Changing to A.C. Tubes—Page 303

GUST

25 CENTS

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UN[illegible]

SEE PAGE 256

ATKINS SILVER STEEL SAWS

The New

ATKINS "Silver Steel" Hack Saw Blades

IN your home workshop—in every shop or on the job—in great industries—these wonderful new Atkins "SILVER STEEL" Hack Saw Blades have revolutionized metal cutting.

Developed and perfected in Atkins laboratories this "SILVER STEEL" blade, for hand or power use, has repeatedly proved in use that it cuts TWICE as fast and lasts SIX times as long as ordinary metal-cutting blades.

YOUR Hardware Store displays these "SILVER STEEL" Hack Saw Blades as shown above.

When you buy any saw, look for the Atkins name on the blade and save time, money and material. Atkins makes "A Perfect Saw For Every Purpose."

Saw Books FREE

It will pay you to write us and get these booklets. "Saws in the Shop" tells all about metal cutting. "Saws in the Home" has suggestions for articles you can make in your home workshop. "Saw Sense" tells about saws and their care. Sent FREE—write us for the one you want.

E. C. ATKINS & COMPANY
Established 1857
426 S. Illinois Street, Indianapolis, Ind.

Leading Manufacturers of Highest Grade Saws for Every Use; Saw Tools, Saw Specialties, Plastering Trowels, Machine Knives, Grinding Wheels and Files

Sold by first class Hardware Dealers the World Over

Popular Mechanics Magazine

200 E. Ontario Street, Chicago, U. S. A.

H. H. WINDSOR, Founder — H. H. WINDSOR, Jr., Editor and Publisher

London: Hachette & Cie., 16-17 King William Street, Charing Cross, W. C. 2 — Paris: Hachette & Cie., 111 Rue Reaumur — Melbourne: Gordon & Gotch 509-513 Little Collins St.

ISSUED MONTHLY — SUBSCRIPTION: — SINGLE COPY, 25 CENTS

In United States and its possessions, also Canada, Cuba, and Mexico, per year, postpaid - $2.50
To all other countries in the Postal Union - - - - - - - - - - - 3.00
All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1908, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.
Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

Vol. 50 — No. 2

Contents for August, 1928

Special Features

[Continued on Page 4]

[Contents—Continued]

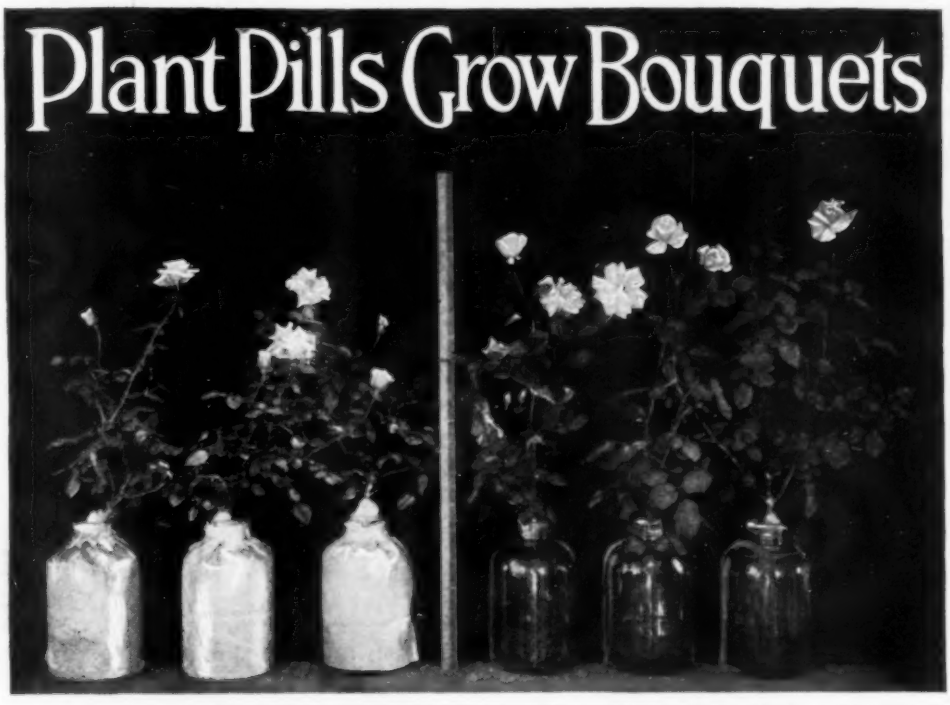
AMATEUR MECHANICS

SHOP NOTES

Popular Mechanics Magazine
REGISTERED IN U. S. PATENT OFFICE
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 50 AUGUST, 1928 No. 2

Plant Pills Grow Bouquets



Rose Cuttings, without Roots, after Growing Four Months in Bottles of Water to Each of Which a "Plant Pill" Had Been Added; the Cut Stems Have Developed Good Root Growths

By H. H. DUNN

AMATEUR gardeners may throw away their spades and forks, trowels and watering pots, and produce their own flowers, any month in the year, in window boxes, jars, tin cans, or any other receptacle that will hold water. In a box, the width of an ordinary apartment-house window, half a dozen rose cuttings, clipped from the parent bush in August, will supply blossoms for the Christmas table.

Sweet peas, planted in jars in the fern box on October 1, will provide abundant bloom for New Year's day. Dahlias, zinnias, asters, chrysanthemums, pansies, phlox, stocks, or whatever flower one desires, may be made to bloom in a similarly short time, indoors, all the year around.

No soil is required, no fertilizer is needed. The secret is a small, white oval lump of the size of a pigeon's egg, that is to say, about two inches long by an inch in diameter, called a "plant pill," soon to be obtained from the nearest druggist at small cost compared with what one pays for cut flowers at midwinter.

This wonder worker among flowers is the product of some seven years' study by Dr. W. F. Gericke, of the University of California. More than 200 varieties of plants, numbering nearly 2,000 individuals, have been made to produce their blos-

soms at any selected date, indoors and out, at the university.

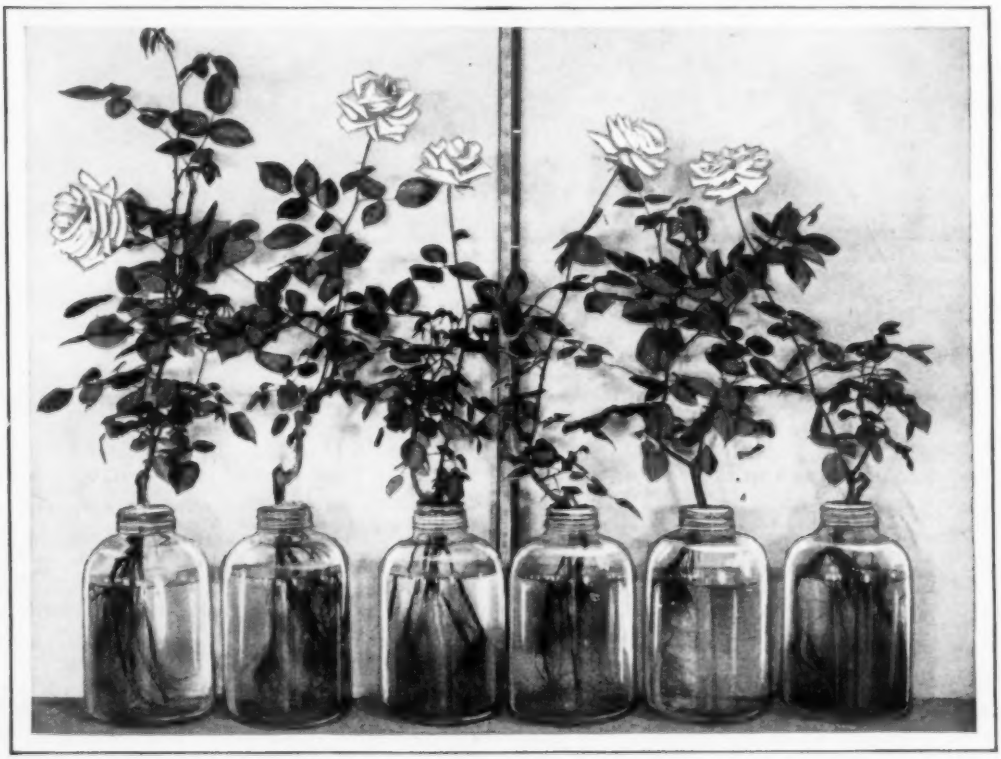
In addition to flowers, any other plant which is transferred from seed bed to garden or field, can be so controlled by starting the seeds in water containing the pill. Thus, indoor vegetable gardens can be made to produce virtually all year.

But the greatest value of the discovery, as so far applied, is in the production of flowers for the home in defiance of winter temperatures outside. The normal warmth at which most houses are kept during cold weather is ample for the growth and blossoming of the plants under the urge of the chemicals in the pill.

In the case of roses for the home indoor garden, cuttings are taken from the bushes in August, or any other summer month, and placed in two or one-quart glass jars, as space may allow, or in tin cans. The open top of the jar is covered with a cork or cardboard, cut to the shape of the jar, through which the stem of the cutting is passed, permitting the lower end to rest on the bottom of the jar, the top, with its leaves, extending well up into the open air.

The jar is then filled from half to three-quarters with water, and the height of the water marked on the outside of the jar, so that it can be maintained by additions as evaporation and absorption lower the level. The water is never changed, merely added to. Either before or after putting in the water, the pill is dropped in, one being sufficient for each plant up to and through blossom time. The period required for root growth and blossoming has been calculated exactly for more than 200 varieties of flowering plants, and varies materially, the range being sixty days to nearly six months.

Rose cuttings which have been planted with the pill in August will be ready for Christmas cutting. Cuttings for November should be made in July; those for January, in September; for February in October, and so on. Cuttings made later than October, in regions where winter is severe, will not produce blossoms so quickly, nor of such large size, as those



Nine Weeks' Growth of Columbia Roses from Cuttings Eight Inches Long; No Part of These Flowering Plants Has Ever Touched the Soil, Despite the Well-Developed Roots

taken from April to October. These cuttings, which have blossomed with the help of the plant pill, may be transplanted to the garden in springtime, and have been found to be far ahead of other plants of the same kind and age originally rooted in earth.

Annuals, such as sweet peas, zinnias, asters, pansies, and many others, may be controlled and made to blossom at any time in the same way. The seeds are planted, either in the ground, at midsummer, in shaded seed boxes, and, at transplanting time, transferred to the water jars containing the plant pills, or, if soil facilities are not available, on the flat surface of a piece of cork, floating in the water in the jar. There they sprout, and the first rootlets get immediate benefit from the solution. Sweet-pea vines, five and six feet in height, loaded with blossoms, have been grown in sixty to ninety days by this method, the longer period being for those whose seeds were started in the earth.

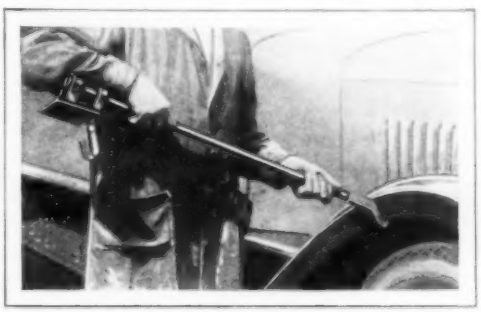
Globe-Shaped Building Exhibited at German Exposition; the Narrow Base Will Permit the Building of Wider Streets, the Architect Believes

HOUSES IN FORM OF SPHERE TO AID TRAFFIC

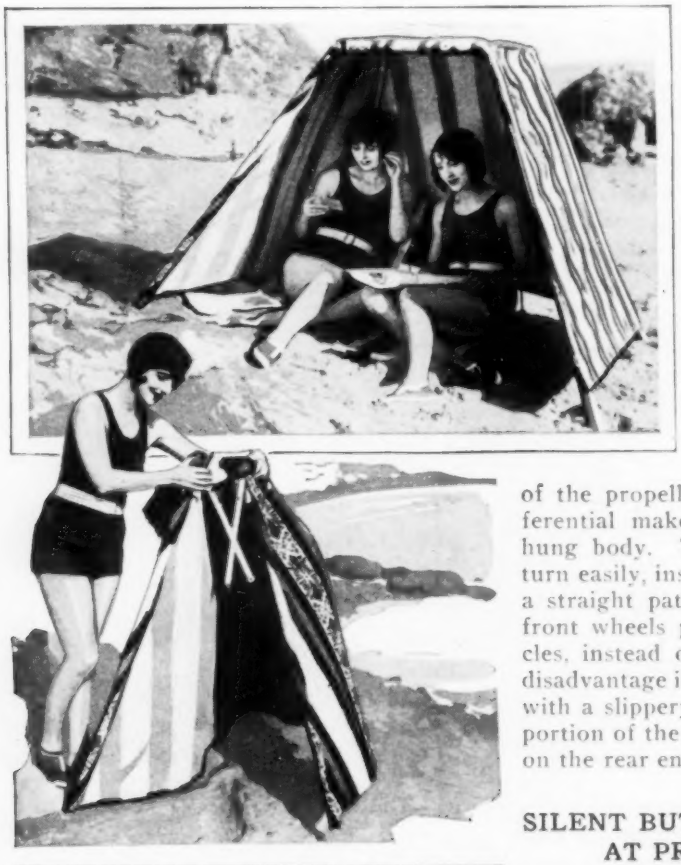
Streets much broader than are permitted at present can be laid out by making the houses and buildings in spherical fashion, as shown at a recent German exposition, the architect who originated the design declares. Means for better ventilation and lighting and a less obstructed view from various parts of the structure are also provided. The model house was ninety-eight feet high, eighty-two feet in diameter and rested on a base sixteen and one-half feet wide. The four lower stories were devoted to business offices. The upper part contained a restaurant and cafe, and an outlook balcony. The skeleton of the building was of steel.

HOOK TO STRAIGHTEN FENDERS REDUCES REPAIR COSTS

To remove the kinks in damaged fenders, a steel bending bar with a hook at one end and a self-leveling leather-covered pad and hook at the other, may be used by almost anyone, it is reported. The close-bent hook is designed especially for straightening up the fender flange, while the other end makes it easy to pry the fender away from the tire.



Removing Kinks in Fender Flange with Straightener



Pitching the One-Piece Beach Tent and View of It Open, Showing Roomy Interior

ONE-PIECE TENT FOR BATHERS EASY TO PUT UP

Weighing but a few pounds and fashioned in one piece, so that it can easily be folded up and carried, a tent for the beach provides effective shelter from the sun and winds and may also be used as a playground tent. The top "jackknives" and folds in a single operation, and the material is furnished in attractive strips of various colors.

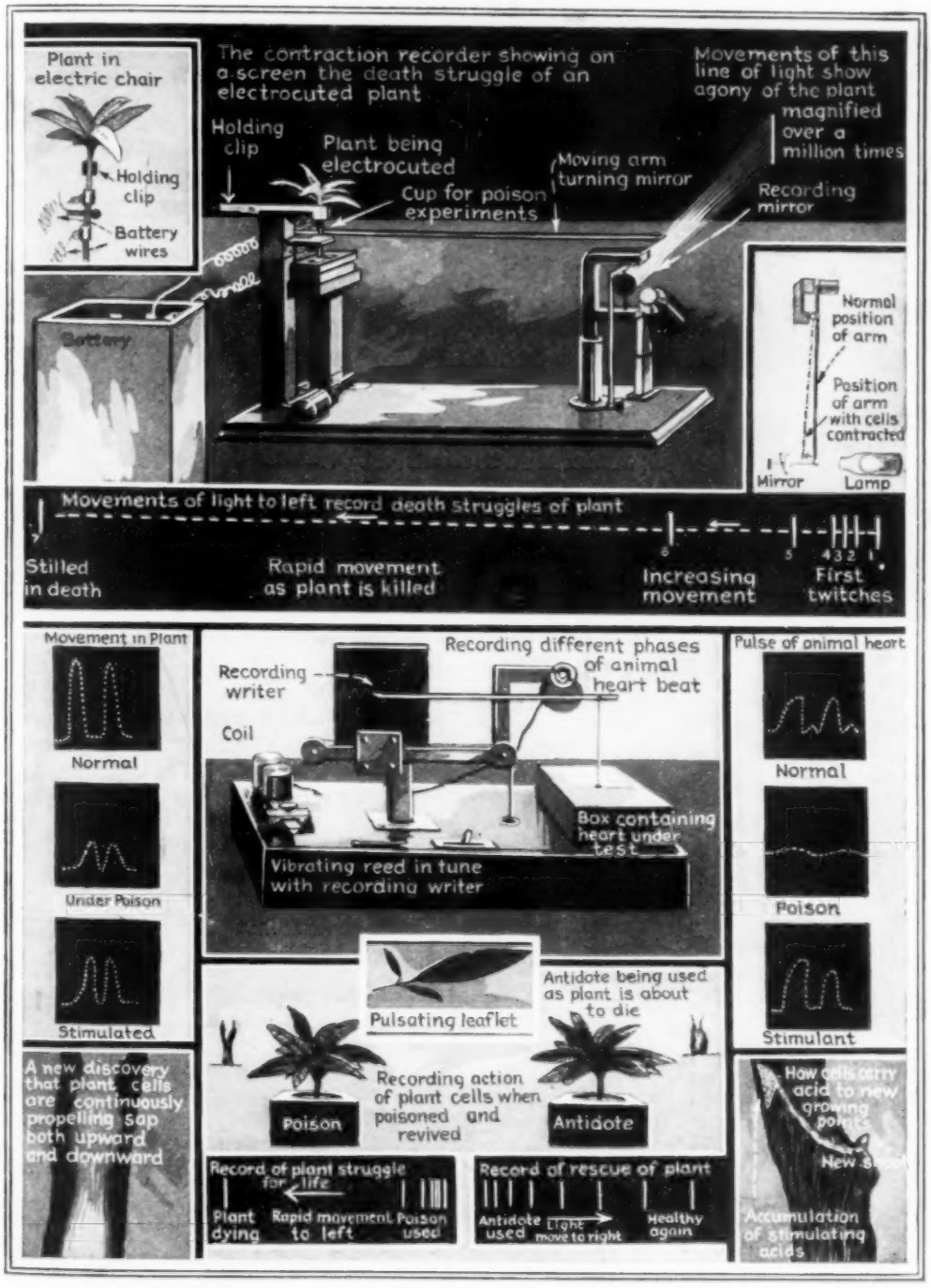
FRONT-WHEEL DRIVE ADAPTED FOR PLEASURE CARS

Front-wheel drive, developed with success for racing, is being tried out in Europe for pleasure and commercial cars. The advantages of driving through the front wheels instead of the rear ones outweighs the mechanical difficulties of transmitting power to steerable wheels, engineers believe. The chief advantage claimed is that the power is always being transmitted in the direction in which the car is moving. When a rear-drive car turns, the propulsive force is being exerted in one direction, while the steerable wheels are turning it in another, a fact that is responsible for upsets when high-speed turns are attempted. Another advantageous feature is that the absence of the propeller shaft and rear-axle differential makes possible a much lower-hung body. The front-wheel drive cars turn easily, instead of fighting to continue a straight path, and on rough roads the front wheels pull themselves over obstacles, instead of digging into them. One disadvantage is encountered on a steep hill with a slippery pavement, for the greater portion of the car's weight is then thrown on the rear end.

SILENT BUTLER ANSWERS DOOR AT PRESS OF BUTTON

Duties of a servant are duplicated in an electric door announcer devised for the convenience of the home owner and the caller. Answering a summons at the door, the occupant of the house simply presses a button which flashes an electrically lighted sign reading, "one moment please" or, "I'll be down in a minute." In addition the announcer is set to show a green signal, "in," if the person is at home. A red signal, "out," is displayed if the occupant is not at home. The attachment is not difficult to install, is rather decorative and occupies but little space on the door.

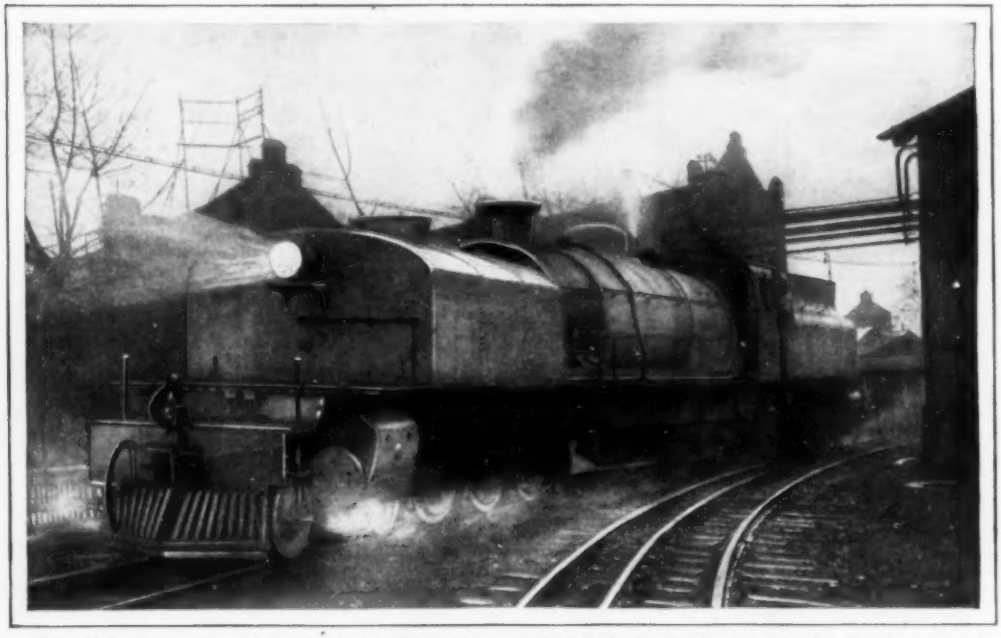
ELECTROCUTING PLANTS AS AID TO MEDICINE



Courtesy The Illustrated London News

Sir Jagadis C. Bose, the Indian Scientist of Calcutta, in a Recent London Lecture Demonstrated That Plants, Animals and Humans Have Characteristics in Common, and Respond in the Same Way to Electrocution, to Poisons and to Antidotes Administered to Counteract Poisons

THREE-SECTION LOCOMOTIVE MAKES SHARP TURNS



Three-Unit Locomotive That Can Make Sharp Turns on Railroads in South Africa; Note Position of the Driving Wheels under the Pilot Section and the Tender

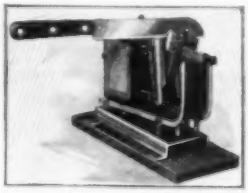
A three-section locomotive, designed to negotiate unusually sharp curves, has been developed in Germany for the South African railways, and forty of them, part of standard gauge and part for the narrow-gauged lines used in much of the African system, have been built. The engine is unusual in that the drivewheels are not under the boiler and cab, in the usual place, but instead are under the pilot and the tender. The boiler and cab are suspended between them, with a pivot at either end. The pilot section, with its two cylinders and six drivewheels, carries the water tank, and the tender, also with a pair of cylinders and six driving wheels, holds the coal supply. The standard-gauge locomotive can turn a curve of less than 300-foot radius and the narrow-gauge engine one of about 200-foot radius.

KITCHEN RANGES IN COLORS ADD CHEER TO HOME INTERIOR

Color, the dominant idea in modern home decoration, has made further conquests in one of the last rooms to be changed in this respect—the kitchen. Ranges in a wide variety of hues, from blues and grays to greens and tans, are now available. They are porcelain-enamel coated, making them more easily cleaned, and the substance is said not to chip, flake or crack. Heating cabinets in colors and in finishes to harmonize with the rest of the room have also appeared to replace the unsightly black stove.

AUTOMATIC KNIFE SHARPENER GIVES KEEN EDGE

Designed especially for hotels, meat markets and restaurants, a knife sharpener, recently introduced, requires no skill to operate and is said to produce a keen edge in a few seconds. The whetting is done between interlacing blocks of carborundum. The knife is simply forced down between them and removed a few times, the sharpening being effected by the action of the stones which are held close together



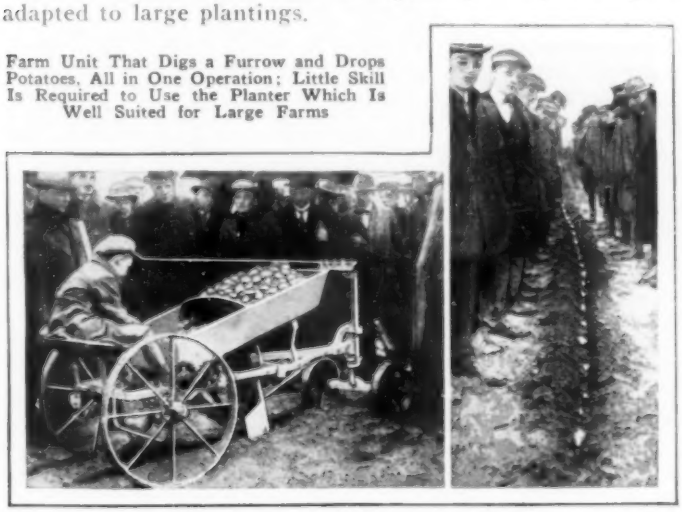
by springs. The latter can be adjusted for tension and regulated to suit blades of varying thicknesses and shapes.

FIFTY THOUSAND YEARS AGO

That men lived in northern Africa 50,000 years ago and were fond of oysters and clams, is the interesting evidence uncovered by Beloit college scientists who have been digging in Algiers. Under strata of earth, they discovered great mounds of the shells and below them were crude stone implements and weapons, indicating that the users must have lived at least 500 centuries ago. The find is regarded as especially valuable in that it offers further evidence in support of the belief that man probably lived many years in northern Africa before entering far into Europe.

PLOW THAT PLANTS POTATOES SAVES HAND LABOR

Farm experts in Holland have introduced a planter that plows a furrow and drops potatoes at regular intervals, all at the same time. The unit performs the work of several men and is especially adapted to large plantings.



Farm Unit That Digs a Furrow and Drops Potatoes, All in One Operation; Little Skill Is Required to Use the Planter Which Is Well Suited for Large Farms

Dining Compartment of the "Hermann Koehl," a New Airplane in Service between Berlin and Paris

RESTAURANT IN THE CLOUDS SERVES AIR PASSENGERS

Airplane service between Paris and Berlin has been amplified by the addition of a ship equipped with a roomy dining room. Food is cooked before the journey and is kept hot and ready to serve in special containers. The plane has been named the "Hermann Koehl," in honor of the chief pilot of the recent "Bremen" flight.

GRAIN REGISTER TELLS EXACT AMOUNT OF CROPS

Attached to a combined harvester, an improved grain register is being used for weighing grain. It measures it somewhat after the manner of a water meter. It consists of a six-compartment rotor, revolving just slowly enough to allow each compartment to become completely filled. An automatic checking device stops the rotor whenever there is not enough grain directly over the rotor to fill the compartment. This enables a more accurate determination of the yield and the amount of the crop harvested.

Southern Cross

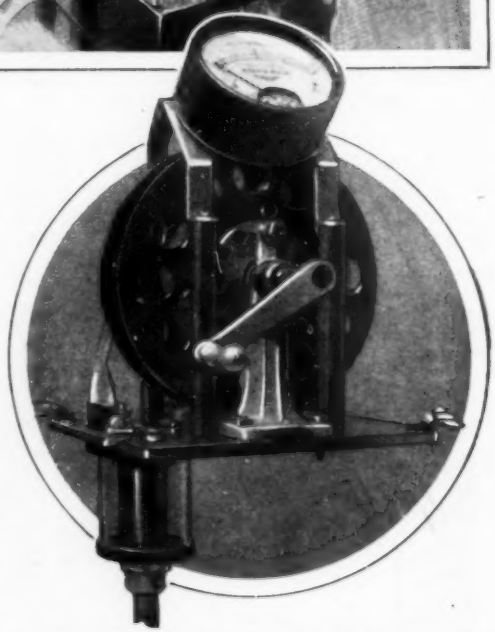
By RALPH M. HEINTZ

Builder of the "Southern Cross" Radio Sets

"GUESS we are lost!"

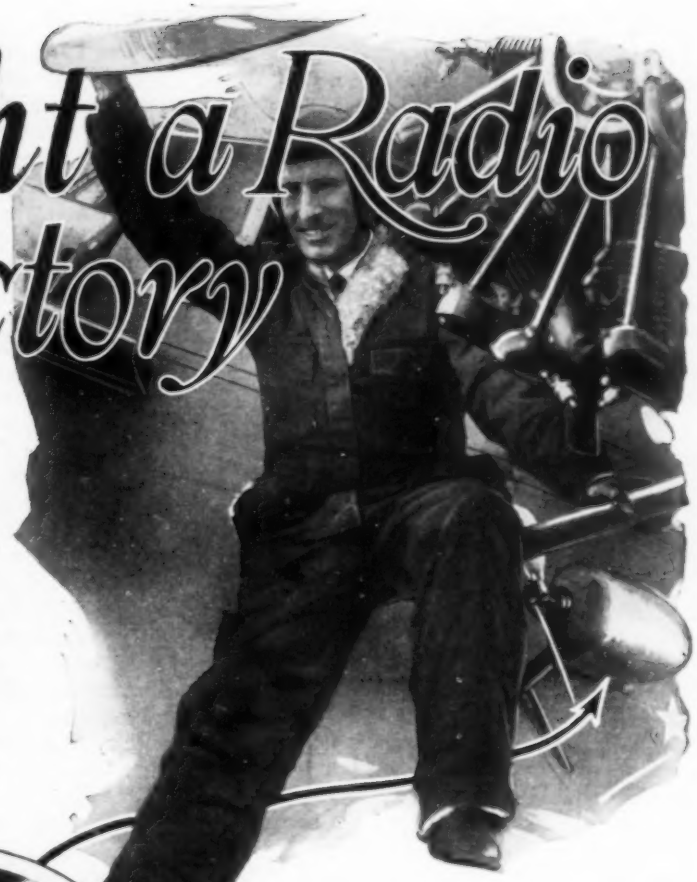
For more than twenty-four hours we had been standing by at the radio-receiving station in San Francisco, in constant communication with the "Southern Cross," as she flew like a homing pigeon straight from Oakland airport over the 2,418 miles to Honolulu. Back and forth, over the first short-wave set to meet such a grueling test, we had chatted with Jimmie Warner, radio operator on board the huge Fokker plane. All had gone well; all was going well, when, suddenly as a fire alarm, came that calm defiance of death: "Guess we are lost!"

Helpless, knowing that gasoline was low in the tanks of the man-made bird, we realized that the lives of four men hung on that little box we had so carefully built into the cabin of the "Southern Cross." But, far out on the Pacific, an American warship picked up that call. Another warrior of the sea heard it. Honolulu, waiting for the first flash of the sun on the metal nose of the air wanderer, got it. From three scattered transmitters, positions went to Warner, and in a moment came back over thousands of miles of sea:



James Warner, Radio Operator, at His Instruments in the Plane, and, Below, Reel for Lowering Aerial

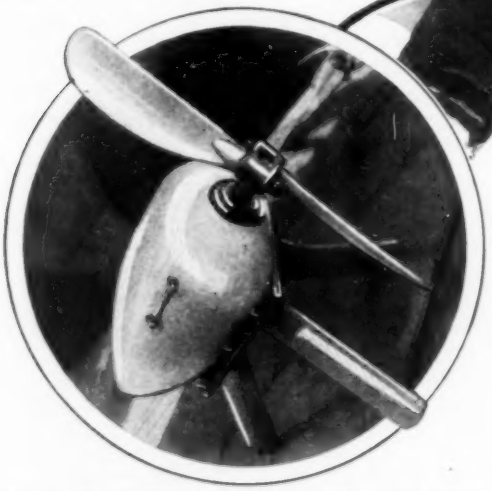
flight a Radio Victory



"OK. Off Hilo."

The smallest and lightest radio set ever installed in a plane on long-distance flight had saved ship and lives to set a record beyond anything yet attempted by daring birdmen.

Again, as equatorial storms tossed the seven-ton plane like a feather on its further southward flight, shore and ship stations picked up other fearless calls for position. With the aid of the replies, received by that tiny set, Navigator Lyon was able to learn that the "Southern Cross" had been flying in circles, sometimes back on its course, sometimes across it, and again straight toward the goal. Through the roar of the three 220-horsepower motors, and above the screaming of the wind through the rigging, came the points of position whereby the flyers were able to locate and redirect their winged Argosy.



Captain Charles Kingsford-Smith with One of the Wing Engines, and, Below, a Radio-Power Generator

Without radio, they would have been lost. Not only once, but three times, the new set, so small as to seem powerless, called on the world to help, and three times the world answered.

From the time that the "Southern Cross" rose from the field in California, we in the receiving station at San Francisco were constantly in touch with her until 9:30 a. m., of the following day, when she landed, at 12:20 p. m., on Wheeler field, island of Oahu. Meanwhile, only one and one-half hours after she left the Golden Gate, Honolulu stations picked up the "Southern Cross," and kept contact

with her until Warner pulled in his antenna about ten miles out from the successful ending of the first hop.

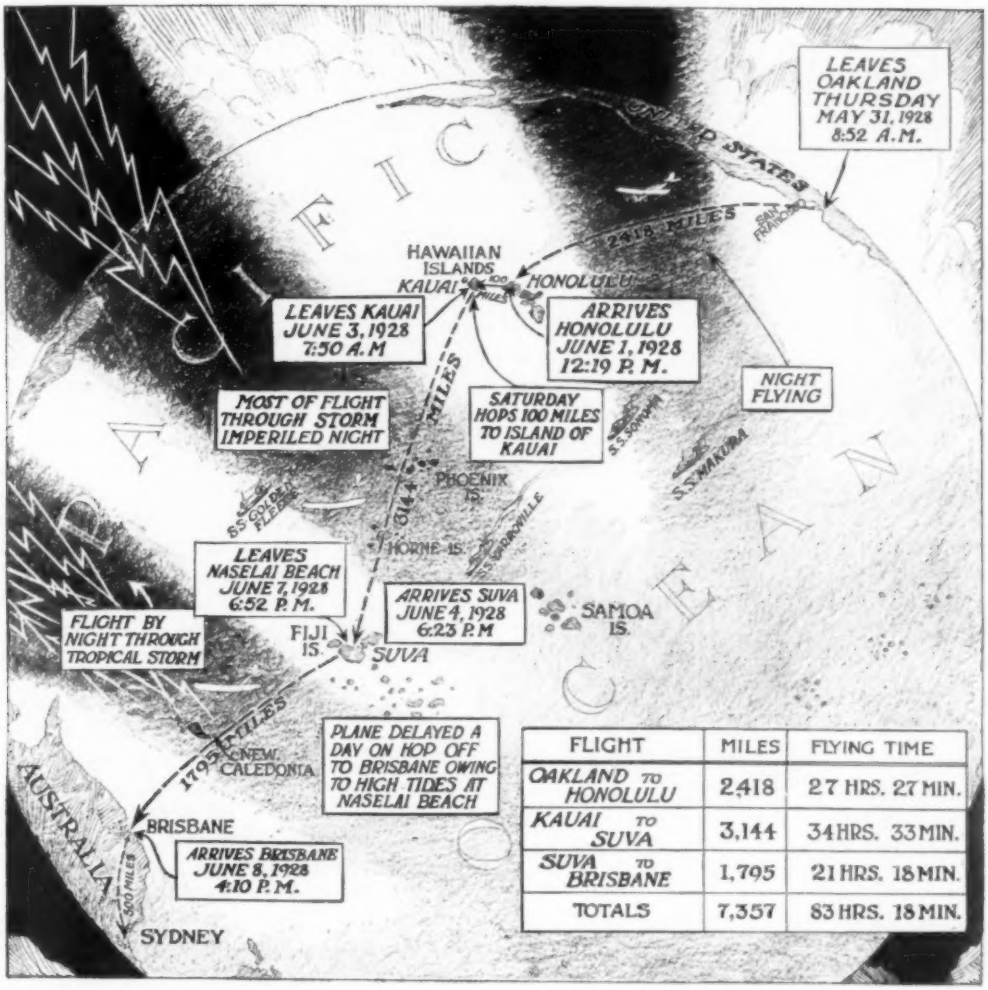
When the "Southern Cross" reached Honolulu, she had covered 2,418 miles, having been twenty-seven hours and twenty-seven minutes in the air. From Wheeler field, she made the trifling hop of 100 miles to Barking Sands, on the island of Kauai, whence on June 3, she took off—weighing in all 14,000 pounds—on the longest hop of the flight, 3,144 miles, to Suva, the port of the Fiji islands. On this Hawaii-Suva link—thirty-four hours and thirty-three minutes—radio listeners in San Francisco obtained contact with the "Southern Cross" the day she hopped and carried through with her until 9:00 a. m. of the next day.

This transmission covered more than 5,000 miles, the longest distance over which messages ever had been sent and received from an airplane in flight. But this record was shattered when Bloemfontein, South Africa, reported clear reception of Warner's messages over a distance of approximately 12,280 miles, or two and one-half times that between the plane and San Francisco. The Honolulu receiving station, Tutuila and British Samoan listeners, as well as warships and members of the merchant marine at sea, maintained contact with the "Southern Cross" clear to the moment when Warner pulled in his antenna, preparatory to landing at Suva.

More remarkable than this, on the last hop of 1,795 miles, from Suva to Brisbane, the tiny transmitter talked to the world clearly by night and less clearly by day, though it was heard around 11:00 a. m., daylight reception, in San Francisco. This was almost 7,000 miles, a distance from which a station never had been heard in the California port. At various points on its flight, the "Southern Cross" worked with ship and shore stations on the 600-meter wavelength. Messages filed in the usual way at San Francisco, addressed to the plane, were delivered promptly and answers as promptly obtained, by relay through the steamship "Wilhelmina." This also was the first time such a thing had been accomplished. In fact, the radio log of the "Southern Cross" is filled with first-time feats of both sending and receiving.

Prior to the development of this set, the writer had devoted nine years to experiments with super high-frequency radio transmission and reception. With the development of aviation came the insistent demand for a light transmitter with a long range, and the first actual experiments with such a transmitter were made on the ill-fated Dole flight to Hawaii. It will be recalled that, after some of the planes in that flight had disappeared, the "Dallas Spirit," with Captain Erwin as pilot, set out over the course, searching the sea, for the missing flyers. One of these small sets was installed, and, as a result, we were in constant contact with the "Dallas Spirit"

"Swinging Ship" to Adjust the Compasses by Compensating for Errors Due to the Mass of Metal in the Plane; the Picture Gives an Idea of the Typical Fokker Thick Wing



FLIGHT	MILES	FLYING TIME
OAKLAND TO HONOLULU	2,418	27 HRS. 27 MIN.
KAUAI TO SUVA	3,144	34 HRS. 33 MIN.
SUVA TO BRISBANE	1,795	21 HRS. 18 MIN.
TOTALS	7,357	83 HRS. 18 MIN.

On Each of the Three Legs of the Flight to Australia the Four Flyers Winged Their Way through the Night, Two of the Hops Being Made Perilous by Terrific Tropical Storms

from the time it left the Golden Gate, until it went into a tailspin, 700 miles out, and was lost. Before this accident, we received the dramatic "SOS" that the plane was falling. From this we were able to locate exactly the place and time of the deplorable disaster.

The two most important uses of the radio in connection with the epoch-making "Southern Cross" flight, of course, are, first the ability of the small set to receive bearings from ships and shore stations at considerable distances; and, second, its ability to send the position of the plane at all times, so that shore stations and ships could know at any moment exactly where the plane was. These two were especially important just after—and to a less extent, just before—the tremendous equatorial storms through and over which the "Southern Cross" passed. Following the call "Guess we are lost," from off Hilo, for example, the plane, almost immediately on receiving positions from ship and shore stations, was able to take a bee line for Honolulu, racing against rapidly emptying gas tanks.

One interesting feature was that during the terrific storm encountered about two-thirds of the way from Hawaii to Suva, land radio reception on board the plane became impossible, because of the howling

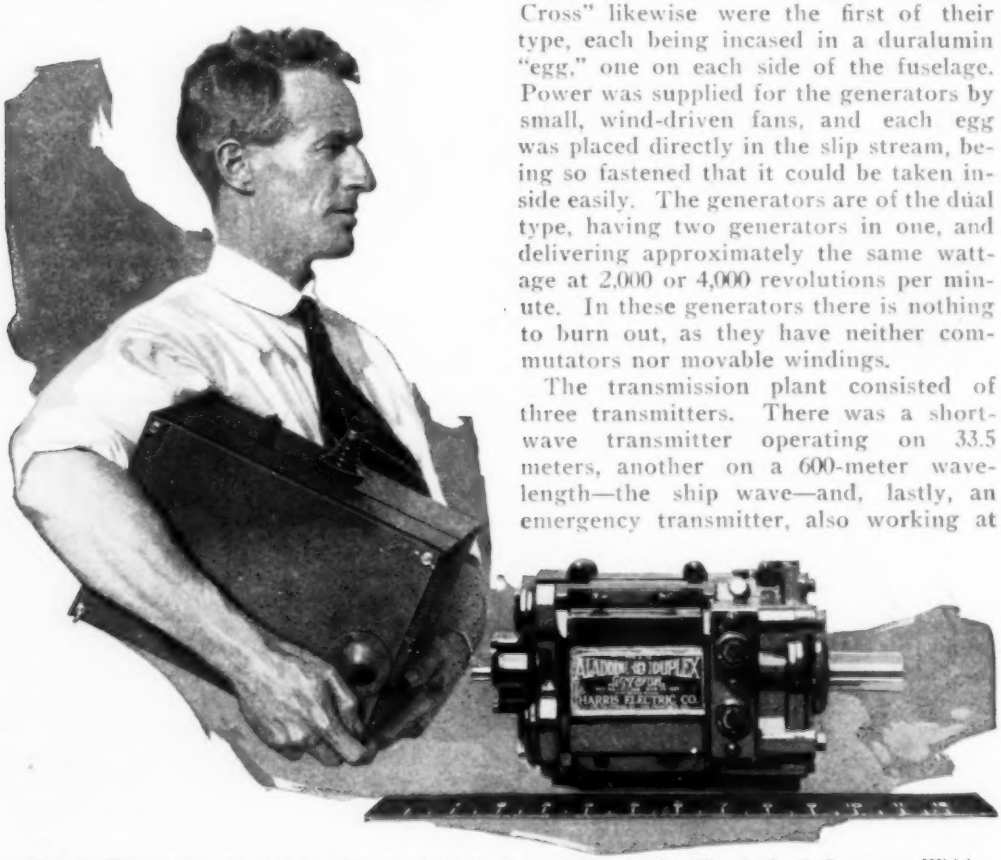
of the wind and the roar of the motors as they strove to keep the "Southern Cross" on an even keel. Yet transmission was perfect at all times, and both land and ship stations were constantly receiving messages describing the position and condition of the plane. Thus, even though Warner could not hear incoming messages, listeners on sea and land knew at all times where the plane was, and any call for help could have been answered instantly. Incidentally, the effect of the motor and gale noises was apparent when it became known that all four men were totally deaf for some time after making their landing at Brisbane.

The transmitter with which the "Southern Cross" was protected is of the short-wave type, with fifty watts' output, employing the tuned-plate, tuned-grid circuit, and weighing, complete, eight and one-half pounds. It uses a UV-211 tube, the short-wave antenna being twenty-six feet long and having a special "fish" which cannot drop off, because of a peculiar spring device which takes up the stresses. One of the most important problems of airplane radio installation is that of the fish dropping off when going at high speed, or pulling the antenna completely off the reel. The novel fish used on the "Southern Cross" cannot do either of these things.

The reel for the antenna also is of a special design, being so constructed that, even when freed from hand control, it automatically locks itself, and prevents the running out of more than one-half inch of the antenna at a time. The long-wave antenna is 400 feet long. Both antennas are thin phosphor-bronze wires, which trail through a bakelite tube, thoroughly insulated, on the fuselage. The long-wave antenna also was used for the purpose of receiving.

The generators on the "Southern Cross" likewise were the first of their type, each being incased in a duralumin "egg," one on each side of the fuselage. Power was supplied for the generators by small, wind-driven fans, and each egg was placed directly in the slip stream, being so fastened that it could be taken inside easily. The generators are of the dual type, having two generators in one, and delivering approximately the same wattage at 2,000 or 4,000 revolutions per minute. In these generators there is nothing to burn out, as they have neither commutators nor movable windings.

The transmission plant consisted of three transmitters. There was a short-wave transmitter operating on 33.5 meters, another on a 600-meter wavelength—the ship wave—and, lastly, an emergency transmitter, also working at

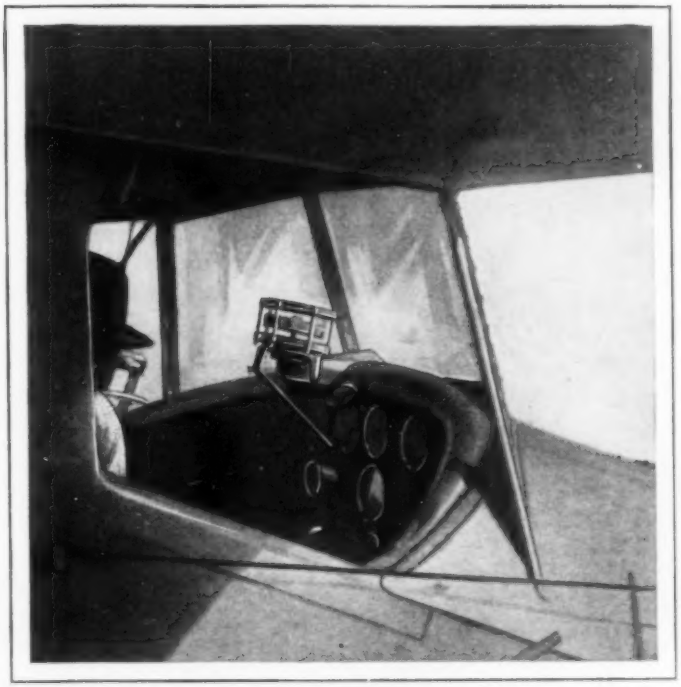


Captain Kingsford-Smith with the Waterproof Radio Set and One of the "Two-in-One" Generators Which Furnished the Power to Operate the Wireless throughout the Flight

600 meters, but completely waterproof, so that it could operate under water for eight hours. This would have enabled Warner to send messages just as long as the plane stayed afloat, either in air or on water.

The receiving set also consisted of three units, equipped with the common audio amplifier. One of these was a short-wave receiver; another a long-wave receiver, and the third, the beacon receiver.

On the hop from Oakland to Honolulu, direct messages from the plane were received in San Francisco until very shortly before the plane landed on Wheeler field. At the same time, Honolulu was getting messages, starting one and one-half hours after the "Southern Cross" left the California port. This was all done on the short wave.



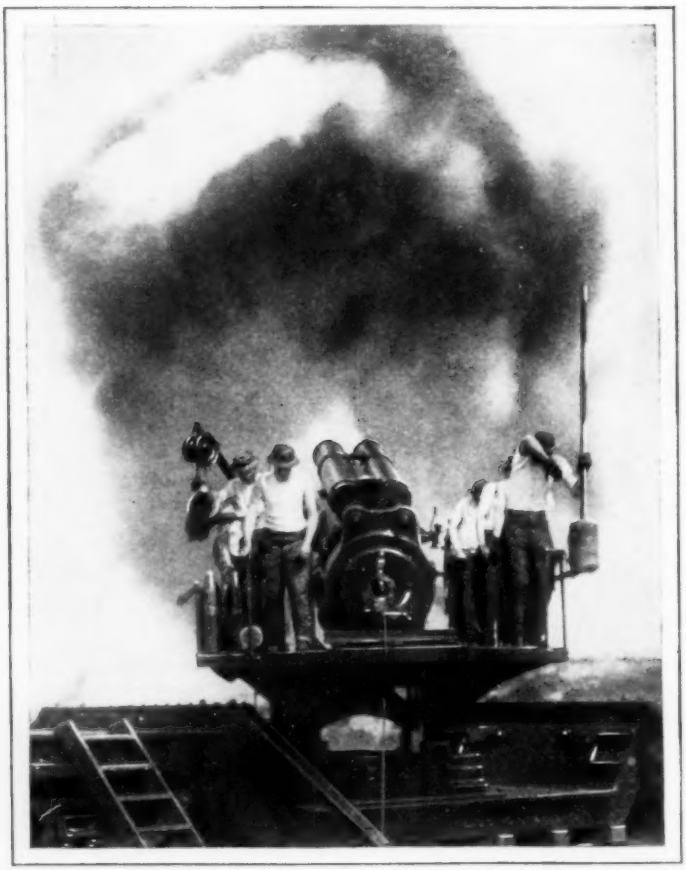
The Pilot's Cockpit of the "Southern Cross" Is Just under the Front Edge of the Wing, with a Clear, but Protected View

Warner also worked four ships on the 600-meter wave, and communicated at will with shore stations on the same wavelength. On the Honolulu-Suva hop, the plane was followed by Honolulu, and after two hours out of that port, was picked up by Tutuila. At night, commencing at 8:00 p. m., and lasting until 6:00 a. m., messages were received direct from the plane at San Francisco, on the short wave. From Suva to Brisbane, the plane was in communication with San Francisco once, for about fifteen minutes, and the remainder of the time, messages were relayed through ships and through the Tutuila land station.

In other words, with a combined transmitter, receiving set and generators weighing only ninety-six pounds, the "Southern Cross" was in constant communication with shore stations or ships throughout the 7,357-mile flight. For the first time in history, messages regularly filed through commercial stations were delivered to the plane, and replied to by the plane. In brief, radio went farther and accomplished more with an entirely new type of equipment, on the "Southern Cross" flight, than it ever had done on any flight before.

MASTER SCALE FOR RAILROADS TO AID SHIPPING

Weighing freight is one of the most important features of railroad operation, as some $4,000,000,000 are involved in charges annually on the United States lines alone. To insure accuracy in this process, a master scale has been installed in Chicago by the bureau of standards where it will be available to thirty-five railroads operating in the territory. It has a capacity of 150,000 pounds, but is so sensitive, that it will register differences as small as one-tenth of a pound. Expert engineers were required to install it and one of the most interesting features of its construction was the manner of building the pit to make it strong and waterproof. The floor is four feet thick and the side walls average two feet in thickness. Special coatings were applied to keep out water.



Coast-Defense Gun Mounted on a Railway Car; the Two Cylinders above the Barrel Absorb the Recoil

BIG GUNS ON RAILS AID DEFEAT OF "FLEET" IN WAR GAME

Two battalions of railway artillery and a battery of sixteen-inch howitzers hurled projectiles at four targets that moved slowly in a line off Cape Henry, Va., recently. The gunners were playing a war game. The targets represented an enemy fleet and the big guns were defense units such as might be quickly mustered in the event of a real engagement. At the end of the "battle," judges declared that the artillery had won.

A CORRECTION

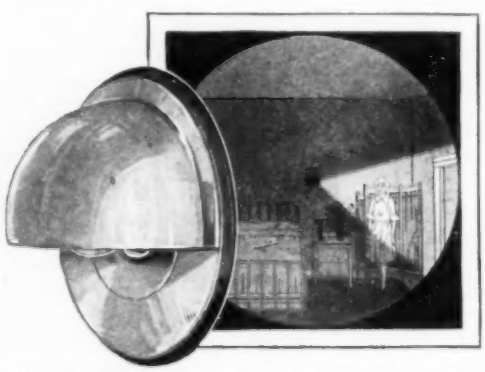
In the description of a cure for seasickness on page 63 of the July issue, the chemical, sodium nitrate, was named in error. The material used in the cure is sodium nitrite.

LAMPBLACK MELTS ICE TO FREE STEAMER

How a lesson learned from his school physics helped a steamer captain free his craft from an ice-locked lake in Alaska, has just been told. Remembering that black absorbs the sun's rays and holds the heat, the captain ordered a long strip of refuse oil and lampblack, forty feet wide, to be swabbed across a frozen lake where his boat was held. In a short time, the strip had melted or softened so that the steamer could break through the channel.

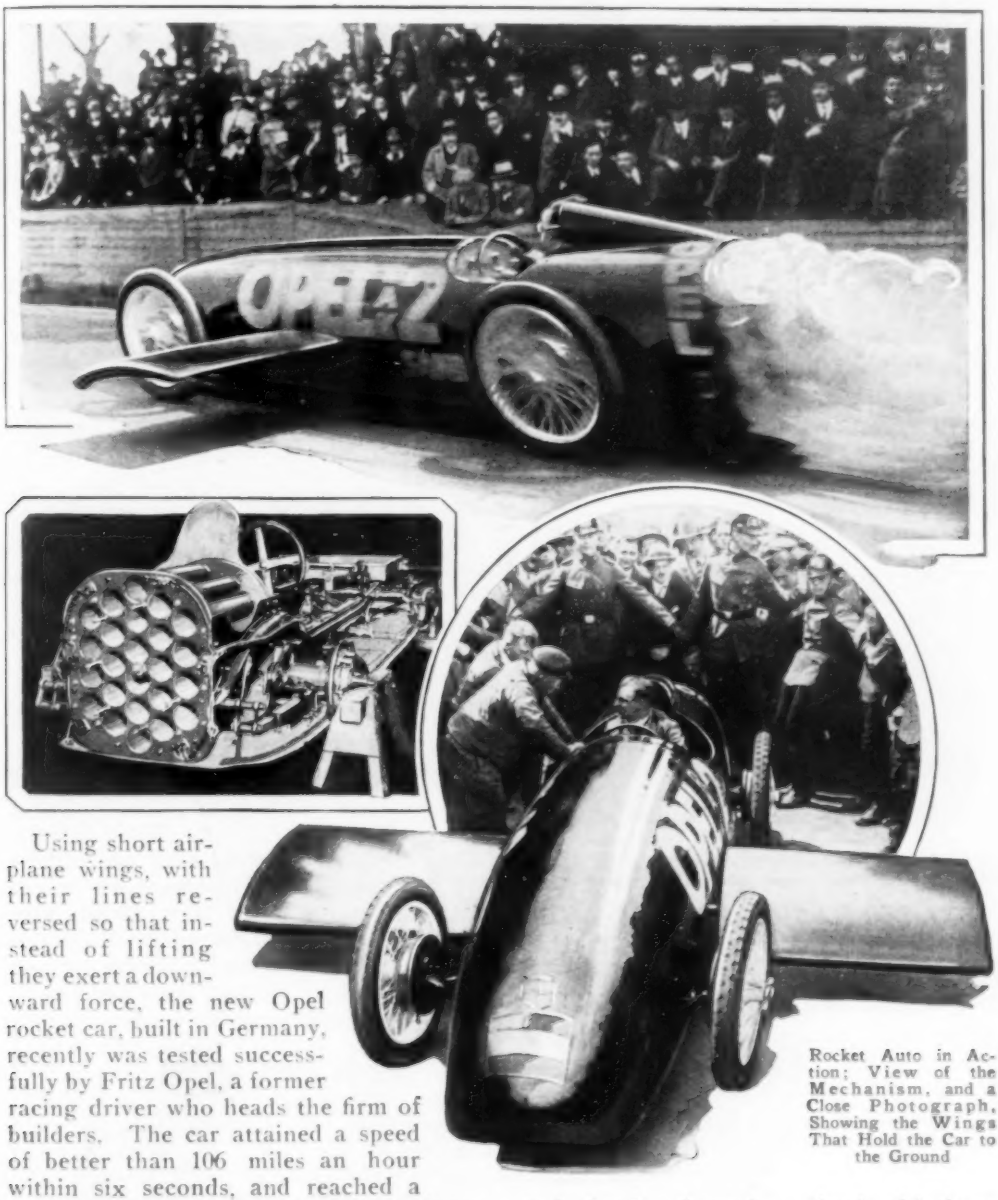
ROTATING SHADE HELPS FOCUS LAMP

Designed especially for use in hospitals, but adaptable to other purposes, a wall lamp has a rotating shade with an open section through which the rays shine out in a directed beam. To focus the light in any direction, it is only necessary to turn the shade. Somewhat the same effect as is produced by a spotlight is thus obtained, and the rest of the room is shielded from the glare.



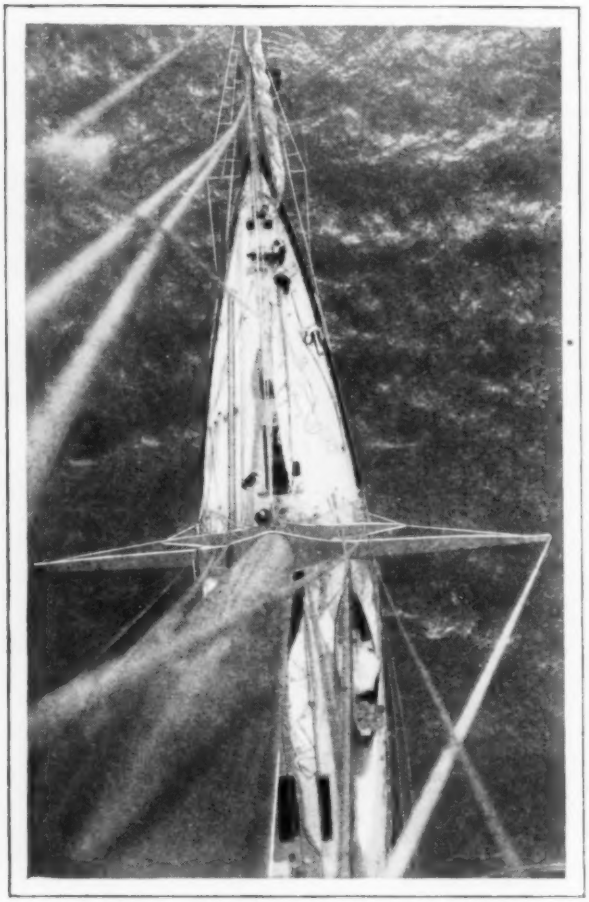
Close View of the Rotating Shade Lamp, and Drawing to Show How Rays Are Focused

ROCKET CAR IS HELD DOWN TO GROUND BY WINGS



Rocket Auto in Action; View of the Mechanism, and a Close Photograph, Showing the Wings That Hold the Car to the Ground

Using short airplane wings, with their lines reversed so that instead of lifting they exert a downward force, the new Opel rocket car, built in Germany, recently was tested successfully by Fritz Opel, a former racing driver who heads the firm of builders. The car attained a speed of better than 106 miles an hour within six seconds, and reached a top speed of more than 130 miles an hour. Twenty-four rockets, housed in compartments in the rear, constituted the propelling force. At the start, the driver closed a switch that fired two rockets simultaneously by electricity. As they burned down, connections ignited the others in turn. When the first pair of rockets lit, there was a tremendous roar, and clouds of smoke, mixed with long tongues of flame, leaped from the rear of the car. The flame and smoke was so dense that spectators across the track were blotted out as the car tore past. The inventor, Max Valier, a German engineer, has built a rocket airplane which is reported to have proved a success in a secret trial in the Roen mountains.



How the "Talayha" Looks from the Top of the Masts; Photograph of the Slender Hull from Upper Rigging

HOW BIG YACHT SPLITS WAVES SEEN FROM TALL MAST

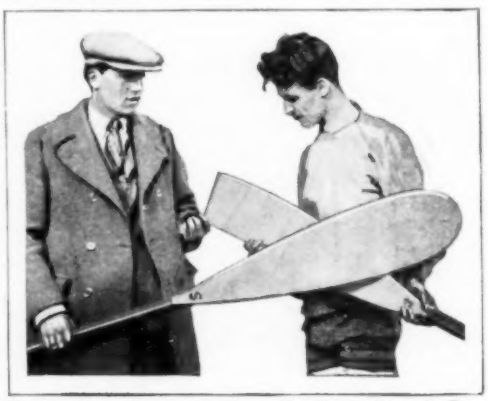
Construction that reduces the resistance of the water to a minimum is an essential factor in racing yachts, and this feature is well illustrated in the "Talayha," one of the boats entered in the race from Los Angeles to Honolulu. A camera view from near the top of the craft's 120-foot mast, showed the slim, graceful lines of the beautiful racer.

MECHANICAL MAN IS NOW GIVEN THE GIFT OF SPEECH

The "mechanical man" invented by R. J. Wensley, of the Westinghouse Electric and Manufacturing company, has had the gift of speech added to his accomplishments. The original machine, which was first used commercially to report on the depth of water in the reservoirs of Washington, D. C., could answer only in code, through buzzer signals. Now, when it responds to a telephone call, it lifts the receiver and in a well modulated and deferential voice says: "Televox speaking." The device can even imitate a conversation, for it is so arranged that, if something goes wrong with machinery or equipment entrusted to its care, it can lift the telephone receiver and, when the operator answers, say "This is Televox calling for" and give the proper telephone number. After the connection is established, the conversation is carried on in buzzer code. By sending the proper signals, the person in charge can get code replies that will fix the trouble. The talking mechanism consists of predetermined conversations, photographed on a film.

SPOONLIKE RACING OAR TO INCREASE SPEED

As a substitute for the usual square-tipped oar, crews of the University of Washington are using an elliptical one, shaped like a spoon. Its designer asserts that it will enter the water more cleanly and quickly than the old type, enabling the oarsman to use faster strokes with greater smoothness, thus gaining increased speed.



Designed for Faster Rowing; the Spoon-Shaped Oars Introduced at the University of Washington

Where Women Do Most of the Work; a Farming Crew in Sumatra Loosening the Soil for Seeding by Digging with Long, Sharp Poles

WOMEN FARM EXPERTS SPEED AGRICULTURE IN SUMATRA

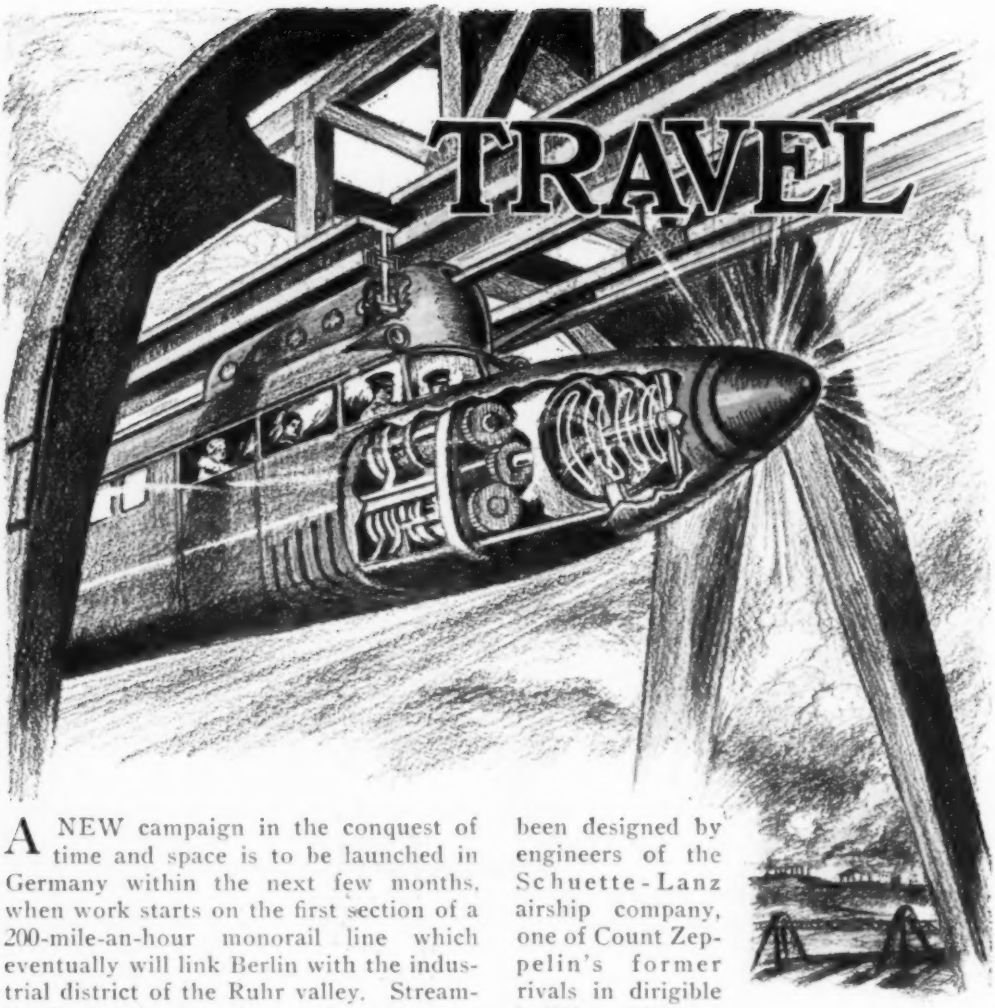
Women do most all of the work in the fields and in the homes among the Bataks of Sumatra. Some of their farming customs and implements are unique. To loosen the soil for planting crops, long poles, sharpened at one end, are forced into the ground and then pried out. This crude method has been in use for generations and is always performed by women.

TWO-FILAMENT MINERS' LAMP PREVENTS LOSS OF TIME

Adequate light for the miner throughout the day is assured in a special electric lamp, developed by the General Electric company. It has two filaments that operate at different intensities. The main one gives a fourteen-candlepower light and is used until it fails. Then a simple switch, attached to the side of the lamp, is turned, throwing the current into a low-candlepower emergency filament that will burn for thirty hours or more. This makes it unnecessary for the miner to stop work and change his lamp in case of failure. The light is fitted into a small reflector on the miner's cap and is operated from a compact, two-cell storage battery strapped to a belt about the man's waist.

EXTENSION RIM ON AUTO WHEEL HELPS TRAVEL IN MUD

Auto travel over muddy roads or soft ground is said to be simplified with the help of a demountable extension rim that can be quickly attached to the wheels. It is fastened with specially designed nuts and has a clamp that holds it to the hub. No tools are necessary to connect it and it does not interfere with travel on pavements.



A NEW campaign in the conquest of time and space is to be launched in Germany within the next few months, when work starts on the first section of a 200-mile-an-hour monorail line which eventually will link Berlin with the industrial district of the Ruhr valley. Streamlined torpedo-shaped cars, driven by airship propellers at either end, are to be hung on ball-bearing rollers from an overhead track.

Monorail lines are not new in Germany, for several are already in operation. The novelty of the new project is the great speed expected from the use of air propellers instead of the usual geared driving wheels.

Electric motors are to turn the propellers, getting their energy from a trolley rail, so that no fuel will be carried. Two experimental sections have been planned, one from Berlin to Halle and the other from Cologne to Dusseldorf, and work on one or the other is planned to start before the end of the year. The aerial cars have been designed by engineers of the Schuette-Lanz airship company, one of Count Zeppelin's former rivals in dirigible building. The projected speed—200 miles an hour—is practically double that of passenger-carrying airplanes, nearly three times the most efficient cruising speed of Zeppelin airships, and almost four times as fast as the railway schedule for the same distance. In fact, not many racing planes, and only a very few special racing automobiles have ever attained it. When Ray Keech, driving the White triplex car, powered with three Liberty engines, recently set a new world's record of 207.5526 miles an hour on the Daytona sands, only two other drivers had officially passed the 200-mile mark—Capt. Malcolm Campbell and Maj. Segrave. Keech made 213.90374 miles an hour over the measured-mile course, trav-

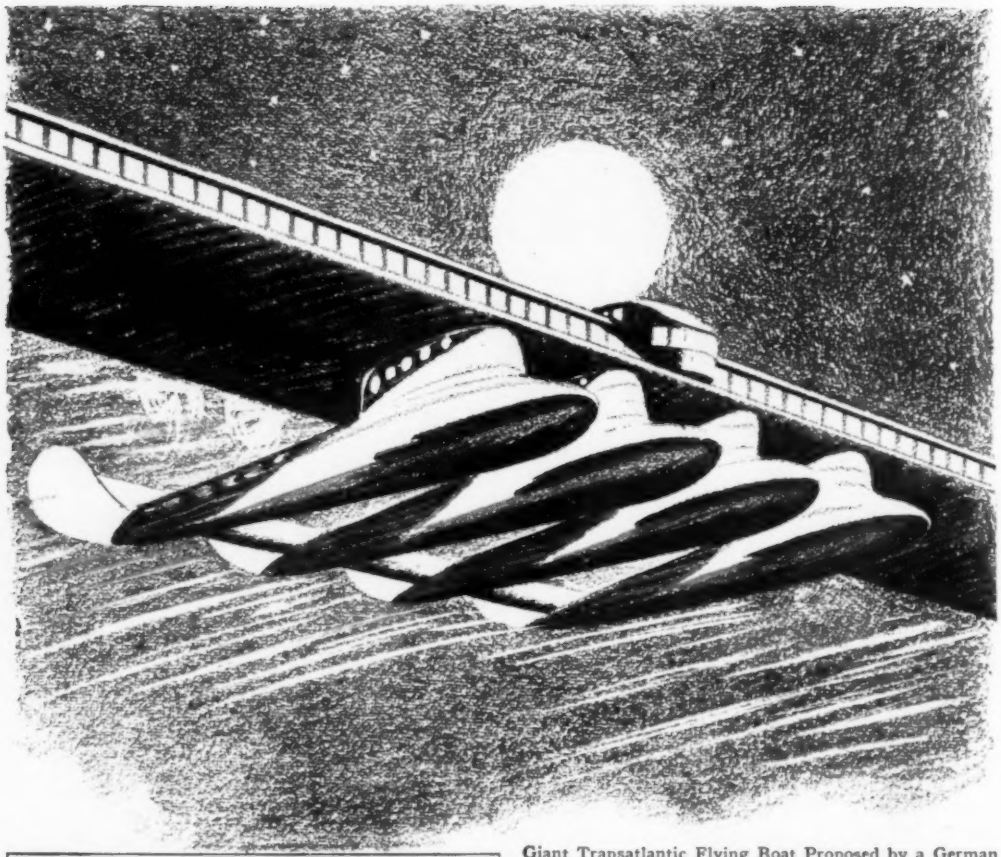
of the FUTURE

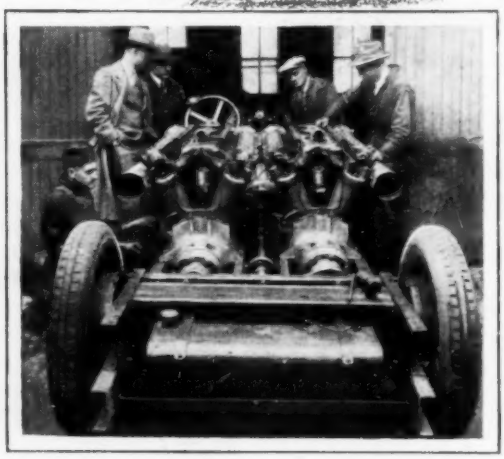
Preliminary Sketches of Germany's New Monorail, with Torpedo-Shaped Cars to Be Drawn by Air Propellers

eling with the wind, and 201.56774 against a thirty-mile-an-hour breeze.

