut. When doing this, care is necessary to get the cut at right angles, or the contour of the end will be different from that of the face of the molding. If a jigsaw is available, it is often possible to set up the piece so that a perfect right-angle cut can be made. There are all kinds of shapes and sizes of molding, but this method of returning it can be followed in all cases with satisfactory results.

Preventing Small Boats from Drying Out When Laid Up on Land

The usual manner of hauling out a small boat for storage on land when not in constant use has some objections in that the planks dry out too thoroughly, allowing the seams to open up, which makes it necessary to use some seam filler or putty before the boat is put in use again. The trouble can be easily overcome by covering the boat with a layer of hay or seaweed after it is turned bottom up, and stretching some chicken wire or an old fishing net over it to hold the weeds in place. This should be thoroughly fastened along the gunwale on each side so that the wind cannot get under the weed. Rain will soak into the hay or weed, and the sun and wind will not dry it out sufficiently to rob the planking of its moisture. The boat can be put in the water whenever it is convenient. Of course, the bottom should be given a coating of copper paint before the boat is put up for the winter. You will find that a boat given such care will not leak when it is put in use, and its life is also prolonged, as the swelling and contraction of the wood in

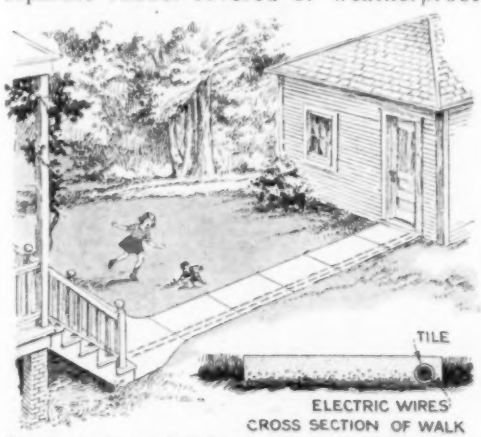
small boat hulls is very hard on the fastenings when stored in the ordinary careless manner.—Newcomb Leonarde, Mystic, Conn.

How to Remove Broken Bottle Stopper of Glass

If the glass stopper in a bottle is broken off, it may be removed without difficulty in the following manner: Obtain a piece of shellac or pitch, about ½ in. in diameter and 6 in. long, soften the end and let it set firmly on the broken end of the stopper. Then heat the bottle carefully, applying the heat around the neck where the stopper is stuck. While doing this, gently pull the pitch. I have removed hundreds of broken stoppers in this manner without a single failure.—Wm. Hurley, San Francisco, Calif.

Electric Conduit Imbedded in Concrete Walk to Garage

Electric wiring from the house to the garage can be run through conduit imbedded in the concrete walk when the latter is laid. This method eliminates overhead wires, which are more or less objectionable and may cause trouble. If no conduit is available, ordinary tile can be used, but in that case, flexible metal-covered conduit should be used instead of separate rubber-covered or weatherproof



Running Electric Conductors to Garage through Conduit Imbedded in the Sidewalk

conductors. If desired, bell wires can also be installed in the conduit.—L. H. Georger, Buffalo, N. Y.

Casters for Heavy Suitcases

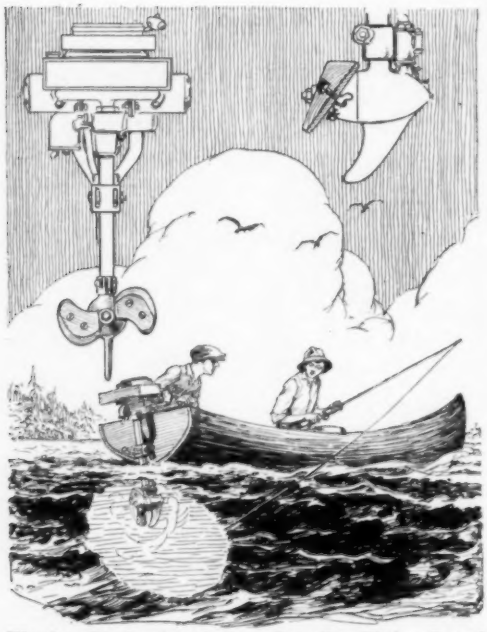
Rather than carry an exceedingly heavy suitcase, one salesman fitted it with casters, which enabled him to roll or push the

Lightening the Salesman's Burden by Equipping Heavy Suitcases with Casters on One Side

suitcase along whenever he walked over a strip of floor or sidewalk. The drawing shows two methods of attaching the casters. Either method can be used, whichever is the most convenient. Rubber or fiber casters are best for this purpose.—Ben Rocklin, Chicago, Ill.

How to Remove Bruises in Woodwork

A bruise or hammer mark in fine finished woodwork detracts greatly from its appearance, but by careful treatment such dents can be removed. One way is to wet the part with warm water. Fold a piece of brown paper several times, soak it in water and lay it over the bruise. Then apply a hot flatiron until the moisture is completely removed. If one such treatment does not suffice, repeat until the bruise disappears. The indented surface of the wood will swell and rise level with the rest. A slight rubbing will smooth down any raised grain. Small bruises can be obliterated by filling them with boiling water and then holding the end of a red-hot poker near the surface.



Wooden Blocks Attached to Propeller Blades Retard Speed of Outboard Motor

Retarding Outboard-Motor Speed

Unless an outboard motor is equipped with variable gears, its speed cannot be reduced sufficiently to permit slow trolling, which is necessary for lake trout, pike and salmon fishing. The only speed control on a two-cycle motor is the spark. But to run continuously on a late spark causes undue heating, which may burn away the oil supply and score the cylinders. A simple method of checking a boat's speed and, at the same time, permit a more advanced spark, is shown in the drawing. Beveled oak blocks are bolted to the propeller blades as indicated. The blocks can be shaped to alter the pitch of the propeller to any desired degree, the exact angle, or pitch, being best determined by experiment. The blocks are bolted to the blades with ¼-in. bolts and wingnuts. It is well to drill small holes through the wings of the nuts and wire each pair together, to prevent loss.

Renovating Floor Mops

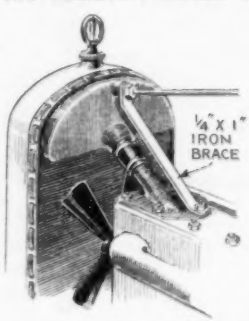
Many floor mops are thrown away after a few months of use without any effort being made to reclaim them. It is an easy matter to renovate them, however. Add a tablespoonful of concentrated lye to a pail of boiling water, and boil the mop in this solution for about 10 minutes. Rinse in clear, hot water and allow the mop to dry thoroughly. It can then again be saturated with clean floor oil and will be serviceable for another six months.—L. H. Georger, Buffalo, N. Y.

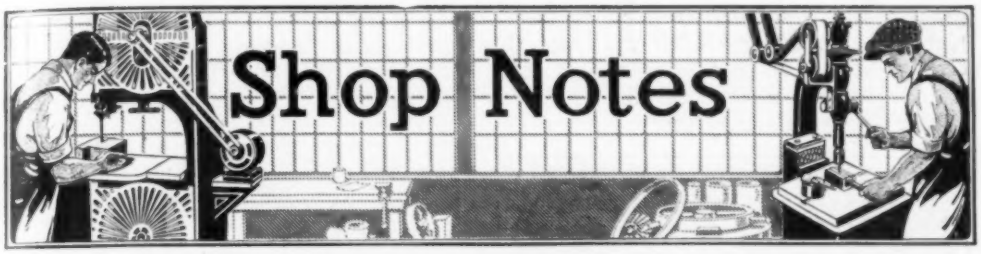
Avoiding Light Streaks on Film Packs

Every photographer who has used film packs has probably found one or more of his best negatives fogged, which was caused by leakage of light into the film pack. A pack has not yet been made that can be relied upon to be absolutely light-tight under all circumstances of use. After attempts to use film packs involving experiments to exclude the light, one photographer found an effective method. Set up the camera and insert the film pack. Place the focusing cloth over the back of the instrument and remove the dark slide. Make the exposure. Replace the dark slide, and withdraw and tear off the tab of the exposed film, working all the time with the hands under the focusing cloth. The film-pack adapter can then be removed from the camera with practically no possibility of fogged negatives. Any other method, except taking the camera into a dark room before and after each exposure, is at the risk of losing a negative every time from light leakage.

Radiator Brace for Autos

On many types of cars the long stay rod attached to the top of the radiator and the dash transmits body movement to the radiator, which consequently loosens the hose. This trouble can be readily overcome by attaching a flat iron brace of ¼ by 1-in. stock, as shown, and bent to the shape indicated. It can be fastened without drilling or tapping the block, if the brace is made to fit the studs already there. —G. A. Luers, Washington, D. C.

