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25 Cent

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 410426

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O. H. Justus owns a big agency and repair shop at Parkersburg, W. Va. He says "that my schools give motor secrets that will put any man 'on easy street.'"

In the Auto and Tractor Business

Read what these men are doing—here is your big chance to get "on easy street." Come to these great shops on the biggest **FREE** offer ever made.

Big Firms Need Trained Men

The Auto and Tractor Business is on the boom. Thousands of trained men will be needed during the next few months. I get calls every day from Garages, Battery Stations, Auto Repair, Welding Shops and other successful concerns for Rahe men. When the big fellows need high grade men they know where to come for them. They want Rahe trained men.

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Scientific tool training—that's the secret. You do things here according to the latest engineering standards. Thousands of dollars have been spent in modern tools and equipment. That's why my men are at home in the biggest shops in the country. If you want to succeed the way Beimer and Justus and the rest have—qualify by the same method in only eight weeks or stay as long as you like.



Emanuel Rushfeldt, Alberta, says: "Earning \$10 a day and only 20 years old."

I'll Pay Your Railroad Fare and Board You

In order to fill the openings that now exist, I am making an offer no one has ever made before—**Free Railroad Fare, Free Board for eight weeks.**

SAVE
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My big illustrated training book tells how others are succeeding. It tells many things you ought to know about Autos and Tractors. Write for it and my **short time** offer NOW. It soon expires.

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W. W. Peace gets \$250 a month and expenses operating a tractor in the oil fields.



Louis Beimer at 24 was made foreman over men many years older. That's not luck—it's *Rahe* training.



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Without any obligation, send me your big free book, "The Evolution of Transportation." Also information regarding special temporary offer.

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THE NEW WAY TO COOK AND BAKE

(ordinary kerosene, the cheapest fuel there is) turning them into an actual gas that burns with an intensely hot, clean flame. No wicks, no smoke, no odor.

Fits All Stoves

Sixteen models fit any kind of cook stove or range. No holes to drill, no bolts to fasten, no changes to make. Simply sets in firebox in one minute. Absolutely safe. It lasts a lifetime. Every day hundreds of letters pour in from grateful women telling how the Oliver has relieved them from the drudgery and heat of Summer kitchens.

150,000 Women Use Oliver's

Mother M. Burchmans, of Mo., writes: "The Oliver burner cooks and bakes beautifully. I wish you could see the beautiful brown, well-baked bread, cakes and pies." Mrs. C. H. Schmidt, of St. Louis says: "My bread and cakes are like pictures." S. Summerrow, of Texas, says: "I am kissing coal and wood goodbye. Don't know how to thank you for the wonderful Oliver." F. H. Horton, North Dakota, writes: "Oliver is what I call a blessing. You couldn't buy it back for any price."



Have a cool kitchen this Summer—don't light the Oliver until you need it. Turn off the heat the minute you are through.



Does away with dirty coal and wood. No ashes, no smoke, no disease breeding scuttles—no grimy hands—cheaper.



Use your own oven—the Oliver improves the baking of any stove.



No smelly and expensive oil stove to clutter up the kitchen—the Oliver fits right into your range. No wicks, no soot, no odor.



The average woman walks 12 miles a day doing her ordinary housework. Experts say the Oliver saves 85% of housework.

30 DAYS FREE TRIAL

But you do not have to be satisfied with reading about the Oliver. On Mr. Oliver's Free Trial Offer, you can test it for 30 days—you can use it in your own home. Mail the coupon at once for our attractive Free Booklet "New Kind of Heat," and Mr. Oliver's Special Low Introductory Price and 30 day Free Trial Offer to Popular Mechanics readers.

Already the Summer demand for Oliver's is keeping our great factories working night and day—but we can still guarantee delivery if you will hurry. There is no obligation—send no money—just fill in and mail the coupon now before you turn this page.

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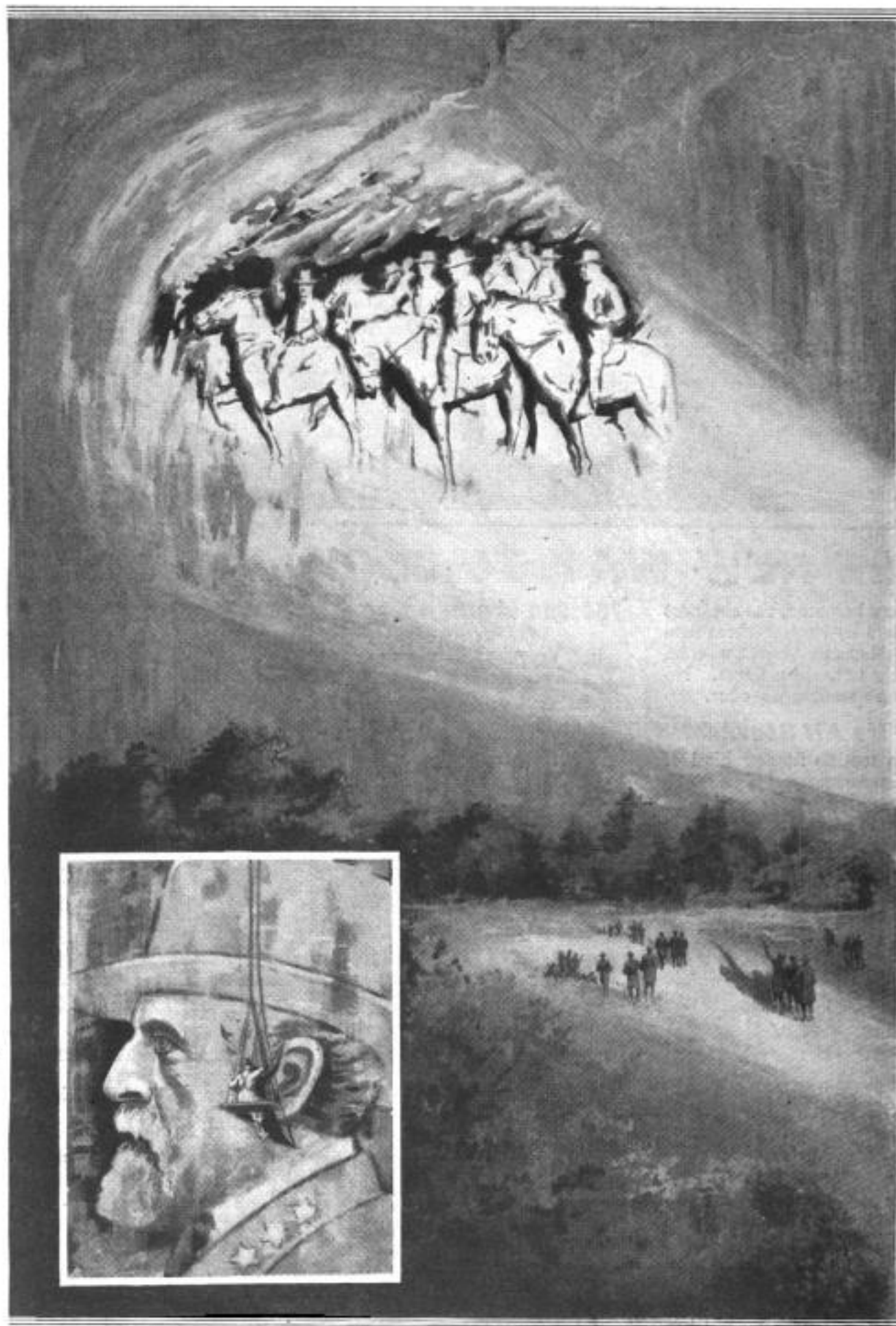
Send your Free Book, "New Kind of Heat," and also your special low price and 30 day Free Trial Offer. This does not obligate me in any way.

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DEANE FROM MAJESTAL
This Illustrates the Method to be Used in Projecting upon the Face of Stone Mountain the Designs of the face upon Which the Picture is Thrown, will Previously be Sensitized for Photographic Purposes, Finally Washed with Water. A Special Projection Lamp with a Powerful

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No. 4

Huge Photo on Mountainside Aids Sculptor

By R. C. FOLGER

USING the face of a mountain as a photographic surface on which to expose and develop pictures 200 feet in diameter, projected on the granite wall by a magic lantern located 600 feet away and 350 feet below, is the unusual procedure adopted for locating the design of the

Confederate memorial which is to be carved on Stone Mountain, near Atlanta, Georgia.

The extraordinary lamp employed for this work uses a slide only $\frac{5}{8}$ inch in size, but the enlargement is such that a pin scratch on the slide will measure 9



SUPPLIED BY GUYTON BORGESON

Heroic Memorial of the Confederacy That will Afterward be Carved in the Granite: That Portion of the Surround, after Exposure, will be Developed and Fixed by Pouring Chemicals from Above, and Then Light and Compound Lens System has been Constructed for This Work

inches wide on the mountain. The picture cast on the mountainside at night will appear as clear as one on the screen of a movie theater. As the beam of light will travel upward at an angle of a little over 50°, great distortion would appear in the projected picture. In order to overcome this, the models are photographed on the level, then the photographs are tilted at an angle opposite to the distortion and rephotographed. The result is that the picture from the distorted slide appears at the elevation on the side of the mountain as it should when viewed from directly in front. The lamp is bolted to a concrete floor and is adjustable to any angle. Experiments recently made with the apparatus have been very gratifying to the sculptor, Gutzon Borglum, who has made and will execute the designs.

In order to retain the projected picture for the daytime, the rock surface will be coated with a sensitizing solution, similar to that used in the wet-plate process of photography, and a time exposure of several hours made of the projected pic-

ture. This will be done by pouring barrels of chemicals from above. After the exposure has been made, the huge negative will be developed and fixed by pouring across its face barrels of other chemicals, and finally washed with water. The picture will then be traced in white to guide the blocking of the carvers.

The design, which will cover a surface about 700 feet long and about 200 feet high, is so large and the surface of the wall such, that the usual method of enlarging from small-scale models has not proved satisfactory. The head of the horse which General Lee rides, is 30 feet from ear tips to end of lips, the stirrup is 9 feet long, and a man standing on General Lee's shoulder, needs a 9-foot stepladder to carve the ear. The first section to be started is a group representing Lee, Jackson, Davis, and five other Confederate generals, all on horseback. The design of the great memorial is completed; engines and air compressors are now being set in place, and it is expected that carving on the head of General Lee will begin about June 1, this year.



BY COURTESY OF THE POST OFFICE DEPT.
Twin Mail Boxes, Experimentally Installed at Washington, of Which One is Reserved for Local Mail and the Other for Out-of-Town Matter

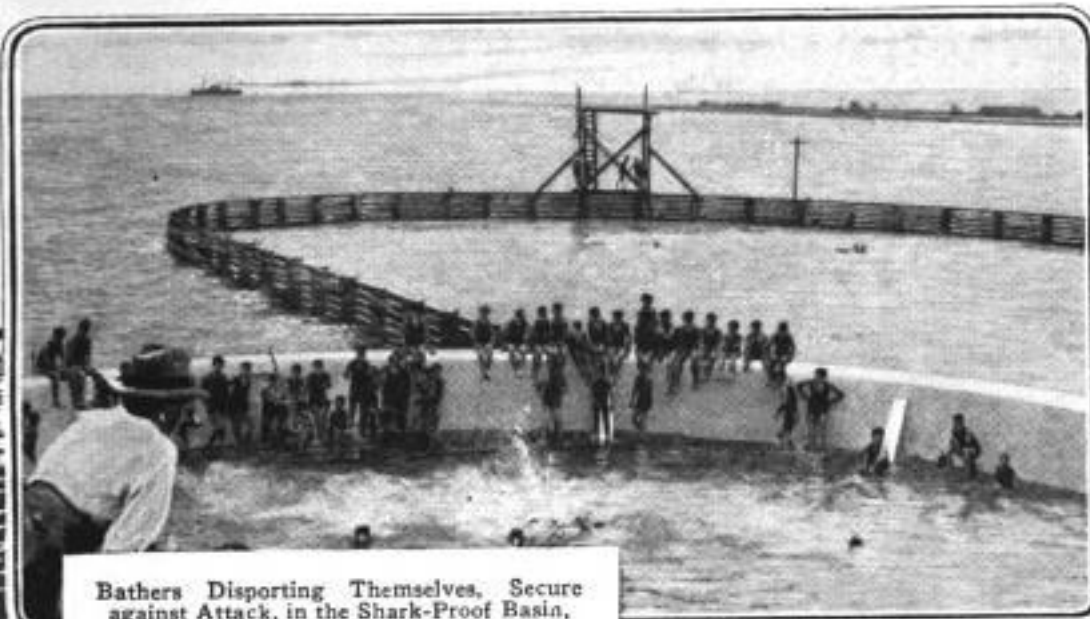
TWIN MAIL BOXES SORT MAIL AT SOURCE

Twin mail boxes will probably be introduced as a means of facilitating the primary separation of letters mailed in street boxes. Experimental equipment of this nature has recently been installed in some of the down-town business streets of Washington, D. C., with a view to testing the public's coöperation in the improved system. The Washington device consists of two ordinary mail boxes, mounted side by side on a single supporting standard. One box carries a printed card indicating that it is for local letters, while the other is marked for out-of-town matter. The purpose of the twin boxes is to simplify mail separation at the initial post office.

SHARK-PROOF BASINS AT AUSTRALIAN BEACHES

The prevalence of man-eating sharks in the bathing waters along Australia's coast has stirred various municipal bodies near the infested regions to take active measures against this danger. Googeo, in particular, one of the most popular beaches in New South Wales, has been the scene of a number of tragedies in which sharks made successful raids upon the bathers. To prevent a repetition of such disasters,

the town council at that point is now making a bold attempt to fence in the entire bay with steel nets, which will be carried on hawsers. What is believed to be the largest shark-proof inclosure in Australia has been built in the waters near Townsville, Queensland. It is 330 feet long by 165 feet wide, is amply braced with piles, and will accommodate 1,000 persons.



Bathers Disporting Themselves, Secure against Attack, in the Shark-Proof Basin, at Townsville, Queensland, Australia



A Shark-Proof Barrier at Googeo, New South Wales, Australia, Which is being Carried 50 Feet Out into the Water to Protect Bathers

COMPACT DEVICE SHARPENS SAFETY-RAZOR BLADES

The short, quick stroke with which a barber puts the edge on a straight razor is claimed as the advantage of a new

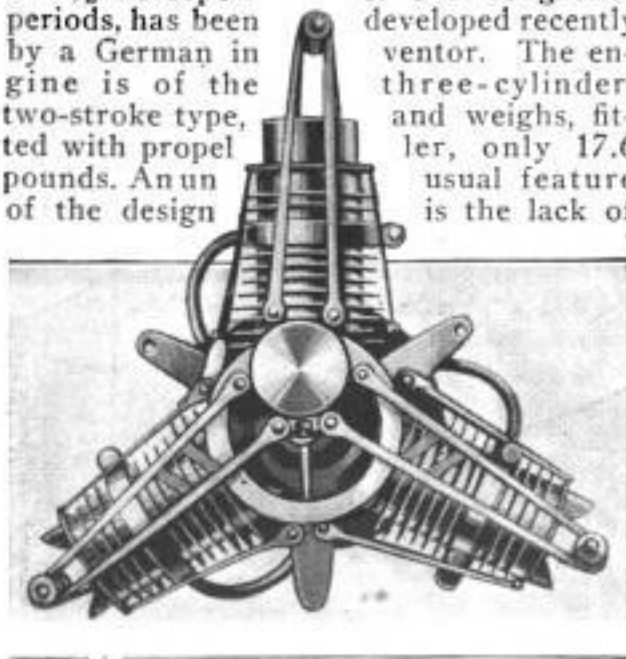


Above: Razor-Blade Sharpener, Ready for Use; a Reciprocating Motion of the Hand Sharpens the Blade. Below: The Carrier Handle Folded Flat

mechanical device for stropping safety blades. It is but 5 inches long. The blade is placed in a clamp and a handle moved back and forward while the blade is stropped, first on one side and then on the other, by a reversing mechanism.

LIGHT AIRPLANE ENGINE HAS NO CRANKCASE

A remarkably light rotary engine for airplane purposes, with a claimed output of $7\frac{1}{2}$ horsepower over long trial periods, has been developed recently by a German inventor. The engine is of the two-stroke type, fitted with propeller, only 17.6 pounds. An unusual feature of the design is the lack of

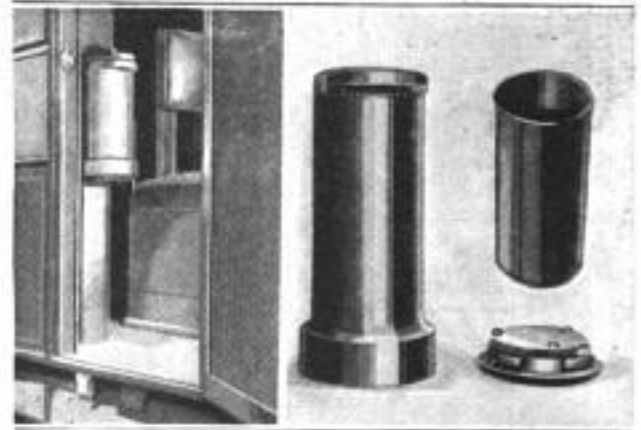


A $7\frac{1}{2}$ -Horsepower Engine That Weighs Only 17.6 Pounds: No Valves are Used, but Intake and Exhaust Ports are Provided Which are Opened and Closed by the Pistons

any crankcase, the cylinders being bolted to a cylindrical intake chamber with their closed ends inward. There being no valves, centrifugal force is relied upon to get the spent charge out of the cylinders, consequently fairly high speeds are necessary for regularity of operation. The bore of the cylinders is about 2 inches, the stroke about $2\frac{3}{4}$ inches, and the gasoline consumption about $\frac{1}{4}$ gallon per horsepower-hour.

VEHICLE SAFE DISCOURAGES HOLDUP MEN

The continued robbery and occasional injury of vehicle drivers who must make collections while selling wares from wagons or trucks, has prompted one inventor to devise an effective remedy against such holdups. A heavy steel shell is riveted to the vehicle frame, which is slotted at its upper end to receive the driver's deposits as fast as collected. The money so received falls into a light removable container, which can be withdrawn only at the office of the employer by operating



Safe, Which cannot be Picked, Installed on Vehicle; Right, Safe Disassembled

a heavy lock in the bottom of the shell. The lock and shell are strong enough to withstand the assaults of a sledge hammer.

NEW ALUMINUM ALLOY HAS UNUSUAL QUALITIES

A new aluminum-silicon alloy is reported to possess the strength and ductility of gunmetal. It does not contain a trace of copper or tin, and it is about 10 per cent lighter than aluminum alloys made with either or both of these metals. It is resistant to corrosion and high temperatures, can be made into extremely thin castings, and—what is of greater importance—single castings with considerable variations of thickness.

SELENIUM EYE OBSERVES STARS WHILE ASTRONOMER SLEEPS

By BERNARD G. PRIESTLEY



Lewis J. Boss, Inventor
of "Selenium Eye"

DEVELOPMENT of a "selenium eye," which, when properly connected with a telescope and recording device, permits the astronomer to register automatically the light variations of any heavenly body throughout the night while he sleeps comfortably in bed, has been completed by Lewis J. Boss, a youthful astronomer connected with Pine Hill Observatory at North Scituate, R. I.

The foundation unit of this eye is a selenium cell, which can be constructed at a very small cost, yet is many hundred times more sensitive to minute light changes than the human eye, according to the inventor. He has obtained remarkable results with a selenium cell made by winding two strands of small, bare copper wire around a flat mica plate, $1\frac{1}{4}$ inches long and $\frac{1}{2}$ inch wide—the wires separated, but the

distance between them never exceeding $\frac{1}{32}$ inch—and coating the mica and wires with selenium.

Selenium possesses the property of conducting electricity more or less readily as more or less light shines on its surface. This being so, by passing an electrical current through the cell and by using suitable apparatus to control and measure the amount of electricity the cell conducts under various changes in the intensity of the light shining upon it, the variability of the light can be determined. Such a method is carried out with the selenium eye.

The cell is mounted in a bakelite case, which is affixed to a brass tube. The tube slips into the eyepiece holder of a telescope. The cell, with a resistance of several thousand ohms, is connected in series

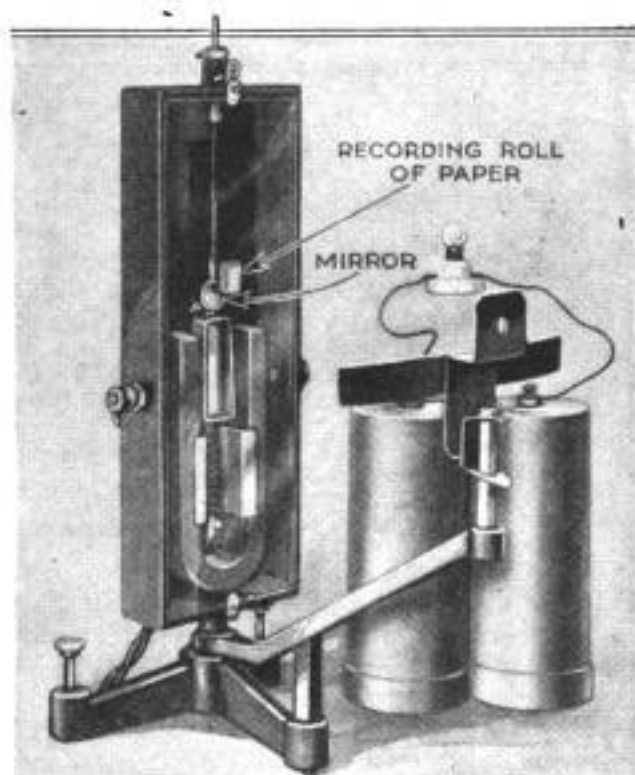
with a dry battery, a variable high resistor, and a sensitive galvanometer.

The variations in the intensity of the light shining through the telescope onto the selenium cell, allow a greater or less quantity of electricity to flow through the cell, and



consequently the galvanometer coil moves more or less.

The light from a tiny electric bulb shining on a small mirror attached to the moving coil of the galvanometer is re-



The Recording End of the Selenium Eye: The Oscillations of the Galvanometer are Reflected by the Mirror Which is Attached to It onto the Highly Sensitized Roll of Paper

flected onto a roll of paper highly sensitive to light, and thus the oscillations of the galvanometer are recorded on the roll of paper. This paper is constantly unwinding—like the roll in a stock ticker—being regulated by a clock device. In other words, the selenium eye observes and records light variations throughout the night of a heavenly body on which the telescope is trained. Since a star that is being observed itself apparently moves in the heavens on account of the rotation of the earth, it is necessary to have the telescope driven by a very accurate clock device that will keep the telescope constantly directed upon the star.

The selenium eye, or photometer, is the result of three years' experimental research in laboratory and observatory. Although already acclaimed by astronomers as a most valuable instrument, it is thought to be susceptible of further refinement.

Tests at Pine Hill Observatory have shown that the conductivity of the selenium cell is affected almost instantly by the variation of light acting upon it—that the time is at least less than .01 second.

Moreover, the cells are not subject to illusion as is the human eye at times, for they do not indicate that light is present when it is not. Nor, unlike the human eye, is the selenium cell affected by long exposure to strong light.

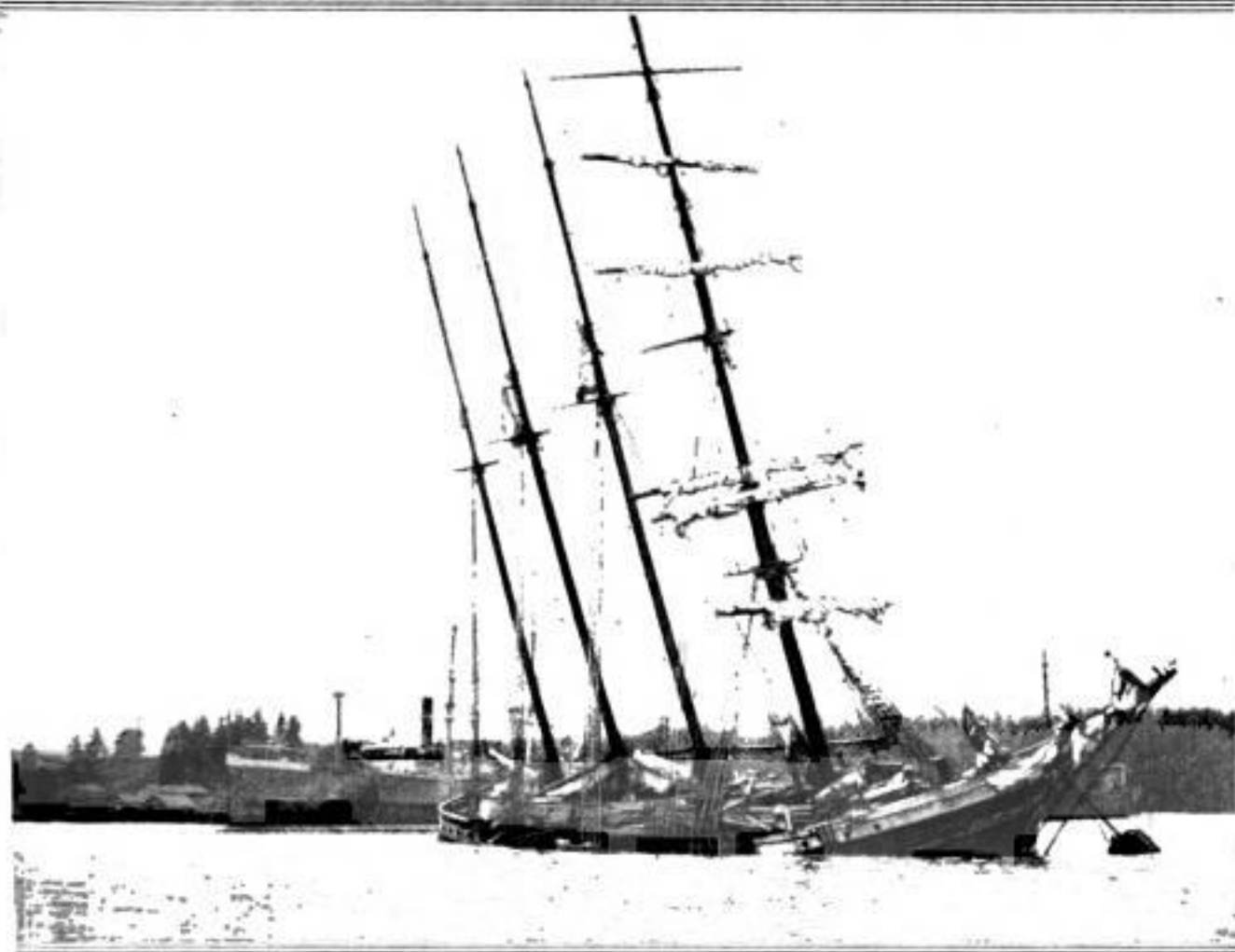
The selenium eye has been viewed by many members of the American Association of Variable Star Observers, before whom the inventor appeared at a recent convention at Harvard University, and explained its operation in detail. Members of the association expressed a belief that the apparatus will be of great value in settling the long-debated question as to whether the brilliancy of certain stars does vary, and to determine the periods of maximum and minimum brilliancy of stars which are known to vary.