The suspended-monorail idea has always interested high-speed railway inventors because it eliminates the difficulty of building a roadbed and track capable of standing the constant punishment of fast traffic. A California inventor recently proposed an elevated monorail line for San Francisco to carry cross-town traffic at sixty miles an hour or faster. His plan contemplates long and narrow cars, so narrow, in fact, that seats would be eliminated and the passengers, standing in a single line, would hold to a handrail to enable them to keep their feet. Moving across town at high speed, the journey would be so short, he claims, that seats would be superfluous. The long thin cars, would offer less wind resistance, and the space occupied by the support would be correspondingly reduced.

Speed on the ocean and in the air is getting an equal share of attention. The German Dornier factory, which has been building double-engined flying boats with success for several years, is constructing a transatlantic air liner in its Swiss factory. The ship, a twelve-engined monoplane, will have a wing spread of 158 feet, will weigh forty-four tons, and carry fifty passengers, besides the crew. Following the usual Dornier design, the engines will be mounted in tandem pairs, one driving a tractor propeller in front of the wing, and its mate driving a pusher



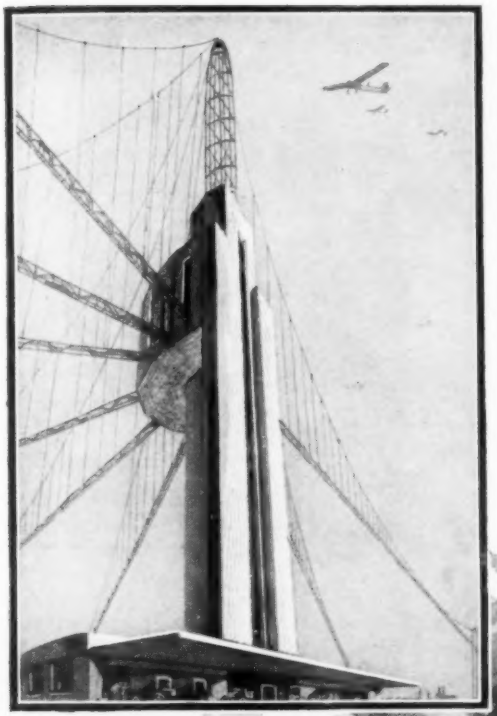


Giant Transatlantic Flying Boat Proposed by a German Inventor, and, Left, the Three-Thousand-Horsepower Triple-Engined Car That Set a World's Speed Record at Daytona Beach

behind the wing. The propellers are to be of the relatively slow, and highly efficient, four-bladed type.

The fuselage, which will contain the passenger compartments, is modeled along the lines of a boat, even to the flaring cruiser bow, and, when at rest on the sea, will be equipped with demountable boat railings. The twelve 500-horsepower engines will make it the most powerful airplane ever built. Nine men will be carried in the crew—two pilots, a navigator, two wireless operators, two mechanics and two stewards.

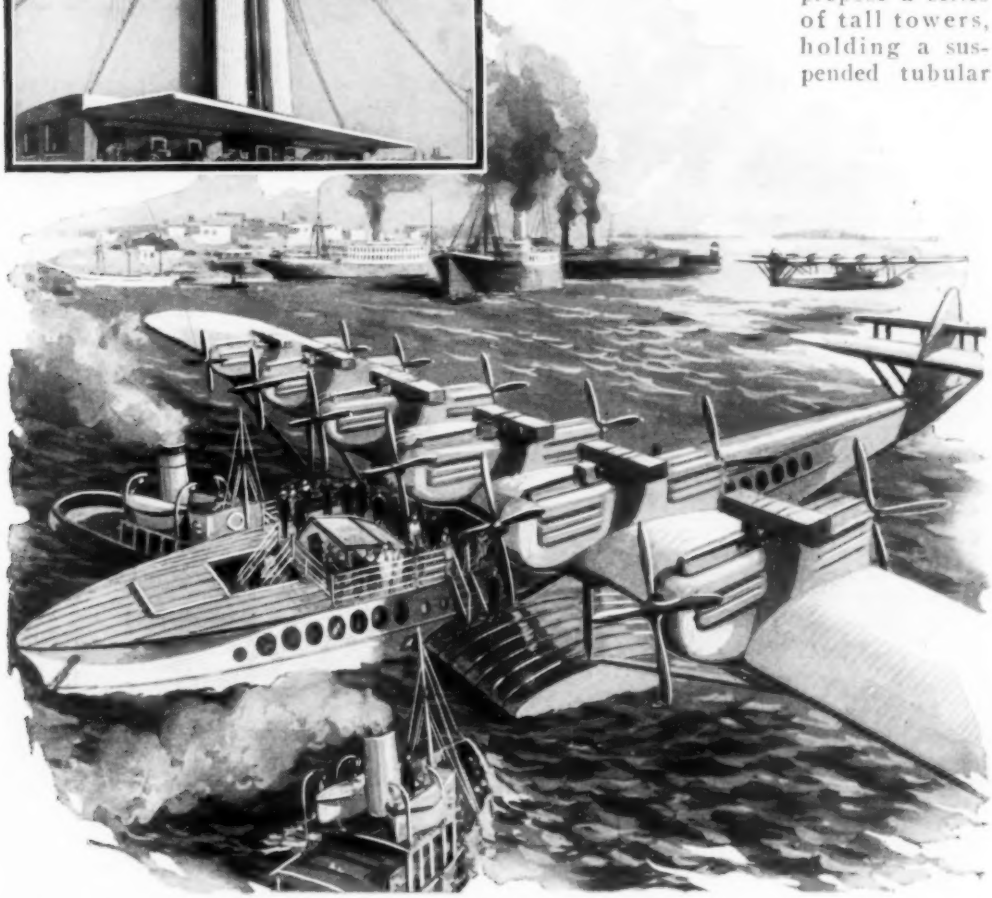
Another German company is experimenting with a high-speed surface liner, which, instead of being pushed through the water by a propeller, will be pulled along by suction blades, drawing water into the hull and expelling it through openings farther aft. The experimental model provides four suction turbines, two on either side just aft of the bow, and two well back toward the stern. The hull itself would be of the "teardrop" type—the most efficient streamlined shape—fairly blunt forward and "fined down" to a point at the stern, and all the super-



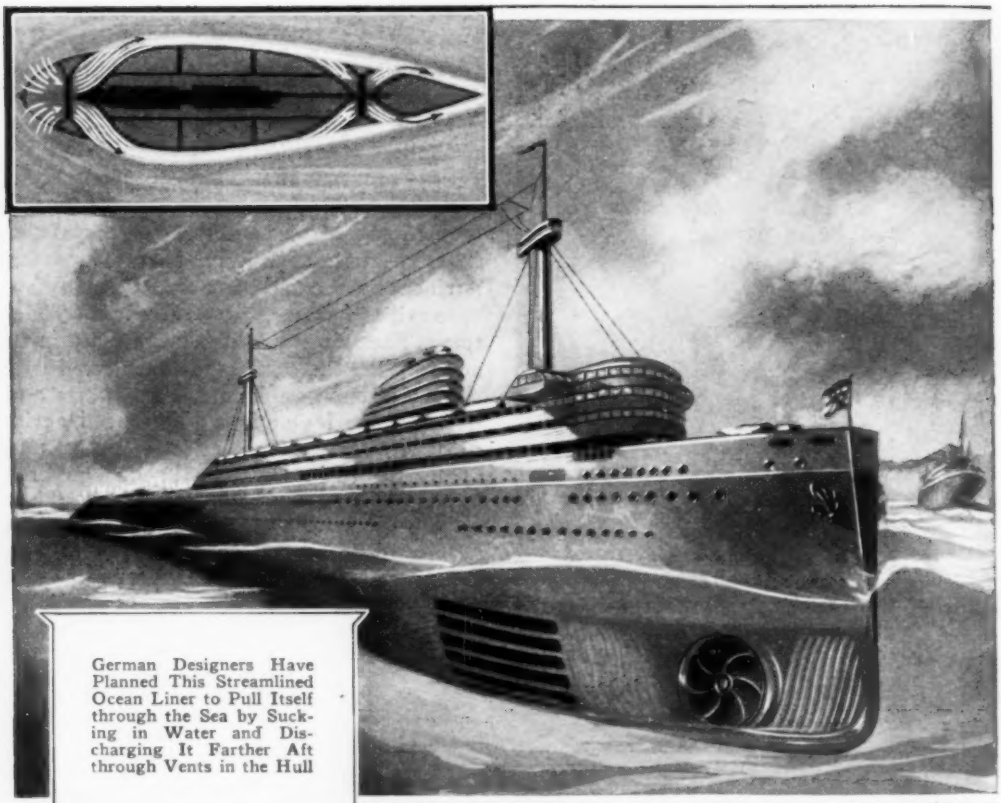
structure would be streamlined to the same shape.

Another transatlantic project proposed in France is a combination of surface boat with short airplane wings and air propellers. A small craft of this type recently crossed the English channel in forty minutes. It combines the lifting effect of the airplane wings with a glider hull, so that, at full speed, it rides the surface of the sea instead of plowing through the water, thereby reducing friction. The wings are not large enough to actually lift the craft off the water.

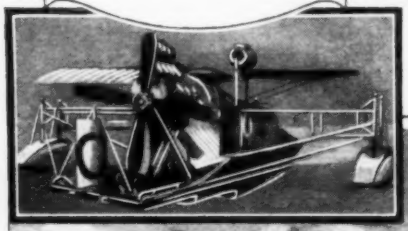
Two French engineers, Hirschauer and Talon, have invented a high-speed aerial cableway for transportation of mails, and are trying to interest the French government in it. They propose a series of tall towers, holding a suspended tubular



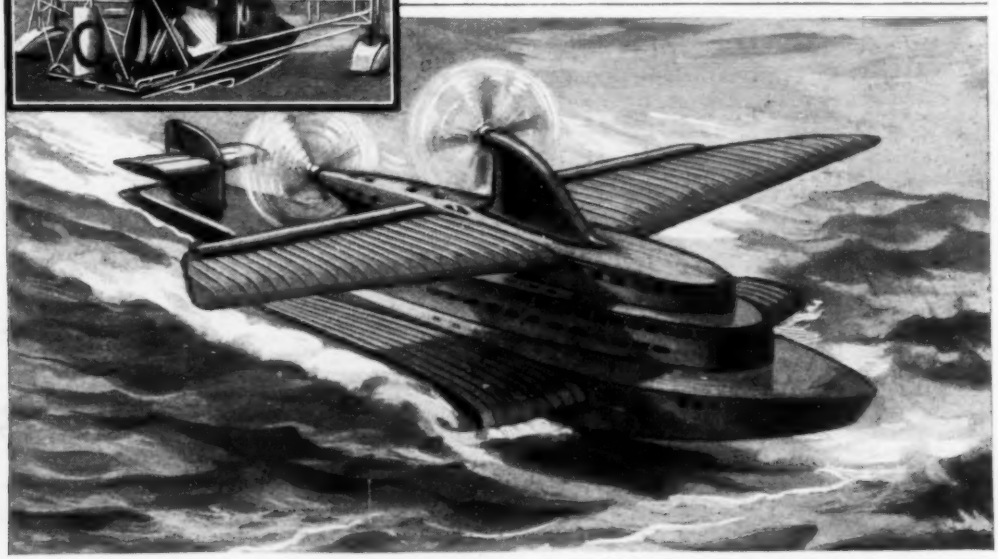
Twelve-Engined Flying Boat Being Built in Switzerland by the Famous Dornier Factory, and, Above, a Frenchman's Idea for a Three-Hundred-Mile-an-Hour Aerial Postal Service

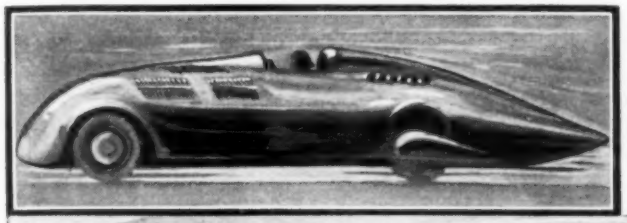


German Designers Have Planned This Streamlined Ocean Liner to Pull Itself through the Sea by Sucking in Water and Discharging It Farther Aft through Vents in the Hull

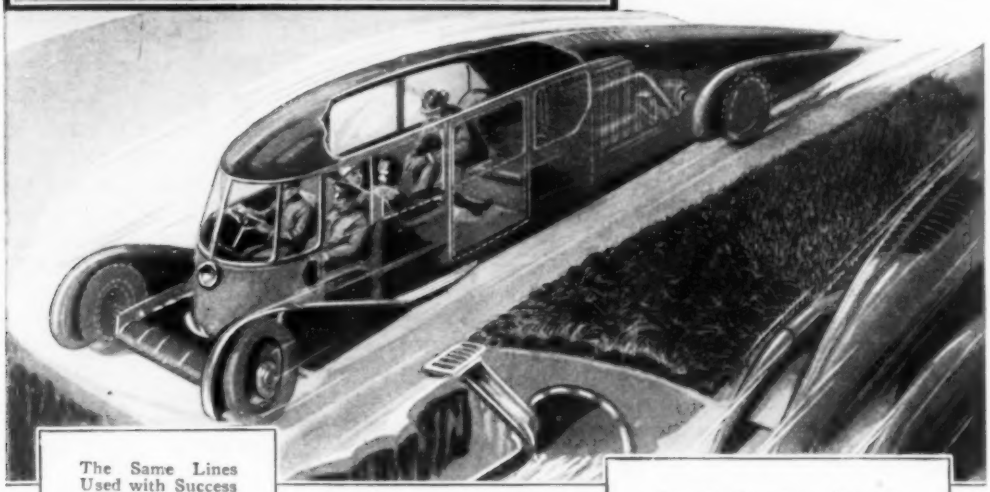


Left, This Queer Craft Is Not an Airplane, But a Hydroplane, Which Has Cut the Voyage from France to England to a Matter of a Few Moments; Below, a Proposed German Air Liner to Carry 200 Passengers across the Atlantic in Half the Time of the Fastest Steamers



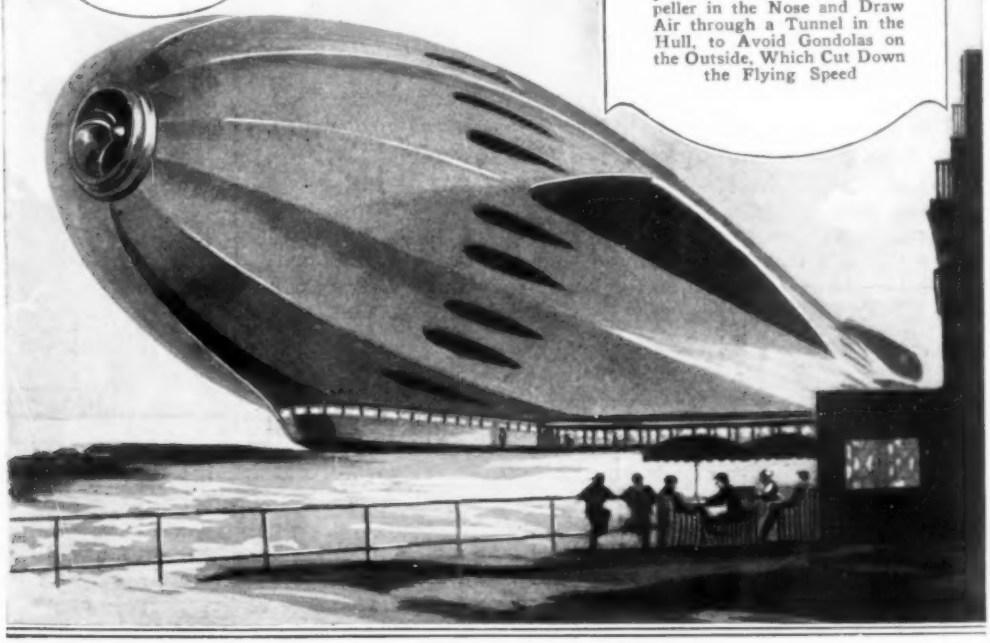


cage, in which torpedo-shaped mail containers, eight or ten feet long, would be driven by electric motors at 200 miles an hour. The construction, it is claimed, is cheaper than underground pneumatic tubes.



The Same Lines Used with Success in Maj. Segrave's Racer Have Been Applied to the Teardrop Motor Cars Built Abroad for High-Speed Operation

Several Inventors Are Experimenting with Changes in Airship Design, to Improve on the Cigar-Shaped Hull Used by Count Zeppelin Since Wind-Tunnel Tests after the War Showed It Was Not Altogether Perfect; One Proposal Is to Mount the Propeller in the Nose and Draw Air through a Tunnel in the Hull, to Avoid Gondolas on the Outside, Which Cut Down the Flying Speed



APPLY FERTILIZER WITH HOSE WHILE WATERING LAWN

As Water Pours through the Nozzle, It Carries with It Fertilizing Material from Chamber

Distributed from a container attached to the garden hose, a special conditioning material has been prepared for improving the lawn soil, preventing packing and baking and loosening hard ground. Fertilizing substance is applied in the same way, insuring even treatment and saving time.

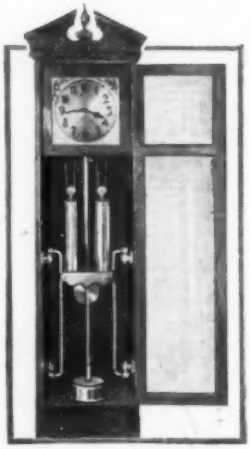
SELF-WRINGING MOP SOLVES CARRYING PROBLEM

The problem of carrying an unsightly mop among hotel and restaurant guests to wipe up spilled liquids is solved by a new self-wringing type, for which a patent application has been filed. The mop disappears into a metal container when not in use, and is ejected as needed by a lever on the handle. While it was designed primarily for use in public places, it also is suitable for homes, and the container handle enables it to be stored away without damage to neighboring articles or to the mop itself. The metal container carries a fixed and a movable roller, the latter controlled by a slide rod and handle, so they can be drawn together and held with one hand while the other operates the lever drawing the mop between them for wringing.

NAILS STILL MADE BY HAND IN PARTS OF ENGLAND

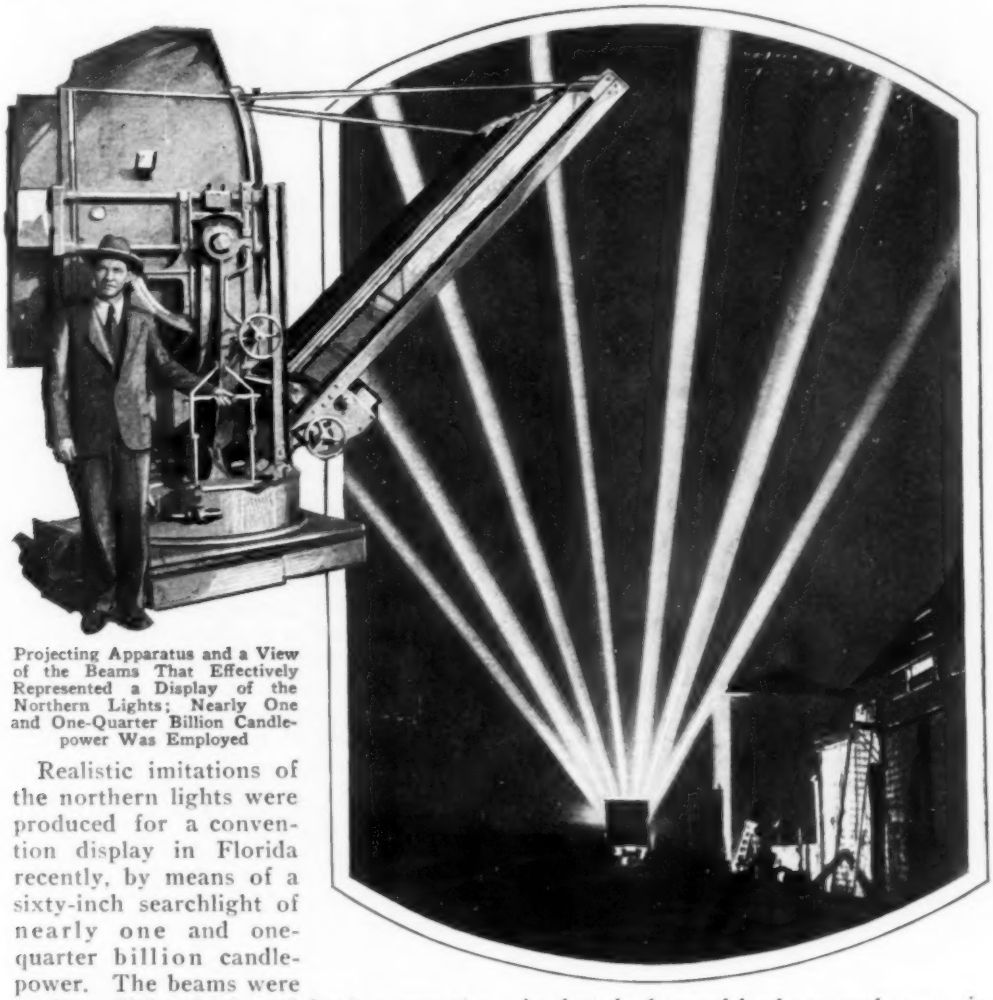
Making nails by hand is still practiced in parts of England, where a few skilled survivors of the days when practically all the nails were manufactured in this manner, fill orders for units of a special pattern. A woman and her young niece are among the best-known workers in this field. It is estimated that there are less than fifty persons living in this part of the world who are adept at the art, while but a few years ago the craft was practiced in nearly every home of every village. A few persons still retain the little "smithy" where their fathers and mothers used to work at forge and anvil.

THERMAL MOTOR WINDS CLOCK AS TEMPERATURE CHANGES



Since 1914, a clock in Dayton, Ohio, has been running without being wound by human hands. It is equipped with a thermal motor, consisting of a gallon tank filled with alcohol, a one-half-inch cylinder and piston with a ten-inch stroke. A rise in the temperature expands the alcohol, pushing the piston up with a series of weights weighing sixty pounds. A fall in temperature allows the weights to descend, winding the springs in the clock movement. There is no escape for the alcohol or the lubricating oil, so that the clock should run indefinitely as long as there is a change of five degrees or so in the temperature every twenty-four hours.

NORTHERN LIGHTS TO ORDER WITH SEARCHLIGHT



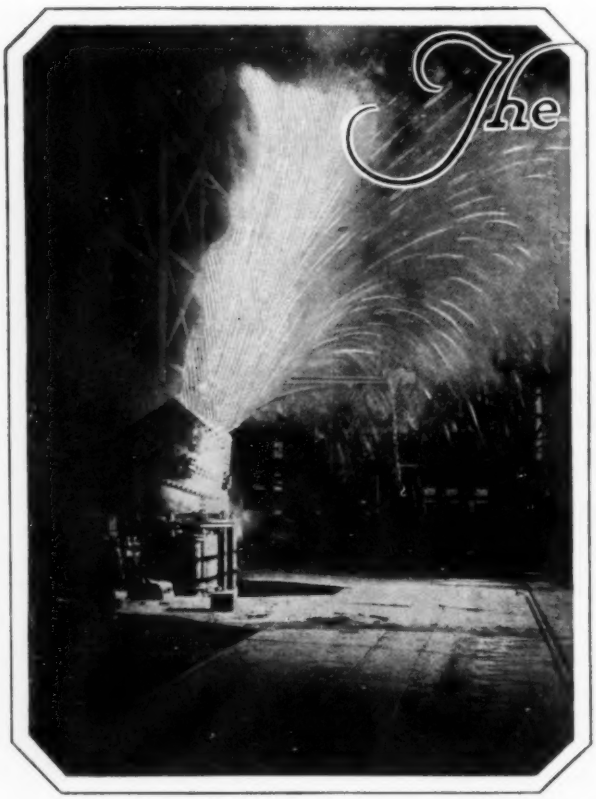
Projecting Apparatus and a View of the Beams That Effectively Represented a Display of the Northern Lights; Nearly One and One-Quarter Billion Candlepower Was Employed

Realistic imitations of the northern lights were produced for a convention display in Florida recently, by means of a sixty-inch searchlight of nearly one and one-quarter billion candlepower. The beams were made to flicker back and forth across the sky, and the light was set on a rotating base to make the effect more natural.

HOW TO TELL GENUINE HOSIERY FROM IMITATION

Full-fashioned hosiery has a seam from top to toe, fashion marks under the knee and on the calf of the leg in two lines parallel to each side of the seam and under the instep and in the heel, a heel of distinctive boxlike structure, a diamond-point toe and an opening in the seam at the inside thickness of the garter welt. The legs and feet of such stockings are knitted separately. Imitation hose differ in that the leg and heel are made on a circular knitting machine, the ankle being shaped by cutting out a portion of the material, and the instep, sole and toe are shaped by machine. The seams are sewed in. On seamless or circular-knit stockings, there is no seam along the bottom of the foot and the imitation fashion marks do not appear at heel or instep. The federal trade commission has warned agents of the mills that they must not sell the imitation varieties as "fashioned" or "full-fashioned" hosiery.

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



© U. & U.

Henry Bessemer Was Laughed at by Steel Makers When He Invented the Converter, Here Seen as It Appears in Action

The Unsung

"I HAVE more men," said Henry Ford, in a recent interview in London, "making machines to build cars than I have making cars."

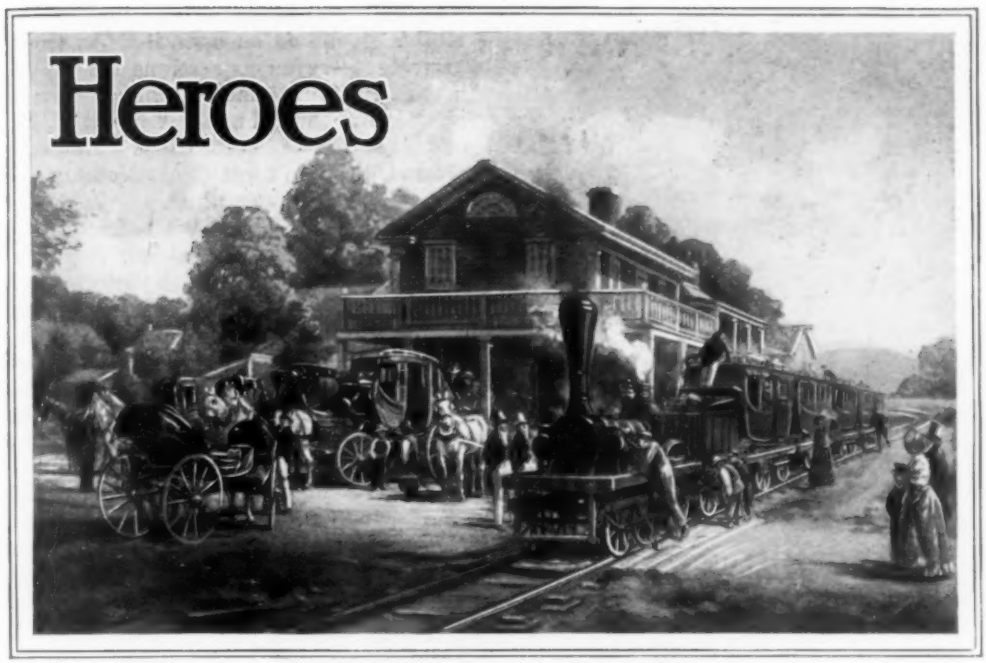
Summed up in that simple announcement is the story of the unsung heroes of industry—the men who build the machines that make modern necessities, conveniences and luxuries possible.

The man who operates the giant power press which turns flat sheets of steel into full-crowned fenders for a fine automobile is a romantic figure in a Pennell etching, but how many have heard of the man who made the press, and therefore made the fender possible?

Ford acquired one of the most remarkable, and least known businesses in the modern world when he bought the Johansson gauge company, and began making fine precision gauges in America. They turn out blocks of steel so perfectly machined that, when several are piled on top of each other, every atom of air is excluded from between them and they stick together like a single bar. Yet, to others than the men who use the gauges, the name Johansson is practically unknown.

More than 200 pounds' weight can be hung from a pair of Johansson gauge blocks "wrung" together to exclude the air. A pile of a dozen or more can be held out horizontally, gripped by the end block, and they remain as firm as a single rod. Carl E. Johansson was a foreman in the Swedish government arsenal at Eskilstuna, Sweden,—one of the world's most famous fine-steel cities and the modern rival of ancient Toledo and Damascus—when he conceived the idea of producing gauge blocks in a variety of standard sizes so that a wide range of gauges could be built up from a small number of blocks, in much the same way as a complete range of scale weights can be assembled from a few standard units. That was in 1897, but it was not until 1911 that Johansson was able to make the blocks in commercial quantities with absolute accuracy. Today they are standard throughout the world and a machine part made in America to Johansson gauges will correspond exactly to a similar part made in any other country.

History has had a habit of overlooking the men who stuck to their regular jobs and made the world's greatest triumphs possible. Every school boy learns the story of John Brown, who had a big hand in starting the Civil war, but few ever heard of another Brown, whose first initial also was "J," who had a big hand in winning it. The unknown J. Brown was the founder of the Brown & Sharpe



The First Railway Coaches Were Modeled after the Stagecoach, Just as, in a Later Day, Designers Thought a Copy of the Buggy Was the Best Shape for an Automobile

company, one of the world's greatest firms of tool makers.

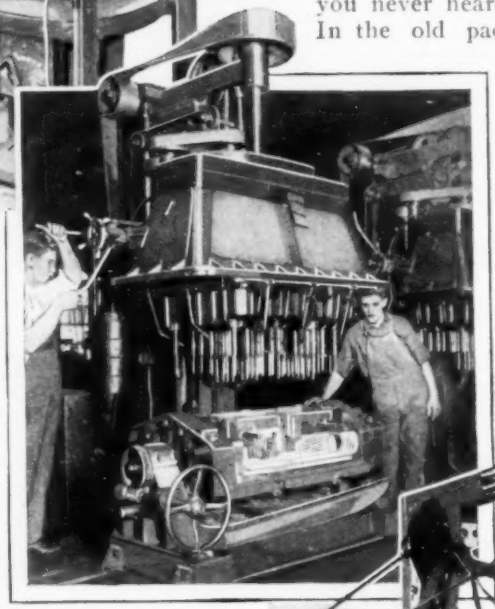
His part in the winning of the Civil war was the invention of the universal milling machine that turned out the rifle barrels for the Union army in the government arsenals. It did away with the slow and laborious rat-tail-file method and produced better musket barrels than had ever been made before. Joseph Brown never got credit for winning a single battle, and he never asked for it.

"The only thing that will put real prosperity into this country is machinery," said Henry Ford. "People believe that machinery brings idleness, but it is really the other way about. It will produce work. For the making of machines means the making of more machines, consequently there is more production, and better wages are paid."

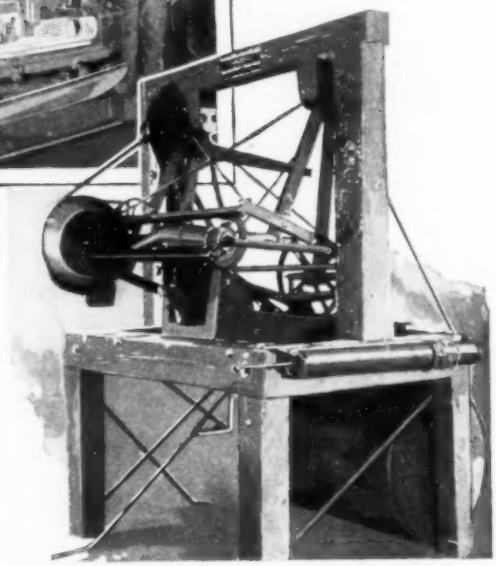
The World war, like the Civil war, was won by men who never saw the battlefields or smelled powder. Marshal Joffre's fleet of taxicabs that turned the tide in the first battle of the Marne and saved Paris, was the product of many motor-car manufacturers, but the men who made the taxicabs possible were Johansson with his gauges and the inventors and builders of gang drills, power presses, turret lathes and the rest of the machinery of our modern factories.

Even the woolen clothes of the armies originated in a machinery designer's head. One power loom can turn out as much cloth as could be produced by 45,000 of the most expert colonial dames of Washington's day, laboring at their hand looms and spinning wheels. The armies wore lots of cotton, too. A modern one-man cotton gin can duplicate the effort of 28,000 southern slaves in the old days. A power sewing machine, one of the most wonderful devices in the world, can sew together two pieces of cloth with a perfect lock stitch, with nine threads feeding and four needles going all at once, as fast as a man can steer the cloth over the slot.

The armies smoked ready-made cigarets instead of rolling their own, and could afford to do so on even a soldier's pay. The reason lay in another machine that rolls, wraps and packs 600 cigarets a minute, where the best hand labor could not do more than four in the same time.



Machines That Almost Think Are Not Unusual; Above Is a Sorting Machine for Statistical Records, Designed by John K. Gore, Vice President and Actuary of the Prudential Insurance Company; in the Center Is a Gang Drill That Drills an Entire Cylinder Block in One Operation



The Original Model of Blanchard's Gunstock Lathe, First Machine to Turn Eccentric Forms from Wood

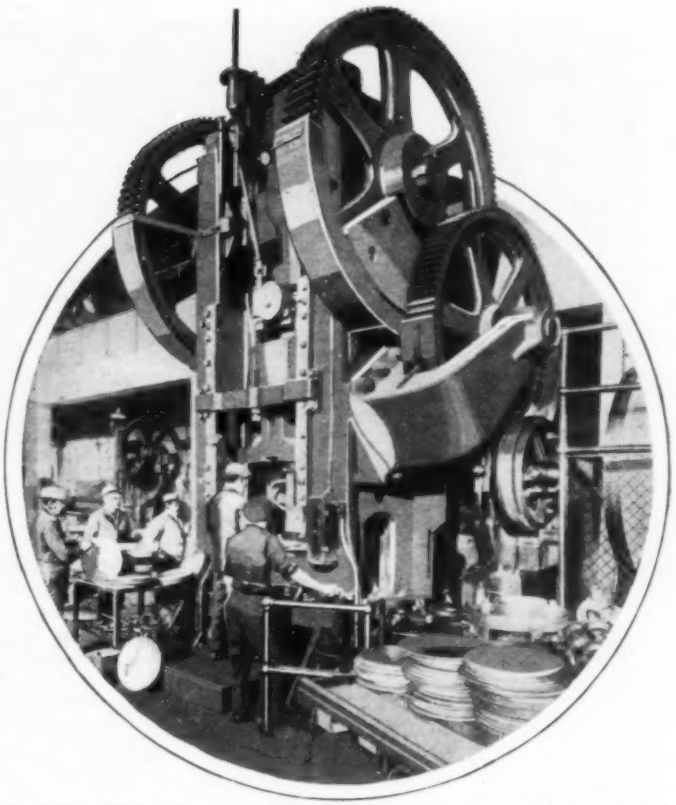
And so all down the line. All kinds of manufactured products are cheap to the consumer because the manufacturers can equip their plants with highly efficient and not too costly machines. And where do the ideas for the new machines come from? Listen to a Bridgeport tool maker's explanation:

"Our customers make suggestions, and we think of plenty more ourselves, in the way of improvements on all models. For another reason, whether we like it or not, we've got to try to keep ahead of our rivals, if we can, in turning out machine tools which will operate with the greatest possible economy and efficiency and speed. In the last war, they had a machine that was about the most wonderful automatic machine in the world. It did seven operations in testing cartridges—seven operations all in one machine! Some machine-tool builder designed that, but you never heard of him, and when the war decorations were passed around, he didn't get one. Nobody ever thought of decorating him.

"You've heard about Watt, I guess. He gets all the credit for giving the world the steam engine. But did you ever hear about John Wilkinson? Well, the steam engine was a commercial success for just one reason—John Wilkinson's boring machine made it feasible to build a steam engine that would work. I'll tell you another thing one of our tribe did. I'll bet you never heard of James Nasmyth. In the old paddle-wheel steamship days they put up to Nasmyth the man's size job of delivering a paddle shaft thirty inches in diameter. He turned the trick, but he had to build the first steam hammer to do it. The ship that needed the thirty-inch shaft never got finished,

because about that time the screw propeller came in and put paddles out of business. But we're still using steam hammers.

"We do a lot of inventing. Sometimes it is a machine ten thousand times as powerful as any of the battering rams used at the siege of Troy. Sometimes a machine to shave a ten-thousandth of an inch off a piece of steel. We've got a caliper in our plant so delicate that the heat of the palm of your hand, from several inches away, will cause it to expand. We can put on a show with stunts like that which would make anyone's eyes stick out."



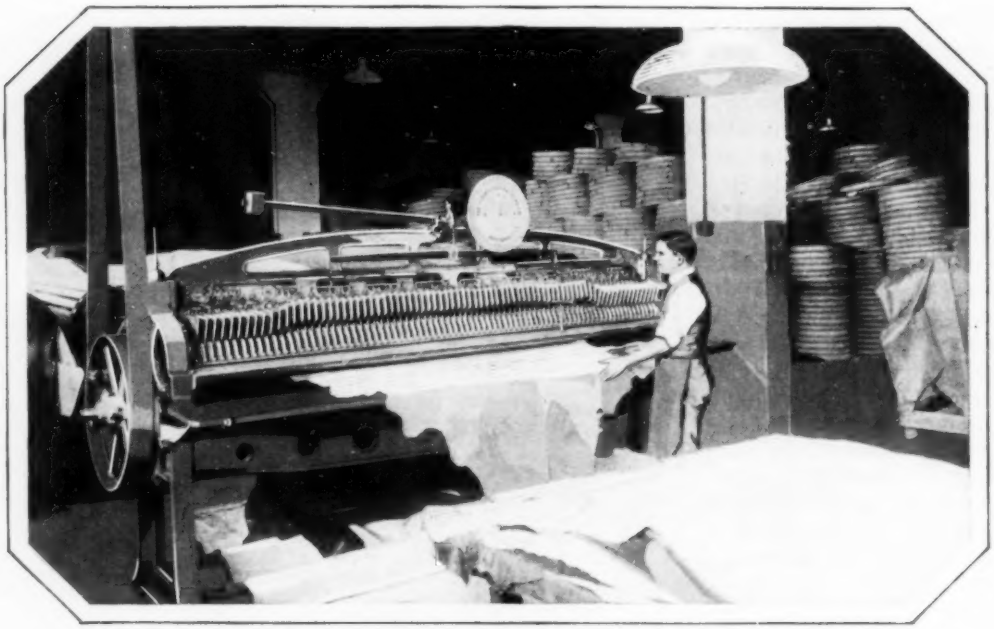
Weighing 170,000 Pounds and Exerting a Pressure of 1,100,000 Pounds, This Huge Press Makes Automobile Brake Drums from Flat Steel Disks

Joseph Brown, of Bridgeport, was not the only New Englander who turned an inventive mind toward producing machines to make work easier. In fact, much of the early reputation of Yankees, and particularly Connecticut Yankees, was based on their aptitude for taking the drudgery out of work by making a machine do the same task in less time and in a better way than human hands could turn the trick.

It was Amos Whittemore, of Massachusetts, who relieved thousands of New England families of their occupation of sticking wire staples, one by one, into sheets of leather to produce cards for cotton and woolen factories. Whittemore invented a machine which did the work, made a fortune by his invention, and thereby helped introduce the power era, in which the former card makers became more productive workers and the cost of cloth was correspondingly cheapened.

Another Massachusetts boy, Thomas Blanchard, turned machine builder at such an early age that he was only thirteen when he brought out an apple-paring machine that could out-pare more than a dozen girls. Blanchard, even younger, had won local fame for his skill as a whittler, making marvelously complicated water wheels and windmills. On the strength of his apple-parer triumph, his brothers took him into business in their tack factory. The making of tacks in those days consisted in stamping blanks out of a thin sheet of iron, then picking up the blanks, one by one, between the thumb and finger, and sticking them into a vise operated by a pedal, following which a lusty hammer blow flattened the part projecting above the vise into a head.

Young Blanchard's daily task called for a certain number of tacks, and they had to be counted to make sure he was producing his full quota. His first improvement was a counting machine, a ratchet-and-pawl affair that moved the toothed wheel one tooth for each time the foot-treadle vise was closed on a tack. Next he started work on a tack machine, and in six years produced one that turned out 500 tacks a minute. His patent brought



Another Machine That Thinks Thoughts the Human Brain Could Not Compass; It Automatically Measures the Square Inches in an Irregular Cow Hide and Gives the Total

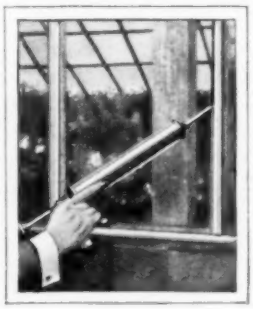
him $5,000. With that money he started in earnest to be a manufacturing machinist, and used part of it to build a machine for turning musket barrels, an operation that was simple enough, except at the breech, where the flat and oval sides had to be ground down or chipped off. Blanchard produced a lathe that did the job satisfactorily. While he was exhibiting it at the government arsenal in Springfield, Mass., a musket-stock carver remarked he had one job that could never be spoiled by any machine designer. Blanchard accepted the challenge, and in six months produced the first woodworking lathe for turning objects of irregular shapes. Under his basic patents, lathes are turning out gunstocks, shoe lasts, hat blocks, tackle blocks, ax handles, and a thousand other objects of irregular form.

Most of the early power machines were developed to make possible some specific product; in other words the machine was designed to fit an immediate need, and the need came first.

But machine building has become such a highly developed art that now the improvements frequently precede the demand from the manufacturer. Turret lathes, boring and milling machines, gang drills and power presses are constantly being improved with the addition of new gadgets that extend their usefulness into new lines, speed up production, increase accuracy, or simplify the work to the point where an untrained laborer can equal the product of a highly skilled mechanic of former years.

But, through it all, the men who make the machines remain virtually unwept, unhonored and unsung.

AUTOMATIC GUN FOR CALKING LEAVES ONE HAND FREE



Operated somewhat like a pistol, a gun for calking or glazing applies the material just where it is wanted and permits the operator greater freedom than with other tools, as he needs but one hand. A large cylinder holds a generous supply of putty or filling substances, and ejection is accomplished simply by pressing a trigger.

FORECAST WEATHER FOR WEEK BY IMPROVED SYSTEM

Methods of predicting weather changes a week in advance, and with an accuracy almost as great as that for the daily forecasts, have been developed by C. L. Mitchell, district forecaster of the weather bureau. More time and preparation are required, but he considers the results worth the extra work involved. On a blank map of the northern hemisphere, he locates the high and low-pressure centers of the current and the three preceding mornings, with the pressures indicated at the centers. These centers are then connected with lines, showing the day-to-day changes in the intensity of the areas and the variations of the low and high-pressure regions. With this as a basis, the locations of the centers likely to affect the weather of the eastern half of the United States are predicted and entered on a chart for each day, a week in advance. On 201 days of the 276 for which forecasts were made two to seven days in advance, the weather changed as predicted, giving an accuracy of more than seventy-two per cent. The record for official daily forecasts is about eighty-two per cent.

PORTHOLES IN WINDSHIELD HELP IN BANDIT CHASE

Cincinnati police have automobiles with bullet-proof windshields and with two portholes in the shield, so that persons in the cars can fire at bandits without exposing themselves to a return volley. The autos are capable of high speed.

Portholes in Windshield of Police Automobile Aid in Bandit Warfare; and the Glass Is Bullet-Proof

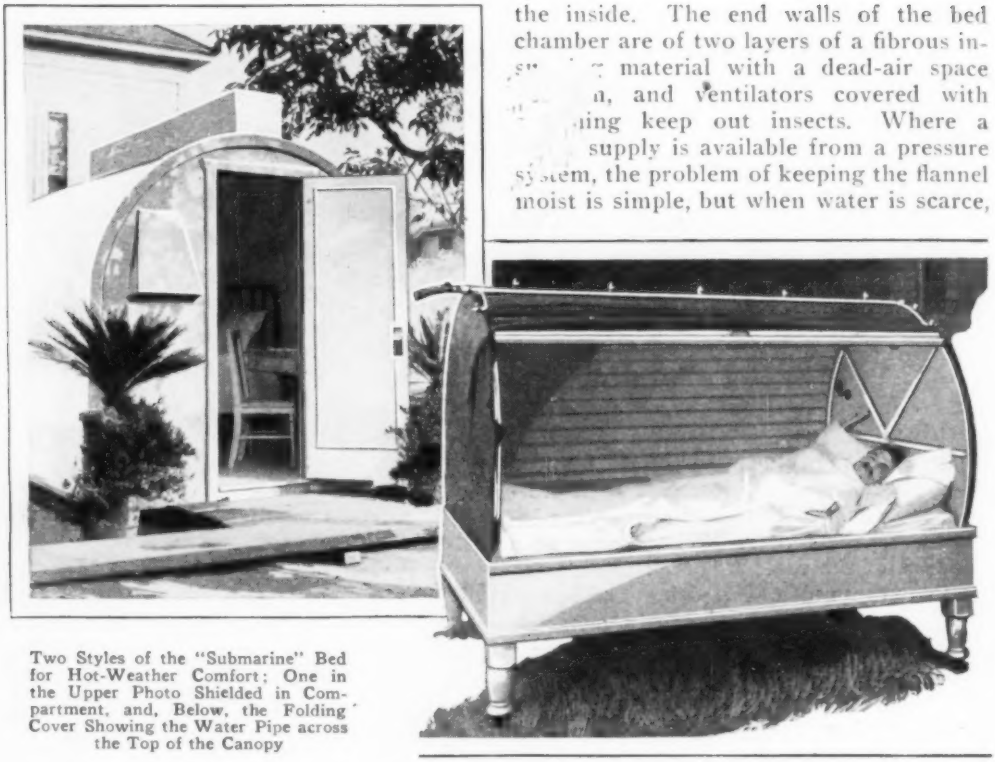
Giving the Hedge an Even Trim with Collapsible Cutter That Saves Time

ACCORDION CUTTER FOR HEDGES LEAVES SMOOTH SIDES

Trimming the hedge is simplified, according to reports, with a trimmer that has nearly 100 inches of cutting edge and is operated like a collapsible bracket with two handles. One man can trim from fifty to 100 yards of hedge an hour with it, and there is less likelihood of leaving irregular edges.

GREATER SAFETY IN SUBMARINE THROUGH IMPROVED DESIGN

Had the "S-4" been equipped with safety devices developed since the vessel was sunk, it would have been possible to rescue the crew, in the opinion of L. Y. Spear, a naval architect who testified before the special senate committee investigating the disaster. He said that the "S-4," which was built in 1916, had all the safety features of that period, but since then great developments have been made, increasing the chances of rescuing the crews on sunken submarines. Auxiliary and emergency controls and air locks to permit the escape of entrapped men are among the improvements, while boats of the latest hull designs are better able to withstand pressure and weight.

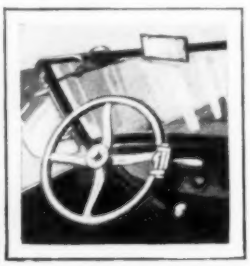


Two Styles of the "Submarine" Bed for Hot-Weather Comfort; One in the Upper Photo Shielded in Compartment, and, Below, the Folding Cover Showing the Water Pipe across the Top of the Canopy

SUBMARINE BED GIVES COMFORT ON HOT NIGHTS

Being unable to sleep because of the hot nights, a western engineer has inclosed his bed in a galvanized sheet-steel canopy, covered with flannel which is kept moist with water. The resulting evaporation produces a comfortable temperature on the inside. The end walls of the bed chamber are of two layers of a fibrous in- material with a dead-air space n, and ventilators covered with ing keep out insects. Where a supply is available from a pressure system, the problem of keeping the flannel moist is simple, but when water is scarce, a small electric pump is used to return the supply to a storage tank. The water falls on the canopy through perforations in a pipe along the roof of the compartment. A wooden roof or canvas canopy keeps the rays of the sun from the chamber during the day. The arrangement has become popular in California and Arizona, especially in sections below sea level.

HANDLE ON STEERING WHEEL IS AID TO AUTOIST



Attachable to the steering wheel of almost any make of automobile, a grip handle is said to promote greater ease and safety in driving. It affords added leverage and allows the operator to assume a more comfortable position. In many cases, it is said to make it unnecessary to lean forward and does away with the use of a small pillow, which some women drivers find essential.

RETOUCH MOTION-PICTURE FILM WITH LESS EYE STRAIN

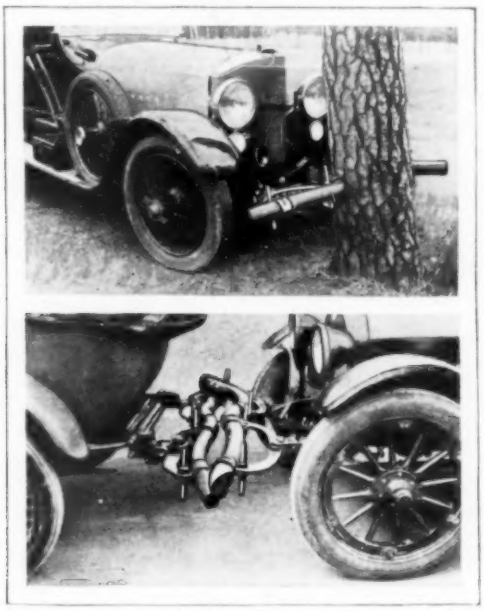
Retouching motion-picture film has been simplified with the aid of an apparatus developed in France. Instead of looking directly at the negative, as in the ordinary process, an image of the film is projected upon a screen, along with the image of the retouching pencil, so that the worker may more easily perform the task and see small details that might otherwise be overlooked.

RADIO REPLACES HUMAN ALARM IN WAKING PEOPLE UP

A picturesque "institution," [illegible]n with the long pole who shuffled a[illegible] t[illegible]e streets and knocked at workers' w[illegible]s to arouse them at the proper time, [illegible]p-idly being forced into the discard at Lancashire, England, by radio. Alarm clocks foretold his passing several years ago, yet many old-fashioned folk still clung to the walking arouser. But now that time signals are broadcast by radio and clocks can be adjusted several times each day, the "man with the pole" is rapidly becoming extinct.

RUBBER AUTO BUMPERS GUARD CAR AND PASSENGERS

Interesting tests of rubber automobile bumpers were made in Germany recently. A car was driven into the rear of a parked auto at a speed of twenty-four miles an hour, but its rubber bumper prevented damage to either vehicle, and in another demonstration, an automobile was run directly into a tree at a speed of thirty-six miles an hour. According to reports, neither the car nor the driver was injured. The bumpers give under strain, acting as shock absorbers in case of collisions.



Results of Crashes in Car with Rubber Bumper; Only Slight Damage Was Suffered

Aviators with the Four-Lens Camera for Taking Photographs from the Air

FOUR-LENSED AERIAL CAMERA TO SPEED MAPPING

Greater speed and accuracy in preparing air maps are anticipated with an aerial camera that has four lenses. It was recently subjected to field tests by army flyers before mapping an area of approximately 2,500 square miles along the east coast of Florida.

SUBMARINE FOR POLAR TRIPS TO AID OCEAN STUDY

Exploration of polar regions by means of submarines is considered practical. Stefansson suggested the plan in 1918, and just recently, Capt. George H. Wilkins indorsed the idea. He declares that a submarine should be able to cruise from Spitzbergen to Alaska and that the craft would be useful in making investigation of ocean currents. Explorers believe that there is little chance of finding new lands at the pole, as air surveys have shown the region to be mostly ice and water.

Half Around the World

Bert Hinkler, Who Flew a Light Plane on a Solo Trip from London to Port Darwin in Sixteen Days

IN the cold dawn of an early morning, an Australian pilot rolled back the doors of a hangar at Croydon field, just outside of London, wheeled out a tiny plane, opened up its wings, which had been folded back to park the ship in a space about the size of a family garage; and took to the air.

Sixteen days later—or a trifle more than fifteen, if you allow for the difference in time—he settled down to an Australian airdrome, having traveled, alone, 12,000 miles, or virtually halfway around the world. In a fraction over two weeks, Bert Hinkler, a comparatively unknown test pilot, had become famous, for he had:

Made the longest continuous solo flight in history.

Made it in a $3,000 airplane, powered with an engine rating but thirty horsepower, and developing eighty at its peak point.

Clipped twelve days off the air record from London to the antipodes.

Made the first non-stop flight from London to Rome.

Crossed seas, mountains, deserts and jungles and winged through tropical monsoons day after day while keeping exactly on his predetermined schedule.

At the age of thirty-six a flyer who, as a boy at Bundaberg, Australia, had saved his pennies to build gliders so that he could teach himself to fly, was holder of one of the greatest flying records ever made.

The London-Australia flight was unique in several ways. To begin with, instead of ordering a special ship, Hinkler overhauled his old Avro "Avian"—the first of the type ever built—which had already seen hundreds of hours in the air, including a non-stop flight of 1,200 miles from London to Riga, Latvia, last year. The original engine, never taken down, was given a "top overhaul" and pronounced ready. The original two-seater open fuselage had been converted, for the Riga flight, to carry only one passenger, with extra gasoline tanks in the spare seat, so no changes in it were needed.

A small supply of food and a collection of maps were the only added equipment. Wrenches, pliers, screwdrivers and a grease gun—about the usual tool kit for an automobile journey—composed the repair equipment. There wasn't even a spare tire for the landing wheels, and the tires reached Australia still filled with English air.

For cargo there was a variety of small articles, whose manufacturers had contributed to the expenses of the trip in exchange for the advertising. Hinkler's chances of breaking the twenty-eight-day record to Australia, set by Sir Ross and Keith Smith, in 1919, were considered so slim that the London papers refused to contribute to the expenses, though later they paid huge sums for brief cables from the pilot. Lloyds, for 150 pounds (roughly $750) had offered insurance against failure, to pay one pound if he broke the Smith brothers' record by one day, two pounds for two days, four for three days, and so on, doubling the amount for each

in Sixteen Days

Hinkler in His Avro "Avian," and the Route Followed in His 12,000-Mile Flight Half Around the World, When He Broke the Record for the London-Australia Flight

day, until they would have paid 2,048 pounds if he made the trip in sixteen days, as planned. Unable to raise the money to buy the policy, Hinkler lost the chance to make the more than $10,000 which his success would have earned.

With enough money raised to buy gas and oil, and pay his steamer fare back to England, he started out. Here, in his own words, is the story of the 12,000-mile jaunt in a $3,000 air flivver, with about the power of a medium-priced car.

"Dawn had not yet broken when, on the morning of Tuesday, Feb. 7, we struggled with a recalcitrant hangar door before wheeling the 'Avian' out on the tarmac. The final supply of gas was put aboard, the last goodbys said, and at 6:45 exactly, I took off into a slight cross wind on the first lap of the flight to Lyons or Rome, as the weather dictated.

"The first lap was in many ways the most critical one, for, as I was flying against the sun, I had little more than eight hours of daylight in which to cover some 1,100 miles. On the other hand, Europe, with its probability of bad weather and consequent delay, presented

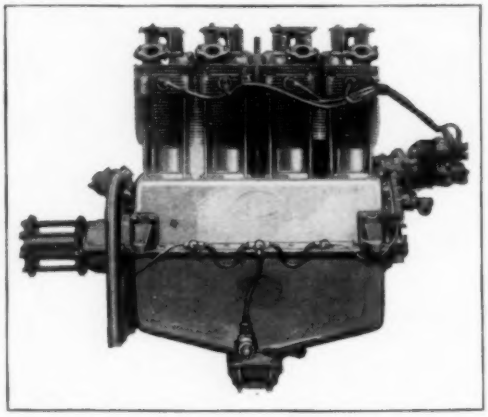
the greatest obstacle to a fast flight to Australia and the sooner it was left behind the better.

"So I carried on throughout the day until, at about 5:50 p. m. local time, or 3:00 p. m., London time, the light began to fade and the rest of the flight over Italy was completed in darkness under a clear moon. There was no more welcome sight that night than the river Tiber and the lights of Rome as we landed at Centocelle aerodrome at 8:40, local time.

"After a hasty meal, the machine was 'serviced up' and greased for the morrow, and then I turned in, pretty well beat, for, owing to the exigencies of last-minute arrangements, I had less than three hours' sleep on the previous night.

"At 9:15 the next morning we left Rome for Malta, the British base in the Mediterranean, 400 miles away. The route first planned had been via Athens, Cyprus, Aleppo and Bagdad, but weather and other considerations induced me to choose the alternative route via Malta, where we arrived after several hours' uneventful flying. After a brief inspection of the machine and engine, I was able to revel in the luxury of a hot bath.

"Early the next day, the third out from England, I started crossing the sea. As with all these longish sea crossings, at first one feels a slight sense of anxiety as land disappears, but this soon vanishes. In flying over bad country, one is always subconsciously looking out for possible landing places. Over the sea, you at least have the relief that any place is as good, or as bad, as another.



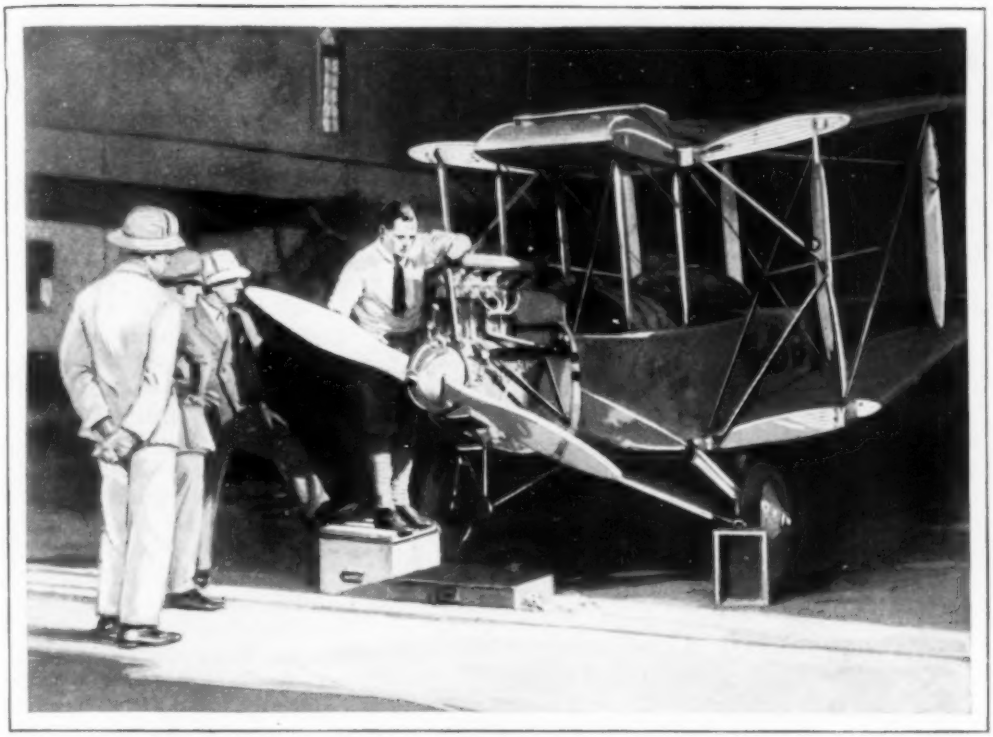
Four Cylinders in Line Are the Novel Feature of the Avro's Air-Cooled Engine

"We made a landfall before noon and landed at Benghazi, on the African coast, at 1 o'clock. Later in the afternoon, when it grew cooler, I flew on to Tobruck, resting place for the night, and 980 miles from the morning's start at Malta. It was on this lap that I had my first experience of the seemingly endless monotony of sand, which we never seemed to escape until Karachi, India, was reached. Here, too, began the clothes-discarding process which, as we neared the equator, continued steadily so that I must have left an unbroken trail of garments behind.

"This first hitch in my plans came the next day, the fourth out from London, for I was unable to get clear of the desert before nightfall, and the rapidly fleeting daylight forced me to land on a patch of desert overgrown with thorns. The next day I was preparing to clear away the thorns for the fairway when a party of Arabs approached. I felt a little anxious in case they might prove to be hostile, but a timely offer of cigarets sealed our friendship, and they finally helped me clear the ground of obstructions. Soon after, we took off and headed for Palestine and reached Ramleh airdrome in the afternoon, where I was able to give the engine the first real attention it had had since leaving Malta, more than 1,600 miles behind.

"The Persian gulf was the next objective, and the 1,000-mile stretch to Basra was the most monotonous of the trip, traversing the seemingly endless deserts of Syria and Arabia. After nine and a half hours of non-stop flying, I was thoroughly tired. The run next day was less tiring, and the 800-odd miles down to Jask village, on the gulf, was covered by 4 o'clock, local time. Jask was two miles from the landing field, and the only means of transport were a donkey and a bicycle. The donkey seemed rather defective on the rudder controls, so I eventually chose the bicycle and pedaled through the blazing sunshine to the luxury of a real long sleep.

"After a pleasant run down the coast, we reached Karachi, the first stop in India, and landed in the early afternoon, on the seventh day out from Croydon. I was



With Wings Folded Back, the "Avian" Occupied Small Space in the Hangar at Karachi, India, While Hinkler Overhauled the Engine and Prepared for the Next Day's Hop

able to deliver papers only a week old in Karachi, and here a slight leak in the oil tank was attended to. Throughout the flight this was the only repair I had to make to machine or engine.

"Flying conditions were good on the next lap, the 850 miles to Cawnpore, apart from some bumps encountered en route, and I landed on the military parade ground, after nine hours and thirty-five minutes of non-stop flying.

"The 650 miles to Calcutta were practically covered in the morning, and I landed at the Dum Dum airport at 1:25. Lette, a friend, was at Dum Dum to meet me and very sportingly spent the rest of the day giving me a hand. With every mile now, the heat increased, and we had already reached the stage where the fabric of the machine almost blistered one's fingers.

"From Calcutta onward, we entered the rainy area, and an East Indian rainstorm is no April shower! Instead of cooling one, they seem to leave the atmosphere more oppressive.

"I reached Rangoon in the afternoon, eleven days out, after covering the 780 miles from Calcutta in seven hours forty-five minutes, non-stop. By a detour at South Akyab, I had managed to dodge the worst of the rainstorms, but at Rangoon I was warned they were breaking all along the Malay coast.

"At 6:40 the next morning we left Rangoon and arrived at Victoria Point, 500 miles away in a direct line, at 2 o'clock, after a memorable flight, in which most of the time was spent in making detours to avoid rainstorms. As we neared our destination, I could see a big storm gathering behind, and at full throttle we raced in, flying low over the thickly matted jungle. A minute or two after landing, a heavy downpour blotted out the landscape, reducing visibility to less than a hundred yards.

"That night I passed in a rubber planter's bungalow, and I have a vivid recollection of going over the machine—pegged down on the edge of the jungle—with a flash lamp, while the thunder shook

Hinkler at Work on the Thirty-Horsepower Cirrus Engine, Which Had Already Flown Vast Distances

overhead and lightning lit the darkness of the jungle with sudden flashes.

"Nine hours' flying the next day brought us to Singapore. From Penang onward, we encountered many rains, and at Tiebad I was forced to make a fifty-mile detour. As we glided down to the race course at Singapore, at 4 o'clock, 720 miles from the day's start, I could see four Supermarine Southamptons, of the Far East flight, moored on the still waters of the harbor. Hundreds of coolies crowded the race course, and the machine narrowly escaped damage in landing and taxying in. Once again, all offers of hospitality had to be refused, and I retired early with my trusty alarm clock.

"The take-off from Singapore was probably the nearest thing in a reasonably uneventful flight, for the ground was sodden and the race course none too large. I managed to clear the buildings by a narrow margin, and headed away to Java. As we arrived over the island, heavy rainstorms closed in from all sides, and I was forced to hang around for nearly an hour before landing at Kalidjati (near Bandoeng and fifty miles east of Batavia) at 3:45, local time.

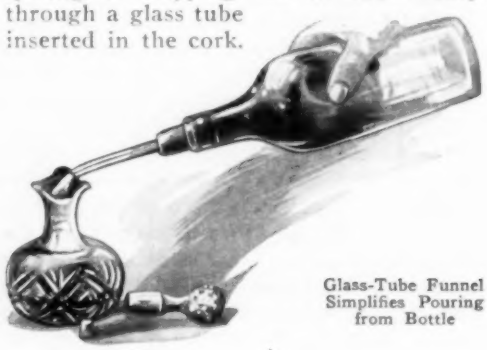
"Then, after an uneventful trip, I landed at Bima the next afternoon, and my lodging for the night was a native's hut, and all night long mosquitoes attacked in mass formation, rendering sleep impossible.

"Early the next morning we set out on the final 1,000 miles that lay between us and Australia. The shortest course from Bima to Bathhurst island lay over the open sea nearly all the way, but the engine was running like a dream, and I felt no anxiety. Good weather prevailed all the way and the last 100 miles over the open sea were uneventful.

"My joy when I made the landfall at Bathhurst can be imagined. It was 5:45 when I changed the course for Fanny bay, the landing place, five miles from Port Darwin. Before landing, I circled the Ross Smith memorial, in tribute to a great pioneer, and then landed on the crowded airdrome. I had reached Australia on the sixteenth day of the journey, and, allowing for the difference in local and Greenwich time, after a little more than fifteen elapsed days from the start."

GLASS TUBE IN BOTTLE CORK SERVES AS FUNNEL

Pouring liquids from bottles without spilling or dripping can be done easily through a glass tube inserted in the cork.



Glass-Tube Funnel Simplifies Pouring from Bottle

It serves as a funnel and is especially useful in filling storage batteries to prevent the acid from getting on the floor.