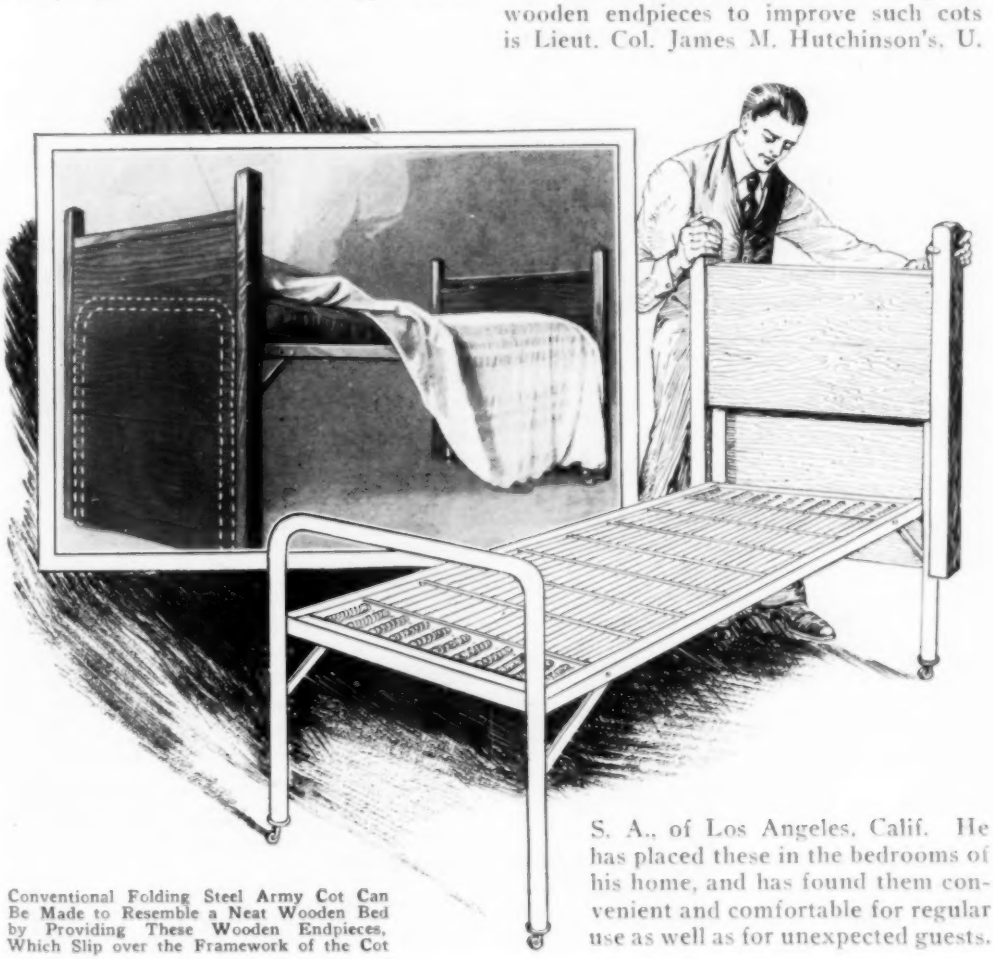




Army Cots Become Attractive Twin Beds

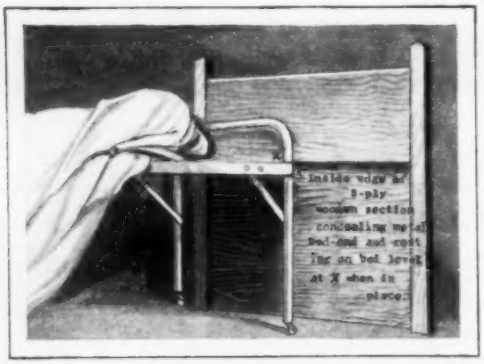
By ALPHEUS LINCOLN

COMFORTABLE and good-looking twin or single beds, as shown in the photo, can easily be made from ordinary metal army cots, which, in themselves, are not by any means attractive in appearance. The cost of these cots is slight in comparison with that of regular beds, as a spring and mattress have to be purchased separately for the latter in addition to the frame itself. The credit for devising the wooden endpieces to improve such cots is Lieut. Col. James M. Hutchinson's, U. S. A., of Los Angeles, Calif. He has placed these in the bedrooms of his home, and has found them convenient and comfortable for regular use as well as for unexpected guests.



Conventional Folding Steel Army Cot Can Be Made to Resemble a Neat Wooden Bed by Providing These Wooden Endpieces, Which Slip over the Framework of the Cot

First, the bed is lowered by cutting a piece, 5½ in. in length, off each leg, the casters being replaced on the legs after the pieces have been removed. This procedure is not really necessary, but was desired in this case, the bed being lowered from 21 in. in height to 15½ in. The wooden endpieces are then made. Lengths of 2 by 2-in. white pine are used for the posts, which do not bear the weight of the bed but are merely ornamental. Pieces of three-ply veneer are fitted and glued in grooves cut in the posts, as indicated, and a 1 by 2-in. rail of white pine is fitted on top of the veneer to give a more finished appearance. The rail is held in place between the posts by finishing nails, and, if desired, may also be grooved to fit on the veneer. The pieces of veneer are spaced far enough apart to permit them to be slipped over the framework of the bed as shown. On one side the veneer reaches down to the floor but on the other side it extends only to the spring. The side rails of the bed itself, which are level with the spring, bear the weight of the endpieces, as shown in the small photo, the lower end of the latter being raised about 1 in. above the floor. This arrangement allows the bed to be moved about without any trouble. The wooden endpieces are carefully stained some suitable color and varnished when completed.



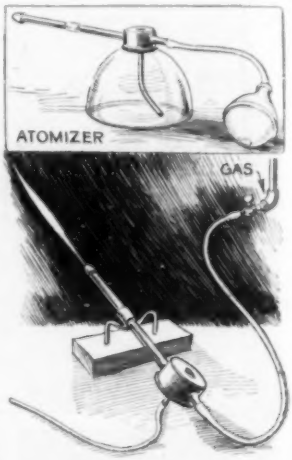
Inside View of Endpieces, Showing How They Rest on the Bed Frame

Cutting and Drilling Corks

There are many occasions when a stopper or other piece of cork has to be cut or drilled, and, unless one knows the method of doing the work correctly, the job is apt to be a ragged one. The best methods of handling cork are as follows: To cut it, provide a dish of water and a sharp knife. Then, dipping the knife almost continually in the water, rough-shape the cork. Then finish the job with a fairly coarse emery wheel, if available, or use a hand-sharpening stone and water, rotating the cork in the fingers while drawing it over the stone. For drilling cork, obtain a piece of thin-walled steel tubing the diameter of the hole desired and sharpen one end on a whetstone. Bevel the edge like a chisel. Drill a hole through the other end and drive a wire nail through for a handle. Hold the cork in the left hand and rotate the sharpened tube with the right, pressing it through the cork. Such a drill will cut a clean hole.

Useful Homemade Blowtorch

A simple, cheap and extremely useful blowtorch can be made from an ordinary atomizer, a piece of gas pipe or other gas-tight tubing, about 3 or 4 ft. long, and a piece of smaller tubing about 2 ft. in length. The latter is used to produce an especially hot flame, and is not necessary for general use. The nose piece or cap is removed from the atomizer, the glass unscrewed and the large tubing is placed where the short tube to the bulb commonly is connected. This torch will serve well for general experimenting, as the tip is adjustable to various angles. If desired, the small tube may be slipped over the lower, bent tube, and blown through. Care should be taken to blow steadily in order to prevent extinguishing of the flame by a sudden blast.



¶A good rolling pin can easily be made from a 12-in. length of aluminum tubing.

Taking Long, Narrow Photos

When it is necessary to take a long, narrow photo like the one shown here, I set up my camera and take parts of the scene

Large, Narrow Photos like This Can Be Taken with Any Ordinary Camera, Two Halves Being Taken Separately and Joined Later

separately, joining them together. This can readily be done and the separate photos will fit together nicely, provided the camera is kept in the same position while being rotated on the tripod.—J. J. Brindos, International Falls, Minn.