FLASHLIGHT HANDLE ON TOOLS LIGHTS UP DARK WORK

Mechanics will find it easy to throw a beam of light on dark work with a new flashlight attachment for use with their tools. The light, when attached, is designed to act as a handle for the tool, and its case is made of heavy metal to withstand hard usage. The tools for which it is specially intended come in sets, consisting of a hammer, saw, pliers, socket wrench, and screwdriver, each of which takes the combination handle and light with ease.



The Flashlight Handle: It is Quickly Attached to Any of the Tools Shown, and Serves as Handle for the Screwdriver, or as One of the Grips for the Pliers



The "James Tuft," Swamped and Listing Badly, but Safely Buoyed in Seattle Harbor after a Desperate Battle against a 75-Mile Gale and a Perilous Towing from off Destruction Island

SHIPWRECKED CREW FIGHT SHIFTING CARGO

By LAWRENCE WM. PEDROSE

PRESENTING a graphic picture of shipwreck and bringing the story of a long-drawn-out triumphant battle with the elements on a wintry, storm-swept sea, the barkentine "James Tuft" reached Puget Sound some time ago, to be reconditioned before resuming its interrupted voyage from Fort Alberni, B. C., to Callao, Peru.

The "James Tuft" carried nearly 2,000,000 feet of lumber destined for South America, a large part of it as deck cargo. When it was 70 miles southwest of Cape Flattery, it suddenly ran into a gale, that soon blew at the rate of 75 miles an hour. Sail was



View of the Deck, Illustrating the Confusion Resulting from the Shifting of the Deck Cargo: One can Readily Imagine the Dangers and Difficulties of the Crew When the Seas Swept the Loose Lumber across the Deck or Overboard

shortened, and the ship headed for San Francisco, but before it had run 50 miles, the captain realized that to continue on invited disaster, so it was turned back and headed for Puget Sound.

At dawn land was sighted, the storm had permitted no observations, and the ship was believed to be in the vicinity of Tatoosh Light, at the entrance to Puget Sound. Too late to wear away from the coast, the officers recognized the land as Destruction Island, 50 miles south of Puget Sound, a veritable graveyard for ships. Both anchors were dropped. The water being shallow, the waves, breaking upon the reefs, swept the ship from stem to stern. Following a futile attempt to reach shore, the American flag was hoisted upside down on the slim chance that a passing vessel might see the distress signal. For more than 48 hours the storm continued. The living quarters filled with water, and captain and crew had to seek shelter on the deck. The lashings of the deck cargo gave way and the cargo shifted—most dreaded peril to lumber carriers. The crew dug a hole in the pile of lumber amidships, placed timbers to keep them above the wash of the deck, stretched canvas overhead, and awaited their fate. Fortunately a pot, some coffee, and meat and vegetables had been salvaged from the flooded galley. A fire was

built upon a wet timber and a meal prepared, which helped keep up their spirits.

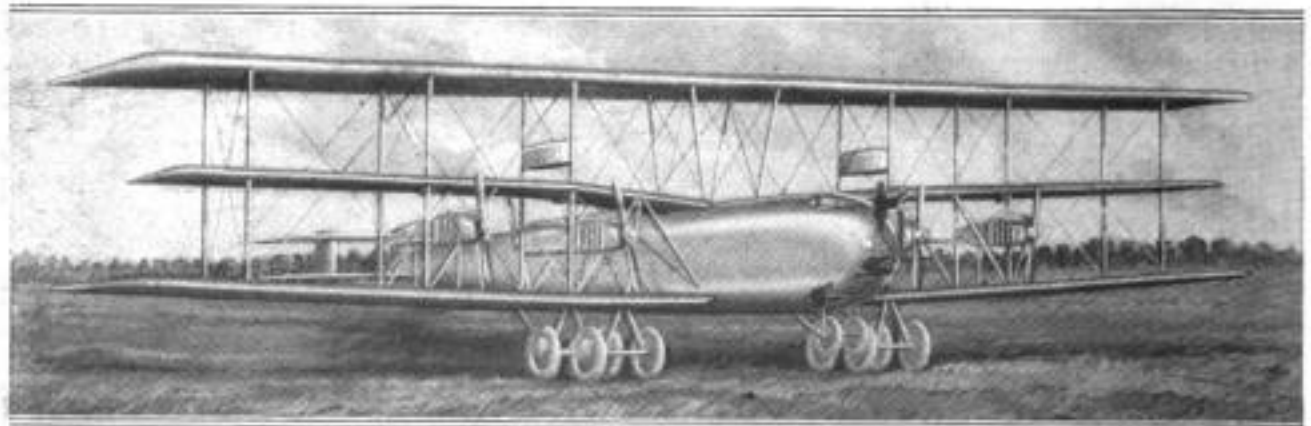
Meanwhile, the distressed ship had been seen and Port Angeles and the Neah Bay life-saving station on Puget Sound notified by phone. The coast-guard cutter "Haida" steamed from Port Angeles to the rescue, and the Neah Bay life-saving crew put out from their station. Forty-eight hours after the "James Tuft" sought safety in its anchors, the cutter and life-saving crew reached it. The "Haida" put a line aboard the barkentine, and its anchor chains were cut, but the "James Tuft" listed heavily and it appeared certain it would turn turtle. While the "Haida" held the ship bow-on to the sea, the life-saving boat dropped back to pick up the crew of the apparently foundering vessel. The captain of the barkentine ordered his men to leave while there was still opportunity to save themselves, but true to traditions of the sea, himself elected to stay with his ship. Two of the crew refused to leave him.

The "Haida," equipped with only gas engines, clung valiantly to its huge tow, but seemed unable to pull the barkentine away from the treacherous inshore waters. Later, a seagoing tug off Cape Flattery, having received a radio message telling of the disaster, came to aid, and the "James Tuft" was towed to Seattle.

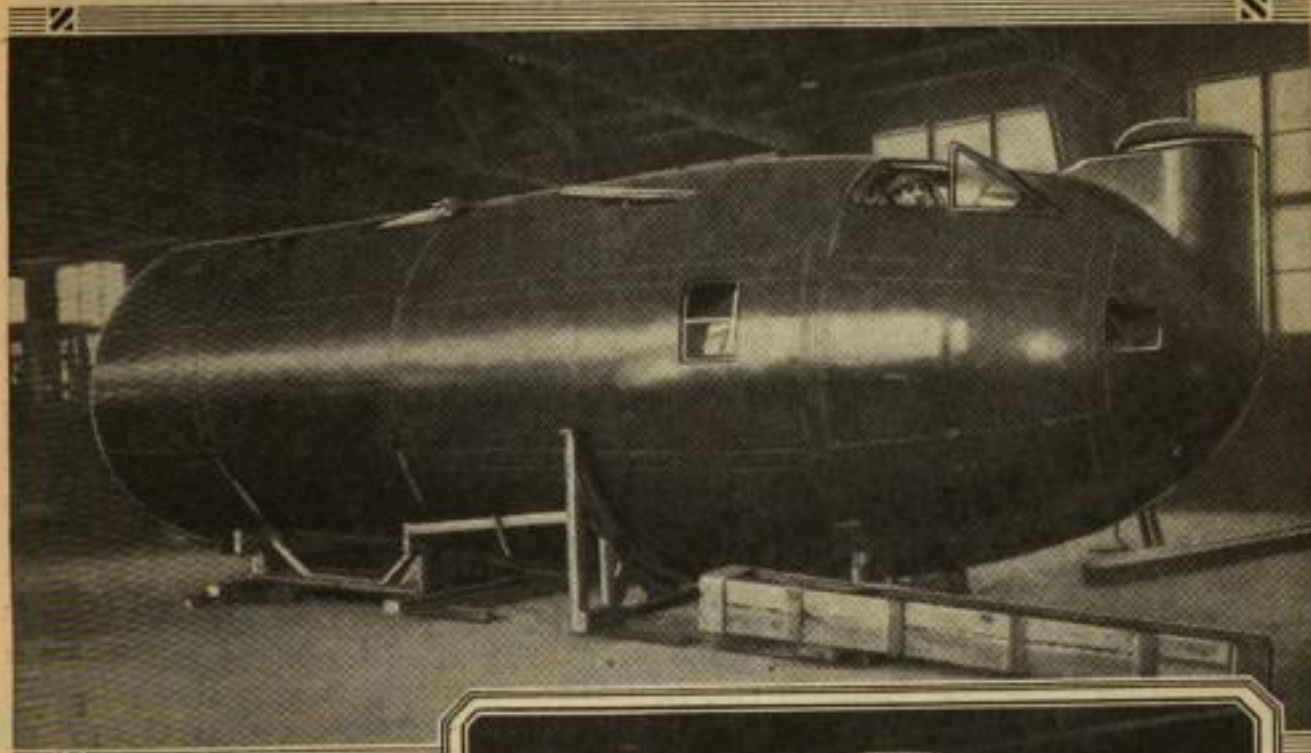
WORLD'S LARGEST AIRPLANE BEING ASSEMBLED

The world's largest airplane, the Barling bomber, now being assembled at Wilbur Wright Field for the United States Army, is expected to be ready for trial some time in April. The ship is a triplane of 120-foot wing spread, a length of 65 feet, a height of 28 feet, and the fuselage is 10 feet in diameter. It will be driven by six 400-horsepower Liberty

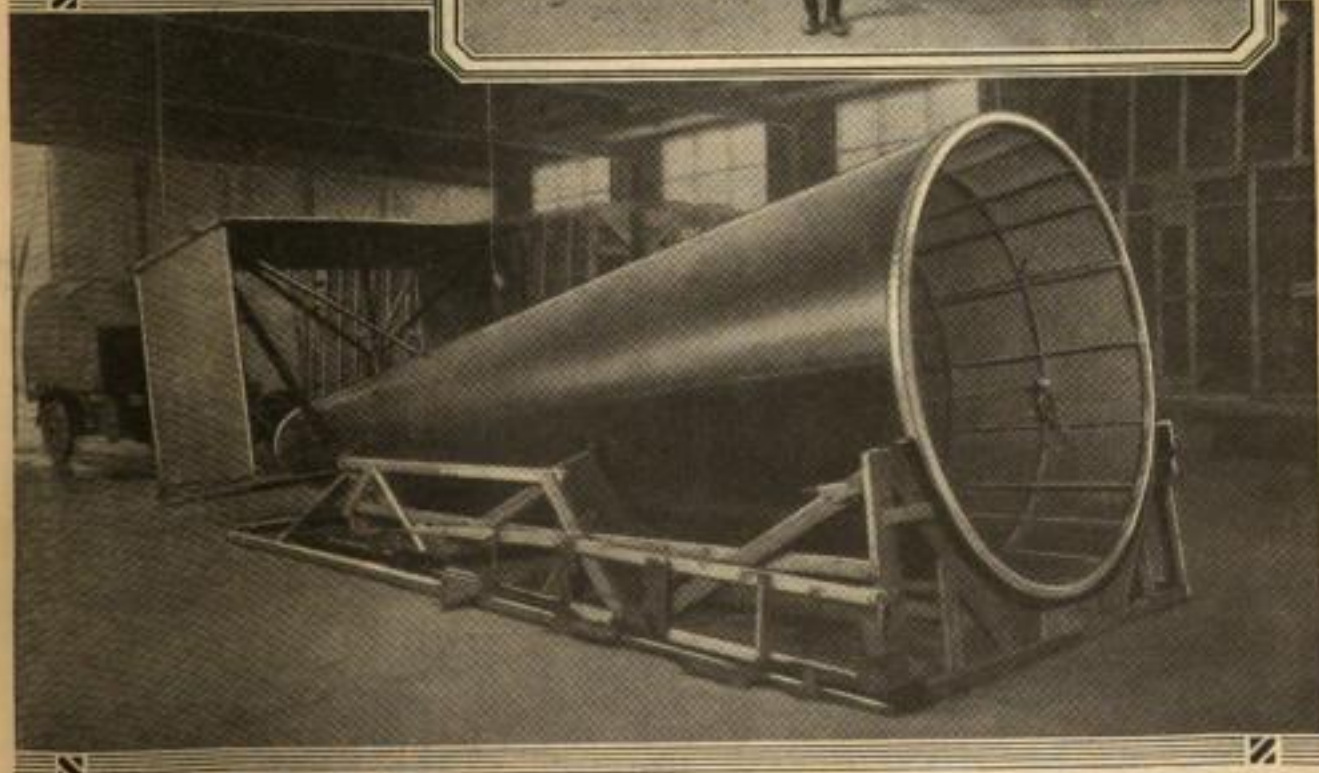
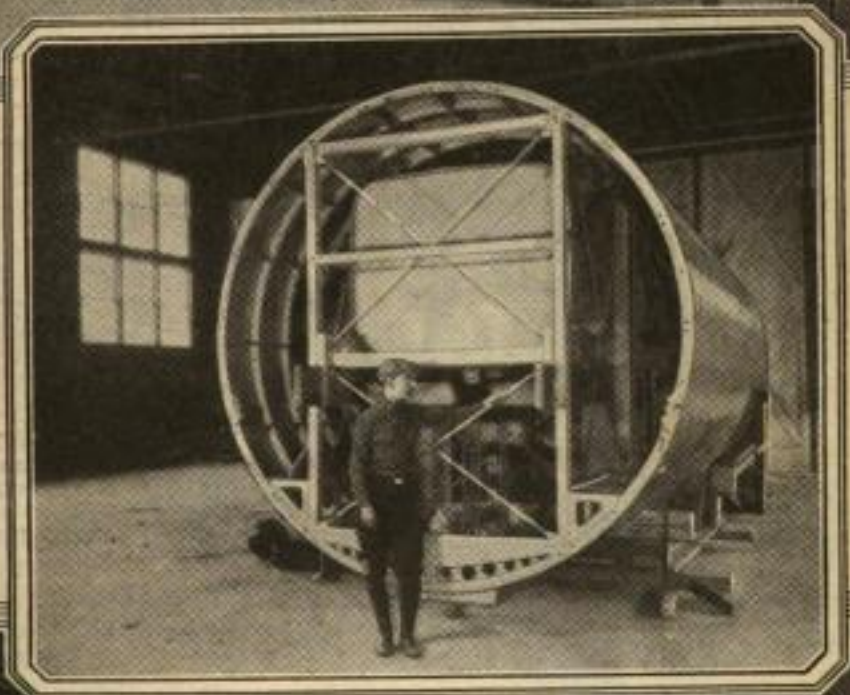
motors and will have a fuel capacity of 1,500 gallons, which will give it a cruising radius of 1,300 miles at a speed of over 100 miles an hour. The completed ship will weigh about 40,000 pounds and will carry 10,000 pounds of bombs. Two pilots working together can fly the ship ordinarily, but in bombing flight the crew will consist of eight men.



The Barling Bomber, the World's Largest and Heaviest Airplane, as It will Look When Completed: Note the Three Sets of Wings Which Carry the Weight of 40,000 Pounds. The Plane will Mount Six Machine Guns and Have a Crew of Eight Men



Above: Fore Part of Fuselage of the New Barling Bomber, the World's Largest Airplane, Now Nearing Completion. The Fuselage Is 10 Feet in Diameter. Right: End View, Showing the Interior of a Section of the Fuselage. Note Its Size in Comparison with the Man Standing Directly in Front. The End of the 1,500-Gallon Gasoline Tank can be Seen in the Upper Half of the Shell, and Some of the Other Equipment in the Lower Half. Below: Tail End of the Fuselage. The Ship will Be 62 Feet from End to End, with a Wing Spread of 120 Feet, and a Weight of 40,000 Pounds. Its Power Equipment is to Consist of Six Liberty Motors of 400 Horsepower Each



THE BRIDGE WITH A THOUSAND SPANS

Concrete Structure, 14,000 Feet Long, over Tampa Bay, and 16,000 Feet of Approaches, 400 Feet Wide, to Shorten by 38 Miles Road Route between Tampa and St. Petersburg

BY FRANCIS W. WILSON


A THOUSAND spans! Where from—where to? New York to Liverpool is perhaps suggested, as you undertake to calculate mentally how far a thousand spans like those of the Queensboro bridge would reach. It is no such ambitious project, however, for the thousand spans of this bridge would not cover the distance from the Woolworth Building to Sandy Hook. The

distance from the Woolworth Building to Sandy Hook. The

spans will be very short—only about 14 feet each—but even so, it will be some bridge.

A mere \$2,000,000 will build the 14,000 feet of structure and 16,000 feet of approaches, which seems a modest sum for so much bridge. Considering that you could wade the waters of Tampa Bay for most of its length, or from the bridge deck, with a 10-foot drop, could dive into the bay, it is not remarkable that this sum can be spread out effectively over such an impressive distance.

If filling in and bridging six miles of shallow water appears a tame engineering feat, on the other hand it is not an easy job. Some unusual problems the engi-



The Bridge of a Thousand Spans across Old Tampa Bay, Which Shortens the Road Route between Tampa and St. Petersburg by About 38 Miles: Portions of St. Petersburg and Tampa can be Seen at the Left and Right, Respectively, with the Bridge Approaches

neers must cope with, even though the structure is lacking in spectacular features. Handling the materials for the reinforced-concrete work is a man's-size job. To build a bridge which will "stay put"—defying the tropical storms which sometimes visit its locality—is another worth-while achievement.

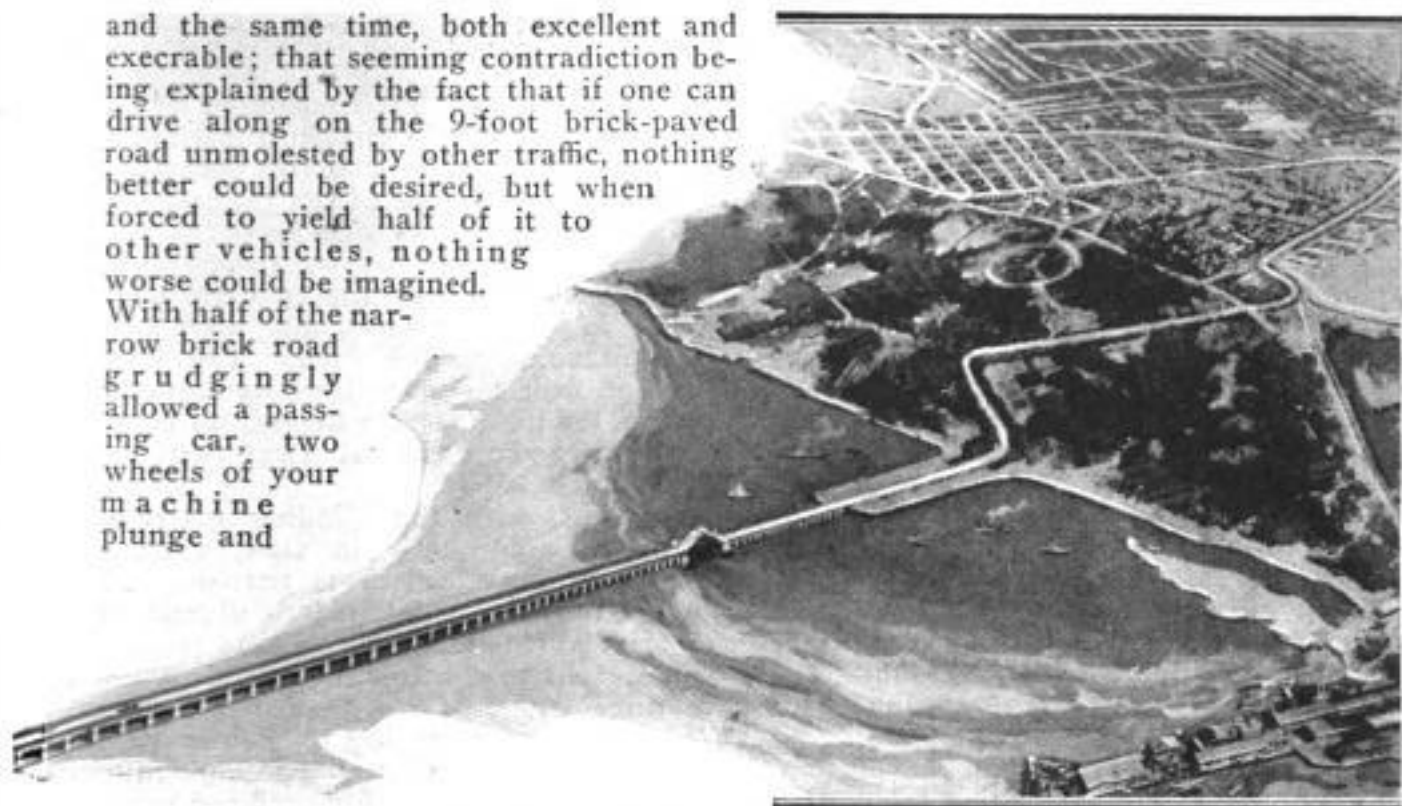
The Gandy Bridge, as it is called, will be the largest undertaking of its kind in America, with two exceptions—the Flagler-Key West extension, and the structure at Salt Lake, Utah.

Its purpose is to shorten the distance between Tampa and St. Petersburg, Fla., 38 miles.

How long does it take to drive 38 miles? How much does it cost? Many could answer the first question—very few could correctly answer the last. The Gandy Bridge Company is betting \$2,000,000 that at least 2,000 motorists per day will spend 75 cents rather than drive an additional 38 miles to go from one of these Florida cities to the other.

Anyone who has traversed the longer route will believe they are betting on a sure thing. The present road is, at one

and the same time, both excellent and execrable; that seeming contradiction being explained by the fact that if one can drive along on the 9-foot brick-paved road unmolested by other traffic, nothing better could be desired, but when forced to yield half of it to other vehicles, nothing worse could be imagined. With half of the narrow brick road grudgingly allowed a passing car, two wheels of your machine plunge and



wallow through deep holes or sandy ruts, the other wheels smoothly rolling along on the brick. You are sharing that road most of the time, too. If the racking and smashing impact doesn't fracture a spring or break an axle, you get a new respect for the material in your car before the journey is completed.

Was it just canny foresight which prompted Geo. S. Gandy, Sr., to obtain a charter for this bridge 20 years ago? St. Petersburg was then just a straggling village, and Tampa but little better. At

any rate he got the charter, after overcoming difficulties which would have balked any but a trained fighter. To the average man that charter—20 years ago—would have looked about as valuable as a soviet kopeck, but Gandy treasured it for 12 years, then started something. It took eight years more of effort to make that charter look worth while, and now it is a valuable asset.

Studying the map, he couldn't see why people should travel 57 miles to go to Tampa, when bridging the shallow bay



This Picture Shows the Immense Length and Width of the Causeway at the St. Petersburg Approach to the St. Petersburg-Tampa Bridge. Several Miles of This Causeway, to a Width of 400 Feet, have been Filled In

would cut the distance to nineteen. The cities grew, tourists flocked from the North, and today those who have occasion to travel between these resorts wait impatiently for the opening of the new connecting boulevard and bridge.

The approaches to the bridge are now being constructed. Until they are completed no work can be commenced on the concrete bridge. Suction dredges are pumping the sand to fill in the approaches—an embankment which is, perhaps, unique as to its flat side slopes. Engineers accustomed to allowing slopes of one-and-a-half horizontal to one vertical, for ordinary earth embankments, will learn with surprise of a fill with side slopes of 10 horizontal to one vertical! That is the slope used on the sand-filled approaches. It is the natural slope of a sandy beach. Forty feet wide at top, and approximately 400 feet wide at bottom, are the cross-sectional horizontal dimensions, the height varying of course with the depth of water.

Structurally the bridge proper will not be unusual. A series of reinforced-concrete pile bents will support a reinforced-concrete deck. On either side of the 24-foot roadway a substantial concrete balustrade will be provided.

One feature of the foundation work is out of the ordinary. For a length of 3,500 feet the bridge foundation is bare solid rock, then the ledge pitches downward, and is covered for the remaining length by from 8 to 10 feet of sand. Where the covering of sand is sufficient, the pre-cast concrete piles will be driven to a bearing on the rock; where the rock is bare, holes will be bored into it to receive the bottom of the piles. This is an

unusual procedure, but considered advisable, for even the dead weight of the bridge might not be able to withstand the lateral hammering of the tremendous seas swept against its side by occasional gales.

Steel dowels will tie the concrete deck to the caps of the piles, and no transverse bracing will be used. The construction will be monolithically bonded, so that, for its moderate height, no other provision against lateral sway will be needed.

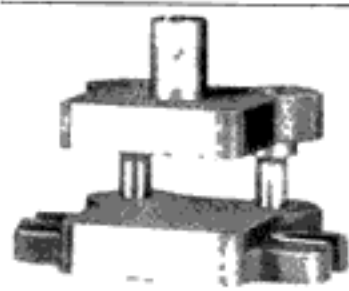
At night, with the blinding glare of headlights continually in view, even a 24-foot roadway will seem narrow. To obviate this, it is proposed to illuminate the bridge brilliantly at night, and require all motorists to shut off their lights while crossing.

Florida is commencing to give marked attention to beautifying its highways. Tourists demand smoothly surfaced roads as a prime requisite, but aside from that they also favor localities where there is something to view besides palmetto and scrub pine.

Recognizing this, the Gandy bridge route will provide scenic attractions and also amusement features for its patrons. For a considerable length at the shore ends of the approaches, they will be widened into broad esplanades, beautified by palms, oleanders, and tropical shrubbery. Parking spaces for cars will invite the motorist to stop and enjoy the cool breeze from the bay in summer, or dance in the casino in the cooler winter weather. At intervals along the bridge, tiny islands will be constructed, with fishing piers, tea rooms, and other features appealing to tourists.