SOUND WAVES BORE HOLE IN GLASS

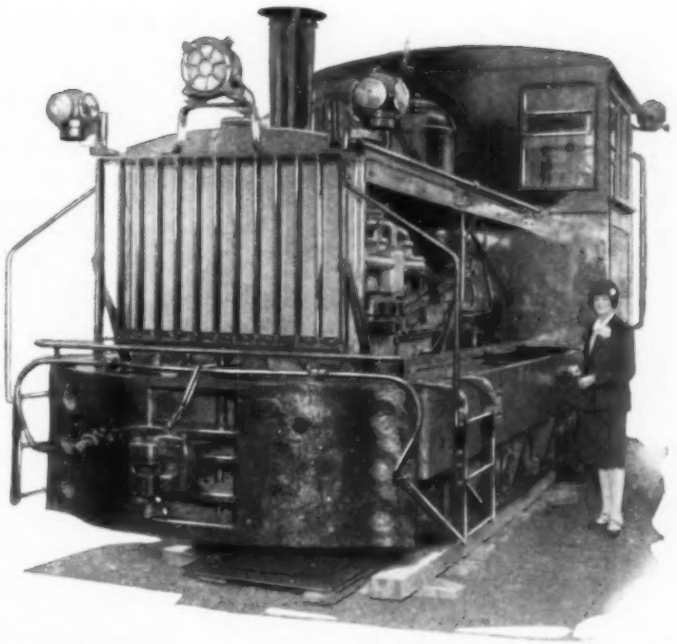
Sound waves of a frequency of 200,000 to 500,000 vibrations a second, passed along a tapering glass rod, caused the tip to bore a hole in a piece of wood and a plate of glass, a French experimenter discovered recently. When the waves were communicated to a glass thread about one one-hundredth of an inch thick and more than a yard long, the frictional effect was so intense that the flesh could be burned. Further tests with the "ultra-sonic" waves showed that they accelerated various reactions and produced crystallization.

RAZOR-BLADE "PARKING" SPACE PREVENTS CUT FINGERS

Storage space for used safety-razor blades is provided in a china holder that has a groove for the razor and another compartment for new blades. The discarded units are removed simply by turning the cabinet upside down and shaking it.

ARTIFICIAL SILK FROM COAL

Among the by-products from coal at a German plant is viscose artificial silk, several tons of which were produced this year. The amount is expected to be doubled when new factories are completed in 1929. Benzine has also been extracted.



Gasoline-Burning Locomotive for Terminal Service That Has Found Favor Because It Reduces Smoke and Noise

RAIL ENGINE BURNS GASOLINE AND SPEEDS SWITCHING

One of the latest developments in locomotives was exhibited in Los Angeles recently in a huge gasoline-burning unit especially adapted to yard service. Quicker handling of trains and cars in switching, and less noise and smoke, are important features of these engines.

AUTO CLOCK ON GEAR LEVER REPLACES KNOB

In line with the tendency toward greater simplicity and compactness in dash equipment, the automobile clock is now attached to the gear-shift lever, serving as a substitute for the usual knob. A small spring in the back absorbs the vibrations, and the hands are visible at night. The crystal is of the unbreakable variety.

soning, the department of agriculture reports. It stops the itching in a short time and recovery is rapid. A brown stain is left on the skin, but this may be removed with a one-per-cent solution of oxalic acid. As the latter is a poison, it should be kept out of the reach of children and carefully used. A preventive, enabling a person to handle the plant with impunity, has been worked out by Dr. James B. McNair, of the Field Museum of Natural History. This consists of a five-per-cent solution of ferric chloride in a half-and-half mixture of water and glycerine. This should be washed freely on the skin and

Pilot House and Body of the Glider before Launching; in This Queer Craft, Equipped with a 700-Horsepower Motor, a French Inventor Hopes to Cross the Atlantic in Sixty Hours or Less

BIG MOTOR BOAT LIKE TORPEDO FOR TRANSATLANTIC TRIP

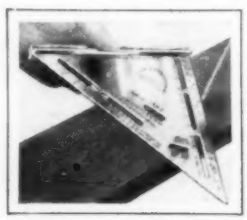
Seventy-five feet long and equipped with a 700-horsepower motor, a torpedo-shaped "glider" is the strange craft in which a French experimenter hopes to cross the Atlantic. It will develop a high rate of speed and its form reduces resistance from air and water to a minimum. It is made almost entirely of metal and was designed especially for rapid trans-oceanic postal service.

CHEMICALS FOR IVY POISONING ARE EFFECTIVE

Potassium permanganate, applied as a five-per-cent solution to afflicted parts with a soft cloth or a bit of cotton, has been found an effective cure for ivy poi-

permitted to dry there before going into an ivy-infested region. This compound contains iron, which enters into a chemical combination with the ivy poison, rendering it harmless.

SQUARE FOR CUTTING RAFTERS AIDS ROOF BUILDERS



To simplify the task of cutting rafters, a special square is marked so that the proper angle to give the pitch desired is quickly and accurately obtained. This is accomplished with the aid of numbers on the square which designate the inch rise per foot on the rafter.

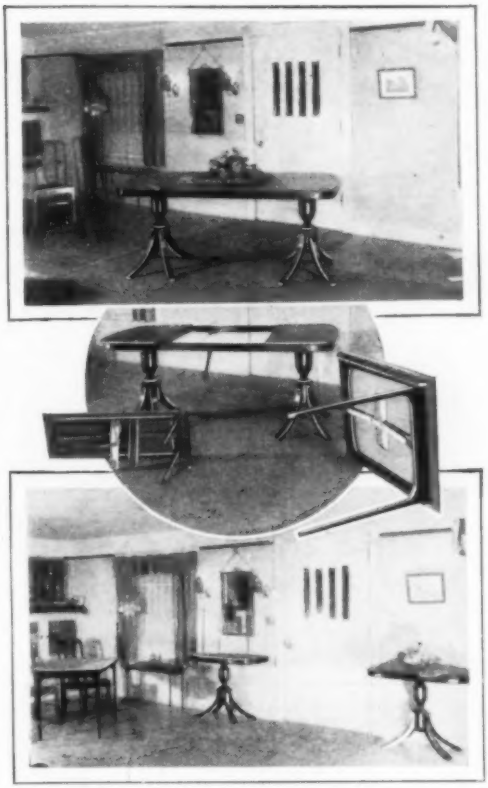
THREE-WHEEL-BRAKE SIDECAR PROMOTES SAFER RIDING

Intended especially for service in the cities where frequent stops are necessary, a three-wheel-brake motorcycle sidecar has been introduced. The brake to the sidecar operates in conjunction with the pedal which controls the cycle's rear-wheel brake. Equalization of all brakes is effected with less danger of skidding and with reduction of wear on the tires. A regular motorcycle front wheel is employed instead of the usual sidecar wheel.

CHILD'S PIANO-PLAYING GUIDE SIMPLIFIES INSTRUCTION

Nursery rhymes, simple melodies and the piano are associated in a helpful guide for youngsters to enable them to play the instrument and become familiar with some rudiments of music. The unit is simply a large card, bearing an attractive picture, and the rhyme and notes to the jingle at the top. The bottom portion is slotted to fit over the piano keys and the card is bent when in use, the upper part being upright and the lower flat over the keys. Below the slots are holes for the fingers. These are numbered to correspond with the figures on the notes of the little song. Thus the child can quickly learn to associate the note with the proper key on the piano and memorize the words.

Practicing with the Piano-Playing Guide



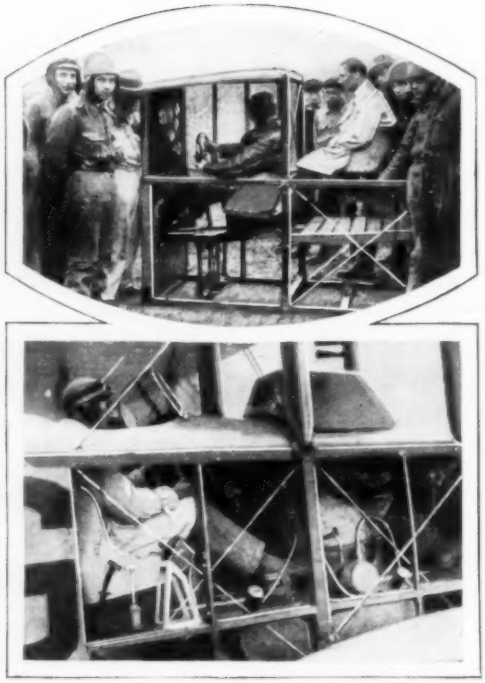
Assembled as Single Table; Center Units and the Separate Tables in Place

EXTENSION-TABLE SET SAVES SPACE IN SMALL ROOMS

Planned especially for the small apartment, a combination table arrangement saves space and meets a wide variety of requirements. It consists of two small console tables, a card table and a window bench. The two consoles may be assembled as a single round table or converted into a dining table by placing the card table between them. This is made still longer by adding the bench as an extra leaf. The combinations are quickly made.

NOISELESS BUILDING AGE SEEN THROUGH WELDING PROCESS

Electric arc welding as a substitute for riveting was used successfully in the erection of a large steel building in Philadelphia. The process is noiseless and saved about 100 tons of rivets and plates that would have been needed by the old method.



Two Views of the Dual-Control Airplane; Note the Open Pit for Clear-Weather Flying

RIGS PLANE FOR BLIND FLYING TO REDUCE NIGHT HAZARD

So that it can be more easily and safely guided at night and at other times when no landmarks are visible, a plane equipped by M. Farman, pioneer French aviator, has a dual control. A feature of the installation is that one pilot is entirely inclosed so that he must rely wholly on his turn-and-bank indicators, compass and other aids to direct him. This is considered a safer plan than the usual way, for in many instances, an aviator, trusting to his senses, has become confused in fogs and in darkness, whereas, had he trusted to his instruments, he would have been better able to avoid mishap. The second pilot is in the open cockpit so he can take over the controls for clear-weather flying.

OLD BEER-STORAGE CELLARS NOW PRODUCE MUSHROOMS

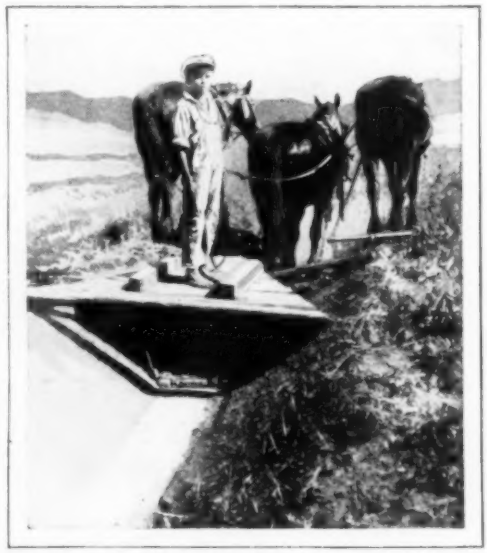
Mushroom production has increased in some parts of the country since prohibition, according to a Texas man. He points out that space formerly used for the storage of beer in various large refrigerating plants, is now being devoted to the cultivation of mushrooms. The areas are well suited to the work as there is abundant shade and the temperature is accurately controlled by the cooling coils.

MICROPHONE AIDS TEACHERS AS WELL AS PUPILS

Sitting at her desk, a teacher in a New Orleans school can speak to the entire student body or make announcements to other teachers in their rooms. This is accomplished by the "public address" system which utilizes the microphone and amplifiers in broadcasting the voice through loud speakers. The plan saved the construction of an auditorium large enough for the 510 pupils, as all of them can hear announcements, speeches and programs in their own rooms.

PLOW FOR FLAT-BOTTOM DITCH MAKES SLOPING SIDES

Forming ditches for irrigating, and other purposes, is simplified by a plow that scoops out a flat-bottomed channel with sloping sides. The depth and width of the ditch are determined by the position of the weight on the platform across the body of the plow. The blades that do the cutting are of steel and are set at an angle for efficient operation.



Scooping Out Ditch with the Digger That Leaves a Flat Bottom and Gentle Sloping Sides

MUSCLE *and* HOW *to* USE IT

The Right Way to Lift a Trunk, Putting the Strain on the Knees Instead of on the Back

BIG BILL is a trunk heaver. So is Little Bill. Big Bill is always tired. Little Bill always has a reserve measure of energy left over at the close of the working day. The explanation of the difference is simple: Little Bill uses his muscles correctly. Big Bill doesn't.

Of course the average man isn't a trunk heaver. Nevertheless, he is called upon occasionally to lift a trunk, run a wheelbarrow, carry out the ashes, and perform other tasks calling for physical exertion. Whether the labor culminates in a "broken back" or merely a natural state of fatigue is largely dependent upon the use of the laws of leverage.

You cannot stoop and expect your arm muscles, assisted by the back, to lift heavy weights. The weight at the end of the arms is at the end of a long lever with a fulcrum at the hips, and the mechanical disadvantage is terrific.

To pick up a weight, you should squat with the back kept straight, grasp the object and then straighten up. The whole work is done with the legs; and the leg muscles are designed for the work. The strongest muscles in the body are the thighs. Next in order come the shoulders. It is on these two sets of muscles that the brunt of weight-lifting and hard physical labor should always fall, not on the abdominal muscles and the slighter, weaker muscles in the pelvic region.

Here Is the Wrong and the Right Way to Lift the Clothes Basket; Any Weight Is Easier Lifted If You First Bend and Then Straighten Up

Don't Stand Back, But Get In between the Handles of the Wheelbarrow, as on the Left, Bend the Knees and Then Lift; Below, a Novel Support for the Truck-Garden Weeder

It Is Practically as Easy to Carry Two Twenty-Pound Bags as It Is to Carry One, Because the Man with Approximately Equal Weights in Both Hands Is Balanced; the Chinese Coolie's Carrying Pole and the Dutch Milkmaid's Shoulder Yoke, from Which Two Buckets Are Suspended, Are Both of Them Based on This Principle

The pictures at the bottom of page 219 illustrate the point. The first shows the incorrect position in lifting a weight; the strain is improperly placed. The other shows the correct procedure; the legs are bent, the weight is close in, the back is straight. The lift, therefore, is done entirely with the heavy leg muscles.

That's the first rule to follow in weight-lifting: Always use the leg muscles.

The second rule is: Get as close to the object as possible. A generation back, the "Georgia Magnet" amazed thousands of people by using this principle. Even the strongest man found it impossible to lift her body because she so cleverly contrived to keep him always at arm's length.

So, in picking up a wheelbarrow, for example, do not stand at some distance from the ends of the handles, but get your body close in so that the leg muscles can lift directly upward without the disadvantage of a diagonal cross strain.

Another important factor in weight-lifting is balance. The Chinese coolie, who carries weights by balancing them on the end of a long pole, has the right idea. In everyday usage, the man who carries two bags of twenty pounds each has very little more to carry than the man with but one twenty-pound bag. The reason is—balance. Moreover, when the weight is balanced in this manner you are

Carry Heavy Weights across the Shoulder, Not in Front of the Body, and Shovel, as the Man in the Center and the One Below Does

far less liable to strain and posture defects than when the burden is carried almost entirely by the muscles on one side of the body.

Get the weight on top of your body whenever possible. It is not a good rule for wrestlers, but it saves backaches to the weight-lifter. A sack of flour, a small box, a heavy plank and other such articles should always be carried across the shoulder, and not in front of the body, hanging down from the partially contracted arms. In lifting a trunk, the weight should be rested on the knees, and the heavy thigh muscles called into play.

Always use the thigh muscles. It sounds simple enough, yet there are people who never give their legs a chance to prove their worth. Few people even know how to get out of a chair. The wrong way is to put the feet far in advance of the body weight. The comparatively small-muscled arms are compelled to do that which should properly be consigned to the heavy leg muscles. When you get out of a chair, do it with the feet almost directly under the body; it needs but a slight forward movement of the trunk and a gentle straightening of the legs to bring the body to an upright position.

A day of sand shoveling teaches the inexpert many things. One of these is the law of leverage. It is far easier to lift a long-handled shovel than a short one. For that reason you should use a maximum stretch of the arms in shoveling with a long-handled shovel, and not merely content yourself with a short grip. Also, do not bend over to an unnecessary degree. Use your leg muscles.

The right way is to squat slightly as you bend over. Use your left knee to sink the shovel into the sand bed—an important contrast from the more tiresome "arm shoveling."

The Leg Muscles, Constantly Exercised by Walking, Are Also Made for Lifting, and Save Back Sprains

All small matters. Nevertheless, they explain why Big Bill always has the backache, while Little Bill needs only a shower to perk him up. Little Bill knows: That his legs were made for lifting; that a weight should be carried on top of his body whenever possible; that a balanced weight is an easy weight; that the closer the weight the lighter the weight.

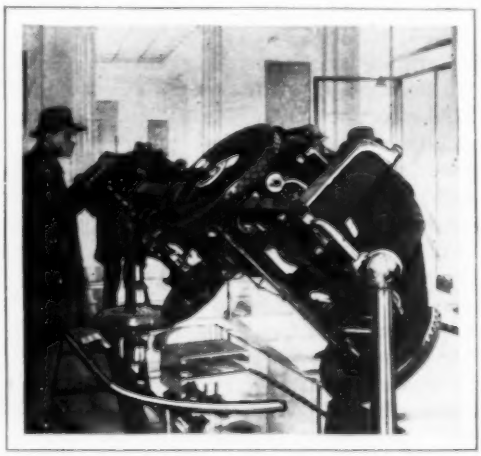
Big Bill is always tired. Big Bill doesn't know these things.

MYSTERIES OF STARS' ORIGIN INCREASE WITH TIME

Astronomers are less positive about stellar evolution now than they were twenty-five years ago, according to Prof. Edwin B. Frost, director of the Yerkes observatory of the University of Chicago, at Lake Geneva, Wis. The nebulae from which the stars were supposed to have originated are now thought to be mere borrowers of light, shining in the illumination from stars near by. Another theory that has been abandoned is that the stars must have started from a state of rest. Observations show that they are all in motion and there is no reason to believe that they were still at any time. Better telescopes and the development of the camera have expanded the scientists' conception of the size of the universe some 10,000 times, within the last thirty years, Prof. Frost declares. Holding a dime at arm's length against the milky way, obscures some 15,000,000 suns, astronomers estimate, while between 300,000 and 400,000 stellar images may be revealed on a single photograph, although it covers less than one-thousandth part of the sky. A star like Antares gives the scientist some idea of the tremendous proportions of the heavens. By accurate measurements, astronomers have discovered that this body has a bulk 40,000,000 times that of the sun.

UNSEEN SALESMAN HELPS AUTO BUYERS

Persons interested in the automobiles sold by a Paris merchant are not annoyed by the presence of a talkative salesman while examining the cars. They hear selling talk, but it is given by an attendant who sits, unobserved, at a desk some distance away and describes the good points of the car through a microphone and loud speaker. The auto is stripped to show its internal parts and turns on a pivot, over a mirror, while visitors inspect it.



Demonstrating Auto on Its Rack, with Mirror Below; Salesman Talks through a Loud Speaker

AIR-MAIL MILEAGE SIX MILLION ANNUALLY

United States air-mail planes flew 5,870,480 miles in 1927, according to figures just compiled by the department of commerce, and in that period they carried 1,654,165 pounds of mail and 2,263,480 pounds of express, not to mention 8,679 passengers. The air mail alone brought the carriers an income of $2,643,454. The enormous amount of aerial express shown by the figures was due to the Ford line from Detroit to Chicago, carrying automobile parts to the assembly plant in the latter city. This one line handled 2,217,621 pounds of express. On May 15 of this year, there were 11,067 miles of airways in daily operation, and the regular plane schedules called for the flying of 26,737 miles daily—greater than the distance around the earth at the equator. In addition to the regular airways operations in 1927, nine transport operators flew 36,918 passengers a total distance of 500,000 miles. Statistics have been compiled covering the air-mail lines, showing that from 1918 to the end of June, 1927, the postal planes flew 15,657,530 miles, carried 298,517,760 letters and completed ninety-three per cent of scheduled trips.

ELECTRIC COOLER IN TRUCK HELPS MOTOR SHIPPING

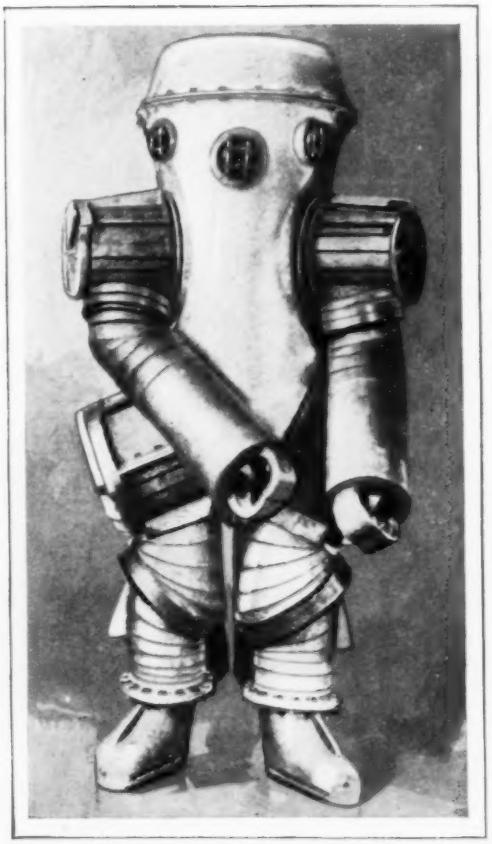
Transportation by motor truck will be made more effective, it is believed, by the introduction of an electric refrigerating unit in the carrier for shipping perishable articles. Butter, eggs and meat are now being handled by an auto-truck line in the west with the help of this equipment.

The "Berengaria" as a Motion-Picture Studio; Filming a Night Scene with the Aid of 4,000,000 Candlepower Lights

HUGE LINER AS MOVIE STUDIO AFFORDS REALISTIC SCENES

In taking scenes for a British motion picture, the "Berengaria" was temporarily converted into a studio. Current for the electric lights needed for night effects was obtained from the ship's own lighting system, nearly 4,000,000 candlepower being used. One of the most interesting views was of a rescue at night, featuring the lowering of a lifeboat from the davits, while the lights were played along the side of the steamer. Cameras and lamps were stationed on special rafts floated near by.

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine.



Heavy Diving Suit Designed for Work at Depths of 200 Feet and for Forty-Five-Minute Periods

QUEER DIVING SUIT TO REACH GREATER DEPTHS

Divers will be able to descend to a depth of 200 feet and work for forty-five minutes and more, in a metal suit recently devised, its inventor hopes. It weighs 1,400 pounds, is equipped with powerful lights and its steel body has overlapping units of aluminum, somewhat like the scales of a fish. The air hose will be contained in a steel-protected sheath.

MAKING GLASS EYES REVEALS BLOWERS' HIGHEST SKILL

Since 500 B. C., when they were made of earthenware and pebbles, the art of fashioning artificial eyes has been developed to a high degree. Today, they are made by expert glass blowers who use no brushes and no tools other than their blowing tubes. A first step is to form a bubble of opal glass the size of the eyeball desired. The iris is put on next by heating and fusing minute streams of blue, brown and other glass until the exact shade is obtained. Some of the color rods have to be heated and drawn out to a fine thread. Flint soda glass is employed, as it is hard and does not irritate the eye socket. When the iris is done, the pupil is added and then the lens, a coating of crystal glass applied in a molten state. For the veins, threads of glass so small as to be almost invisible are added. The back is shaped so that the muscles will grip the eye. Cooling in a sand bath is the last step. Artificial eyes have been made for birds and dogs. A Chow dog, entered in a contest, had a glass eye that was so nearly perfect it escaped the notice of the judges who gave the dog a mark of 100 per cent on its eyes.

ICELESS COOLER KEEPS MILK AND FOODS FRESH

Designed especially to prevent the bottle from spoiling when left on the doorstep, a cooler, adaptable also to other products, has been introduced. It consists chiefly of a cone-shaped frame covered with cloth, which is kept moist by water supplied from a jar at the top. The cooler is placed over the bottle in a drip pan partly filled with water, to shut off outside air. The cooling is accomplished largely by evaporation of the water as it soaks down into the cloth. One filling of the jar is said to be sufficient for twenty-four hours or more. The cloth is easily removed for the purpose of cleaning.

FIRST AID FOR GOLDFISH

Artificial respiration, similar to that used in reviving human victims, was applied in saving the life of a goldfish not long ago. A woman discovered her pet lying on the

floor, apparently dead. She held it under water with one hand, grasping it with the other just back of the gills, and applied intermittent pressure. In a few moments, the fish showed signs of life and, at the end of twenty minutes, it was swimming about in a normal manner.

SAND LOADER DEVELOPED FROM TOY

Toys modeled after full-size machinery are not new, but the development of a practical machine designed from a toy is an unusual procedure. A California inventor who has produced a small toy sand loader to add to the joys of children's play, is preparing to market two sizes of large machines for commercial use. The toy loader, which scoops up sand and empties it into a toy motor truck, has a ten-inch disk wheel, fitted with scoop buckets to dig the sand and elevate it into the truck. It weighs but seven pounds, and comes in a convenient carrying case. The large machines will have conveyor belts for distant delivery of the sand.

Toy Sand Loader Which Served as Model for a Commercial Unit; It Operates like the Larger Loaders

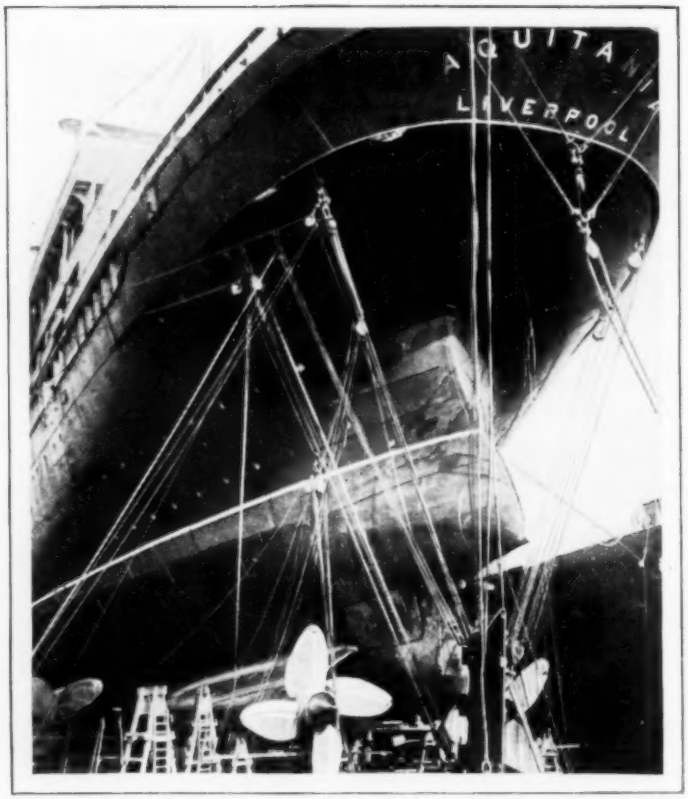
Powerful Airplane Beacon and Tower with Identifying Letters; the Light Can Be Seen for More than 100 Miles

BIG AIRPLANE BEACON ON HILL VISIBLE HUNDRED MILES

Two powerful beacons have been erected recently in California to help guide airplanes. One is near San Francisco, the other on a hill not far from Los Angeles, and each is visible at a distance of 100 to 150 miles. Lamps of 10,000,000 candlepower are installed at the top.

MIND WORKS BEST AT NIGHT STUDENT TESTS SHOW

In the morning, after a night's rest, the mind is well prepared for brief spurts of activity but is too restless for long concentration, experiments have shown. Mental tests on a number of students recently, proved that the subjects achieved a ten-per-cent higher score at night. As the day wears on, the brain appears to become better adapted to concentration.



The "Aquitania" in Drydock during Change of Rudder, Which Is Seen Connected to Tackle on Ship's Sides

RUDDER AS HIGH AS A HOUSE GUIDES BIG SHIP

The "Aquitania" was without a rudder for a short time recently, but no harm was done, as the vessel was in drydock undergoing repairs. Although the rudder alone is a huge unit, it seems tiny in comparison with the vast bulk of the ship, which is nearly 869 feet long. Its engines develop 60,000 horsepower.

NOISE CAUSES MILLIONS LOSS IN DECREASED EFFICIENCY

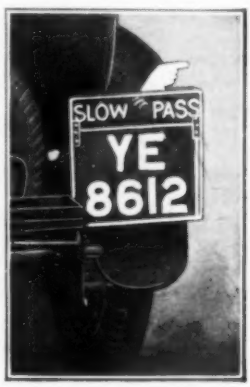
According to the estimates of a British expert, noise causes a loss of more than $5,000,000 weekly in England alone. He bases his assertion on the contention that disturbing sounds of various kinds result in impaired efficiency among workers of many classes, loss of sleep and sometimes illness. Many persons become accustomed to certain noises, but it is said that, although they do not appear conscious of them, the sounds have a detrimental effect upon their nerves. Tests have been conducted with office workers and others to show that they perform their tasks more efficiently in rooms relatively quiet than where there is disturbing noise.

A BIRD'S EYE SECRET

Birds have exceptionally keen eyesight and the additional faculty of seeing an approaching person while apparently intent on feeding. Small birds will instantly discover a hawk, although it is so high as to be merely a speck to the human vision. The mystery is explained by the fact that the bird's eyes do not co-operate but each can focus on a different object at the same time. While one is intent on searching the ground or other close area for food, the other may be adjusted for distant vision.

HAND ON REAR AUTO SIGNAL PROMOTES SAFETY

So that drivers behind may clearly see what course the car ahead is to take, a rear auto signal recently put on the market flashes the words "Slow" or "Pass" and a small white hand, visible from a distance, points in the direction that the machine is to go. This is operated by a special switch, while the words are automatically illuminated.



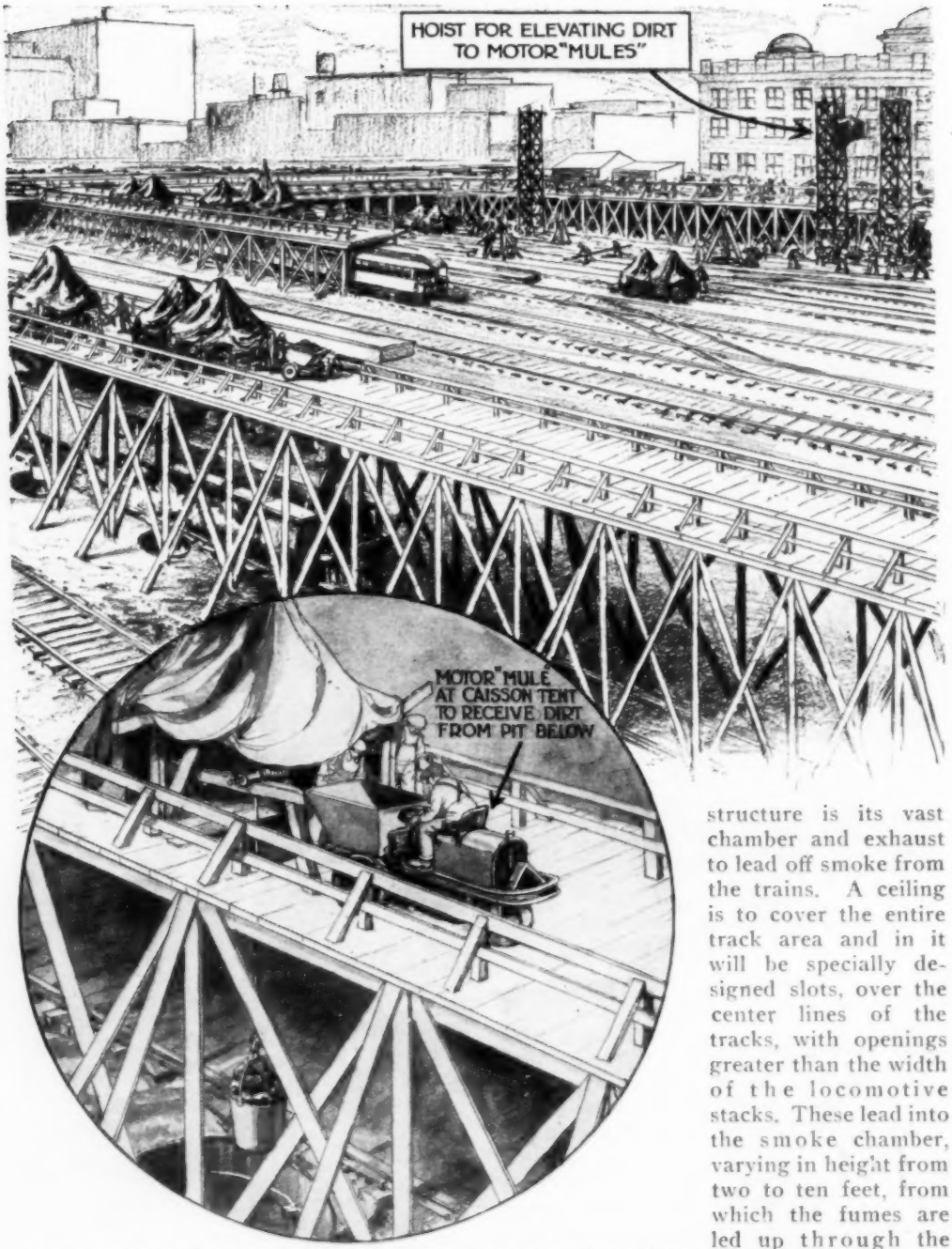
© P. & A.

Air Rights Skyscraper Swallows Railways

Drawing of the Chicago Daily News Building, Showing the Smoke Chamber over the Railroad Tracks, and the Stacks to the Top of the Chamber

BY covering their railroad tracks with buildings, cities are utilizing valuable space to relieve congestion and to hide unsightly terminals. The first notable development of the "air rights" in Chicago is now under way with the construction of a twenty-five-story skyscraper, the new home of the Chicago Daily News.

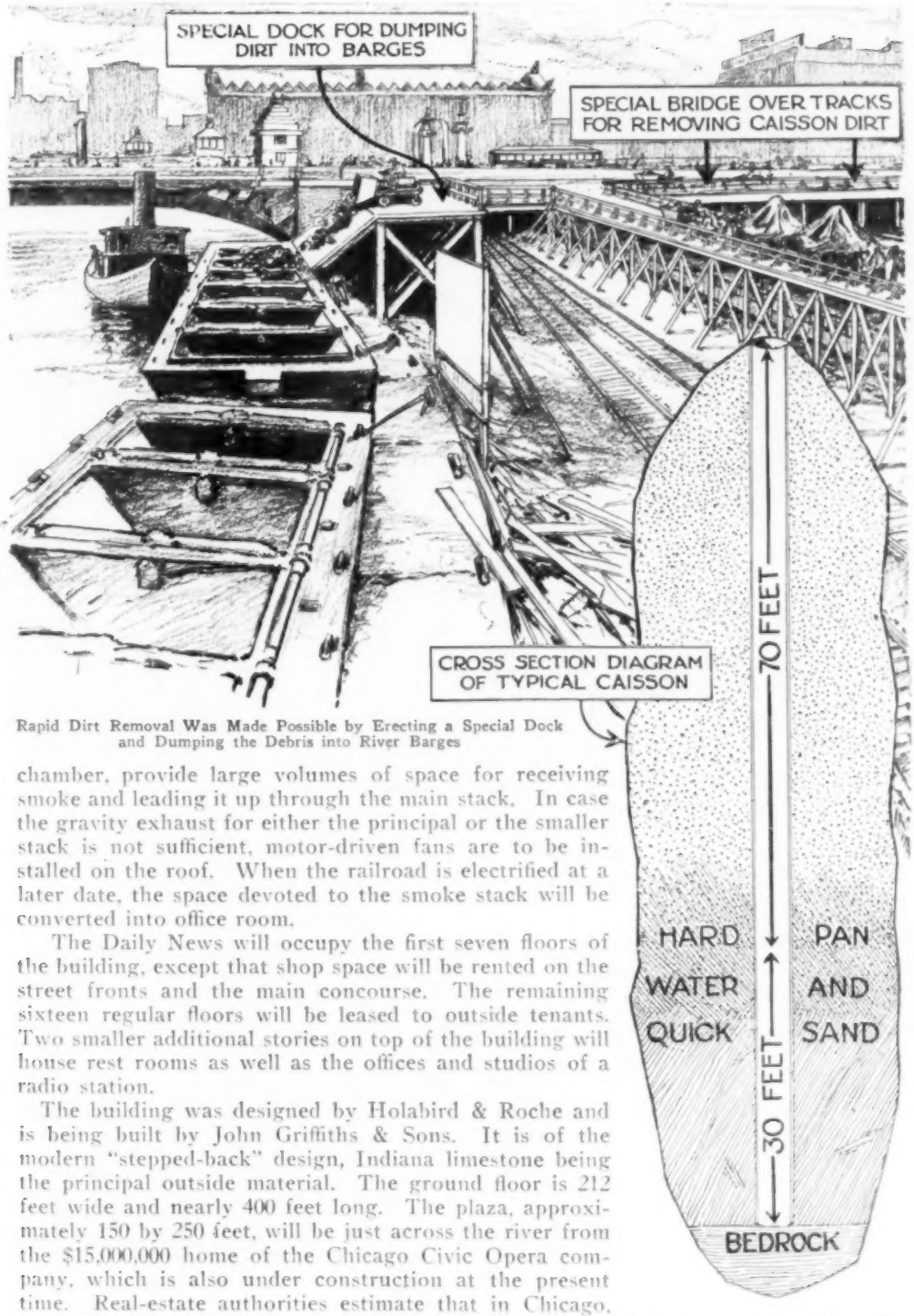
Interesting engineering problems were solved in this project. In the first place, 100 caissons were sunk 100 feet to bed rock to support the main structure, and fifty-nine were dug to hardpan as foundation for the plaza, an unusual and beautiful feature of the building. All of them, comprising more than two and one-half miles of boring, were made without interrupting train service, although they are scattered among the network of tracks. This



Trains Were Not Interrupted while the Building Was Erected above Them; Note the Caisson in the Inset, Close to the Track

was done by erecting scaffolds and platforms for the dirt-bucket elevators, so that trains could run underneath.

The second unusual feature of the structure is its vast chamber and exhaust to lead off smoke from the trains. A ceiling is to cover the entire track area and in it will be specially designed slots, over the center lines of the tracks, with openings greater than the width of the locomotive stacks. These lead into the smoke chamber, varying in height from two to ten feet, from which the fumes are led up through the stacks to the top of the building. In the main stack, containing 220 square feet of area and extending 335 feet above the tracks, the smoke is conducted by gravity. Domes, or extra-high places in the smoke



Rapid Dirt Removal Was Made Possible by Erecting a Special Dock and Dumping the Debris into River Barges

chamber, provide large volumes of space for receiving smoke and leading it up through the main stack. In case the gravity exhaust for either the principal or the smaller stack is not sufficient, motor-driven fans are to be installed on the roof. When the railroad is electrified at a later date, the space devoted to the smoke stack will be converted into office room.

The Daily News will occupy the first seven floors of the building, except that shop space will be rented on the street fronts and the main concourse. The remaining sixteen regular floors will be leased to outside tenants. Two smaller additional stories on top of the building will house rest rooms as well as the offices and studios of a radio station.

The building was designed by Holabird & Roche and is being built by John Griffiths & Sons. It is of the modern "stepped-back" design, Indiana limestone being the principal outside material. The ground floor is 212 feet wide and nearly 400 feet long. The plaza, approximately 150 by 250 feet, will be just across the river from the $15,000,000 home of the Chicago Civic Opera company, which is also under construction at the present time. Real-estate authorities estimate that in Chicago, there is property valued at more than $400,000,000 which might be developed by utilizing the air rights over the tracks, as has been done in the Daily News building.

It Does the Work of Several Clerks, the Coin-in-the-Slot Stamp Dispenser, in New York Post Office

COIN-IN-SLOT STAMP DISPENSER FOR POST OFFICE

Distributing stamps from a coin-in-the-slot machine is not a new idea, but the method has been amplified in a dispenser installed in the New York post office. It delivers several denominations of stamps besides books of them, stamped envelopes and postal cards. No extra charge is made for the service, the customer getting the full equivalent for his money just as he would at the regular stamp window.

FEVER FROM LOW-WAVE RADIO TO HELP TREAT DISEASE

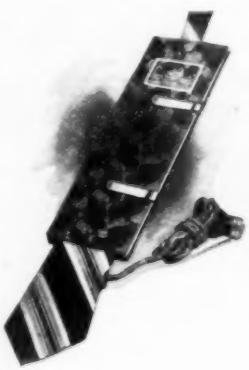
That radio may be used indirectly in treating disease, is the possibility suggested by recent investigations into the effect of waves of low frequency upon the human system. It had been noticed that men working about a six-meter set in an eastern laboratory frequently fainted, or became ill. A fever was present in almost all cases of this kind, and experiments showed that it was induced by the action of the waves. In treating some diseases, fever is induced to kill germs that will not live at high temperatures, so it is thought that radio waves may be used for this purpose.

PROBING THE TOMB OF FIRST ARTIST OF ALL HISTORY

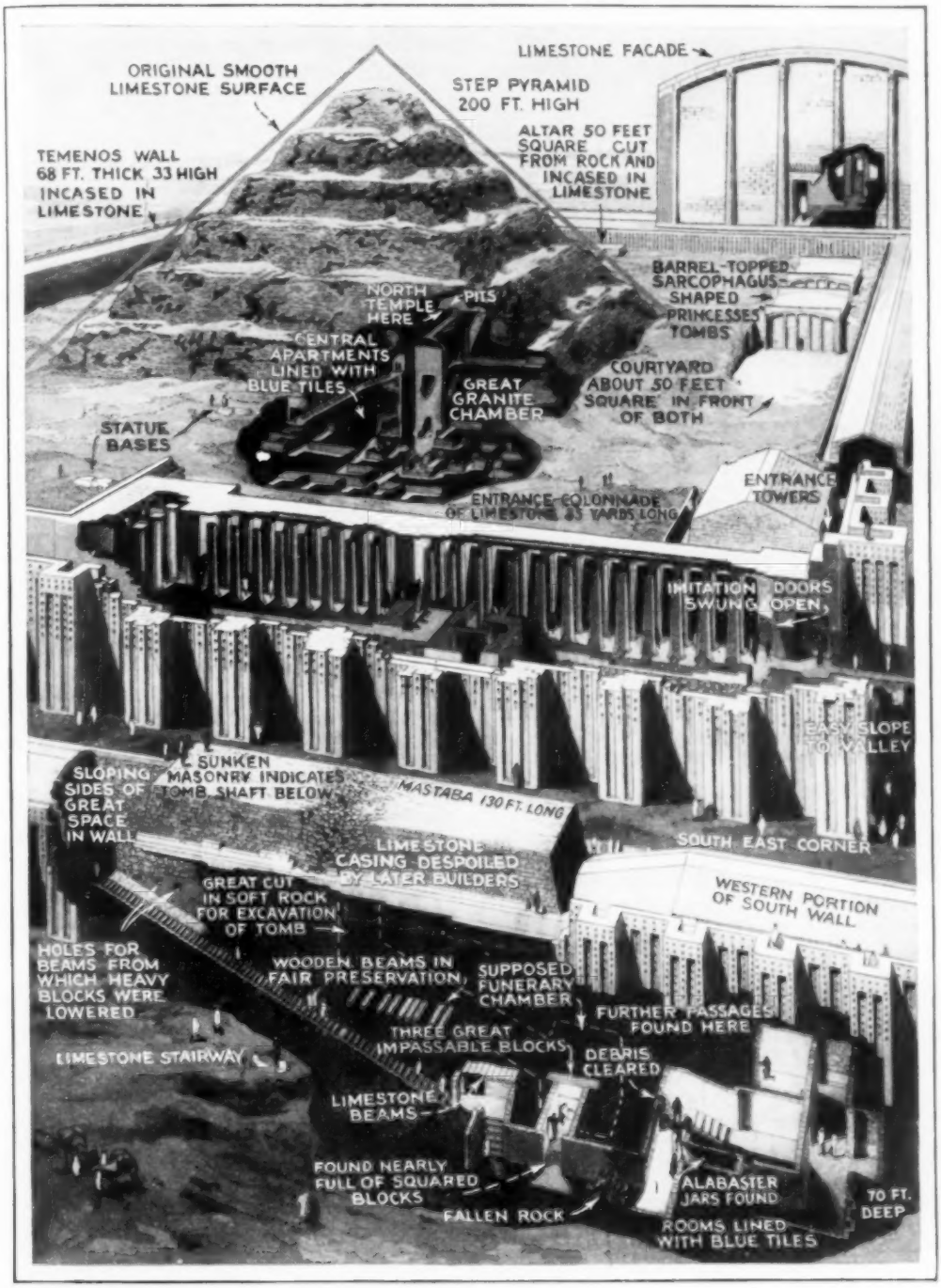
The tomb of Imhotep, the first great Egyptian architect and the first artist in recorded history, is believed to have been located by excavators who are probing the famous "Step Pyramid" of Saqqara, known as the oldest stone building in the world. The pyramid was built about 3000 B. C. by Imhotep for Zoser, famous pharaoh of the Third Dynasty. The excavations have already disclosed that the name Step Pyramid, given it because it rises in a series of terraces, is a misnomer, for the original pyramid was smoothly faced with limestone blocks, but later pharaohs had their workmen steal the ready-cut blocks to face their own pyramids, leaving the denuded base. The excavators have uncovered a series of princesses tombs, with delicately fluted columns, long series of underground passages and rooms, many lined with blue tile, and believe they have located the entrance to the burial chamber of the architect. They found a robbers' shaft, where tomb looters had reached some of the chambers seventy feet underground, but the discovery of a limestone stairway, leading down through a long sloping cut in soft rock, indicates the robbers never reached the real burial chambers far underground.

ELECTRIC PRESS FOR NECKTIES HELPS PRESERVE FABRIC

Neckties are kept in good condition at all times with the aid of a small electric presser which is suitable for home use. The tie is moistened slightly and then placed between the two sides of the unit, which apply pressure and heat from a lighting socket. A metal tongue, inserted in the tie, keeps the seam and lining from showing through on the face and helps hold the fabric for pressing.



WORLD'S OLDEST STONE BUILDING YIELDS SECRET



The "Step Pyramid," Above, with Lines Showing How It Appeared When the Original Smooth Limestone Facing Was in Place, and, Below, Diagrams of Some of the Underground Chambers Which May Lead to a Burial Chamber Far Older than King Tut-ankh-Amen's

For Service in Rough Country; the Three-Wheeled Motorcycle Tested by Military Experts in England

THREE-WHEELED MOTORCYCLE TRAVELS ROUGH GROUND

Designed for cross-country service, a three-wheeled motorcycle has been tested in England. There are two small wheels in the rear and the machine has a duplex steering arrangement. The cycle has been proposed especially for military uses.

BIG GLASS TESTED AT NIGHT TO REVEAL DEFECTS

Light, and plenty of it, is usually required in searching for visible flaws in any object, but the seventy-inch disk of optical glass recently made at the bureau of standards for the Perkins observatory at Ohio Wesleyan University, was subjected to its most exacting tests in darkness. The reason was that the internal condition of the big piece of glass is revealed by passing beams of light through it and then studying the patterns and colors that result. This can be done satisfactorily only in a dark place. There was no room large enough at the bureau, so the tests were performed at night. At least 100 feet of unobstructed vision was necessary in making the proper observations. The examination revealed that the distribution of internal strain in the piece was remarkably uniform, and that the degree of strain, per unit of thickness, was less than is frequently found in small lenses and prisms used in optical instruments of the highest precision. The glass is eleven inches thick and weighs 3,500 pounds. It was baked for eight months under graduated temperatures in a specially constructed furnace. Four previous attempts to obtain a disk of this size had been unsuccessful.

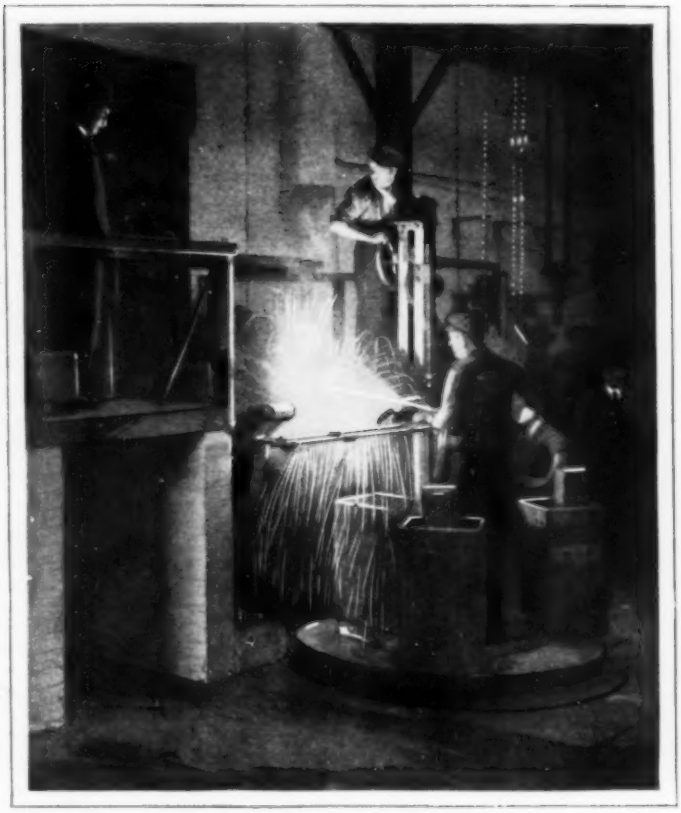
PICTURES "PAINTED" WITH SAND INSIDE OF BOTTLES

Forming pictures and designs of colored sands on the interiors of bottles, is the interesting art hobby of a California man who got the idea from a natural group of "painted rocks." The grains are carefully arranged with special instruments to achieve the effect and the bottles are packed full and sealed so that the sand will not become loose and spoil the pattern. Fifty-six shades, all of natural colors and of samples sent to the artist from different parts of the world, are employed in making the designs.

Completing a Sand Design on the Interior of a Glass Bottle; the Grains Are of Many Different Colors

CRUCIBLE STEEL IS MADE WITHOUT FURNACE

Steel is made by electric current, without the use of wires or a furnace, under a process recently developed. The material is melted inside a wooden box that remains quite cool to the touch. The method is adapted to the melting of crucible tool steel, which has been made in clay pots heated in a furnace and lifted out with long tongs. Under the new process, some 450 pounds of metal are put in a single crucible surrounded by an inch of sand to prevent the radiation of heat. Around the sand, is a coil, cooled by water, carrying a high-frequency alternating electric current. The whole is encompassed in a wooden casing so that the apparatus resembles a large packing box. By action of the current in the coil, although there is no direct connection with the crucible or its contents, heat is induced in the metal until it is melted and, at the same time, the steel is made to move violently so that a thorough mixing results.



Making Crucible Tool Steel in a Wooden Box, Which Contains the Crucible and the Electric Heating Element

GRIP GUIDE FOR GOLF PLAYERS HELPS IMPROVE GAME

Easily slipped on, a grip arrangement is said to teach the beginner how to hold his thumbs and fingers in the proper manner, to strengthen the left hand and insure control of the stroke, especially at the top of the swing. It automatically holds the club in the fingers and lifts the palm away from contact with the shaft at the same time. The guide is worn on the third and fourth fingers of the player's left hand and is held in place by adjustable straps. Once adjusted, there is no need to loosen the strap. It is slipped on and off like a glove. Left-handed players use it on the right hand, on the third and fourth fingers. It is used with all clubs.

FABRIC FOR CEMENT ROAD SIMPLIFIES REPAIRS

Laid over the concrete base of a road, a fabric of loose cotton mesh affords cleavage between the foundation and the surface material. When the top layer must be repaired, it can be removed, and a new surface installed, without impairing the more permanent base below it.

The "Train Shed" of the New Airport to Be Built at Pau, France; International Planes from All Europe Will Take Off and Land within the Giant Airdrome, Safe from Rain and Snow

French Plan Airport Modeled on Railroad-Terminal Lines, with Giant "Train Shed" for Air Passengers

A RADICALLY new idea in airports is to be realized at Pau, France, fifty miles from Bordeaux, as a result of competition for the best airdrome plans. The winner of the prize, Maurice Chauchon, who also has won a traveling scholarship in the United States to permit him to study American architecture, has taken the railroad-terminal idea and applied it to the needs of aerial travelers.

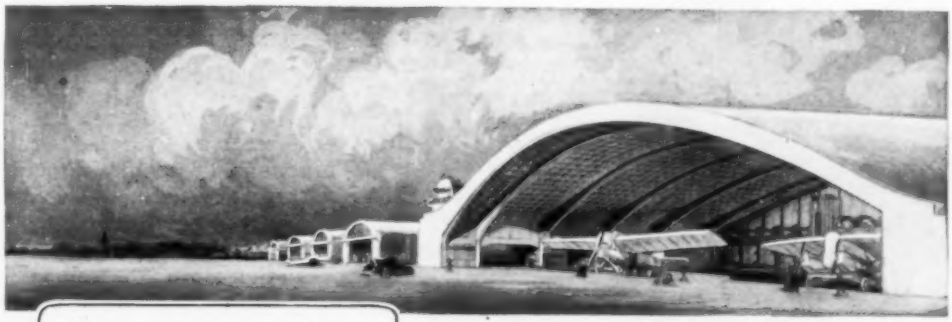
Under a glass-lighted "train shed" of heroic dimensions, the passengers of the European international air lines will embark and debark, sheltered from the weather and protected from the dust or mud of the usual landing field. The enormous landing room is to be 370 feet wide and 260 feet deep, furnishing plenty of room for three of the largest air liners at one time. The incoming planes, landing on the open field, will taxi directly into the shelter, and after unloading, will run out again and down the line to one of the row of hangars alongside of it.

Two giant searchlights will be mounted at the front corners of the landing shed, one of each pair pointing directly upward at night as beacon lights, and the other leveled across the field, to furnish a stream of illumination for landing planes. The marking beacon of the field, throwing three vertical beams, will be at one side of the hangars, and the name, set in the ground, will be covered with heavy glass and electrically lighted by night.

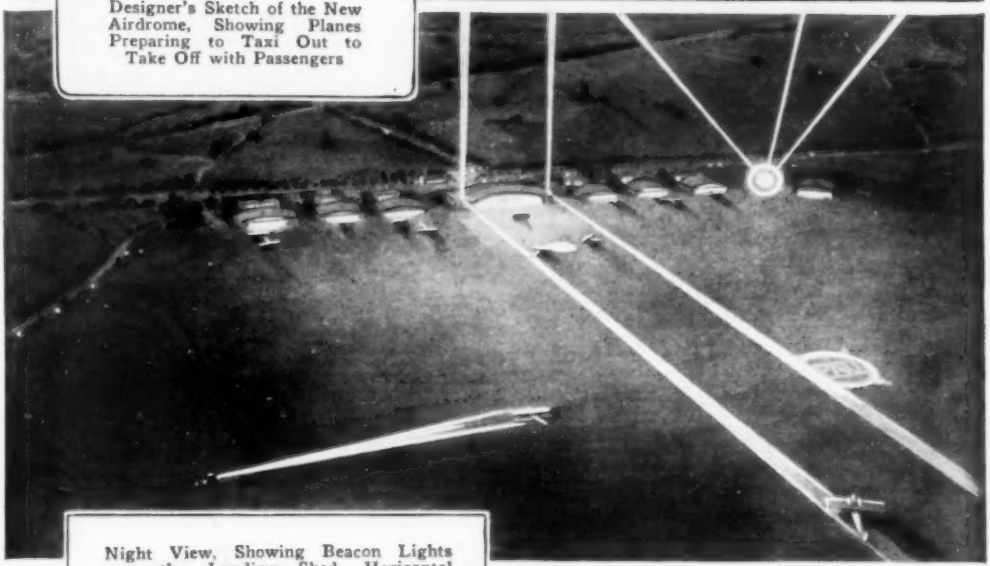
In addition to the landing room and hangars for the planes, the plans include machine shops, storehouses for spare parts, a restaurant, hotel rooms, custom office, information bureau, ticket office, and even a booth where money can be exchanged for the currencies of any other country to be visited, so the traveler will reach his destination supplied with funds of the right kind.

Although only twenty-eight years old, the designer has won a number of other prize contests since his graduation from the famous Ecole des Beaux-Arts.

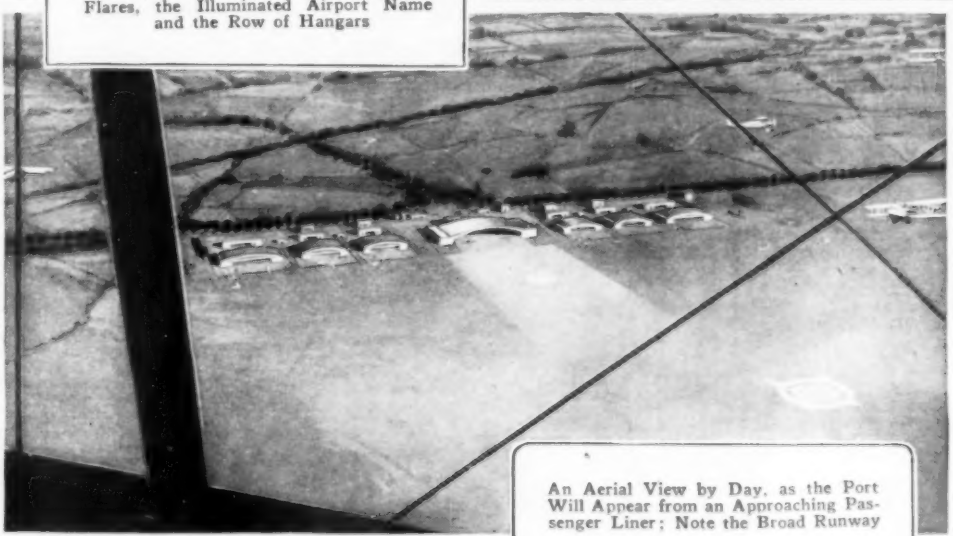
The American Institute of Architects established the French traveling scholarship, which has been awarded M. Chauchon, as "a valuable contribution to international architectural education and a graceful recognition of our educational debt to France."



Designer's Sketch of the New Airdrome, Showing Planes Preparing to Taxi Out to Take Off with Passengers



Night View, Showing Beacon Lights over the Landing Shed, Horizontal Flares, the Illuminated Airport Name and the Row of Hangars



An Aerial View by Day, as the Port Will Appear from an Approaching Passenger Liner; Note the Broad Runway

Steadying the Small Motion-Picture Camera with the Shoulder Strap and Supporting Rod

STRAP HOLDS MOVIE CAMERA FOR STEADY PICTURES

To keep the small motion-picture camera steady while in operation, a shoulder strap and supporting rod have been introduced. The rod is placed in a socket at the lower part of the strap loop, which is easily adjusted to fit the wearer. The arrangement makes it easy to focus the instrument, takes the weight from the hands and arms and eliminates most of the bothersome shaking in the finished reel.

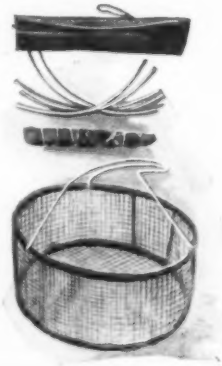
AUTO CLOCK LIKE SPEEDOMETER WITHSTANDS SHOCKS

Resembling a speedometer, a clock for the automobile instrument board is said to keep accurate time in spite of the jolts and jars it receives, and has the further advantage of being more easily read than the usual dial. No hands are exposed, merely the numerals, the hours being displayed in an upper opening, while the minutes are registered in a window below.

THINKING MACHINE FOR STORE HELPS RECORD SALES

Constant record of merchandise, from the time it is unpacked until it is sold, is kept by means of an apparatus devised especially for department stores. It combines the functions of tabulating units, telephone selector devices and electrical transmitters and recorders. A chief purpose is to enable clerks and others in various parts of the store to transmit a quick and accurate record to the central office, where the data are conveniently arranged for auditing or other examination. Transmitters are distributed in the various departments of the store and connected with the recording units at the central office. By inserting a punched card into the transmitter, a record is made at the main desk of such factors as the selling price of the article, the salesman, cashier and the customer. The installation is said to save time, reduce trouble by eliminating the loss of bills and merchandise slips, and to afford a means for a quick check-up.

MINNOW NET COMES APART FOR EASY PACKING



For greater convenience in carrying, a minnow dropnet is quickly taken apart when not in use. The hoops are made of steel and the net is shaped to insure a large catch. The outfit is light in weight and rolls up into a very compact bundle.

"ROBOT" TO GIVE ANAESTHETIC SAVES EXTRA ATTENDANT

A mechanical unit that administers anæsthetic has been developed by a University of Maryland professor. It does the work of an extra attendant and is also said to prevent an under or overdose, as it uses the exact amount to keep the patient unconscious. Its operation is governed partly by the subject's breathing.

POWER OF AUTOMOBILES EXCEEDS ALL OTHERS

If all the automobiles in the United States were linked to the stationary engines of all descriptions and sizes, locomotives and windmills, the motor cars would outpull the entire assembly, according to figures compiled by the department of the interior. In 1923, the horsepower of all generating equipment, exclusive of pleasure automobiles, was 230,514,000, while the total, including pleasure cars, was 684,044,000. In 1849, two-thirds of the total industrial power equipment was found on farms, but in 1926, the farms had only seventeen per cent. Between 1899 and 1923, the capacity of this equipment increased 260 per cent. If converted into man-power, this amount of horsepower would furnish sixty servants for every person in the United States.

CYCLE LEAP THROUGH HOOPS FEATURES MOTOR CIRCUS

At a recent motorcycle show in London, a rider demonstrated his skill by driving his machine through a double paper hoop while going at high speed. The stunt required a steady hand at the take-off, since the obstruction was of considerable length, and there was danger of turning the front wheel so as to make landing hazardous.

Through the Double Paper Drum; a Motorcycle Thriller

Foam Apparatus, and Drawing to Show Application to Oil Fire

FOAM GENERATOR STOPS FIRES IN OIL STORAGE TANKS

Adapted to the protection of oil storage tanks of moderate size, a foam generating unit has been introduced. It operates automatically, mixing a special fire-smothering powder with flowing water and discharging it to the top of the tank.

EGGS TESTED WITH EYEBALLS TO INSURE HATCHING

Hatching eggs in incubators is popularly supposed to be a modern method, but it has been practiced for many years in Egypt. The incubator is a dome-shaped building of mud and brick with six compartments, each having a capacity of about 500 eggs. Heat is furnished from smoldering barley and wheat straw which is spread in troughs. To determine if the eggs are being kept warm enough, the attendants hold them against their eyeballs. It is said that a high percentage of chicks are hatched in this way.

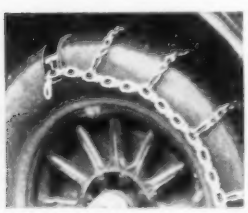
Going to Sea in a Basket: Passengers Boarding the "Llandovery" during a Heavy Storm That Made It Impossible to Use the Companion Ladder

PASSENGERS PUT IN BASKET TO BOARD STEAMER

High seas prevented the use of the companion ladder when passengers wished to board the liner "Llandovery" at Port Elizabeth, South Africa, recently, so a large basket was lowered from a derrick and the travelers swung to the deck without difficulty. The container was fashioned like an elevator car.

CLASPS FOR AUTO SKID CHAINS SIMPLIFY ADJUSTMENT

For easy attachment of skid chains to the automobile tires, a special clasp has been introduced. The links of the side chains are slipped into hooks on the clamp, the car is driven or rolled forward, pulling the chain with it, and, after one revolution, the links are in position for connecting and the clasp is removed.



HUNT MYSTERIOUS "DEATH TREE" IN AFRICA

Explorers have gone into central Africa to search for a strange plant which natives call the "death tree." According to legends, anyone who rests in its shade becomes unconscious and, if not rescued in time, dies. Native criminals are sometimes put to death by being bound and placed under the branches of the tree, according to reports. Pending the findings of the expedition, scientists are reserving opinions concerning the tree. Years ago, the upas tree of Java had a reputation even worse than that of the death tree. It was said to be fatal to anyone who came within ten or twelve miles of it. These stories apparently grew out of the fact that the natives were in the habit of dipping their arrows in the poison sap of the tree.

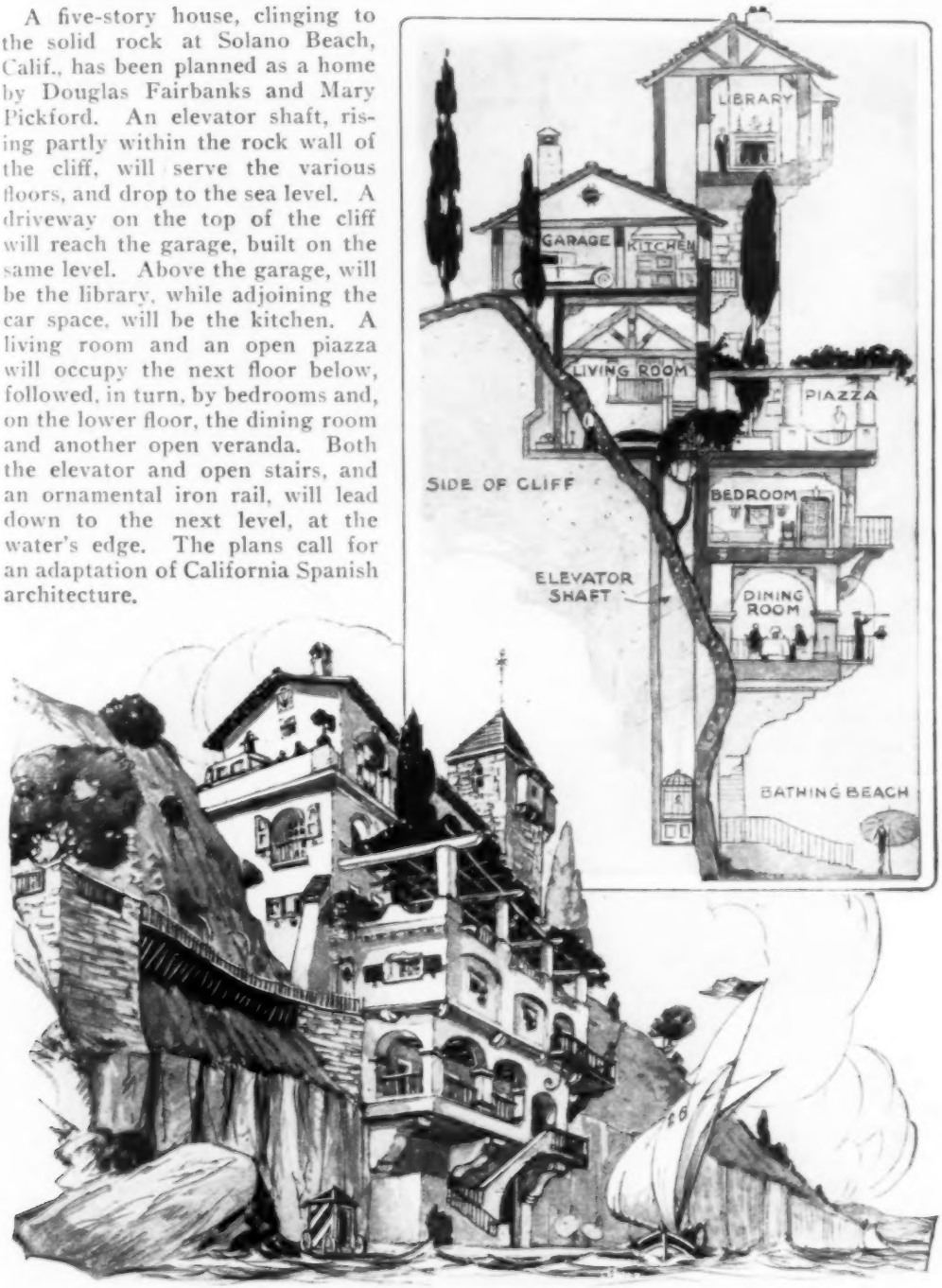
BAG HAS ELECTRIC HEATER TO KEEP WATER HOT

Usefulness of the hot-water bag is increased by inserting a special electric heating unit into the neck to keep the water warm. It is supplied with current from a lighting socket and is not intended to heat cold water, but merely to keep the contents at a high temperature. The attachment may be screwed into any standard hot-water bottle, is safe and consumes but little electricity.

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

MOVIE STARS PLAN HOME BUILT IN SIDE OF CLIFF

A five-story house, clinging to the solid rock at Solano Beach, Calif., has been planned as a home by Douglas Fairbanks and Mary Pickford. An elevator shaft, rising partly within the rock wall of the cliff, will serve the various floors, and drop to the sea level. A driveway on the top of the cliff will reach the garage, built on the same level. Above the garage, will be the library, while adjoining the car space, will be the kitchen. A living room and an open piazza will occupy the next floor below, followed, in turn, by bedrooms and, on the lower floor, the dining room and another open veranda. Both the elevator and open stairs, and an ornamental iron rail, will lead down to the next level, at the water's edge. The plans call for an adaptation of California Spanish architecture.