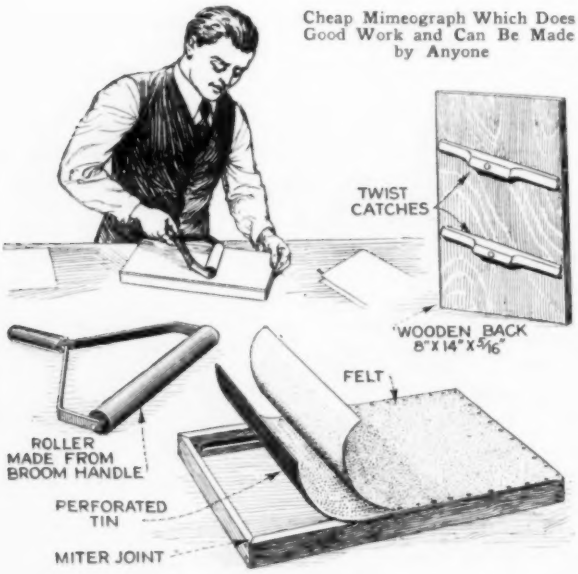
Locating Air Leak in Condensing Turbine

Someone has said that a little leak will sink a big ship, and the same statement might easily apply to a condensing turbine, for if a turbine of about 500-kw. capacity were fully loaded and a hole, ¼ in. in diameter, should be drilled in the condenser above the water line, it is highly probable that, unless the load were reduced or the initial steam pressure increased immediately, the turbine would slow down until it stopped or until the load was light enough for it to pull it noncondensing. A leak of this size would no doubt be discovered, but small leaks that let in a small amount of air constantly cause a loss of efficiency. Trouble of this kind was experienced by the writer some time ago. All the joints in the machine and condenser had been gone over and painted with shellac, and every means tried to find this small leak but to no avail. Finally, someone suggested that the machine be shut down and the turbine casing and the condenser filled with water, for it was reasoned that if air could get in water would come out. The plan was given a trial and a tiny trickle of water flowed out over one of the clamping rings on the corrugated-copper expansion joint between the turbine and the condenser. The continued "breathing" action at this point, due to expansion and contraction, had finally opened a small crack, which, being behind the clamping ring, could not be seen. A new expansion joint corrected the trouble. —Earl Pagett, Coffeyville, Kans.

Cool Grip for Small Drain Cocks

When hot, the drain cocks on radiators or heating coils cannot be handled comfortably with the bare fingers or even light gloves. To remedy this, saw a wooden spool in two and cut a slot in it as shown in the photo. The slot should be formed so that the spool will grip the cock handle securely. The spool will always afford a cool grip, and a better one for turning the stem if the latter is a little tight.—Frank W. Bentley, Jr., Missouri Valley Iowa.

Wooden-Spool Handle for Radiator Drain Cocks



Cheap Mimeograph Which Does Good Work and Can Be Made by Anyone

How to Make a Practical Mimeograph

A commercial mimeograph is usually rather costly, but one that will turn out good copies in any number can be made for almost nothing. Four lengths of ¾ by 1-in. wood are cut to form the frame, which measures 8 by 14 in., inside dimensions. The joints are mitered and nailed to make it rigid. A piece of wood, 5/16 in. thick, 8 in. wide and 14 in. long, is fitted loosely in the frame to form a removable back. The frame is laid on a level surface, the back is pushed down into it against the surface, then two pieces of ½ by ¾ by 8½-in. wood are made into twist catches and attached to the back with one screw in each, as shown, a groove being cut in each side of the frame to receive the catches. Turn the frame over and tack a piece of perforated tin over the entire top, nailing it to the frame only, so that the back can be removed by loosening the catches. Next tack a light piece of felt over the perforated tin surface; this is the ink pad. A light piece of bright tin is cut the same size as the back and put into the frame between the perforated tin and the wooden back in order to prevent the wood from soaking up the ink. This completes the mimeograph. A stencil sheet of the type used in mimeographs is obtained, and a negative stencil is made in a typewriter according to instructions on the stencil sheet. The back of the mimeograph is removed and mimeograph ink is applied to the perforated tin with a small paintbrush, until the felt pad is evenly soaked but not saturated. The tin plate and wood back are then replaced and the stencil sheet is spread out evenly on the ink surface and pressed lightly with the roller until it adheres to the inky surface. The mimeograph is now ready to print, and a sheet of paper to receive the copy is spread over the stencil sheet and rolled firmly but lightly with the roller. The copy is removed from the stencil sheet and the process repeated any number of times. If the copies become indistinct, remove the backing and apply a little more ink to the perforated tin surface; this is not necessary for less than 125 copies.—Steward A. Marshall, Jr., Rome, Ga.

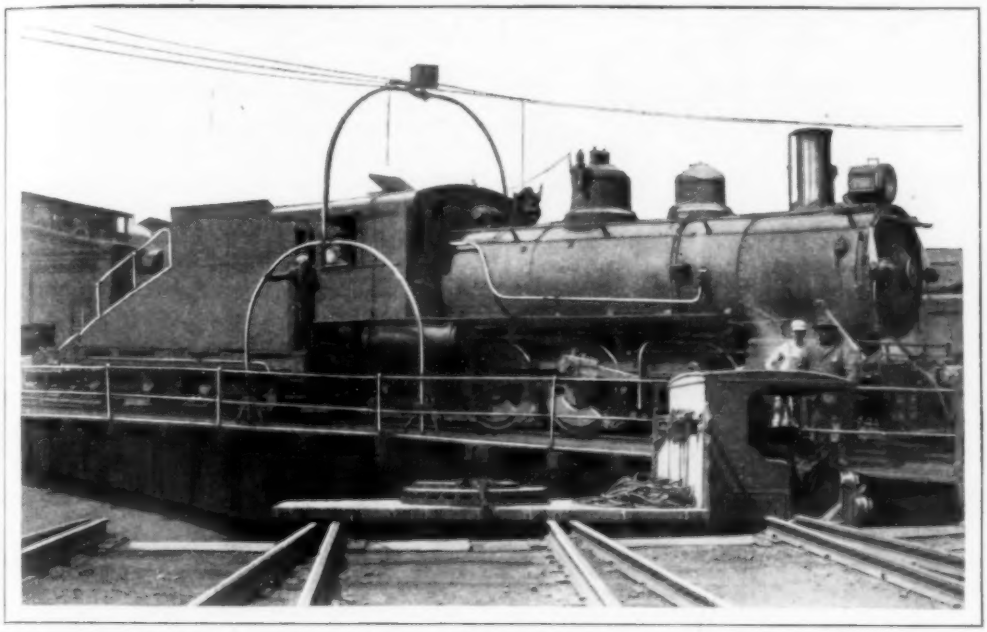
Gauge for Measuring Latticework

In the construction of latticework, it is common practice to space the battens by their own width, and this distance is usually measured by means of a piece of batten. When doing some of this work, recently, I found that the method of spacing was greatly facilitated by tacking a short section of batten on the hammer handle, with its end slightly below the top of the hammer head, as shown in the illustration, so as not to interfere with nail pulling. The spacing block was thus under the control of the hand holding the hammer handle, and this made the work easier.—Royle Snow, Westmount, Can.

¶A casting should be well pickled and free from sand before it is placed on a milling machine.

Truck Replaces Turntable Motor

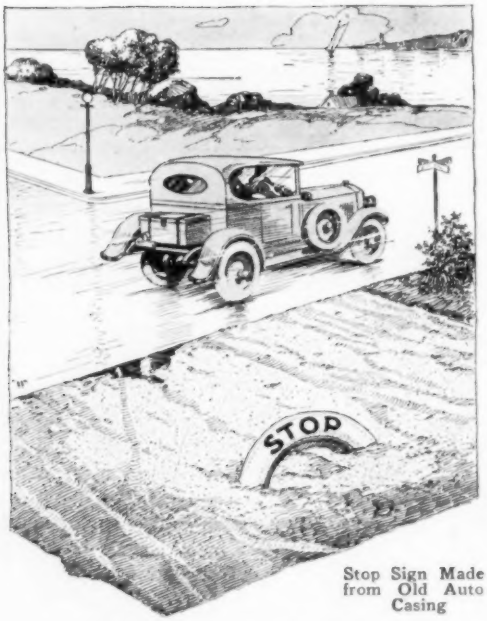
The 25-cycle electric motor which operated the turntable in the motive-power yard of an eastern railroad failed. As the turntable led to forty-six tracks, and it was necessary for the engines to utilize it in making return trips, all traffic would have been tied up had the table ceased functioning. This could not be permitted at any cost. At first, there seemed to be but two possibilities. A new motor might be purchased at a cost of from $1,500 to $1,800, but this plan was not feasible because 25-cycle motors of this type were not carried in stock, and it would have taken several weeks to manufacture one to order. The second possibility was the use of approximately eighteen men to keep the table in motion. But the trouble with this plan was that it would cripple operations in other quarters. The foreman of the auto-trucking department came to the rescue. He argued that a truck could be lowered into the turntable pit with a crane and that the truck could push the table around with the loss of but one man's time and one truck. A 2½-ton truck was first lowered into the pit, but it was soon seen that it was too light for the work. A 5-ton truck was accordingly substituted and for two and a half weeks it pushed the turntable around until the motor had been repaired. To connect the truck to the table, a special bar was made and clamped to the heavy front bumper of the truck and the lower portion of the turntable.