STANDARD DIE SETS REDUCE STAMPING COSTS

Small machine shops, using but a few dies in a year, are aware of the comparative



high cost of making them to the required degree of accuracy and quality under their own roofs. To meet the demand from

this class of user, a series of standardized die sets and parts is being placed on the market, on the principle that where quan-

tity production is possible, the unit cost is correspondingly reduced. The dies are made in a convenient range of sizes to satisfy varied needs.

BALLOON HANGARS KEPT COOL BY CORRECT PAINTING

In order to keep the interior of balloon hangars at as low a temperature as possible, it has been suggested that the outside be painted with a highly reflecting coating like white paint, while the inside should be covered with aluminum paint. By this means the radiation into the interior may be reduced 78 to 81 per cent. White paint reflects the sun's rays, while aluminum paint is a poor radiator of heat rays. The effect at night is reversed.

Coal in Germany

By A.W. MacMillan

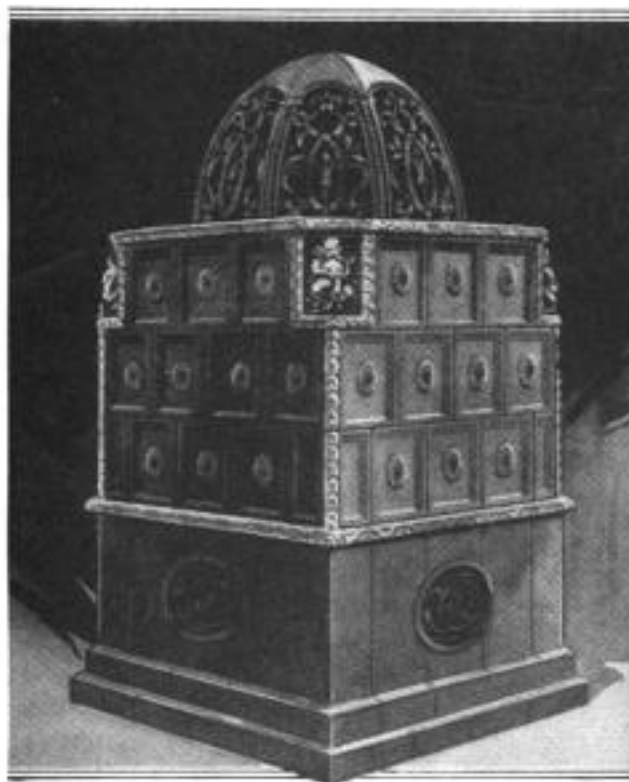


THERE are two general grades of coal in Germany, the brown coal, or lignite, and the harder stone, or *steinkohle*. The brown coals are not good coals as judged from American standards. About three tons of brown coal would be required to give the same amount of heat as one ton of good American coal. About one-half of all the brown coal used in Germany is made into briquettes. These briquettes are made by pressing finely divided coal into shapes, using pitch or other material as binders. A common sight in the rural communities of Germany is the bent back of a briquette vender who walks from dwelling to dwelling with these black bricks of fuel on his back. The householder buys in small quantities, and uses the briquettes sparingly in his peculiar porcelain stove. Heat among these people is a luxury rather than a necessity. The better grades of coal found in Germany are called hard coals, but they are not hard as we classify our anthracites, most of it comparing with our better grades of steam, gas, and coking coals. It has about three times the heating value of the brown coal and is sufficiently varied in quality to find efficient usage in most of the industries.

Germany has lately made great strides in its methods of burning coal, both for economy in firing and in using inferior grades of coal. Gases which were formerly allowed to escape up the chimney are now utilized. Air-preheating devices have been developed beyond past

practice, and sign has been im
Coal dust and
peat are coming
cient use because
intelligent application of these improved
burning methods. A complete educa-
tional system has been built up by the
present German government to encour-
age the use of fuel-saving schemes for
both industries and individuals. It is
realized that the lower-grade fuels must
be used wherever possible, so as to con-
serve the better grades upon which the
country's industrial well-being depends.
There are many industries which cannot
use brown coal. It is out of the question
for use as locomotive fuel.

oven de-
proved.
even
into effi-
of the



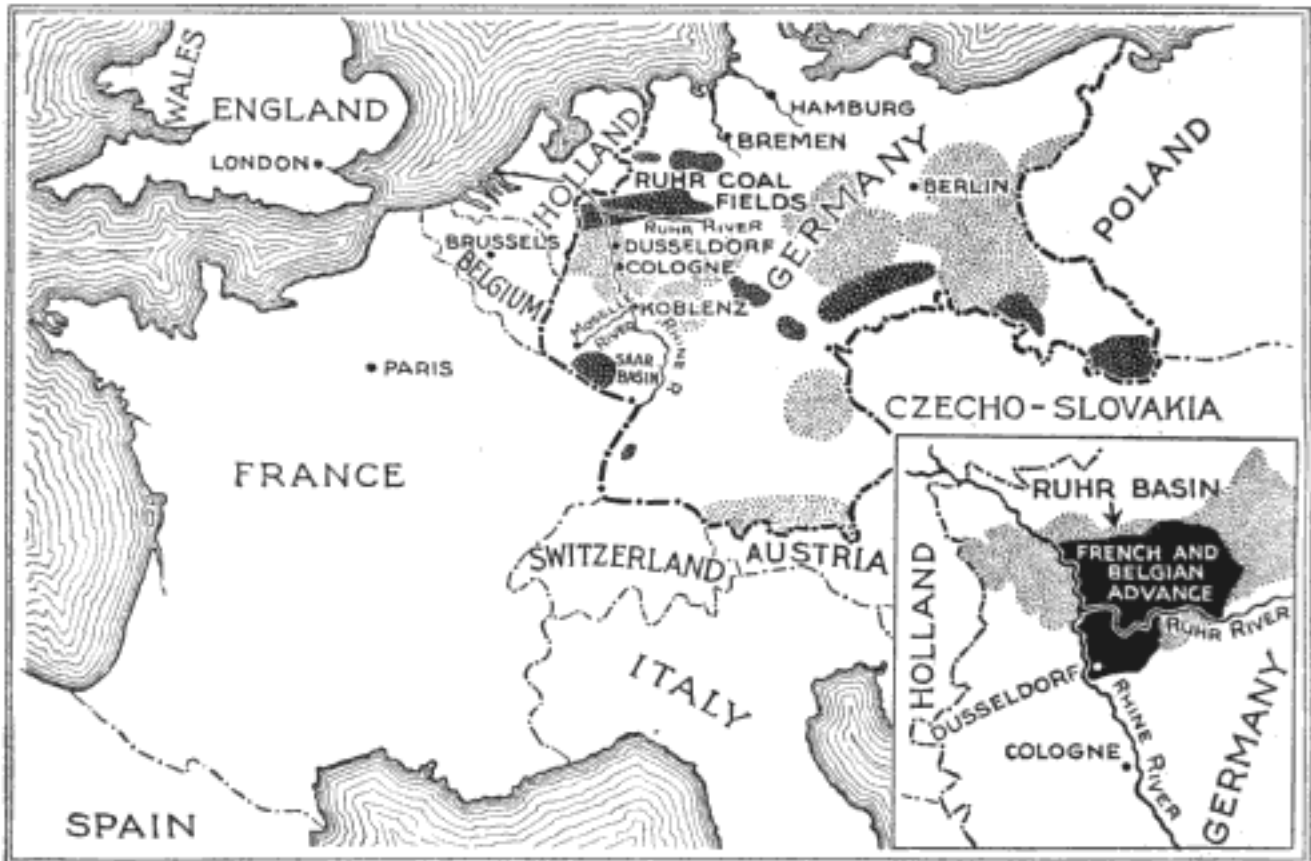
One of the Porcelain Stoves Commonly Used in Germany: They are Designed for Burning Briquettes Made from Either Hard or Brown Coal

The accompany-
ing table indicates
how Germany is
using its brown
coal. It is taken
from *Wirtschaft
und Statistik* and
shows the percent-
ages used by vari-
ous industries of
the total brown-
coal consumption
of Germany.

It will be noted
from this that over
half of the brown-
coal briquettes
made in Germany
go to domestic
use and similar
fields.

The problem of
briquetting coal is
not as easy of solu-
tion as may appear
to the casual ob-
server. To be use-
ful, a briquette
must be strong,

hard, and tough to withstand rough usage
in handling and shipping; it must be able
to withstand the heat of the sun and
weathering; it must retain its form while
burning, as returning to the original fine
pieces would clog the draft, and it must



The Coal Fields of Germany Shown on the Above Map are Indicated by the Shaded Portions. The Lighter Shade Indicates Brown Coal or Lignite; the Heavier Shade Indicates the Harder Coals or Steinkohle. The Inset Shows French and Belgian Advance, January, 1923.

ignite readily and burn without producing smoke or odor. Germany's briquettes pass all of these requirements.

There are groups of industries in Germany which have considerable effect on the coal situation. Each group operates under one financial head. The groups which include all processes from raw material to finished product are called

has 6 coal mines, 37 iron-ore mines, 17 blast furnaces, 15 steel works, and 18 rolling mills. The Phönix has 5 coal mines, 1 iron-ore mine, 18 blast furnaces, 22 steel works, and 8 rolling mills. The 12 principal groups in 1920 produced nearly 50 per cent of the total coal and coke taken from the Ruhr Valley.

One of the most important activities

USE OF BROWN COAL IN GERMANY

	Per Cent of Total Brown Coal Used	
	Coal	Briquettes
Domestic, small industries, agricultural.....	5.7	52.7
Naval and military.....	..	.2
Railways and shipping.....	.3	1.0
Water and gas works.....	.5	.5
Electric plants.....	22.7	4.2
Chemical industries.....	22.4	5.8
Stone and earthenware, glass and porcelain.....	6.6	7.6
Textile and paper.....	13.3	6.5
Ore reduction, iron and metal industries.....	11.5	11.6
Foodstuffs.....	5.1	3.6
Potash, salt, etc.....	6.4	1.4
Others.....	5.5	4.9
	100	100

vertical groups. The groups which function in the same phase of production are called horizontal groups. They are organized on the general principles outlined in *Rathenau's Planwirtschaft*. The Stinnes group possesses 26 coal mines, 65 iron-ore mines, 26 blast furnaces, 22 steel works, and 8 rolling mills. The Krupp group

of Germany before the war was its chemical industry. Most of the chemical products were produced directly from coal. Before the war Germany produced 73 per cent in value of all the dyes made in the world, averaging in value annually \$68.-300,000. Among other important products which it distills from coal are:

benzol, solvent naphtha, naphthalene, carbolic acid, heavy oil, anthracene, and pitch. These chemicals form the bases from which a large number of fuels, solvents, explosives, paints, perfumes, and medicines are drawn, either by distillation at various temperatures or by dissolving them out of the base material. Some of these processes are very complicated. Whether or not Germany will continue to lead the world in these industries depends upon the disposition of its coal.

Transportation enters into the coal problem of Germany as in any country. The brown coal of Germany can be burned at a saving if it is used at or very near the mine. It is estimated that if the user is over 50 miles from the mine, the saving is very small. Germany's purchases of foreign coals have, in the past, been influenced principally by transportation conditions within its own borders. Its coal fields are far from ocean water transportation, so that Hamburg, Bremen, and the north German plain have depended on South Wales and other English ports for a considerable portion of their coal. Even Berlin, in 1906, purchased 20 per cent of its coal requirements from

Great Britain. During the months of frost, river and canal transportation is not efficient in Germany. Grain shipments during this period also interfere with coal movement. As a result of these conditions, it is found that fully 40 per cent of Germany's principal industries are located practically on top of coal mines.

It was estimated before the war that there were 410,000,000,000 tons of the so-called hard coal in Germany which could be commercially exploited. About one-quarter of this amount is in veins 12 to 24 inches thick. The remainder is in veins over 24 inches thick. A complete estimate of the brown-coal reserves has not yet been made. In 1913, the exploitable resources of brown coal were estimated to be at least 13,400,000,000 tons.

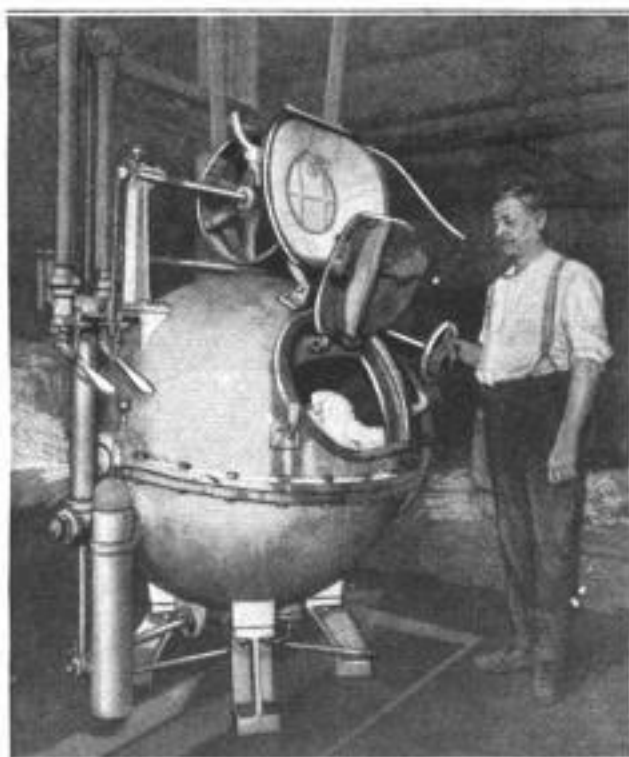
These facts are interesting because coal is the one vital food for the present state of our civilization. Coal has developed the arteries of transportation and the nerves of communication to such an extent that great economic changes in one part of the world vitally affect the prosperity of the rest of the world, and so the world is watching the coal situation in Germany.

PUMP INCREASES CIRCULATION OF WATER IN BOILERS

Circulation of water in a boiler has been stimulated by means of a screw pump. The driving spindle of the pump passes through the boiler shell and is arranged so that it can be packed while the boiler is under pressure, there being no part inside the boiler subject to wear. The pump revolves in an open-top casing connected to the cooler part of the boiler, and from which it takes the water, discharging it at the point of greatest heat. Drier steam, increased evaporation, and a fuel saving of 8 to 12 per cent have been noted.

WASHING MACHINE REVOLVES IN BUT ONE DIRECTION

One of the newer types of washing machines, intended especially for large quantities of towels, or other unmixed laundry, is claimed to do this work faster and with less soap and water than usual. The outside shell of cast iron, and the perforated copper basket into which the soiled material is placed, are both spherical. The basket, contrary to general practice, revolves in but one direction, the

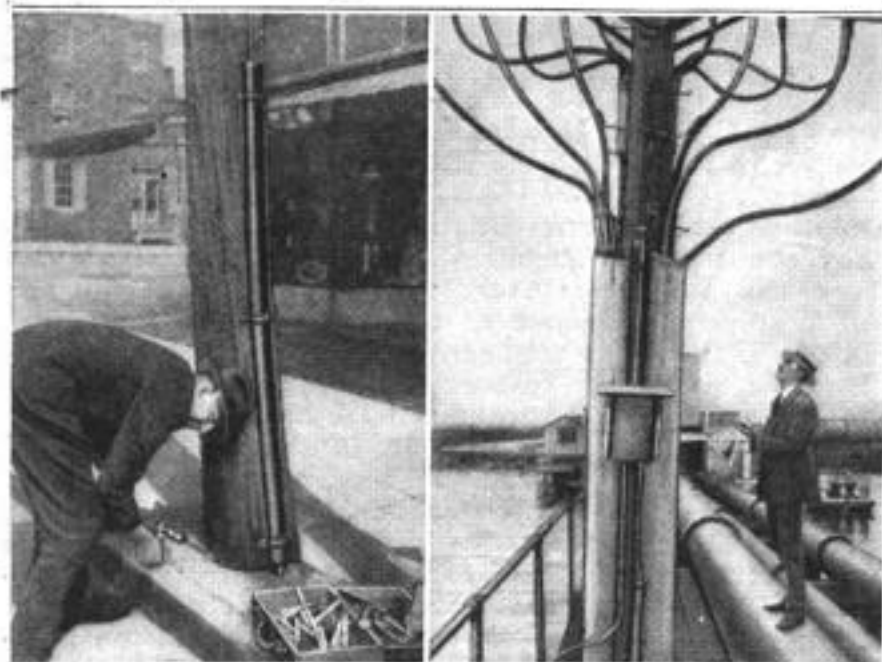


Washing Machine, for Unmixed Laundry, with a Perforated Basket Which Revolves in But One Direction: The Doors are Shown Opened

machine making 40 revolutions a minute. It is said that the power required to drive one of the old machines will operate three of the new ones.

ELECTRIC-LIGHT POLE TESTER PLAYS MODERN "PIED PIPER"

The "Pied Piper" of olden days who avenged himself upon the people of Hamelin by charming, with his flute, an



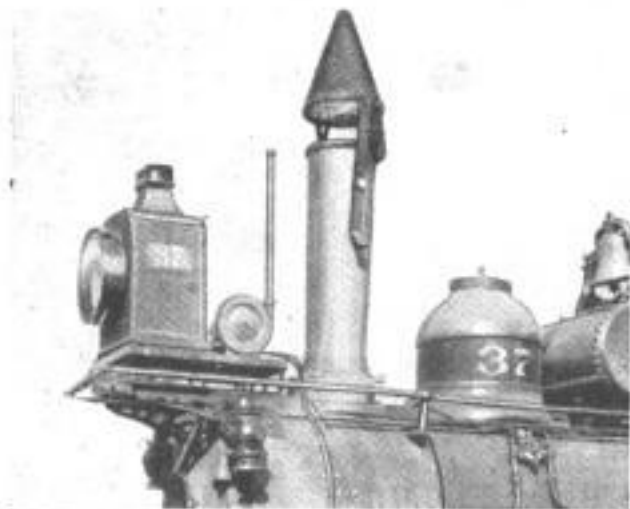
Left: The Pole Tester at Work; after Examining the Heartwood of Each Suspected Pole at the Groundline, He Plugs Up the Boring with a Wooden Peg. Right: Inspecting High-Tension Lines for Defects

army of their children to follow him into a mountain, has a more generous present-day counterpart who follows the occupation of a pole tester for a large eastern electric-light company. With his brace and bit, and with an ice pick to aid him, he goes from pole to pole every day, boring test holes at the groundline, or chipping away dead portions, so that he may know the condition of each one and recommend a new pole where necessary. It often happens that he is followed on his route by groups of children, who become so absorbed in watching his work that they stray far from their homes. Experience has taught this kindly pole inspector that the simplest solution is for him to retrace his route, and soon the juvenile spectators are back once more in familiar surroundings.

SPARK ARRESTER SAFEGUARDS FORESTS AND CROPS

In order to reduce the fire hazard to valuable timberlands and fields of standing and harvested grain from the sparks of passing locomotives, the United States Forest Service has cooperated with western railroads in developing a new spark arrester. The device has proved effective

in saving forests, even in the case of a prolonged drought, and it has given gratifying results on engines operating through the "hay country," where previously men had been kept busy plowing fire guards along the right of way. It is an easy matter to make and install the arrester, which consists merely of a funnel-shaped hood of wire netting, fastened, with the small end upward, over the top of the stack of the locomotive.



In Addition to Its Fire-Prevention Features, This Spark Arrester Keeps Cinders from Flying through the Open Train Windows

ODORLESS MANUFACTURING OF CHEMICAL WOOD PULP

Cellulose industries in Sweden have succeeded in solving a most vexing problem, which has hitherto defied solution, by making cellulose without the vile odors that accompanied earlier processes. Sulphur-free lye is used in the new method, as distinguished from the sulphate method which uses sulphur-bearing lyes. Incidentally, chemical products of high value are produced from the organic substances dissolved by the waste lye. These by-products, resulting from what was hitherto waste, and comprising from 50 to 65 per cent of the volume of the wood, are said to effect an enormous change in the economics of the cellulose industry.

EXPERIMENTAL ROAD DEVELOPS NEW HIGHWAY DESIGN

The vast sums now available for new road construction have prompted highway engineers to undertake extensive tests in the hope of obtaining valuable data upon which more efficient designs could be based. In the case of Illinois, a test section of road was built and tested practically to destruction. Observations taken indicated that the edges of any of the rigid-type pavements previously used as standards were not as strong as the interior portion of the concrete slab. The new cross section which has been adopted takes advantage of these findings, by increasing the edge thickness to 9 inches, tapering to 6 inches at a distance of 2 feet from the edges, and having the remainder 6 inches in thickness. The new design will result in a saving of 195½ cubic yards of concrete per mile of pavement.

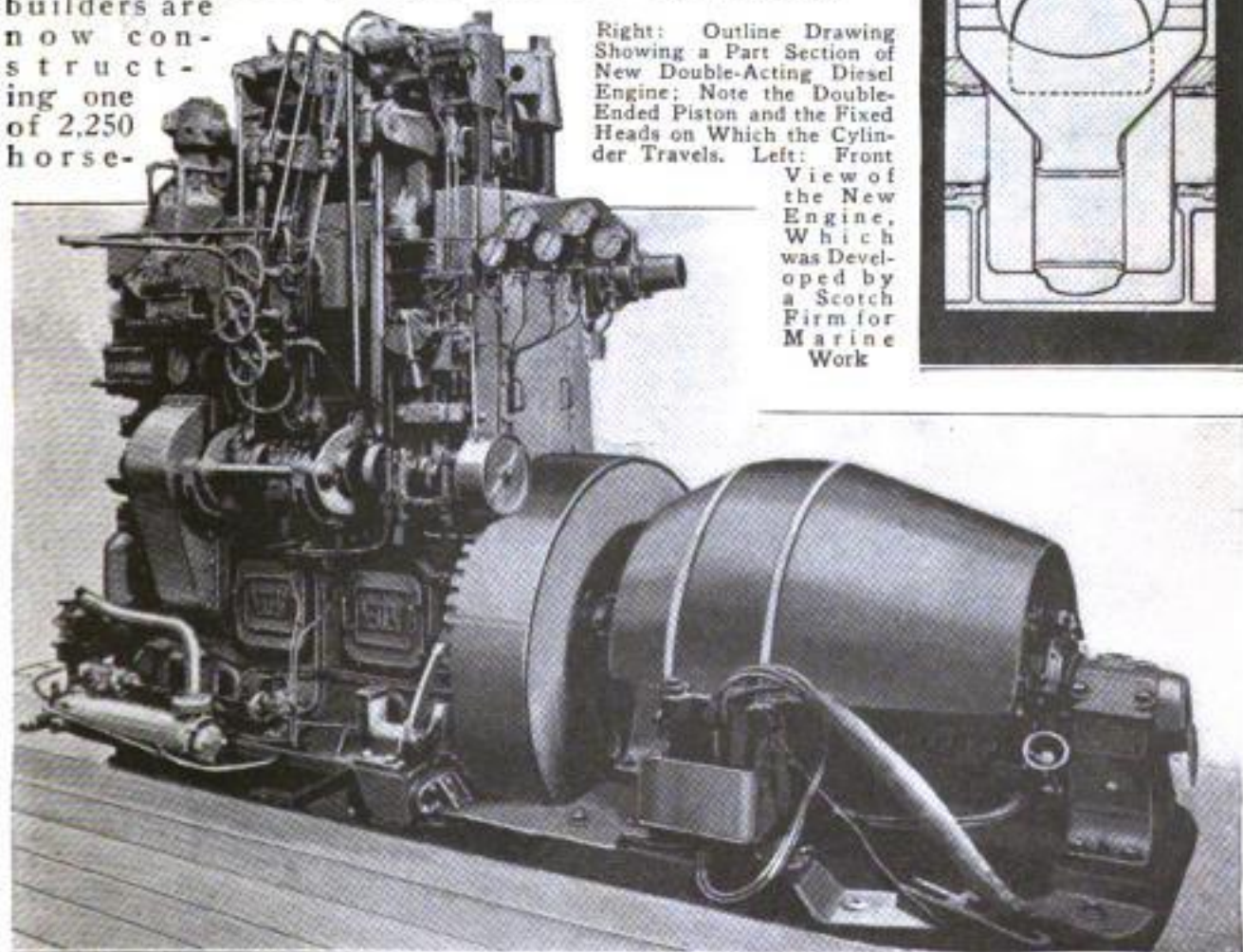
NEW MARINE DIESEL ENGINE IS DOUBLE-ACTING

Tests of a new design of two-stroke double-acting oil engine of the Diesel type, have been so gratifying that the builders are now constructing one of 2,250 horse-

power along the same lines. The outstanding feature is an open-ended cylinder, which may be considered as two cylinders end to end, and which travels on two cylinder covers, that are virtually fixed pistons, a distance approximately equal to one-third the engine stroke. A piston on both sides of which the combustion gases act, moves back and forth in the cylinder. This construction permits of better exhaust and scavenging than the usual two-cycle engine.