Artist's Sketches of the Seaside Home Planned by Douglas Fairbanks and Mary Pickford; at High Tide, Boats Will Be Able to Land at the Base of the Cliff, Mooring at a Swimming Float, While from the Topmost Floor a Wide View over the Pacific Will Be Available

Player Posing with the Mechanical Stroke Instructor; It Helps Teach Correct Form for Various Shots

DUMMY AS GOLF INSTRUCTOR SHOWS PROPER FORM

Golf swings are executed in correct form by a mechanical model which shows the proper position of the arms and legs at every point of the stroke. It is adjustable for drives or putts, and enacts every portion of a real stroke even to the follow through.

PHOTOGRAPHS MADE ON STEEL WITH HIGH EXPLOSIVE

Shooting a photograph into hard chrome steel with a high explosive was accomplished recently at the bureau of mines. A camera print was laid on a piece of the steel, about two inches in diameter and an inch thick. A disk of nitrogelatin was placed on top and fired. The paper photograph was completely destroyed but when the steel had cooled, a profile of the subject was found impressed on the surface. Where the picture had been black, that is, in the shadows, the surface of the steel was raised, and where there had been high lights, the steel was cut out. Another example of the effect of explosives in making pictures of this kind was obtained by transferring words impressed into the surface of the block of explosive upon a disk of steel. The action is explained by the fact that, when the explosion occurs, the entire amount of the solid is converted into gas which momentarily has the same shape and size as the original block of explosive. Where there is a cavity in the explosive material, the rapidly moving gas molecules find the line of least resistance for escape and in so doing, they collide with each other, producing a vast number of tiny "drills" which bore into the hardest steel. A somewhat similar result was effected in blowing open a safe with a hollow cylinder of dynamite. A number of sticks were tied into a bundle, the center ones pushed out with a tin can and the rest fired in a vertical position. After the explosion, there was a hole in the safe corresponding to the hollow center in the ring of dynamite stick.

VIOLIN WITH STRAIGHT SIDES IS EASIER TO PLAY

Instead of being curved, the body of a violin constructed by a Chicago maker is angular, the form enabling the player to reach farther on the strings although his fingers may be short, and making the instrument easier to hold under the chin. At the same time, an improvement in tone is claimed for this pattern, less likelihood of breakage and greater simplicity in manufacture with correspondingly less cost.

Inventor with Violin of Angular Pattern, Which Is Said to Be Easy to Play

STREET PAVEMENTS OF DIAMONDS IN KIMBERLEY

Blue clay, containing diamonds, was used in paving streets at Kimberley. When the mistake was discovered, the material was scraped up and carefully washed. Thousands of dollars worth of the gems were found, including several large ones. Huge blocks of jasper, topaz and jade were ground up to make roads in Swerdlovsk, Russia, and at Woolwich, England, waste from an arsenal was used for a road. It was found to contain brass valued at nearly $200 a ton. In the East Indies, roads were sometimes made of camphor wood, a rare and costly variety which is now valued for interior panelings and other fine finishes. In the city of Lyons, France, a costly road about one-eighth of a mile long was finished by laying the top with blocks of glass.

MILLION PIECES WASHED DAILY IN SLEEPING-CAR LAUNDRY

To maintain its "household on wheels," the Pullman company washes 1,000,000 pieces of linen daily for its 9,000 sleeping cars. It has sixty-six laundries in different parts of the country, so that fresh equipment may be more easily gathered and the soiled linen collected. A stock of 10,000,000 sheets, pillow cases, towels and sundries is maintained and 100 seamstresses are employed to do the mending. Some 400 persons are required to keep constant check of the bed linen. About 2,000,000 pieces disappear annually and 750,000 wear out.

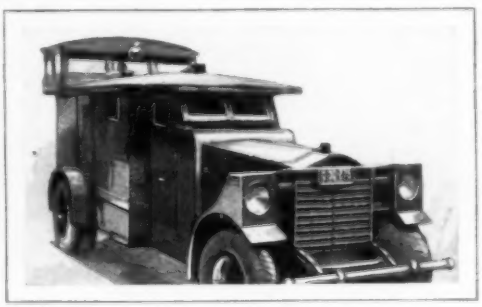
Baby Giraffe in "Skyscraper" Crate for Shipment; the Animals Are Difficult to Keep in Captivity in Northern Climates

"SKYSCRAPER" CAGE IS NEEDED TO SHIP BABY GIRAFFE

Caring for giraffes in captivity is one of the most difficult tasks of the animal keeper as the specimens are delicate and subject to many ailments in northern climates. Shipping them is also a problem. In transporting a baby giraffe, from South Africa to England, recently, a "skyscraper" crate had to be constructed.

OBSERVATORY IN ARMORED CAR HELPS GUARD MONEY

Guards riding with money in an armored car used in a western city, can command a wide view of the street, both in front and to the rear, through an observatory in the roof. The glass windows, windshield and headlights are of the bullet-proof variety, and the radiator and front lamps are also incased partially in armor.



Observation Cage on Armored Car Gives Treasure Guards a Wide View Ahead

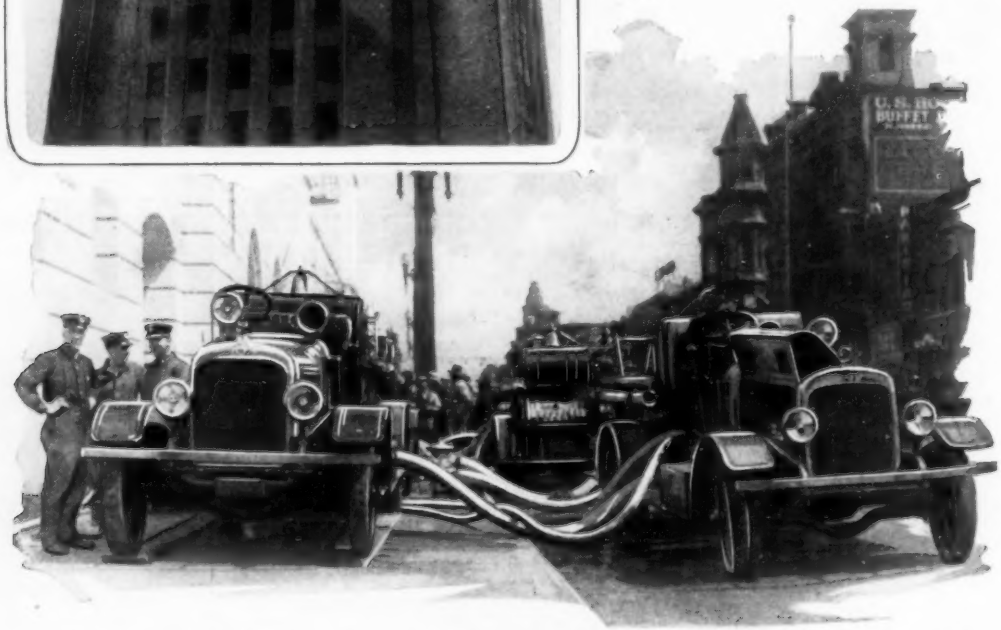
On the Trail

"IT'S a touch-off!"

Two men, one of them lugging a huge camera, hurry from an office of the Detroit fire headquarters, leap into a car and speed to a burning store, blocks away. The call, received by telephone, came from a battalion chief at the blaze. Sergeant George W. Smith and William F. McDonnell, the city's arson squad, a pioneer organization of its kind, are on the trail of a fire swindler.

To an unpracticed eye, there is little to indicate anything unusual in the smoldering debris of the store's interior. But a trace of white dust attracts the investigators' attention.

"Celluloid!" they exclaim, turning to the battalion chief. "You were right. This is a touch-off, sure."



Modern Skyscrapers Are Relatively Fireproof, but Powerful High-Pressure Systems Are Installed for Added Protection; Here, Engines Are Pumping Water through the Lines to the Top of the Tower on the New City Hall in Los Angeles

of the Swindler

Sergeant George W. Smith of Detroit's Arson Squad, Examining a Fire-Making Machine; This One Failed to Work and the Swindler Was Caught

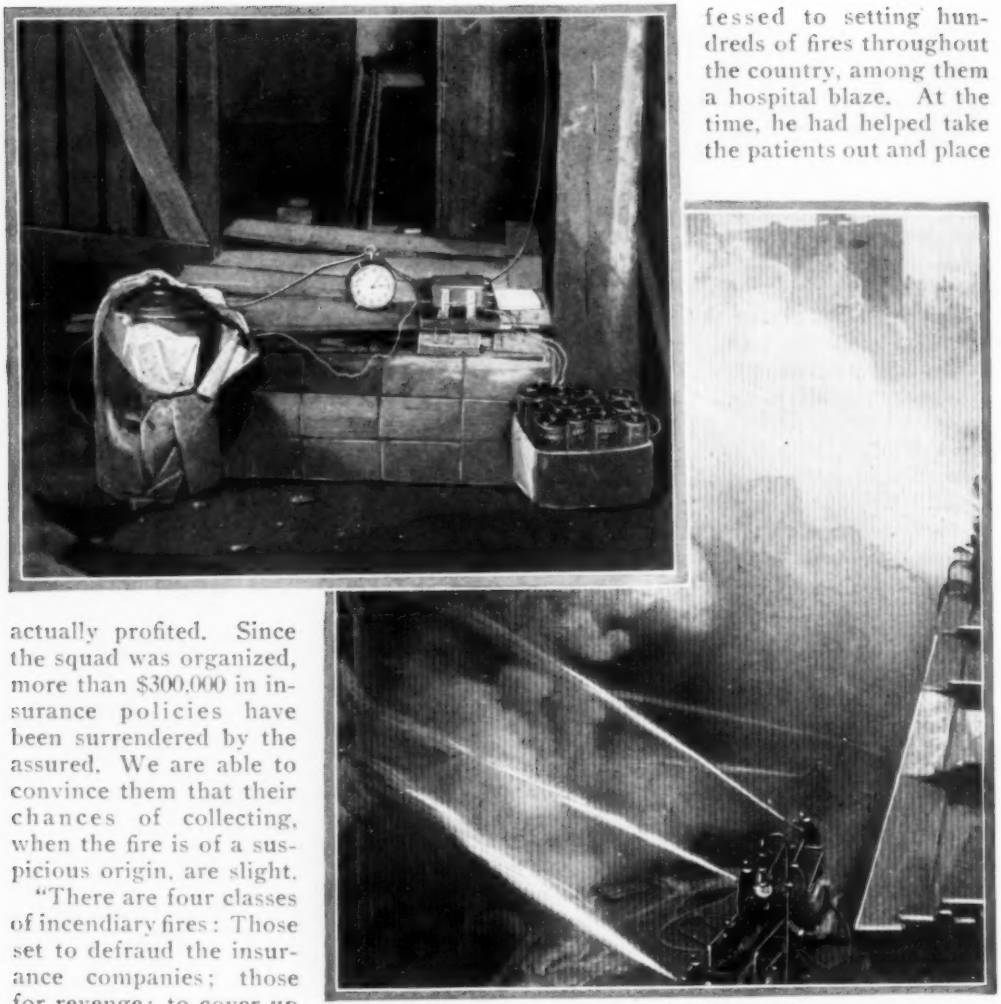
"I suspected something was wrong. No wonder three fires popped up at once," says the chief. The dust, sprinkled along the floor, had fed the hungry flames like gunpowder.

Sergeant Smith, who takes and develops all pictures himself, sets up his camera and snaps a half dozen views of the interior of the store. McDonnell scrapes up a bit of the powder. It will be sent to the city chemist for analysis. The merchant's papers, ledgers and other documents are seized. Firemen are closely questioned. Was the store locked when they arrived? Who has the keys? Where is the proprietor? Was the stock piled around the fire? Anything else unusual?

A fight to expose the fire swindler—one of the cleverest, most dangerous and most destructive of all criminals—is on. Since Nov. 1, 1921, Detroit's two-man squad has been engaged exclusively in this kind of work. They started when the city was suffering a veritable epidemic of "touch-offs." Fires were being set by contract. Chief of Detectives Edward H. Fox and Fire Marshal C. S. Goldwater finally decided to "fight fire with fire."

"Trained fire swindlers?" they said; "all right, we'll meet them with men specially trained to discover their tricks." Accordingly, the arson squad, one of the first in the country, was established under the supervision of the police department and composed of an experienced detective and a fireman, both empowered to make arrests and to seize evidence, if needed, without formalities of warrants. In the year the squad started, Detroit's loss from incendiary fires was $755,112.35. The average for the next five years was less than $265,000 annually. During the first ten months of 1921, there was not a single conviction on an arson charge. In November and December of that year, the squad effected three, and, since that time, have obtained thirty-two more. Detroit's insurance rates were lowered in 1923, resulting in a saving of more than $300,000 to the citizens. The arson squad, in the opinion of the insurance companies, was one of the reasons for the decrease.

"If you can't send a man to jail for arson, you can beat him in another way," said Sergeant Smith. "You can take the profit out of his fire. This fact can't be stressed too strongly. Arson does not pay the swindler. He is bound to lose in the end. I don't know of a single case in this city in which the swindler has



Electrical Set-Up Intended to Start a Blaze, but It Failed and the Arson Squad Caught the Maker

actually profited. Since the squad was organized, more than $300,000 in insurance policies have been surrendered by the assured. We are able to convince them that their chances of collecting, when the fire is of a suspicious origin, are slight.

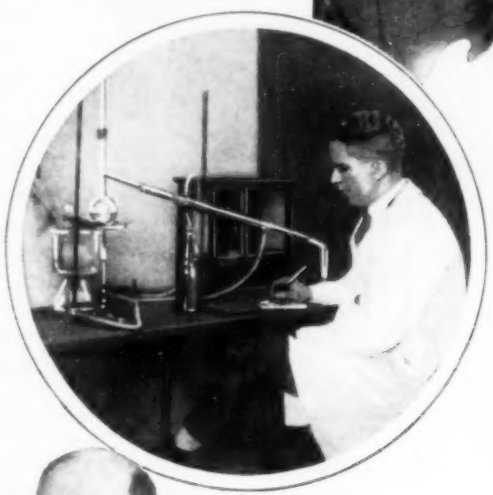
"There are four classes of incendiary fires: Those set to defraud the insurance companies; those for revenge; to cover up another crime, and those started by 'bugs.' In the first three classes, especially, there is often great difficulty in establishing a case. The motive is not always clear and the evidence is frequently burned up.

"The fire bug, that is, the pyromaniac, is not as clever as the swindler, but he is a greater menace. You don't know when or where he will break out. But we have found that he will often become active just after a big fire, with which he may have had nothing to do. The excitement seems to inspire him to some fire starting of his own. During a costly blaze here, recently, a pyromaniac dashed into four office buildings and set eight different fires. He was caught in the act and confessed to setting hundreds of fires throughout the country, among them a hospital blaze. At the time, he had helped take the patients out and place them in a hotel lobby. Then he set the hotel on fire. He's in an institution for the criminally insane now, but the tragedy was that he could not have been caught sooner. Fire fiends often start their careers with the relatively innocent amusement of turning in false alarms for the fun of seeing the engines. But anyone addicted to this malicious tendency should be curbed at once, for he is a potential pyromaniac. When the excitement of seeing the engines has died down, he is likely to try starting fires for an additional thrill.

"Our main trouble, however, is not with the pyromaniac. He is usually so clumsy that he leaves clues, and once captured,

his pitiful mental condition is not difficult for a competent physician to determine. In the case of the swindler, we are dealing with a criminal who has no thought for the danger to which he may be exposing others, and who usually is also smart enough to realize that, if possible, he must cover up his tracks. The swindlers are growing more and more clever in their technique, but here is something they often overlook. The very pains they take to start a 'natural' fire, to stage a 'perfect crime,' in other words, may be their undoing. Take a look at this!" He shoved a queer-looking wooden contraption across the desk.

"That's a fire machine and it's a dandy. But, fortunately, it didn't work. Notice that a razor blade is attached to the alarm clock in such a way that, at a certain time, it will vibrate and sever the string, and the weight will pull a strip of abrasive along the place right here, where some matches were inserted. But, in this instance, the matches were a fraction of an inch too high. The abrasive strip didn't touch them. Elaborate fire machines are made with electric coils and batteries, with the aid of candles and other apparatus.



"Sometimes, luck seems to be against the swindler. Not long ago, a man poured ten gallons of high-test gasoline over his store and touched a match. He came flying out through the plate-glass window almost into the arms of a policeman. And he had his insurance policy in his pocket! Another fellow slipped up because he failed to arrange his bed to make it appear as though he had occupied it. He left town after setting things so that his store would catch fire early in the morning. He declared later that he was in a neighboring village and so could not have had anything to do with causing the fire. He even introduced a telegram he had received at his hotel. It was from his wife, telling him about the fire. The message had been delivered all right and he had received it in his room. But he left the hotel at once, the evidence subsequently showed. The point was clinched, when the chambermaid testified that she had found his bed undisturbed

Sergeant Smith and William F. McDonnell Answering Call; Chemist Analyzing Fire Evidence and McDonnell Inspecting Kerosene Container

Alarm Clocks Are Favorite Tools of the Fire Swindler as Well as the Bomber, but Their Use Is Discouraged When Alert Arson Squads Are on Duty

when she went to the room next morning. Had he mussed up the covers, he might have made his alibi hold. Sometimes, but rarely, the swindler's conscience gets the best of him. Not long ago, a man walked sixty-five miles to Toledo after starting a fire here, strolled into the police station there and gave himself up. It happened that we didn't know that this fire was of incendiary origin, but we found that the confessor had told the truth."

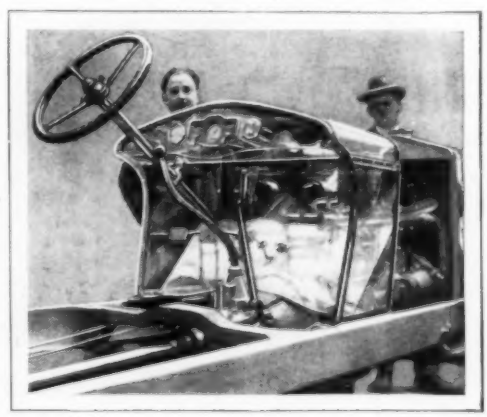
In many cases, careful examination of the books, a thorough inventory and comparison with bills of the wholesalers who sold the dealer his merchandise, will reveal the discrepancy in the storekeeper's statements and show the motive for the fire. Weeks and months are often required in preparing a case for court. The squad leaves no stone unturned in its search for evidence against a swindler. The records are consulted to determine if the person under arrest has been in similar trouble before. In the office of the fire detectives is a complete filing system containing the disposition of court cases the squad has handled, data on arrests, how fires were started, and other information useful in checking up on suspects.

Often a fire swindler will be caught in a net that he least expects—his fingerprints. Convinced that the fire would destroy his trail, he may be careless about handling glass bottles of inflammable liquids he uses in starting the fire, with the result that his finger marks are plainly visible. In examining a suspicious fire, the arson squad makes careful search for evidence of this kind. If the prints are found, they are photographed and checked as usual with the police records in an effort to trace the suspect.

More careful examination of insurance applicants, inspection of premises and repeated checkup of stocks by insurance or other authorized bodies, would help check arson, Sergeant Smith declared.

GLASS HOOD ON AUTOMOBILE PERMITS VIEW OF MOTOR

So that spectators might easily see all exterior parts of the motor, a demonstration car was constructed with a glass hood. This permitted running the engine without exposure and assisted the demonstrators in explaining various points.



Demonstration Auto with Glass Hood over the Motor, So Engine Can Be Seen in Operation

MOTOR FUEL FROM SISAL PLANT SUBSTITUTE FOR GASOLINE

Approximately eighty gallons of motor fuel can be produced from an acre of sisal plant by a chemical process developed in France, it is reported. The leaves and other fibers, ordinarily wasted, are utilized and, under certain conditions, the by-product can be used as fuel without further treatment. Sisal is cultivated on a large scale in northern and western Africa for rope and matting fiber. At a recent exhibition in France motor fuels derived from nuts, corn and bananas were used to run machines, but these products are believed to have too high a value as foods to justify their conversion into gasoline substitutes. The sisal, on the other hand, is said to offer a relatively cheap and abundant supply of material for fuel.

SHEARS AND NIBBLER IN ONE SAVE USE OF DRILL

As a substitute for the usual drill in preparing templates and gauges of metal, a combination of shears and punch has been introduced. It is portable and is said to cut smoothly, requiring little filing, saves time, and can be quickly attached to any vise. Powerful leverage is afforded, and it is designed for accurate work. New parts are fitted with little difficulty.

RECLAIMED U. S. LAND YIELDS BIG CROPS

Land considered practically valueless a few years ago, but later reclaimed by irrigation and other projects, has yielded more than $1,000,000,000 in crops in the last ten years, according to government reports. Last year, the value of crops from this acreage was more than $133,000,000, the highest since the peak of 1919. Alfalfa led all other products from the standpoint of acreage, being grown on thirty-one per cent of the total cropped area of 1,431,560 acres.

Electric Signal Lantern Made More Effective by "Stop" Warning on Red-Celluloid Disk

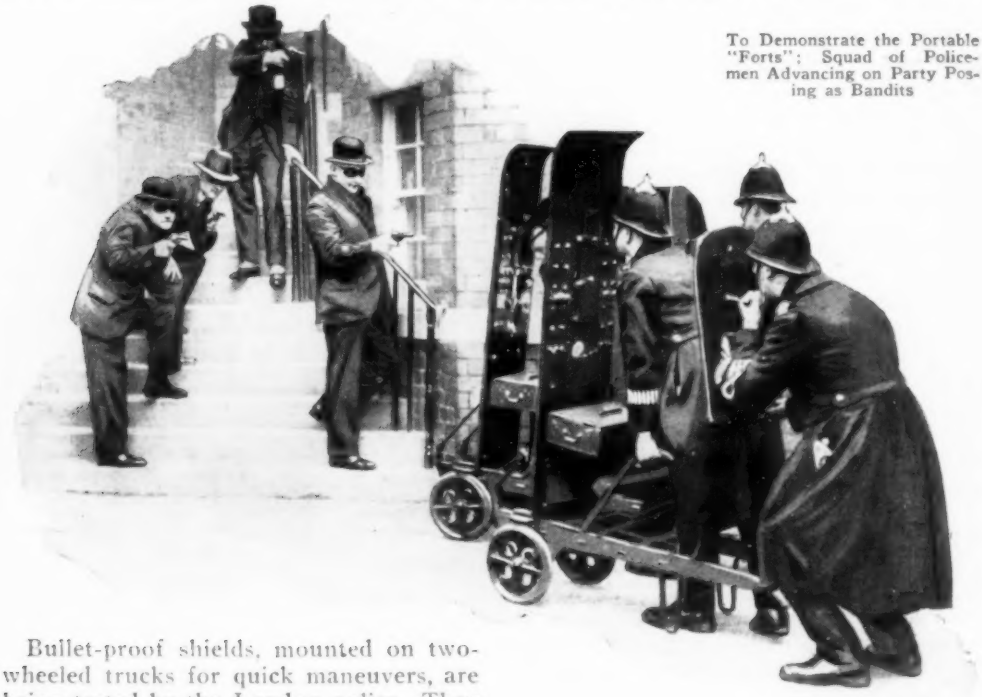
ELECTRIC HAND STOP SIGNAL TO PROTECT PEDESTRIANS

As a substitute for the ordinary red lantern, a western inventor has introduced an electric stop signal for night use at dangerous crossings. It is supplied with current from a battery and, when the bulbs flash on, they shine behind a red-celluloid disk on which is the word "Stop."

SPOON ON METAL BOTTLE CAP AIDS IN TAKING MEDICINE

Designed especially for those who have to take liquid medicines, a bottle has been put on the market with a spoon attached to its metal cap. When not in use, the spoon fits closely to the side of the container and also helps to identify the bottle so that it can be picked from a cabinet with less likelihood of making a mistake.

TWO-WHEELED FORTS AID POLICE WAR ON BANDITS



To Demonstrate the Portable "Forts": Squad of Policemen Advancing on Party Posing as Bandits

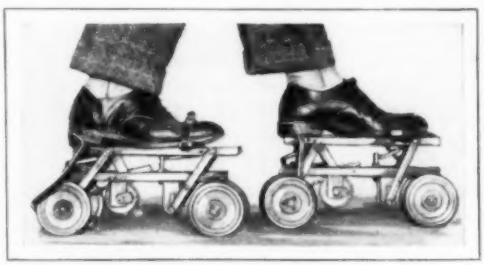
Bullet-proof shields, mounted on two-wheeled trucks for quick maneuvers, are being tested by the London police. They are high enough to protect the entire body and can be set at different angles.

FISH ANSWER CALL TO DINNER AQUARIUM TESTS SHOW

Interesting experiments showing that fish sometimes learn to associate signals of various kinds with food, have been made by an English research worker. A common species of shore fish that likes to make its home in a jar when kept in an aquarium, was taught to respond when the temperature of the water was raised slightly. At first, a worm was dropped into the tank as the heat was applied, and upon seeing it, the fish left its jar to devour the bait. Later on it acted similarly whenever the temperature was raised. Another learned to respond to slight alterations in the salinity of the water. A change of but three parts to 1,000, not enough for the human palate to detect, caused the fish to search for its food after it had learned to associate the change with the bait. Others replied to a tuning fork, to a buzzer and to electric lights. One was taught to enter a food bottle when a light was switched on and wait for the worm.

MODERN "SEVEN-LEAGUE BOOTS" AFFORD HIGH SPEED

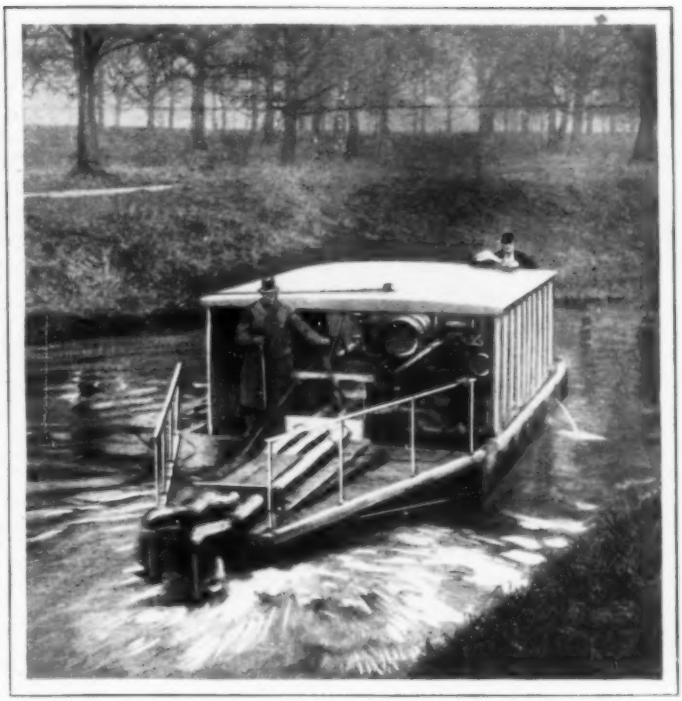
Ordinary walking speeds are accelerated several times, it is claimed, with a pair of spring cog-wheel shoes which were exhibited at a recent show in London. They are somewhat like roller skates with a special driving mechanism, which is said to be easy for the wearer and makes it possible to attain a rate as high as thirty miles an hour.



Cog-Wheel-Drive Roller Skates on Which Person Can Develop Speed of Thirty Miles an Hour

MAN'S ANTIQUITY VIDENCED BY NEW FINDS

Additional proof that men lived upon the earth hundreds of thousands of years ago, has been found in a number of chipped-stone arrow and spear heads imbedded in the banks of the Nile river. The discovery was made by an expedition under the direction of Dr. James H. Breasted, of the University of Chicago, who regards it as an important geological testimony that the men who made the spears must have lived at a time corresponding to that of the Ice Age in Europe. An additional find of interest was that of the skeletons of thirty-one Hittite men and women in a mound of clay formed by the disintegration of the brick homes in which the people lived. The structures are believed to have been built at least 3,300 years ago. From the skeletons, scientists hope to establish the bodily appearance of the Hittites and so contribute to our scant knowledge of them.

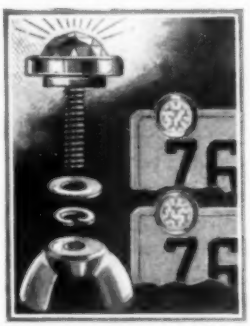


Tri-Motored Sweeping Outfit Removing Mud from the Bottom of the River Avon in New Zealand; Silt Is Stirred Up and Carried Away

MOTOR-DRIVEN RIVER SWEEPER SIMPLIFIES MUD REMOVAL

Mud and debris are quickly removed from the bottom of the river Avon, at Christchurch, New Zealand, with the aid of a three-motored sweeping apparatus. The unit is not a dredge but operates more like the sluicing outfits used in gold mines. Water is pumped up through large pipes and discharged again while a current of air is introduced at the nozzles. This serves to agitate the water, driving the mud and silt into suspension, so that it can be carried off downstream.

JEWELS ON LICENSE BOLTS INCREASE MOTOR SAFETY



Colored reflectors of red and green glass on the license-plate fasteners have been introduced to improve the car's appearance and also to promote safety. The jewels serve as supplementary lights, the red being used behind, and the green for the front plate. The metal parts of the fasteners are plated with a rust-resisting metal.

CROSSING RADISH AND CABBAGE LATEST PLANT TRIUMPH

What is regarded as an achievement in plant breeding has just been accomplished in the production of a cross between a cabbage and a radish. The two are of remote relationship, hence the hybrid is considered far more remarkable than those yielded by crossing varieties that more closely resemble each other.

Policeman Using Portable Radio Loud-Speaker Set for Giving Orders; the Pole Is Collapsible

PORTABLE LOUD-SPEAKER SET LATEST AID TO FOREMEN

For bosses of street gangs, police and others who must address crowds, a portable loud-speaker apparatus has been introduced in Germany. It consists simply of a horn, batteries, microphone and a sectional pole to support the horn. The outfit is quickly assembled and is constructed for long service.

SEA OVER SEVEN MILES DEEP ECHO MEASURES SHOW

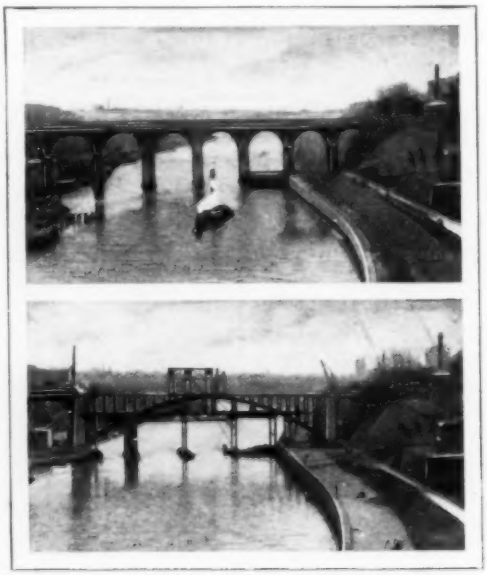
Depths of between seven and eight miles have been found in the ocean by means of the recently developed echo-sounding apparatus. This system of measuring the depth of the water is considered a great improvement over the former method of sinking a lead which could rarely be used for a depth greater than five miles. By the echo measurements, revised and more accurate charts of the ocean's floor are being made. They indicate that the "canyons and valleys" at the bottom of the sea exceed in depth the height of the loftiest mountain ranges on land.

THREE HUNDRED AIR SCHOOLS SHOW AVIATION'S GROWTH

According to reports of the department of commerce, more than $6,000,000 is invested in air companies engaged in regular flying operations and there are now over 300 schools of aviation in this country. Planes and engines valued at nearly $24,500,000 were produced in 1926 and 1927, and last year companies engaged in regular transportation by air flew 5,809,999 miles on scheduled trips and carried 8,500 passengers, 2,261,507 pounds of express and 1,654,454 pounds of mail.

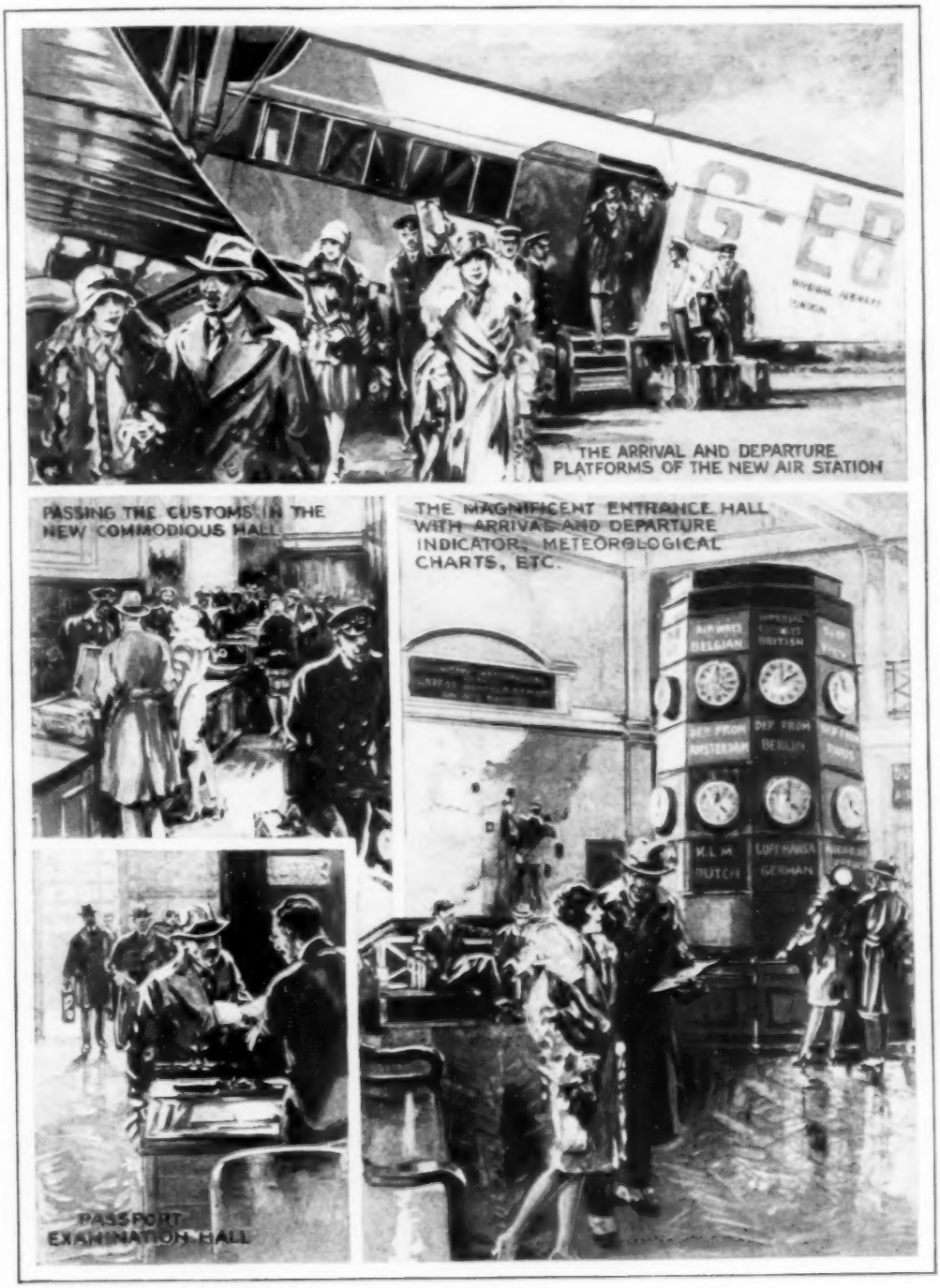
LONG STEEL SPAN IN BRIDGE REPLACES STONE ARCHES

Five Roman arches in the famous high bridge over the Harlem river in New York are being replaced by a single span of steel, 426 feet long. The reconstruction was necessary as the water, swirling about the stone piers, had made them unsafe, particularly because the bridge carries the water of the Croton aqueduct. Although the expense involved is large and the work demands great engineering skill, the bridge will cost some $500,000 less than would have been required by the alternative of driving a tunnel under the river to carry the water.



Old High Bridge over the Harlem River and the New Structure, Below, Showing Span under Construction

BRITAIN'S BID FOR THE WORLD'S AIR CAPITAL



At Croydon Field, the London Airport, England Has the Finest Air Terminal Yet Constructed. Since the Recent Opening of the New Buildings; a Feature of the Waiting Room Is the Clock Board That Shows Arrivals and Departures over All Europe

THE TRAINMASTERS OF THE AIR WHO USE RADIO

The Control Tower atop the Croydon Terminal Is a Busy Place When Planes of Five Nations Are Arriving and Leaving; Magnetic Maps, Wireless Weather Reports and a Complete Weather Observatory Help the Aerial Trainmaster Keep the Traffic Moving

AND WEATHER CHARTS TO DIRECT TRAFFIC MOVES

London News

The Cross Section of the Control Tower Shows the Operating Side of the Big Airdrome from Which a Net of Air Lanes Spreads over Europe; a Horn, Called a "Hooter" in England, Signals the Nationality of Planes Sighted on the Far Horizon

End View of the Swinging Park Seat, Showing the Coin-Slot Compartment and Locking Mechanism

COIN-IN-SLOT SWINGING SEAT LATEST PARK CONVENIENCE

Patrons of parks, amusement resorts, and other places may enjoy a reserved swinging bench as a result of a California inventor's product which has just been introduced. Dropping a nickel in a slot of the locking mechanism at the side tips the seat up for use and the bench automatically returns to a tilted position when the occupant leaves it, so that the next person also must insert a coin.

KETTLE GIVES WHISTLE SIGNAL WHEN FOOD IS COOKED

Suited especially to boiling eggs or cooking vegetables, a kettle now on the market has a small steam whistle in the cover. This sounds when the contents have been cooked to the proper degree, thus insuring more satisfactory dishes and reducing the amount of waste. Fuel is also saved, especially when cooking with gas or with electricity, as it may be reduced or turned off when the whistle blows.

SAFETY RAZORS' THICK BLADES LAST INDEFINITELY

A safety razor using full hollow-ground thick blades, the same as an old-style implement, has been marketed by an English firm of razor and sword makers. Unlike other safety types, the blades of the new razor are not discarded, but are rehoned after each shave and used indefinitely. The original safety razor was a guard on an old-style blade, but did not prove satisfactory because the honing problem was still left. Then came the clear thin blade, which could be discarded. With the development of satisfactory automatic strop-pers, the new-type blade was made possible. It looks like a short section of the usual thick blade.

FRUIT SQUEEZER FITS ON TABLE AND SAVES TIME

Quickly clamped to a bench or table, a hand-crank fruit squeezer removes the juice from large or small oranges, grapefruit, lemons and other fruits without soiling the hands. The crank turns a ridged cone-shaped member like that of the small glass extractors and, by pressing on the fruit with the other hand, practically all of the juice is quickly removed. The squeezer is easily cleaned and durable.

AIR-RAIL PASSENGER ROUTES TO SPEED TRAFFIC

Regular journeys from coast to coast in forty-eight to fifty-two hours, are planned by joint airplane and railroad transportation. Passengers would use the trains at night and the planes by day. A traveler going from New York to St. Louis, for instance, would start at six o'clock in the evening by rail and transfer to an airplane at Columbus, Ohio, the next morning, arriving at his destination hours ahead of the train schedule.

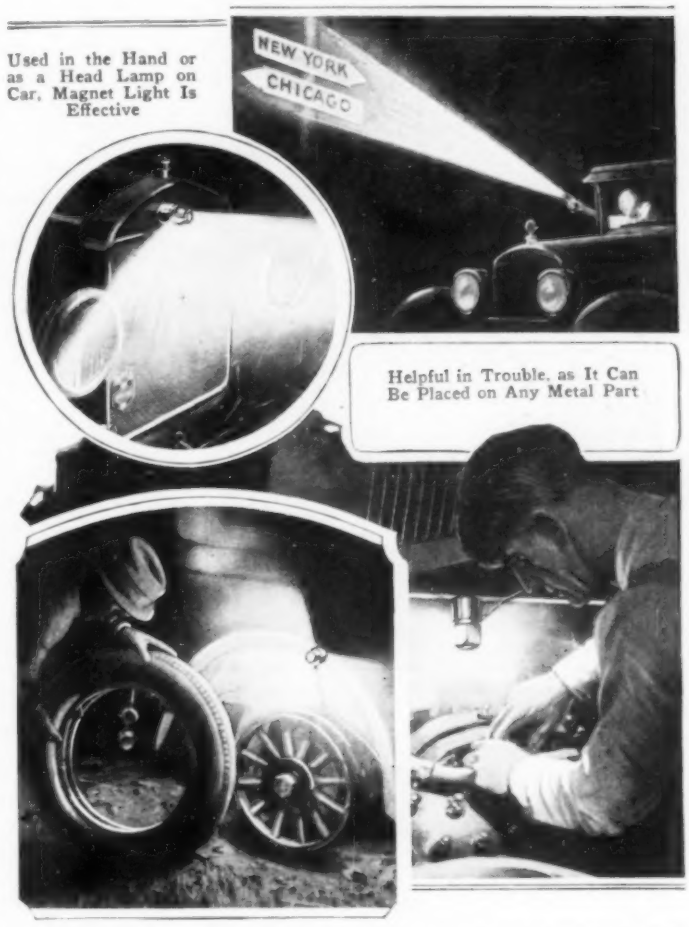
HIGHEST TIDES ON ATLANTIC COAST

According to the latest records, the highest tides occur along the Atlantic coast, where the range is from one to fifty feet. The highest are found in the Bay of Fundy. In New York harbor the range is about four and one-half feet, while at Eastport, Me., only a few hundred miles distant, the tides have a range of twenty feet. Boston's tide rises ten feet, while at Key West, Fla., the ocean's tidal variation is but one and one-half feet.

MOVING PICTURES EXHIBITED ON AIRPLANES

Motion pictures were shown to passengers on an airplane trip in California recently, the innovation proving so popular that the company has decided to include the feature as a regular part of all long journeys. The screen was stretched at the forward part of the cabin. A five-reel comedy was displayed. Looking at the pictures is said to offer relief for those who are affected by flying.

Airplane Passengers Enjoying Motion-Picture Film; the Show Helps Prevent Air Sickness



Used in the Hand or as a Head Lamp on Car, Magnet Light Is Effective

Helpful in Trouble, as It Can Be Placed on Any Metal Part

AUTO LIGHT WITH MAGNET BASE FITS ANYWHERE ON CAR

Both hands are left free for work and the trouble of adjusting a clamp is saved with an emergency auto light that has a strong, magnet base. It is magnetized by passing current from the automobile batteries through it.

BRONZE GRILLE ON HOUSE DOOR GUARDS AGAINST BURGLARS

To protect residences against burglars, a door now on the market has a strong bronze grille with a secondary door which can be opened to talk with the person outside without opening the main door. The grille is on the outer side and there is a screen for additional protection between it and the inner sash, which swings back.

Parachute Jumper Wearing the Fabric Fin Which Helps Prevent Spinning in Descents

FIN FOR PARACHUTE JUMPERS AIDS SAFER DESCENT

So that the jumper may more easily guide himself while falling through the air and also avoid twisting and turning immediately after stepping from the plane, a fin arrangement has been devised for the parachute man. It is simply a web of fabric, pulled on over the legs and functions somewhat like a fish's fin or rudder, to keep the wearer more steady in the air. Its chief aid comes before the parachute has opened, as, after that, most of the steering and guiding is done by pulling on the ropes of the canopy.

CROWN WASHER TO HIDE NUTS IMPROVES LOOKS OF WORK

Quickly set over nuts or screws, a crown washer gives a better appearance to the surface and protects the unit beneath. It can be painted over, giving the appearance of rivets, or may be plated to add a touch of brightness. As a protector, it prevents tampering with screws and nuts.

COAL SMOKE CAUSES COLDS CHEMIST SUGGESTS

Gases from the smoke of soft coal may be partly responsible for colds, in the opinion of Prof. Samuel W. Parr, of the University of Illinois. He suggests that the effect upon the nose and throat tissues of the billions of cubic feet of sulphur dioxide and other vapors that pour from the nation's chimneys each year be investigated. Approximately ninety per cent of the fuels burned in this country produce smoke, it is said, and the amount of soft coal consumed totals over 600,000,000 tons annually.

AUTO DRIVER'S POSTURE PAD PROMOTES HEALTH

Greater comfort and avoidance of troubles resulting from improper posture are claimed for a special cushion devised for the automobile driver. It is shaped to give support to the back where it is most necessary, is molded and padded and is quickly adjusted.

GLACIERS TELL THEIR SECRETS IN CLOCKWORK "DIARY"

Glaciers move spasmodically and not in a uniform manner, like a stream of oil, as has been held by some scientists, evidence gathered by Prof. R. T. Chamberlin, of the University of Chicago, shows. For seventeen years, he has been studying ice fields in Canada, Alaska and Switzerland and has obtained the glaciers' own story of their movements by means of a clockwork mechanism which scratches telltale lines on a disk as the ice moves. These "diaries" indicate that there is a sudden slippage when the ice yields to an accumulated stress.

ULTRAVIOLET RAYS REVEAL TOOTH CAVITIES

By directing ultraviolet rays upon the teeth, dark spots, where small cavities are beginning to develop, have been revealed in tests conducted at Northwestern University dental school. The teeth react to the rays by shining brightly with a visible light, but if a cavity is forming, that spot does not glow under the rays even though no coloring matter has yet appeared. Further investigations of this method of examining the teeth are expected to lead to the development of ultraviolet lamps with which a competent dentist may make a thorough inspection and remedy cavities before they have done harm.

Rowing Class Watching Their Strokes and the Coach in the Big Mirror

ROWING PRACTICE WITH MIRROR HELPS TRAIN OARSMEN

So that they may more easily correct their mistakes and learn to stroke together, boys training for the crew of an eastern preparatory school, practice in front of a large mirror. This enables them to see the effect of the coach's directions and gives each man a clear view of the entire crew.

UMBRELLA-TOP GAS STATION HAS AUTOMATIC GONG

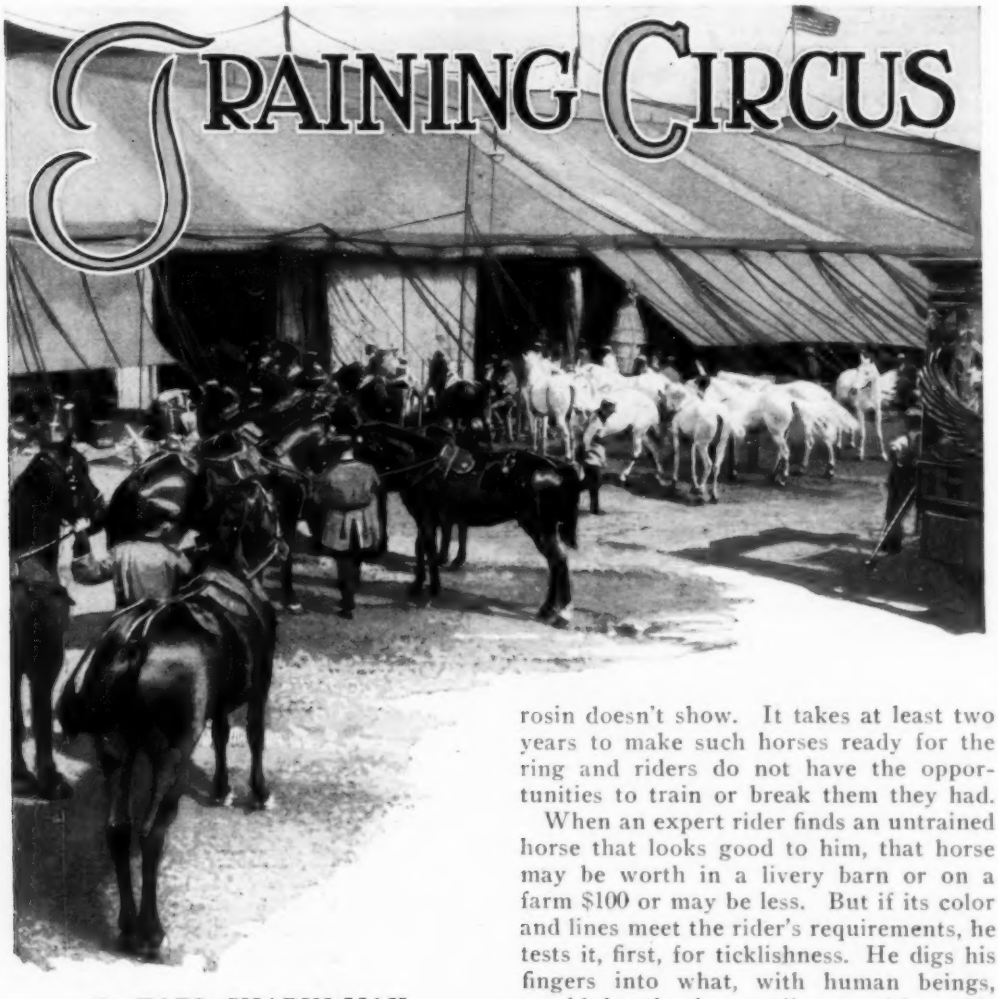
To shelter himself from the rain while operating a gasoline pump, a western service-station man constructed a metal top over it in the form of an umbrella. He also rigged a gong signal, so that, when cars drove up, it would ring, telling him that a customer wanted service.

Gasoline Filling Pump with Umbrella Canopy, and Treadle by Which the Car Sounds Bell Signal for Service

LIFE OF RUGS IS FIFTEEN YEARS, EXPERTS SAY

Dropping cigar ashes on rugs or carpets will not damage the fabrics, experts declare, but may have a beneficial effect instead, for the ash is displeasing to moths. With proper care, a rug or carpet of good quality should last at least fifteen years, it is said. In sweeping, the strokes should be with the nap and not against it. Uneven floors and travel over the rugs may cause them to change shade in spots. This difficulty can be remedied by turning them frequently and lining them. In using a vacuum cleaner, the attachments should be properly adjusted to prevent damaging the rugs, and using a beater is often harmful as it breaks the strands. Face powder, dropped upon the rug, often permanently spots it.

TRAINING CIRCUS



By EARL CHAPIN MAY

ALTHOUGH most of them live in daily danger of nasty falls and other accidents and are listed as extra-hazardous risks by life-insurance companies, circus riders are quite as particular about their horses as about themselves, especially their "principal" and "finish" horses.

A principal horse is one on which the beautiful lady rides around the magic ring. Such a horse is, preferably, one with a broad back and a large barreled body and thin legs. It should be gray or white because a principal horse is a "rosin-back," that is, its back is covered with powdered rosin to keep the rider from falling off. If the horse is gray or white the powdered rosin doesn't show. It takes at least two years to make such horses ready for the ring and riders do not have the opportunities to train or break them they had.

When an expert rider finds an untrained horse that looks good to him, that horse may be worth in a livery barn or on a farm $100 or may be less. But if its color and lines meet the rider's requirements, he tests it, first, for ticklishness. He digs his fingers into what, with human beings, would be the lower ribs on either side of the spine—the small of the back, as we would say. If the horse flinches or wrinkles up its skin, it means that it is ticklish and will not do, because the rider's feet "take off" and land on that particular spot.

The horse destined for circus life must be broad-backed because a rider not only has to stand on it, but must pirouette, or whirl, and even turn somersaults and must have a broad landing place. For a similar reason the horse's rump must not slope too abruptly toward the tail, or the rider, in "landing too far back," might not be able to keep his feet.

After a "green" horse is selected, the animal is given its first lesson out of doors. It is saddled and bridled and ridden a few

HORSES

Daring Riding and Spectacular Feats by Matched Groups of High-School Horses Furnish Many Circus Thrills in These Motorized Days

minutes daily for many weeks. Gradually its mouth is curbed, that is, its chin is pulled toward its chest if it is to be a principal horse, because curbing makes it canter best. But care is taken in curbing it, for sometimes a horse too tightly curbed will rear backward and break its neck.

Once thoroughly accustomed to close curbing and to the saddle girth and to the human weight on its broad back, the equine pupil is given a lesson under the roof of a big ring barn, but it is still saddled and bridled like any horse. During this second stage of breaking in, the animal is gaited, with the reins and bit, until it canters or lopes around the ring both ways.

In a principal riding act the mount and rider move from right to left. That is the way you see them when the band begins to play. But during the second stage of training the green horse, who is either gray or white, is also sent around in the ring in the opposite direction. This is to cure it of shying. Any normal horse soon gets used to the ordinary sights and sounds of circusdom, even to the presence of the elephants. After that, it only shies at the unusual or something it cannot readily see. In loping around the ring from right to left, its right eye takes in everything outside the ring, which is about the only place any unusual sight or sound can come from. But the left eye only gets an occasional glimpse of what may be happening in the world outside the ring. And at such a glimpse some horses may shy. So the well-trained ring horse is taught to see the outside world with both eyes, after which it goes back to the regular right-to-left loping inside the curb.

Circus riders try their best to prevent all shying, partly because, if a horse shies when the rider is standing on its back, the rider is certain to fall heavily. Even if the equestrian is nearer to the ground, a shying horse can do a deal of harm. Some

time ago May Wirth was doing a fancy stunt in which, with one foot caught in the girth or "roller" of her horse on the ring-curb side, she leaned inward across the loping horse and picked up a handkerchief from the ground. While she was doing this stunt at Brooklyn during a matinee, a strange dog came yelping down the hippodrome track, the horse shied at this unusual sight and sound, threw May clear across its back and left her hanging outward, head down, with one foot still caught, while it ran around and around the ring, dragging the equestrienne's face in the cinders and banging her head against stakes and curb, until spectators stopped the frightened animal. It was two weeks before May could ride again.

May Wirth, Most Famous of the Women Riders, with Her Snow-White Horse, and a Difficult Balancing Feat, in Which Baskets Rob Soft-Soled Shoes of Their Gripping Power

This training advances from the second stage to a third, during which the saddle is

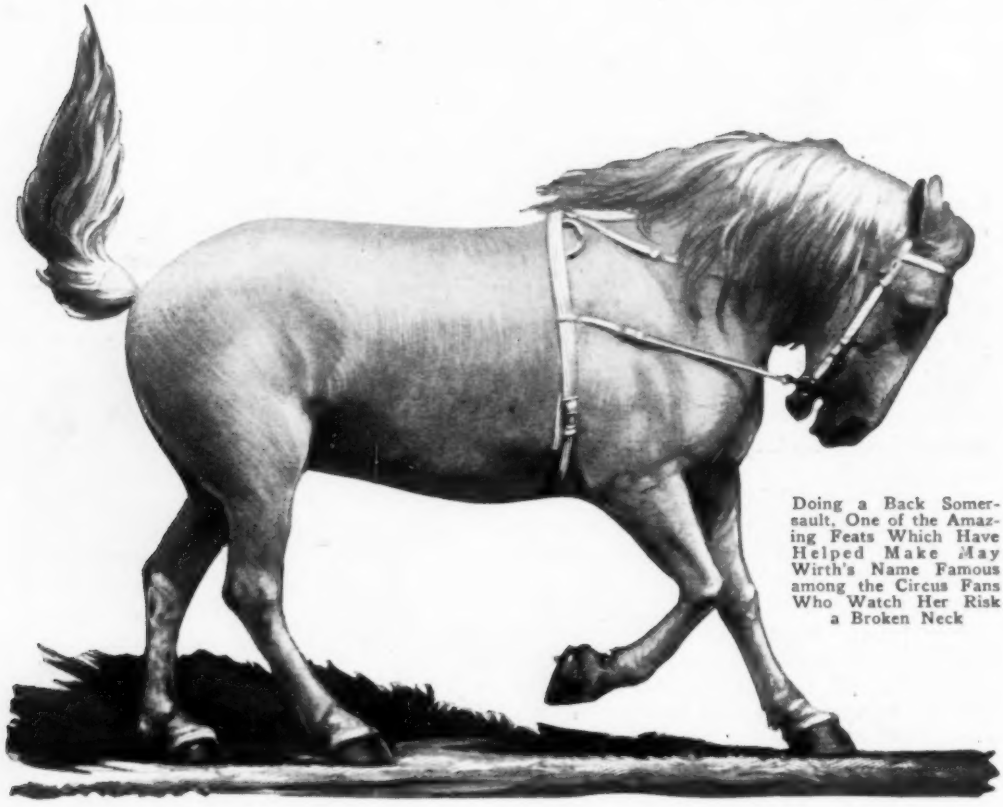
taken off, a roller, or broad leather girth with two handholds on the upper side, is buckled closely around the horse's belly, and a lunge rope is snapped into the bridle bit. The trainer holds the other end of this rope as he stands in the center of the ring and with a long-lashed whip urges the animal to canter or lope close to the curb. The whip is used sparingly, because much whipping ruins the spirit of any horse. As soon as the horse knows that the whip can sting, it is no longer necessary, except as scenery.

For quite a while the rider practices vaulting, aided by the handholds, from the ground to a sitting position on the loping horse. In time the rider assumes an upright position, then gradually works into pirouettes and somersaults. Usually, after the horse has learned to stick close to the ring curb and to lean inward to oppose the centrifugal force and to keep on going steadily, the lunge rope is discarded and the animal is permitted to go and stop only at the spoken word.

The Circus Blacksmith at Work, and May Wirth with Jules Turnour, the Circus' Oldest Clown

Until recently no principal act was complete without obstacles and "balloons." Some of the obstacles were hurdles—poles extending from the ring curb toward the center of the ring. The horse was taught to hurdle, usually while still working with saddle and bridle, just as any hurdle horse jumps in steeplechases. Having learned what hurdling meant, the principal circus horse hurdled automatically. Another kind of obstacle was the banner, or long and wide strip of colored cloth, under which the animal loped and over which the rider leaped. Six of these were held by banner holders, who stood on the ring curb. Half the success of the trick was in the manner of holding, by the banner men. They had to judge when the banner should be brought backward, to avoid the descending feet of the equestrian, for space and time are important in a circus-riding act. But the most important to all concerned was the training of the circus horse. A balk while the rider was in the air would probably break a human arm or leg. So the horse was first taught to lope beneath an outstretched hand, then a whip, then a slender pole, until the bright-colored banner didn't bother it.

The same process was followed with balloons, which are, to "towners," paper hoops. After the horse learned to lope under them, alone, the rider got upon the horse's back and, after many circles in this style, stood up and somersaulted through the hoops. Of course none of the results here touched upon were achieved as simply as this description sounds. Shy-



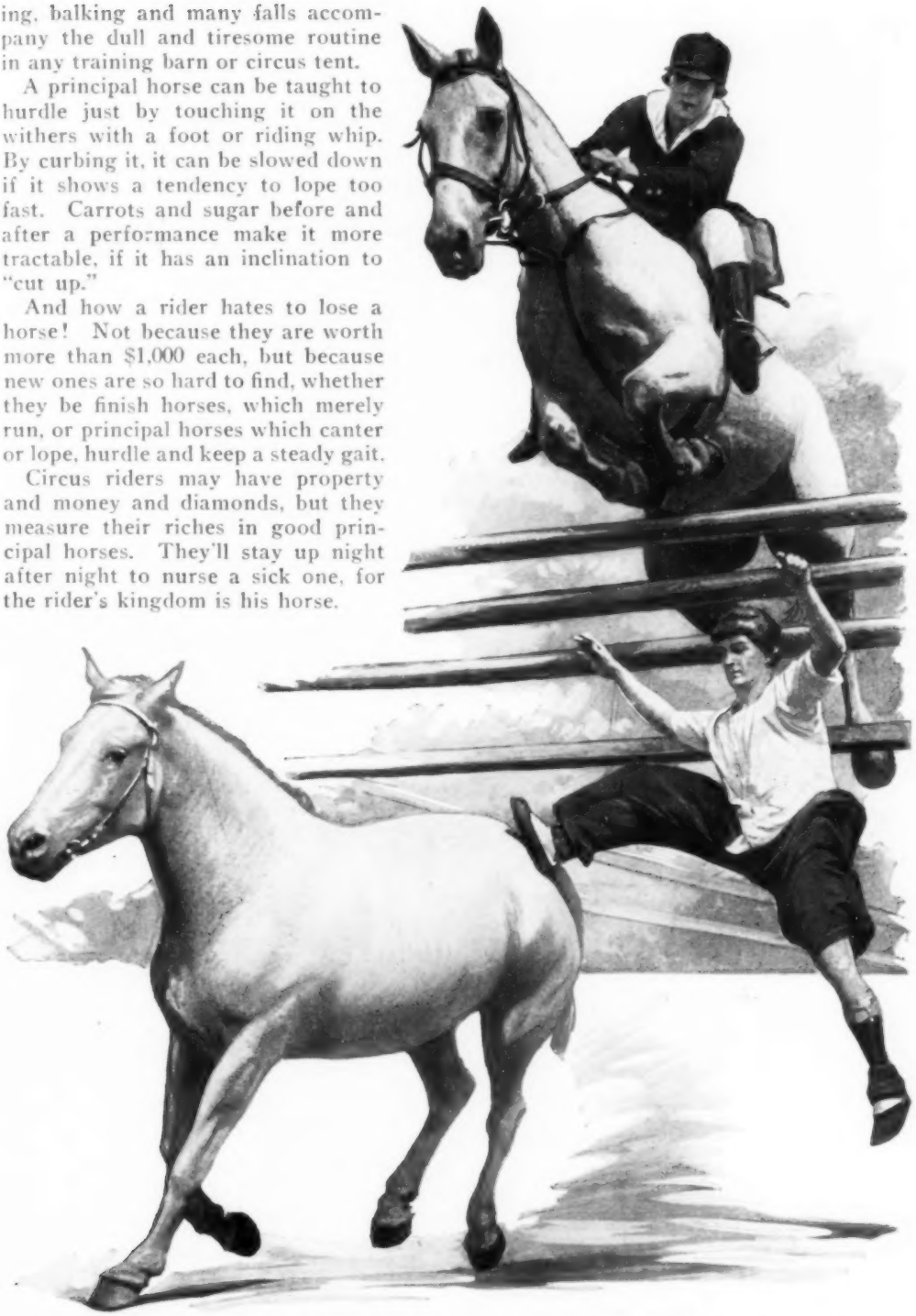
Doing a Back Somersault, One of the Amazing Feats Which Have Helped Make May Wirth's Name Famous among the Circus Fans Who Watch Her Risk a Broken Neck

ing, balking and many falls accompany the dull and tiresome routine in any training barn or circus tent.

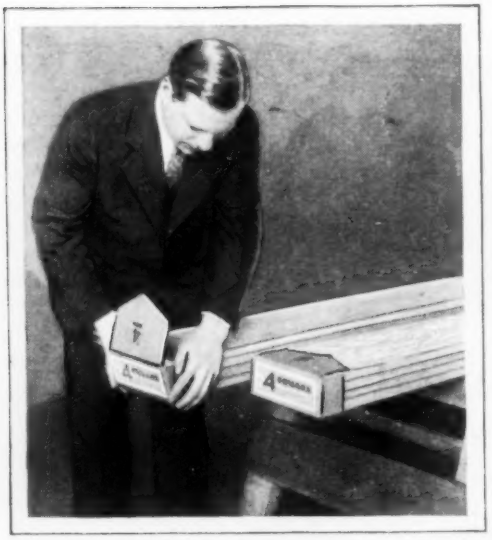
A principal horse can be taught to hurdle just by touching it on the withers with a foot or riding whip. By curbing it, it can be slowed down if it shows a tendency to lope too fast. Carrots and sugar before and after a performance make it more tractable, if it has an inclination to "cut up."

And how a rider hates to lose a horse! Not because they are worth more than $1,000 each, but because new ones are so hard to find, whether they be finish horses, which merely run, or principal horses which canter or lope, hurdle and keep a steady gait.

Circus riders may have property and money and diamonds, but they measure their riches in good principal horses. They'll stay up night after night to nurse a sick one, for the rider's kingdom is his horse.



Phil Wirth Stepping off a Bareback Horse, and One of the Circus Equestriennes Taking the High Bars on a Trained Jumper; Circuses Have Always Been Famous for Their Fine Horses

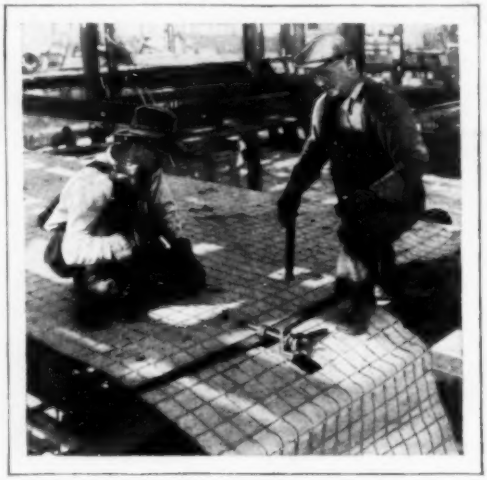


Assembling Lumber Pieces in Convenient Shipping Package after Finishing with Special Saw

LUMBER SHIPPED IN PACKAGES TO SAVE WASTE AND TIME

Introduction of a special saw that cuts the ends of boards as smoothly as a plane finishes the sides, has made it possible to prepare and ship finishing lumber in packages. Each board is perfectly squared, saving handwork, eliminating waste and the substitution of inferior grades on the job. The package is made by slipping a fiber cap over each end of a group of three to twelve pieces. The saw is filed and set by a new method, the teeth are finer and the saw runs faster than ordinary mill equipment. Every tooth travels a true circle and does its full share of the cutting. The unit is operated by an electric motor and is simple to use. An additional feature of the package plan is that lumber is more quickly inventoried and handled more economically.

¶Tin may be reduced to dust by extreme cold.



Applying the Wire Carpet as Reinforcing for Concrete Floor; It Also Serves as Insulating Material

TELESCOPE WITH GIANT LENS TO REVEAL NEW WORLDS

With the aid of the telescope, the camera has made approximately 1,500,000,000 stars visible on photographic plates, while but a few thousand can be seen by the unaided eye. Many more new spheres will probably be revealed with the constantly increasing size of the lenses of the giant telescopes used to sweep the skies. In the opinion of Dr. Francis G. Pease, of the staff at Mt. Wilson observatory, a telescope with a twenty-five-foot lens is not impossible in view of the increasing improvements in glass making and grinding. The mirror of the present telescope there is 100 inches in diameter. A twenty-five-foot lens instrument would cost at least $9,000,000, he says, and an endowment of $3,000,000 would be needed for its maintenance and operation, while a special location would have to be found for it to escape atmospheric difficulties arising from searchlights in the neighborhood. One of the troubles with the big reflecting mirror of the present telescope is that it bends in the heat of the sun.

WIRE-CARPET CONCRETE FORM IMPROVES CEMENT FLOOR

As a combination form and reinforcing material, a steel-wire mesh, with specially constructed backing, is suitable for cement floors, stucco and plaster. It is said to save concrete and eliminate the need of wood or metal forms, act as insulation against sound and to increase the strength of the cement, as it helps retain the original amount of water, thus insuring better curing. The fabric is quickly placed over the joists for laying the floors, as it comes in conveniently handled rolls. It is also suitable for use on roofs.

ELECTRIC PAGE MAKES BOOKS "TALK" TO BLIND

Blind persons, and those having defective or failing eyesight, may enjoy books in spite of their handicap with an apparatus recently devised by Robert E. Naumburg, an eastern inventor. It literally makes books "talk" by translating the print into sounds. No special type is used and no phonograph records are employed. Any printed book is made to talk. Curiously enough, the talking is done only where blank spaces occur on the pages.

Above, Mr. Naumburg Giving a Lesson in Reading on the "Talking-Book" Machine to Toivo Laminan, and, Below, Student Showing Mrs. Naumburg How Letters Are Recognized on the Panels

The instrument combines principles of the radio, the light-sensitive cell and the televisor. A book, in ordinary print, is placed in a special holder and a tiny ray of light is directed on the page, the apparatus being adjusted so that it can be moved along each line of print. As long as the beam of light is shining on the white paper, an electric current flows through the machine, producing a continuous buzz which is amplified in a loud speaker. When the light ray strikes the black letter, the current ceases. The result is a mixed "sound pattern" for every letter or character so that with practice they may be recognized by the listener. A large "learning chart" has been devised for the use of a pupil or student of the system, through which he can himself reproduce these patterns by mechanical means.

HONEYCOMB FIFTY FEET LONG FOUND IN HOUSE WALL

Workmen repairing a house in Stockton, Calif., not long ago, found a honeycomb fifty feet long inside one of the walls. It extended from the ground to the roof and was a mass of bees and honey.