Five-Ton Truck Moved Heavy Locomotive Turntable While Electric Motor Was Out of Service, Doing the Work of Eighteen Men, Which Would Otherwise Have Been Required

Good Packing for Small Valve Stems

Packing of small valve stems frequently gives out and this often occurs at a time when there is nothing handy with which to repack them. The following emergency method will then be found helpful: Take the tinfoil from a cigaret package, roll it tightly to form a string, as shown, and slip it under the gland.



Stop Sign Made from Old Auto Casing

Stop Signs for Motorists

A number of unpaved side roads in a western town terminated in a busy boulevard and no regular electric stop signs were provided. To give proper warning, to the motorist coming onto the boulevard over these side streets, cheap and effective signs were arranged as shown in the illustration. They consist of old auto tires imbedded in the dirt so that only a section projects above the surface. The word "stop" is painted on the visible portion of the tire. Nearly every motorist is looking at the road while driving, and his attention is arrested by the sign, both during the daytime and at night. Such stop signs will not damage a car even if they are driven over accidentally.—A. Oscar Wiggenjost, Lincoln, Nebr.

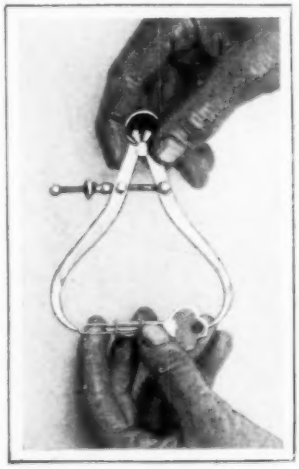
How to Prevent Corrosion in Air Pipes

Corrosion in air pipes can readily be prevented by mixing about 2 gal. of water glass with 1 gal. of water. Open the air valve, allow all the air to escape from the tank and then pour in the mixture. Start the compressor and, when the tank gauge registers about 20 lb. pressure, the mixture can be blown through the pipes and out of the hose. All tools should, of course, be disconnected from the air line before this is done. Open the valve only about one-fourth. The water glass will be deposited on the walls of the tank and pipes, preventing the formation of rust. Water glass should never be used without water.—August Jeffers, Philadelphia, Pennsylvania.

Gauge for Testing Try-Squares

The invariable dispute regarding the trueness of a try-square is not proved by reference to another square. Both may be out of true and consequently a check by this method is valueless. A cold-rolled steel gauge is used in the tool room of one shop for testing try-squares. It is about 5 in. long and 3 in. in diameter. The outside diameter is ground to a true cylinder and one end is ground at the same time or at the same set up, to provide an edge, circular in shape, on the test end of the gauge. The inner surface of the end is cupped or relieved. In use, the stock of the square is set against the end of the bar and the blade against the side. If the grinding machine is capable of grinding a true cylinder, this is one of the most accurate methods of forming a 90° angle.

Inside Calipers for Close Quarters



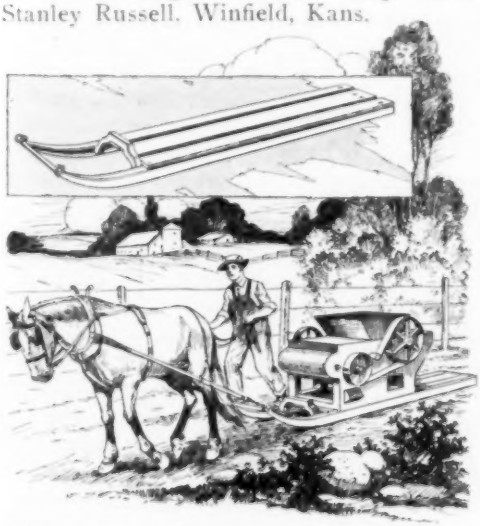
The writer had some small followers to turn for several cylinders, which, because of their location, could not be calipered with the usual small tool. A key and a short loop of wire were assembled as shown, the wire being held firmly in the grooves by twisting two shorter bits of wire around the key and the wire loop. It was easy to handle and adjust, the holes being satisfactorily calipered.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Making Chain Block Work Both Ways

On many jobs where hand lifting is necessary with a worm hoist, more commonly known as a screw or chain block, there is a time loss of 5 to 10 minutes on each hoist, depending upon the number of stories that the loads are being raised. In addition there is the extra labor of working the chain until the hook returns for its next lift. The loss and unnecessary work can be eliminated by making the chain block work both ways. Cut a link in the slack of the lifting chain and attach a hook as on the opposite chain.

Farm Sled from Old Auto Frame

The farm sled shown herewith was made from a discarded auto frame turned upside down. The engine hanger was left on the frame, but the cross members were removed, to allow sufficient clearance. The rod across the front of the sled was placed through the holes formerly occupied by the spring bolts. The rod forms the hitch and strengthens the sled at this point. Lengths of 2 by 6-in. wood were attached across the top of the runners and covered with 1-in. lumber, to form the top of the sled. The sled may be used both during summer and winter, being especially handy for hauling water, fodder, posts and for doing many odd jobs about the farm where a strong, low sled is required.—Stanley Russell, Winfield, Kans.



Old Auto Frame Makes a Strong and Useful Sled for Hauling about the Farm

Improvised Gauge for "Eight-Squaring" Large Tapered Pieces of Timber

Gauge Aids in "Eight-Squaring" Timbers for Spars

After squaring a timber and shaping it to the proper taper for making a spar, such as a mast, boom or flagstaff, the first move is to "eight-square" it. The accompanying drawing shows a simple and handy gauge for doing this. It consists of a length of 1-in. wood, cut as indicated in the detail and drilled at two points to hold pencils. A gauge of this type, having the dimensions indicated in the drawing, can be used on timbers 12 in. square or less. If a larger timber has to be marked, the gauge should be made correspondingly longer, say, 24 in. between points, the other dimensions also being doubled. The marking is done by holding the points firmly against opposite sides of the timber, and bearing down on the pencils, which are drawn over the surface of the timber as indicated.

¶Do not use wedges under shaper or planer work; use flat shims as these do not slip when the tool is taking a heavy cut and the work tends to vibrate.

Make These CANDLE-

RADICALLY different from the usual types of wooden candlesticks of the better grade that can be obtained at art stores, antique shops, etc., the "helical" candlestick shown in the accompanying drawings will present a pleasing appearance, in good taste on any mantel. The feature that is especially appealing is the symmetry of the spirals. Both are formed from a single piece of wood, a task which seems exceedingly difficult but is much easier than might be supposed. Only patience and care are required in doing the work, and any person who has a small wood-turning lathe, a coping saw, a metal hand drill and a few other common tools, can readily make the candlesticks.

It is absolutely necessary that a tough, close-grained wood be used. Mahogany, for example, was found entirely unsatisfactory, while a good grade of maple served the purpose very well. It is not advisable to turn the whole candlestick out of a single piece of wood, as the base and the drip flange will not be so strong nor show the beauty of the grain as is the case when it is made out of separate pieces as described in this article. The four parts are the base, the central section or body, the drip flange and the cup, these parts being finished separately, doweled and glued together securely and then gone over at the joints to insure smoothness and continuity of line. Accordingly, 2 by 6-in. maple will be satisfactory, and although the shortest stock available at lumber yards is usually about 10 ft. in length, it is well to have extra stock on hand in case some of the work is accidentally spoiled. A piece of 2 by 6-in. maple, 10 ft. long, costs about $2.50.

In making a pair of candlesticks of this kind, cut off two pieces 6 by 6 in. square; set up in the lathe and turn them down to form the bases, using a template in order to get both exactly alike in contour, height and width. Sand them down carefully until no tool or sandpaper marks can be seen on the surfaces. The dimensions and the curve of the base are given in Fig. 1. The center sections are turned according to the measurements in the same drawing. The pieces used for this purpose should be about 2 by 2 by 10 in. and are turned down to 9 in. in length, 1¾ in. in diameter at the bottom, and 1½ in. at the top. A neck is turned on the top end where the drip flange is attached. This end should be turned to ¾ in.

Attractive STICKS

By E·R·Haan

diameter and, when the flange and cup have been doweled on, which is done after the center section has been entirely completed, it can be carefully turned down to ⅝ in. Two 6 by 6-in. pieces are turned down for the drip flanges, a length of 2 by 2-in. stock is turned to 1½ in. in diameter, and the cups or candle holders are turned and finished, care being taken to make them exact duplicates.