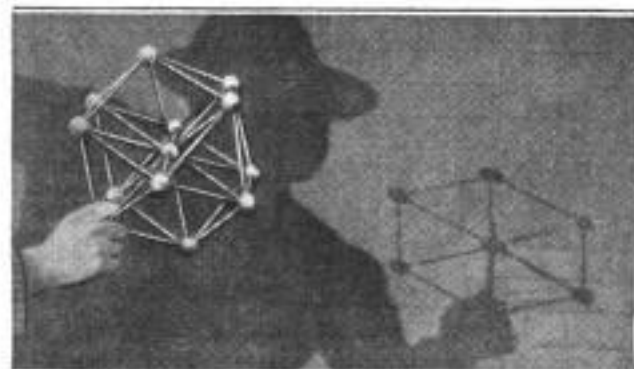
Right: Outline Drawing Showing a Part Section of New Double-Acting Diesel Engine; Note the Double-Ended Piston and the Fixed Heads on Which the Cylinder Travels. Left: Front

View of the New Engine, Which was Developed by a Scotch Firm for Marine Work



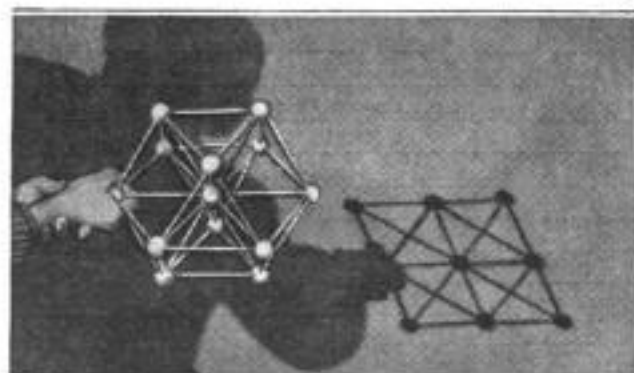
GEOMETRIC SHADOWS CAST BY SKELETON FIGURE

The student of geometry or drawing will be helped greatly in visualizing the



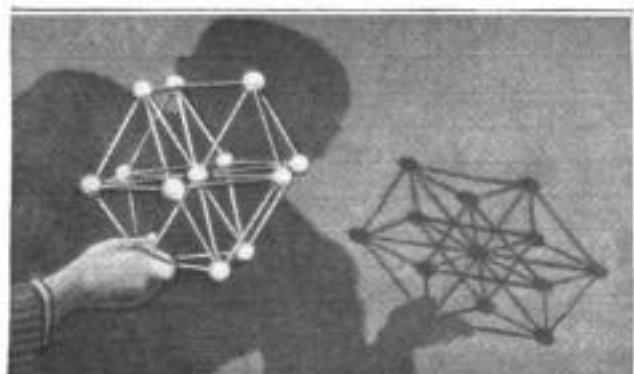
A Complicated Figure Throws a Simple Shadow. A Slight Distortion Is Visible in the Shadow Because of Inability to Get Direct Light Rays on the Figure

complicated figures he deals with by the aid of a new geometric device which presents these abstract figures in concrete form. Small spheres, each having 12 equidistant holes on its surface, represent



A 14-Sided Figure in Perspective: The Lines are Positioned over Each Other So Skillfully That Only a Square Results

geometric points, while wires with screw ends form connecting lines between the spheres. With these elements a very large number of combinations is possible, producing the crystalline structures



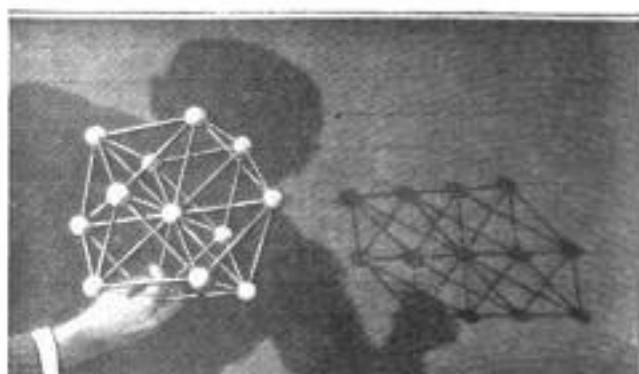
Right, an Irregular Figure of Four and Five-Sided Faces: In Contrast to Other Views Shown, Note That Every Sphere Here Casts a Distinct Shadow. Left, the Faces of the Figure Are All Triangular or Square: Note in the Shadow How One Six-Sided Figure is Contained within Another

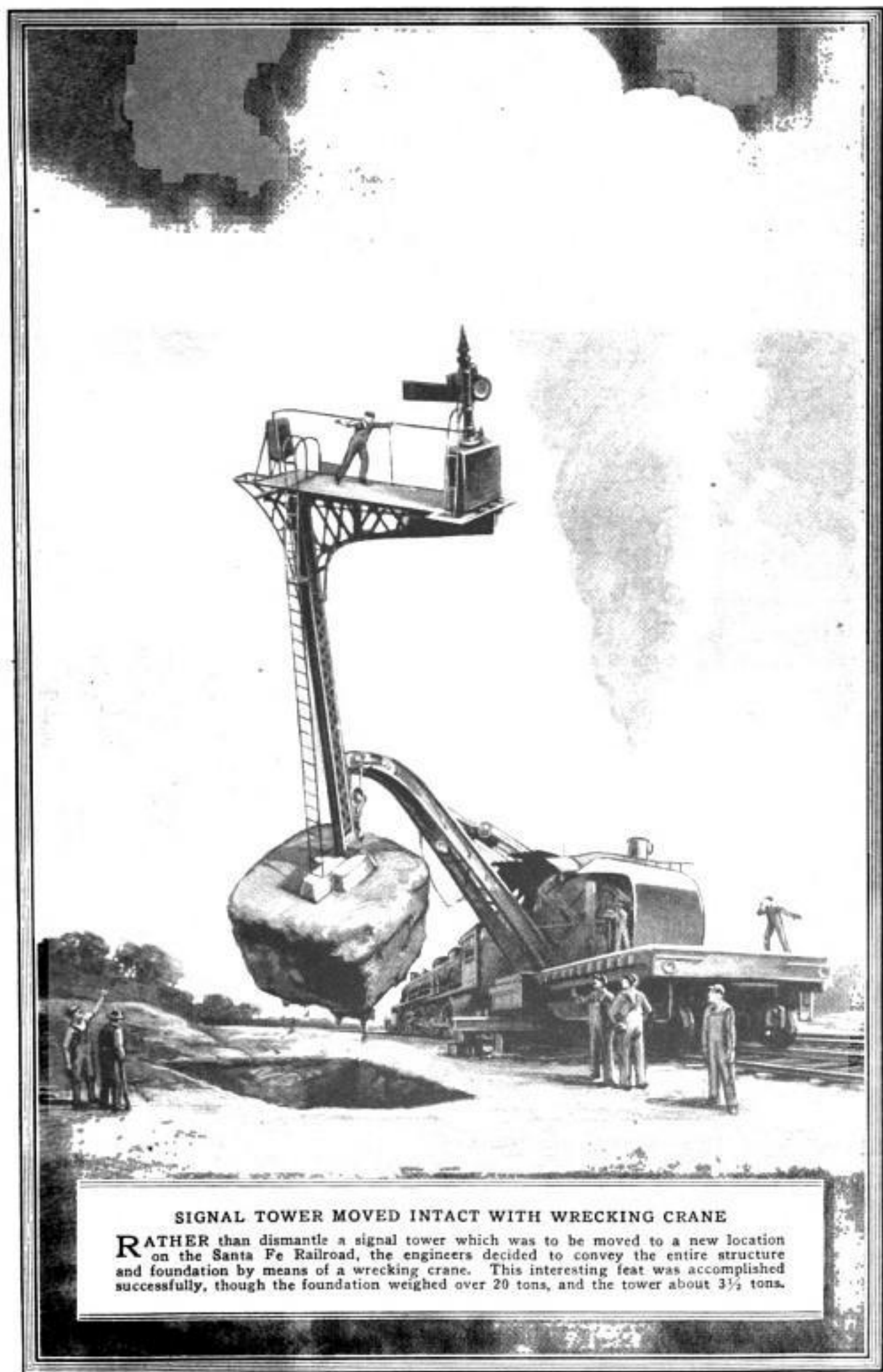
of chemistry, figures known to solid geometry, as well as interesting modifications. When cast in shadow, the figures, of course, are seen in perspective, resulting in a great variety of views of beautiful symmetry.

ELECTRICALLY CHARGED SAND USED TO MAKE RAIN

Electrically charged sand of very fine grains, released from an airplane, has been successfully used to disperse clouds and produce rain or snow in a series of experiments recently conducted at McCook Field, Dayton, Ohio. In the work done so far, which has included nothing with highly charged storm clouds, the time taken to precipitate and destroy a cloud has rarely exceeded 10 minutes, and in some instances only five minutes was required. The method is a scientific development and, contrary to most rain-making schemes, seems to be favorably regarded by many scientists of authority. The basis for the process is that when a negatively charged particle in a solution, such as a cloud or a fog, comes in contact with a positive particle, the two are precipitated. The cloud may be either positively or negatively charged, and the operator adjusts the apparatus to give an opposite charge to the grains of sand, which are then attracted to and unite with the droplets of water. The combined mass gives them weight, and they fall through the moist cloud, picking up other droplets as they go.

☐ The United States received more than \$8,500,000 worth of hair nets from China, in 1921, states a report from that country. During that year and the previous one, the ports of Chefoo and Shanghai were said to have exported hair nets almost exclusively.





SIGNAL TOWER MOVED INTACT WITH WRECKING CRANE

RATHER than dismantle a signal tower which was to be moved to a new location on the Santa Fe Railroad, the engineers decided to convey the entire structure and foundation by means of a wrecking crane. This interesting feat was accomplished successfully, though the foundation weighed over 20 tons, and the tower about 3½ tons.

COÖPERATIVE STATE FIGHT AGAINST BOLL WEEVIL

THE governor of Georgia, when requested for a statement on the work of the boll-weevil conference recently held at Atlanta, had the following statement prepared for Popular Mechanics Magazine:

"War was declared upon the 'Billion Dollar Bandit,' when more than 500 prominent citizens, representing more than 20 states, gathered in Atlanta, Ga., on February 20 and 21, and enthusiastically launched the national campaign for boll-weevil control. This is probably the most comprehensive movement of its kind in history.

"It begins with the cordial endorsement of President Harding and scores of influential men like Roger W. Babson, and also with the pledged coöperation of Federal and state agencies. Every branch of the cotton industry, from dirt farmer to manufacturer, was represented at this conference, which sprang from a long-expressed desire to coördinate and consolidate all efforts and agencies concerned with eliminating the disastrous ravages of the cotton-boll weevil, which result in an annual loss to the United States estimated as high as a billion dollars.

"Dr. Miller Reece Hutchinson, of New York, noted scientist and inventor, a southerner by birth and education, presided over the conference and was unanimously chosen to direct the campaign which now begins.

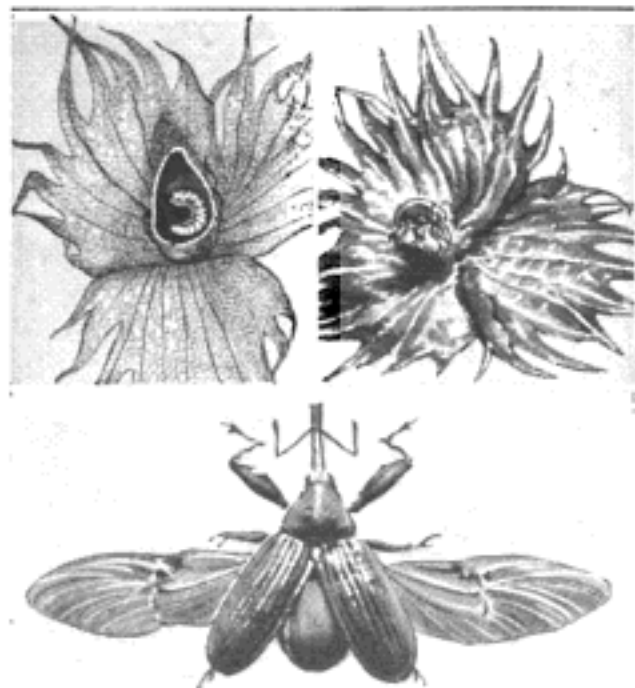
"The movement was given specific direction by incorporation of the National Campaign for Boll Weevil Control under the laws of Tennessee, with the charter of an eleemosynary institution. Dr. Miller Reece Hutchinson, of New York, becomes president of this corporation, with a directorate of at least 100 representatives of all the cotton-producing and manufacturing states and all branches of the cotton industry as a whole. Among those already selected for service in this connection is Sir Hudson Maxim, who delivered one of the most interesting addresses at the Atlanta conference.

"The campaign will first center upon the raising of a fund of at least \$2,500,000, which will be administered by a representative finance committee, with John D. Martin, well-known financier of Memphis and president of the Southern Baseball League, as treasurer. Thus financed, the corporation will secure the services of the greatest entomological experts, and experiment stations will be established under practical conditions upon hundreds of farms scattered throughout the cotton belt.

"The elimination of the boll weevil is sought, not for the purpose of producing an inflated cotton crop, beyond natural market demands, but rather to make secure the necessary world supply of this great staple. With this pest eliminated or effectively controlled, the cotton farmer will be able with certainty to raise larger crops upon much less acreage than has heretofore been employed. Coincident with the devising of means to destroy the weevil, the campaign will do everything possible to encourage intensive cultivation, diversification of crops, and to promote better methods of marketing and distribution.

"Acting on President Harding's suggestion, Governor Hardwick has appointed a committee of southern governors to coördinate state activities in this anti-boll-weevil campaign."—Editor.

CÓMING across the Mexican border line in 1892, the cotton-boll weevil



Above to the Left is Shown a Cotton Square with the Larva of the Boll Weevil Encapsuled in It. At the Right Is a View of the Beetle Puncturing a Young Flower Bud. Below: The Weevil with Wings Outspread

has spread rapidly until it is now rampant in almost the entire cotton belt of the United States, and causes enormous damage, at times, as in 1921, destroying as high as 70 per cent or more of the crop.

The destruction varies greatly, however. After a mild winter and a moist spring, the fields are usually heavily infested the following summer, while again, in certain instances, as the winter has been severe, the weevil finds it difficult to hibernate.

The beetle responsible for all this trouble is only about $\frac{1}{4}$ inch long, varying somewhat in size according to the amount of food it has obtained in the larva stage. The female, in the spring, eats its way into the boll of the plant and deposits the eggs. These hatch within a few days, whereupon the grub immediately begins to feed. About a week or so later, it issues as an adult, and shortly after begins the production of another generation.

Though entirely successful methods of eradication have not been found, there is a fairly satisfactory means of control. This consists in treating the plants with powdered calcium arsenate, thus "gassing" the insect. Indirectly, it has been found advantageous to attack the various hibernating quarters outside the field; to destroy the cotton plants in the fall, either by plowing under or burning, and to produce an early crop.

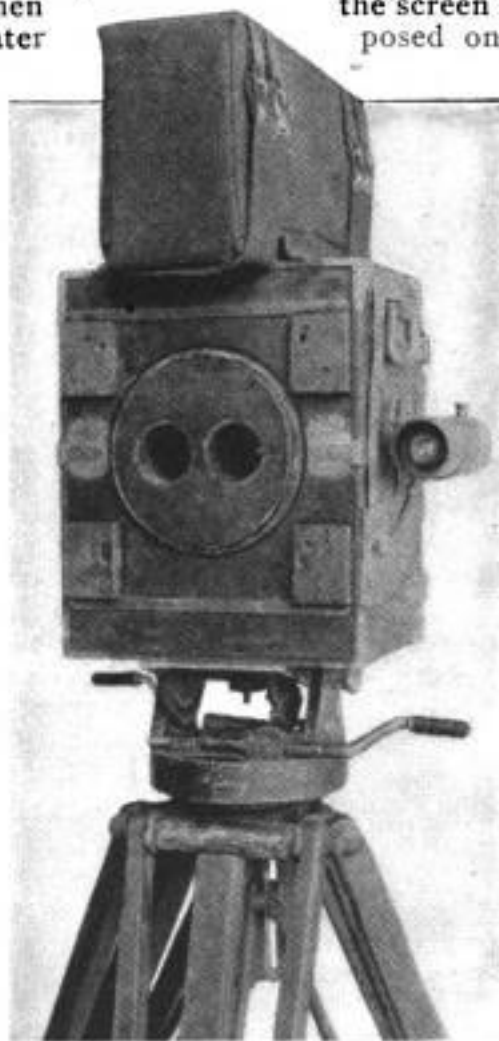
Both Federal and state governments have given much thought to the problem, and have laboratories whose sole reason for existence is to find more successful ways of combating the evil. One of the most encouraging steps taken recently was the conference held at Atlanta.

MOVIES SEEN IN RELIEF WITH COLORED GLASSES

When an invited audience of 200 scientists, photographers, motion-picture experts, and newspaper men left a Los Angeles theater on a recent night, they did so with the realization that they had just witnessed a long-sought achievement—a motion picture in which the characters did not appear to be on a flat screen, but seemed to be moving about in locations which had depth exactly like the real spots where the pictures were taken. This stereoscopic picture has been developed by a western inventor, and a six-reel dramatic production made entirely by his method has already been completed.

Four main features characterize the invention: The first is a camera which takes pictures on two films at once, through two lenses, screened respectively by a red and a green light filter and set at a distance from each other equal to the average distance between the human eyes. The second is the tinting of the films, one red

and the other green. The third feature is the projection of these two films upon the screen simultaneously and superimposed one upon the other, with the



Special Camera for Taking Two Independent Films, One through a Red and the Other through a Green Light Filter, to Produce Stereoscopic Moving Pictures

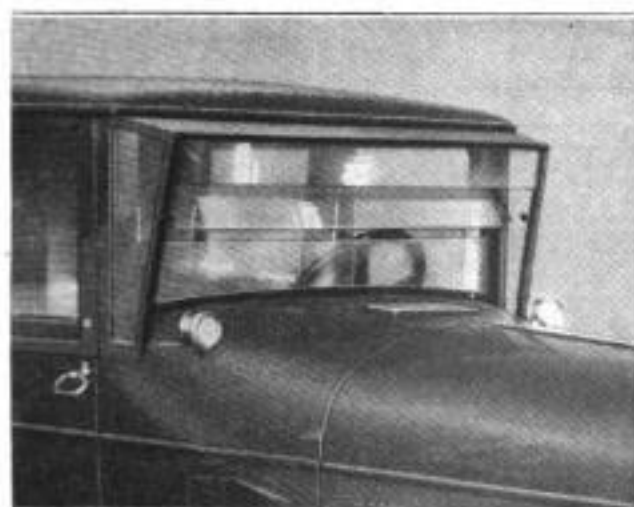


The Spectator must Wear Glasses with One Red and One Green Lens in Order to See the Screen Picture in Relief

use of two standard projection machines, and the fourth, a pair of glasses with one red and one green lens, which the spectator wears.

The combination of these arrangements causes stereoscopic vision; that is, each eye really sees a single picture of its own and cannot see the picture viewed by the other eye.

but, nevertheless, the visual brain centers "see" one picture in relief.



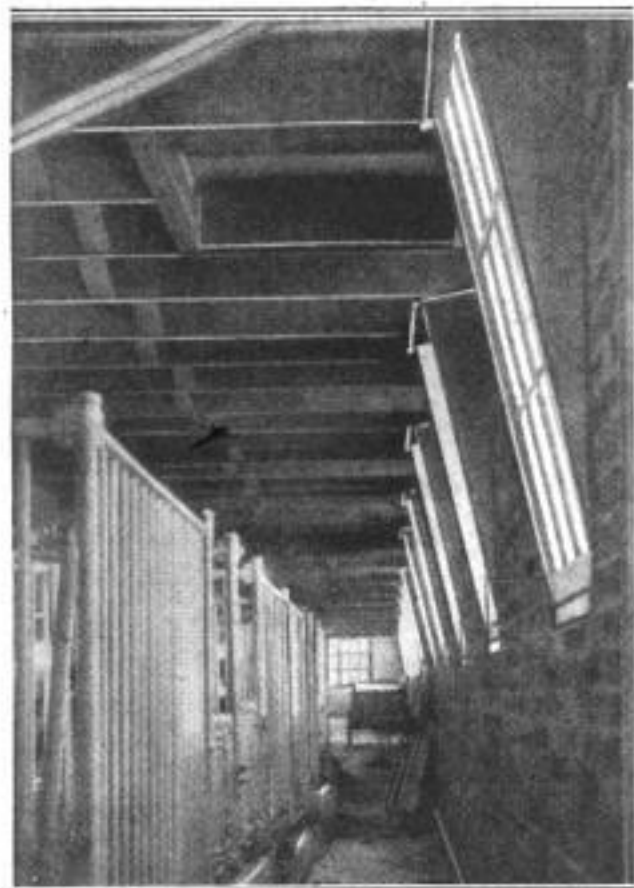
A Windshield Which Ventilates in Any Weather: The Side Panes, Outer Pane, and Inclined Inner Pane Prevent Any Direct Blast into the Driver's Face

AUTO WINDSHIELD VENTILATES IN BAD WEATHER

The fresh-air fan who likes a well-ventilated car even when driving in stormy weather, can now enjoy his oxygen without the discomfort of a direct blast in his face. A new type of windshield has an outer glass guard and an inner pane which is set at an upward angle, to admit air to the upper part of the car interior. A sharp gust of wind or sleet is intercepted, therefore, by the outer pane and deflected against the inner one, rendering a direct draft impossible and promoting clear vision. Two protecting side panes of glass contribute to the effectiveness of this all-weather windshield.

NEW VENTILATION DEVICE PREVENTS DRAFTS

Dairy farmers are said to be receiving with favor a new window for cow barns,



Cow-Barn Windows Hinged at the Bottom, and with Deflectors That Direct the Incoming Current of Cold Air toward the Ceiling

which is so constructed that it will admit fresh air in abundance without subjecting the stock in the barn to the danger of drafts. The window is hinged at the bottom and closes flat against the frame. A triangular piece of sheet metal is fastened to each side of the window casing with the apex of the triangle down-

ward. In this position the top of the piece projects about a foot into the barn. When the window is opened, the metal plates confine the air and force it upward. A pull on a chain opens the window by permitting it to swing and drop forward from the top, and a notched rod catches the swinging leaf and holds it in place with any desired amount of opening.

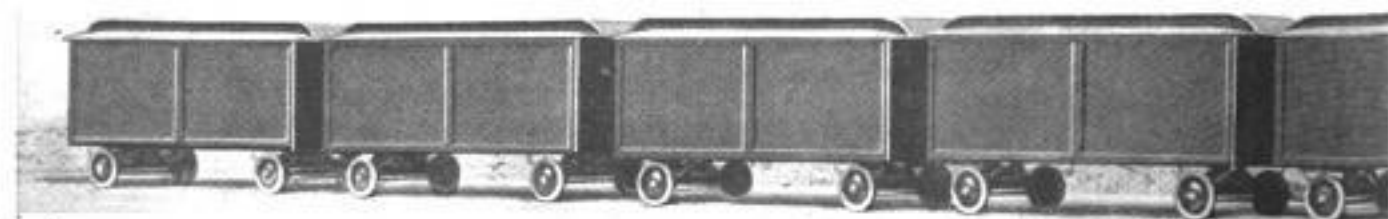
STREET CAR OR LOCOMOTIVE AUTOMATIC BELL RINGER

For application to electric street and interurban cars, and also to locomotives, there has been produced an automatic bell ringer, which makes it impossible to start without ringing the bell. Numerous accidents, caused by pedestrians or vehicles getting in front of a car just as it is starting, will thus be avoided. The bell ringer is piped to the air supply in the locomotive or electric car, and is mounted in such a manner that the throttle lever of a locomotive, or the controller handle of an electric car, cannot be moved without moving an operating lever on the device, which opens a valve, admitting the air that rings the bell. As the locomo-



Left: Automatic Bell Ringer Used with Electric-Car Controller. Above: Close-Up of Control Valve

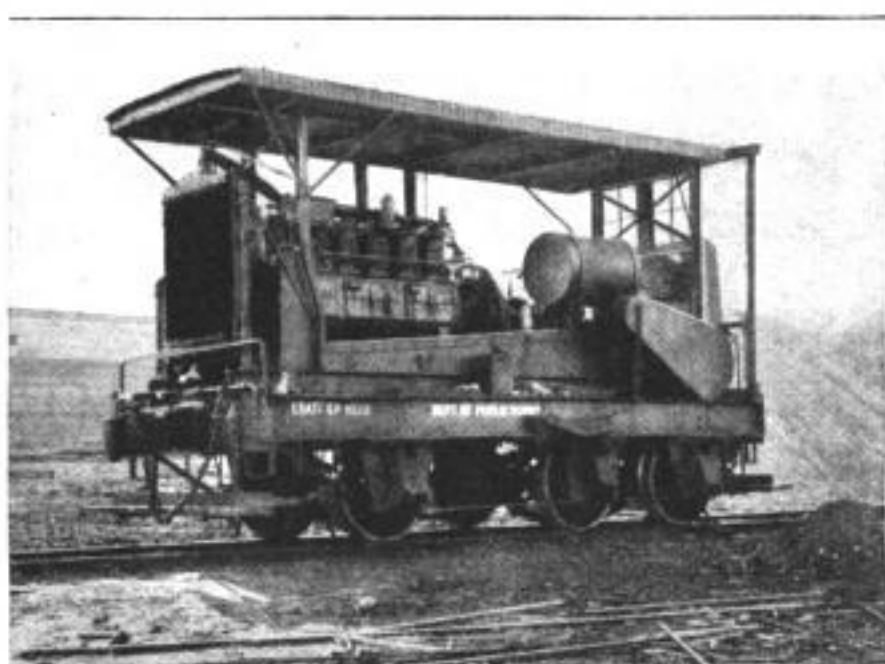
tive, or car, gains headway, the lever returns to its normal position, cutting off the air, so that the bell ceases ringing.



Seven-Car Section Which Is One of Three Similar Ones That Compose the Automobile Train That will Leave Indian Power, Car, Aside from Pulling the Trailers, Supplies Light, Water, Refrigeration, Radio Service, and Quarters at the Various Cities along the Route. The Lead Car Is a Five-Ton Motor-Truck Chassis.

TRACTOR SOLVES PROBLEM OF SWITCHING CARS

With a 20-ton tractor mounted on a specially constructed body, engineers of the Nebraska state shop have solved the problem of switching cars for the building of the new capitol at Lincoln. After an electric switch engine had failed on account of the overhead wires interfering with hoisting, the engineers designed a tractor-driven engine which now is being used successfully. The tractor is a stock model, and the car on which it is mounted was built in an Omaha machine shop, where the locomotive was also assembled.



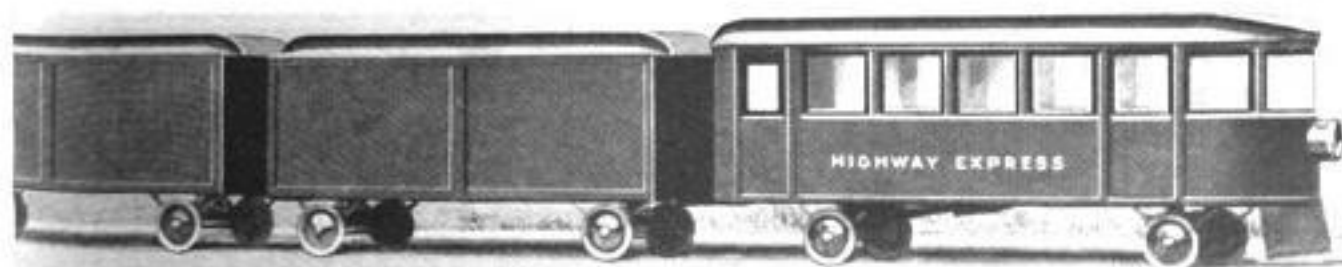
Gasoline Locomotive Built for Switching Cars on a Construction Job Where the Overhead Wires of an Electric Locomotive Interfered with the Work: It Is a Modification of a Standard 20-Ton Tractor

INTERSTATE AUTO TRAIN TO DISPLAY GOODS

Construction has recently been completed on a motor-car train that will, this season, make a 10,000-mile tour through a number of the middle-western and eastern states, displaying the products of manufacturers who may avail themselves of this novel scheme. The train will be made up in three sections of seven cars each, consisting of six display cars mounted on auto trailers and one power car built up on a five-ton truck chassis. In addition to the power equipment, the lead cars on the second and third sections will have sleeping quarters for two men, while the power car on the first section will have sleeping quarters for six men. This car will also have a dining room and complete kitchen equipment, including an

electric range, an electric refrigerator, and an electric-lighting and water plant, that will supply light and water to the entire train. A complete radio-receiving and sending outfit will also be installed in this car.