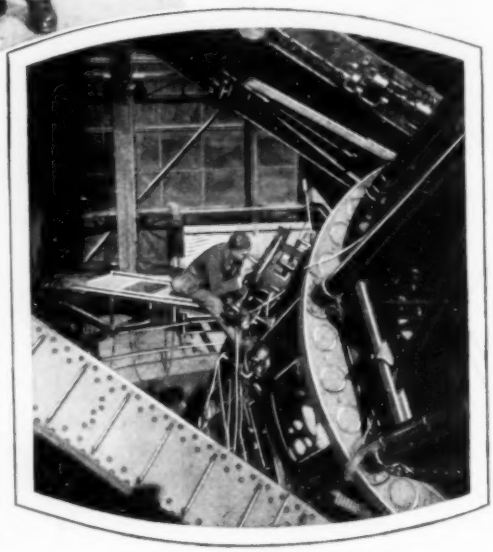
The Latest Mystery

Not many years ago, the phenomenon of a new star would have caused wide concern. The splitting of a heavenly body would have struck terror to the hearts of millions, but the astronomers went calmly back to their telescopes, for they knew that the break, whatever its cause, would not affect the earth—that it actually happened many years ago, anywhere from 300 to 1,000. Nova Pictoris is so far from us that it has taken light, speeding here at the rate of more than 186,000 miles a second, centuries to reach us. The split was a new and wonderful discovery here, but to the heavens, it long had been a matter of history.

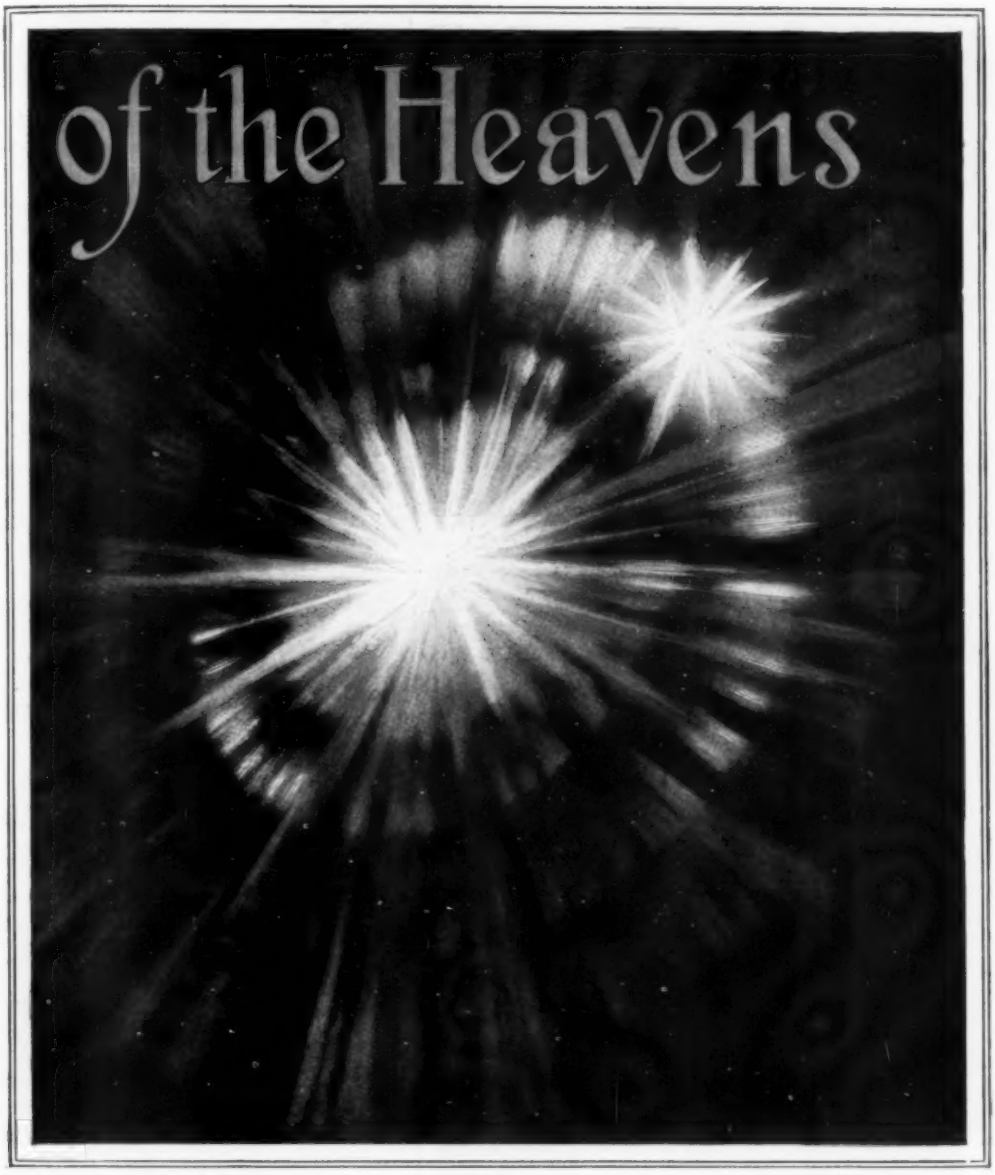
By PAUL PADDOCK

ASTRONOMERS, peering through a big telescope in Argentina recently, discovered the latest mystery of the heavens. "Nova Pictoris," a new star, found in 1925, had split in two. Word was flashed to the Union observatory in Cape Town. Scientists there trained a twenty-six-inch glass on the star. They, too, saw the wonder.

The spectacle was without precedent. The breaking of a star has never been seen before, according to Dr. W. H. Steavenson, president of the British Astronomical association. New stars like this appear from time to time, five having been observed in the last ten years. They flare up suddenly, glow with intense brilliance, may be for but a few hours, and then subside or disappear.



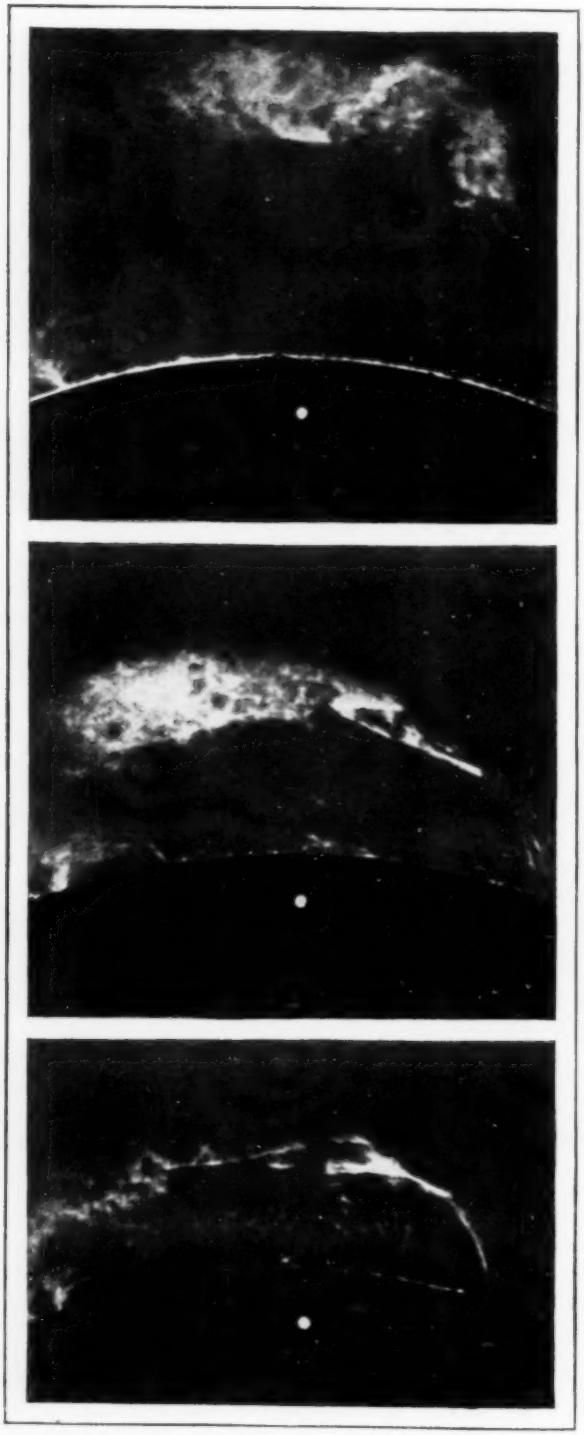
Mr. Lee Taking Spectroheliogram of the Sun at Yerkes Observatory, and F. G. Pease at Mt. Wilson's 100-Inch Reflector Telescope



© The Illustrated London News

Hundreds of Years Ago a World Blew Up, Probably after a Collision of Two Suns, But the News Just Reached the World When Astronomers Saw the Star Nova Pictoris Split in Two

"The skies are filled with mysteries as baffling as that of the new stars," said George C. Blakslee, who supervises the photographic work at Yerkes observatory. "One of the first impressions we gain of the heavens is a sense of the enormous distances involved. They are incomprehensible, but comparisons help to grasp them. We are living in a day of rapid travel. Suppose we wanted to take a trip into space in an airplane and the journey were possible. Flying at the rate of 200 miles an hour, night and day, it would take us six weeks and five days to reach the moon, fifty-four years to get to the sun, and 13,329,625 years to go to the nearest star. It takes light four years to reach us from this star and forty years



A Mystery Eruption on the Sun, Which Was Observed While Taking Photographs of It in 1919; the Flaming Canopy Rose to a Height of 410,000 Miles; Dot Shows Comparative Size of Earth

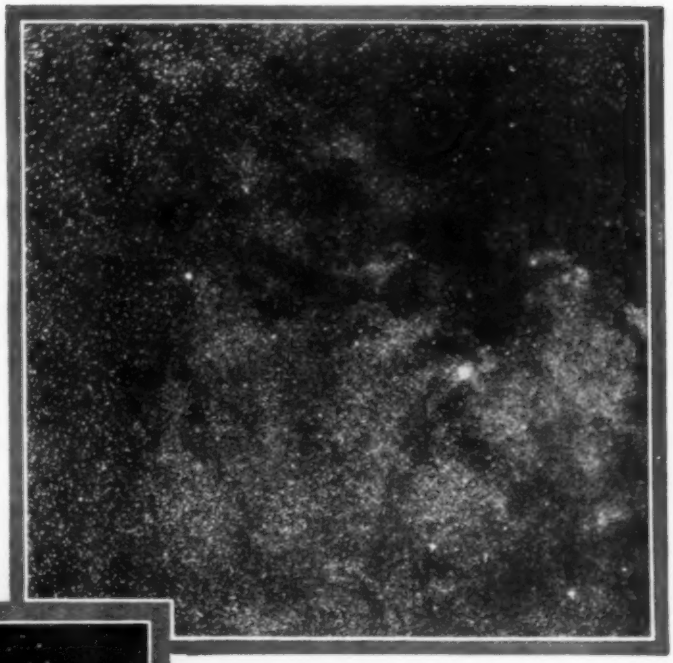
from the Pole star. The light you see tonight from Orion, started at about the time of the Crusades.

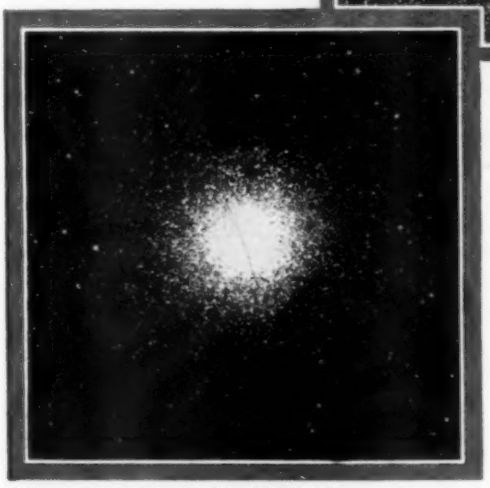
"Millions of stars are so far away and the light from them is so faint, that the unaided eye can never see them. The telescope has pushed the frontiers of the heavens back far beyond the dreams of the earliest astronomers, but we owe a debt almost as great to the camera. Astronomy is one of the oldest sciences, but star photography is of comparatively recent birth. You might say that it had its beginning with the introduction of the dry plate. Prof. Henry Draper, of the University of New York, made the first successful star photograph in 1840. A year later, at the Harvard observatory, a picture was made of the moon. It was considered so wonderful that it was exhibited throughout the east and then taken to the Crystal Palace in London.

"Today we may be inclined to smile at this picture, for many far more complete and better in every way have been taken, but these early photographs are of inestimable value because they give us a tangible basis by which later studies can be compared and any changes noted. Taking pictures of the stars is a laborious and highly exacting procedure. For one good plate, hundreds may be failures. The star photographer endures the hardships of winter and the heat of summer, for his observatory dome must be kept as near as possible to the temperature of the outside air to preserve the accuracy of his instruments and so as not to distort the vision. Negatives must be developed with the utmost care and precision to insure accurate reproduction of every detail. The big telescopes must be nicely focused and kept in constant adjustment to compensate for the rotation of the earth. This is ex-

ceedingly important when long-time exposures are made, and practically all star photography falls in this class. A single plate may be exposed for hours and sometimes on two or more nights in order to record far-distant stars. Giving long time enables the camera to 'see' for us thousands of stars that our eyes could never detect. The faint rays of light keep 'tapping' away on the plate until they make their little mark, a dot that shows a star."

Imagine a camera weighing twenty tons, with a



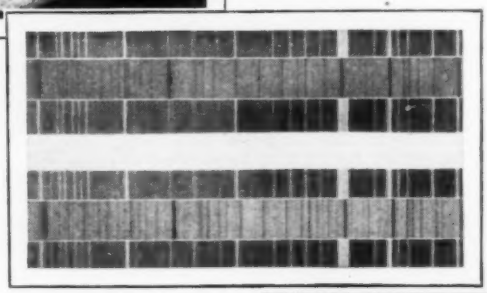


Above, Star Cluster of a Million Suns as Large as Ours, and a Three-Night Exposure of Hercules Cluster from Negative Taken at Mt. Wilson

lens forty inches in diameter which weighs a little less than 1,000 pounds, with a focal length of sixty-three feet, that can be extended nearly ten feet when special attachments are used, and you have an idea of the giant refractor telescope at Yerkes observatory as it is used for photographic work. In spite of its tremendous weight, the long six-ton tube is so delicately adjusted and balanced that it can be moved with one arm, but, in operation, it is focused electrically with accurate indicators. One of the most important features is the clockwork mechanism which corrects the position of the telescope with reference to the rotation of the earth. Its gears keep the big glass pointed exactly on the star, regardless of the earth's turning. But in addition to this mechanism, an assistant always works with the observer when a star photograph is being taken to keep the telescope aimed with perfect accuracy, according to guide lines on one of the eyepieces.

In winter time, astronomers and star photographers at Yerkes observatory frequently have to dress as warmly as polar explorers. Temperatures of thirty degrees below zero, and colder, are not uncommon in the big dome that rolls about on wheels so that any section of the sky can be exposed to the glass.

The forty-inch telescope is used for photograph work more than for direct-vision purposes. Smaller lenses, including a six-inch glass that can be quickly moved about for hunting comets, are favored for ordinary observations. To make a star photograph, the plate holder is carefully adjusted to the lower end of the big telescope, thus transforming it into a camera. Two interesting attachments are used for making special photographs of the heavenly bodies. They are forms of



Contrast Upper Photo of Moon with Lower, Taken in 1841, the Oldest Astronomical Photograph; Center, Spectrogram of a Star

practically every radio fan knows that the lights disturb the sending and receiving of messages. Quite recently an organized effort has been started to learn more of the effects of these spots. Observatories in this country and in other parts of the world are taking pictures of the sun in connection with careful weather observations. By comparing all the facts obtained, we may have a much better basis on which to make long-range weather forecasts. For instance, if it is found that world weather changes with the sunspot cycle, these changes may be predicted in eleven-year intervals, for that is the duration of the spot period. They increase in number for about eleven years, reach a maximum and then subside until another 'outcropping' of spots in great number occurs eleven years or so later.

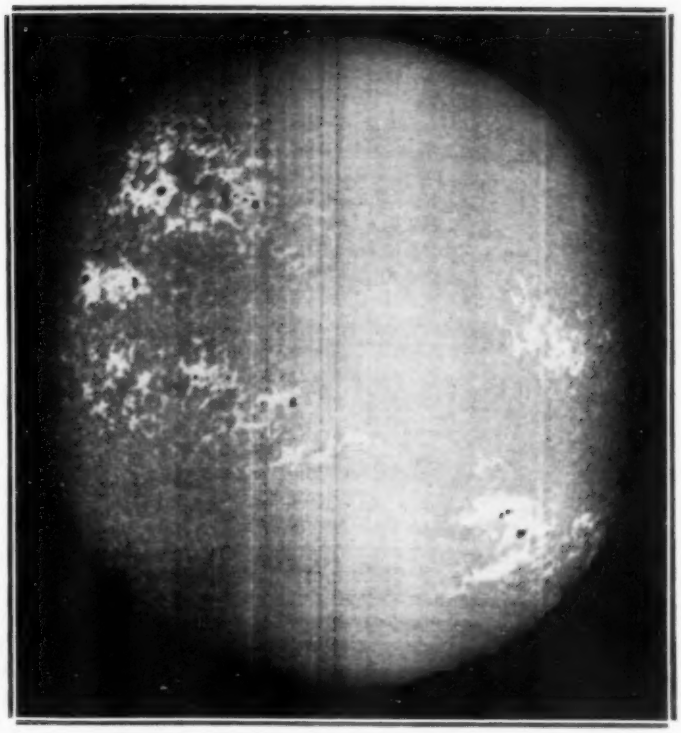
"One of the most remarkable of the sun pictures was taken by Prof. Edison Pettit, in May, 1919. It was at a time of the maximum spot cycle and he had noticed a peculiar cloud hanging above the sun. The next day, he concluded, something unusual would happen. He was right. With the assistance of his wife,

the spectroscope, an instrument which splits light into its different elements. The spectrograph makes such a light picture of the star. It shows the body, not as a round object, but as a curious pattern of dark and light lines. By studying these marks, the astronomer can tell what materials are in the star, whether the body is new or old, whether it is going toward or from the earth and about how fast. Similar light studies of the sun are made, for this is the time of the maximum sunspot cycle, a phenomenon that occurs once in every eleven years or so. At least five spots can be seen with the unaided eye by looking at the sun on a clear day through a piece of smoked glass.

"The camera may help clear up some of the mysteries of these sunspots," Mr. Blakslee continued. "We know that they are forms of electrical cyclones of tremendous intensity and size, and just now, they are of special interest to us, for we are trying to find out what connection they have with weather conditions here on earth. We know that they have an effect on the northern lights and these, in turn, cause atmospheric disturbances. Not long ago, many telegraph lines were out of commission for a short period during an unusual activity of the lights, and

he took sun pictures as long as he could. He was richly repaid. One of the most curious happenings ever recorded was preserved for all time on his plates. A huge, flaming canopy suddenly rose far above the sun, dipped and rose again and, finally, when it had reached a height of 410,000 miles, it vanished. Photographs the next day, showed not a trace of the strange specter. It doubtless had some connection with the sunspots, but no one knows just what caused it, where it went or what it was.

"In recent years, star photography has become of still further importance through the introduction of plates that are sensitive to the infra-red and ultraviolet rays. The infra-red are long rays that penetrate mists and fogs, revealing what is behind them, so that, with their aid, we may be able to pierce the shrouds of mystery that hang about some of the planets. The short ultraviolet rays reveal details that cannot be registered in ordinary light. We are learning more about Mars by means of special photographs of this kind. Opinions differ as to whether there is life on Mars at the present time. It seems wholly probable to the astronomer that there are thousands, perhaps millions, of bodies out in space that do support life in some form. At least, it is difficult to believe that our globe is the only abiding place of life, when the heavens are filled with bodies, millions of them many times larger than our earth."



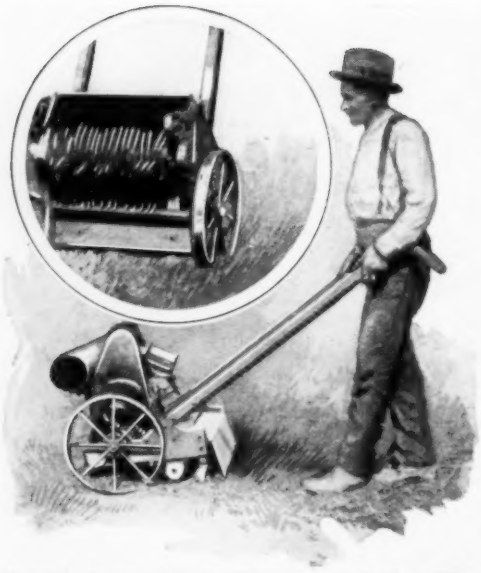
How Sun Appeared April 12, This Year, through Yerkes Observatory Telescope; a Maximum Spot Cycle Is Now at Its Height

WEED LEAVES LIKED AS FOOD IN EASTERN MARKETS

Leaves from the early blooming mustard, a weed that grows in abundance in California, are shipped to the eastern markets in fancy cartons and sold for greens. Pickers are sent out through the fields in late February, when the plants have matured sufficiently, to gather the leaves, which are graded according to size, packed in small boxes lined with oiled paper and shipped in cracked ice with other perishables.

MUD CLAMPS FOR AUTO TIRES PREVENT GETTING STUCK

Quickly clamped to the rear automobile tires, a pair of metal hooks afford traction when the car sinks in a mudhole or other soft spot. They do not injure the rubber will not come off and help lift the automobile out of the mire. The clamps are made for both balloon and small tires and are easily carried in the repair kit.



Treating Lawn with the Renovator, and Close View Showing the Arrangement of Rotary Cutters

RENOVATOR TO CLEAN LAWNS REDUCES HAND RAKING

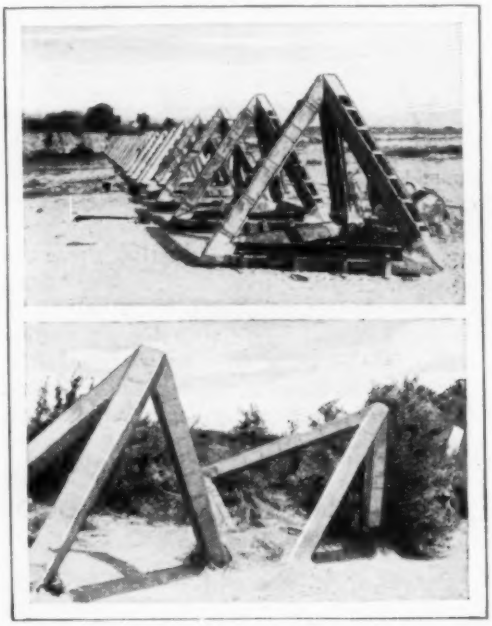
Clumps of foreign grasses that endanger the lawn are easily broken up and the soil loosened or prepared for further seeding with a motor-driven renovator now on the market. It has a group of rotary cutters which can be raised or lowered according to the depth of the cut desired and are propelled by a small gasoline engine. The unit raises the runners of some of the grasses so they can more easily be cut with the mower, breaks up the crust and stimulates the growth of the desirable planting by cultivating the ground.

RICH AMBER MINE GIVES WORK FOR ENTIRE VILLAGE

Nearly everyone of the 800 inhabitants of Palmnicken in Prussia is employed in the amber mine there, said to be the only plant of its kind in the world. The spot has been famous since the days of the ancient Phoenicians, when amber was used in trade. It was usually dredged up by fishermen along the Baltic coast, but recently has been dug out of the blue clay. The mine yields nearly 125,000 pounds annually, but only about one-half of it is suitable for beads and ornaments. The rest is ground into powder to make pressed amber or is melted and distilled for other products. The most valuable pieces bear the name of "sauerkraut" amber because of their pale-yellow tinge and the markings suggesting strands of cut cabbage. The material is found in a wide variety of shades, and many pieces contain the preserved bodies of insects, which became imprisoned in the sap of the coniferous forests that flourished here thousands of years ago. It is this sap, in petrified form, which is so highly valued as the amber of today.

SEVEN-TON CONCRETE BRACES HELP CURB FLOODS

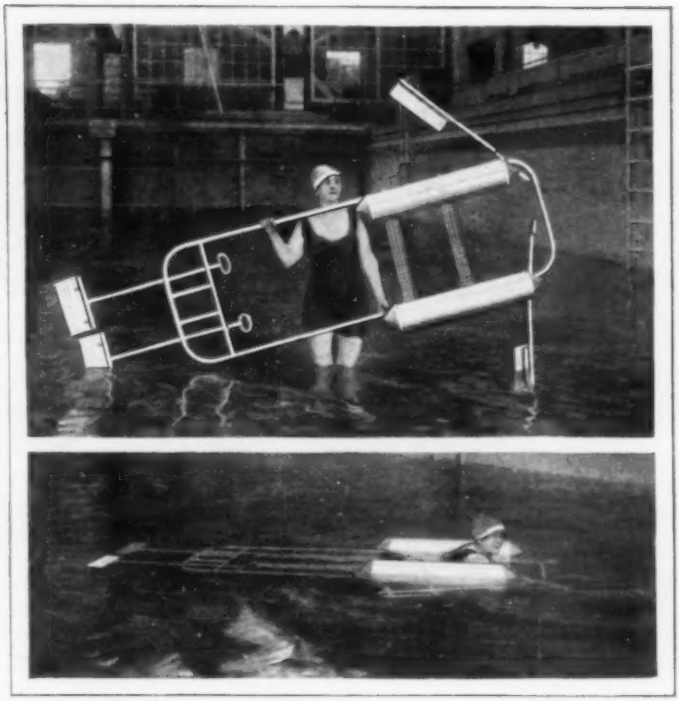
Concrete braces in the form of a three-cornered pyramid, each thirteen feet high and weighing seven tons, are effectively used in California to strengthen the banks of the Santa Clara river during flood times. The chief advantage of the units is that, even if they tip over, they offer a barrier, as a broad base is exposed regardless of how the skeleton falls. Driftwood lodges against a row of the units, gradually silt and sand accumulate and, in time, this embankment, made secure by the concrete braces, forces the river back to its old channel.



Concrete Braces Used to Collect Dirt and Brush and Help Stop Floods; They Are Difficult to Upset

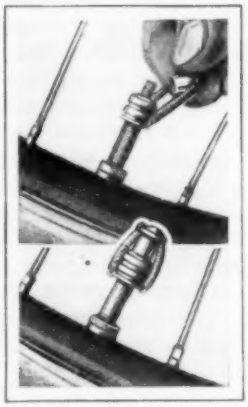
NEW HELIUM PLANT FOR MILITARY DIRIGIBLES

To insure a constant supply of helium, the non-inflammable gas used to inflate the bags of lighter-than-air craft, the bureau of mines has closed a contract for the establishment of a large plant in Potter county, Texas. It is proposed to extract the helium from the natural gas in the region, cooling it to 300 degrees Fahrenheit below zero so that all its constituents except helium are converted into liquids. The valuable gas will then be drawn off and compressed in tank cars or steel cylinders for shipment. The remaining liquid will be restored to a gaseous state for use in heating and other purposes. After the natural gas has gone through this process of extracting the helium, its qualities as a heating agent are said to be appreciably improved.



Showing How Easily the Swimming Skiff Can Be Lifted, and the Unit in Use; Note the Foot Paddles

SPRING TO HOLD VALVE CAP PREVENTS LOSS



Quickly removed or replaced, a tire-valve cap, used in Germany, is held by a spring so that it cannot drop off when taken from the stem. This saves time while inflating tires and also keeps the cap from becoming dirty, as usually happens if it falls to the ground.

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

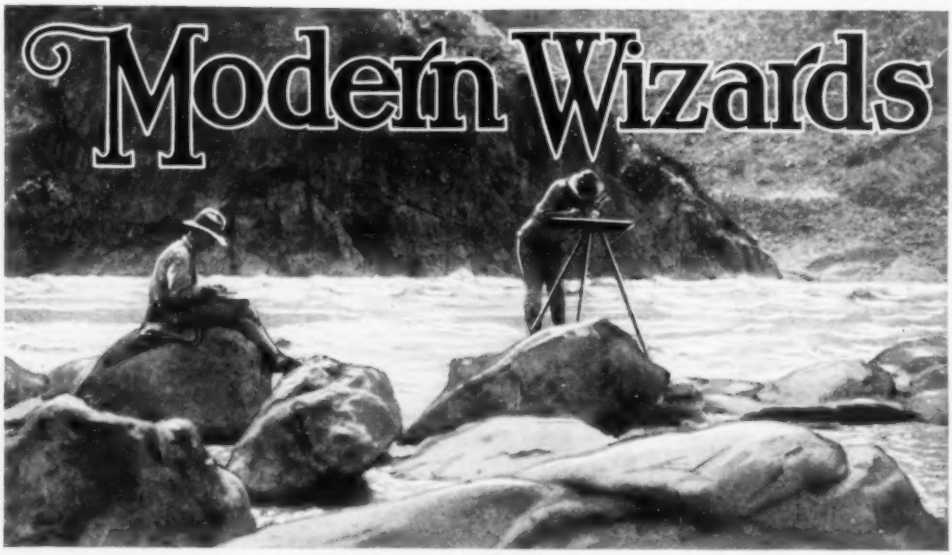
SWIMMING SKIFF SAVES LIFE AND AFFORDS SPORT

Supported by special floats and propelled by means of paddles, worked by the hands and feet, a light-weight skiff has been introduced as a life-saving unit and to provide sport in the water. It is easily managed, a number of them can be stored in small space, and considerable speed can be developed. When lying on the skiff, the operator's head is well out of the water.

LIGHTING FOR FIFTY HOMES IN GIANT ELECTRIC BULB

Three feet high and twelve inches in diameter, a huge bulb for airport lighting and other special purposes, produces illumination equivalent to that needed for fifty average homes, officials of the General Electric company report. It will have a life of 1,000 hours, while the thirty-kilowatt power bulbs already in use, have an average life of but ten hours. To prevent melting of the glass, a chimney has been fitted on top of the lamp.

Modern Wizards



U. S. Geological Survey Engineers Charting the Depths of the Grand Canyon of the Colorado, to Map the Possibilities of Utilizing Its Potential Five Million Horsepower

By JAMES NEVIN MILLER

WATER inspires the something like seventy-five engineers of the geological survey into a series of daily adventures that would make well-nigh any movie-stunt man envious. Within the space of a few weeks, they may be called upon to suspend themselves from a cable car above a raging torrent; dig holes through ice of sizable thickness so as to measure a stream's velocity; penetrate the ultra-arid regions of the great southwest, or risk their necks while surveying in the vicinity of rocks that tower hundreds of feet above the water level.

Bear in mind that these are typical, not unusual, cases. For practically all the survey's engineers are field men, worshiping the very name of water—the greatest of all the world's needs. Quenching thirst, offering transportation and power, transforming arid wastes into bountiful fields, it spells health, prosperity and progress to every one.

Veritable wizards in ingenuity, quick-fire judgment, inventive skill and action are these men. They must be, for theirs is the man-sized job of supplying the entire nation with reliable data regarding our water supply. Millions of dollars annually are saved, directly or indirectly, through their efforts. Records already collected have been the basis of most irrigation projects in the west; of modern development of power, both hydro and steam; of water supplies for cities and industries, and of studies for sanitation, drainage, flood control and navigation.

Located at strategic points along the edges of our major streams are about 1,800 measuring stations, devised to probe conditions of surface water—that is, the velocity and average rate of flow of our rivers. Each station is a good-sized concrete hut or shelter. Ordinarily it contains the following standard equipment: a steel cable—to be stretched above the stream from points along the shores—and a car that runs along it and into which the engineer may go when the occasion demands; and two ingenious devices, perfected after long years of study—the water-stage recorder and current meter.

The recorder is a permanent fixture of each station, being installed within the shelter over a well connected with the waterway whose surface is to be measured. The newest type shows the fluctuations in stages of the stream by means of a graph from which the height of the water at any time may be read. As for the cur-

# of Water Magic

rent meter, its purpose is to measure the velocity of a given stream, and this may be done by the observer in two ways, either by suspending the device by wire from the cable car, in case the stream is deep or violent, or by dropping it from a rod. It consists of a wheel, containing five cups, which revolves upon impact with the flowing water.

On impressive streams, such as the Colorado, where depths as great as fifty feet and velocities up to fifteen feet per second must be measured, using the water meter becomes hazardous. In such case no less than a hundred pounds of lead are necessary to hold the meter in proper position against the torrent, and cables as long as 1,500 feet must be used at dangerous points. Though the observer's perch may be lofty, and therefore seemingly exempt from dangerous risks, he is liable at any moment to be jerked from his position by the terrific impact of floating logs and other drift against the meter.

Measuring the Current Flow of a River with a Meter Lowered through Rows of Holes Cut in the Ice

Mountain climbers extraordinary are many survey engineers. Their work carries them to the very summit of our loftiest peaks. There, with the magic tools of modern hydraulic engineering—the map and the surveying rod—they create great artificial lakes, stepmothers of rivers. Few know of, but many gain by, the fact that, in regions of arid, unused land, engineers often can increase the mean flow of a river some three, four, fivefold and more, by means of expert planning and creation of storage lakes at the headwaters.

Notable among the recent large-scale developments in which far-seeing survey engineers were directly or indirectly concerned, was the Salt river project in Arizona. Here they outdid Mother Nature herself by their help in arranging an artificial lake, or reservoir, between seven and eight miles long. For many miles the available water supply was increased something like three times.

Such great storage basins are not like the popular conception of the average reservoir—which is merely a nice bit of a man-made lake. Instead they are many-shaped, many-sized, following in general the natural geological contours of the countryside. At times, they stretch some twenty, thirty and even several hundred square miles and they are regulated for the most part by a single dam situated at the "neck of the bottle," or headwaters.

If the everyday work of our surface hydraulic engineers tends to be little short of amazing in its results, no less so is that of the underground scientists of the survey. Their work has to do with discovering, developing, protecting and making more accessible the underground water resources of the country. As Dr. Oscar E. Meinzer, for the past fifteen years geologist in charge of the underground-water activities for the survey, phrases the situation: "About 55,000,000 people in the United States, or about half our total population, obtain their water from wells." Small wonder Uncle Sam is interested in underground water!

Geological Survey Signboards in the Southwestern Deserts Point the Route to Every Dependable Spring

Two main classes of wells are particularly emphasized by the survey investigations: the ordinary well, or that which is pumped, and the artesian well, which the dictionary describes as "a spouting well bored down to the point, usually at a great depth, where the pressure is so great as to force the water up into the air." These wells mean that miles away, at a considerably higher elevation, vast quantities of water from rain and snow have been seeping into the porous sandstone rocks which underlie the region, and then have percolated through the rocks far down into the earth. Thus, when man's drill penetrates the deep-seated rock and water formations, the pressure underground forces the water into the air.

Locating these valuable artesian water supplies is one of the most important jobs of the government geologist, particularly in the great stretches of country in the west and southwest where arid conditions prevail. In the case of a 3,000-foot deep well at Edgemont, S. Dak., a survey geologist guessed within one per cent of the actual depth. His trained eye glanced searchingly at the available geological maps, which, by the way, he himself had constructed after many months of painstaking research.

Indeed, the underground-water geologist, by virtue of expert knowledge of strata, can approximate the extent and location of our unseen water resources with almost the same degree of accuracy as can the hydraulic engineer with respect to surface water. Nor does he always have to be on the actual scene of opera-

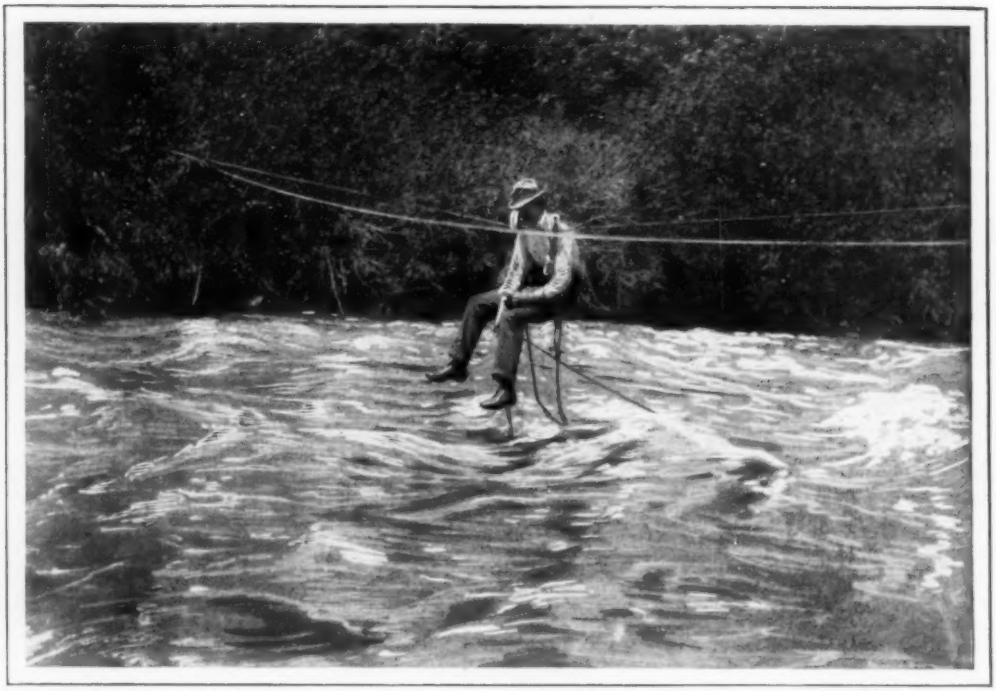
tions, as the following example illustrates: During the World War, an army officer, newly installed at a post in California, wired the survey for advice regarding the drilling of a proposed deep well at his base. Already he was working out plans for the purpose. However, he seemed anxious for the expert opinion of the geologists. Terse and to the point was their immediate response to the wire. Upon examination of reports and maps of the region, they found that the officer was about to try the feat of drilling through solid granite!

A sizable southwestern city, owing to a prolonged drought, was suffering from a serious shortage in its water supply. All the water that presumably could be obtained from mines, shallow wells and tunnels of the city waterworks proved woefully inadequate, and some of the houses on the higher levels were unable to get any water whatsoever for prolonged periods. A remedy must be found immediately, so the city was planning to purchase a spring some ten miles away, which at the time was flowing at about 145 gallons a minute, and to lay a pipe line across the mountains from the spring to the city. The project would cost about $120,000 and would involve serious engineering difficulties.

Measuring Deep Wells, and Charting the Current Flow, in Winter and Summer, with an Electric Meter

Fortunately, a survey geologist was called upon to help. Within a short time he found two sizable drilled wells within the city limits. One flowed about seven gallons a minute and the other wasn't even being used. So far as he could discover, neither well had ever been given a pumping test. Apparently they had been drilled in the attempt to get artesian water but it had not occurred to anyone that the yield of an artesian well might be increased materially by the simple process of pumping. Therefore, the survey geologist lost no time in advising the town authorities to install an air lift, which forces artesian water out of the ground considerably faster than its normal course permits, in each well.

Results were instantaneous and gratifying. For a period of three weeks both



Photos Courtesy U. S. Geological Survey

Suspended from a Cable in a Traveling Seat, Torrents Have No Terrors for the Hydraulic Engineer, Who Swings above the Rapids to Measure Depth and Current Flow of the Stream

wells were pumped, on an average, ten and a half hours a day. During this time the flowing well yielded about ninety gallons a minute, while the hitherto idle well gave about seventy gallons a minute. Thus two valuable water sources which nobody had thought were worth bothering about yielded as much water per minute as did the spring across the mountains, and their use at this time meant a saving of at least $120,000.

RUBBER IN TIRES PROTECTED BY CHEMICAL

Greatly increased mileage from automobile tires is anticipated from the use of a recently developed chemical preparation which is said to prevent the rubber from oxidizing in the air. The substance is added when the rubber is compounded and is not affected by vulcanization. According to reports, tires containing the chemical will not deteriorate through chemical reaction while in storage or carried as spares, but will fail only through wear or damage. In tests, samples treated with the preparation are said to have retained their elasticity indefinitely. It is intended for use in all kinds of rubber products, including bands, fruit-jar rings, washers, garden hose, hot-water bottles and all sorts of molded goods.

DESK FENDERS SAVE SILK HOSE FROM STRAY SPLINTERS

Fenders to protect the stenographer's silk hose from the splinters that lie in wait along the corners of desk legs are the newest accessory for the office. The fenders, metal strips copper-plated to blend with mahogany or oak desks, have a curved edge to fit over the sharp corner of the desk leg. A screwdriver is the only tool needed to install them.

PATENT INSURANCE PROTECTS INVENTOR AND MAKER

For the protection of inventors, manufacturers and others interested in patented articles, a new form of insurance has been announced by two eastern companies. The policies provide two forms of coverage, one for defense and indemnity in the event that infringement suits are brought against the policy holder, and the other for bringing of suits when his rights are violated. The insurance is designed to safeguard the interests of all persons concerned in a patent, including the inventor himself, the manufacturer, the seller and the user. A primary function of the plan is to alleviate the timidity that now not infrequently deters manufacturers from exploiting desirable patents.

MUSHROOM ANCHORS TO HOLD LANDING FIELDS AT SEA

Special anchors have been devised by an eastern inventor to hold the "floating island" landing fields for airplanes. They are of cup or mushroom shape and are intended to grip the bottom of the sea through the partial vacuum which will be formed within the bell-like portion of the anchor. A number of these, it is believed, fixed to a rock bottom, would keep the landing field or seadrome from being torn away from its moorings.

Model of Mushroom Anchor Intended to Hold Floating Island Airplane Ports to the Bottom of the Sea

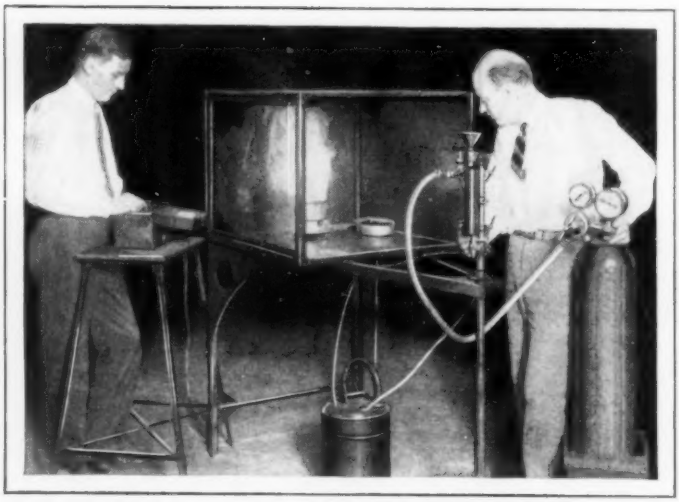
Pillar of Sleeping Porch, with Decorations Showing Changing Styles in Bonnets

HISTORY OF BONNETS IN CLAY NOVEL PORCH DECORATION

Changing styles in women's hats furnished the theme for unique decorations on the sleeping porch of an eastern man's home. On the tops of the railing posts, he modeled the heads of women wearing bonnets in fashion during the 60's, a mode of about 1900 and the turban of today.

CATNIP AS LURE FOR BOBCATS HELPS PROTECT GAME

Catnip oil is being used effectively in trapping bobcats, mountain lions and lynxes that destroy between $20,000,000 and $30,000,000 worth of game and live stock in the western states each year. It is placed on traps or on poisoned bait and seems to attract the beasts as strongly as it does the domestic cat. The government planted a catnip garden at Arlington, Va., to provide oil for the first experiments and the first trials proved so successful that larger crops were grown at Saratoga Springs, N. Y. Last year, hunters of the biological survey caught 246 lions, 3,677 bobcats and forty-one lynxes, hundreds being victims of their love of catnip.



Testing the Extinguishing Power of Different Chemical Mixtures on Blaze of Oil, in Special Cabinet Where Temperatures Were Measured

FIRE-FIGHTING TESTS HELP REDUCE LOSSES

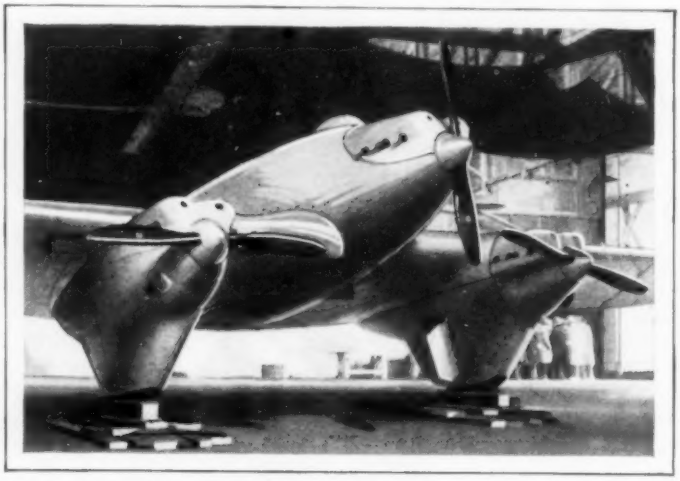
For hundreds of years, man has relied chiefly on two principal methods of combating fires—lowering the temperature by water, or smothering the blaze with substances that cut off the oxygen. These ways are now being supplemented by the use of special chemicals, notably in fighting oil and similar fires difficult to manage by ordinary means. Interesting effects have been observed in tests with these substances. Some that contain large amounts of oxygen were discovered to be effective agents in putting out fires, if the proper amount of water was mixed with them. In making the trials with the different chemicals, a special testing chamber is employed, in which carefully measured amounts are directed on a blaze of gasoline under pressure. Different solutions of the substance are tried until the most effective one is found. Accurate temperature-measuring apparatus was used in connection with the cabinet to duplicate actual fire conditions.

TORTOISE FARMS IN DESERTS TO SUPPLY FOOD

Fifty specimens of the giant land tortoise have been brought to this country from the Galapagos islands to determine if they can be raised on the desert lands of the west. The species is primarily a cactus eater, according to Dr. Charles H. Townsend, of the New York aquarium, but it also feeds on grass and vegetables of different kinds. Its value as a meat producer long has been overlooked, he declares. The tortoises sent here are infants, the largest being about the size of a washtub. In captivity, this variety often doubles its weight annually for a time and has been known to reach a weight of 400 pounds in fifteen years.

NINETY-FOOT TRI-MOTOR PLANE FOR TRANSATLANTIC FLIGHT

Undiscouraged by many failures at flying across the ocean, aviation engineers are building new ships with which they hope to make transatlantic flights practical. One of the most recent of these

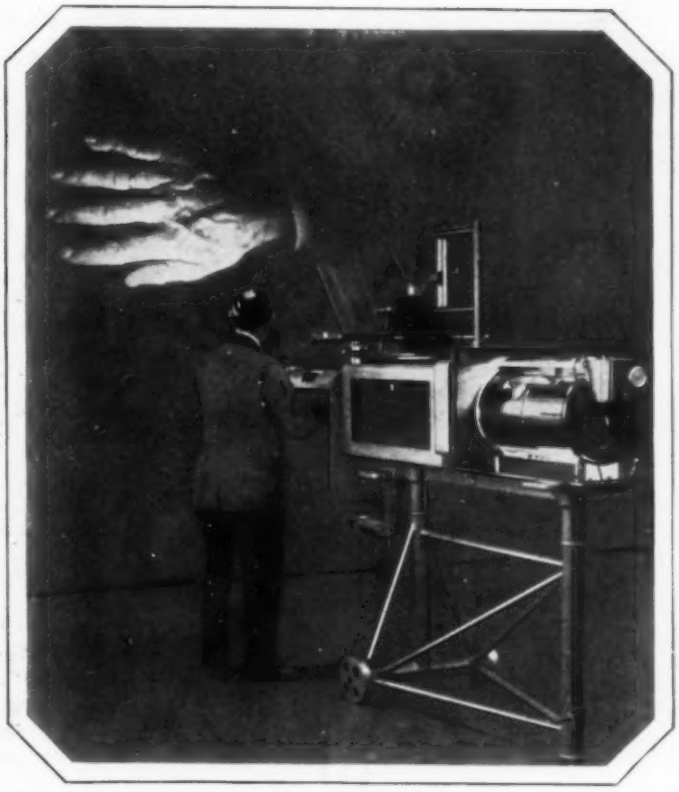


Front View of the French Tri-Motor Plane for Transatlantic Flights; It Will Carry Nearly 1,700 Gallons of Gasoline

craft is of French design. It has a wing spread of ninety feet, is equipped with three motors, each of 180 horsepower, and carries 1,638 gallons of gasoline, besides seventy-four gallons of oil. There are seven tanks for fuel. The plane will carry radio-transmitting and receiving equipment.

SEEK LONGER LIFE FOR PAPER MONEY

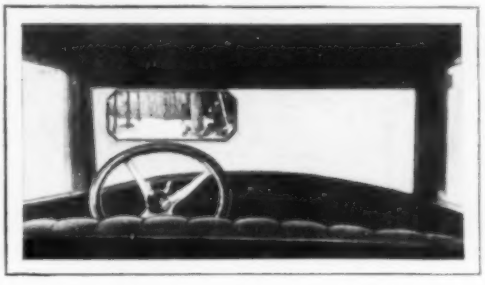
By increasing the strength of the fibers, the government has prepared paper currency that will last about twice as long as the old kind. A bank note can be folded 5,000 times in two directions without separating the fibers. Strengthening the paper with glue sizing was tried at first but with less success as the paper suffered in the process of printing. Better results were obtained by improving the fibers. Experiments are now under way to determine if cotton can be used as a substitute for linen without impairing the quality of the paper.



Three-Dimensional Projection of the Human Hand with Apparatus Intended to Aid in Lecture and Demonstration Work

AUTO WINDSHIELD KEPT CLEAR WITH GLASS PROTECTOR

Moisture and frost are prevented from collecting on the inside of the auto windshield by means of a plate of clear glass fastened to the interior and forming a dead-air space between itself and the shield. It is held securely by a half-inch rubber molding, so that no drilling or cutting is required. An additional feature is that it does not interfere with the wiper.

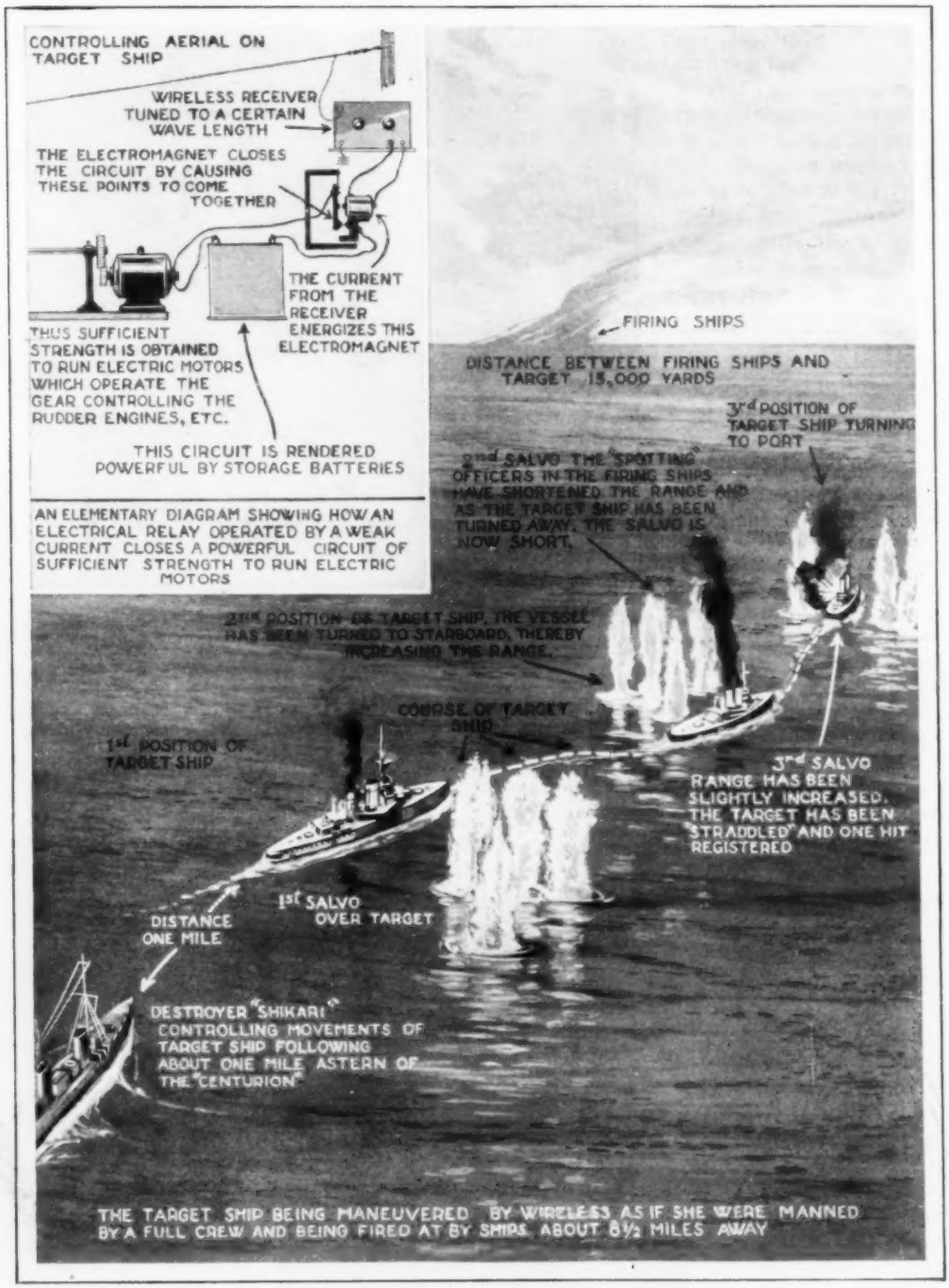


Windshield Protector Installed, Showing the Clear Space Left Due to Dead-Air Space under Glass

"SPIRIT"-PICTURE PROJECTOR TO AID TEACHERS

Objects of many kinds and shapes are projected upon a wall or screen in three dimensions, with an apparatus German scientists have developed. It produces an image from the real object through an arrangement of mirrors and lenses with special illumination. To an observer, the effect is somewhat like that of the so-called "spirit" pictures, in which a tangible object seems to materialize out of space. The projector is especially adapted to lecture and instruction work, is as simple to operate as the ordinary projector, and saves the preparation of slides.

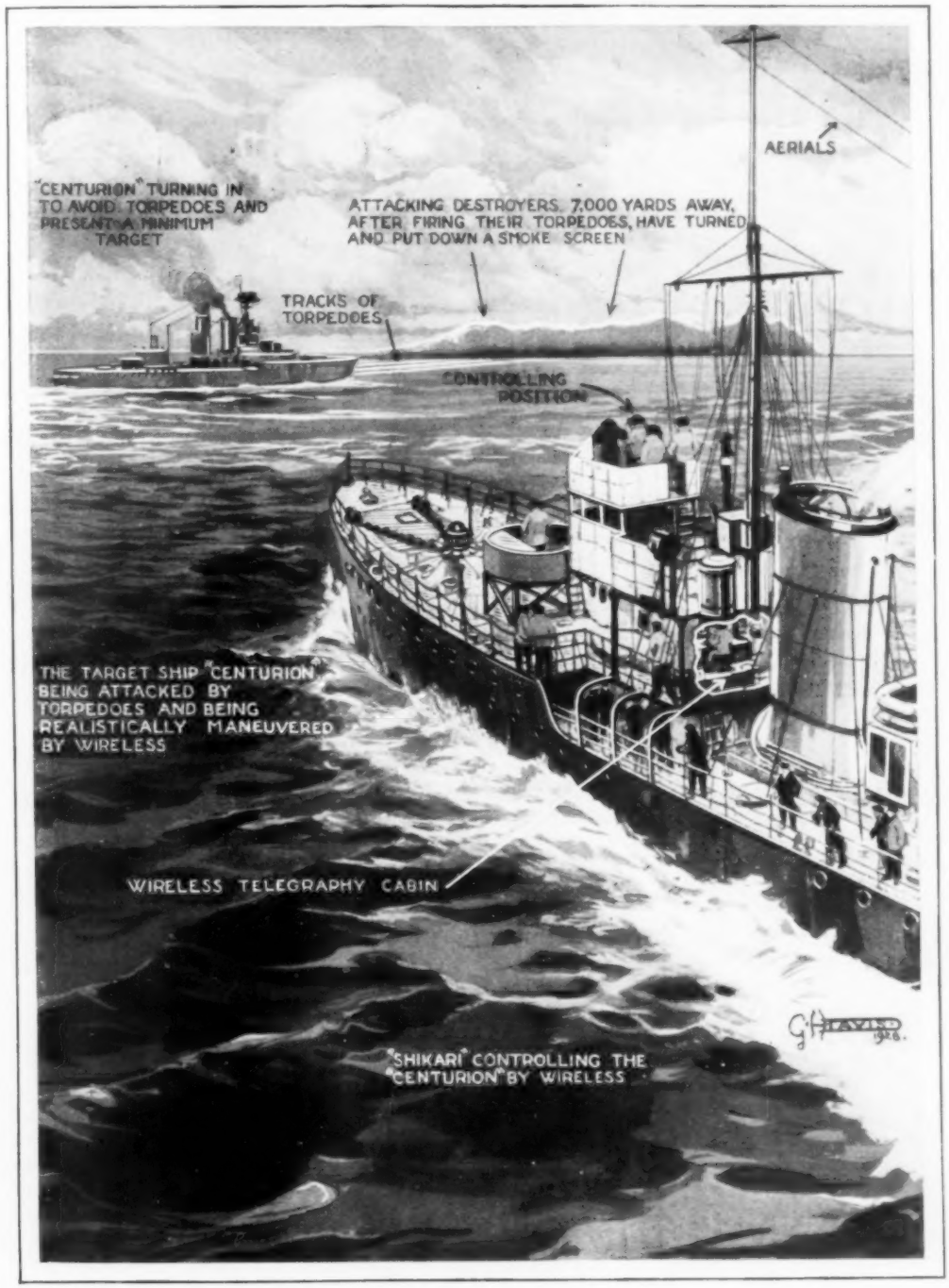
WIRELESS-CONTROLLED BATTLESHIP, STEAMING



Courtesy The

Following in the Line of Experiments Made by the American Navy Some Years Ago, the British Admiralty Has Equipped the Old 25,000-Ton Battleship "Centurion" for Remote Wireless Control So That the Grand Fleet Can Have Actual Battle Practice without Danger

WITHOUT A SOUL ABOARD, USED AS GUN TARGET



Illustrated London News

After the Crew Is Taken Off When the Drill Ground Is Reached, the "Centurion's" Captain, from the Bridge of a Destroyer a Mile Away, Maneuvers the Battleship by Radio to Dodge Shells from the Enemy beyond the Horizon, and Thwart the Torpedoes of Attacking Destroyers

Weaver, and Sample of Seamless Trousers Made from Burlap

WEAVES SEAMLESS TROUSERS IN HAND LOOM

Trousers are woven without seams from such materials as burlap and other cloth by an eastern expert who has had more than sixty years' experience with a hand loom. Even the side openings for the pockets are woven instead of being cut. The garments have a neat appearance.

CLOCK BUZZES WARNING OF ENGAGEMENTS

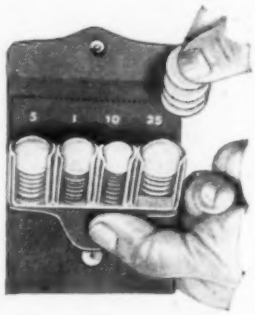
To aid in keeping appointments, a memory-jogging clock that gives an audible and visible reminder of duties to perform, has been introduced. Around its face are forty-eight slots, one for each quarter of an hour. A tab, bearing a memo of the engagement, is inserted in one of the slots opposite the proper time and the alarm set. When the hour arrives, the clock gives a buzz, which sounds for five minutes but ceases when the tab is removed.

TONS OF EXPLOSIVES SHIPPED WITHOUT LOSS OF LIFE

Last year, nearly 500,000,000 pounds of dangerous explosives were shipped in the United States and Canada without loss of life or injury to any person, and with a money loss of only $45. The record is considered largely due to the efforts of the bureau for the safe transportation of explosives and other dangerous articles, organized in 1906. Nearly 230 different kinds of merchandise are now listed by this bureau as requiring special handling to prevent fire and explosions. In 1907, explosives were charged with seventy-nine accidents, fifty-two fatalities, eighty personal injuries and a property loss of nearly $500,000.

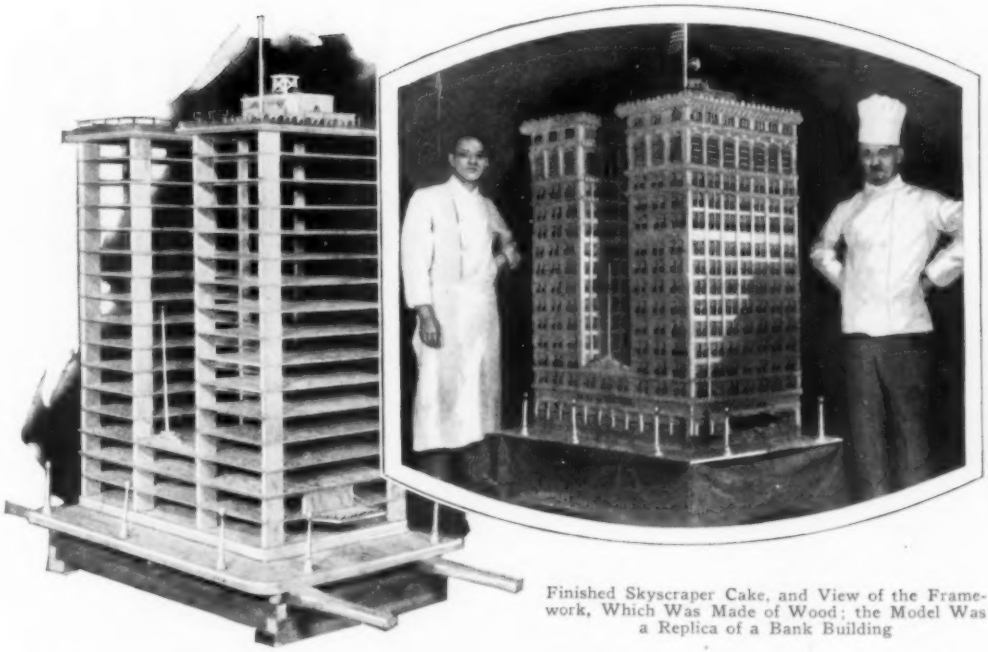
HOLDER KEEPS COINS SORTED SAVING TIME AND LOSS

Coins of different denominations are kept conveniently sorted, where they are not likely to become lost, and may easily be picked out, in a pocket holder recently introduced. This saves searching for the right coin, reduces wear on the pocket and enables a quick estimate of the amount of money on hand. Beside the compartments for small coins, the holder has space for those larger than a quarter and for bills.



KEY CASE WITH SWIVEL HOOK SOLVES TURNING PROBLEM

A leather key container with the hooks mounted on swivels, so that the key in use can be turned without revolving the entire case or twisting a part of it, has been placed on the market. Each hook is mounted on an individual swivel disk that turns easily by itself. A leather flap carries an identification card under a transparent window to insure return of lost keys, or identification of the owner.



Finished Skyscraper Cake, and View of the Framework, Which Was Made of Wood; the Model Was a Replica of a Bank Building

CAKE IN FORM OF SKYSCRAPER WEIGHS HALF A TON

They built a skyscraper in three weeks in Spokane, Wash., recently, but the structure was of wood and pastry and the result was an enormous cake, a replica of a bank building in the city. The cake weighed 1,100 pounds and was formed about a framework of wood. Its builders took out an insurance policy on it.

RECORDS MADE IN YOUR HOME WITH PHONOGRAPH UNIT

A recording attachment for any make of phonograph is now available for those who wish to make their own records at home, preserve the voices of their loved ones or "can" radio programs for future use. The unit operates on familiar principles but requires no skill to use. It is simply attached to the phonograph, you speak into the horn, and the voice is recorded and ready for reproduction in a few moments. Blank disks are furnished with the outfit, which has been recommended especially for voice and dramatic schools to enable the pupils to listen to their own performances and so correct their errors.

Making Her Own Phonograph Record; the Attachment Is Easily Adjusted and Is Simple to Operate

TYPEWRITER FOR THE BLIND HAS SIX KEYS

Portable typewriters, cross-word puzzle boards, and a set with which children can work problems in mathematics, are among the recent aids developed for the blind. The typewriter has only six keys, yet it prints every letter in the alphabet and all the common signs in the perforated Braille system. At the headquarters for the war and civilian blind in Paris, a rotary press that prints 12,000 Braille pages an hour has been received from Switzerland. Former machines turned out but 4,000 pages.

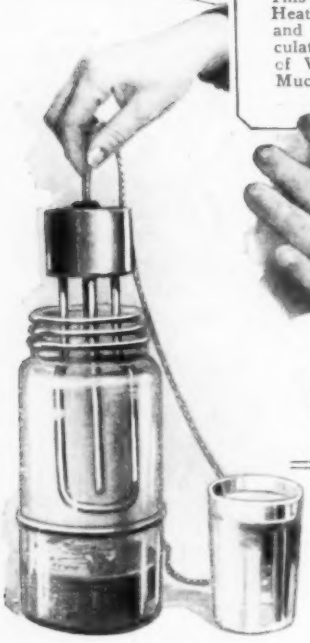
To Save Work

This Portable Electric Heater Contains a Fan and Generates Steam to Insure Circulation and Healthful Condition of Warm Air; It Uses About as Much Current as a Flatiron and Requires Little Attention

Window Cleaner, with Brush and Squeegee, Also Has a Container to Hold Water So That a Pail Is Unnecessary; It Combines Four Tools in One, Saving Time and Trouble

To Keep the Infant from Sucking Its Thumb; This Small Attachment Is Held by Adhesive Tape

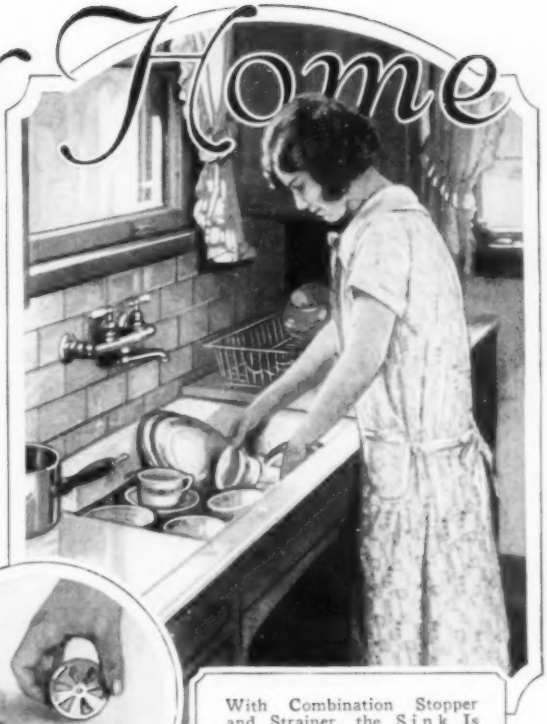
The Handle of This Magnifying Mirror Contains a Nail File and a Pair of Tweezers, and Folds Up as a Support for the Glass on Table



For the Traveler Who Wants Pure Water, This Electric Unit, Operated from Lighting Socket, Floats and Collects Impurities as a Scum Which Is Easily Removed

in Your Home

Food Press Is Easily Taken Apart for Thorough Cleaning and Has an Efficient Dasher

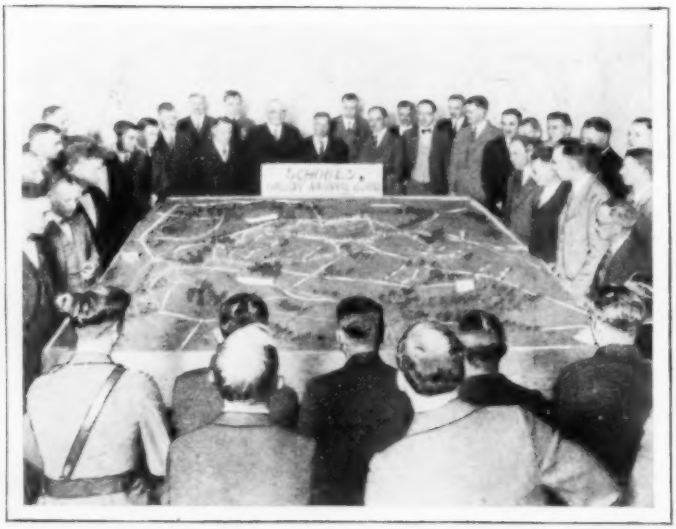


With Combination Stopper and Strainer, the Sink Is Converted into a Dishpan, Saving the Bother of an Extra Article

Pastry Cutter and Mixer, Invented by a Woman, Saves Time and Is Said to Insure Lighter Crusts; It Supplants Hand Method of Cutting Shortening into the Dough

The Back of This Clothes Brush Has Small Tank for Cleaning Fluid, to Aid in Removing Spots

Cross-Shaped Candle Support Holds the Candle Securely in Socket and Also Catches the Drippings; It Is Serviceable When Sticks Are Too Large for the Candle



Civilians Studying Army Maneuvers on Model Map; Problems Are Worked Out by Directing Hypothetical Troops over Mimic Battlefield

WAR GAME WITH MODEL MAP TRAINS CITIZEN SOLDIERS

Civilians being instructed in some of the fine points of war, make use of a model map, like those employed at the war college in Washington. The group is divided into opposing sides and the various moves to be made by a hypothetical army are indicated on paper. Hills, trees, railroads and other strategic features are represented on the map.