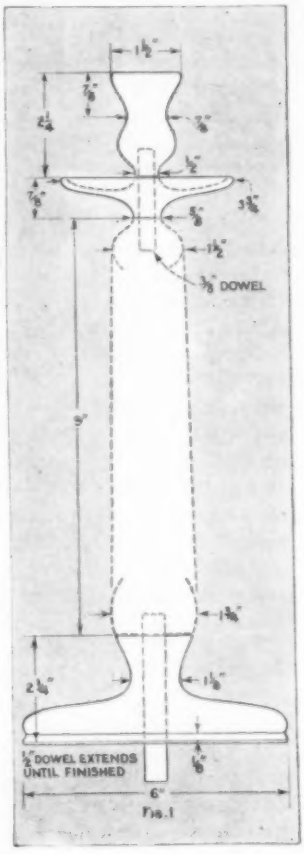


Fig. 1

The following method of turning the various parts has proved convenient. For the base, drill a hole in the center of the 6 by 6-in. blocks, cut off the corners at a 45° angle and attach the block to the screw faceplate of the lathe. The hole, which should be drilled just a trifle smaller than the screw on the faceplate, should extend entirely through the block so that the dead center of the lathe can be butted into the hole. Thus securely supported on both sides, the block will not chatter or get out of alinement. If the top and bottom sides are not perfectly parallel, face one side, then reverse the block and turn the other side. The neck part of the base should not be finish-turned until after the center section has been finished and doweled on. The center section is drilled lengthwise at both ends, at one end for the screw of the faceplate and at the other end for a ⅜-in. dowel, by means of which the drip flange and cup are attached later. The drip flanges are turned down in the same manner as the bases, a small hole for the faceplate screw being first drilled, the corners cut off and, after the base is completely finished, a ⅜-in. hole is accurately drilled all the way through it. In making a cup, the hole for the candle is bored first, to a depth of about 1 in. and not more than ¾ in. in diameter. Similarly the ⅜-in. dowel hole in the bottom, ½ in. deep, should be drilled before the cup is turned to shape. The wood may split if the cup is first turned and then drilled. A steady rest will be of use when boring the ¾-in. hole.

After the individual parts of each candlestick have been turned and finished, except at the ends where they join, the center section is taken and two strips of gummed tape, ½-in. wide, are wound around it as indicated in Fig. 2. The strips are wound around exactly 2½ turns and must be equidistant at all points; the starting points of the strips

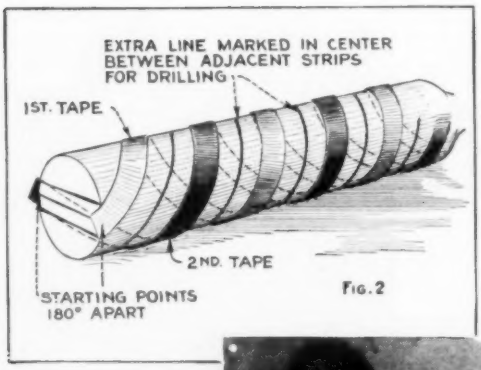


Fig. 2

are diametrically opposite each other at the lower end, that is, 180° apart. An extra line is marked in the center of the wood exposed between the strips to serve as a guide for drilling, which is done by means of an ordinary metal hand drill, using a ½-in. drill. It is necessary to drill holes through the center piece at various points and the holes must be drilled exactly at right angles to the axis, not to the surface. A good method of drilling the holes is shown in Fig. 3, a simple wooden jig being used to hold the work and to guide the drill. Although this method takes some time, it is accurate.

The exact construction of the jig is shown in Fig. 4. It consists of a base, two sidepieces with vees cut in them to hold the round piece securely, and a top piece. The sidepieces are made from ¾-in. wood and are cut the same dimensions, except that one piece is exactly ⅛ in. higher than the other. Clamp the two pieces, with the top edges flush, in a vise, and saw out the vees, which have previously been laid out. The vees should be just deep enough so that the work will be raised about 1/16 in. above the top of the sidepieces. The latter are screwed to the base, 7 in. apart, the screws being driven up from the underside of the base. Nails are not used as they might split the sidepieces. The top piece has a row of ½-in. holes drilled lengthwise in the center. After the work is laid in the vees, the top is screwed on as indicated, and will hold the work securely. It must be remembered that one sidepiece is ⅛ in. higher than the other to allow for the taper, and the end of the work having the 1½-in. diameter should rest on the highest piece. The row of holes in the top must be centered accurately over the work. Then, before clamping the top on the work, arrange the center guide line between adjacent strips to come directly under the center of a hole. Proceed to drill through the work slowly in order to avoid splintering the wood as the drill comes through. Turn the work a trifle and drill another hole, adjacent to the first, and also centered on the

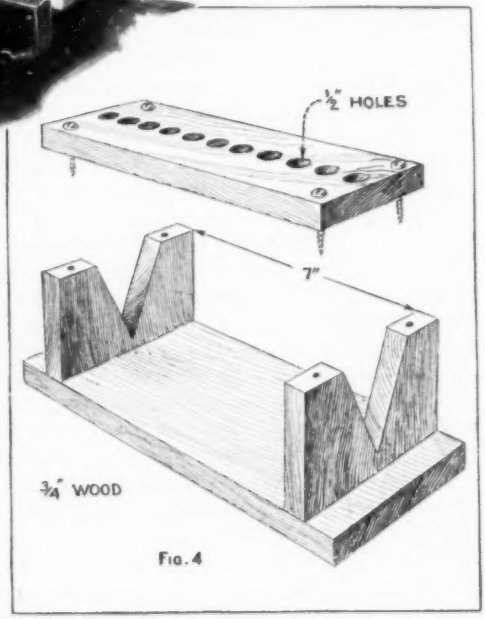


Fig. 4

guide line. In this way holes are drilled through the work to remove the bulk of wood between the helices. Do not drill closer than ½ in. from the bottom end and about 1 in. or so from the top end.

After the work has been drilled, it is set up in a lathe and the remaining wood is carefully cut away by means of a coping saw, as shown in Fig. 5. When doing this, guide the blade of the saw toward the waste wood. If you saw straight down a cut will be made in the wood forming the helices, and this should, of course, be avoided. Cut as much wood off in this way as possible and then take a round file and dress down the ragged sides of the helices evenly, which will give the work the appearance shown in Fig. 6. The rounding of the helices is the next operation and this is a good deal easier than you may think. Get a number of strips of ¾ or 1-in. emery cloth, rather coarse, and dress down the helices by partly wrapping a strip of the cloth around a helix and drawing it back and forth as in Fig. 7. Do not pull too hard or the work will break. Sand equally over the helices to get them perfectly round. After the corners are taken off with coarse emery and the helices have assumed a round shape use a finer grade of emery or sandpaper and lastly fine steel wool to smooth off all scratches. The sections where the ends of the helices join must also be sanded down carefully. When completed, enlarge the hole in the base and in the lower end of the helical section, and dowel and glue the two pieces together. Then dowel and glue on the top parts. The ½-in. dowel in the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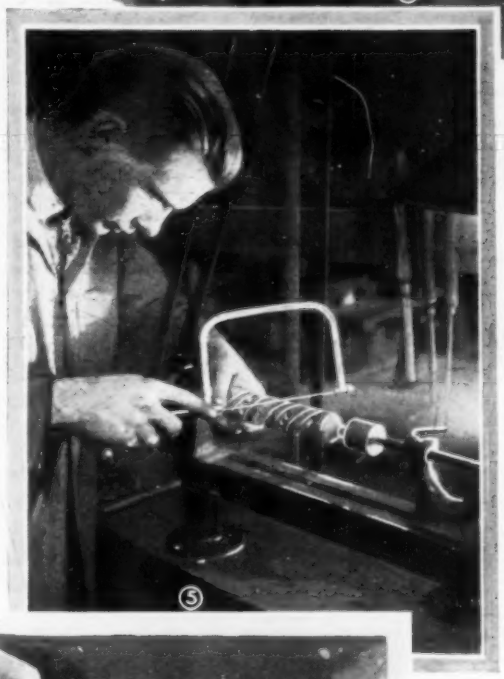
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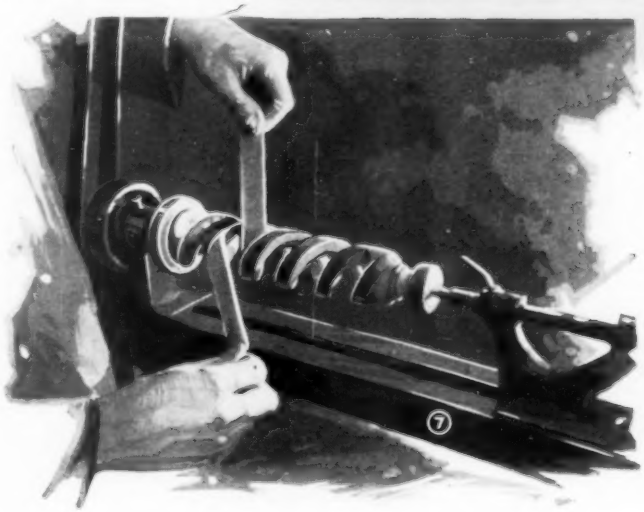
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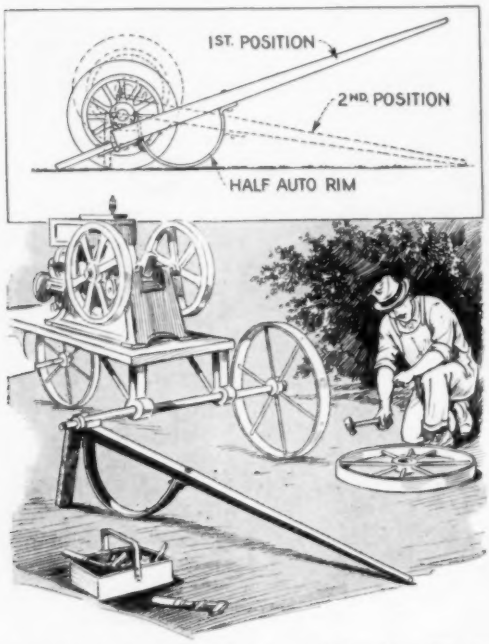
base should be left extending, as shown in Fig. 1, so that it can be used to hold the work in the lathe chuck. After the candlestick is entirely completed, the projecting end of the dowel is cut off. The joints between adjacent pieces should be well finished. Sandpaper or steel wool can be used to remove all scratches.