The starting point of the train will be Indianapolis, where it is expected to exhibit the display train in connection with the annual industrial exposition. From there the train will start on the eastern trip. A publicity man will travel one week in advance of the train, making arrangements at the towns at which it will stop. A pilot car will be with the train, and will mark the route for the train to follow, finally guiding it into the city where the display is to be made.



apolis This Spring on a 10,000-Mile Trip through Some of the Middle-Western and Eastern States: The Lead, or for the Crew. The Trailers Provide Space for the Display of Manufactured Products That will be Exhibited on Which has been Mounted a Special Body, Representing an Electric Pullman Car.

OFFICER DIRECTS TRAFFIC FROM SMALL HOUSE

Standing in a little house which he built himself, Traffic Policeman Curtiss



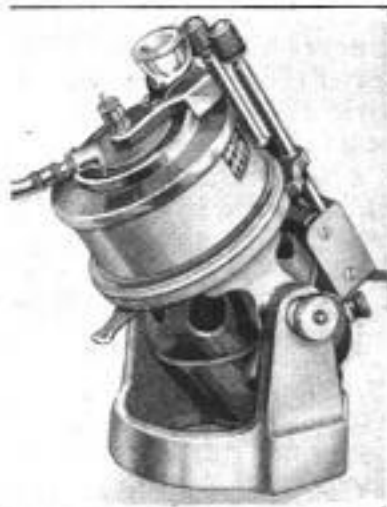
This House for a Traffic Officer Weighs Only 35 Pounds. The Stop and Go Signals on the Roof are Operated from Within

Vanosdall gives the stop and go signals comfortably in cold weather at Thirteenth and Ohio streets, Terre Haute, Ind. The sides of the house are made

of wallboard and glass, and each side swings on spring hinges, so that he may make a quick exit if need be. The house is 3½ feet square. Mirrors in the top give him a view in four directions. A kerosene stove keeps the house warm.

NEW MOTOR-DRIVEN MACHINE CLEANS DENTAL BURRS

One of the latest devices on the market is a machine for cleaning the small cutter, called a burr, that a dentist uses in his dental engine for drilling out a cavity in a tooth. The machine is self-contained with a motor that drives at high speed a special brush that has a combined up-and-down and rotary movement, and from which the burr receives about 10,000 vibrations a minute. The cleanings are picked up by a small suction fan and thrown against a porous cloth around the circumference. Alcohol from a small glass cup is fed on the brush.



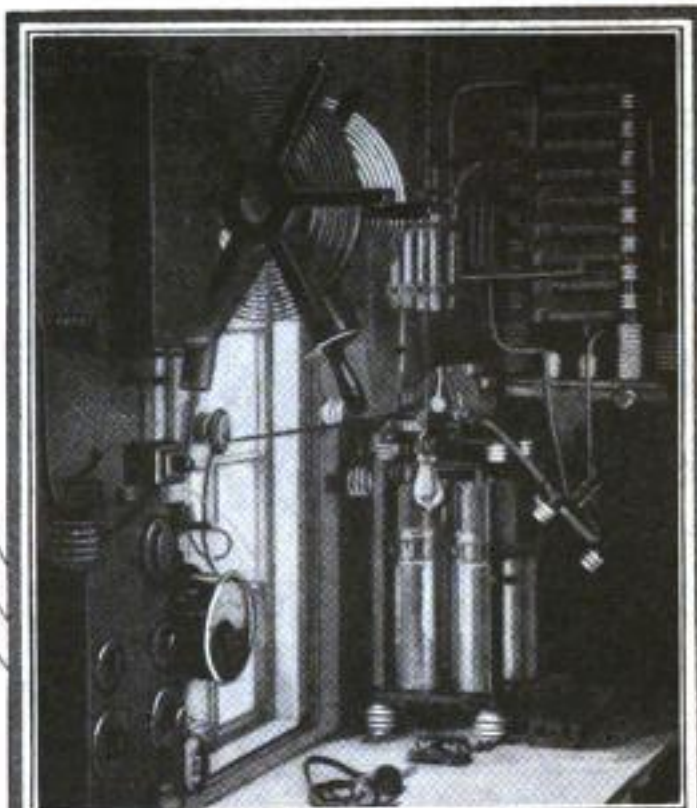
FARTHEST-NORTH RADIO WEATHER STATION

Jan Mayen Land, a tiny volcanic island north of Iceland, is in the track of arctic storms sweeping toward the coast of Norway, 600 miles distant. In order to obtain timely warning of the storms which peril its interests, the Norwegian government less than two years ago established on the island a radio station, the farthest-north station in the world, as mentioned

in the February, 1922, Popular Mechanics Magazine. Scientific men are agreed that such a station is of the utmost value in broadcasting notices of the approach of storms coming out of the north. It is in charge of Akbard Ekerold, an American citizen. The operator and his assistants are the first permanent inhabitants of the island. Similar stations are planned at other points.

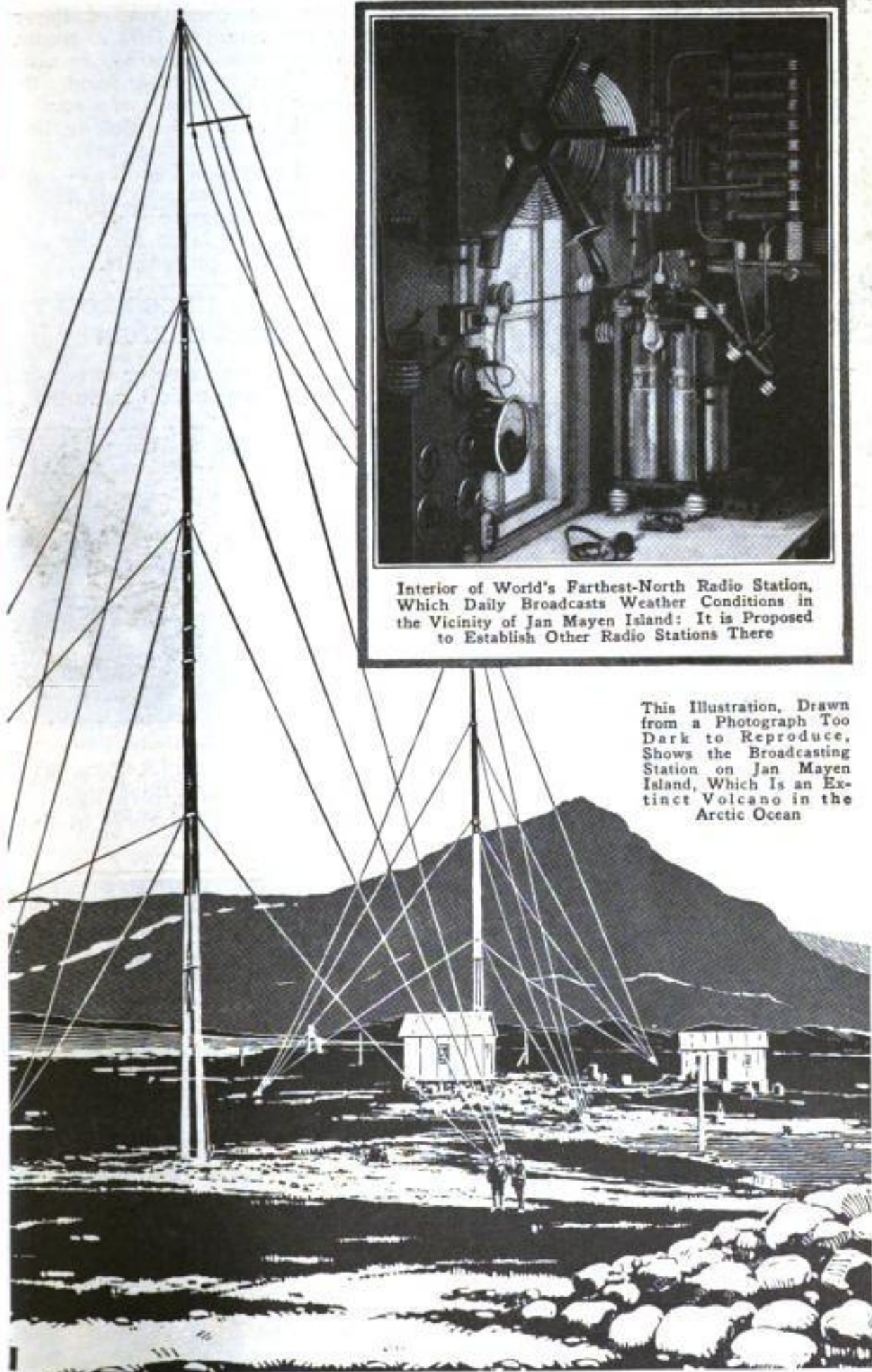


MEMBERS OF PARTY WHICH BUILT AND OPERATES BROADCASTING STATION ON JAN MAYEN ISLAND: AKBARD EKEROLD, WHO IS IN CHARGE, STANDS THIRD FROM THE LEFT



Interior of World's Farthest-North Radio Station, Which Daily Broadcasts Weather Conditions in the Vicinity of Jan Mayen Island: It is Proposed to Establish Other Radio Stations There

This illustration, Drawn from a Photograph Too Dark to Reproduce, Shows the Broadcasting Station on Jan Mayen Island, Which is an Extinct Volcano in the Arctic Ocean



GOLF SHOE MADE WITH NEW STYLE OF GUM SOLES

A golf shoe recently placed on the market has a sole about $\frac{3}{4}$ inch thick made of gum material that is different from



Golf Shoe, with Extremely Thick Yet Flexible Sole. That does Not Wear Smooth



the usual rubber composition found in the soles of sport shoes. The gum, which in this case is extremely pliable and resilient, continuously presents a rough surface even as it wears down.

"ONE-MAN" RAILROAD IS RUN WITH AUTO EQUIPMENT

When the Bangor and Aroostook Railroad last fall abandoned its branch from Brownville, Me., to an iron works, 12 miles distant, Albert L. Green, a farmer,



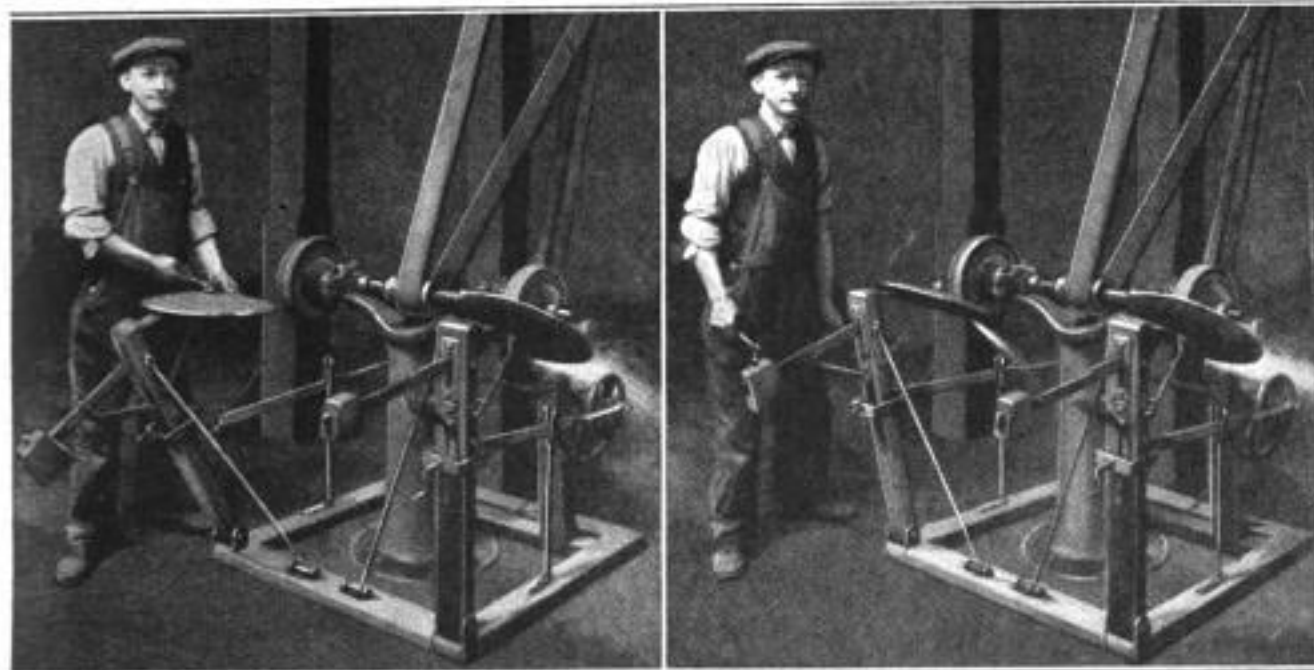
Above: The Combination Locomotive and Passenger Coach in Service, with Bulk-Freight Trailer. Note the Radiator and Auto Headlight on Front End. Right: The Manager of Maine's "One-Man" Railroad, in the Capacity of Engineer, at the Throttle of His Locomotive.

took over the operation of the road. Leasing the line for \$100 a month, he became the whole operating organization, from president to section hand. By fitting flanges to the wheels of a small automobile and housing the chassis, he converted it to a combination locomotive and box car. Long steel handles attached to the high, low, and reverse pedals made it convenient to operate them. Trailers carry freight too large for the car. It accommodates 15 passengers.

RADIO DOLL SINGS FROM TINY ROSE GARDEN

An enterprising inventor is responsible for a talented mechanical radio doll, that can both sing and lecture from the midst of a miniature rose garden. Its dress is made of fine enameled wire and serves as a tuning coil, running from its hand, like a tiny wand, to a detector set concealed in a rosebud. Two phone posts, flanking the entrance to the garden like a gateway, add to the effectiveness of the picture.





Two Views of the Harrow-Disk Sharpener and Polisher: The Balanced Springs under the Disks Allow Free Play, Yet Exert a Steady but Yielding Pressure against the Grinders

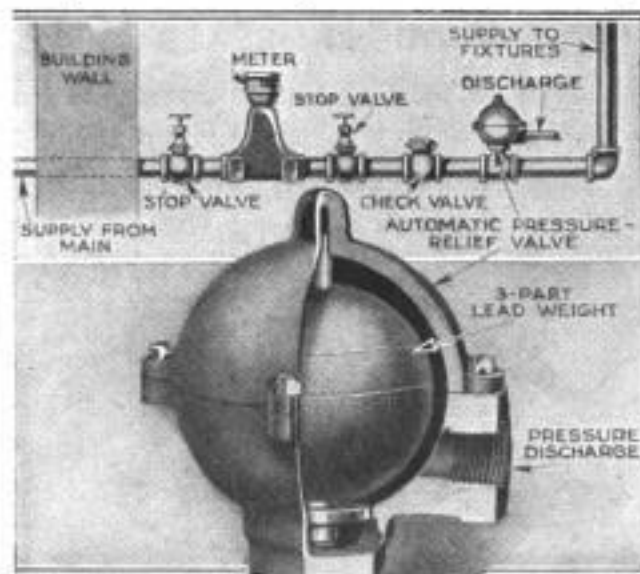
HARROW DISKS SHARPENED EASILY BY TWOS

The edges of harrow disks are sharpened, and their surfaces polished, two at a time, by means of a new emery-wheel device which performs both operations quickly and easily with one setting. Two emery wheels are mounted at opposite ends of a driver shaft, while the disks to be ground are attached to a frame that brings them both into resilient contact with the grinding wheels. The operation is semiautomatic in character, requiring only slight attention from the man in charge.

AUTOMATIC VALVE RELIEVES HOT-WATER PRESSURE

It is usual, in many household plumbing systems, to install a check valve to prevent hot water from backing into the supply main and thus into the meter. This method is the so-called "closed system." While it effectively protects the meter and prevents the expanding hot water from backing into the supply main, it at the same time creates an excessively high pressure in the plumbing fixtures and piping of the house. A tank heater left burning too long, may send the pressure soaring along with the temperature. In a closed system these excessive pressures are especially destructive to the ordinary range boilers commonly used. A newly developed device is said to cope successfully with this common danger. It operates on the dead-weight principle, and

is constructed entirely of anticorrosive metals, to insure dependability. The dead weight is a three-part lead ball, and by



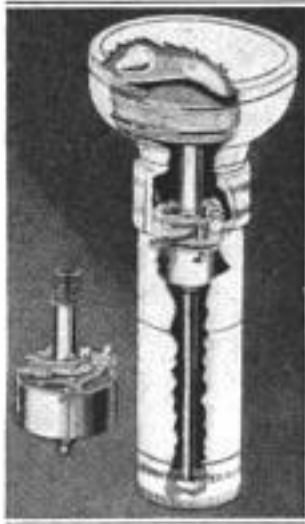
Above: The Auto Valve Installed in of an Ordinary "Closed System." Below: Close-Up of the Valve

the subtraction or addition of the various sections, the pressure in the fixtures and piping may be suitably controlled. Relief is afforded at 70, 100, or 130 pounds' pressure per square inch, as desired.

Questioning more than 5,000 children in the grammar schools of St. Louis, Mo., it was found that 40 per cent had never seen a sheep, 17 per cent had never seen a pig, 14 per cent had never seen a mule, and 12 per cent had never seen a cow. It is planned to add some of these animals to the municipal zoo.

NO-BATTERY FLASHLIGHT USES SPRING MOTOR

In a new type of flashlight just placed on the market, a spring motor takes the place of batteries commonly used. The motor weighs only 8 ounces, being so concealed in the handle that externally the flashlight presents the same appearance as the ordinary type. A single winding furnishes light for a period of 4 to 5 minutes. It is claimed for the device that its lighting qualities are not affected by exposure to dampness, or ordinary rough handling.



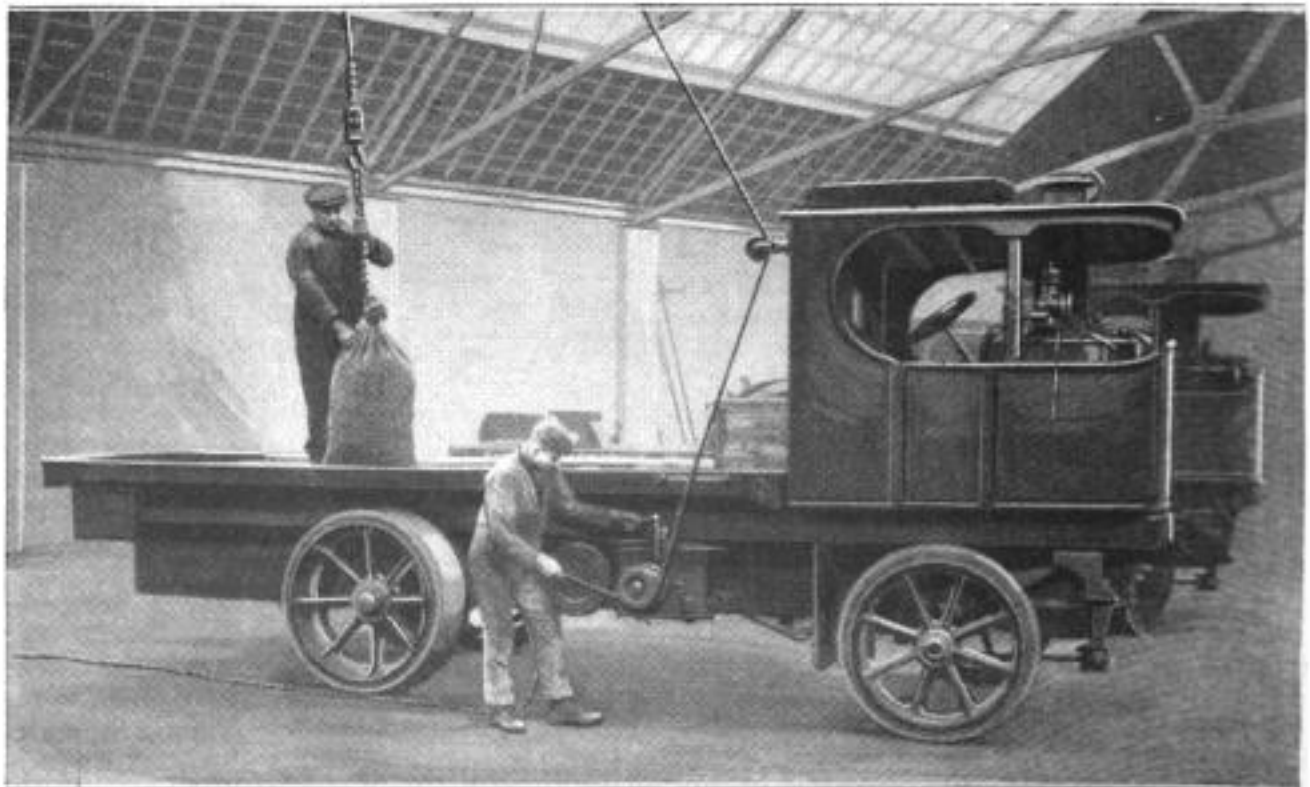
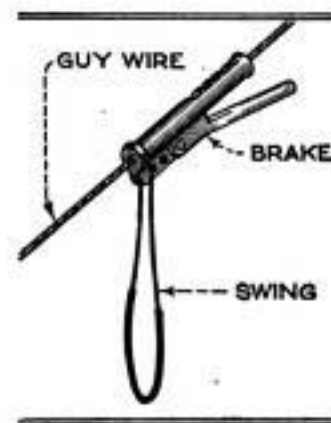
SELF-LOADING STEAM TRUCK REDUCES DELAYS

Delays in loading trucks constitute an expensive drain on their earning capacities. To reduce these delays as much as possible, an interesting power winch has been developed for use with a steam truck, practically identical with the type

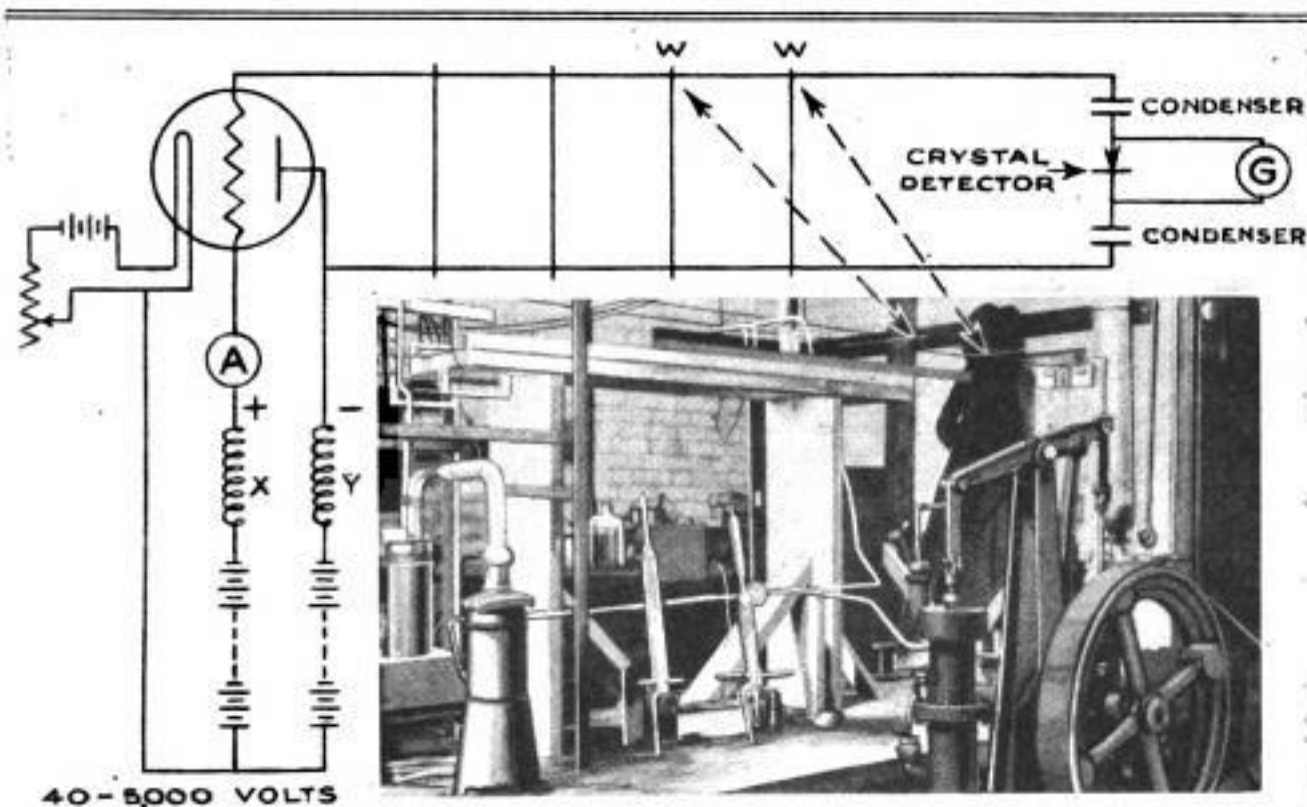
used for tipping a truck body to dump bulk materials. Power for the winch is derived from a small independent engine, and is transmitted from the crankshaft to the winch shaft by a worm and gear arrangement. At 900 revolutions per minute the engine is capable of raising a 300-pound weight at the rate of one foot per second.

OIL-WELL DERRICK WORKERS HAVE SAFETY APPLIANCE

Oil-well derrick workers now have a ready and safe means of reaching the ground, should an excessive pressure result when the gas is "struck," or should the fumes become ignited. The safeguard consists of slings which are fitted over the steel guy cables at each derrick level. In the event of danger, the workers merely climb into the outfits and slide to earth, controlling their speed by a special brake, thus eliminating the chance of receiving serious cuts from broken strands in the cables.