RAIN AND SNOW FEED GEYSERS IN YELLOWSTONE PARK

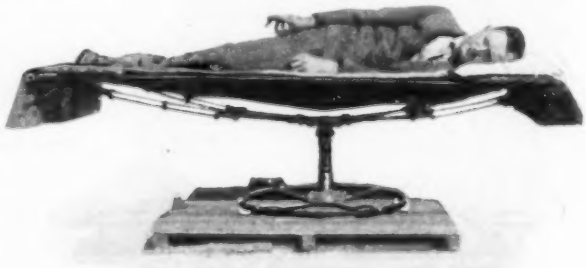
Rain and melting snow help run the geysers in Yellowstone park, scientists have found. The columns of steaming water are shot up, not wholly by the action of subterranean boiling springs and vast steam chambers, but by rain water and melting snow trickling through fissures in the surface of the rock until they meet steam and other volcanic gases from a buried lava mass. The water gets hot and when a certain pressure is reached, the geyser spouts. There are three main classes of hot springs and geysers: those sending out the greatest volumes of water, clear, very hot and usually alkaline in reaction with but little sulphur; smaller ones whose water is often acid and turbid, and a third group whose water contains lime and considerable sulphur but is comparatively clear and not excessively hot.

GAS FLAME KEEPS FISH SHIPMENTS FROZEN

Shipping fish in iceless refrigerator cars has been successfully tried between New York and Fort Worth, Tex. The cars are equipped with freezing apparatus that utilizes a gas flame and a special material which produces intense cold in combination with the flame. No source of mechanical power is required, and the compactness of the refrigerating unit increases the space available for loading by about ten per cent.

FOLDING PEDESTAL BED FITS IN DRESSER DRAWER

Instead of standing on four legs, a folding bed, introduced by a California inventor, rests on a center pedestal. It is said to conform more nearly to the figure of the occupant and needs but little bedding for comfort. In a few moments, it can be converted into a wall bed or may be taken apart and placed in a bureau drawer. A special feature is that the support revolves on the pedestal, making the bed suitable for use in a sickroom.



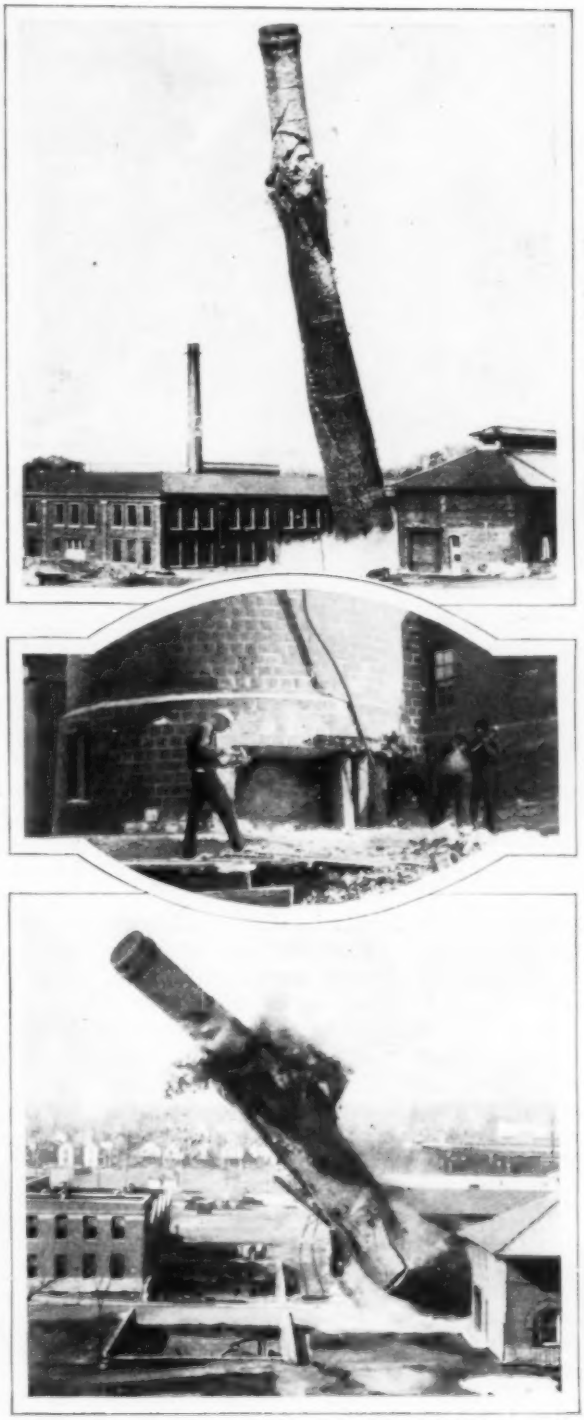
Bed on Pedestal Instead of Legs Can Be Folded in Small Space and Gives Comfortable Support

FELLING GIANT CHIMNEY SHOWS SKILL

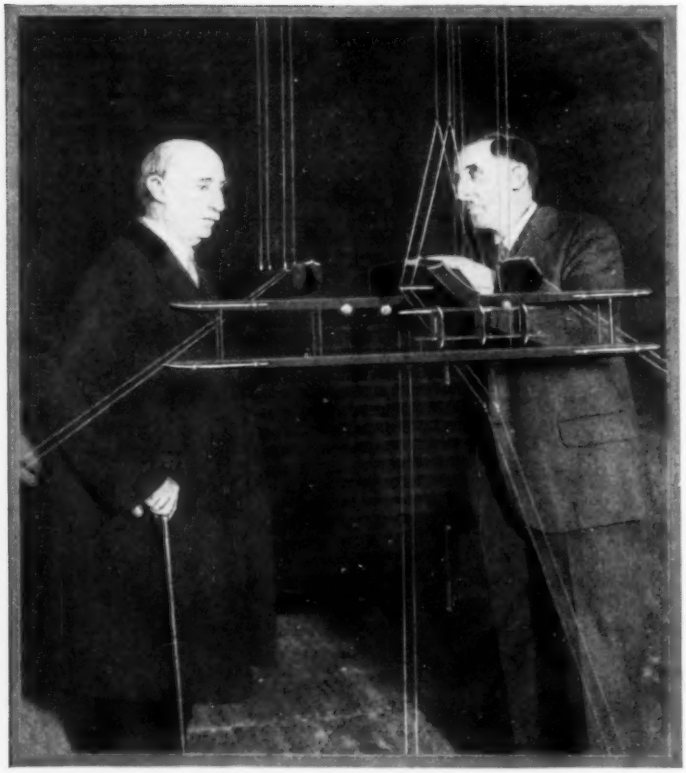
Toppling a 700-ton smokestack, 204 feet high and seventeen feet in diameter, is as easy as felling a chestnut tree, if you know the trick, according to W. M. Barber, veteran chimney thrower. He demonstrated his skill recently when he wrecked a huge stack on the Ohio State University campus, bringing the big pile down within a few feet of a building without damaging that structure. Workmen first cut away the bricks and concrete on the west base of the chimney, since it was to fall westward, and filled the hole with timber props. After the supports were in place, they were covered with inflammable material that had been soaked in oil. A match flared, the pile was ignited and for nearly half an hour a big crowd waited while the chimney smoked. Finally, the fire-eaten supports began to crumble. A minute later, the whole structure collapsed. An added thrill was furnished when a large crack broke through the base of the stack and tore zigzag toward the top, as the chimney fell.

PHONE SHIP AND PLANE BY DIAL SYSTEM

Telephone messages to moving ships, airplanes and trains are now possible by the dial system, provided the proper receiving apparatus is carried. By the new method, which has just been developed, a subscriber sitting in his home might talk to a passenger on the "Leviathan" at sea, could get a message to the Twentieth Century Limited as it sped along or reach the "Los Angeles" while is was high in flight. The process permits linking of radio and land-wire systems and is not expected to supplant the existing land-telephone installations but merely to amplify them.



Big Chimney Splitting Just as It Fell; Cutting Away the Bricks for Temporary Timbers That Were Burned, and Stack an Instant before Final Collapse



Testing Model of the Giant Seaplane Which Has Been Planned to Carry 300 Persons at One Time across the Atlantic

SEAPLANE TO CARRY HUNDREDS OVER OCEAN IN FEW HOURS

Transatlantic flights in nineteen hours in a giant seaplane that will carry 300 persons at one time, are planned with a craft being designed by a New York inventor. Whether the plan will be a success or not, is being determined to a degree of certainty, by means of wind-tunnel tests on a model of the plane. These experiments reveal any structural defects or faults of design, so that errors may be rectified.

OUNCE OF RICKETS REMEDY EQUALS TONS OF OIL

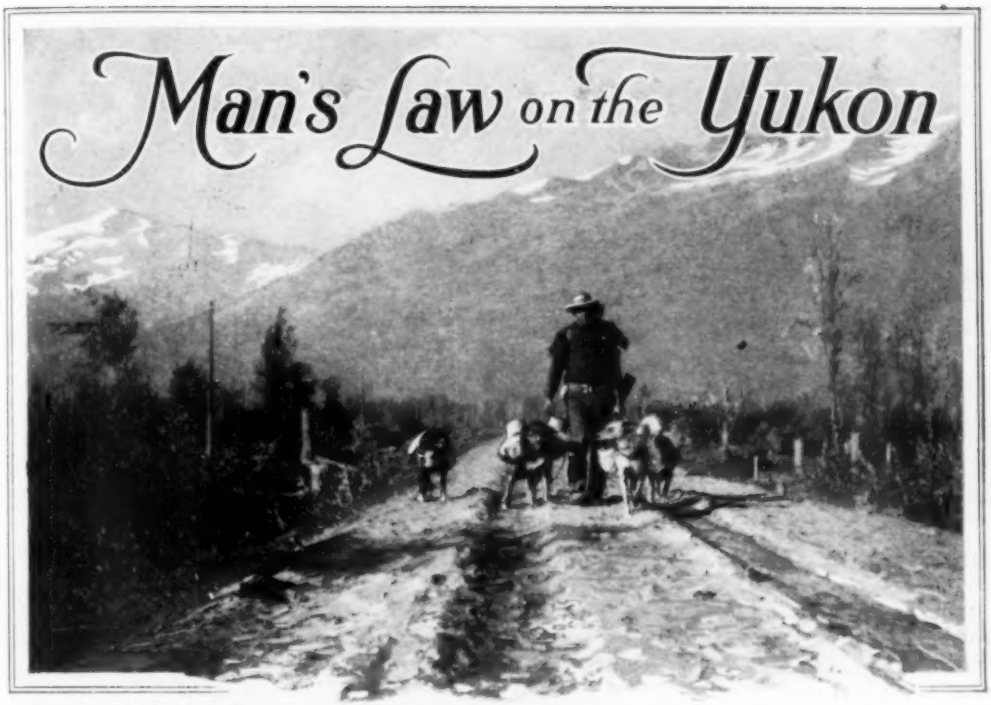
Irradiated ergosterol, a new remedy for rickets and similar bone diseases discovered a year ago, is so powerful that a single ounce of it is equal in effect to six tons of cod-liver oil. The substance, which is the parent material of vitamine D, is so potent that a twenty-five-thousandth of a milligram, a quantity almost inconceivably minute, will protect a rat from rickets when added to its daily diet. Dr. Alfred Hess, of Bellevue hospital, New York, and Prof. A. Windaus, of the University of Goettingen, Germany, working together, discovered the remedy. Babies receiving from two to four milligrams a day in the Bellevue hospital clinic are almost regularly cured, according to Dr. Hess. One of the advantages of ergosterol over cod-liver oil is that it is both tasteless and odorless, so that it is easy to get children to take it.

CHANGEABLE SIGNS MADE UP WITH LOOSE LAMPS

Electric signs in the form of panels with perforations, in which letters, numbers and designs can be arranged with little trouble and changed at will, have appeared in advertising. No alphabets, guides or other accessories are needed, the legends being made with small lamps which anyone can insert. A druggist, for instance, could utilize space and current required for a fixed sign, to advertise a different feature daily.

Inserting the Small Bulbs in Board, and a Sample of Illuminated Design

Man's Law on the Yukon



Courtesy U. S. Geological Survey

In Summertime, the Sled Dogs Become Pack Carriers and Frolic Along as the Alaskan Game Wardens Cross Snow-Clad Mountain Ranges on Their Rounds

NINE men, with a territory nearly a fifth as large as the United States, spread over an area almost as wide, a large part of it virgin wilderness, have brought the law to the Yukon district.

The nine game wardens of the United States biological survey have been, since 1925, charged with the great task of enforcing game laws in Alaska, once a fur paradise where men have been accustomed since the beginning to trapping and hunting what they wanted when they wanted it, without regard to open or closed seasons.

Mighty rivers, tundra plains, ranges of mountains that include the highest peak in North America, a vast chain of islands stretching in a giant semicircle far out toward the shores of Asia, glaciers, volcanoes, alive and dead, the famous valley of Ten Thousand Smokes, the home of the brown Kodiak bears, largest living carnivorous animals; all these and many more come within the empire ruled by just nine men. Some day, when the force is recruited to full strength, it will number fourteen—the maximum the game law allows to police 586,400 square miles of land and water—a territory more than twice the size of Texas, and with a population, at the last census, of but 55,036.

To police it, the nine have divided the mainland and the long chain of the Aleutian islands into districts. The smallest is 360 miles across, and the biggest 1,600 miles long. The latter includes the islands of the sea, the active volcanoes, the valley made famous by its thousands of smoking, steaming craters, the seal rookeries of the Pribilofs, and the only way to cover it is by boat through some of the world's worst seas.

Sudden storms and treacherous fogs, and the always present menace of freak winds, the "willie-waws" of the north, make the Aleuts a constant danger zone. Small, stanch ocean-going boats, moderate in length, but built with the flaring bows, deep draft and straight sides of the north Pacific halibut fishing fleet, are used by the seagoing wardens.

On the mainland, the mighty Yukon and its maze of tributary streams, provide ice-sheathed roads for dog sledges in winter,

and lanes for small steamers or canoes in summer. Away from the rivers there are few trails, no roads, once the settlements are left, and only dogs as the main reliance for transportation. In winter, the sled dogs drag in supplies, and in summer they carry small packs strapped to their backs. A few horse pack trains are used, but much of the territory the wardens cover is too rough even for pack horses to get through.

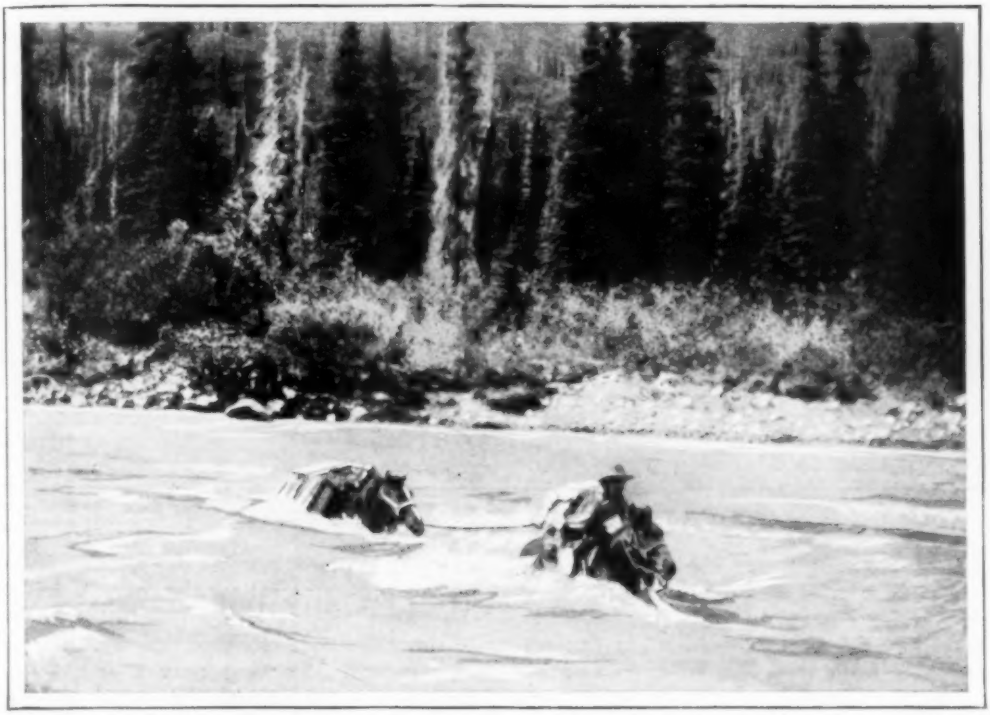
Pair of Frolicsome Brown Bears, Largest of Their Tribe in the World, and a Dog Team Mushing Supplies over the Ice

In such an empire it is easy for a man to drop from sight and never be heard of again. Not long ago, fifty men, in ten small steamers, searched the Chichamin river for weeks without finding a clue to the fate of one of the wardens. Five weeks before he had chartered a boat to make a hurried trip up the river. Under orders to exercise extreme care on his mission, which was presumed to be a secret, he had also been directed to reduce expenses as far as possible, so his renting of a boat for the hurried journey indicated something important had developed. Yet man and boat both disappeared, and no trace of either has ever been found.

Until a few years ago fur trapping and hunting in Alaska, yielding a return running into the millions, went practically unregulated. What closed season there was, was dictated entirely by the trappers' instinct against taking a pelt not yet in its prime. Under such conditions the available fur supply has dwindled rapidly in recent years.

When the biological survey took charge, in 1925, it started with a closed season on such fast-disappearing species as the marten and beaver, and a reduced bag limit on others, including trophy hunting for moose. Game regulation has never been popular with professional hunters, and in a region where there never had been law enforcement, the task of the wardens was enormous. But, according to Ernest P. Walker, formerly executive officer of the Alaskan game commission, who helped put the new regime in operation, the wardens have established the record of winning ninety-six per cent convictions where they went to court with offenders, and the heavy penalties instilled respect for the new order of things.

Chosen from the pick of Alaska's trail experts, the game guards are noted not only for being quick on the trigger, but likewise for being level-headed and cool. Two years after they went into action, the game regulations were strengthened by a rule requiring every legally taken beaver



Bridges and Fords Are Rare in Alaska, So, Frequently, the Game Wardens and Their Pack Horses Must Plunge through Brawling Rapids, at Imminent Risk of Death

and marten pelt to be presented for the inspection of the game commission or wardens, and also demanding an affidavit from every trapper attesting the legality of his catch.

The temptation to beat the law is strong, for a single marten pelt may bring $100, and a few laid away before the season opens, later to be smuggled out and sold to some fur buyer, may net a tidy sum. A beaver pelt brings, on an average, $20, and the trapper is limited to ten in southern Alaska and twenty each season in the north. Every five that can be taken outside the law means another $100 profit.

In making their rounds, the wardens utilize almost every form of primitive transportation, and now they are beginning to adopt the most modern of them all, for flying is being established on a practical basis in the far north. Thirty-odd landing fields have been cleared, and several air lines are in active operation. On many trips the cost of an airplane is cheaper than travel by dog sled, for weeks of painful work may be compressed into a few hours by air.

With a range in climate from warm summer days, to winter blizzards, when the thermometer may drop to fifty or sixty below zero, the work of the wardens is far from pleasant. One, in his report of a long and lonely patrol from Bethel, somewhat north of the Kuskokwim river down to the Bristol bay region, tells of starting in winter, sledging his camp equipment and supplies over the snow and ice. A warm spell before he reached his destination melted the surface snow and softened the ice until, at river crossings, the dogs were almost buried in slush. Even in summertime, with the ice danger removed, crossing Alaskan streams is no child's play. Coming down from the mountains through narrow gorges, dropping rapidly toward the plains, the rivers and creeks abound in rapids, and there are no well-marked fords by which they can be crossed. Even the navigable streams are dangerous, and the small steamers that travel them during the short summer season are provided with enormous timbers which can be thrust out from the sides to keep them from being

An Alaskan Game Warden, with Well-Loaded Sled and a Dozen Dogs, on the Trail; Away from the Settlements, Dogs Are Still the Main Reliance, though Reindeers Are Coming In

whirled into the river banks in bad gorges.

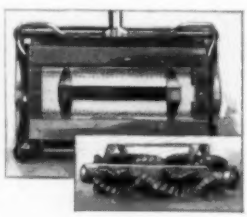
Not all the adventures of the game warden are with poachers or natural enemies. Occasionally, the game they are protecting takes a dislike to them and other animals show fight. One of the force was badly mauled in a battle with a giant Canadian lynx, and the brown bears of Kodiak are notable for their short tempers, while even a moose is not averse to charging, if cornered.

The introduction of reindeer into Alaska has lessened the game hunting by Indians and Eskimos in search of food. Instead of being nomads, continually moving from place to place to follow the migrations of the game, the natives are settling down to the job of shepherding the vast flocks of reindeer. Starting only a few years ago with 1,200 animals imported by the government from Siberia, the herds are now counted in the hundreds of thousands, and a thriving meat-packing industry is springing up.

The reindeer also are displacing the dog teams. Their greater speed, and ability to dig out their food from beneath the snow, make them especially valuable.

COMBS IN CARPET SWEEPER KEEP BRUSHES CLEAN

Brushes in a carpet sweeper now on the market automatically keep clean, saving the user much unpleasant work and loss of time. This is accomplished by combs, so adjusted that they remove dirt from the bristles as they revolve and convey it to the sweeper pan. One comb swings in as the other swings out, the action causing the combs to clean the brushes and the brushes to clean the combs. For sweepers not already equipped with these cleaning units, sets of combs are furnished and may be installed with little trouble.



CORN HUSKS TO POLISH RUBBER SERVE AS EMERY

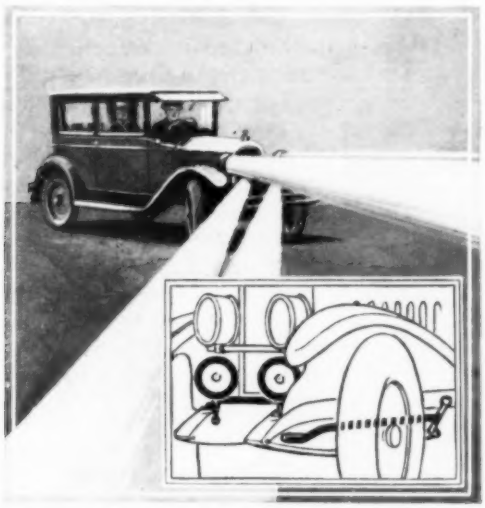
Corn husks, generally considered as a waste product, have been applied to various manufacturing processes as polishers for hard rubber. Cleaned and clamped between two iron disks, with an axle through the center, the butt ends are used to give a high luster to the material in much the same way as emery wheels are employed. Automobile steering wheels and combs of hard rubber, as well as a number of other articles of common use, are often polished in this manner.

SPEECH IN EIGHT LANGUAGES AT SAME TIME BY RADIO

With the aid of interpreters and a special broadcasting installation, persons attending a labor conference at Geneva were able to hear the same speech in as many as eight languages at one time. As the talker delivered his address, the interpreters, sitting at microphones, translated his words into different tongues and relayed them through an amplifying circuit to the hall, where the auditors were provided with special listening equipment, so that they could tune in on any translation desired. The interpreters talked in low tones so as not to disturb the speaker or interfere with each other. Experiments are being made to record the speeches in the various languages without the help of shorthand reporters.

STEERING WHEEL TURNS LIGHTS FOR SAFER DRIVING

Driving the automobile at night is made safer and easier with a pair of lights adjusted to turn as the steering wheel is turned so that the roadside is well illuminated on either side and on turns. Being set below the regular lights, the special lamps do not shine into the eyes of approaching drivers. They may be operated with or without the main lights and have a special control button on the dash.



Photograph and Drawing to Show How the Special Automobile Lights Swing with the Front Wheels

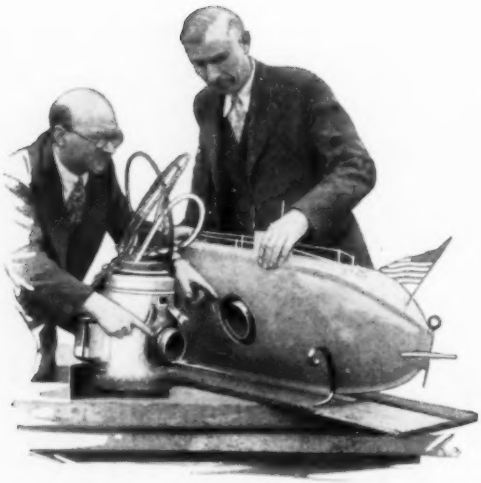
Home Exercising Outfit, with Special Attachment to Stretch and Strengthen the Neck Muscles

NECK EXERCISER FOR HOME USE HELPS PROMOTE HEALTH

Attached to the door frame, or other convenient location, an exerciser to strengthen the muscles of the neck has been introduced. It affords healthful recreation, calculated to improve the circulation and benefit the nerves.

MICROPHONES IN JAIL ROOM TO TRAP PRISONERS

Microphones and loud speakers have been used successfully in the Los Angeles county jail in obtaining evidence against prisoners. Installed in the "shadow box," the room where suspects are paraded under powerful electric lights shining through a screen, they give attorneys and deputies an opportunity to "listen in" on the prisoners' talk. Detectives are stationed in a room removed from the shadow box.



Model of the Diving Bell for Submarine Rescues, with Small Craft to Show Method of Connecting

DIVING BELL FOR SUBMARINES TO AID IN RESCUES

For rescuing men trapped in submarines, two eastern inventors have devised a diving bell that can be lowered to the sunken craft, screwed to a special porthole in the submarine and so afford a means of escape for the occupants. From six to ten men can be accommodated in the bell at one time.

SCULPTOR WORKS SIX YEARS ON WAR MEMORIAL

One of the most elaborate stone carvings in this country is under way on the Elks memorial building in Chicago, where a 170-foot panorama of War and Peace is being chiseled as a border around the front of the structure. It is the work of Adolph A. Weinman, who spent nearly four years in preparing the plaster models and in making studies for the huge bas-reliefs. One-half of the work has just been completed after a year of carving, and the other half will be finished in the summer of 1929. Scores of figures, each cut in great detail, appear in the designs. The panorama of War, already finished, depicts Satan and Gossip starting baseless rumors to incite a conflict. Greed clutches his money bags and seeks protection behind the throne, while the ruler signals his heralds to sound the call to arms. The dogs of war are unleashed and stalwart men march forth to battle. Scenes of carnage are depicted and finally Victory emerges in triumph to receive the evergreen sprig of immortality, offered by Truth. The panorama of Peace will be represented in symbolic tableaux. The work will cost approximately $120,000.

Close View of One of the Stone Figures in the Panorama of War on the Elks Memorial; a Pageant of Peace Is Being Carved Opposite

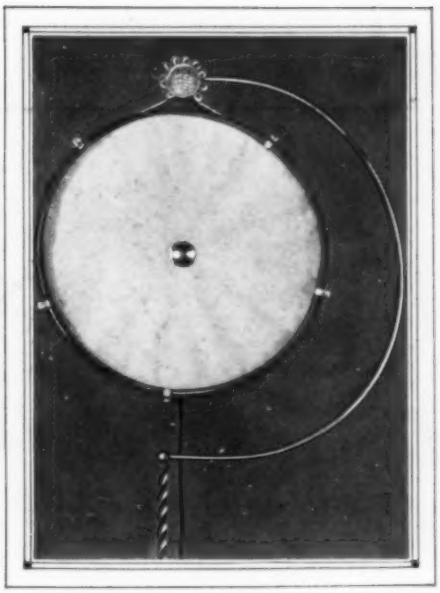
IMPROVED NEON ARC LIGHT TO AID AVIATORS

The brilliant red rays of neon-gas light that penetrate fog will be better adapted to use on airplane landing fields and other places, it is believed, through the introduction of an improved tube for producing the light. By means of an additional electric circuit, the cathode or electrode, through which the current passes into the tube, is heated, giving off electrons that cause the neon gas to glow and making it unnecessary to have such high voltages as are required in the older tubes. In the opinion of Dr. J. D. Forney, who worked with Dr. Clifton F. Found in preparing the new tube, the light should be useful in photography when combined with the mercury-vapor light.

¶Thirteen species of rattlesnakes are known in the United States.

MAKE THIS EFFECTIVE DRUM SPEAKER

By H·C·McKay



THE interest in speakers of the tension-diaphragm type is growing because of the remarkable fidelity with which the entire range of sound is reproduced. One of the principal objections is the awkward size and shape, which make it rather difficult to house the instrument attractively if the console is not large enough to take the diaphragm. The author, desiring to experiment with a loud speaker of this type, hit upon the toy-drum and cage-stand idea described in this article as a novel solution of the problem. The use of cloth for the diaphragms in the speakers of this type has several disadvantages and the skin head of the drum suggested a good substitute.

A drum of good size can be purchased at a reasonable price. It should have at least one real skin head and should be fitted with metal strainer bars instead of the leather type, so that equal tension may be maintained. In addition to the drum and birdcage stand, the only other materials necessary are: a piece of thin wood, about ⅜ in. thick by 3 in. wide and long enough to extend across one face of the drum; a heavy-duty cone-speaker unit similar to the types shown on page 298, and two heavy conical metal disks with a chuck and threaded bushing to anchor the disk on the thrust rod for the rear diaphragm. Metal disks with chuck and bushing are now available for speakers of this type; the thrust rod is furnished with the cone-speaker unit, is threaded at the apex end for a locking nut and is either screwed into the vibrating unit or dropped into a small hole in the vibrating member, where it is held by

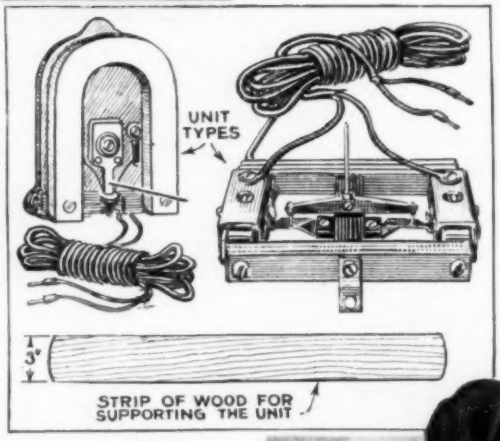
Taking the Drum Apart; the Apex Shields and Picture Cords Are Shown at the Right

means of a setscrew.

The photo on page 297 shows the necessary materials assembled before construction is started, the first step being to dismount the drum. The tension, or strainer, bars and the heads are then loosened and removed and the hoops lifted off. Usually drums of the less expensive type have one skin and one fiber, or parchment-paper, head. A small hole is punched in the exact center of the paper head, using great care that the hole is properly located and just large enough to permit the thrust rod of the speaker unit to pass through it.

Next the skin head is placed over a large pan, with the rim up as shown in the bottom photo on this page. A dishpan was used by the author and happened to be just the right size for the purpose. Now pour ½ pt. or so of warm water into the top of the skin head and let it stand until the head is thoroughly soaked, which will require only a few moments. Then, with a sharp awl, a hole is pierced in the exact center of the head. The water will drain off through this hole, leaving the upright edges of the head dry. The wet skin is mopped with a towel or other absorbent cloth until the surface is dry, leaving the head soft and pliable and considerably stretched.

The paper head is placed over the shell of the drum, and the thrust rod of the speaker unit, with the chuck and bushing disk slipped back toward the unit end, is ready for the paper diaphragm. In some cases the metal disk with the chuck is designed so that it may be mounted directly on the diaphragm. In either case the conical metal disk for the paper diaphragm must be placed so that the holding surface is toward the apex, as shown in the top photo and sectional diagram on page 299. The thrust rod is slipped through this disk on the paper diaphragm, and you are ready to place the skin head in position on the shell of the drum. The centers of the heads, with the metal disk in position on the skin head, are pushed together until the rod protrudes through the front disk; a small hexagon nut is then

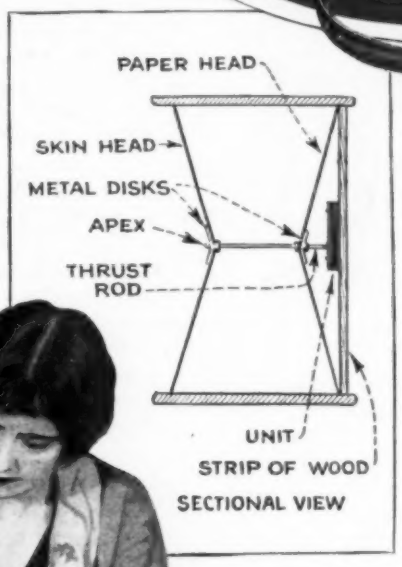


Top, Drum Dismounted Ready for Preparing the Heads; Center, Two Suitable Standard Cone Units and Detail of the Wooden Supporting Strip; Bottom, Pouring Warm Water into the Head, to Soften the Skin

screwed in place on the end of the rod, or apex, and the two heads will now retain their positions upon the drum shell. If trouble is encountered in coupling the heads on the rod, loosen the chuck bushing on the end back of the paper diaphragm and readjust it so that the apex nut may be screwed in position. Any extra tension required may then be obtained by screwing the nut down.

The next step is to apply the hoops and strainer bars. When this is done, the drum will appear as shown in the bottom photo. This completes the construction of the speaker itself; the strainer bars are tightened barely enough to hold them in place and the drum is then set away in a dry place for 24 hours. At the end of this time, the skin head should be thoroughly tight and dry. If the work has been properly done, rubbing the finger over the head will produce a loud rasping sound, and both heads will be under tension owing to the drying of the skin.

The wood piece is now cut and the ends rounded so that it will just fit in the hoop on the side of the drum bearing the paper head. The cone-speaker unit is mounted upon this strip with wood screws as shown in the sectional diagram. The proper location of the speaker unit on the wood strip is important; therefore, see that the unit is so placed that the thrust rod may be fastened to the vibrating element without subjecting the rod to any side strain. The wood strip is screwed in position on the drum shell as shown in the photo on page 300, and the thrust rod secured to the unit by means of the setscrew. If the thrust rod is permanently fastened to the speaker unit, it will, of course, be necessary to push it through the diaphragms and secure it at the apex after the board is in position, the actual method varying according to the type of metal disks used and the design of the speaker unit.



Top, Assembling the Speaker and Connecting the Heads; Center, Sectional Diagram Showing the Method of Connecting the Heads and Mounting the Cone-Speaker Unit; Bottom, Stretching the Heads

A pair of picture cords and hangers of the rosette type serve to support the drum speaker on the birdcage stand. If a stand of the type shown is not available, a metal bracket projecting from the wall at any

Rear View of Completed Drum Speaker Showing the Wooden Strip Supporting the Speaker Unit

convenient point will answer as well. The diaphragm may be decorated with water colors if desired. Do not use heavy-bodied pigments for this purpose, as they might interfere with the acoustic properties of the diaphragm, particularly if they start to peel. Transfers or decalcomania also may be used to good advantage for decorative effects.

Speakers of this type are supersensitive to vibrations owing to the fact that the diaphragm is under stress at all times; see that there is no loss of energy due to a whipping or side motion of the thrust rod. The speaker units suggested operate efficiently with any B-voltage either with or without power tubes.

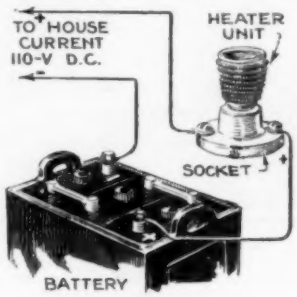
¶Popular Mechanics' radio department offers its information service free to all readers of the magazine.

Good Tuning Devices Important

The tuning devices in a radio receiver handle the high-frequency energy which is elusive compared with the audio, or low-frequency, energy following the detector. These devices include antenna coils, r.f. transformers, fixed and variable condensers and tickler or feedback coils. These parts must be selected with great care and only standard tested devices used, as nothing but the best materials and workmanship will produce the results now demanded by the critical broadcast listener. Good low-loss variable condensers should be strongly built and easily adjusted; fixed condensers of the mica-insulated type in molded bakelite are now available and are dependable. When wiring the r.f. end of the receiver, space the coils 4 or 5 in. apart, if possible, and keep the fields at right angles. Shielding is advisable, and, if convenient, each section should be entirely inclosed. If this is impossible, owing to the nature of the assembly, use shielding plates mounted between the units. Excellent aluminum shields of the single-panel and knock-down box type are now available in a variety of sizes. It should be remembered also that it is good practice to connect the stationary plates of the variable condensers to the grid circuit of the tube, to avoid hand-capacity effects. Keep all grid and plate leads as short as possible and well separated; do not parellel these leads and keep all wiring carrying r.f. current away from the filament wiring.

Charging Batteries from D. C. Supply

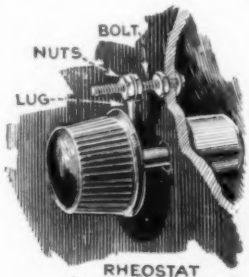
The simple arrangement shown in the sketch provides a method of charging storage batteries from a 110-volt d.c. line. The input is controlled by an ordinary electric-heater unit mounted in a porcelain-base lamp socket and the charging rate is about 7 amp. The heater unit is connected in series with the



positive line, which may be identified by holding the terminals about ½ in. apart in a glass of water in which a pinch of salt has been dissolved, the terminal causing the least disturbance in the solution being positive. A device of this kind cannot be used with a.c. current. A cheap ammeter of the auto type should be placed in series with one side of the line for checking the charging rate. The heater unit should be mounted on an asbestos pad and in a location where the heat generated will do no harm.

Safety Stop for Screw-In Rheostat

Rheostats of the screw-in, or carbon, type should be provided with a safety stop when used with tubes of the 199-type. They are very efficient but when used with the 3-volt tubes some means of knowing just how far to screw them in or out to obtain the required voltage, is necessary. A machine screw, about ¾ in. long, mounted on the panel directly over the rheostat knob and just high enough so that the knob will clear the nuts when turned in, provides an adjustable mounting for a long soldering lug which acts as a safety stop. The machine screw is secured against the panel with one nut, and the soldering lug is held in the desired position by means of two additional nuts. The correct tube voltage is found by means of a voltmeter held across the filament terminals of the tube socket; the lug is then adjusted on the screw to stop the knob at this position and the nuts are locked.



Reducing Power-Line Pick-Ups

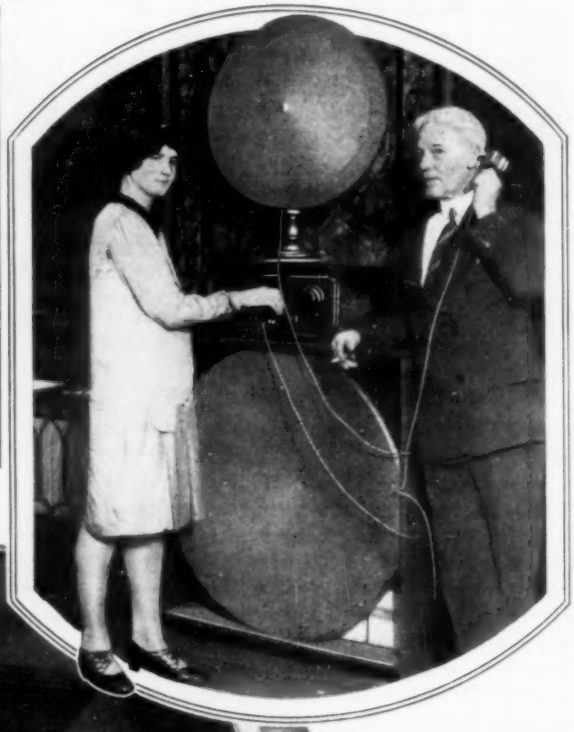
Broad tuning is frequently caused by power-line pick-up when a receiver is operated with a socket-power device. It may be caused by the power line acting as an aerial and ground system, owing to the manner in which the plug is placed in the wall socket. Reversing the plug will usually eliminate the trouble.

Combination Test Set for Direct and Alternating Current Tubes with Adapters and Other Accessories

Combination A. C. and D. C. Test Set

The popularity of sets using a.c. tubes has brought many new problems to the experimenter and radio-service man. The new set-testing outfit shown was specially designed to make simple and highly efficient tests possible where either a.c. or d.c. is employed. In operating the combination test set, a tube is removed from the receiver and the plug inserted into that socket. Adapters of various types are supplied so that sets employing any of the standard tubes or tubes of the old type may be tested. Provision is also made for certain tests on the UY five-prong base combination. Binding posts are supplied so that tubes having indirectly heated filaments with terminals at the top may also be handled. The meter at upper left is an 0 to 150-volt a.c. instrument with binding posts for checking line voltage. The upper right-hand instrument is an a.c. voltmeter with a range of 3 and 12 volts, so that readings may be had on the various a.c. filaments now in use. Plainly marked and easily operated push buttons are supplied for connecting either of these low readings to the filament leads from the plug, so that readings of true filament voltage may be taken rapidly.

Facts and Fads for Radio Fans



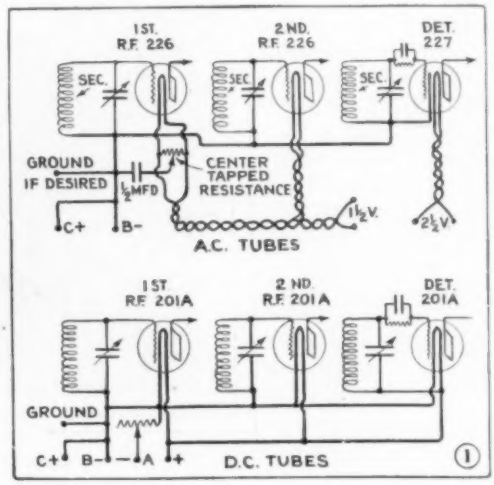
Upper Left, Photo-Radio Receiver Recording in New York a Signed Letter Transmitted from Paris; Above, a New Device, Recently Tried at the New York Institute for the Deaf and Dumb, Enabled the Students to Hear an Entire Radio Program for the First Time; S. A. Dickerson Is Shown Demonstrating the Device

Above, the First Telephone and the Latest Loud Speaker Utilized to Demonstrate the Development of Electrical Science at the New York Meeting of the Engineers' Society; Sergius P. Grace Is Speaking through a Model of Bell's First Telephone, His Voice Being Amplified 100,000 Times by the Giant Speaker; Right, Navy-Department Operator Receiving Radio Messages at a Speed of Seventy-Five Words per Minute, the Recorder at the Right Registering the Message as a Wavy Line

Five ways to ELECTRIFY YOUR SET

by Frank L. Brittin

MANUFACTURERS of tubes, transformers, cabled harness and sockets have pooled their efforts to simplify the changes necessary in standard battery-operated sets to adapt them for the use of the new a.c. tubes. The introduction of these tubes had a rather disturbing effect at first, due to a lack of understanding on the part of the public, who, of course, did not take kindly to the idea of junking perfectly good sets in order to use the new tubes. When it is understood that the change involves the installation of the proper sockets, and the rewiring of the filament circuit only, and that suitable devices for the purpose are now available, the job loses its formidable aspect. As there are a number of methods now in use and several new types of a.c. tubes on the market, it is not possible to go into detail as to the merits of each. The reader should understand that a change to a.c. tubes does not necessarily add to the efficiency of his set, and that these tubes have been developed simply as a convenient method of doing away with the storage battery and the charger.



Our readers are familiar with the Arcturus type employed in the All-Electric-Five receiver described in the April, 1928, issue, hence this will not be discussed now. The RCA and Cunningham *226* and *227* or *326* and *327*-types are of two varieties, one having a directly heated filament and the other containing a separate heater element which is not directly connected into the receiver circuit. The *226*-type employs a standard four-prong base, while the detector *227*-type, with the separate heater, has five prongs in the base. In other types, filament-heater wires are brought out at the top of the tube or are taken from the sides of a special base.

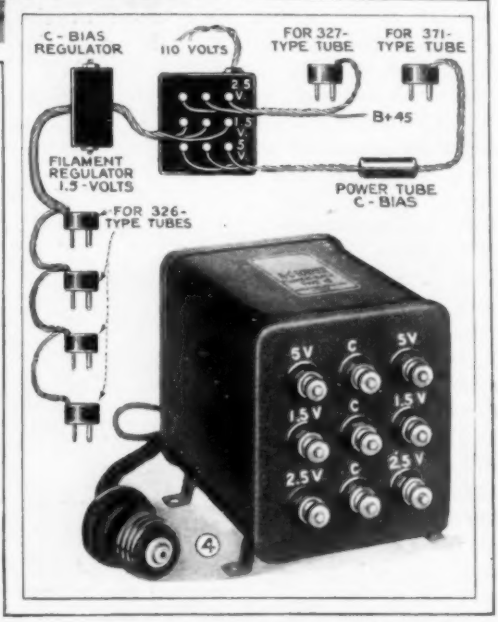
When using raw a.c. current in a sensitive receiver, it is necessary to keep these wires as far as possible from the grid and plate leads, and the filament wires should be twisted lampcords or similar cable of sufficient current-carrying capacity for the tubes.

Ordinary rheostats are not used in the filament circuit. If a control is desired, there is an

automatic device for the purpose of protecting the tube, or a rheostat of proper type may be cut into the 110-volt a.c. supply line which also contains a power switch. In order that the 110-volt current may be cut to the correct values, a step-down transformer is used. The 226 or amplifier tubes require 1½ volts, while the detector or 227-type must be supplied with 2½ volts. The positive C-battery connections and the negative-B go to the grid-return lead instead of to the filament circuit, as in d.c. receivers. The comparative circuits, shown in heavy lines in Fig. 1, indicate where the filament wiring differs. Note that a .5-mfd. by-pass condenser is used to prevent a short circuit that might result from the grounding of the lighting system. The filament connection to the 226-type tubes is provided by a center-tapped resistance obtainable from any dealer in radio supplies; this is connected as shown in the diagram. A slight hum is usually present in a.c. receivers but is not audible when a station is tuned in.

These mechanical and electrical differences in receivers originally designed for d.c. tubes are provided for by means of special socket adapters which insulate the tubes from the original filament terminals in the sockets and provide new filament or heater leads.

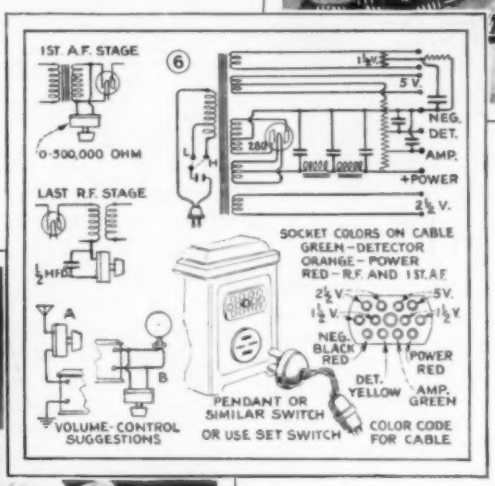
Figs. 2, 3 and 4 show one type of adapter harness and special step-down transformer, making possible the conversion of practically any battery-operated set without changing any of the wires in the set itself. The d.c. tubes are simply removed from the set, the A and C-batteries disconnected and the adapters supplied with the harness inserted in the tube sockets, as shown in Fig. 3. The ends of the harness are labeled for the proper terminals on the step-down transformer, as shown in the diagram, and are connected accordingly. Since the A and C-batteries are disconnected, the A-battery posts on the set remain unused.



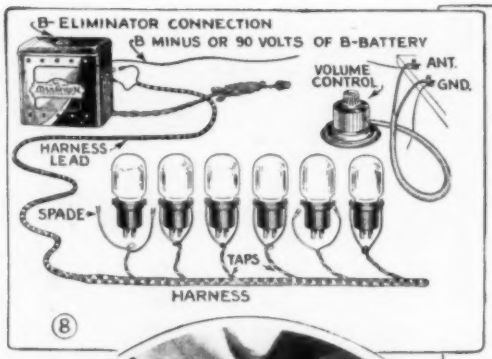
The C-negative terminals or binding posts are connected to the C-positive binding

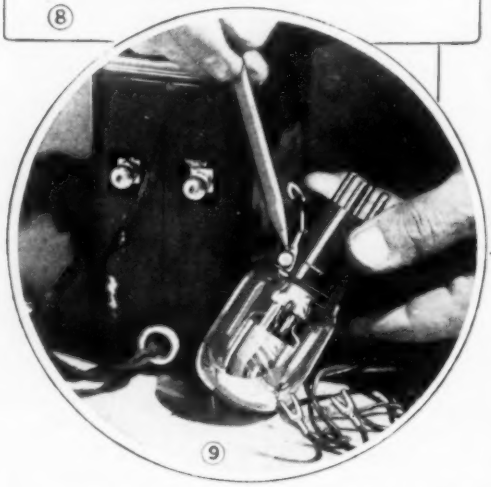
posts with a short piece of wire, to complete the circuit, and the set is ready to operate without any batteries whatever, if a B-eliminator is used. The variable resistance or C-bias regulator, shown in Fig. 2, is connected in series with the grid lead. By adjusting this resistance, the C-bias voltage applied to these tubes may be kept at any desired value. The detector section of the adapter harness and that for the power tube are separate units, because there should be no electrical connection between them. The power-tube part of the harness has a small container unit housing the resistor to bias the power tube that provides the necessary C-voltage. These harnesses are supplied in different types, using any standard filament transformer and any standard B-eliminator.

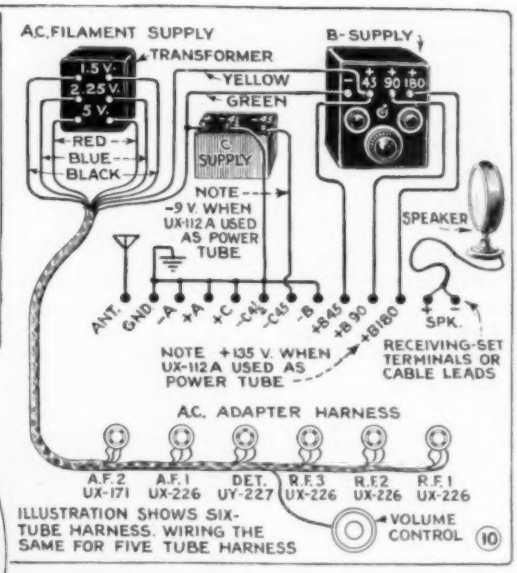
In Figs. 5, 6 and 7 is illustrated a combination A, B and C-converter, which is furnished either in kit form or mounted in an attractive steel container ready to operate. The 226 and 227-type tubes previously mentioned, as well as the 171 power tube, are used in the model shown, and another model is designed for use with the Arcturus tubes. The B-power unit delivers 40 milliamp. at 180 volts and employs a full-wave filament-type rectifier tube in the socket indicated in Fig. 7. A C-voltage of 45 volts is also furnished in this unit. A converter harness, with the proper adapters, is also available and terminates in the multiple plug indicated in Fig. 5. If necessary to provide a volume control, the suggestions given in the diagram (Fig. 6) may be followed with good results. The schematic diagram of the power supply and the harness-terminal connections at the multiple plug are also shown.



In Fig 8 is illustrated what probably offers the quickest change to a.c. operation, the entire outfit coming in a complete kit and including the tubes. In applying this kit there are no changes or new connections to be made; each tube has on its base two special filament or



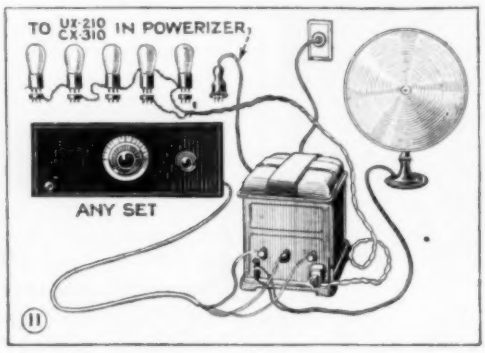




heater connectors, as pointed out in Fig. 9. Connecting spades are arranged on the harness and are slipped over the terminals as indicated. The heater extension connections coming from the cable are twisted into pairs, and no attention whatever is given to polarity connections. The special tubes employed all require the same heater voltage. The detector tube is plainly marked and should, of course, go in the detector socket of the set. The amplifier tubes all have the same characteristics and no distinction is made for their positions. The adapters are plugged into the set sockets and the tubes inserted; the B-eliminator, if one is used, is plugged directly into the receptacle at the top of the transformer unit, and the power is then controlled entirely by the light-socket switch. With this apparatus, it is possible to change the standard five or six-tube set in less than five minutes.

Fig. 10 shows an adapter harness and standard filament-heating transformer similar to others previously described for adapting storage-battery-operated sets to use the type 226 and 227-tubes; but in this case the C-power supply is obtained with the usual C-battery.

The device shown in Fig. 11 goes a step farther than any of the other adapters. Complete a.c. harness, A and B-power supply and power amplification for a UX-210 or CX-310 tube are provided.



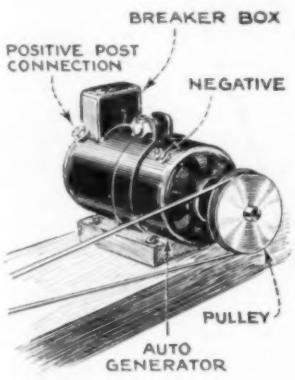
Antenna Protects Building

A properly installed antenna should always be provided with a lightning arrester connected between it and ground. Devices of this type approved by the insurance underwriters are not expensive and may be obtained from any dealer in radio supplies. The antenna, so protected, not only prevents damage to the set but also provides

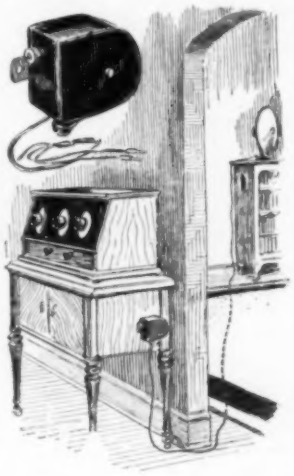
protection for the building. It is preferable that the ground lead from the lightning arrester be kept outside, although this is not insisted upon. A lightning arrester is safer than a switch, since the latter is manually operated and the owner may forget to throw it to the ground when the set is not in use.

Old Auto Generator as Battery Charger

A very good battery charger can be made for about $2 from parts that may be obtained from an auto junk dealer. Several weeks ago I made up my mind to do away with the trouble, cost and inconvenience of taking the battery to the service station, and this is how I went about it: The ¼-hp. electric motor used about the house for general purposes caught my eye, suggesting that it might be employed for charging purposes in connection with an old auto generator. A trip to the local dealer in junked cars resulted in the purchase of a generator, with a breaker box on it, and an ammeter for $1.50. Upon my return home, I made a wooden pulley, 3 in. in diameter, which happened to be the correct size for the speed of the generator. The latter was mounted at one end of a 3-ft. plank, about 1 ft. wide, as shown, and the motor on the other end. The motor was then belted to the generator and the battery connected to the terminals indicated, with the ammeter in one side of the line. The outfit worked fine with the exception that the charging rate was a little high, according to the ammeter, but this was adjusted by means of a setscrew directly beneath the breaker box. The alteration in the rate may also be obtained by changing the size of the wooden pulley to regulate the speed. The breaker box acts as a safety device and the installation is extremely simple.—E. D. Fahling, Tama, Iowa.



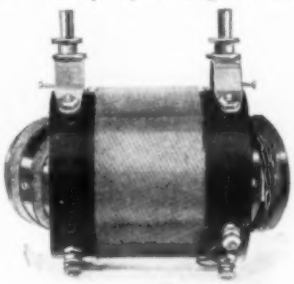
Self-Winding Reel for Loud Speaker



A self-winding reel with 25 ft. of cord is now available for quickly placing the loud speaker in an adjoining room, or changing the speaker to various locations around the same room. The device is finished in nickel or brown mahogany enamel and may be mounted at any convenient point on or near the set. Lengths of cord may be added by means of small cord-tip couplers.

New Coil Has Twin Rotors

The twin-rotor coil shown in the illustration is now available for set builders and provides a means of varying the coupling between the primary and secondary to suit the conditions peculiar to any location. As three-circuit tuners have a primary, secondary and tickler winding, and, in the usual tuner of the three-circuit type, the primary and secondary windings are stationary, the fixed coupling is determined by the distance between these coils. The set builder must choose between a tight coupling that will produce good signal volume but poor selectivity, or place the coils far apart and get good selectivity at the sacrifice of volume. The nearness of powerful broadcasting stations will, of course, determine the proper degree of coupling. The problem is solved by the double-rotor coil, as the primary is wound on one of the rotors and the coupling may be varied as desired.



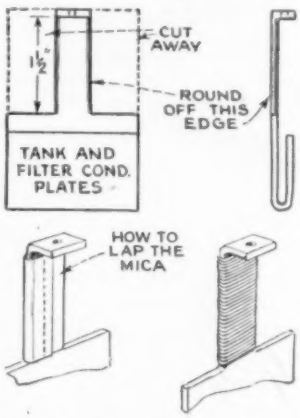
Radio Tables for the New Electric Sets, Showing Two Arrangements

Tables for Electric Sets

Electrically operated radio sets require little room, and the attractive tables shown in the photo are small enough to fit almost anywhere, yet sufficiently large to accommodate not only the complete radio set but a row of books as well, if desired. Two suggestions for the installation are illustrated. The manufacturer also supplies a similar table provided with two book shelves below.

Electrolytic B-Eliminator Kink

When building electrolytic B-eliminators of the type described in the February, 1927, issue of Popular Mechanics, difficulty is often experienced in preventing overheating during the cell-forming process. It is almost impossible to find a rubber tape that will cling to the flat surface of the wide aluminum electrodes, as the liquid seems to creep up under the insulation, causing surface sparking, heating of the cells and pitting of the electrodes. The writer used several kinds of insulating preparations with varying success, but finally found a simple method that proved highly satisfactory. The details of this are shown in the sketch. Purchase some mica of the kind used in heating stoves and strip off layers until thin sheets are obtained; the thinner the sheets the better. Cut the upper part of all the aluminum plates to a width of ½ in., that is, all the portion to be insulated, and also both lead plates of the rectifier cells. Round the edges with a clean file, so that the mica will fit tightly against the metal, over the edges, without cracking. Coat each portion to be insulated with a good grade of insulating varnish, obtainable from any electrical-supply house. Cut a piece of paper long enough to go around this coated portion and slightly overlap, and use it as a pattern for cutting the mica to the correct size. When putting on the mica, use a narrow piece of heavy paper, about the thickness of a postal card, and lay this over the mica when bending it around the plate so as not to break the edges. Hold the mica in position and have someone tie it on the electrode in several places. When all electrodes are prepared in this manner, wrap heavy thread tightly over the mica, removing the temporary cords as you proceed with the winding, and tie both ends of the thread securely. Next coat the entire wrapped portion with the insulating varnish. Two or three coats should be applied, allowing each coat to dry thoroughly. The lead electrodes in the tank and filter condensers need no mica insulation and three or four coats of the insulating varnish will protect them sufficiently. Assemble the electrodes in their respective cells, where they can now be formed exactly as shown in the blueprint diagram No. 117. No further trouble from overheating will be experienced. The writer has used this eliminator almost every night for four or five hours during the past three months with very satisfactory results. The electrolyte has dropped only 1/32 in. during this time and no oil of any kind was used on top of the solution. The cells are as cool after four or five hours' service as when first turned on.—Theodore H. Hanson, Clinton, Iowa.

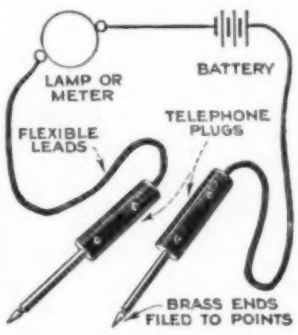


Soldering Lead to Lead

It is not an easy matter to solder lead to lead, but it can be done and such connections are sometimes advisable on storage batteries or other radio accessories. A good hot iron, well tinned, and some regular soldering acid are necessary. First clean the lead parts thoroughly by scraping. Place a small amount of the acid on the surface to be soldered and tin each piece separately by rubbing the hot iron, with solder, over the cleaned surface. Now place the pieces together and flow the solder in, taking great care that direct contact with the iron is on the solder and not on the lead. The shade of difference between the melting points of solder and lead makes this a rather ticklish operation, but with a little practice, good solid connections can be made. Where two flat pieces are to be joined, or a small flat piece to a heavier one, a small hole may be drilled through the thinner flat piece, and, after the surfaces to be joined are tinned, the point of the iron is applied through the hole. Turning the iron carefully in the hole and applying solder so that it will flow into the joint will produce an excellent connection, but practice is indispensable. Soldered connections on storage-battery terminals will hold nicely, but must be protected with vaseline or grease to prevent the battery acid from attacking the tin in the solder. If it is necessary to solder a wire to a lead terminal, first tin the lead and the wire and then join them by holding the hot iron on the wire.—Harry Saine, chief engineer, Station KQW, San Jose, Calif.

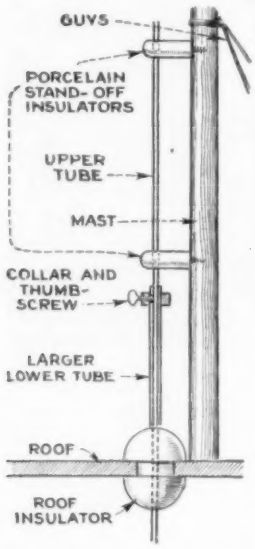
Test Points from Phone Plugs

Old telephone plugs may be used as shown in the sketch and make excellent testing points for checking circuits. No alteration in the plugs is needed, but it is a good idea to file or grind the ball ends to a blunt point. One long flexible lead, made from a length of telephone cord or similar insulated wire, is required for each plug. An old receiver cord with the outer cotton or silk covering removed will serve excellently. Since the long brass sleeve in the plug is not connected in the circuit, it does not matter if it touches any instrument while testing, but, if desired, it may be covered with rubber tubing. The lead is connected to the insulated portion of the plug that terminates in the bare pointed end. The usual circuit for continuity tests is shown in the sketch, and consists of a battery, and either a lamp or meter for the continuous circuit indicator.—H. R. Wallin, radio operator, Brooklyn, N. Y.



Building a Telescope Antenna

All amateurs working with short-wave transmitters have encountered difficulty in obtaining maximum radiation when shifting from one short-wave band to another. If the antenna is correct for the 80-meter band, it does not radiate properly on the 20 and 40-meter bands. The writer has worked out the telescope antenna shown in the sketch and found it a better method than cutting off, or splicing, a lead-in according to usual practice. The antenna is placed directly above the set, with the lower end threaded and screwed to the top of the roof insulator. This lower section consists of 8 ft. of ½-in. brass tubing. The upper part of the rig is made up of two 10-ft. sections of ½-in. brass tubing, held together by a threaded coupling. This part is held vertical by means of porcelain stand-off insulators mounted on one side of a strongly guyed 2 by 2-in. pine mast. A brass collar, turned in a lathe and tapped for a thumbscrew at one side, is slipped over the lower section near the top, a hole being drilled there to allow the thumbscrew to clamp the inside tube. When testing the installation on the various wave bands and finding the radiation about half what I think it should be, I slide the aerial up or down about 6 in. until the correct point for best results is located.—Harold S. Sykes, operator, Station KGAR, Tucson, Arizona.

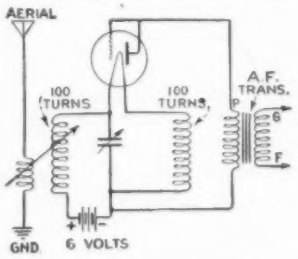


Prolonging Dry-Cell Life

Strictly speaking, there is no such thing as a "dry" cell, for the content is actually a moist paste which, when it becomes perfectly dry, causes the battery to become useless. In order to prevent undue drying out, such batteries should never be kept where there is too much heat and, by the same token, extreme cold may have a similar effect. Some radio amateurs make it a practice to coat all batteries with paraffin or wax to prevent access of air and thus delay drying out, while some of the better makes of dry B-batteries are entirely impregnated in wax for the same reason. Usually these batteries will last from two to three times as long as batteries which have not been treated. Dry cells should also be kept in an upright position at all times and the ordinary cell used for doorbell ringing will last much longer, if installed in this manner. The same thing holds true of dry B and C-batteries, which should be so placed that the cells, inside the casing, are vertical and not on their sides. Proper treatment of batteries will usually double their lives.—Wm. F. Crosby, engineer, Wireless Radio Corp., Brooklyn, N. Y.

Detector Circuit without B-Battery

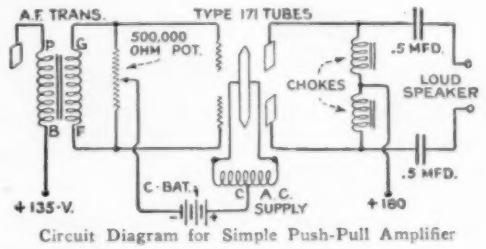
The accompanying diagram shows a new detector circuit employing a two-element tube, which may be any ordinary three-element type, such as the C-301A, with the plate and grid short-circuited. This circuit is unlike the DeForest and Fleming systems of early design and is of additional interest, owing to the fact that no B-battery is employed; in fact, the plate is given a slight negative potential by return to the negative side of the A-battery. It will be noted that the filament current flows through the inductances and that the emission of electrons from the filament and their flow to the plate are directly controlled by the r.f. fluctuations present at the high-potential end of the pair of tuning coils. Two coils are necessary to prevent the direct short-circuiting of the tuning condenser by the filament. The antenna coupler may be any standard type with the secondary rewound to 100 turns; the second coil in the filament cir-



cuit is also 100 turns. For those who wind their own coils, the following data may be useful: A .00035-mfd. variable condenser is employed in the circuit given and the coils are wound on a tube form, 2 in. in diameter, the wire being No. 24 d.c.c. If the condenser is .0005 mfd., use the same-size wire and tube and wind the coils 77 turns each. The primary coil at left depends on the length of aerial used; try 15 or 20 turns for this coil on the same-size form and either add or deduct turns until the set tunes sharply. This system of detection gives excellent results when employed with any standard radio set and prevents tube blocking which so often occurs with the grid-condenser and gridleak method. The quality of signal obtained is excellent and compares favorably with crystal detection.—L. J. Lesh, consulting engineer, Chicago.

An Inexpensive Push-Pull Amplifier

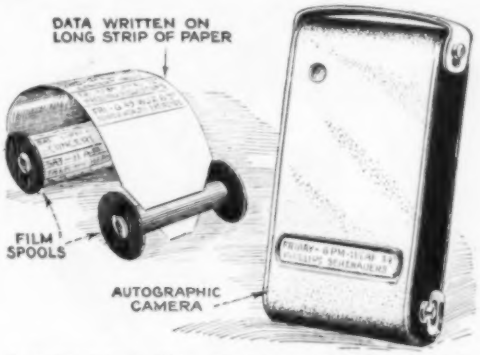
A good push-pull amplifier may be built at a very low cost, without the usual center-tapped transformers ordinarily required for this type. Select an audio-transformer of good make and use it as the input-transformer to the push-pull stage. A 500,000-ohm potentiometer is shunted across the secondary of the transformer as shown. The negative of the C-battery is connected to the center tap of the potentiometer to provide the negative bias for the grids of the push-pull tubes. The output circuit is composed of two Amerchokes, or autoformers, and two .5-mfd. condensers, which feed the loud speaker. Alternating current is used to light the filaments by means of any standard filament-heating transformer and there is no noticeable hum. The original amplifier built by the writer employed two UX-171 tubes. At present, an amplifier of this type, having two 50-watt tubes and feeding six large exponential horns, is being used for public-address work and is satisfactory in every respect.—M. J. Weiner, chief engineer, Station WODA, Paterson, N. J.