Use a light-oak wood dye to get a colonial-maple effect. Do not use the shellac first as it will spoil the finish. Before the stain has dried, wipe off the high lights and then finish with a coat of white shellac. After this has dried thoroughly, rub it down with finely powdered pumice-stone and oil, just enough to remove the luster and the brush marks, if there are any. Then apply polishing wax, which, after being rubbed down, will give the sticks a pleasing satin finish.



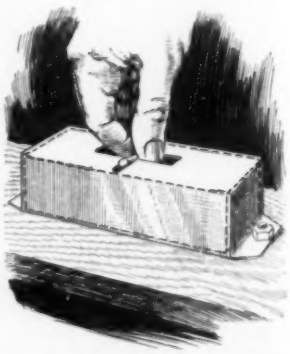
Simple Jack Facilitates Greasing and Repairing Wheels of Farm Wagons and Implements

Handy Homemade Jack

The drawing shows a type of lifting jack, which, although rather unusual in design, is nevertheless quite simple to make and use. It consists of a length of 2 by 4-in. wood as a lever, a half auto rim, a piece of 1-in. wood, hinged to the end of the lever, and a length of flat iron bent to a shallow "U" and bolted to the lever at the same end. The illustration shows how these parts are assembled, and the upper detail indicates the method of using the jack. It is especially useful on the farm to jack up wagons and farm implements when greasing the wheels or making repairs. In use, the U-shaped piece on the end of the lever is brought under the axle, while the rim is set on the ground. A little pressure on the lever will quickly raise the load and the hinged piece will drop to a vertical position, holding the load securely.

A Safe Match Container

Many shops object to keeping matches around to light up gas furnaces, blow-torches, and the like, because of the danger and the fact that some men are apt to help themselves rather generously for their own private use. Both these objections can be easily overcome by adopting the container illustrated, which holds matches safely and prevents more than one or two from being taken out at the same time. It is made of tin and is large enough to cover the inner half of a box holding about 500 matches. It has one slot cut out on top for the insertion of the thumb and forefinger and one at right angles to this for the removal of the matches. The container is held by means of a couple of screws and nuts in any convenient position. With the thumb and finger in the slot, the matches can be removed only through the narrow slot, which permits the passage of two matches at the most.

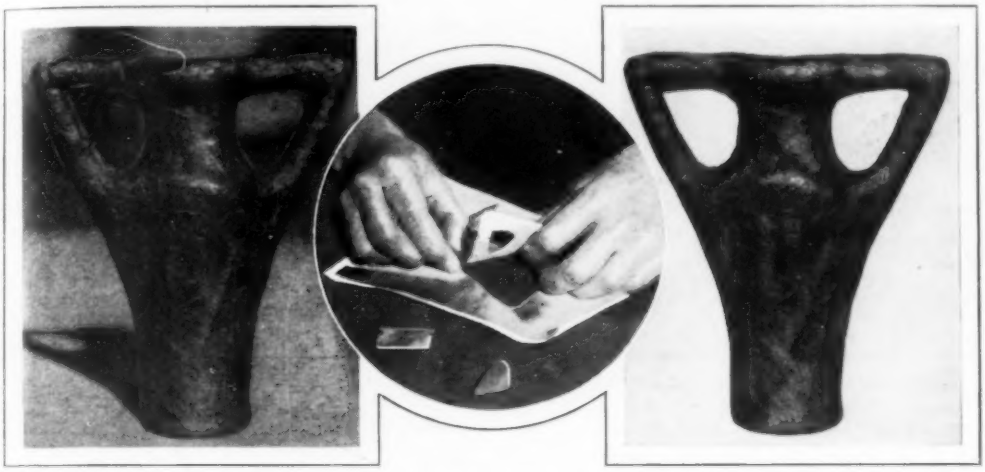


¶Never brush chips into the running parts of a machine; use guards, if necessary, to keep the chips out.

Blocking Out Photo Backgrounds

By DICK HUTCHINSON

BLOCKING out the background of a negative is a tedious operation, and it is a hard matter to get a satisfactory job without allowing the brush to slip on some of the long lines, thus blocking out a margin of the picture itself and spoiling an otherwise good negative. For the commercial photographer, or anyone who has a lot of blocking-out to do, the following method will be found useful:



Left, Photo in Which Background Causes a Loss of Contrast; Right, Background Blocked Out to Give Contrast; Center, Cutting the Photo Out of the Background

Place the negative to be blocked out in the printing frame and make a contact print on single-weight paper; develop, fix and wash in the usual way. While wet, place the print, face up, on a drawing board or some other smooth surface and cut out the picture along the outline with a safety-razor blade, care being taken that a good even outline is obtained. Put the cut-out part, face downward, on the original negative and press it down evenly all over, thereby covering all of the negative except the picture, or the portion that is to be printed. The moisture still in the paper will make it stick to the negative. Place in the printing frame and proceed to make prints. These will have a pure white background, which is seldom attained with the old method of blocking out.

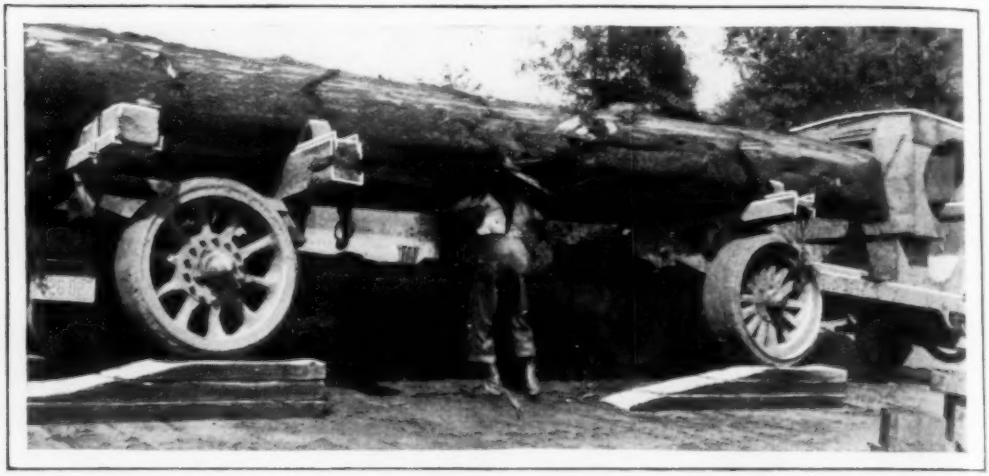
A black background is often desired, and is especially suitable with photos of statuary, etc. The following is the simplest and most satisfactory method of getting this effect: Develop, fix and wash the negative and let it dry thoroughly. Then take a safety-razor blade with a good sharp corner and cut through the emulsion all around the subject. Place in water again and let it soak for an hour or so, then remove, and with the razor blade scrape off all the emulsion outside of the lines, leaving only the subject itself. Let dry thoroughly and the negative is ready for printing. The prints should show a good sharp picture, with a clear black background.