A Steam-Driven Power Winch on a Steam Truck: Heavy Packages are Quickly Attached to the Pulley Hook, Elevated by the Winch to the Truck Platform, and There Detached



In the Above Diagram of Apparatus for Producing Extremely Short Radio Waves, X and Y Are Choke Coils Forcing High-Frequency Oscillations on Two Parallel Wires of the Aerial. Cross Wires, W, are Moved Until Galvanometer G Indicates Minimum Deflection. The Picture Shows the Mercury-Vapor Pump and Other Parts of the Apparatus

POWER TRANSMISSION BY RADIO

BY OTIS S. SAWN

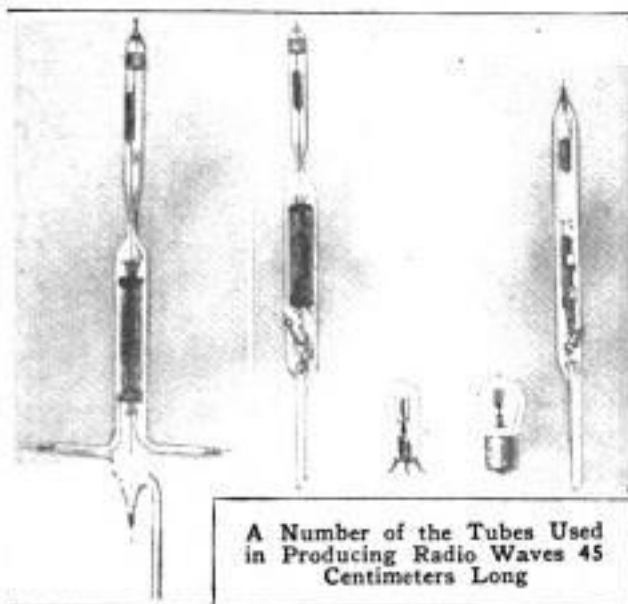
RECENT experiments in an eastern engineering institute on power transmission by radio, have resulted in the discovery of some interesting phenomena.

It is known that wireless waves may be more or less directed in one vertical plane. They have never been directed in a single line. That is, if a man were sending in a valley to a man on top of a mountain, and his waves were directed, every one between the two stations could pick them up. Now it is possible to so direct the waves that no one not in a straight line between the two stations could receive them. This opens up possibilities of power transmission.

If the waves may be so controlled that they are in a straight line, there will be very little energy lost due to promiscuous radiation. Hence, if one kilowatt could

be sent out, very nearly one kilowatt would be received. Why has no one ever done this before? The answer is simple. Wireless waves in use today are about

300 meters or longer. These long waves are many more times liable to radiation and diffraction than shorter ones. This is so because of the inability to control their direction. The problem, therefore, is to make short waves. Previous experiments have been conducted with waves around 50 meters in length, and now waves of the unprecedented shortness of 45 centimeters have been



A Number of the Tubes Used in Producing Radio Waves 45 Centimeters Long

produced. With an apparatus capable of producing waves of, say, 50 centimeters, it would be comparatively simple to make them transmit power. Waves as short as this are of the nature of light waves but are not seen by the eye. So, the rig-

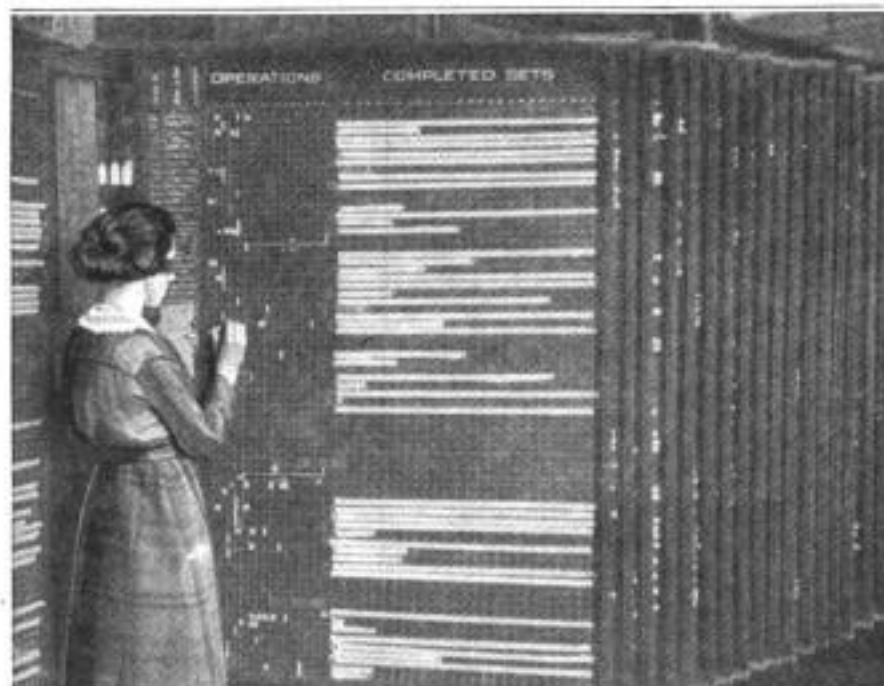
ging up of an aerial consisting of a foot or less of wire, in the focus of a parabolic reflector, and a receiving outfit of a similar aerial and with a similar reflector, would constitute the complete outfit. The unsolved part of the problem, however, lies in getting a tube which will stand up under one kilowatt, or more, and such

short waves. At present, tubes are being made to stand this strain and when they have been found satisfactory, the question of practicable power transmission by radio will not remain long unsettled. It might be well to state that this problem is not to be confused with wireless control of motor apparatus.

PRODUCTION-CONTROL BOARDS VISUALIZE PROGRESS

In manufacturing plants where a large variety of parts, involving many different

operations, enter into the finished product, an accurate record must be kept of



The Exact Progress of Any Assembling Unit in the Plant can be Quickly Told by Glancing at These Boards, Arranged in an Eastern Automobile Factory

the progress of the various units through the plant, in order to have the required number arrive on schedule at the assembly department. An eastern automobile factory uses for this purpose 24 control boards, on which the exact location of any unit is indicated by means of celluloid buttons. These are marked with the number of units in the batch and the department where they can be found, and are moved ahead as the work progresses. A vertical line on the board indicates the schedule standard and shows which departments are behind with their work.

FACTORY-MIXED CONCRETE DELIVERED BY MOTOR

The delivery of ready-mixed concrete in any quantity required, from a central

plant to the site of operations is a new business in the larger cities. That concrete of any desired mixture can be prepared more economically in a factory than in the field, is, of course, only natural. There is a certain limitation, however. The consistency of the concrete must be kept sufficiently plastic to allow its flowing off the truck floor easily and without separating. However, there is a wide range of work, such as foundations, piers, sewer constructions, and street pavements, where ready-mixed concrete may be employed.



Delivering Factory-Mixed Concrete in Trucks of This Type has been Tried with Success in Larger Cities

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AUTO "PIE WAGON" SYMBOLIC OF CHANGING WEST



Old-Time Stockmen of a Wyoming Ranch, Out on a Round-Up, were at First Shocked When This "Gasoline Pie Wagon" Hove in Sight. Later, However, They Found That It Possessed Many Advantages over the Old and More Familiar Outfit

Life on the open range seems to have bred in the stockman and cowpuncher the Indians' aversion to "devil wagons" and "smoke chariots," and long after the farmer of the middle West turned his stable into a garage, the men of the range still regarded motor cars askance. The old-timers declare that the last note in the passing of the old West has been struck by the appearance of the motor truck as a substitute for the time-honored mess wagon.

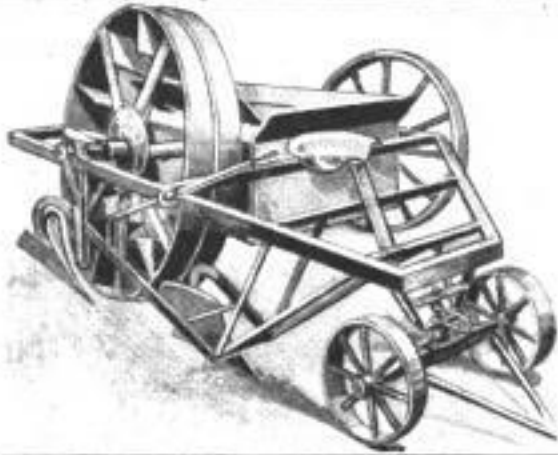
It was somewhat of a shock to those accustomed to the old method of spring branding, when the round-up crew of a big Wyoming outfit appeared on the range accompanied by a motor truck to carry the cowboys' beds and cooking utensils, but the "gasoline pie wagon," as it was termed, covered many a mile of sage-brush country, and proved a great success. Such a machine can easily run back to the ranch for additional supplies—a practice unheard of previously.



The Tent Carried by the Motor Truck is Erected So That, When Shut, It Incloses the Entire Body. In This Way the Floor of the Car can be Used for Sleeping Quarters, While in the Daytime the Truck and Tent, Respectively, Serve as Dining Room and Kitchen

MACHINE PLOWS, ELEVATES, AND DUMPS EARTH

In excavating for buildings, a device recently brought out in the West is likely to



Elevating Grading Machine Which Loosens Up a Furrow of Earth, and Deposits It into an Elevating Wheel, Which Carries It to a Central Dump Box

prove efficient. A right-hand plow loosens a furrow, while a left-hand plow throws the earth into an elevating wheel, by which it is carried upward and thrown by deflectors into the central dump box. The machine fills the box in a distance of 30 feet, and may be dumped without stopping.

ARMY TESTS FASTEST PURSUIT PLANE

The fastest military pursuit plane in the world, which was modeled after the world's fastest airplane, in which General Mitchell established a record of 224 miles an hour, has been given preliminary tests at Hazelhurst field, L. I. It will be fully

equipped with fuel, oil, machine guns, ammunition, photographic apparatus, and other devices required in an army pursuit ship. An important development in this plane is the ability to get off the ground in cold weather in less than five minutes, accomplished by short-circuiting the wing radiation system for the engine-cooling water. Another feature is the cellular wing construction, which is practically immune to shrapnel fire.

COMBINED UNION AND VALVE SIMPLIFIES PIPING

A valve-containing union has just been developed which has a variety of applications in steam or liquid-piping layouts.

In place of two union tailpieces, a valve and a union tailpiece are provided, with a wrench-operated valve body mounted between them. This arrangement is of particular benefit when the unit is used as a cap on dead ends, as the line may be extended at any time without shut-down.

It may also be used as an auxiliary valve for cutting out parts of a line without rendering the whole line dead by the closing of a main valve. The valve-union is furnished in all usual sizes, and is of all-bronze construction, in accordance with standard practice.



Army Pursuit Plane That Is a Modification of the Airplane with Which General Mitchell Established a Speed Record: In Addition to Speed, It Features a Wing Structure That Is Practically Invulnerable to Shrapnel Fire, and the Ability to Start Quickly in Cold Weather



A White Brother of the Snake

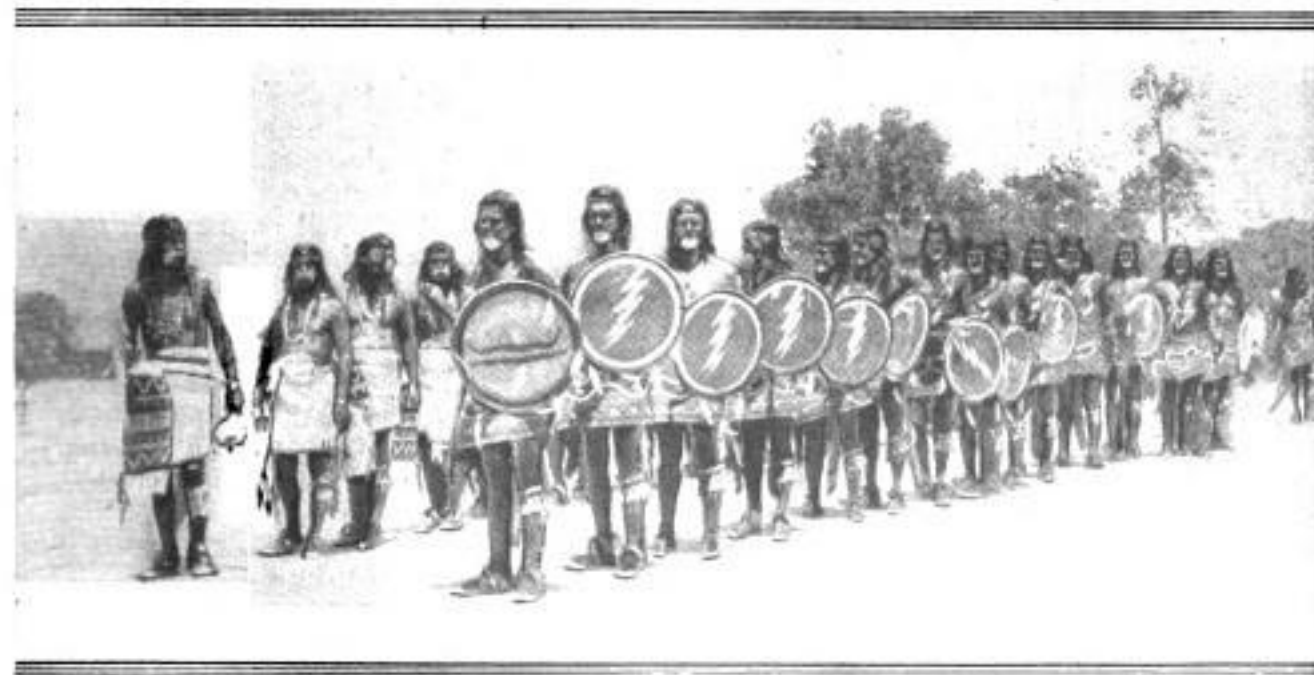
BY LYLE ABBOTT

WELL in advance of the growing sentiment in favor of expressing American tradition in pageantry, is the effort of Arizona, the newest state, to preserve what is undoubtedly the oldest ceremonial still performed in the United States.

For two years, citizens of Prescott, Arizona's first territorial capital, have reproduced the rain ceremonial of the Hopi Indians, the snake dance, by means of which this desert tribe indicates its

compliance with the commands of its principal deity. The third reproduction of the snake dance by white men, students of the Indian ritual and long practiced in the art of its steps and chants, will take place in June, this year.

It is not easy for Caucasians to transform themselves into acceptable Indians, but the men of the "Smoki" tribe of Prescott have done it, and with greater success last year than the year before. They look forward to a higher degree of per-



"Antelopes" Lined Up on the Left, and "Snake" Priests on the Right, in a Procession of the "Smoki" Tribe, Which is Composed of Citizens of Prescott, Arizona, Who Aim to Preserve, by a Yearly Pageant, the Ancient Ceremonials of the Hopi Indians



The Reverential Prayer of the Smoki: Facing and Guarding the "Kisi," the Priests Invoke the Blessing of Their Ancestors, and Call to Their Little Brothers, the Snakes, in Mimicry of the Savage Worship of the Early Indians

fection in their next effort. For unlike the usual attempts to "make up" as

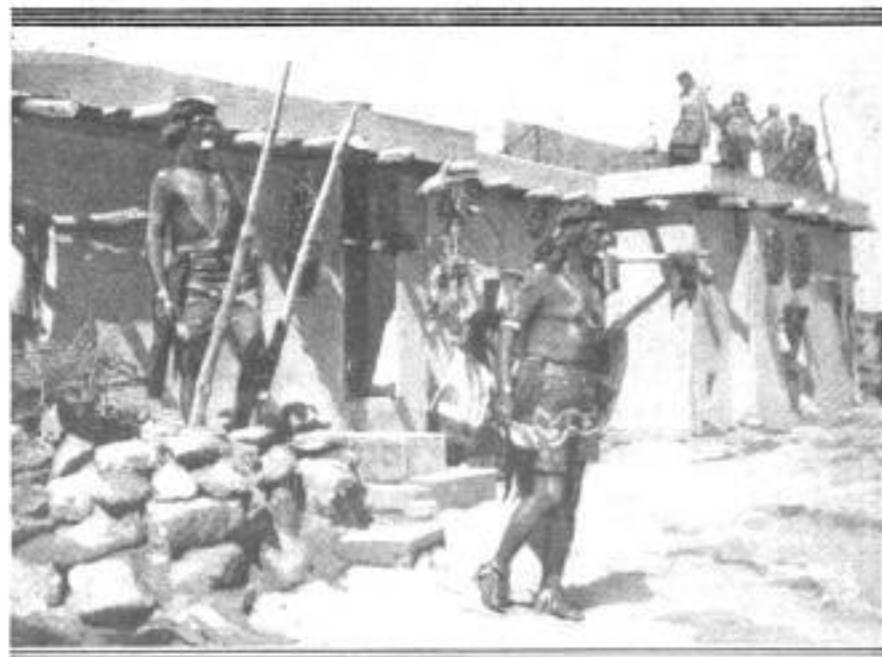
Indians, the Smoki (a coined name by which the organization is known) actually transform

themselves into the medicine men, or priests, whose parts they play. It is impossible to go behind the scenes of the original Hopi ceremonial, except one be favored as was Colonel Roosevelt in 1913, when he went into the rock-carved kivas at Walpi and watched the preparation of the rattlesnakes. But whereas Colonel Roosevelt told us, after he had left the underground chamber, that his lips were sealed by his position as the guest of a noble and peaceful race of Indians, ours are not, and we recount how the Smoki get ready to give their dramatized version of the same dance.

A brown, coppery stain, when properly applied, alters the paleface to a redskin. The Smoki men do not color themselves to a chorus of incantations, but with a considerable degree of scientific study. They stain their entire bodies until they closely resemble the dusky race. They cover their hair with long black wigs; hang beaded ornaments at knee and elbow, and wrap their loins in kilts such as the



Beginning of the Weird Dance of the Smoki, with the Snake Priests and Their Little Brothers Exhorting the Rain Gods to Be Good to Their Dusty Fields



Snake Priests Leaving the Kiva: These Priests Carry Live Rattlesnakes in Their Mouths, and Color Their Chins White, and Their Cheeks Black



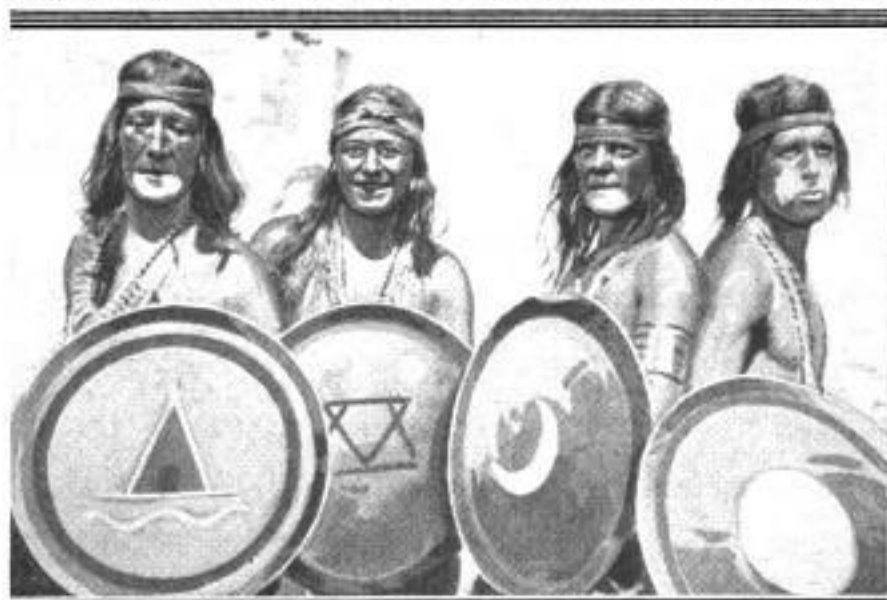
The Wind-Up, as It is Called, in Which Everyone Clings to a Snake, Ready to Deposit It in the Ring of Sacred Cornmeal Which has been Spread upon the Ground: This Is One of the Wildest Parts of the Ceremonials

real Indians wear. These extremely short skirts are the product of a distinguished artist who lived for many years in Hopi villages, and knows their language and customs.

The final touch to the costume is the characteristic paint. Each dance is participated in by the priests of two divisions of the Smoki tribe. The "snake" priests — principal actors in the dramatic pageant — carry the live and deadly rattlers in their mouths, and color their chins white and their cheeks black. The "antelope" priests, who sing the monotonous chants, reverse the coloring, wearing white on cheek and black on chin.

On the breasts and backs of the latter are painted in white the rain-cloud symbol, a large white blob from which descend two streamers, representing rain and lightning. The snake priests wear on their bodies and upper arms the white zigzag symbols of that trinity peculiar to Hopi ritual: Snake, Lightning, and Winding River.

On the arena, which in June will be the scene of this unusual pageant, a reproduction of a Hopi village is constructed of



Left to Right: Chief Snake Dancer with Shield Symbolic of the Kisi and Rattlesnake; Sanctifier of the Dance Rock with Shield of Antelope Clan; Snake Priest; and an Antelope Priest



The Tom-Toms: Whether the Dance Be the Measured One of the Antelopes or the Wild Half-Gallop of the Snakes, the Priests Keep Perfect Time

light material, but without a detail lacking, even to the sun-curing meat hanging from the walls, and plenty of dusky kids play about like those who swarm in every Indian pueblo.

With such a background, the white men perform a dance they hope to preserve from the altering hand of time.

Dancers of the Smoki find it easy to forget their culture. They encounter no difficulty when the spell is on them. They cast off the veneer of civilization, finding deep inside themselves a well of savagery that makes the muscles tireless and inspires the chants. No case of stage fright has been recorded, for each Smoki fairly lives his part. Under the stimulus of the incessant beating of the drums, the banker, the lawyer, the mine superintendent, and the grocery clerk lose themselves in the aboriginal, and dance and sing, not gayly, but gravely and earnestly.

How do the Hopi like it?

The Indian is reserved and more than a little jealous of his ceremonies. Anyone in the Southwest knows that it is safer to tamper with the rattlesnake itself than with the ceremonial dance of which it is so important a part.

Yet the medicine men of the Hopi, some of whom have added a college education to the tribal traditions that go by word of mouth from generation to gen-

eration, are intensely interested in the white man's mimicry. And next summer some of them hope to see the Prescott reproduction for the first time.

Leaders of the pageant movement have gone to the Hopi and consulted them. They have frankly disclosed their purposes and have won approval for the Smoki dance. Helpful hints of a kind never dreamed of have been given by the Hopi to the white men. The Indian has rehearsed emissaries of the Smoki in his oldest customs, probably withholding some of the phases, but willingly confiding secrets of dress, intonation, and rhythm.

It is the desire of the Smoki to add to and expand their Indian pageantry, so that by 1926, when the rest of America is rehearsing the landing of the Pilgrims, the signing of the Declaration of Independence, and the founding of New Amsterdam by the Hollanders 300 years ago, there will be in the Southwest a pageant going back still farther. It may deal with the Indian account of the creation—something oddly like our own Biblical one. It will certainly seek to probe the history, buried in legends, fireside tales, myths, religious rites, and tribal traditions that hold the key to the earliest inhabitants of the southern Rocky Mountain region.

FILMING A LIGHTHOUSE FROM THE AIR

BY H. E. THOMAS

THE monotony of the tireless vigil at the Tillamook Rock lighthouse, probably the loneliest station of the service, was relieved recently when a photographer for a moving-picture company made a film of the rock and its surroundings.

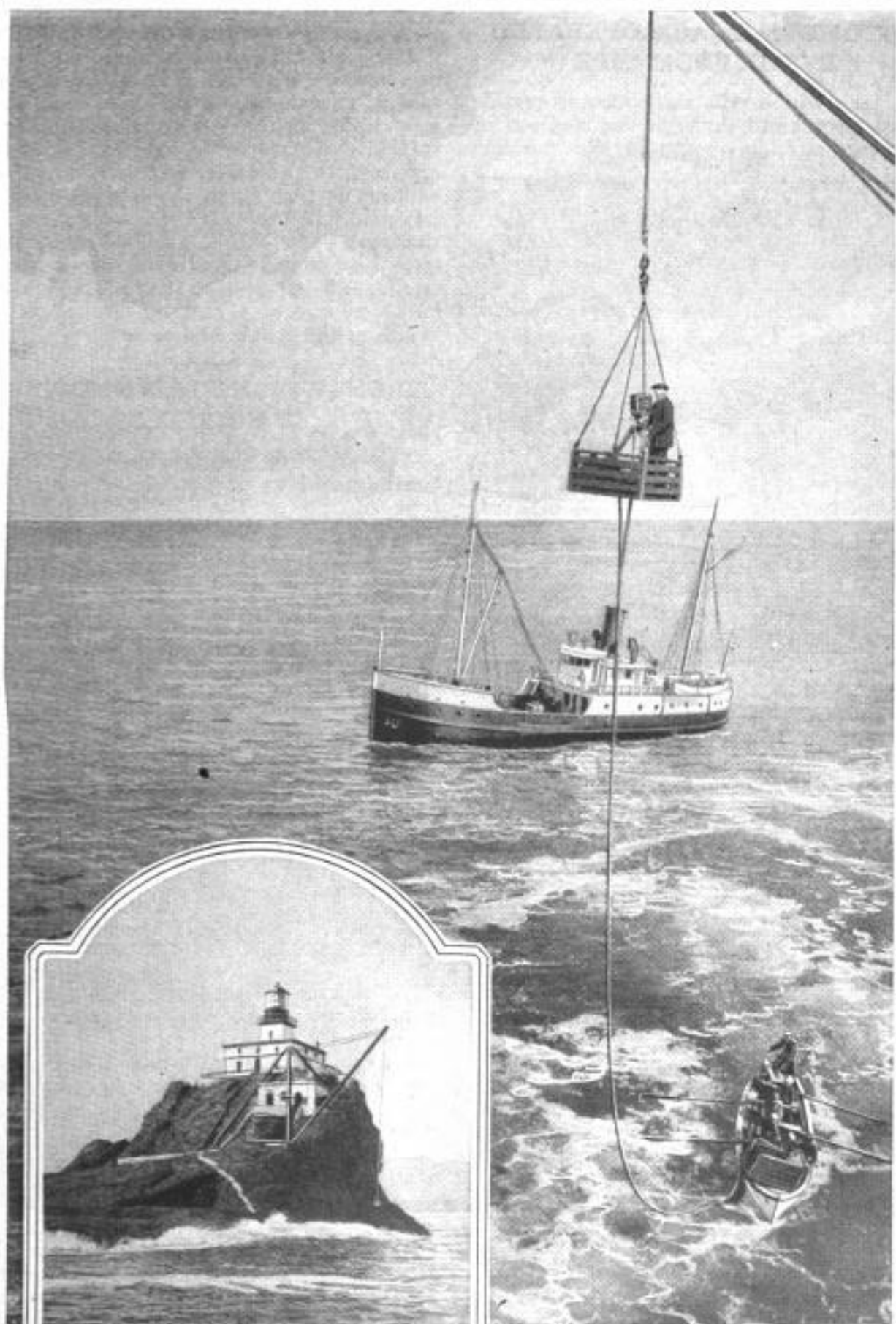
Tillamook Rock is located a mile off the coast of Oregon, near the mouth of the Columbia River, and is known to every mariner who sails the Pacific. A rough sea almost constantly breaks against its base, and only in the calmest weather will even a small boat attempt a landing. When the lighthouse tenders, "Rose" and "Manzanita," make their periodical visits, they stand off at a distance and supplies for the lighthouse are transferred to a small boat, then hoisted to the rock by means of a derrick.