Circuit Diagram for Simple Push-Pull Amplifier

Handy Radio-Program Index

Radio listeners who are in the habit of selecting their programs in advance will find the idea illustrated in the sketch very



Left, Data Strip Wound on Spool Ready for Inserting in the Camera; Right, Strip in Position

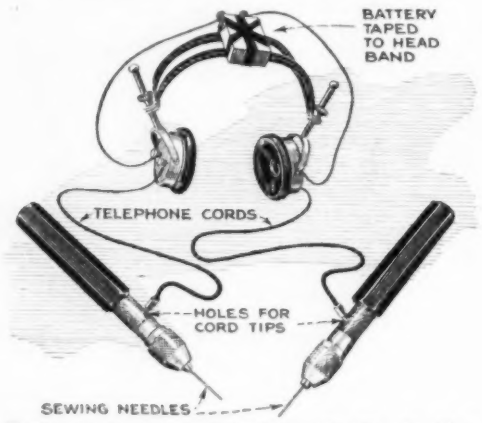
convenient for keeping such data. An autographic camera, available in most homes, is used. No change in it is necessary. A strip of white paper, several feet long, is cut to the width of the film and is wound on a spare spool. The programs selected are typed or written in pencil on this strip of paper along with the date, time, station and dial reading. When the list has been completed, the strip is rolled on the film spool, inserted in the camera and turned to position as shown. Any of the data inscribed may then be read through the slot by merely turning the film spool.—H. R. Wallin, radio operator, Brooklyn, N. Y.

Reducing Local Interference

The writer has found that much local interference can be reduced or eliminated by the simple expedient of disconnecting the ground lead from the set and shifting the aerial to the ground post. The coils in the set will usually pick up enough energy to bring in the signals, making reception possible under conditions that are often regarded as hopeless.—C. R. Yarger, chief engineer, Station KFNF, Shenandoah, Iowa.

Handy Radio-Testing Points

By combining two sewing needles, two small pin vises, one pair of headphones and a small flashlight battery, as shown in the sketch, a very handy outfit for testing open circuits in radio apparatus may be had at little expense. The battery is fastened to the headband with tape and is connected in series with one side of the phones. The pin vises should be provided with insulated handles, and small holes are drilled in the side of each metal shank to take the cord tips. When drilling these holes, first measure the latter and drill the holes slightly smaller, say, .001 in., to provide a friction fit. With ordinary needles in the pin vises, coils wound with fine wire may be penetrated and explored for open circuits in transformers and for other tests. A particular advantage of this combination is that nothing is destroyed in making the instrument.—J. McIntyre, Hartford, Conn.



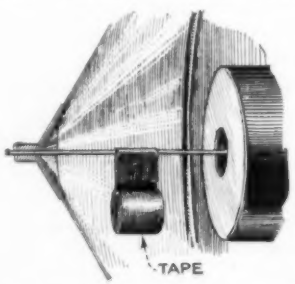
Testing Instrument Assembled from Needles, Pin Vises and a Headset, Showing Connections

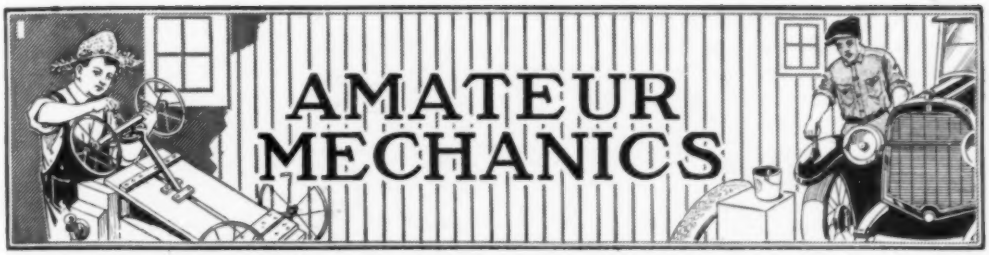
C-Voltage Depends on B-Voltage

If B-batteries are used to supply the plate current for a receiver, the voltage should be watched and the batteries discarded when each 45-volt block runs down to about 34 volts, or when that of each 22½-volt block drops to about 17. It is necessary to provide a proper relation between the C-voltage and B, or plate, voltage. It is generally known that while B-batteries run down in use, the C-battery loses practically no voltage in its entire life. This means that when the B-batteries are new, the proper C-battery is being used for best results, but just as soon as the B-voltage begins to drop, the C-voltage is greater than is needed. For example, if a power tube of the CX-112A type is operated with new B-batteries supplying a total of 135 volts and used with the recommended 9-volt C-bias, the current drawn by the tube is about 6 milliamp. If the B-batteries are allowed to run down to 34 volts per 45-volt unit, or a total of 102 volts, the current drain with an applied voltage of 102 volts in the plate circuit, and a negative grid bias of 9 volts, will be approximately 1 milliamp. Under such conditions, the tube will not operate at proper efficiency, but if the C-voltage is reduced in proportion, the amplifying efficiency of the tube can be maintained at a high level in spite of the lowered plate voltage. In the example mentioned, a reduction of C-voltage to 6 volts instead of 9 will cause a current flow of about 5 milliamp., at a plate voltage of 102. The same applies to the first audio stage; for instance, if 90 volts of B-battery is used and drops to, say, 68 volts, reduce the C-battery from 4½ to 3 volts for a 301A-tube.

A Practical Cone-Speaker Kink

There are few if any cone-type speakers which do not at one time or another develop a singing tone, owing, it has been found, simply to vibration of the driving pin. This interferes greatly with the diaphragm. The drawback may easily be overcome by the simple method shown in the sketch. Obtain some electricians' tape, wind up enough to make a roll about ½ in. in diameter and leave an end by which to fasten it to the pin, as shown, without touching the surface of the cone. This light weight will change the vibration period, and the general tone of the speaker over all frequencies will be appreciably improved.—L. H. Georger, Buffalo, N. Y.





A Plane for "Lindy Junior"

By HI SIBLEY

THE boys of a generation ago believed that the most glorious career lay in becoming a fireman or a circus acrobat, but now, with such an idol as Lindbergh before them, they have turned to aviation with even greater enthusiasm. Here is something constructive that every boy should be encouraged in. Experts agree that aviation is still in its pin feathers, and that there is a promising future for all who take up flying as a career—particularly those of mechanical turn of mind.

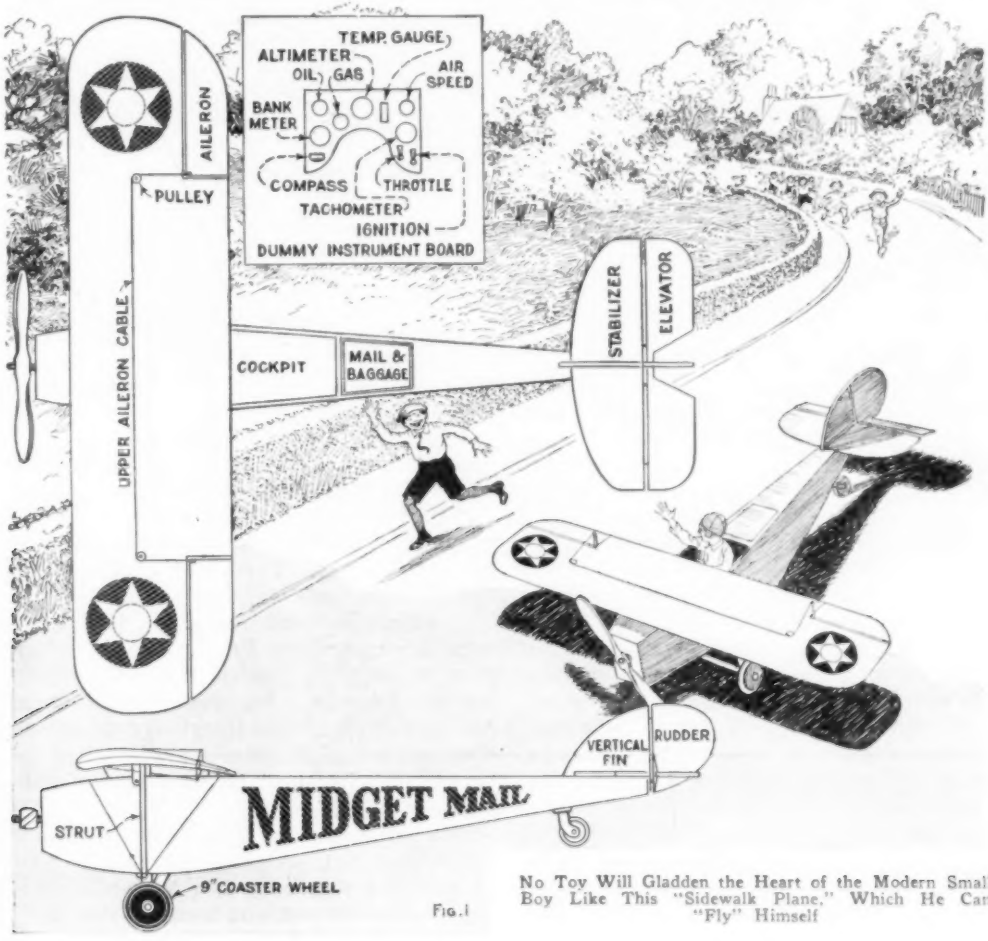


Fig. 1

No Toy Will Gladden the Heart of the Modern Small Boy Like This "Sidewalk Plane," Which He Can "Fly" Himself

Model planes are doing their part in a preliminary educational way, but to give the boy a more accurate concep-

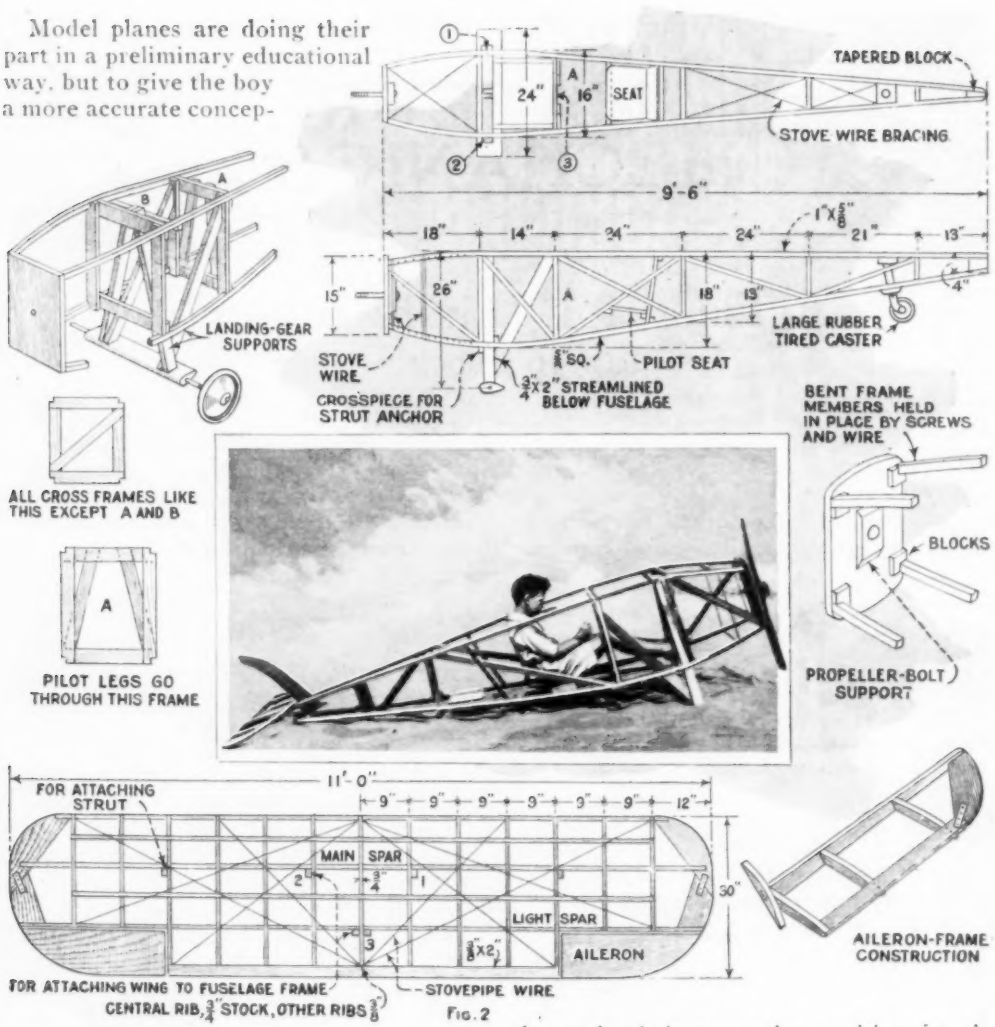
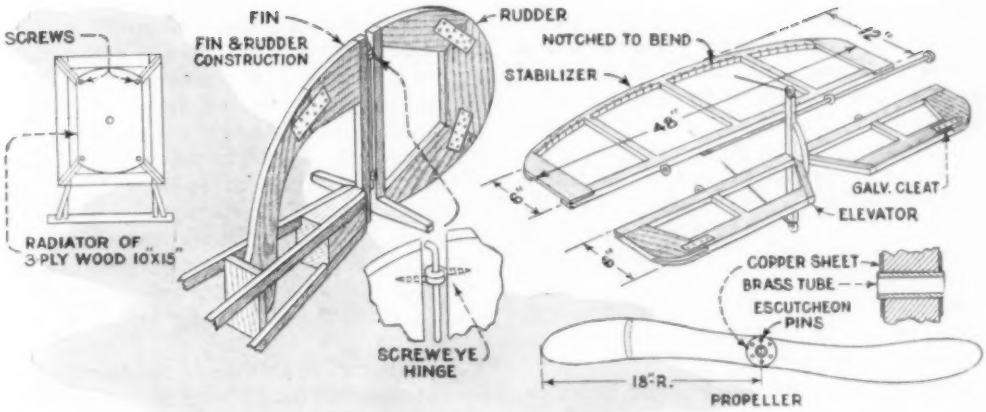


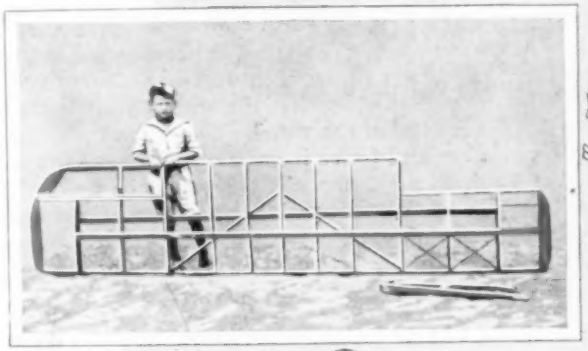
Fig. 2

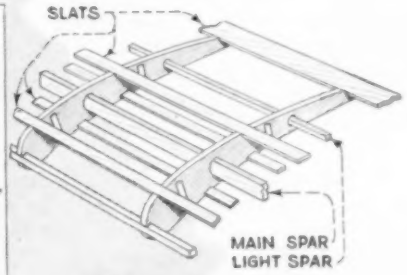
tion of how a real plane is constructed and controlled, he should have a ship big enough for him actually to ride in it. The cost of the materials for the "Midget Mail" illustrated is negligible, though no little painstaking work is required. However, balanced against the educational value, the wholesome fun and the satisfaction of making it, this little ground plane is worth many times its cost in time and money. The original plane, as shown in the accompanying photos, has been the greatest success of a long series of elaborate toys at our home. In fact, it has almost become a nuisance because so many children, from toddlers up to high-school seniors, are in convention around the house in their spare time waiting for the ship to be trundled from its hangar. There has been no abatement in weeks.

The first step is to make the transverse fuselage frames. These are all similar in design with the exception of the one (A, Fig. 2) just in front of the cockpit. This must have provision for the pilot's legs to pass through to operate the rudder bar, and also have room for the "joystick" when pushed forward in an imaginary nosedive. The corners of all frames are notched to receive the longitudinal members of the fuselage.

The latter are of 5/8-in. square section for the two bottom members and 5/8 by 1-in. stuff for the top. The bottom pieces are smaller in section, because they are

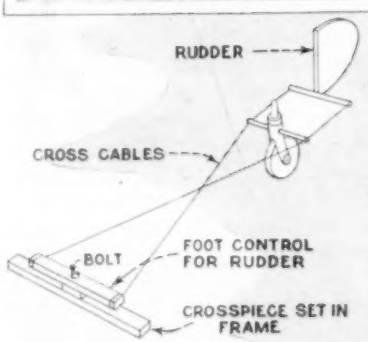


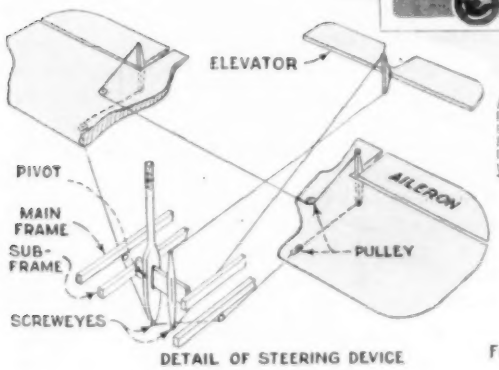




WING ASSEMBLY

FIG. 3





DETAIL OF STEERING DEVICE

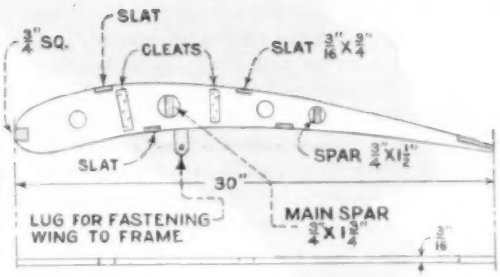


FIG. 4 DETAIL OF RIB CONSTRUCTION

required to take a greater bend. The inside corners of all four side members should be notched, about one-third through, with a saw in the front section so that they will bend in readily to meet the "radiator." They can be drawn together with stovepipe wire to meet the blocks provided for them on the inside of the radiator. Screws in the corners of the radiator board hold the latter to the frame members.

Next install the running-gear supports. These are made from 2 or 2½ by ¾-in. clear pieces, and streamlined where they are exposed below the fuselage. The vertical members come together at the top; the inclined ones are screwed to the side-frame members at top and bottom. A streamlined wood axle is secured to the supports with screws, and roller or ball-bearing coaster wheels are fitted to the ends with lagscrews.

For the rear wheel, which does the steering, one can use a strong coaster wheel with a steel fork, or a large, rubber-tired caster. Lacking either of these, a substantial wooden fork can be made, such as was used on the original model. This, however, is not as satisfactory as the metal fixtures. In case a metal fork is used, two arms should be attached to carry the steering cables. This is a simple matter on the wooden type.

Now brace the entire fuselage with stovepipe wire as shown, leaving the cockpit compartment unobstructed for easy operation. The stabilizer and vertical fin are easily made, the elevator and rudder respectively being hinged to them by means of a stiff wire running through screweyes. This permits easy dismantling for adjustment or packing.

The wing requires more skill than any other part of the ship, but if the diagram is followed and white pine used for the ribs, no trouble should be encountered. A main spar carries the bulk of the wing structure, supported by a light spar. Each of these pass through holes in the soft-pine shaped ribs. There are thirteen of the latter, including the heavier center rib, which is ¾ in.thick. All others are of ⅜-in. stuff. A stringer across the front edge of the wing, and a flat piece at the rear (Fig. 3) contribute their part in making the wing rigid.

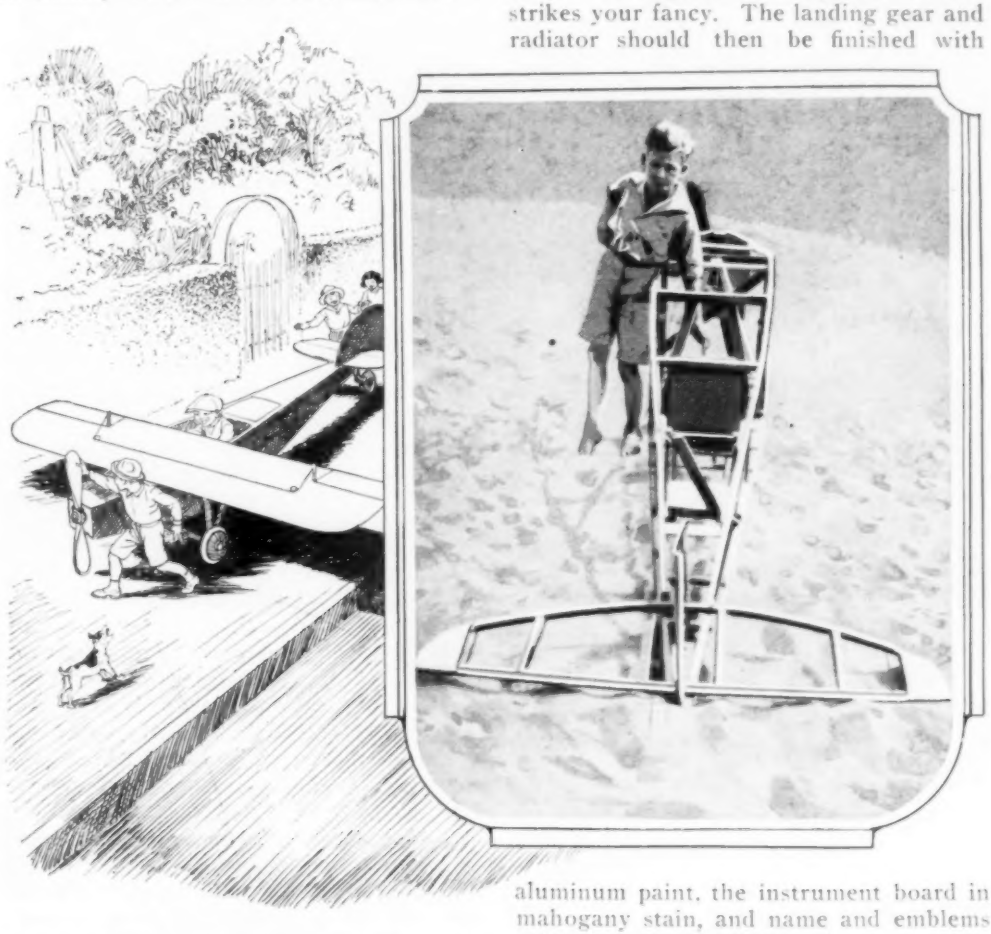
Short pieces, marked 1, 2 and 3 in Fig. 2, are securely screwed to spar and center rib, as indicated, to serve as means of fastening the wing to the frame. Similar blocks are attached to hold the upper ends of the struts. The curved pieces of the wing tips are made of ⅜-in. white pine. To give the wing the correct taper toward the ends, trim down the rib widths in proportion to the distance from the end. The spars should also be tapered slightly, to permit smaller holes being bored in the outer ribs.

After the wing frame is completed, support it on two boxes placed near the ends, so that it will sag slightly at the center. Then brace the top side with stove wire, as shown in Fig. 2. Wherever the wire crosses a rib or slat, notch the latter not over 1/16 in., so that the wire will lie below the edge of the wood. Now turn the wing over and brace it on the bottom side in a similar manner. There should be no slack in any of the bracing wires when the wing is completed.

The best propeller is made from a single piece of soft wood, but the work can be simplified somewhat by making the blades separately from flat pieces of wood and inserting them in slots in a hub block and securing them with wooden pegs. The appearance of the propeller depends entirely upon the skill of the maker, and there is no very good rule to follow in making one. It is a job for a drawshave, a small plane and a gouge. A bushing made from a short length of brass tube will permit it to turn more easily on the carriage-bolt shaft, and its appearance will be greatly improved by facing the hub with a circular piece of sheet copper and studding it with escutcheon pins.

The joystick and controls are simply made, but important, for they give the boy action while he is learning imaginary take-offs, spirals, glides, dips and nosedives. The stick control, as well as the rudder, is better illustrated than described. Wire cable is preferred to single-strand wire, picture wire being very satisfactory. The cables in the rudder and elevator control can be guided through screweyes where required, but you will find small pulleys necessary on the aileron system for the reason that there are so many corners. Apply hard grease or graphite to the

cables where they rub against screweyes. A dummy instrument board, made from discarded auto accessories, will add greatly to the fascination of the craft, and should include oil, gas and temperature gauges; tachometer or revolution counter; air-speed indicator; compass; banking meter, altimeter, all made of old ammeters, and throttle and ignition switch.

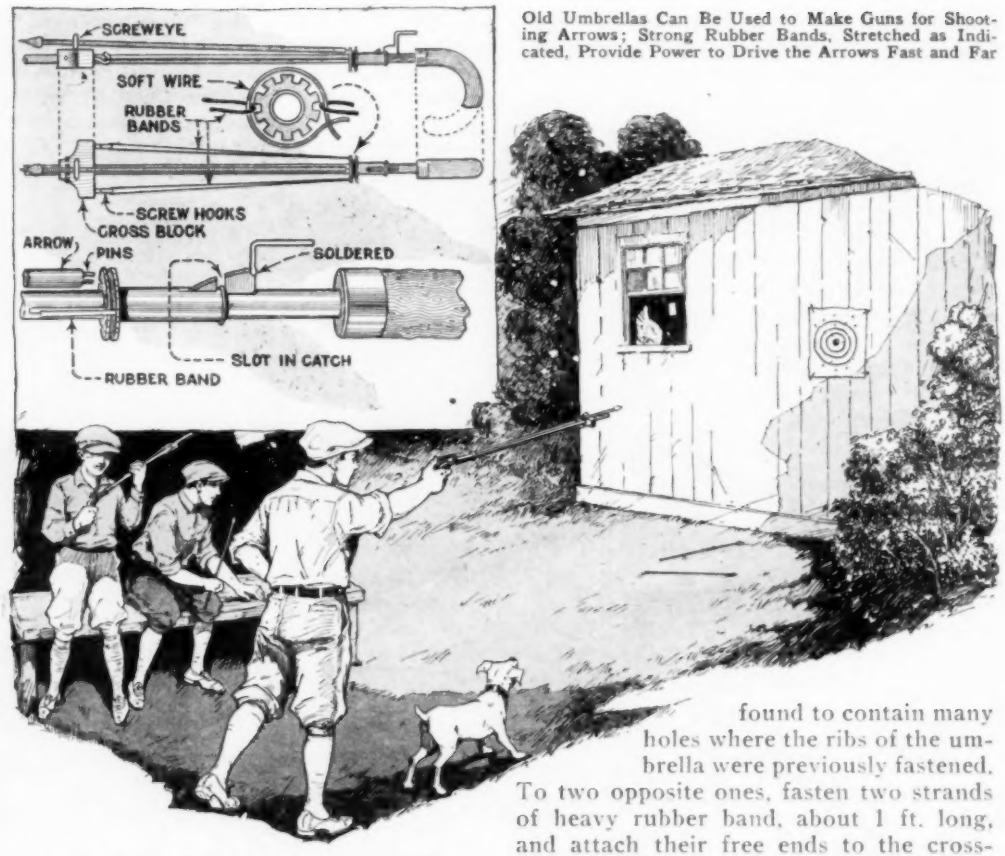


Tacking on the fabric, which is unbleached muslin, is very simple. Pull it as taut as possible over all surfaces, and use small copper tacks. The curved parts of the wing can be fitted by tacking, but where the corners of ailerons, rudder, vertical fin and stabilizer are rounded, a better job will be done by sewing two pieces of muslin together to fit the curves.

When the fabric is entirely fitted, it can be left in its original state, or your neighborhood auto painter will not charge you a great deal to spray it gray, orange, sky-blue, willow-green or any shade that strikes your fancy. The landing gear and radiator should then be finished with aluminum paint, the instrument board in mahogany stain, and name and emblems painted on the finished work.

The young owner of this ship may be assured that he will have a line of youngsters half a block long waiting their turns to coast downhill or be pushed over level pavements. Certainly it provides a tremendous thrill, and in a stiff head wind while coasting, who knows but that it might take off? It would not take a great deal of ingenuity to equip the plane with pedal drive, taken from an old "bike," so that the pilot would be independent of a "ground crew," in the very unlikely event that volunteer "pushers" were hard to get.

Don't wrap paper around a lamp to serve as a shade; if you go away and forget it, a fire might result from the heat. Use a glass or metal shade.



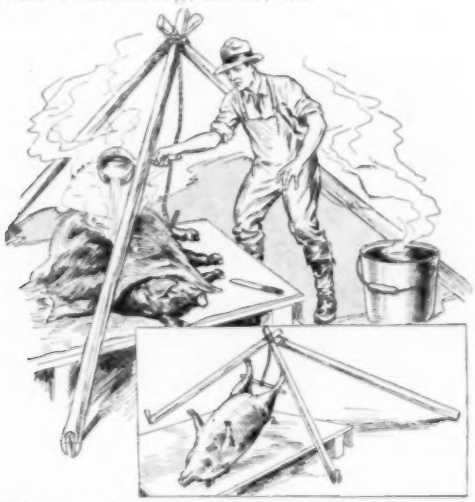
Old Umbrellas Can Be Used to Make Guns for Shooting Arrows; Strong Rubber Bands, Stretched as Indicated, Provide Power to Drive the Arrows Fast and Far

Spring Gun Made from Old Umbrella

An old umbrella stick, some strong rubber bands and a few little odds and ends will make a gun that is hard to beat. With it any boy can have plenty of fun and learn to be a good marksman. Strip an umbrella so that nothing is left but the steel stick, the handle and the ferrule that slides along the stick to engage with the catches. Remove the catch near the lower end and drive on a piece of hardwood, about 3 or 4 in. long and with a hole drilled through the center. This is the crosspiece and should remain near the end of the stick. Drive a large screweye into the center of this piece and in line with the remaining catch near the handle. Solder a piece of stiff wire, which is bent in the manner indicated, to the top of the catch and file a deep notch halfway down the top edge so that the slot in the ferrule will fit over it when the catch is depressed. The ferrule flange will be found to contain many holes where the ribs of the umbrella were previously fastened. To two opposite ones, fasten two strands of heavy rubber band, about 1 ft. long, and attach their free ends to the crosspiece, as shown. Their length must be such that they have to be stretched to their limit when the ferrule is pulled back to engage with the catch. The arrows used with this gun are made from slender lengths of tough wood properly balanced. Drive one or two pins into the butt to engage with corresponding holes in the ferrule, as shown in the lower detail. If the arrows are balanced with feathers, be sure that these will go through the screweye without hindering the arrow's progress. To shoot the gun, pull the ferrule back until it engages with the slot in the catch. Fit the arrow in the screweye and set the pins in the ferrule holes. Aim as you would a gun, and press down on the trigger. This releases the ferrule which springs sharply forward under the tension of the bands and shoots the arrow where pointed. It will be clearly seen that the speed and range of the arrow depends on the length and tension of the rubber bands. —L. B. Robbins, Harwich, Mass.

Scalding and Hanging Hogs

Here is a simple method of scalding hogs, which requires little water and enables one man to handle a large carcass without difficulty. After killing the hog, lay it on sacks, or preferably a piece of canvas, large enough to permit it to be turned over. Cover the upper side thoroughly with sacks, so that there will be two thicknesses of material. Pour hot water, which is slightly below the boiling point, over the sacks, taking care that all parts of the body are covered. Remove some of the sacks and scrape off the hair, continuing until one side is completely clean. Then turn it over and scrape the other side. This method eliminates sousing and lifting. An easy way to lift a hog is as follows: Make a V-shaped frame from 2 by 4-in. stock, as shown, the legs being about 6 ft. or longer. Lay it over the hog, after the flesh is cut between the tendons and the bone of the hindlegs and a stick is inserted. Brace the legs of the frame and tie a rope to the gambrel stick, fastening the rope securely around the top of the frame. Now get a piece of 2 by 4-in. stock, about 9 ft. long, and also fasten it to the frame by means of a small rope. Drive a couple of spikes into this piece and also into the frame to prevent the rope from slipping. When all is secure, push the 9-ft. brace until the carcass is clear of the ground. This is a job that a single man can perform easily.—Edward Van Valkenburg, Silvis, Ill.



Easy Method of Scalding and Hanging Butchered Hogs Single-Handed

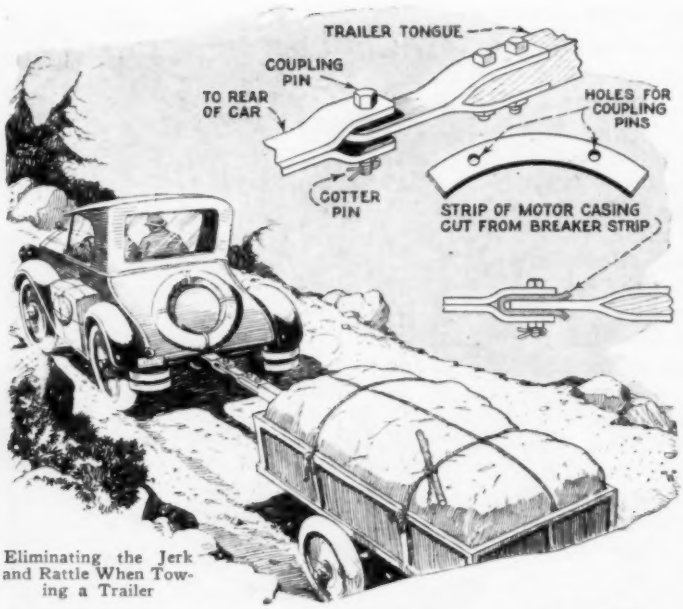
Simple Method of Opening and Holding Overhead Windows in Any Desired Position

Opening Swinging Windows That Are above Reach

In a trip through a brass foundry the other day, I noticed a simple method of opening overhead windows and holding them in any position desired. A light but strong cord was fastened to the window catch so that a pull would unlatch the window and swing it open. A spring was fastened to the upper window frame and the sash, as shown, so that the window had to be pulled against its resistance. Several metal rings were tied to the cord and looped over a nail, as shown, to hold the window open in any position. The windows were about 25 ft. overhead.—K. M. Coggeshall, Webster Groves, Mo.

Staining Wicker Furniture

Many purchase unfinished wicker furniture with the idea of staining it when it is soiled beyond the cleaning stage. In most cases oil stain is used for this purpose, but, after a few months, the stain wears off. Water stain is preferable, as its power of penetration is much greater.—L. H. Georger, Buffalo, N. Y.



Eliminating the Jerk and Rattle When Towing a Trailer

Shock Absorber for the Auto Trailer

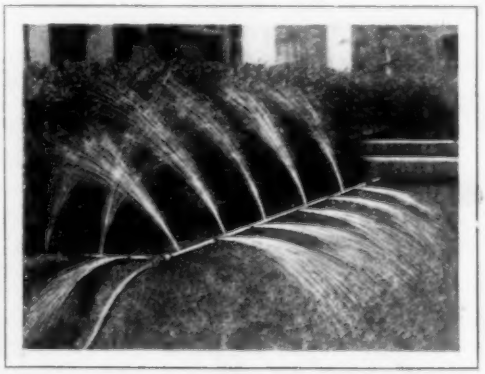
The writer frequently has occasion to pull a trailer behind an auto, and has attempted for a long time to make some sort of a shock absorber to eliminate the rattle and jerk between the trailer tongue and the connecting yoke at the rear of the car. It is this constant rattle and jerk which make towing a trailer more or less unpleasant. After trying various methods, none of which were successful, I tried padding the end of the trailer tongue with a piece of old auto casing. It works as well as could be desired, eliminating so much of the rattle and jerk that I do not mind towing a trailer. The shock absorber is cut to the desired dimensions; two holes are punched through it to take the coupling pin, and it is then attached as indicated. A piece of casing will last about 1,000 miles, and then it is a simple matter to cut another.—John Edwin Hoag, Los Angeles, Calif.

Removing Emulsion from Old Negatives

There are several methods of cleaning emulsion from old negatives. The most common is to use hot water. This is equally effective on film and glass, but when used on film, the water should be just hot enough to melt the emulsion. Clean both sides of a film, as the back is covered with emulsion to prevent curling. Caustic soda can be used for cleaning glass plates, but not for films, for the reason that reaction between the two may cause the film to take fire when it dries. The proper caustic-soda solution for cleaning should read about 10 by a hydrometer test. Do not get your hands into the caustic solution while doing the cleaning. Use rubber gloves and protect the clothing in some suitable way. If possible, place the negatives on a rack to keep the surfaces separated. When the emulsion is softened and commences to peel away, transfer the plates to a tub of clean, hot water and scrub them with a brush.—L. B. Robbins, Harwich, Mass.

System for Watering Hedges and Terraces

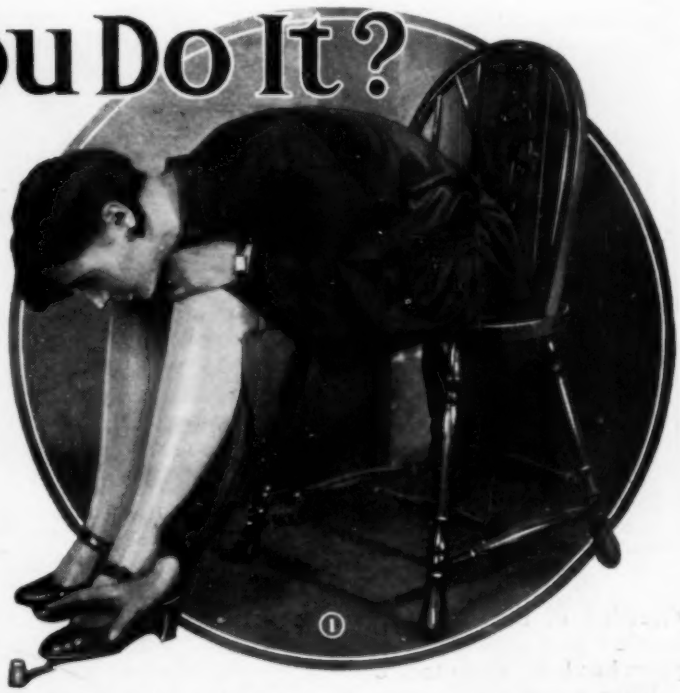
The photo shows an inexpensive watering system for hedges and terraces. Lengths of pipe are laid on the ground under the hedge, as indicated. The pipes are arranged to receive the end of a hose when watering is required. Numerous holes drilled in the pipe permit gentle application of water.



Permanent Pipe Installation under Hedge Waters Both Hedge and Terrace

Can You Do It?

by Sam Brown



"CAN you do it?"

Everywhere we are met with this question, and so the performer turns Can-You-Do-It man, and proceeds to entertain the evening party with a few easy "give-away" problems, and incidentally, maybe, to turn the tables on the literary light of the party, who has stumped him with a simple question like "What year was Tutankhamen born?"

The first problem out of the bag is the "Long Reach." In this number, the entertainer seats a member of the audience in a chair, and places a cork, or some similar object, to the right and a little in advance of the subject's left foot. The problem is to reach down between the legs with the right hand, going around behind the left leg as shown in Fig. 1, and remove the cork. The subject, of course, is warned that he or she must not slip forward on the seat of the chair, but must sit as first placed. Can you do it?

You will, no doubt, affirm that you can if you are an average person, and have looked at all the pictures before reading the article. Even though you must not slip forward on the seat, the chair need only be tipped forward, as shown in Fig. 2, and the feat becomes quite easy.

If someone handed you an ordinary soda straw, and asked you to lift a heavy bottle, using the straw only, you would probably look him over carefully and then advise him to see a doctor. However, it can be done! Bend the straw, as shown in Fig. 3, in such a way that, when inserted in the bottle, the short leg of the doubled straw will catch under the shoulder of the bottle, and enough of the longer leg will project from the neck to enable you to grasp it, and the trick is done. Of course, the bottle selected for the trick must be of such a size and shape that the long leg will project from the neck; otherwise the performer may be embarrassed by not being able to do his own trick.

Can you touch one card in a deck, and only one, and make the entire 52 cards turn over? Well, why not? Lay the cards out as shown in Fig. 4, one overlapping the other in a long line. Now slip your finger under the card at the end of the line (the first card laid down) and start lifting it by its outer edge. Don't grasp the card, lift it up with one finger. This, of course, will make the cards that overlap it rise also. Keep on lifting until the card is vertical, and then exert a steady pressure to the right (Fig. 5), and the remaining cards will obligingly somersault for your benefit, and will finally assume the position shown in Fig. 6, completely turned over. A little experimenting will show how the cards should be overlapped, and will demonstrate how the end card should be continually shoved in the

Above, How the Cork Is Lifted; Left, Raising the Bottle with the Soda Straw

direction of the remainder of the pack, lest it turn completely over before an impulse has been given to those at the right.

Place a cork in a glass of water. It floats! Sure it does, but what of it? Well, can you place a cork in a glass of water in such a position that no one can remove it without spilling every drop of water? Of course you can! Simply place a sheet of heavy paper over the mouth of the glass, invert the glass on the table, and then pull the paper away. Where's the cork? Try and get it. Just a word of warning; Inspect the glass before you use it, for a little chip on the edge may ruin your budding reputation as the "life of the party"!

Imagine that you had only half of a match box—the cover—and you wanted a whole one. Could you make it? Allow me: Simply cut the cover into three portions, A, B and C, as shown in Fig. 8, assemble A and B as in Fig. 9, then slip C diagonally into the opening between A and B, and there you are! The finished box appears in Fig. 10. It is an odd-shaped match box, but it's a whole box, none the less.

Here is how you test the lungs of the audience, who are, by this time, breathless with amazement—perhaps. Take a visiting card and turn the ends down for a distance of about ¼ in., forming a sort of "U." Place this "U," inverted, on the table. Now, the problem is to turn the card over by blowing. Can you do it?

It's not likely you can, even if you are gifted with a pair of lungs like the wolf in the fable, who "puffed and puffed until he blew the wee house down," unless you know the secret. Don't blow at the card as is the natural thing to do, or even under it, but blow on the table, about 10 in. from one of the open ends, as illustrated in Fig. 11, and the card will turn.

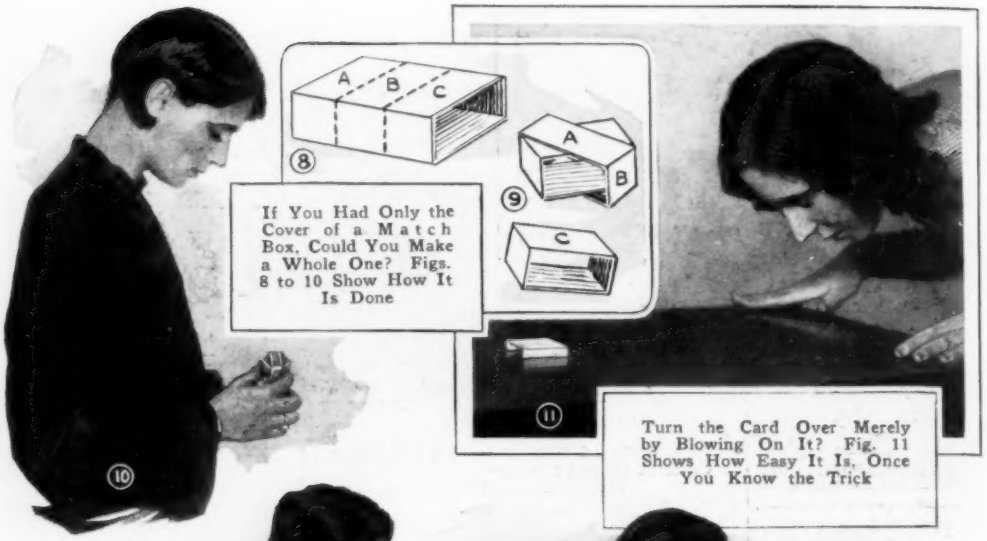
Here's a new game with dice, to be played by two persons. Each is provided with a die. You show one side of your die, say the one-spot. The second player also shows a number, Fig. 12, and this number is added to yours. The addition is continued and the first player reaching 50 with a show of his or her die wins the game. Simple enough, but can you always win? Certainly, here's how: There are certain key numbers, 8, 15, 22, 28, 36, 42 and 50. You should commit these to memory, but that is an easy task. Now you must exhibit your die so that its spots, when added to the previous total, will equal one of the key numbers. To play safe, start with the one-spot, as mentioned above, and then, whatever your opponent shows, you need only add sufficient to it to total eight, and so on.

For example, if A (yourself) shows a one-spot, and B shows a six, the total is seven, and A must next show a one to bring

Figs. 4, 5 and 6 Illustrate How the Pack of Cards Is Turned Over by Touching One Card; the Trick Is a Simple One

Fig. 7 Shows How the Cork Is Put in the Glass of Water So That It Cannot Be Removed without Spilling the Contents

the total to eight. B may now throw or show a three, which will bring the total to eleven, and A must then exhibit a four to bring it to fifteen, which is the second key number. If B next shows a three, the total will become eighteen, and A must show another four to bring it to 22, the third key number. Continuing in this way, A will always have the deciding show, and will always win the game. If it happens that B at any time shows a num-



If You Had Only the Cover of a Match Box, Could You Make a Whole One? Figs. 8 to 10 Show How It Is Done

Turn the Card Over Merely by Blowing On It? Fig. 11 Shows How Easy It Is, Once You Know the Trick

Fig. 12 Illustrates a Dice Game in Which You Can Always Be the Winner; All You Have to Do Is to Memorize a Few Key Numbers, and You Can Win Every Time

The Problem Is to Blow the Match-Box Drawer through the Opened Cover and toward Yourself; Fig. 14 Shows How It Is Done

Can You Lift a Number of Matches without Using Your Hands, with the Aid of Only the Cover of the Match Box? If You Can Produce a Good Vacuum, the Rest Is Simple

Here Is a Very Easy One; All You Have to Do Is to Take a Pack of Cards, Lay Them, Face Down, on the Back of Your Hand, as in Fig. 16, Above, Then Flip Them Gracefully in the Air and Catch Them Delicately in Your Fingers, as in Fig. 17. Try and Do It!

ber that makes the total fall on a key number, A simply shows a one-spot, and starts the process all over again.

Here is another lung tester. Arrange a match-box drawer and its cover, cut open, in the manner shown in Fig. 13. Now, standing on the side nearest to the cover, can you blow the drawer toward yourself and through the bridge formed by the cover? No, not suck it through; blow it through. It's really very simple. Take a magazine or book, and hold it in the position shown in Fig. 14. By blowing against this you can waft the drawer through the cover, and thus accomplish the seemingly impossible.

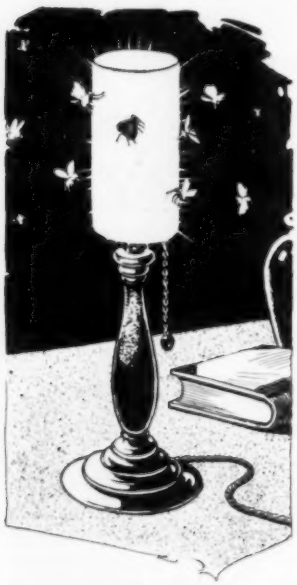
The entertainer now arranges a number of matches on the table, side by side, so that they form a compact square. The problem is to raise the matches from the table, using the cover of the match box only, and this cannot be held in the hands. Can you do it? The solution, as usual, is easy, and is illustrated in Fig. 15. The match-box cover is held in the mouth. By placing the other end over the matches and sucking in the breath sharply, the resultant vacuum will cause the matches to adhere to the open end of the box, and they can be lifted several inches.

Now for one that really justifies the title of this article. The performer ex-

hibits an ordinary pack of cards. He places half of these on the back of his hand, as shown in Fig. 16, and then, raising his hand smartly, he somersaults the cards from the table and delicately catches them in his fingers, as illustrated in Fig. 17.

But can you do it?

Trap for Catching Moths at Night

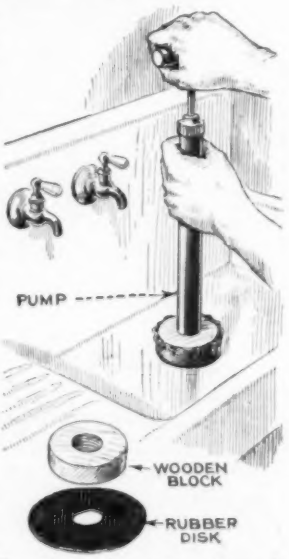


At summer cottages where moths and other insects get into the house every time the screen door is opened, especially at night, the trap illustrated will be found effective. Roll a piece of flypaper to form a cylinder with the sticky coating on the outside, and pin the overlapping edges together. From a length of wire form a ring that fits on the top of an ordinary electric lamp, leaving the ends of the wire extending on opposite sides of the ring and pushing them through the wall of the cylinder from the inside, near one end. The cylinder is then hung over a lamp, as shown. The bulb should, of course, stand upright and there must be plenty of space between it and the cylinder to prevent the heat from causing the coating on the paper to run. The light attracts the insects and they are caught on the flypaper. —William C. Thomas, Chicago.

Use of Pack Films in Cut-Film Magazine

Like a great many other photographers, who now do the bulk of their work on cut films, instead of glass plates, I use a cut-film magazine. I usually carry a few film packs. Once on a photographic trip remote from any supply store, I had used up all of my cut films and then found that a leak had developed in the light trap of the only film-pack adapter I had with me. However, I had a changing box, and attempted to load pack films into the cut-film magazine by tearing the pack to pieces inside of the changing box, and putting the films into the partitions of the cut-film magazine. With this arrangement, I found that the pack films could be inserted without any trouble, provided care was taken when pulling off the paper tabs, and that they seemed fairly secure. In taking pictures with this outfit, the different exposures could be turned up in the cut-film magazines without any tendency of the pack films to drop out of the partitions. The development of the exposures produced a set of negatives that were entirely satisfactory. This kink enabled me to take twenty-four additional photos. The same method can be used with ordinary two-shot cut-film holders.—J. E. Hoag, Los Angeles, Calif.

Cleaning a Stopped Sink

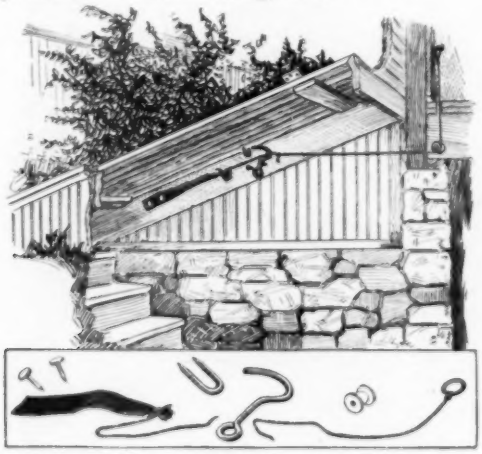


The other day a stoppage in the kitchen sink required the improvising of a device to clear it, as there was no tool at hand for the purpose. An old tire pump, a piece of sheet rubber and a wooden plug turned the trick. The plug was about 1½ in. thick and 3 in. in diameter. This was bored, through half its thickness, with a bit slightly smaller than the pump barrel, and the rest of the way with a 1-in. bit. A disk, as shown, was cut from the sheet rubber and stretched over the bottom of the plug, then drawn tight with tacks. The pump barrel was unscrewed from its foot stirrup and screwed into the plug. The whole device was then set over the drain opening and the handle of the pump

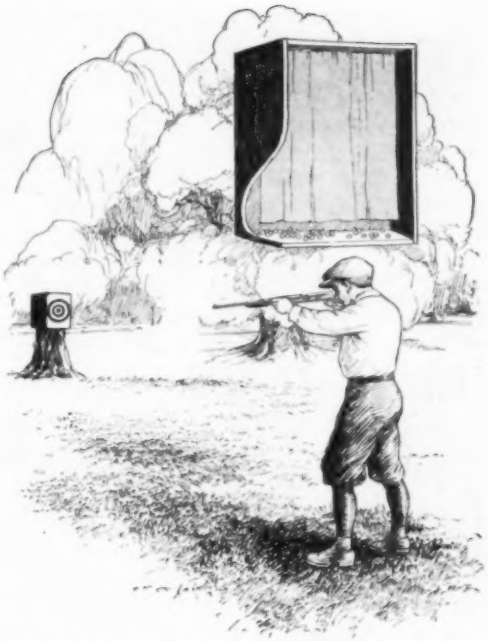
forced down. If the stoppage is far from the sink opening, water pressure must be used to force it away, instead of air. Have a pail of water handy, or fill the sink with water. Then fill the pump barrel and force the handle down as before, after the pump has been placed over the drain. Several charges may be necessary before the obstruction is removed.

Lock for the Cellar Trapdoor

Inclined cellar doors of the kind shown in the drawing are seldom locked. A padlock may be used for this purpose but it is rather unhandy. A simple and effective latch can, however, be provided, which is opened by merely pulling a cord and closes automatically when the door is shut. It consists of a strip of rubber band cut from an old inner tube, a hook and staple and a length of cord. The hook is pivoted to the door jamb and the staple is driven into the underside of the door in line with the hook, so that the latter, when swung back and forth engages and disengages with it. The rubber band is then tacked to the door jamb and is connected to the hook by means of a cord. The band should be slightly stretched when the hook engages with the staple. Another cord is tied to the hook but is run in the opposite direction, to any convenient point. Pulling this cord releases the hook from the staple, while, when the door is closed and the cord loosened, the rubber band pulls the hook back into engagement.—Mrs. Orville J. Kaiser, Warrensburg, Mo.



Simple Locking Arrangement Which Is Handy to Use for Inclined Cellar Doors



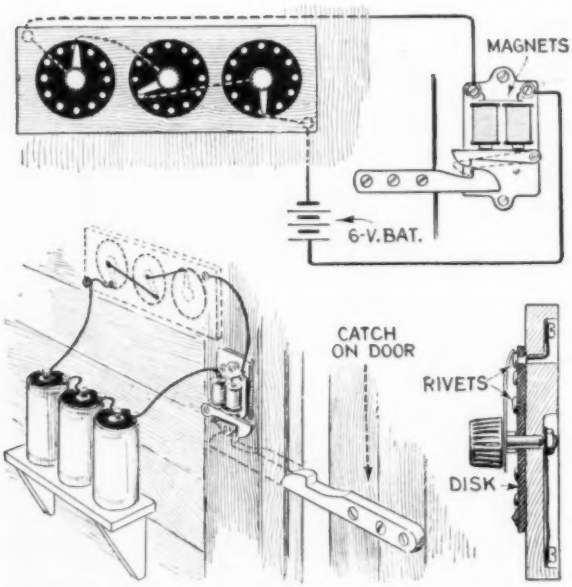
Air-Rifle Bullets Can Be Saved and Used Over Again with This Target

Target Saves Air-Rifle Bullets

A target for air rifles which will save the bullets without deforming them, so that they can be used repeatedly, may be made from a fairly large wooden box and some heavy cloth. The cloth is hung inside of the box, without touching the back, and is nailed only at the top. After the bullets have passed through a paper target tacked to the front of the box, they will strike the cloth and, their force being practically spent, drop to the bottom, where they can be collected.—E. T. Gunderson, Jr., Humboldt, Iowa.

How to Make Flypaper

Linseed oil, rosin and honey, which are readily available, can be used to make a good sticky flypaper. Melt a lump of rosin in linseed oil until the mixture assumes the consistency of a thick paste. Do this over a slow fire, so that the rosin will not burn. Then add about one-third the volume of clear honey and stir thoroughly. Apply the mixture while it is hot to sheets of heavy wrapping paper with a stiff brush, and when the sheets have cooled they will have a sweet, sticky surface.—L. B. Robbins, Harwich, Mass.



Combination Electric Lock for Sliding Door Which May Be Operated at a Distance

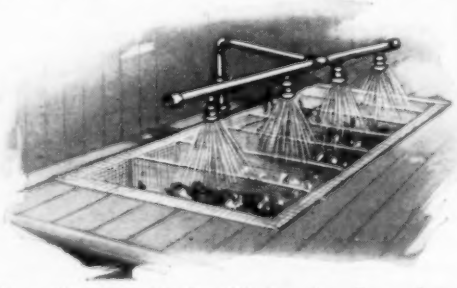
Remote-Control Electric Combination Lock for Sliding Door

A novel electric lock for a sliding door is shown in the drawing. The current to operate it is obtained from a battery of three dry cells, a 6-volt storage battery or a bell-ringing transformer connected to the house-lighting circuit. The lock consists of a magnet taken from a doorbell or buzzer, a wooden latch securely screwed to the sliding door, a soft-iron catch to engage with this latch, and three radio inductance switches or sets of switch points and levers.

The latch is made of some hardwood, oak or ash, for instance, and is screwed to the door at any convenient height so that it projects over the door jamb or the wall about 3 in. It may be made of brass, if preferred, but not of iron or steel. The soft-iron catch is pivoted to the wall so that, when pulled up, it will just clear the latch, and when at rest, it engages with the latch, keeping the door locked. Strip a large electric doorbell of everything except the magnets, leaving them attached to the base, which is then attached to the wall at such a distance above the catch that, when an electric current is sent through them, they will raise the catch. If radio inductance switches are not available, get three bakelite or hard-rubber disks, about 3 in. in diameter, drill 12 holes in each disk for switch contacts and one in the center for a switch lever, or the disks may be cut from small phonograph records. Set the disks in line on a panel in the place from which the lock is to be operated. Connect the points and levers as indicated. Choose switch points in different positions on each disk to make the combination that works the lock difficult to discover by persons "not in the know." To make it possible to operate the lock, the latch should drop into place loosely when the door is tightly shut. To open the door, turn the switch levers on the disks until each makes contact with the wired point. The setting of the last lever completes the electric circuit through the magnets, and the catch is raised so that the door can be slid aside. Then turn the switch arms to break the circuit. The combination can, of course, be altered at will by changing the wiring to the switch points.—L. B. Robbins, Harwich, Mass.

Sprayer and Drain for Vegetables

Vegetables on display in a large Colorado store, are kept fresh by a fine spray of water which is kept up all the time. The display also attracts attention as a novelty. A sink in the window is fitted with a wire-mesh tray having a number of compartments and a pipe with suitable sprays above it, as shown in the photo. —Charles A. Goddard, Los Angeles, California.



Vegetables in a Display Window Are Exposed to a Constant Spray of Water

Making a Chinese Screen

By HERBERT C. McKAY

RECENTLY miniature Chinese screens have become very popular, but their high price puts them out of the reach of most of us. By the method described here, these screens may be closely imitated, and the designs altered in cases where the Chinese touch is not wanted.

The original screens are made of two thin slabs of colored stone, the first layer being pierced to show the contrasting surface of the underlying stone and the two mounted between two uprights of black wood.

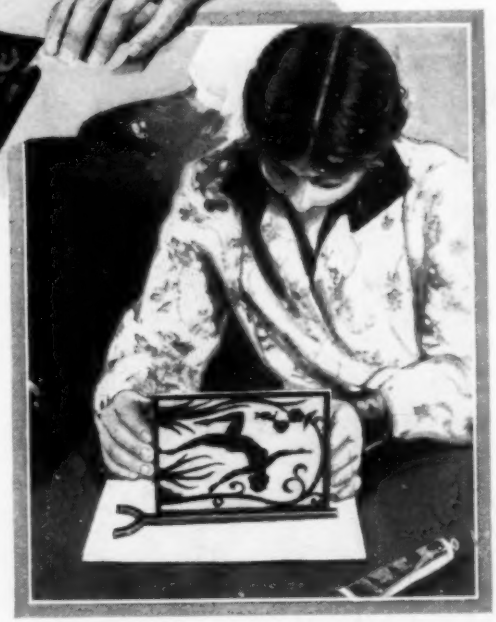
In making our screens, we substitute two sheets of different-colored celluloid for the stone slabs, and use the same material for the supports. The separate pieces are then assembled with celluloid cement, which makes the operation quite simple.

The materials needed are: 2 sheets of black celluloid, 5 by 7 by ⅛ in. and 3 by 11 by ¼ in., respectively, 1 sheet of white celluloid, 5 by 7 by ⅛ in., and 1 tube celluloid cement.

The 5 by 7-in. sheets are carefully squared and the edges smoothed. A coarse-toothed saw blade will work this material more satisfactorily than a finer one, as the heat generated by the fine saw tends to melt the fragments removed from

the sheet into a paste which cements the material behind the blade. The black sheet is then sandpapered thoroughly on one side until all the gloss is removed. The design to be used is drawn on this side with a colored pencil sharpened to a fine point. Thin-lead red pencils are very useful for this work.

When the design is completed, it is sawed out in the usual manner, using either a hand or power fretsaw. As the celluloid will crack near the end of a cut, this sawing must be carefully done, and when completed, there will be several rough places in the fretwork. These



are removed with a coarse-cut file of knife-blade shape. Round and half-round coarse files will also be useful. After the preliminary smoothing, all sawed edges are carefully finished with sandpaper. The white sheet is now sanded until the surface is matted. The back of the black design is coated with celluloid cement, then laid upon the white sheet, and both placed under pressure for about two hours, when they should be firmly united.

In the meantime, the sidepieces are cut out. These may be of any desired design. The design shown in the photos, or one similar to it, may be economically cut out of the 3-in. strip of celluloid by laying out the sidepieces "head to tail," that is, with the foot or base of one piece at one end of the strip, close to the side, and the foot of the second at the other end. In this manner, the width of the bases may be made a little over 2 in. The width of the upright portions should be $\frac{3}{8}$ in., or a little over, so as to allow about $\frac{1}{16}$ in. of overlap on the panel, when assembled. The over-all length, laid out in this manner, will be about 10 in. If any other design, demanding a wider base, is selected, it will be necessary, of course, to obtain a correspondingly wider piece of material. When they are cut out, the edges are smoothed with a file, and one side is sandpapered until mat. One sidepiece is laid on a table, dull side up. One edge of the combined sheet is given a thorough application of cement and gently placed upon the sidepiece. It is held so for a few moments; then, turning it upside down, the assembly is put in a vise in such a manner that the stand or sidepiece lies on top of the screen. Now prepare the other sidepiece and fasten it in the same way. When this has been done, and the cement partly set, bind the whole with string and put it away for twenty-four hours to set completely.

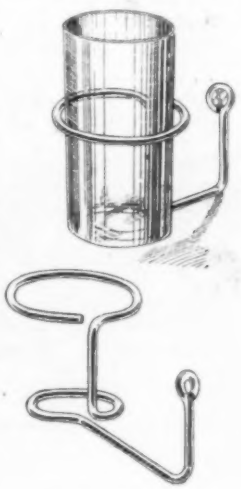
If no cement is at hand, it may be made by mixing one part acetone and two of amyl acetate and adding to the mixture a few shreds of transparent celluloid. A camera film, 1 by 2 in., finely shredded, suffices to ripen 2 oz. of the mixture.

Protection against Vermin

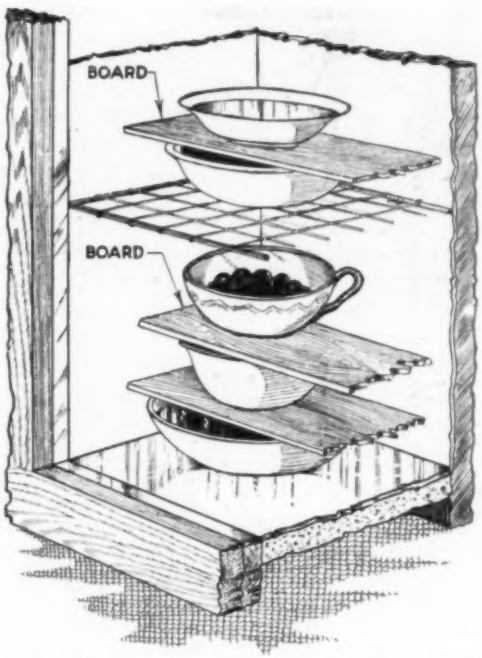
In mountainous sections, pack rats, weasels and other kinds of vermin are quite common. They force their way into boxes of food, bedding, and, in fact, everything. To exterminate them is impossible, and the best thing to do is to arrange things so that they cannot do any harm. One method, which I have found highly successful, is to place each leg of a table in an empty coffee can. The creatures, even if they gain access to the cabin, cannot climb over these cans. Thus, whatever is put on top of the table is perfectly safe from them. Another practical scheme is to line the inside or outside of clothing chests with sheet metal, preferably tin, to prevent the animals from gnawing their way through. As many things as possible should be kept in cans or tin-lined containers.—Henry H. Graham, Twin Falls, Idaho.

Homemade Tumbler Holder

Tumblers set on window sills, tables or other painted or varnished surfaces are likely to leave water marks and are also in danger of being knocked down and broken. A wall tumbler holder, which will prevent these risks is shown herewith. It is made from a length of No. 10 or 12 galvanized-iron wire, bent into a circle, about ½ in. larger than the bottom of the tumbler, then brought down about 2 in. and formed into a smaller circle directly under the first. The diameter of the second circle should be less than that of the tumbler bottom. Finally, bend the wire out horizontally, then up at right angles, and form an eye at the end for a woodscrew by which it is fastened.—W. C. Thomas, Chicago.



¶A hot-water bottle held against a porous plaster will assist in quickly removing it from the skin.



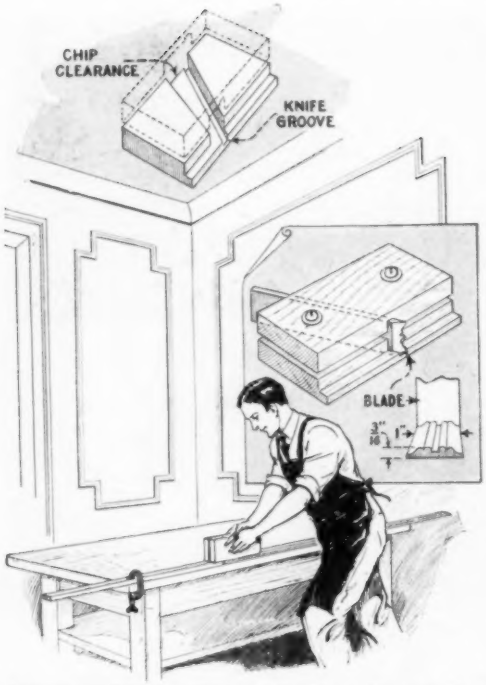
Economizing Space in a Refrigerator by Piling the Dishes on Each Other

More Space in the Refrigerator

If your refrigerator is small and gets overcrowded, obtain some thin lumber from an orange crate and cut pieces large enough to reach across the dishes placed in the refrigerator. Deep dishes should be used whenever possible. With the boards arranged as shown, several dishes can be piled on each other. The boards should be scalded occasionally to keep them sanitary. Pieces of slate from roof covering also may be used for the purpose. If economy is no object, get a dozen wire shelves similar to, but smaller than, those already installed in the refrigerator. Meats and some vegetables can be piled on the shelves without the dishes.—James F. Hobart, Dunedin, Fla.

Restiffening Straw and Panama Hats

Straw or panama hats that become flimsy and soft from usage, or from becoming damp, may be restiffened very easily. Dissolve ½ oz. of gum arabic in ½ pt. of water and use this to sponge the inside of the crown and the underside of the brim. Allow the hat to dry in the sun, and it will have the required stiffness.



Improvised Beading Plane for the Home Owner's Tool Kit Is Used to Make Molding

Improvised Plane for Making Molding

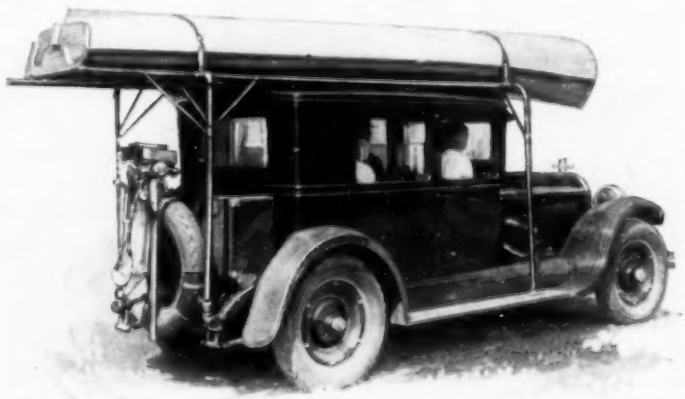
Paneled walls add to the appearance of a room and this method of decoration is well within reach of any home owner if he is handy with tools. The molding used for this purpose has a number of small grooves and ridges, and is not always obtainable at lumber yards. It can easily be made, however, by means of an improvised plane shown in the drawing, if a regular carpenters' molding plane is not at hand. The homemade tool consists of two pieces of wood, grooved along the bottom edge to provide chip clearance, and diagonally to accommodate a cutting blade. The blade can be made from a section of discarded file or similar steel, one end of which is ground and carefully whetted down to a sharp cutting edge shaped to produce the beading desired. It is clamped between the two sections of the holder and two bolts or screws keep them together securely. Molding should be made from close-grained wood.