Use for Vacuum Cleaner

Tool cabinets and their drawers collect considerable dust, mainly because many people consider it too much trouble to remove the small pieces in order to clean up. I keep my entire cabinet dustless by using a vacuum cleaner. From a piece of ordinary wire fly screen, I made a cover to fit snugly over the opening or mouth of the small nozzle used with the hose attachment. With this arrangement the nozzle gets into all corners and among small parts, sucking up every particle of dust.—Walter C. Michel, Jersey City, N. J.

Unloading Logs from Trailer

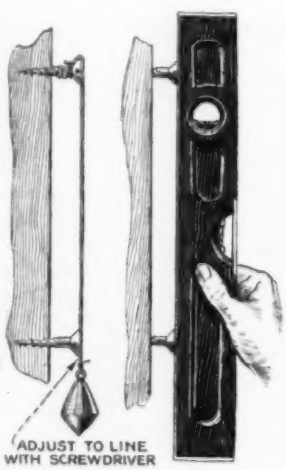
Three planks, nailed together and beveled on one end so that a trailer carrying a load of logs can be pulled up on them, as indicated in the photo, have been found very useful to help unloading. The driver first loosens the chains holding the logs and then drives the trailer on the blocks so that it is tilted to one side. This causes the logs to roll off quickly.—Carlton Groat, The Dalles, Oreg.



Timesaving Method of Unloading Large Logs from a Truck Trailer by Running It onto a Pair of Beveled Blocks to Tilt It Sideways

Simple Rig Checks Accuracy of Level

All levels sold in hardware stores are supposed to be accurate, but unfortunately there are many grades of levels, and some of these do not come up to this requirement. In the drawing is shown a simple method of checking a level in a few moments. Drive a flat-head screw into any post or side wall and suspend a plumb line, as indicated. About 2 or 3 ft. below this screw, drive in another screw so that the head will be exactly in line with the plumb line. All that is necessary now is to place the level against the screws for checking, as shown in the right-hand detail.—L. H. Georger, Buffalo, N. Y.



Care of Pneumatic Tools

The life and efficiency of a pneumatic tool depend to a great extent on the care it gets. A clean air supply is necessary, and therefore it is a good idea to blow air through the hose pipe before connecting the tool, in order to remove moisture and dust. After use, a pneumatic tool should have a charge of suitable oil blown through it to remove any moisture, cover the metal parts and protect them from rust. All tools should be returned to the storeroom after the day's work. They should never be left in the open all night, as this will cause corrosion and consequent loss of efficiency. Tools should be placed in a kerosene bath once a week to clean them. Upon removal from the bath, they should be dried thoroughly and lubricated plentifully before use. Shanks of snaps, chisels, drills and reamers must be of exactly correct dimensions, as chisels and snaps with defective shanks are apt to ruin the hammer piston. Likewise, if drill shanks become bruised, bent or otherwise damaged, they will not fit the socket of the drill accurately. The result will be a damaged socket and perhaps a broken drill.

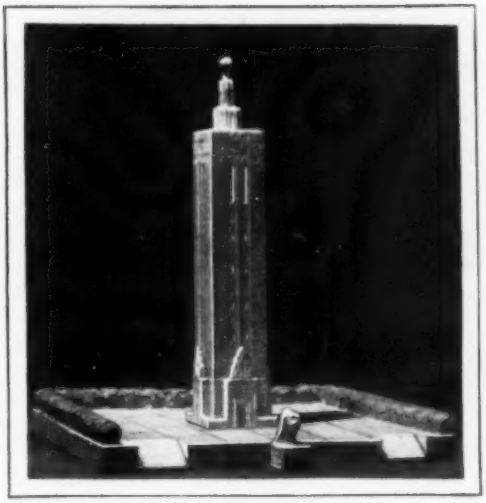
Only light oil should be used for the hammers and a good grade of heavy oil for drills.—August Jeffers, Philadelphia, Pa.

Atomizer Used for Oiling Firearms

Every sportsman knows that rust is highly injurious to firearms, fishing tackle and other sporting equipment, which must receive proper oiling and care to remain in good condition. In fact, more firearms go to the scrap heap every year from rust than are ever worn out by use in the field. The writer has quite a collection of firearms, and, in spite of the best care, they have suffered a slight depreciation from rust. Oil, of course, is the antidote for rust, but there are two problems to be met in keeping firearms properly oiled. One is to use the right kind of oil, and the other the method of applying it, for the oil must get into every crevice. Any special grade of good gun oil is suitable for rust prevention, but it cannot be applied satisfactorily with a cloth or with an oilcan. The application problem is solved in a satisfactory manner by the use of an old nasal atomizer, by means of which the oil can be sprayed into all the cracks and corners of the gun mechanism. The atomizer has a flexible nozzle which permits spraying the gun oil into the receivers of rifles and other parts of firearms that cannot be reached with any oilcan. It is also useful

Oiling Firearms with an Atomizer Insures Getting the Oil into All the Crevices

for spraying ferrules of fishing rods, metal parts of artificial fishing lures, and practically every other kind of sporting equipment which needs oiling.—John Edwin Hoag, Los Angeles, Calif.



Soap Has Been Used Successfully as a Medium for Architectural Models

Architectural Models Made from Soap

Standard cakes of white soap were used to make the architectural model shown in the photo. The surface of the cakes was cut smooth by means of a heated knife. The cakes were held together and grooves were cut on the sides where they joined. Soft soap, made by melting some of it, was poured into the groove and the cakes were pressed together firmly and allowed to stand for several hours. The result was a mass of soap of uniform consistency, which was easy to carve. This was done by means of a steel tool and an orange stick.—Henry Bern, Chicago, Ill.

Cutting Cast-Iron Soil Pipe

There is a trick in cutting soil pipe, especially when it is in the shape of a bend or elbow. First mark or score it where you wish to cut it. Then place a piece of 2 by 4-in. timber on edge. Have some one hold the bend by the end to which the collar is attached, and rest the part to be cut on the timber. Tap the pipe in several places on the scoring with a cold chisel and hammer, letting the helper rotate the pipe as you do this. With care and not too heavy blows, the material will break off clean along the mark.

¶In knurling a piece of work apply oil on the working face of the roll and also on the pin.

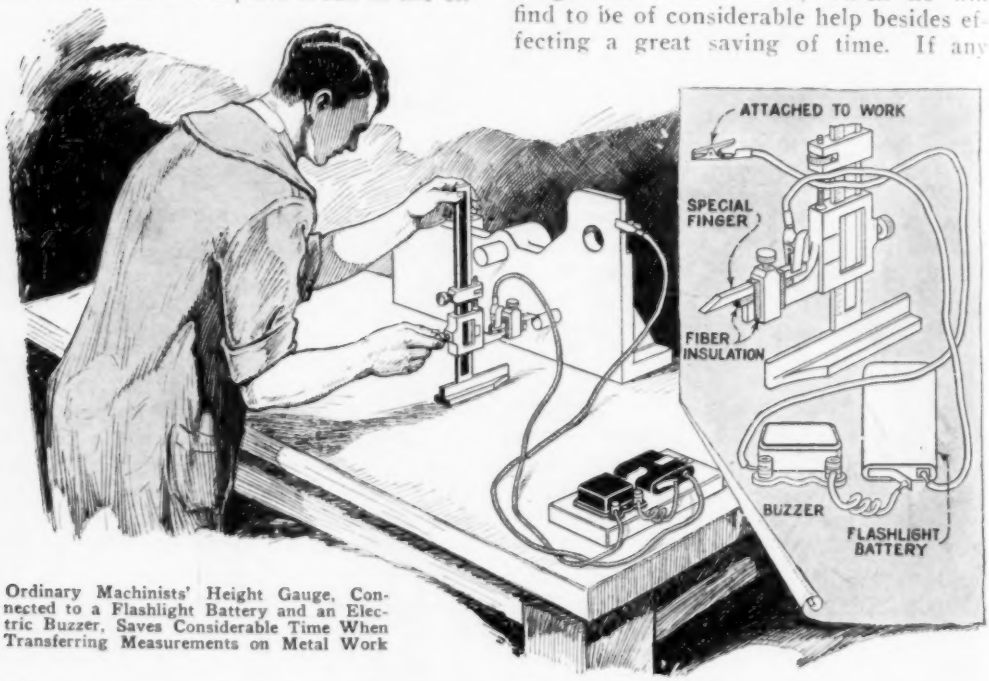
An Electrical Height Gauge

By JAMES McINTYRE

ACCURACY in using a height gauge usually depends on the sense of feeling. Some machinists, however, use Prussian blue on the measuring or transfer finger, noting the transference of this blue onto the point or object being measured, and in this case accuracy depends on sight. Both of the foregoing methods take considerable time, and the novel method illustrated in the accompanying drawing, will be found much more convenient, besides being just as accura e as the others. It consists in an arrangement using a flashlight battery and a buzzer, the latter being energized the moment a circuit is completed by the transfer finger making contact with the work.