This derrick came in handy when the photographer made his call. Suspended from the derrick in a cage, he obtained fine views of the rock and its environs,

the pounding waves breaking almost directly beneath him.

The lighthouse has its foundations anchored in the solid rock, which rises 85 feet above the sea, and is tended in turn by three keepers.

Although the coastline is rough and threatening, few marine disasters have occurred in this locality, for the Tillamook light sends out its friendly beams to guide ships into the Columbia. In a storm, the wind howls and tears at the lighthouse as though it would sweep it from its foundations. Men in the government service still find a favorite topic in a gale of two decades ago, when the waves dashed clear over the lighthouse and threw rocks against it with terrific force. One of the boulders shattered the lenses of the light, letting in the heavy seas to drench its occupants. This piece of rock is still preserved as a souvenir in the office of Robert Warrack, superintendent of the 17th lighthouse district.



While the Camera Man Hangs Suspended in a Cage, He is Filming the Tillamook Rock Lighthouse, Its Tender, and a Small Boat. Left: "Loneliest Lighthouse," and Derrick Used in Landing Supplies in Rough Weather

AUTOMOBILE JACK OPERATED BY AIR FROM TIRE

A jack which will raise an automobile from the ground through the medium of five pounds of air



Left: Close-Up of the Air-Operated Jack Which Weighs Only 11 Pounds. Above: Showing the Connecting Hose Conveying Air from the Tire to the Jack. A Lock Arrangement Supports the Car Securely After It has been Raised

obtained from one of the tires, is a new accessory. The appliance may also be operated by means of a hand or motor pump, or by a compressed-air inflating hose, such as are commonly seen at filling stations. The jack weighs but 11 pounds, and is said to raise a five-ton truck as easily as a small car, requiring only 15 seconds. In using, the simple outfit is placed under the front or rear axle of the machine, which it elevates quickly and with minimum of effort on the part of the motorist.

COMBINATION TABLE AND VISE FITS ANY DRILL PRESS

Of interest to machinists is the recent marketing of a combination vise and drill table which can be readily attached to any drill press. The entire unit is de-

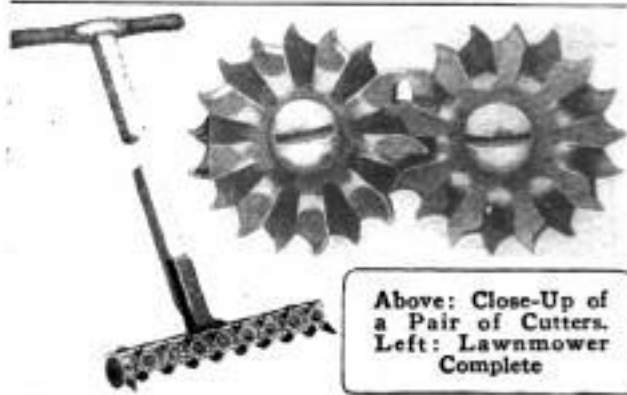


A Combination Drill Table and Vise: When Closed, the Vise Forms a Table Which will Turn Over Three-Fourths of a Revolution in Either Direction

signed to fit into the socket formed for the regular table, and is made to swivel in the same manner. The attachment is said to save considerable time in drilling operations, as the worker does not have to hunt up a separate vise for clamping his work to the table. An additional advantage is that when the vise is open, it forms a split table so that projections on the work piece can be placed in the opening. For convenience in making replacements, the vise jaws have been made both removable and interchangeable, avoiding the trouble of refitting.

LIGHTWEIGHT LAWNMOWER IS NOISELESS

The noise of the lawnmowing operations is said to be eliminated by a new type of mower recently developed and placed on the market. It is similar in appearance to the general style, but the cutters consist of 16 small gear-shaped wheels, having beveled finlike edges. These fins are adjustable and intermesh



Above: Close-Up of a Pair of Cutters. Left: Lawnmower Complete

with each other, resulting in great evenness of cut at any desired height. Two side wheels, only 2 inches in diameter, make possible close cutting around trees or shrubbery without resorting to hand trimming. The machine weighs only 7 pounds.

TO BUILD NEW ART MUSEUM NEAR PHILADELPHIA

A \$500,000 art museum to house the \$3,000,000 collection of paintings owned by Dr. Albert C. Barnes, chemist and art connoisseur, is to be built at Merion, a few miles from Philadelphia. The structure will be erected on a tract said to contain one of the finest private arboretums in the country. In the collection of Doctor Barnes are numerous canvases representative of the best in the modern

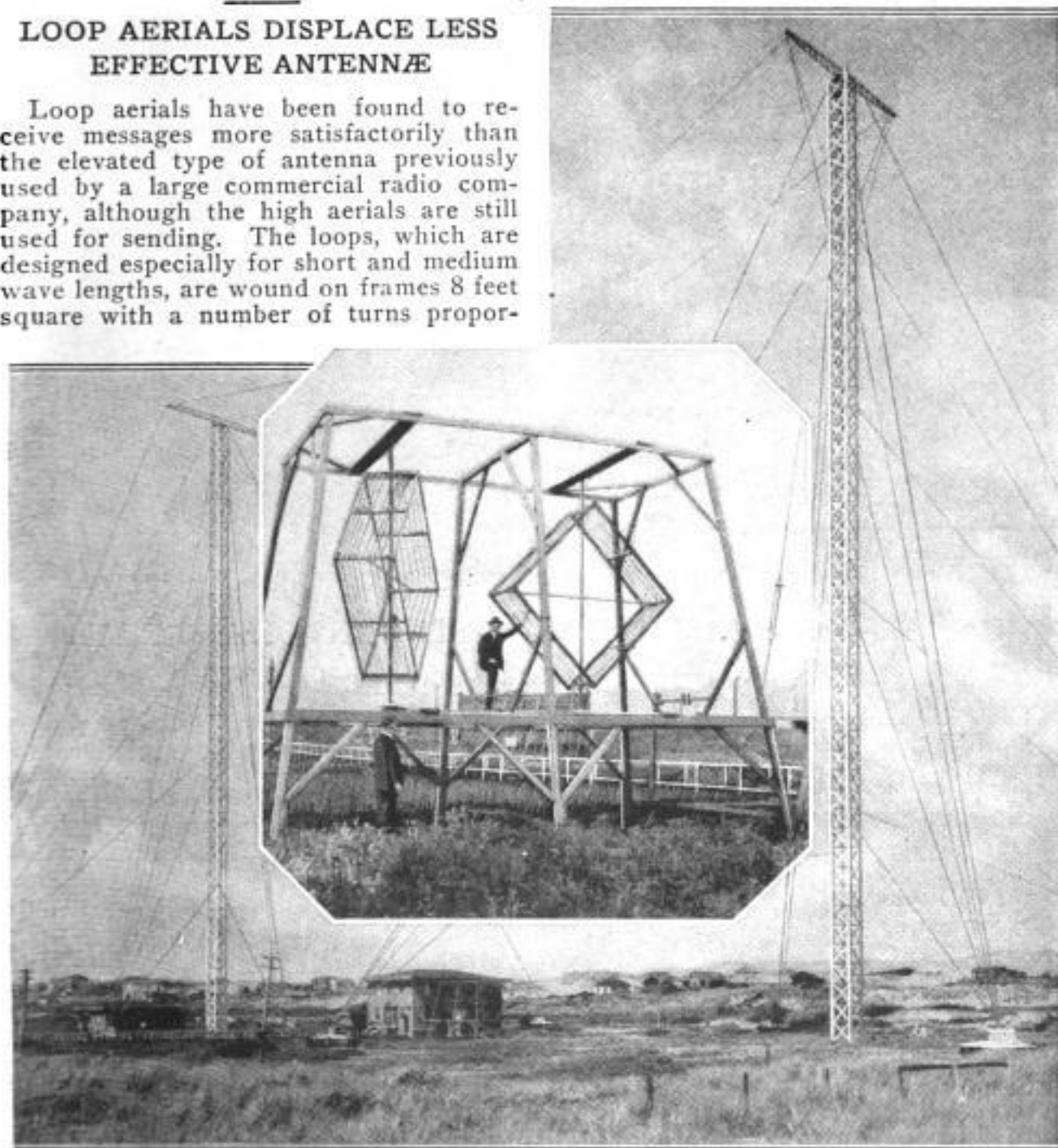
French school, while about one-third are by American artists. The collector has also arranged to leave a large sum of money for other purchases, and intends, eventually, to turn the museum over to the public.

LOOP AERIALS DISPLACE LESS EFFECTIVE ANTENNÆ

Loop aerials have been found to receive messages more satisfactorily than the elevated type of antenna previously used by a large commercial radio company, although the high aerials are still used for sending. The loops, which are designed especially for short and medium wave lengths, are wound on frames 8 feet square with a number of turns propor-

PLAN TO HAVE INTERPRETERS ON BUSES IN LONDON

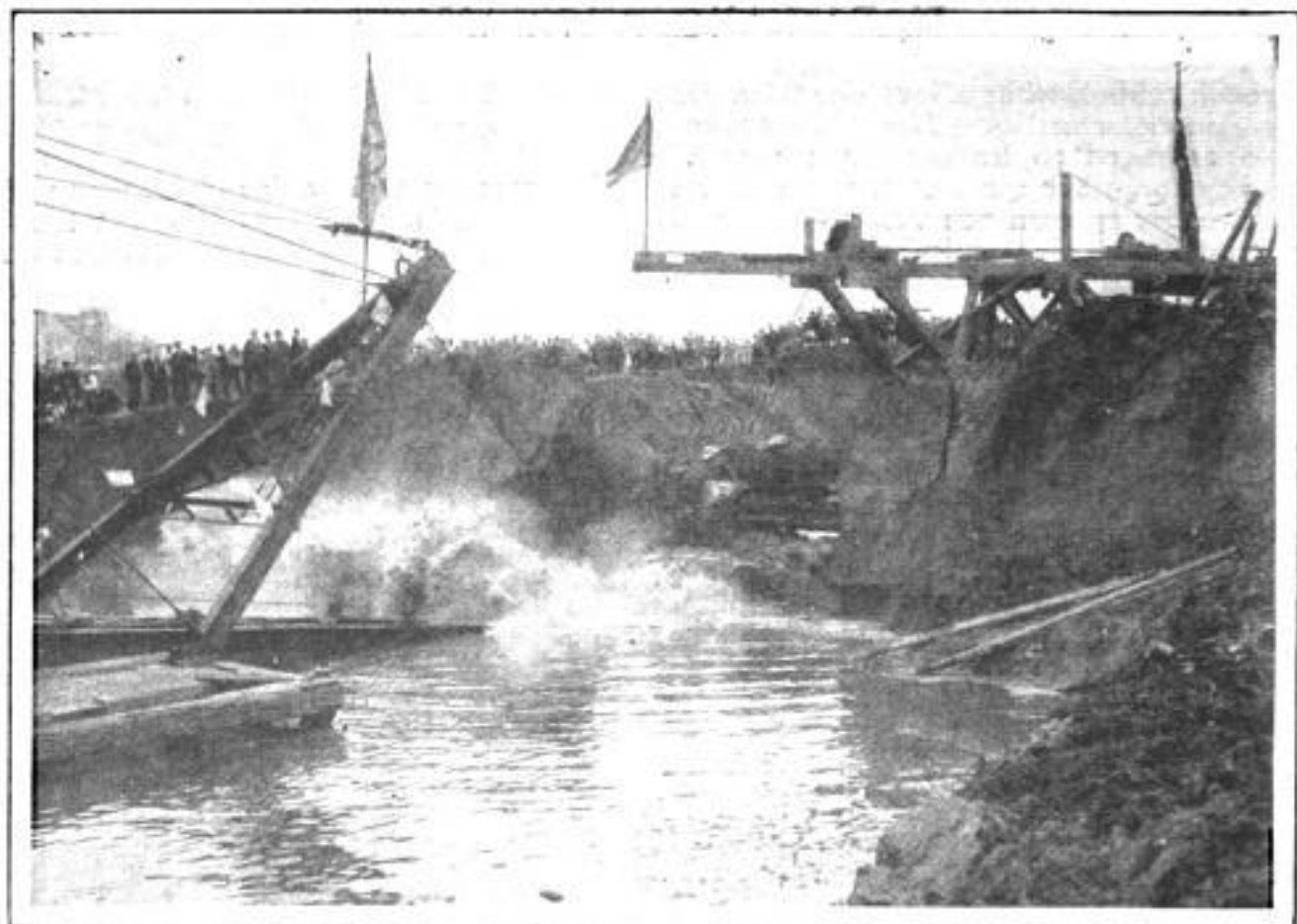
Interpreters will be found on many of the London busses during the next tourist season, according to a report from that



Antennæ, 300 Feet Long and Fastened to the Top of the 250-Foot Steel Towers Shown Above, have been Abandoned for Receiving Radio Messages by a Large Commercial Radio Company, Which is Now Using the Loop Aerials Shown in the Center

tionate to the wave length of the signals to be received. They are arranged to be revolved by gearing from the receiving room, in order to place them in the plane of the incoming waves, and thus eliminate from the receiving circuit much of the interference arising from near-by commercial and amateur stations.

city. It is expected that the innovation will be of benefit to foreigners sight-seeing in the city, and it has also been suggested, seriously, that the men will be of great aid to Americans who, it is asserted, sometimes have difficulty in making the conductors understand where they wish to alight.



Hydraulic Dredge Making the Final Cut That Connected the New Orleans Industrial Canal with the Mississippi River: This Canal, Which has Been under Construction for Nearly Five Years, was Thrown Open to Navigation on February 6, This Year

CANAL JOINS MISSISSIPPI AND PONTCHARTRAIN

By T. E. DABNEY

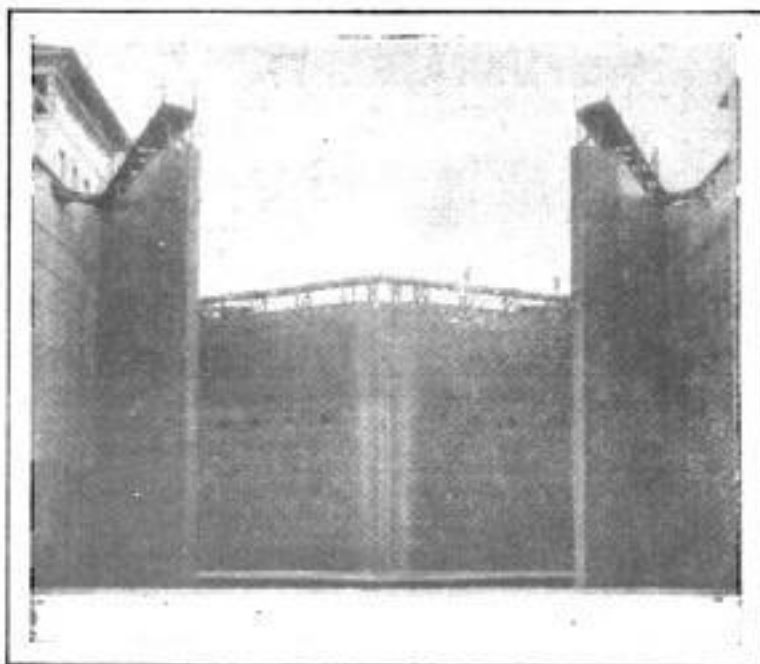
NEW ORLEANS' industrial canal, which has been under construction for nearly five years, was thrown open to navigation February 6, this year, when the city fire tug "Samson" carried a distinguished assembly of Louisianians, headed by Governor Parker, through the mighty lock.

The canal was connected with the Mississippi on January 29, when two hydraulic dredges cut through the levees that hold back the floods of the Father of Waters, joining it with the forebay, the half-mile link between the

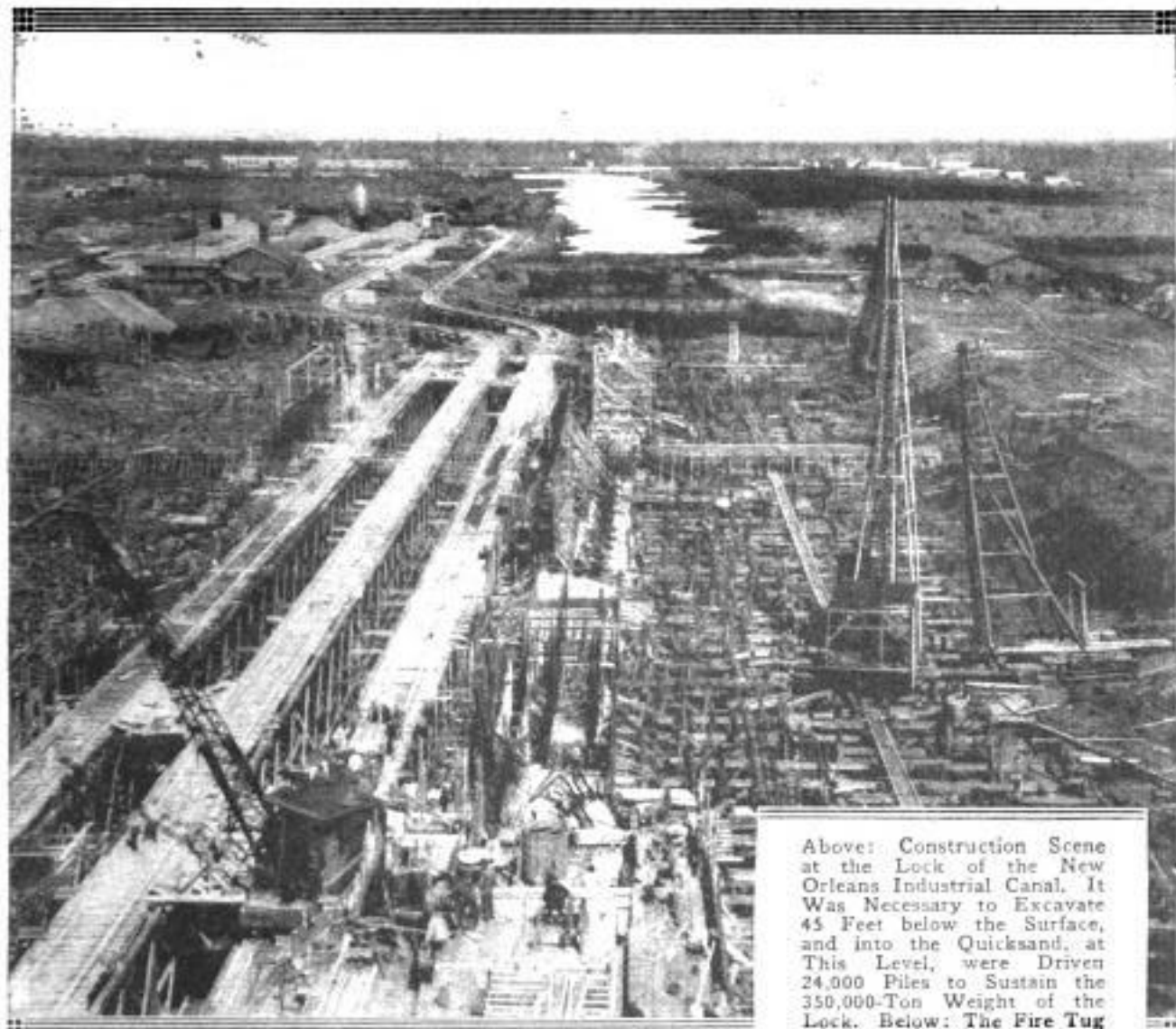
river and the lock. Levees had previously been built along both banks of the forebay. A full account of this large undertaking appeared in the October, 1919, issue of Popular Mechanics Magazine.

A recapitulation of the important points is here given:

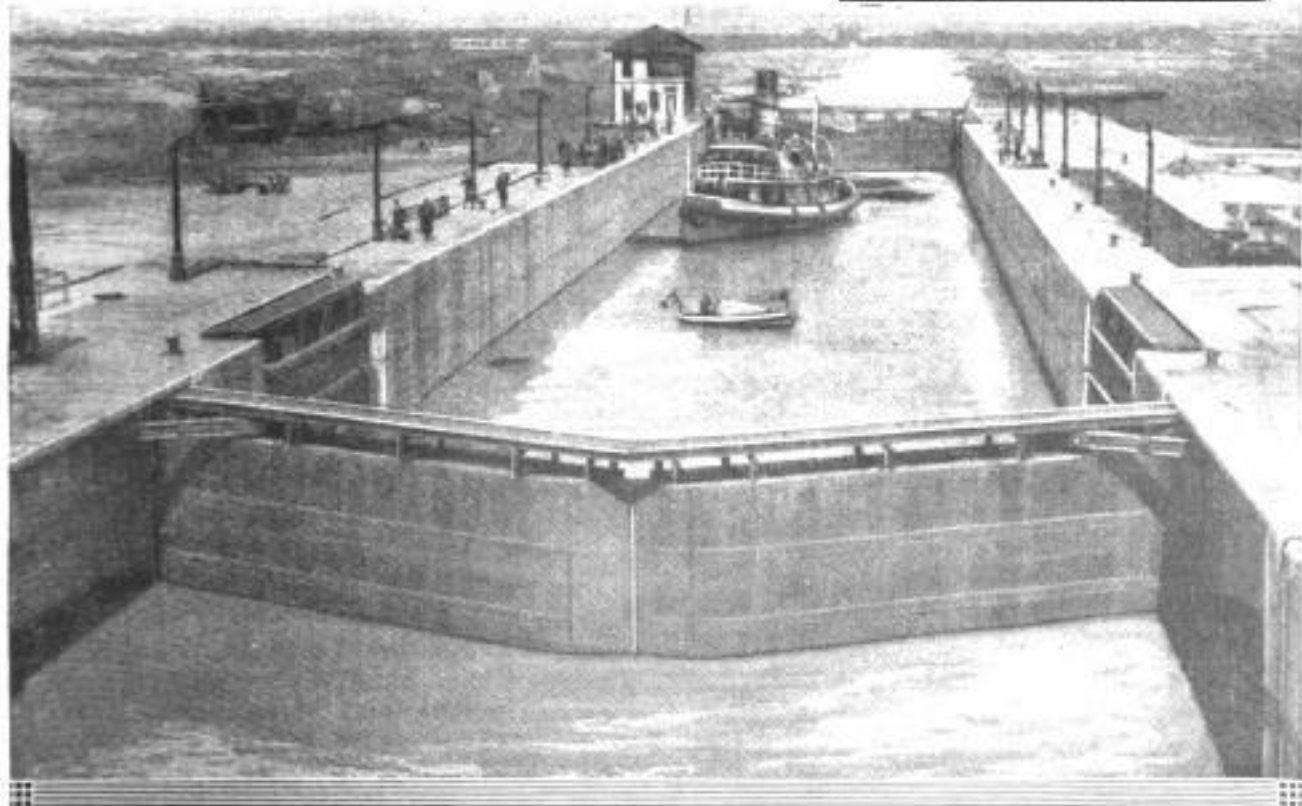
The industrial canal is $5\frac{1}{3}$ miles long. It connects the Mississippi River and Lake Pontchartrain, which is not a lake but an arm of the Gulf of Mexico. Ultimately, it is believed, ocean vessels will enter New Orleans by the lake route, which is not only shorter,



Two Sets of the 200-Ton Gates Used in the Lock of the New Orleans Industrial Canal: Note That One Set Is Open and the Other Set Closed



Above: Construction Scene at the Lock of the New Orleans Industrial Canal. It Was Necessary to Excavate 45 Feet below the Surface, and into the Quicksand, at This Level, were Driven 24,000 Piles to Sustain the 350,000-Ton Weight of the Lock. Below: The Fire Tug "Samson," of the Dock Board of New Orleans, Which Was the First Boat to Enter the Lock



but free from the peculiar problems of the jetties at the mouth of the river, where the navigation of the Mississippi is always more or less of a problem.

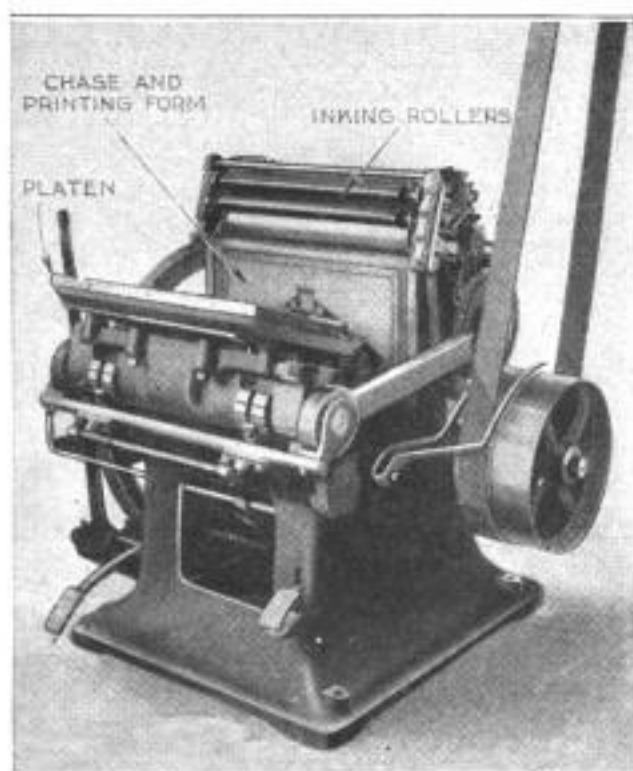
The canal and lock have cost, to date, about \$19,000,000. If development is carried on in accord with present plans, it will have cost about \$50,000,000 within the next quarter-century.

The lock is 1,020 feet long by 120 feet wide. The maximum depth of water over the sill is 31 feet, and ships up to 31-foot draft can thus be accommodated.