Pyrethrum-Soap Spray

Pyrethrum powder is non-poisonous to humans, and can be applied to vegetables or fruits just previous to consumption, but it is deadly to many insects. It can be applied with safety to tender plants without running the risk of burning the foliage or discoloring the flower. It is easily sprayed with a dust gun. I have used this remedy successfully against the cucumber beetle, potato bug, cabbage worms, roaches and flies, as well as against the Japanese beetle. Spray the soap around the walls of your rooms, and a few minutes afterward you can sweep up dead flies on the floor.—August Jeffers, Louisville, Ky.

Pipe Frame on Auto Holds Canoe

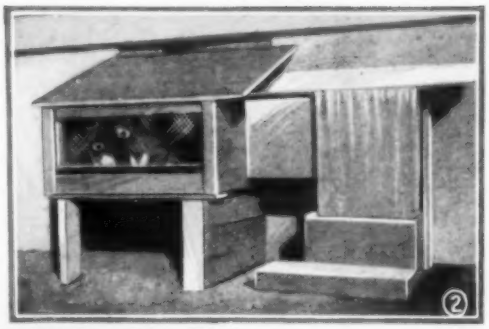
It is often rather difficult to find a suitable method of carrying a canoe on an auto when going for a camping trip. The writer made a special frame of pipe for this purpose, which can be attached or detached in a few moments, is not in the way, and has proved satisfactory in every respect. The canoe is held in place on the frame by means of thumbscrews and heavy trunk straps, the latter being slipped over the bottom as indicated. An outboard motor for the canoe was securely attached to the spare-tire holder.—E. S. Mason, Norwood, Ohio.

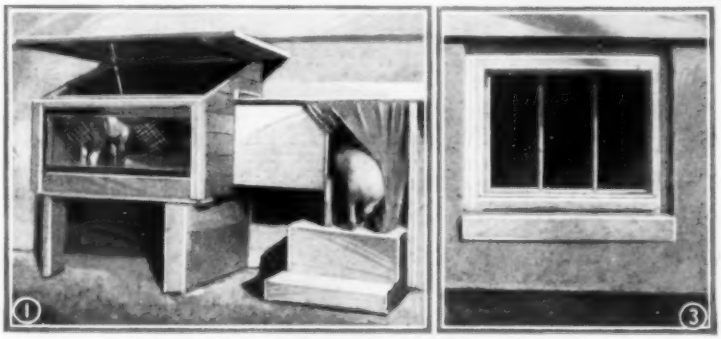


Pipe Frame on Auto Makes a Strong Support for the Canoe When Out on a Camping Trip

Portable Heated Dog House

The portable house shown in the photos is used during the winter to provide a comfortable place for my dogs, and is accessible to them at all times. When warmer weather arrives, it can readily be detached from the basement-window sill to which it is fitted, and stored until it is again needed. With this arrangement, the dogs, while out of doors, have access to a sleeping and lounging compartment of





Comfortable Winter Quarters for Dogs Are Heated with Warm Air from the Basement; the Entrance Has Four Curtains to Keep Out the Cold Air

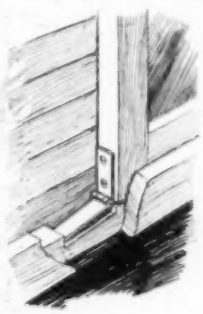
practically the same temperature as the basement, which is heated by a furnace. The window is, of course, kept open and a screen is substituted. The house is made of tongue-and-grooved stock and is lined throughout with paper. Any opening at the joint between the dog house and the frame of the cellar window is stuffed with cotton, to prevent cold air from entering the basement. The dogs enter through a vestibule in which four curtains, spaced 6 or 8 in. apart, are hung. After a dog has passed under them, they drop back so that very little cold air gets inside.—F. C. Manning, Newark, N. J.

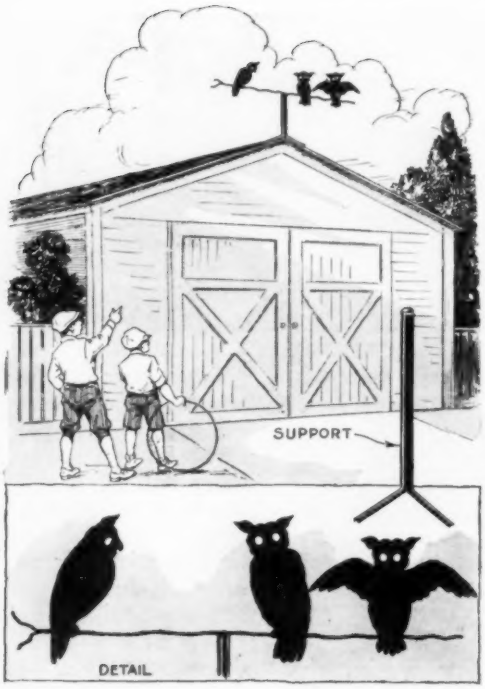
Preserving Old Leather

Leather, when old, often cracks on the surface and becomes "powdery." To prevent this, a good dressing can be made from the following ingredients; lanolin (anhydrous) 14 oz.; beeswax, 1 oz.; cedarwood oil, 2 fluid oz.; and hexane, 22 fluid oz. First dissolve the wax in the hexane in a warm place, taking care to keep the latter away from fire as it is inflammable. The cedarwood oil is then added, and lastly the lanolin, which should be softened by warming it. Before applying this mixture, wash the leather with soapy water and let it dry in a warm room for two or three days. Some of the dressing is then rubbed in with the hands. The leather will feel greasy, but after 48 hours it will be quite normal. When the dressing has been thoroughly absorbed by the leather, it may be polished. The effect of this dressing is to soften the leather and restore its freshness.

Lock for Sliding Windows

Sliding windows of the kind used on sun porches are sometimes left unlocked unintentionally. An automatic lock is shown in the drawing. One leaf of a narrow hinge, about 3 in. long, is screwed to the window frame on the side opposite the stop. The hinge should be set so that the free leaf forms an angle of 10 or 15° with the window slide when it drops into a recess cut in the latter, as shown. To open the window raise the free leaf with one hand and slide the window back with the other. The hinge pin should be kept oiled so that the leaf will drop into the recess by its own weight when the window is closed.—Frank W. Harth, Bayside, N. Y.





Novel Weather Vane Comprising Three Wise Owls Sitting on a Twig

Novelty Weather Vane

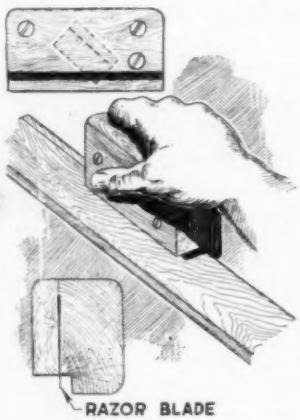
This weather vane works as well as any other type and will attract attention. Three wise owls in varying poses offer the necessary resistance to the wind to turn it. The birds are cut from rather heavy sheet metal with a cold chisel, and are then brazed or riveted to a rod which is hammered out to resemble a tree twig. To the center of this twig a small straight rod, with its lower end pointed, is riveted or brazed. This rod is set in the end of a vertical gas-pipe support, which is split and bent at its lower end and drilled so that it can be attached to the roof with lagscrews. A hardwood plug should be driven into the lower end of the pipe before it is placed in position, to provide a support for the pivot rod. Pour some oil into the pipe so that the rod will not rust. Painting the tree twig black and owls black with white eyes completes the vane. The size, shape and arrangement of the birds on the vane in the drawing must be followed, for one side must offer greater resistance to the wind than the other, or the vane will not turn into the wind.—Dale R. Van Horn, Lincoln, Nebr.

Cleaning Paintbrushes

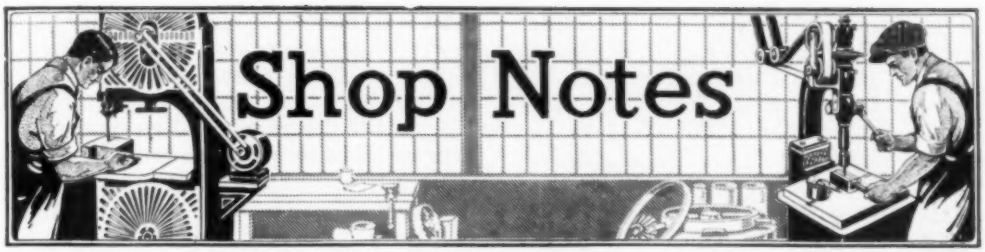
Turpentine is one of the most satisfactory materials for washing paintbrushes, but it is expensive. Unless the turpentine can be used again in paint after washing the brush, the cheaper kerosene will do as well. After washing with kerosene, rinse in gasoline and shake out thoroughly. If brushes are to be put away for some time they should be well washed with soap and water, thoroughly rinsed in clear water, and then hung, with the bristles down, to dry. Brushes that are to be used in a few days may be hung into a can of kerosene or turpentine with the bristles submerged. Drill a hole through the handle of the brush for a wire hook so that the brush can be suspended from the edge of the pail, without touching the bottom.—A. T. Bowden, Ottawa, Can.

Improvised Strip Cutter

Small strips of wood, such as are used in the construction of kites, model airplanes, etc., are very often difficult to obtain. The writer found that the wood from which yardsticks are made is a very suitable material for such sticks, and it is easily cut into strips with a safety-razor blade. A suitable holder for the blade is made from two pieces of hardwood, held together by three screws that serve to clamp it firmly. The blade is set at an angle to make it cut easier. The lower edge of the guide block is grooved $\frac{3}{16}$ in., or the width of the strip that is to be cut.



In using the cutter hold it rigidly up against the wood and push along, being careful not to bear down too hard for the first time. Cut about halfway through the wood, then turn it over and cut it through from the other side.—Chas. Homewood, Hollywood, Calif.



All Shop Notes published in 1927, in book form—Fifty Cents—from our Book Department

Artistic Doorplates Beautify Home

By MAURICE M. CLEMENT

THE other day my wife had an idea. Not that this is anything to rush into print about; she gets them often, and her ideas have made our home the talk of the neighborhood for sheer beauty and comfort. But this idea was so simple and the results so splendid that it is very much worth while passing on.

Her idea was that the glass plate on the swinging door between the dining room and kitchen had rather a blank look, and that it would be the easiest thing in the world to change this condition, and make it an attractive ornament, simply by putting some kind of a picture under the glass. I objected immediately that, while the idea was a good one, I didn't want to go downtown to hunt for a picture that would fit behind the narrow glass panel.

That objection was killed at once, however, when she produced a last year's calendar that she had been saving, womanlike, because the picture on it was "too pretty to throw away." She trimmed it to the size of the glass while I

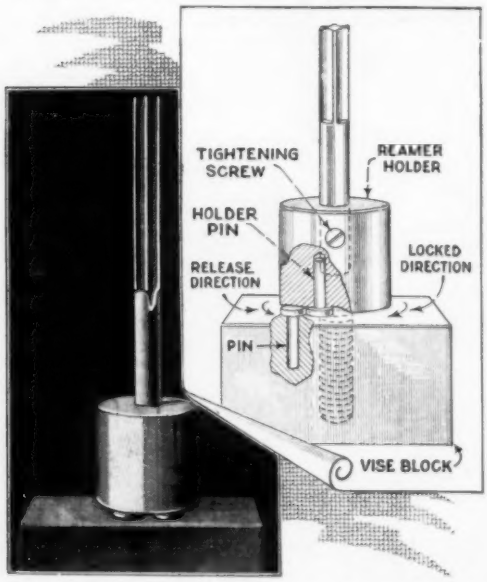
The Ordinary Blank, Unattractive Glass Doorplate at the Left Is Transformed into a Thing to Be Admired with the Aid of a Pair of Scissors, Some Scrap Wallpaper, Pictures or Thin Linoleum

got the screwdriver, and a few minutes later we stood back to survey our work. "Isn't it beautiful?" cried my wife, her face aglow. I was compelled to admit that it was. "What about the plate on the other side of the door?" I demanded. "It's inside the kitchen, and hardly anybody ever sees it. Why not stick an old piece of linoleum or wallpaper under the glass?" This I said in jest.

She opened the door and looked thoughtfully at the inside plate. "An excellent suggestion," said she. "We have two fine pieces of figured linoleum and a dozen small pieces of wallpaper in the garage. Get them, and we'll see how they look." It was useless to protest that I was only joking, so I got them, and, before the evening was over, we had learned many things about "picturizing" doorplates. For instance, the linoleum and wallpaper suggestions which I had offered in a facetious mood proved to be an absolute knockout. Three other calendars furnished subjects for as many plates. Popular magazines of the larger size yielded innumerable pictures, drawings and reproductions of oil paintings fit to put under glass. Several decalcomania designs mounted on parchment proved particularly attractive.

Non-Reversible Reamer Holder

When hand reaming is done with a reamer held in a vise and the work in the hands, it often occurs that the work is revolved toward the left when it is removed from the reamer. This soon dulls the edge and spoils the tool for finishing work to size. A good method of avoiding this trouble is to use a vise holder like that shown in the photo and drawing. It locks when the reamer is used in the ordinary way and releases when the opposite movement is attempted. To make the device, take a piece of square or rectangular steel, drill and tap it in the center. Next make the reamer holder of round steel, threading it on one end to fit the tapped hole in the block and drilling it out at the other end to take the reamer. Drive one pin into the block and another into the holder, their heads being slightly less in thickness than the pitch of the thread in the block. The pins will prevent the holder from turning when it is used in a right-hand direction, but when used in the opposite direction the holder itself turns. One revolution clears the heads of the pins so that further turning the work in the wrong direction only results in unscrewing the holder.—Harry Moore, Rosemount, Can.



Holder Which Prevents Turning the Reamer in Left-Hand Direction

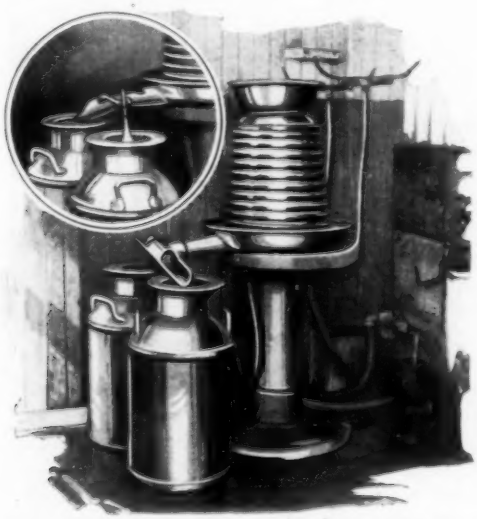
Using Erasers

To erase fine lines use a sharp or narrow-edged eraser. When erasing broad or thick lines hold an eraser at an angle of about 15° to the surface of the paper, alternating the sides of the eraser. This procedure will prepare the eraser for the finer lines. It will be found that better work can be done by erasing a small section of the drawing and redrawing than by using an erasing shield. The eraser should always be used carefully. If the surface of the drawing paper or tracing has been roughened by careless erasing, the drawing will gather dirt. Never use an ink eraser on tracing cloth. It takes longer to erase with a soft eraser, but the surface is left smooth and the ink will flow better when applied. When an eraser becomes hard and smudges the drawing,

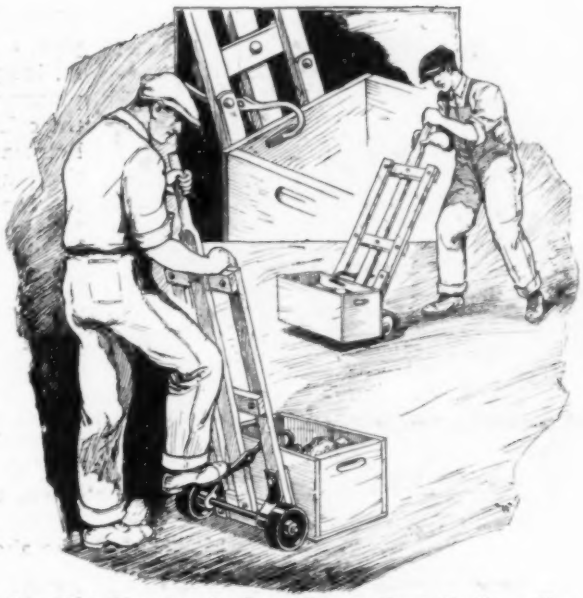
it can be restored to good working condition by rubbing vigorously on a clean piece of drawing paper. If you have roughened tracing cloth by erasing, the ink will have a tendency to spread. This can be prevented by dusting the surface with soapstone or ordinary talcum powder, and wiping off the surplus before applying the ink.—Frank N. Coakley, Buffalo, N. Y.

Milk-Cooler Spout Shifts Automatically

The accompanying photo shows a milk cooler on the farm of L. C. Young, of Montgomery, Ala. The delivery nozzle of the cooler is equipped with a double, tilting spout, of such a length that it can discharge into either one of two cans placed as shown. The spout is fitted with a float, which is dropped into one of the cans, so that this can will be the first to be filled. As the milk rises in this can the float also rises, until, when the can has been filled to the proper level, the float tilts the spout so that it discharges into the empty can. Each can is filled uniformly, and all the operator has to do is to have an empty can ready to replace the filled one.—J. C. Allen, Lafayette, Ind.



Spout of Milk Cooler Which Shifts Flow of Milk from Full to Empty Can



Iron Hook Pivoted to the Center Bar of a Truck Facilitates Handling Tote Boxes

Adjustable Tote-Box Truck Handles Boxes of Varying Height

In a shop where small or medium-sized tote boxes are used, it is an easy matter to arrange a truck to carry them about from place to place. An iron hook is pivoted to the center bar of the truck frame, as shown, so that it can be slipped over the edge of a box, while the rear part is used as a foot lever to raise the hook. The latter should be heavier than the pedal part so that it will not slip off the side of the box. A number of holes are drilled at regular intervals in the center bar so that the hook can be attached at various heights to suit boxes of different sizes. The device is held in place by a bolt and nut.—Avery E. Granville, Cleveland, Ohio.

Homemade Floor Oil

A mixture of equal parts of turpentine and linseed oil is recommended for pine floors. Most floors will readily absorb two applications of this mixture, and it will leave no objectionable coating. For varnished floors, use one part of linseed oil to three of turpentine. Barely moisten the mop with the preparation. An occasional slight oiling prolongs the life of varnish considerably.

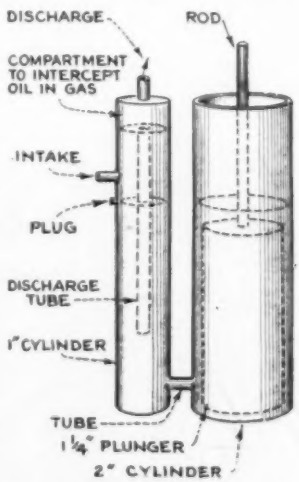
Non-Slip Base for the Camera Tripod Can Be Made of Furniture Webbing

Cure for Slipping Tripod

The accompanying drawing shows a simple device which will prevent a camera tripod from skidding when it is set on steep or slippery inclines, or on polished wooden or marble floors. It consists of three strips of heavy webbing, each 22 in. in length and arranged to form a triangle, as indicated. At each corner a piece of rubber, ¼ in. thick, which may be cut from a discarded auto tire, is placed underneath the webbing, the straps overlapping above it. A sheet-metal socket for the tripod leg is placed on the webbing at each corner and the assembly riveted together.—Leslie H. Phinney, Springfield, Mass.

Oil-Seated Valves for Hydrogen Sulphide

In order to prevent valves of the ordinary type from clogging up when used for hydrogen sulphide, and to forestall the loss of gas with its attendant discomfort, often caused by careless students, special valves have been installed by the University of Oregon in the chemistry laboratory. In the construction of these valves use was made of an oil-sealed trap. Each valve consists of two cylinders, approximately 13 in. in height, and connected at their bases by a small tube. The larger cylinder, which is made of 2-in. galvanized-iron pipe, contains a plunger of 1¼-in. pipe, 8 in. long and plugged at both ends. The plunger, of course, makes a sliding fit in the cylinder, and can be raised or lowered by means of the rod screwed into one of the plugged ends and extending through the top. The smaller cylinder, made of 1-in. pipe, is tapped and fitted for two ¼-in. gas connections. The intake is located about 4 in. from the top, while the discharge pipe goes through the closed top of the cylinder and extends downward 8 in. Both cylinders contain oil. The desired level of oil can be maintained by means of a small drain hole fitted with a removable plug about halfway up on the smaller cylinder. When the plunger is down, the surface of the oil is at its highest, that is, even with the plug. It is also about 3 in. above the end of the discharge pipe which dips into the oil and consequently is effectively trapped, or closed. When the plunger is lifted, the oil level falls below the open end of the discharge pipe, and the gas that was confined in the chamber above flows out. When the plunger is released, it settles back and the oil level rises again, automatically sealing the discharge. Pressure in the gas mains is regulated so that it never exceeds the pressure of the 3-in. column of oil. To prevent oil from being blown out of the discharge pipe, a small compartment has been provided in the top of the smaller cylinder to stop the oil while gas is flowing. Mica gaskets with a tiny perforation are put in the unions on the intake line, close to the valves, in order to cut down the flow of gas to the valve, as a great quantity is never desired. A wooden box, 14 in. high, 6 in. wide and 3 in. deep, houses the assembly.

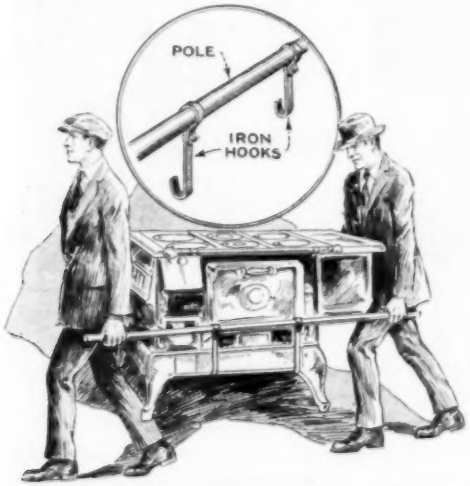


How to Remove a Broken Spindle Bolt

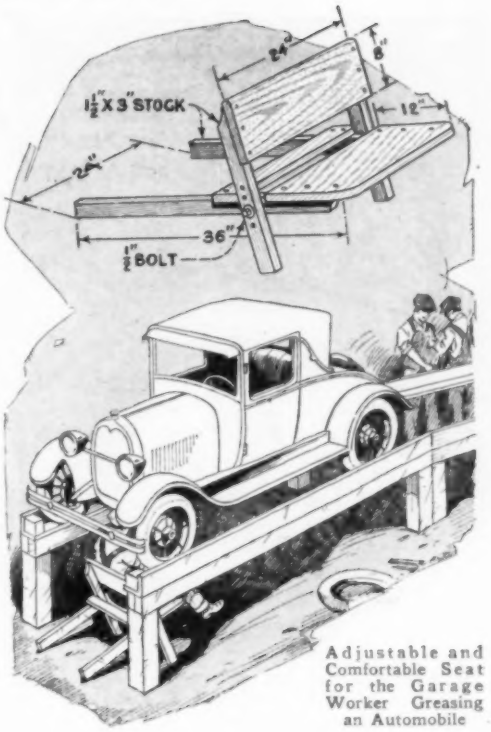
I had to remove a broken spindle bolt from the axle fork of a Chevrolet. I had intended to saw a slot in the bottom of the bolt and turn it out with a screwdriver, but the bolt was casehardened and this made sawing impossible. I first took off the nut and washer, after which the threads at the bottom were well doped with rust-removing fluid. The bolt was then turned as far as possible by means of a punch stuck into the cotter hole. A piece of 20-gauge soft-iron wire, about 3 ft. long, was wrapped once around the bolt where the washer had been, and, while both ends of the wire were held firmly in the hands, a steady pull was exerted toward the left. The friction of the wire loosened the bolt, although it had been in place several years.—Neil Nelson, Kansas City, Mo.

Moving the Kitchen Range

One of the most awkward and heavy articles to move about is a kitchen range, and as nearly all the individual parts are castings, care must be taken to avoid breakage. To facilitate the task, two 5-ft. lengths of 1½-in. iron pipe, with hooks attached, as shown in the detail, can be used. The handles extend beyond the ends of the stove, and two men can readily carry it. Hardware dealers will appreciate a pair of these handles.



Carrying a Range with the Aid of Two Handles Fitted with Hooks



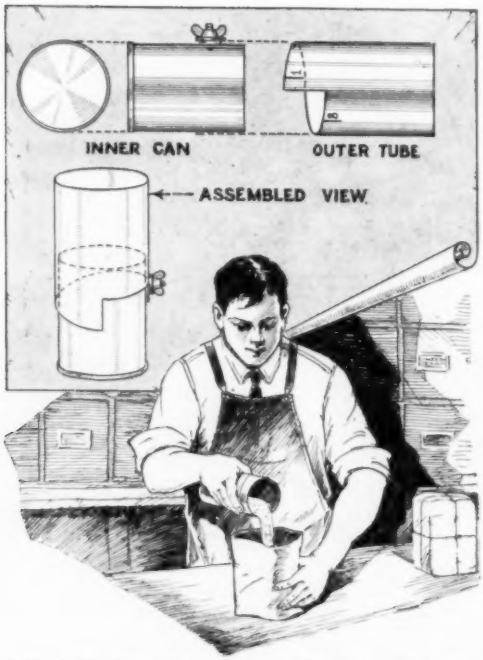
Adjustable and Comfortable Seat for the Garage Worker Greasing an Automobile

Seat for Auto Greasing Attendant

After going to the trouble of providing the garage with two of the usual inclines, so convenient for greasing and repair, it was found that their use caused more or less discomfort for the attendant working underneath. After some consideration, the problem was solved by providing a seat as shown, which can be adjusted to suit the worker. Two boards make up the seat and backrest, four lengths of 2 by 4-in. studding form the frame, and two small bolts hold the separate parts together, while holes in the backrest sidepieces permit adjustment.

Steel Wool for Oilcan Strainer

The man who wants to keep his oil as free from dirt as possible, will find it advisable to put some sort of filter at the base of the spout. A piece of fine copper or brass gauze is commonly used for this purpose, but if it cannot be obtained, a small wad of steel wool may be substituted. This makes an excellent filter and is even better than gauze, but it should be changed often.



Adjustable Measuring Can for the Shop Eliminates Guessing and Weighing of Small Material

Adjustable Measure for the Shop

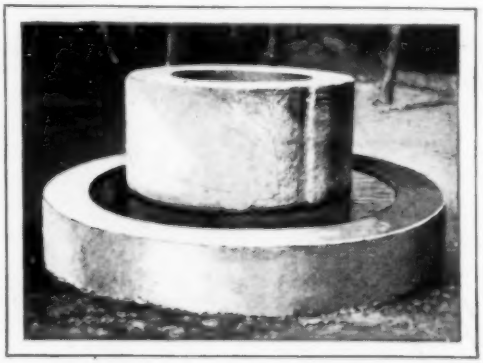
Factory stockroom workers who issue materials by weight can save a lot of time by using the adjustable measuring can shown in the illustration. One of these, kept in a barrel of material for which it is to be used, can be quickly adjusted to measure any quantity within its capacity, and so save the trouble of guessing or weighing it. Two lengths of tubing of convenient size are required, one to slide within the other. The inner one is closed at one end by soldering a flat disk to it, and the edge of the outer tube is cut to a spiral, as indicated. Drill a hole in the inner tube for a screw and use two washers, one a little thinner than the tube and the other large enough to tighten on the outer tube when the wingnut is turned. Make a mark on the inner tube and graduate the outer tube, along the spiral, in sections to correspond with the weight contained in the can when the outer tube is turned to bring the marks in line. In use, the nut is loosened and the outer tube turned to one, two or three ounces, or pounds, as the case may be, the nut is tightened, the can filled to a heaped measure and leveled with a stick.

How to Cool a Hot Bearing

Some machine bearings continue to get very hot no matter how much ordinary oil or lubricant is applied. Even when mixtures of oil and graphite, powdered mica, soapstone, etc., fail to reduce the heat, there is one substance, namely coconut oil, that I have seen tried a number of times, and in every case the bearing, to which it was applied, cooled down and the machine was kept running without a shutdown. Even after the bearing gets very hot, the use of this oil will generally cool it in a short time. On bronze and brass bearings coconut oil seems to work like magic. In cool climates the oil may get too thick to be fed from an ordinary oilcan, but a little heat applied to the can will thin the oil. A bearing cooled by using coconut oil does not require flushing out after its use, as is necessary when mica, soapstone or some other "last-hope" remedy is tried.—James E. Noble, West Vancouver, Can.

Watering Trough for Hogs

Hogs like to wallow in mud and water, and will upset any ordinary trough. A Texas rancher made the circular concrete trough shown in the photo, which cannot be overturned. It has a float in the center which, when properly adjusted, keeps just enough water in the trough for the hogs. —L. A. Wilke, Fort Worth, Tex.

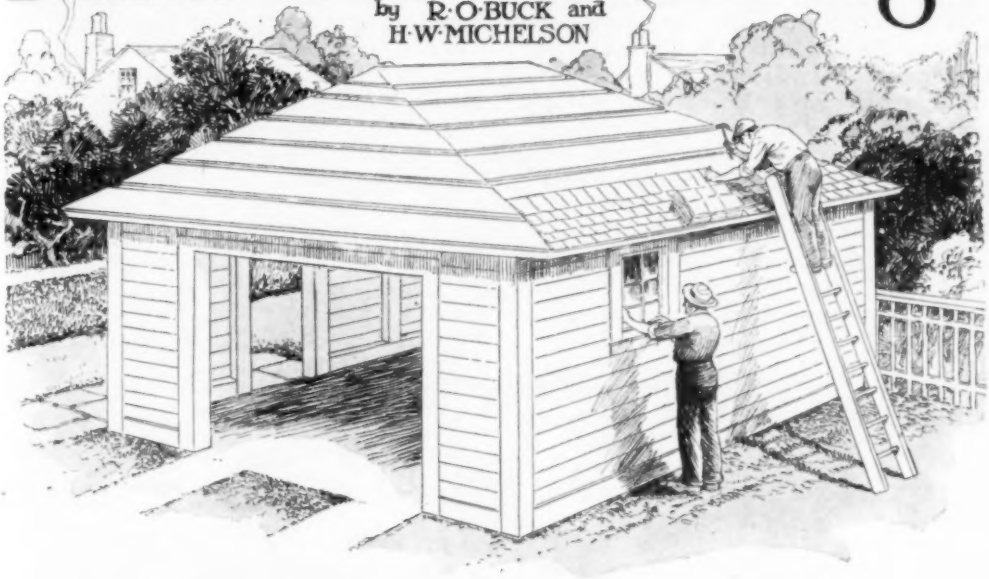


Circular Concrete Watering Trough for Hogs Cannot Be Overturned

¶When filling nail holes in yellow pine, use beeswax instead of putty, as it matches the color well.

Build Your Own Garage

by R·O·BUCK and H·W·MICHELSON



PART II

THE building is now ready for siding. This should be done before putting on the roof boards so that the top pieces of siding can be notched to fit around the rafters, with the top edge flush with the bottom surface of the roof boards. Do not fail to do this, as it is much more difficult to block the openings between the plate and the roof boards after the roof is on.

There are several types of siding on the market, the most popular of which are shown by Fig. 8. It is advisable to choose the type that will match your house best. Before putting the siding on, I covered the studs with a heavy building paper, placing one length of paper on at a time, starting from the bottom, and boarding over this until I reached the top of the paper, after which another was applied in the same manner. The paper makes the garage wind-proof and much warmer. The siding was sawed flush with the two-by-fours that formed the door and window openings. By following this method, only a few hours were required to inclose the entire garage.

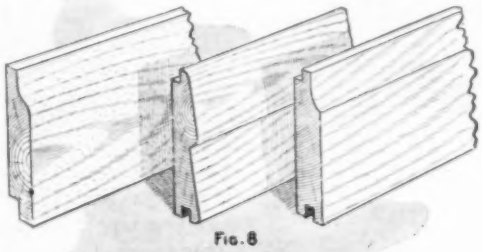


Fig. 8

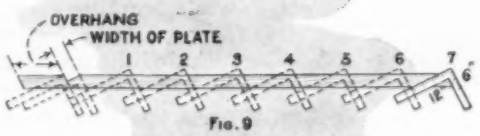


Fig. 9

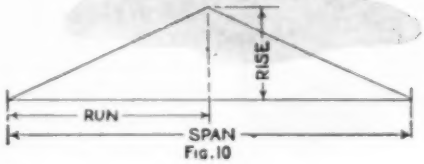


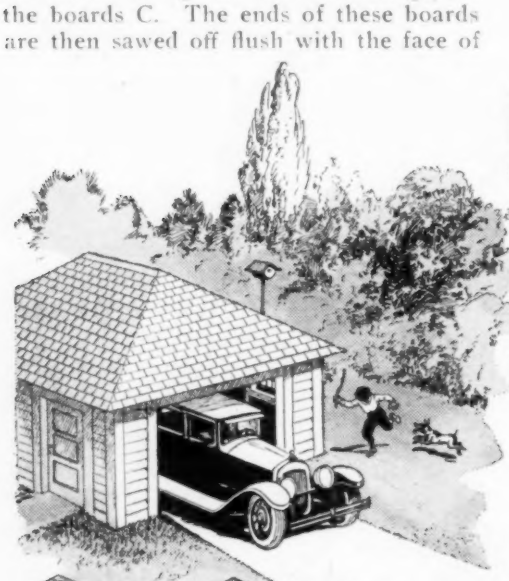
Fig. 10

Putting on the roof boards was now in order, and I found that this was going to be more of a problem than an ordinary gable roof would be, as all of the

corners over the hip rafters had to be mitered. This cut can be handled very well, however, if you follow the method I used. Starting from one side of the roof and at the bottom, lay the boards in the position shown by A, Fig. 12. After two or three boards have been nailed in place, saw the ends along the hip rafters even with the edge marked as indicated at B. This cut, of course, is at right angles to the face of the board, but follows the slant of the hip rafter. Continue the roofing all the way to the top in this manner and repeat the procedure on the opposite side. After both sides are covered and the ends sawed, a similar arrangement may be used for the ends by butting the boards D against the sawed edges of the boards C. The ends of these boards are then sawed off flush with the face of the boards that form the side covering.

Matched material of a fair grade is best for roofing, although builders use just ordinary No. 2 boards, with the edges butted. Joints between the ends of roofing boards should come over a rafter, as otherwise there is danger of the board warping, tearing off the tongue, and making a hole in the roofing. The roofing boards should be started about 1½ in. beyond the ends of the rafters so that water will be carried beyond the facing strips which are to cover the rafter ends.

On my garage I used individual asphalt shingles of the same color as those on the house. I laid them 4 in. to the weather for the same reason, although I believe the general practice is to lay them with



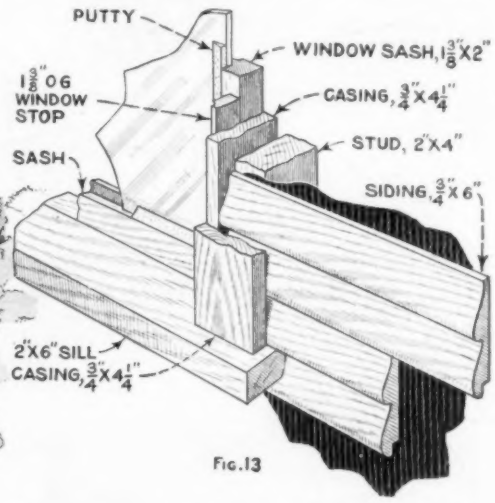


Fig. 13

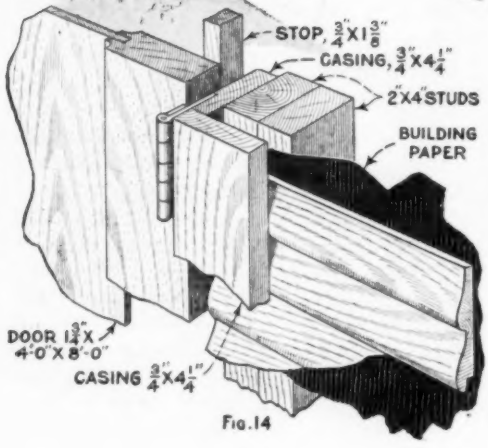


Fig. 14

5 in. exposed. Roll roofing is cheaper but not so good looking or serviceable, yet very satisfactory. Roofing of either kind is always laid from the bottom up, so that the lap is on top. The roof on the garage is flat enough for you to stand on while working, but unnecessary walking on asphalt roofing should be avoided, as much of the gravel or slate is loosened or rubbed off, resulting in unsightly black spots on the roof.

Putting on the trim, hanging the doors and windows, etc., is the pleasantest part of the job, or so it seemed to me at least. You are beginning to see the results, the structure looks like a garage and you can visualize it with a tidy workbench, shelves and cases in position, as well as a snug

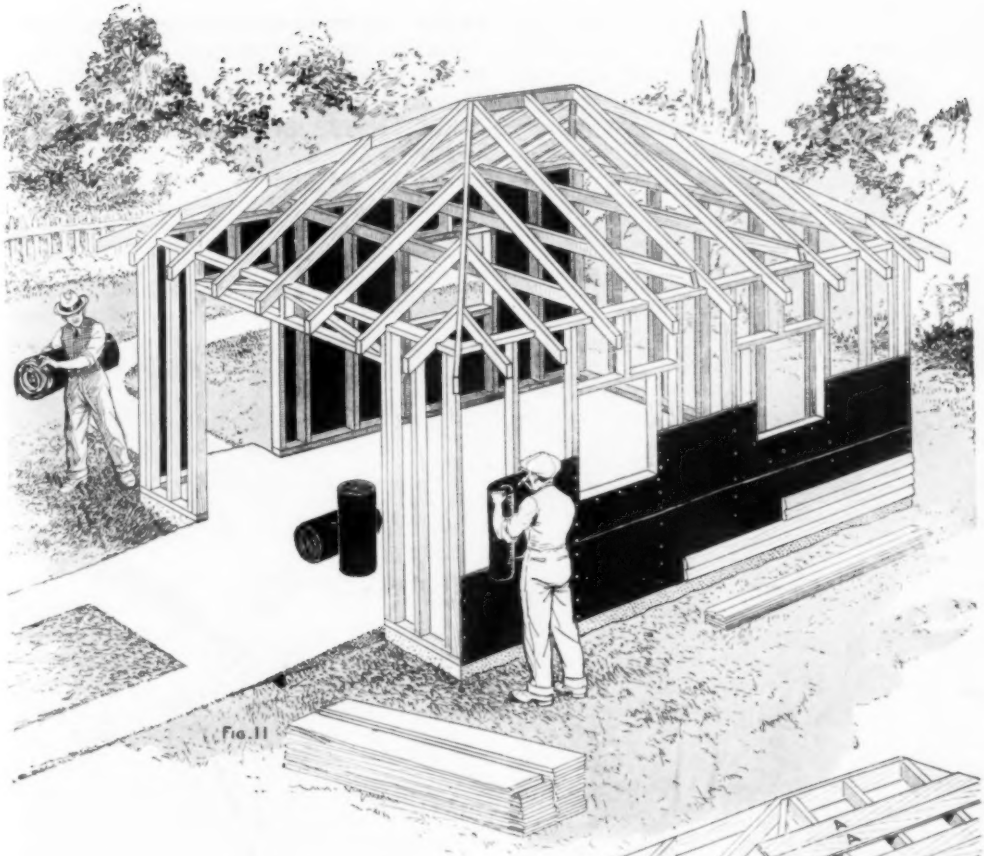


Fig. 11

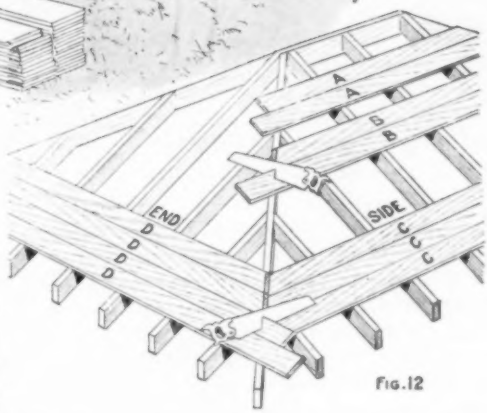


Fig. 12

berth for the "little old boat." Perhaps I felt a bit glad, too, that the rough part was finished for I would rather work with the white pine in the doors and windows.

The series of detail drawings, Figs. 13 to 17, show you just how to put on the trim for the corners, cornice, windows and doors. They detail the garage exactly as I built it, with the exception that no window is shown in the back wall. I put a window in the end toward the alley, but found it of so little use that I have omitted it in the drawings. You will use your own judgment about this.

Fig. 13 is a section through a window, showing the sash, frame, casing and sill. The sizes and spacing of all these pieces are given in the sketch. The frames I made myself, buying only the sash ready-made and glazed. A 2 by 6-in. plank, planed as shown, makes a good sill, and as no machining was necessary, I used ordinary dimensioned lumber to make the rest of the frame. Ogee (OG) stops can be obtained at any millyard for a small sum.

The large doors were purchased from a mill company as I did not think that I could build doors that would be nice-looking enough for the front of the garage. However, if your garage faces the alley, it would be entirely possible for you to build the large doors with ¾-in. matched and beaded ceiling material, which would be satisfactory. Fig. 14 shows how to case the doorway, place the stops, etc.

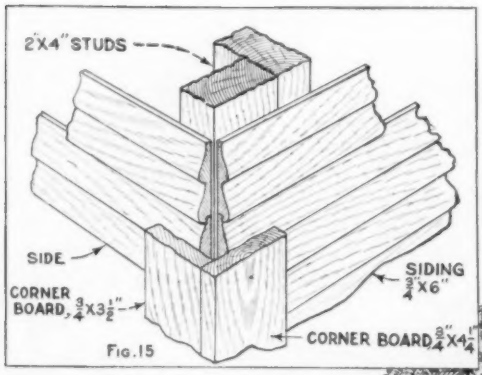


Fig. 15

as this will result in a tighter corner joint.

Fig. 16 shows a section of the service door. I used an ordinary five-panel pine door and rabbeted frame, which I purchased at the mill complete. This door

Fig. 16

The doors may be hinged or run on one of the various types of tracks on the market. I used a three-section door on a track for my garage and find it very satisfactory. This type has one of the doors hinged to one side of the opening and the other two hinged to the opposite side, and folding against each other. The purpose of the track, which is on the outside, is to carry the weight of the center door. The "roll-around" type of door is also very convenient, as the three doors roll against the inside of one of the side walls. In some cases, however, this is an objection, as it makes that part of the wall space useless for any other purpose.

Fig. 15 shows the method of placing the corner boards and is self-explanatory. It is customary to nail the boards together in a trough-shape before putting them up, swings in. A lock is advisable. Around the rafter ends, I placed a facing strip, 4½ in. wide, as shown in Fig. 17. The lower side of the rafters I also cased in with ⅝-in. matched and beaded material.

My purpose in using so wide a facing strip was to give the effect of lowness, as my house is a bungalow. However, in the case of a two-story house, it may be advisable to secure the opposite effect, that is, one of height, by making the facing strip narrower. If the overhanging ends of the rafters are ripped along a line level with the top of the plate notch, you can use a narrow strip in the same manner. Many garage builders omit the cornice and facing strip entirely and leave the rafter ends exposed. I do not believe this makes as nice-looking a garage.

Not content with a facing strip, I placed

a box-type gutter completely around the garage, with downspouts at the ends toward the alley. This finishing touch completed the garage with the exception of painting, but it nearly finished me as well. I had so much trouble hanging and soldering the eaves trough that I am sure I would not attempt to put one up again, and unless you are experienced in that kind of work and have a tinner's equipment, I advise you against it. For this reason I have omitted it from the drawings, though it is shown in the photo.

Three coats of good-quality paint are required. The color scheme, of course, should be in harmony with your house so I will say nothing further about this.

Electric lights are a great convenience in a garage and may be installed at very small cost. The supply line can either be brought in from the house by means of overhead wires or, preferably, by laying a two-wire lead-covered cable, which is inexpensive and can be purchased from most electrical dealers. The inside wiring I did with armored cable (BX) and the usual iron outlet boxes. The circuit (see Fig. 3, page 167, of the July issue) provides for a trouble lamp, a light at the front of the car and also one over the workbench. All are controlled by a single switch close to the service door. I find this very convenient and I believe it conforms with most city regulations.

If you submit the accompanying drawings to your dealer, you can obtain an estimate of the cost of material to construct this garage. Add to this an equal amount for your labor, and you will have the approximate cost of having this garage built by a contractor. My total cost for material, exclusive of the cement drive and approach, was $185, but this amount will vary greatly in different localities and according to the material used.

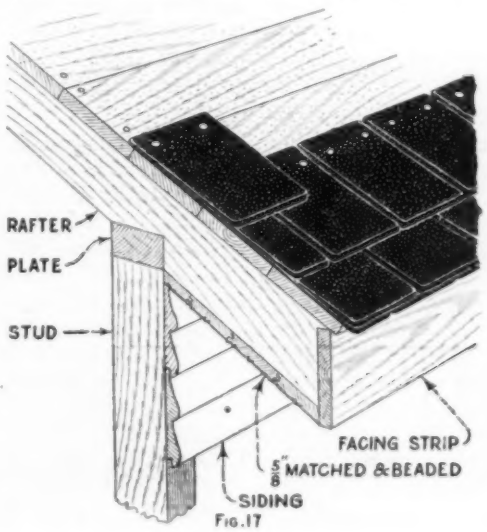


FIG. 17

I have endeavored to make the directions and drawings of the garage so simple and complete that you should have no difficulty in successfully constructing a well-built and serviceable garage; and if you find the pride and pleasure in it that I did, you will feel well repaid.

Copperplating Small Tools

Copperplating small hand tools is frequently desirable, as it provides an easy method of marking the tools for identification of ownership. Besides, in many shops where soldering is done and where soldering acids are kept on hand, steel tools tarnish and rust very badly. A light deposit of copper will prevent this. The apparatus and material required for this work are: a storage battery, fully charged, a handful of copper sulphate (blue vitriol); a vessel of suitable shape and dimensions for containing the article to be plated and a small piece of copper or some scrap copper wire Dissolve the copper sulphate in water. The strength of the solution is not important for this kind of plating and a small handful of the crystals will be enough for about 1 qt. of water. To the wire connected to the positive terminal of the battery fasten the piece of copper or a short length of scrap copper wire twisted into a compact wad. The article to be plated is connected to the negative terminal of the battery. Both the copper piece and the article are supported over the container so that they are completely immersed in the solution, keeping them separated from each other. The length of time required for the plating operation varies according to the thickness of the plating desired. A few moments is sufficient for a thin protective coating. To obtain uniform thickness, the article must be clean and bright.

Locking Clamp for Pump Pipe

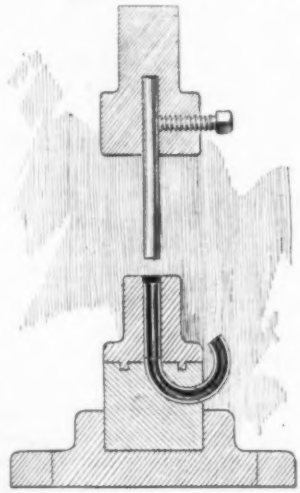
Anyone who has attempted to raise a water pump with a length of pipe attached to it knows that it is a hard task. When the pipe is raised halfway, the whole is top-heavy and almost unmanageable. Hence it frequently happens that it is dropped back into the well. The drawing shows a simple brace that catches the pipe at each lift, steadying it and preventing it from dropping back. It is simply a strip of flat iron, about 1½ ft. long. It is bent, and screwed to the well cover as indicated, the free end being rounded off to fit the pipe. After a lift has been taken, the clamp will automatically bind against the pipe and hold it until you have moved your hands for another lift.—C. M. Wilcox, Torrington, Conn.

Convenient Location for Auto Tool Box

Having other use for the running boards of its business cars, one concern disposed of the tool boxes in a novel place, namely, between the frame members where they extend in front. The customary running-board tool box, as a rule, will fit this space. It is located behind the bumper where it will not be easily damaged, and is, at the same time, readily accessible. The box is attached, at each end, by means of two bolts and wingnuts, the latter being inside of the box. The use of wingnuts is preferable to regular nuts as it may be necessary sometimes to remove the tool box in order to crank the car. As the box must be unlocked to remove the wingnuts, safety against theft is insured. This location for the box is especially convenient for tourists, as the running boards are loaded with other things, and the tool box forms a shelf in front on which a roll of baggage, the tent, or the like, may be packed.

Forming Small Brass Tubes

On one of the new radio devices several ¼-in. brass tubes, 1¾ in. long and bent to a quarter circle, are used. As these must be produced quickly and at as low a cost as possible, the method shown in the illustration was employed with satisfactory results. The forming device consists of a punch, or forcing tool, for driving the tubes through the forming-die hole. The upper part of the die is fitted to the lower part by tongues and grooves and the necessary dowel pins. The lower part is made in two pieces, each grooved to receive one-half of the tube. It is easy to mount the two blocks on a lathe faceplate, and cut the grooves with a round-end tool. The two parts are then fitted together. By this method the tubes are bent without the slightest kinking and as fast as an operator can feed the cut pieces to the punch press. While a power press is used for this job, a hand-operated arbor press will do if the output needed is not large. The same method can be used for heavy-walled brass tubing up to ½ in. in diameter, and larger, if the bend is not too sharp, but thin-walled tubing, larger than ⅜ in., is likely to buckle.—A. E. Granville, Cleveland, Ohio.



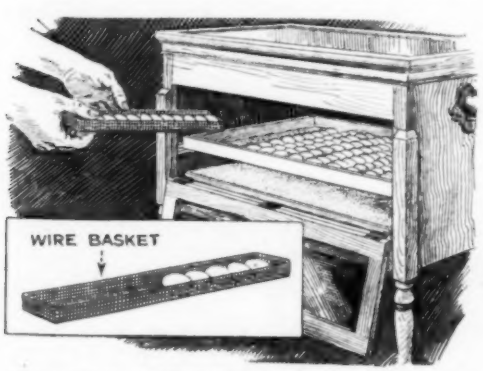
¶Several turns of tape around the middle of a pulley face will prevent a belt from working away from the center.

Maintenance of Concrete Silos

In the spring it is time to think of your silo, which, possibly, is in need of repairs. Silage juices, if not cleaned off cement walls, will continue their destructive action on the cement. Small pinholes enlarge rapidly during the hot summer days and in a short time the walls begin to crack and the silo will leak. To clean cement walls, use large-size wire brushes and hot water. It is advisable to dissolve about 1 lb. of coarse salt to each pail of water, which should be very hot. This application will kill the destructive germs of the silage juices. After drying, it is a good idea to cement-wash the walls as smooth as possible.—G. J. Issakoff, Sioux City, Iowa.

Wire Basket Helps Turn Eggs in Incubator Tray

Turning the eggs in an incubator is a rather slow and tedious task. Many poultrymen simplify and hasten the work by placing the egg tray on a convenient table and removing a row of eggs at one end so that the rest can be rolled in a mass toward that side. The turning is thus effected in a natural way and the eggs, which were removed, are replaced in the vacant end. While this method has its advantages, the removal of one row of eggs is slow and is accompanied by some danger of breakage. This can be eliminated by the use of a screen-wire basket, as shown in the illustration, one being provided for each tray. The basket is just large enough to accommodate a whole row of eggs.—G. E. Hendrickson, Argyle, Wis.



Wire Basket Holding One Row of Eggs Facilitates Egg-Turning Task in Incubators

Convenient Scaffold Which Is Portable and Adjustable to Various Heights

Adjustable Scaffold for Painters

The adjustable scaffold shown in the drawing will be found useful by painters. It consists of two right-angle brackets made of 2 by 4-in. material, two pairs of diagonal braces being nailed to each bracket to make it rigid and to permit the insertion of a 2 by 6-in. supporting plank, which in turn is prevented from slipping by means of stakes driven into the ground, as indicated. After the brackets have been set up against the side of the house, planks can be laid over them. Two or three pairs of supporting planks should be provided so that the scaffold can be set at various heights.—John Tobiason, Willis, Kans.

India Ink in Fountain Pen

India ink, used in fountain pens, dries out quickly and obstructs the flow through the feed line. This trouble can readily be remedied by plugging the small air holes in the cap. Moisten a bit of cotton batting with glycerine and push the wad into the end of the cap. After the pen has been filled with india ink, be sure to replace the cap as soon as you have finished writing, and every time you use it, or the precaution will be of no avail.—J. E. Noble, Hollyburn, Can.

Homemade Machine for Making Rope

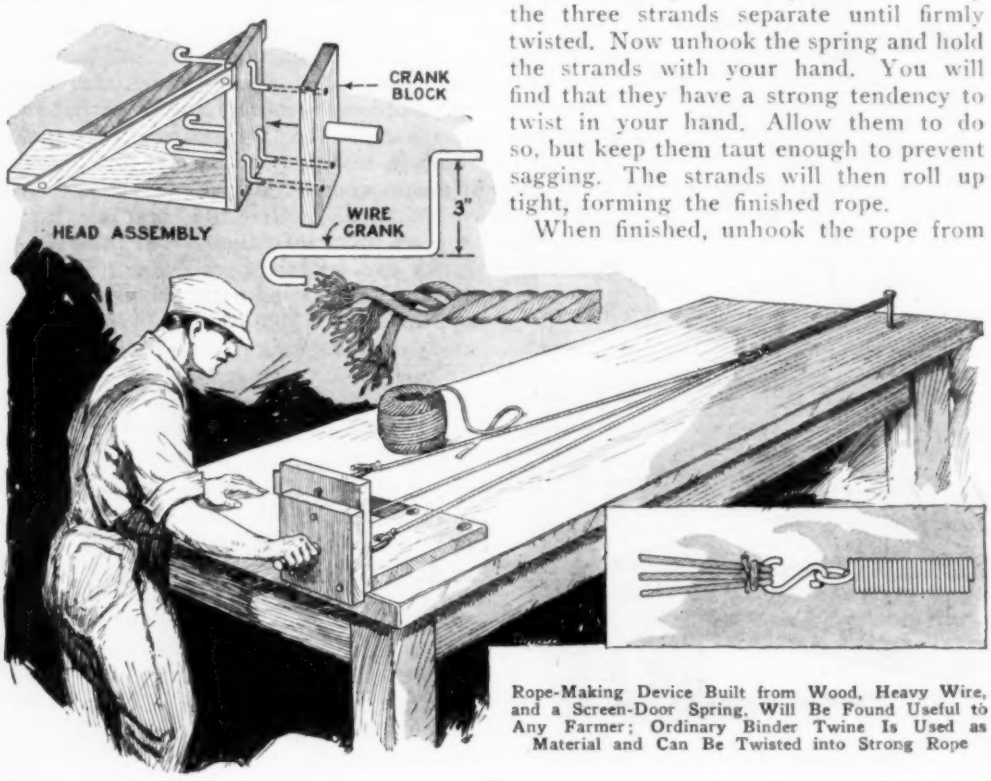
By HAROLD JACKSON

HERE is a simple machine with which you can make rope for halter ties, straw slings, etc., from ordinary binder twine. It is made from a few pieces of 6-in. wood, some wire, about 3/16 in. in diameter, and a screen-door spring. The drawing shows the construction of the parts and the assembly.

The head of the machine is made from two pieces of 6-in. wood, nailed together to form a right angle, and braced as indicated. Three ¼-in. holes are drilled in the vertical piece about 4 in. apart and in the form of a triangle. Three cranks, made of the wire and shaped as shown, are placed in the three holes. The cranks should be about 3 in. long and all exactly alike in this respect. Make the crank block next. This is another piece of wood, 6-in. square, which is fitted with a wooden handle. Three holes are drilled in it to coincide with those in the head and fit over the horizontal crank ends. When this block is moved by means of the handle, the cranks will all turn with it. The head assembly is nailed to a bench about 12 ft. long, or to the floor or hay-rack, if a bench is not available.

The door spring is held by a nail driven into the bench some distance from the head. If you wish to make a halter rope that is to be 7 ft. long, fasten the spring so that there will be 8½ ft. between the head and the near end of the spring. The twisting of the strands shortens the finished length of the rope considerably. It takes 36 strands of twine, 12 on each crank hook, to make a ⅝-in. rope. This is a good size for halters. All the strands are then attached to the hook at the end of the spring. Draw the strands tight so they will not sag, and the winding will then be easy. Now turn the crank slowly. This will twist the strands separately. Twist them very tight, for the tighter they are, the stronger the rope will be. Keep the three strands separate until firmly twisted. Now unhook the spring and hold the strands with your hand. You will find that they have a strong tendency to twist in your hand. Allow them to do so, but keep them taut enough to prevent sagging. The strands will then roll up tight, forming the finished rope.

When finished, unhook the rope from



Rope-Making Device Built from Wood, Heavy Wire, and a Screen-Door Spring, Will Be Found Useful to Any Farmer; Ordinary Binder Twine Is Used as Material and Can Be Twisted into Strong Rope

the head of the machine and it will be ready for use. If you are going to use the rope on a halter or want to put a ring or snap on one end, you can best do so by making a noose on the end. This may be done by running one end of the rope through the loops of the twine that were placed over the hooks on the machine. This forms a neat connection. A hog ring should be pinched onto the other end to prevent unraveling.

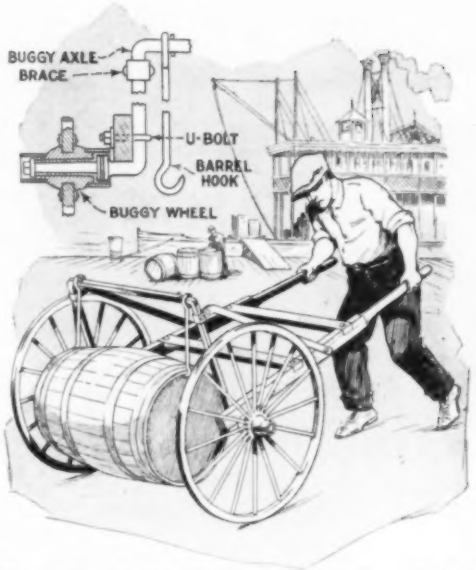
Cementing Gear-Shift-Lever Ball

After having several beautiful onyx gear-shift-lever balls stolen, the writer hit upon the idea of cementing one on to prevent its theft. Get about 6 oz. of fresh litharge, making sure that it is reasonably fresh, as it becomes "slacked" when exposed to the air and will not set. To a teaspoonful of litharge add glycerine until the mixture reaches the consistency of a very thick cream, and apply this to the threads both on the lever and in the ball. Then screw the ball down as tightly as possible. After a day or so, it will be impossible to remove the ball by hand.—G. T. Fowler, Bakersfield, Calif.

Dividers with Bent Points for Marking Centers

Ordinary straight-pointed dividers are often unsuitable for laying off hole centers when there is an obstruction such as a boss, shoulder or other raised part between the two points. To mark off center-to-center positions under such conditions, make a pair of dividers with bent points, as shown. With these you can get around most obstructions that would interfere with the ordinary tool. These dividers are made of flat metal with a caliper joint and are used as indicated.

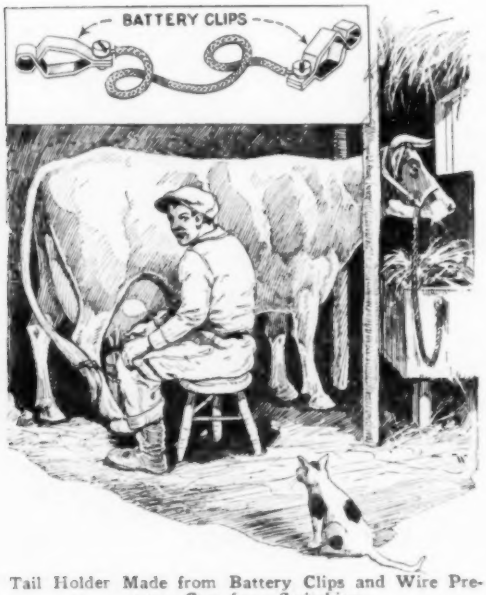
Laying Off Measurements over Obstructions with Bent-Pointed Dividers



Heavy Barrels Can Be Moved About Single-Handed by Means of This Truck

Truck for Carrying Heavy Barrels

The manager of a large oil station made a barrel-carrying truck that will prove of interest to garage and gas-station attendants generally, and also to orchardists, farmers and gardeners, as it allows one man to lift and convey a filled barrel. The truck consists of a U-shaped axle made by welding sections of two buggy axles together, and suspension hooks that engage the chines of the barrel. When the handles are pushed down to the position most convenient for moving the truck, the barrel will be raised 4 or 5 in. above the ground. Narrower trucks of similar construction can be used by ice-cream manufacturers, by making the suspension hooks shorter so that they will engage with the handles of the ice-cream tubs and hold them upright. —G. E. Hendrickson, Argyle, Wis.



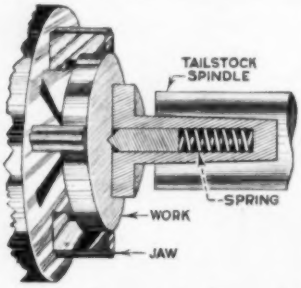
Tail Holder Made from Battery Clips and Wire Prevents Cow from Switching

Preventing the Cow from Switching

When being milked in the summer months, cows are often annoyed by flies and switch their tails to the discomfort of the milker. To avoid this trouble one dairyman provides his milkers with the tail holders shown. Each is made from a pair of battery clips, to which a length of wire is attached. In use, one clip is attached to the knee portion of the milker's trousers, and, as he seats himself to do the milking, the other clip is attached to the brush of the cow's tail.—G. E. Hendrickson, Argyle, Wis.

Spring Center for the Lathe

Many jobs that are held in the lathe chuck are first laid out in order to determine the exact location of the part to be turned, bored or drilled. The spring center shown has been found of great help in locating the central point of the layout before closing the chuck jaws upon the work. The device is first entered into the center mark of the layout, while the work is held firmly up against the flanged face of the center holder. It is then approximately in the correct position to be held in the chuck, after which the center is moved out of the way. If a more accurate setting is desired, it can be accomplished by using an indicator.—Chas. Homewood, Hollywood, Calif.



Jug Makes Good Bee Trap

Swarming wild bees often settle in very inconvenient places about the farm buildings, such as between partitions, under floors and other out-of-the way corners, where they can hardly be caught by ordinary methods. On a Wisconsin farm, a swarm collected between the lining and outside boxing of the barn, annoying both the farm folks and the live stock. At length, on the advice of a neighbor, the farmer suspended an open jug just beneath the opening in the building where the bees had entered, doing this work after nightfall. A piece of cardboard, rolled up to form a tube, was inserted several inches into the mouth of the jug. By the following evening practically the entire swarm was trapped. The secret of the trick, it is claimed, lies in the fact that in the slightest breeze, a low hum, very similar to that made by industrious bees at work inside of the hive, is produced in the open jug. The wild bees enter the jug to pilfer but cannot easily find their way out again.—D. R. Van Horn, Lincoln, Nebr.

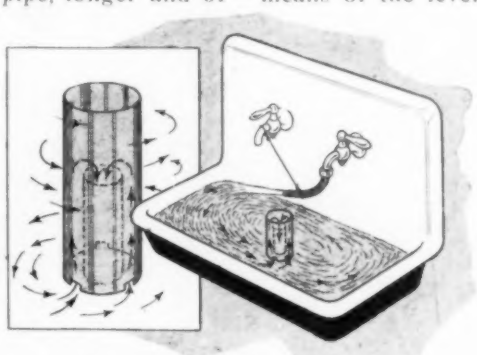
Steam-Boiling Liquids in Vats

In one workshop there are a number of large vats full of liquid, which must be kept boiling for several hours every day. The method formerly used to do this was to turn steam into each vat. As an experiment, the vats were fitted with light metal covers and just enough steam turned on

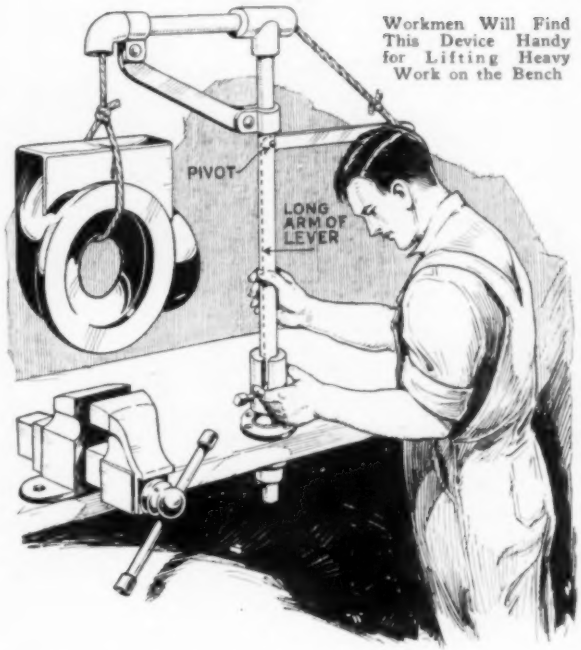
to keep the liquids boiling slowly. The result was satisfactory as it effected a saving of more than 20 per cent in steam. There are many factories where live steam is still used to boil liquids in uncovered vats. Even when exhaust steam is used in closed coils, much of the steam can be saved and used in some other way if all the vats are provided with covers, especially if the vats are located in unheated rooms during the cold season.—James E. Noble, West Vancouver, Can.

Washing Photographic Prints in the Kitchen Sink

To be efficient a photo-print washer should have two features: The water should be kept in motion and the drain should be located at the bottom so that it will carry off the hypo, which is heavier than water and hence settles at the bottom. Both of these conditions are met in an ordinary kitchen sink if arranged as shown in the illustration. All that is necessary to use is a length of hose and two short pieces of pipe. The hose is attached to the faucet and held toward one side, as indicated, by means of a cord tied to the other faucet. This makes the water rotate freely in the sink. Remove the strainer from the drain and insert one of the pieces of pipe, which should fit into the drain snugly and rise 2 or 3 in. above the bottom of the sink, depending on the depth of water maintained during the washing. The other pipe, longer and of larger diameter, is notched in the bottom edge to permit the passage of water and placed over the first, as indicated. The water at the bottom, which contains the hypo, is forced out by the pressure and the swirling motion of the whole body of water.—J. G. Pratt, Washington, D. C.



Kitchen Sink Makes a Good Print Washer for the Home Photographer Who Does His Own Work



Workmen Will Find This Device Handy for Lifting Heavy Work on the Bench

Device for Lifting Heavy Work on Bench

Often it is a rather difficult task to place a heavy piece of work in a vise single-handed, especially if the work is of awkward form. To facilitate the job, a special lifting tackle will be found useful. That shown herewith was made up of pipe and fittings, a lever of flat stock, a length of wire rope and a lock collar. The method of assembly is clearly shown, and it is used in the following way: The work is first placed on the bench, or on a truck of the same height, and the rope and hook are attached. It is then lifted by means of the lever and swung over the vise. If necessary, the lever can be locked in this position by the slotted collar as indicated. After the vise jaws are opened, the work can be let down with one hand on the lever, while, with the other, the vise is tightened. When through, the device is stowed away.

Is This Your Home?

Plan No. 5E4

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.

IF the five-room bungalow is more extensively represented among the small homes of this country than any other type, evidently there must be something supplied by the house of this type to give it such wide popularity. The principal reason for this no doubt is its economy in respect to building costs.

In this design every acknowledgement has been made to the absolute requirements of economy, and yet the house has good character from the exterior through the proper massing of walls, openings and roof. This little house has the virtue of simplicity and yet, when it is finished and set among pleasant surroundings with flowers in the window boxes and with vines upon the trellises, its attractiveness will be apparent to all.

The plan is designed expertly so as to make the most of what five rooms can bring. The living room, dining room and kitchen are arranged in order, one behind the other, with dining alcove at the rear. There is not an inch of space wasted anywhere. Each room is well ventilated, has fine large windows with space for furniture. Convenience and economy have gone hand in hand.

The attic provides not only possibilities for extension in the way of an extra bedroom, but there is plenty of space for storage, that may remain unfinished for the time being. Later on, as the family grows, a bedroom may be arranged in the attic as illustrated in the plan.

The construction is of frame with exterior finish of wide siding. Shingles or stucco could be used. A lot of approximately thirty-five feet in width would be required. This house has been designed to face south or east. If views, prevailing winds, or other conditions make it more desirable, it may be built reversed.