Any height gauge can be equipped for this purpose by simply inserting a piece of electrical insulating material at the points indicated. In my case, I made a special finger, half the width of the one provided on the gauge, and then inserted a piece of fiber under it. The part that clamps the finger must also be well insulated to make a complete break in the circuit. The reason for this careful insulation is that the metal surface plate, or table on which both the gauge and the work are set for measuring, provides a path for the current and this would keep the circuit closed at all times. However, if a piece of plate glass is used as a surface plate, it is not necessary to insulate the gauge, and the wire can be attached to it at any convenient point by means of a spring battery clip. One length of insulated copper wire is connected to the transfer finger and to the flashlight battery; another is provided with a spring battery clip, which is clamped to the work, and this wire is connected to a terminal on the buzzer. The battery and the buzzer are connected as shown in the detail. If no buzzer is handy, a flashlight lamp will answer the purpose, or a radio headset can be used. As soon as the finger makes contact with the work, the buzzer will sound, the lamp will light or the headphone will "click."

Anyone can readily improvise an arrangement of this kind, which he will find to be of considerable help besides effecting a great saving of time. If any



Ordinary Machinists' Height Gauge, Connected to a Flashlight Battery and an Electric Buzzer, Saves Considerable Time When Transferring Measurements on Metal Work

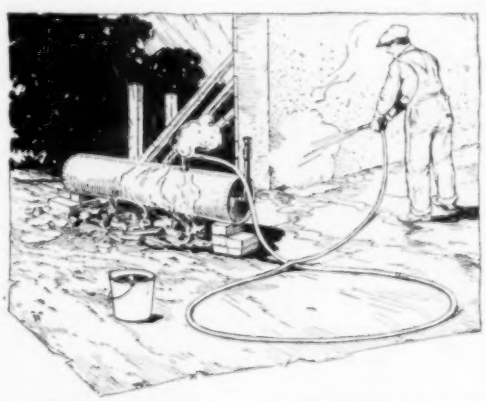
machinist or toolmaker desires to have his gauge arranged so that no addition is necessary when making measurements, all he has to do is to grind a shoulder on the back of the measuring finger, and to use a piece of insulating material the exact depth of this shoulder.

Salt as a Milk Producer

A Wisconsin dairyman has discovered that, although it is commonly acknowledged that salt is good for dairy cows, it does not receive the consideration it deserves in making up the regular diet. In comparative tests with two herds containing an equal number of cows, the farmer claims that the first herd, which was given access to salt at all times, consumed 25 per cent more water than the second herd, and the milk flow increased from 12 to 15 per cent, while that of the second herd remained practically the same. To give milk in any quantity, a cow must consume more water than her bodily health requires and salt must be provided at all times.

Melting Snow and Ice Quickly

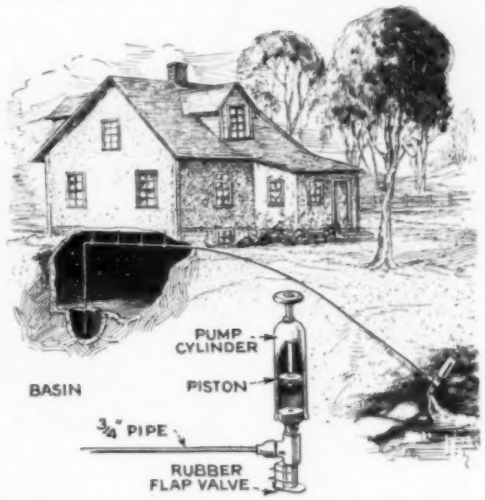
Sometime ago, during the winter, we were building a concrete dam, having a gas-engine concrete mixer on the job instead of a steam-power mixer. We had no way of removing the ice and snow from surfaces where fresh concrete was to be poured, so we used an old range boiler in the manner indicated in the drawing. It was raised from the ground by setting the ends on stone or brick supports. A filler pipe was arranged at the end, as shown, the tank was filled about two-thirds with water and a length of hose was then connected to the tank by means of a short pipe nipple. A fire was then built under the tank and the steam produced was directed against the snow and ice.—A. C. Brundage, Rochester, Minn.



Snow and Ice Can Be Quickly Melted by Applying Steam from This Improvised Boiler

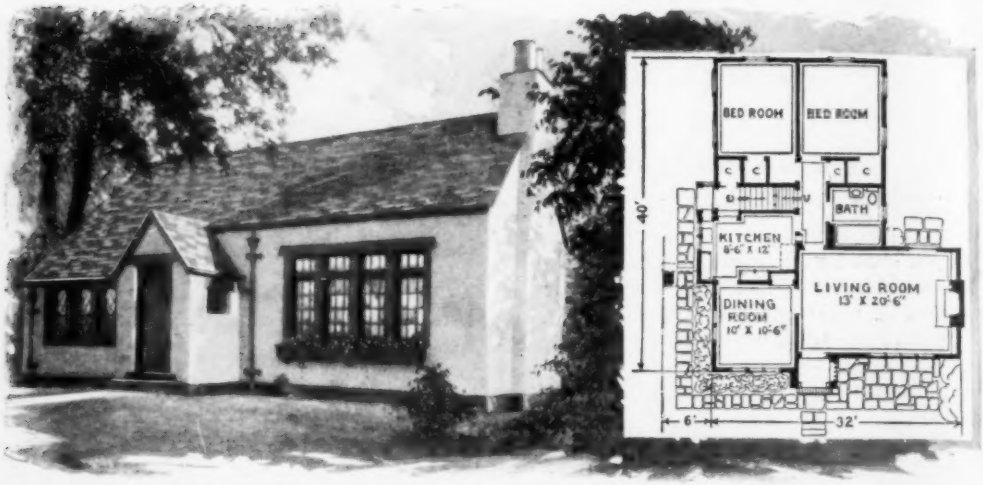
Draining Cellar with Siphon

There was quite a bit of water in my cellar. Being unable to drain it and not having a pump, I struck on the siphon idea illustrated in the accompanying drawing. The house was situated on a slight rise of ground, which enabled me to extend the outside section of the siphon to a lower level than the cellar floor, for otherwise the siphon would not work. A number of lengths of ¾-in. pipe were coupled together, using lead in the joints to make them air-tight. A hand pump and a rubber flap valve were provided on the outside, as shown in the detail. The water flow was, of course, started with the pump. As soon as the water reaches the outlet, it will keep on flowing as long as the inside end of the pipe is immersed. It is a good idea to fit a short piece of rubber hose on the inside end of the siphon and extend this to the lowest point on the cellar floor in order that the water may be drained out completely.—Luther Strosnider, Onaga Kansas.



Simple Siphon Made of ¾-in. Pipe Quickly Drains Water from Cellar

Is This Your Home?



Plan No. 5D35

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the United States department of commerce. Blueprints, specification forms, and material lists for the house shown here may be obtained from the Architects' Small House Service Bureau for a small fee. If further information is desired, literature describing the plan service and publications of The Architects' Small House Service Bureau will be sent you upon request. A booklet entitled "50 Ways to Lower Home Service Costs," illustrated by ten Bureau homes actually lived in and showing how as much as $1,000 can be saved on a home, may be obtained for 20c.

THERE are plans without number for five and six-room bungalows, but two particular arrangements have the strongest appeal, especially where economies are in order. In one of these the living quarters of the house are separated from the sleeping rooms and bathroom by the wall that runs down the center from front and back. Thus living room, dining room and kitchen are arranged on one side, with bedroom, bath and second bedroom on the other. The other scheme is to have living room, dining room and kitchen in front and two bedrooms in the rear.

The design shown here is the second of these schemes, but only in the most general way. Changing the direction of the living room, for example, is a variation which seems to make a completely new plan scheme. There is the separation between living quarters and the more private quarters of the house, which should be possessed by every bungalow.

Undoubtedly the most distinguishing feature is the living room with its high ceiling. This has sometimes been called a studio-type room. The rafters form part of the ceiling. This makes possible the use of a large window in the front wall and adds a sense of luxury and spaciousness at small expense. The qualities of this room have been heightened by making a decorative feature of the bookcases. These have been built at each side of the fireplace in line with the mantel and with it form a band of decoration across this end of the room. The enjoyment of the family will be increased by the generous opening to the rear upon the garden view.

Dining room and kitchen are well arranged, completely equipped with the facilities that make toward convenience in housekeeping. The location of the kitchen with respect to the grade entrance and basement stairway will appeal to efficient housewives.

A terrace may be arranged at the side of the entrance and before the living room and a porch or sun room may be built in the corner back of the living room.

Construction: Wood frame; exterior finish stucco.