The lock is built of concrete, in one piece, weighing, with its gates and

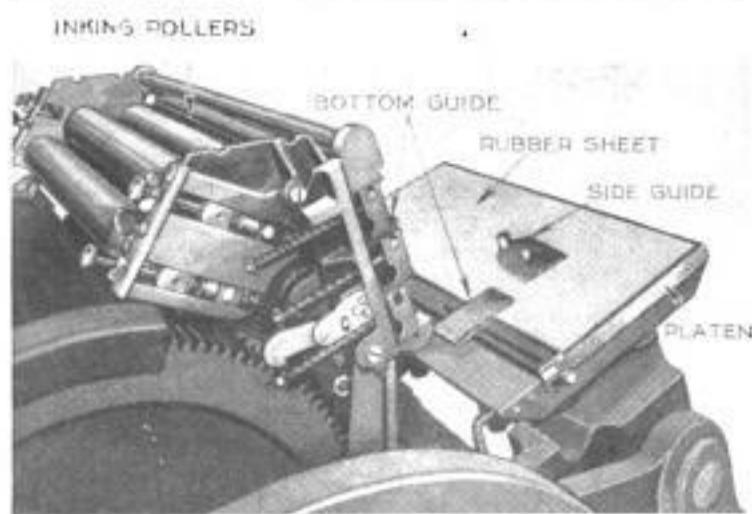
machinery, 225,000 tons, and filled with water, 350,000 tons. It rests upon 24,000 sixty-foot piles, which support, by friction, this vast bulk upon a quicksand foundation. There are five sets of gates, weighing 200 tons each, and an emergency dam weighing 720 tons. This dam consists of eight girders, 80 feet long, 3 feet wide, and 6 feet high, which are dropped, by an electric crane, into slots in the wall of the lock.

The canal was built to provide waterside sites for industrial plants, which, under a Louisiana law, could not own water frontage.



IMPROVED PRESS IS ADAPTED FOR PRINTING ON WOOD

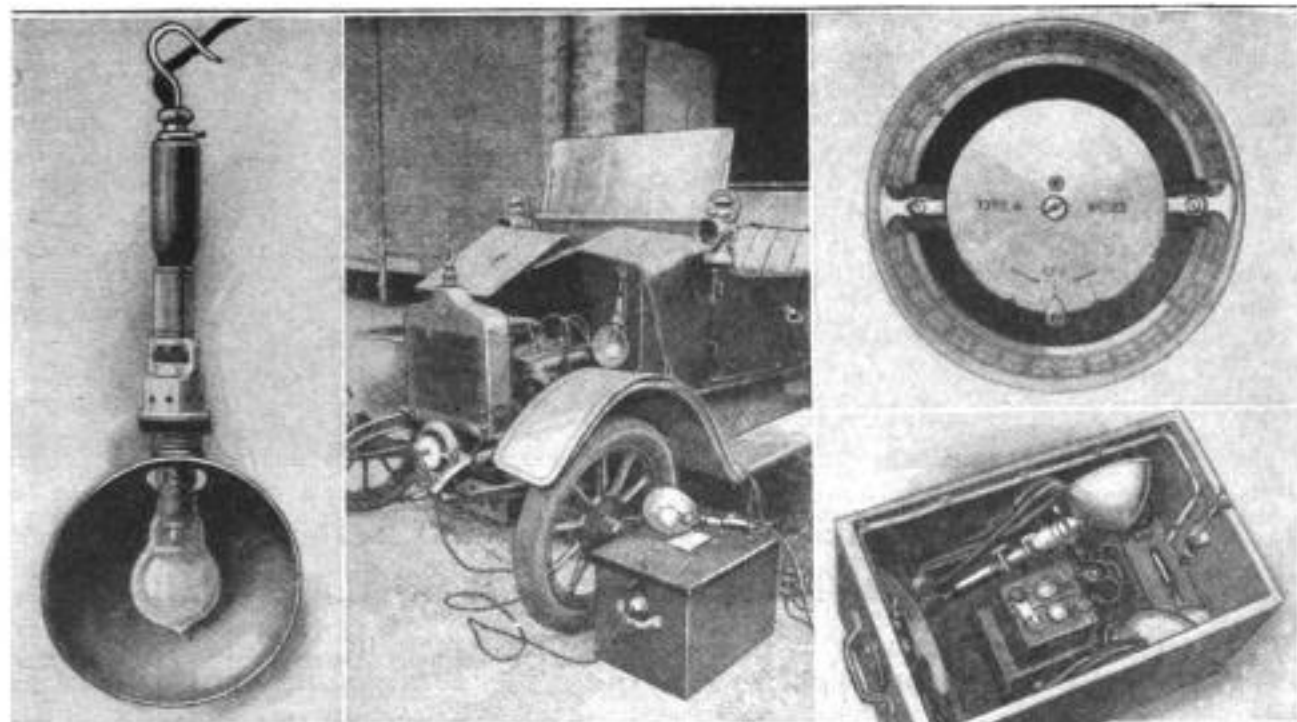
An improved press is now available for printing a variety of work on wood, and it can also be used for printing on paper and heavy cardboard. The platen is cut down to take boards $\frac{3}{4}$ inch thick, and to print on boards of less thickness, a piece of wood of a thickness equal to the difference between $\frac{3}{4}$ inch and the thickness of the board to be printed on, is glued to the platen, the gauge being set for a $\frac{3}{4}$ -inch board. Printing with metal-type forms, such as type-metal type, iron type, or brass type, may be done on this press, which will also use hard-rubber dies containing lettering and illustrations. The press is equipped with automatic ink font and rollers, and can be used for three-color work. When "making ready," a rubber sheet is laid on the platen. It is adapted for such work as printing illustrations and lettering on various kinds of advertising matter, such as wooden coat hangers, rulers, backs for thermometers, and cigar boxes, and for marking shipping containers, wooden signs, game boards, toys, and the like.



Above: Front View of Press Especially Adapted to Printing on Wood, but Which can Also be Used for Paper and Heavy Cardboard. Below: Side View, Showing Platen with Rubber Sheet in Place to Take Care of Unevenness in Work to be Printed

MAY HAVE WEATHER BUREAU AT SEA

A floating weather bureau may be established by the French and American governments. Forecasters from both countries recently sailed across the Atlantic on a French ship, broadcasting reports of their observations twice daily. This service, if made permanent, is expected to be of great value in safeguarding lives and property at sea.



Left: Special Neon Lamp That is Used with the Apparatus for Study Mechanisms. Center: Apparatus Coupled to Crankshaft of Motor Car. Plate on the Outside of the Gear Box is Shown Above, While Below Is the

ing High-Speed Right: The Switch Complete Outfit in Cabinet

NOVEL APPARATUS MAKES FAST MECHANISMS APPEAR SLOW

Apparatus by means of which a rapidly moving mechanism can be made to appear slowed down or even at a standstill, while running at normal speed, is now being introduced. It is adaptable to the study of the rapidly moving parts of a sewing machine, the valve movements of gasoline engines, and the functioning of many other mechanisms which have a revolving part from which the special gear box of the apparatus can be driven. This gear box contains cam-operated contact breakers that control the flashing of a light from lamps specially constructed to give an instantaneous flash such as cannot be obtained with the ordinary filament. The gear box is provided with two distinct gears, one giving the exact speed of the mechanism to the interrupter, and the other giving a speed one-hundredth or one-thousandth less. No auxiliary apparatus, through which to view the mechanism under test, is needed.

NEW COMBINATION BRUSH LATHERS AND MESSAGES

A recent invention for the comfort of men who shave themselves is a rubber lathering and massaging brush, designed to take the place of the fingers in rubbing in the lather and softening the beard. The lather is first rubbed on with the

bristles, as with the ordinary brush. The bristles are then withdrawn into the handle, and 176 tiny rubber fingers work the lather into the skin. The use of this brush is said to make shaving much easier, and to leave the skin more com-



Upper Left: Lathering the Face with Combination Brush. Upper Right: Massaging the Face to Soften the Beard. Lower Left: Brush Adjusted for Lathering. Lower Right: Brush Adjusted for Massaging

fortable after the shave, than the ordinary procedure.

☛ The use of gold monograms on automobile headlights, said to have been encouraged by auto manufacturers, is one of the latest fads of car owners.

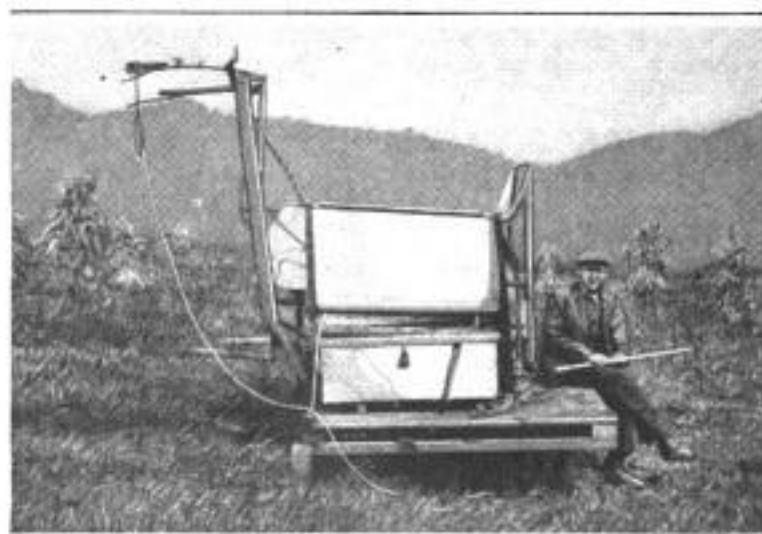


Left: A Harvester Which can be Drawn by Three Horses or a Light Tractor. A Full Sheaf of Corn can be Shocked Every Four Minutes. Right: When Shock Holder Is Full Enough to Make Desired Size of Shock, One Man Proceeds to Clamp the Circular Arms around the Shock at the Tying Point

LIGHT CORN HARVESTER SHOCKS STALKS QUICKLY

Of interest to corn growers is a new type of harvester, sufficiently light to be attractive to the farmer and yet capable of cutting and shocking a full-size sheaf of corn. An output of 18 shocks per hour is claimed for the machine, each containing from 350 to 400 stalks of corn. V-shaped guides, running close to the ground on each side of the row, bring the stalks into contact with a moving sprocket chain, which is provided with large steel fingers.

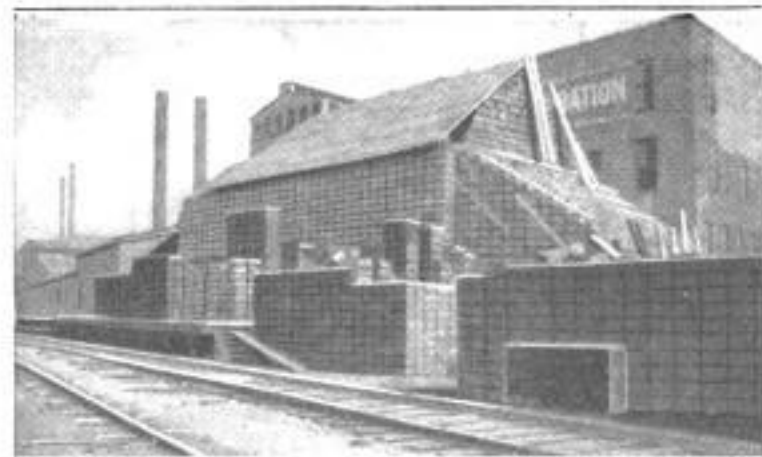
Canvas sidewalls, close to the chain, carry the corn in an upright position



The Position of the Harvester After the Tied Shock has been Released: An Adjustable Chain Limits the Rise of the Hinged Table

and set off the machine. Only two men are necessary to operate

to the cutting sickle, and as the stalks are cut they are quickly conveyed to an inclined table, where their tips are held by a light spring. The ends, however, continue to move toward the shock receiver, where their butts are evened, then automatically tied, released, and set off the machine. Only two men are necessary to operate the machine to capacity.



To Protect These Fruit-Packing Boxes, a Shelter was Built about Them, with the Boxes Themselves Serving as a Support

FRUIT-SHIPPING BOXES SUPPORT OWN SHELTER

Some 40,000 fruit boxes of a Los Angeles packing company, left over from the past season, could not be kept in the regular storehouses for lack of room, and had to be left outside. Then, rather than let them become spoiled, it was decided to build a house about them. This was done by simply piling the top boxes pyramid-fashion, laying a roof directly upon them, and then nailing walls around the sides.

TRACTOR TRUCK SNOWPLOW CLEARS ROADS QUICKLY

An automobile-truck or tractor snowplow, which has opened a 24-foot road 10 miles long through 3 to 5 feet of damp, well-packed snow in three hours, has been devised by a Maine man. The 10-mile record was established with the tractor type, weighing about half a ton. This resembles the snowplows used 40 to 50 years ago by the railroads. It can be adjusted to any width of road from 10 to 24 feet. In use the tractor is fastened inside the plow.

The road upon which the 10-mile test was made was of bituminous macadam, built through the heart of the Maine woods by one of the big paper companies for "toting" supplies to its logging camps, and had to be cleared in order that the company's fleet of motor trucks might be operated during the winter.

The motor-truck plow is much smaller, weighing about 400 pounds. It is attached to the front of the truck. In 45 minutes it has cleared a stretch which it would require the work of three teams of horses five hours to do. Its range is from 4 to 12 feet in width. In regions of heavy snowfall, such as Maine and other states bordering on the Canadian line, this self-propelled vehicle promises a wide range of useful application.

GAS FUMES SHORT-CIRCUIT TRANSMISSION LINE

Complete tie-up of a 4,000-volt transmission line was prevented recently by

the timely discovery of a peculiar condition which tended to nullify the effectiveness of the insulation. Fumes from a near-by fertilizer plant were found to be responsible for this potentially dangerous condition, having coated the glass with

a heavy deposit which was a good conductor of electricity. In wet weather the current made an arc over the surface of the wooden pin under the insulator hood, setting fire to it and dropping the wire to a crossarm below. Grounding of the circuit followed, but a prompt repair prevented suspension of service. Persistent scraping of the glass cap was necessary to remove the heavy deposit.



Above: Tractor Plow Clearing Street after a Heavy Blizzard. Left: This Tractor Plow Opened a 24-Foot Road of Heavily Packed Snow in Three Hours

NEW MACHINE OF BENCH TYPE SANDS, POLISHES, OR SCRUBS

Convenience and portability are the outstanding features of a small electrical-driven sanding and polishing unit just



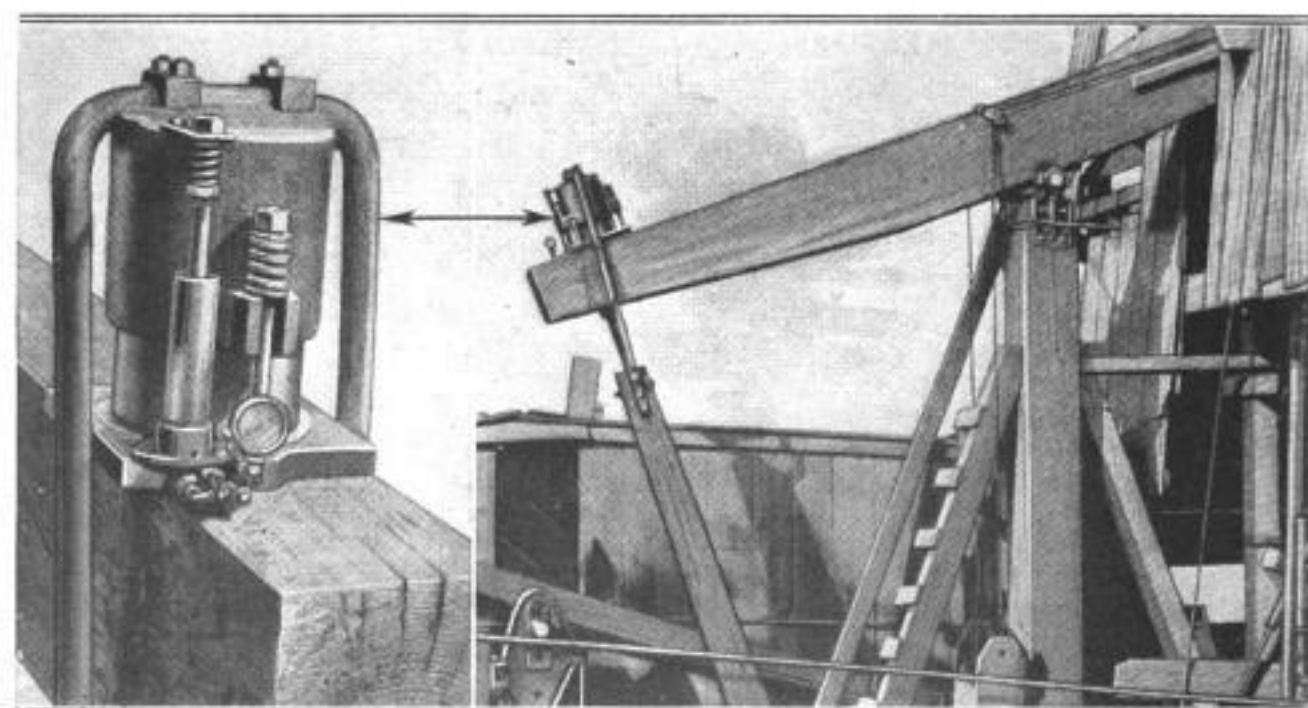
Above: The Rotating Sanding Part and Its Tightener Ring. Right: The Scrubbing and Polishing Machine Complete

placed on the market. The machine is adapted to sandpaper and refinish such work as tables, benches, or school desks, as well as marble surfaces, and a special attachment is also provided for scrubbing worktables, benches, or chopping blocks in butcher shops, and candy or canning factories where sanitary conditions must be maintained. Of special interest is the fact that standard electrical connections

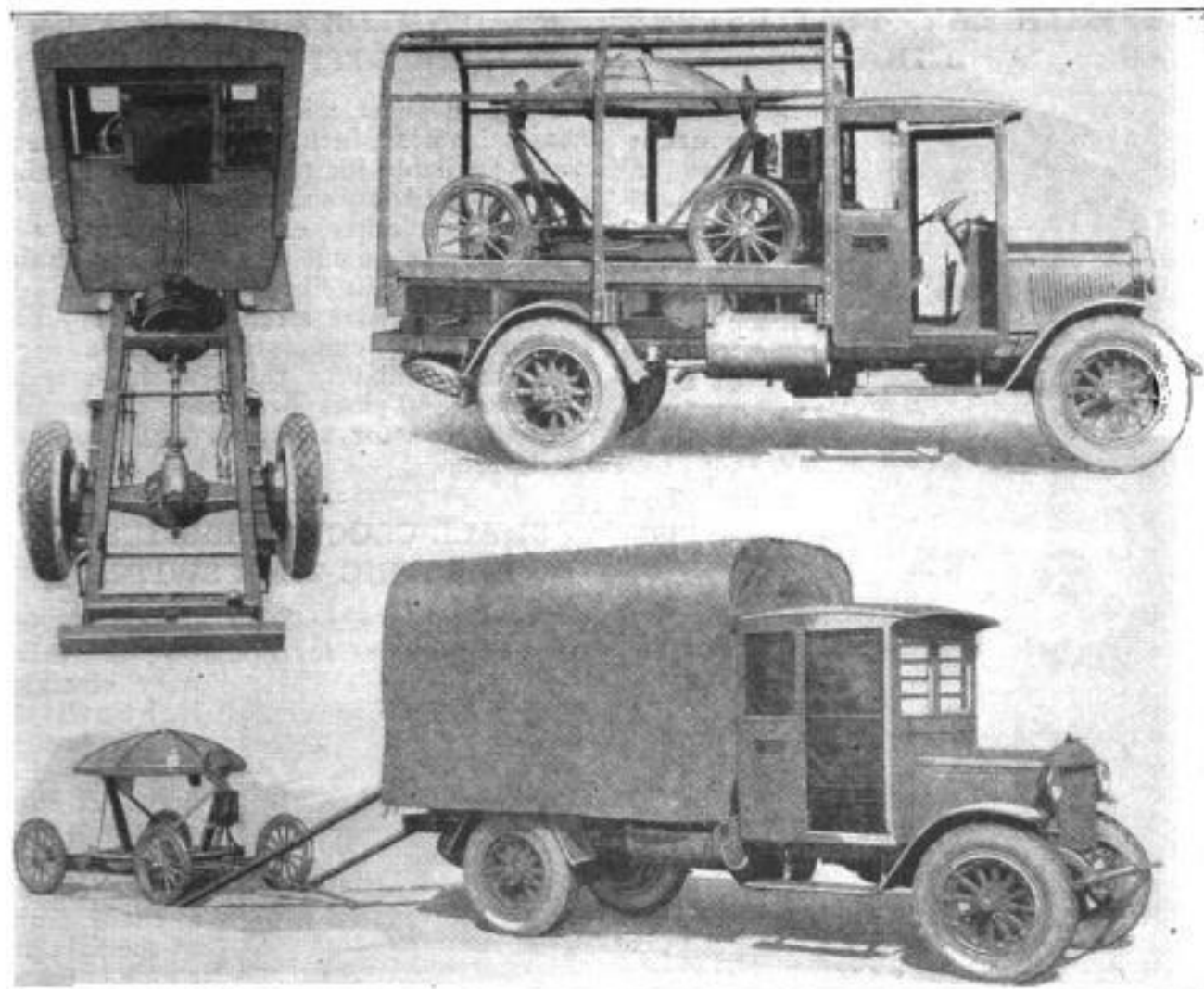
facilitate attachment to a base plug or light socket. The motor for this combination unit is rated at $\frac{1}{8}$ horsepower, and the entire weight complete is only about 50 pounds. Although it is claimed for this machine that it will do the handwork of 10 men, its cost of operation is said to be small, averaging only four cents per hour.

OIL-WELL DRILL FITTED WITH SHOCK ABSORBER

An extremely useful device now receiving the attention of well drillers, eliminates to a great extent the severe shocks and strains to equipment hitherto regarded as unpreventable. The tremendous jerk on the line which follows the rebound and lifting of the drilling tools is responsible for most of the damage and repairs done to them. In the new shock-reducing apparatus, a 9 by 10-inch cylinder about one-third full of heavy oil is fitted with a sliding cap piston which makes an air-tight fit over the cylinder. Air is pumped automatically into the space above the oil level, and the whole unit is so mounted that the air cushion between the oil and the piston is between the stirrup and beam of the drilling rig. Since the air pump receives its piston stroke from the larger plunger, the pressure is entirely self-regulating, always accommodating itself to the severity of the downward jerk.



Left: The Shock Absorber in Position on the Beam of the Drilling Rig. The Small Air Pump Connected to the Pressure Gauge Receives Its Piston Stroke When the Stirrup is Jerked Downward. Right: The Shock-Absorber Piston in "Low" Position, Automatically Raising the Air Pressure in the Pump Cylinder



Above: At the Left is Shown the Truck Chassis with the Generator Mounted on It for Supplying Lamp with Current; at the Right, the Truck Uncovered with Searchlight Aboard. Below: Searchlight Demounted, and Complete Truck Unit with Tarpaulin Cover

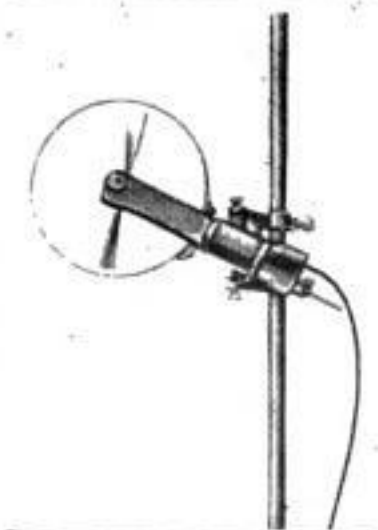
PORTABLE SEARCHLIGHT UNIT FOR MILITARY SERVICE

A new searchlight unit intended for military and naval service in connection with airplane operations, carries a 60-inch open-type lamp of 1,300,000,000 candle-power, mounted on a light chassis with four rubber-tired wheels. The searchlight chassis is arranged to be transported on a two-ton high-speed truck, from which it is easily unloaded when it is to be put in use. The 42-horsepower engine of the truck is provided with a clutch connection to a 110-volt electric generator that furnishes current for the searchlight. A control panel and rheostat are located in the back of the cab, and two reels hold 1,640 feet of cable for connecting the generator and the light.

ⓂA motion picture entitled "Behind the Breakfast Plate," depicting various phases of the American pork industry, has been made by the U. S. Department of Agriculture, especially for distribution abroad.

FAN KEEPS AUTO WINDSHIELD CLEAR OF RAIN OR SNOW

A rapidly moving fan is a new device for keeping the windshield of an automobile clear of rain, snow, or sleet, by means of a current of air which drives them away from the glass. The fan has two blades and is adjusted on a rod to suit the convenience of the driver. It is driven by a flexible shaft from a pulley on the fan shaft, and operates at a speed of 700 revolutions per minute.



GERMAN LAMP-POST USED AS A HOIST



Being forced to strictest economy in municipal street lighting, the Germans have adapted unused lamp-posts to a variety of uses, giving full play to their enforced ingenuity. The overhanging cast-iron post lends itself admirably for conversion into a hoist, simply by removing the idle lighting equipment and rigging up the necessary pulleys and tackle.

NEW GASOLINE SAVER WORKS ON HEAT-VALVE PRINCIPLE

Gasoline-saving devices continue to attract attention. The latest to appear is attached to the vacuum tube and admits air directly into the manifold at the front of the carburetor. Being made to extend over the engine block, the attachment becomes heated quickly, with the result that a



thermostatic valve opens and admits air into the manifold. As long as the engine is cold, the valve remains closed, permitting a start to be made with a richer mixture, but as the engine becomes hotter, the valve opens more widely, admitting more air and decreasing gasoline consumption.

READY-MADE BUILT-UP MICA FOR ELECTRICAL PURPOSES

Built-up sheet mica, of various thicknesses from .01 inch up, is now commercially available for the making of insulators for flatirons, soldering irons, electric stoves, and other electrical-heating devices. It can be cut to any desired shape and may be split like ordinary mica. It possesses unusual strength and rigidity even at high temperatures, has a high electrical insulating value at high temperature, and does not react chemically with the resistor materials that are generally used.

SMALL CLOCK OPERATES AS ELECTRIC TIME SWITCH

Exceedingly simple is a new device just brought out for operating the ordinary electric-

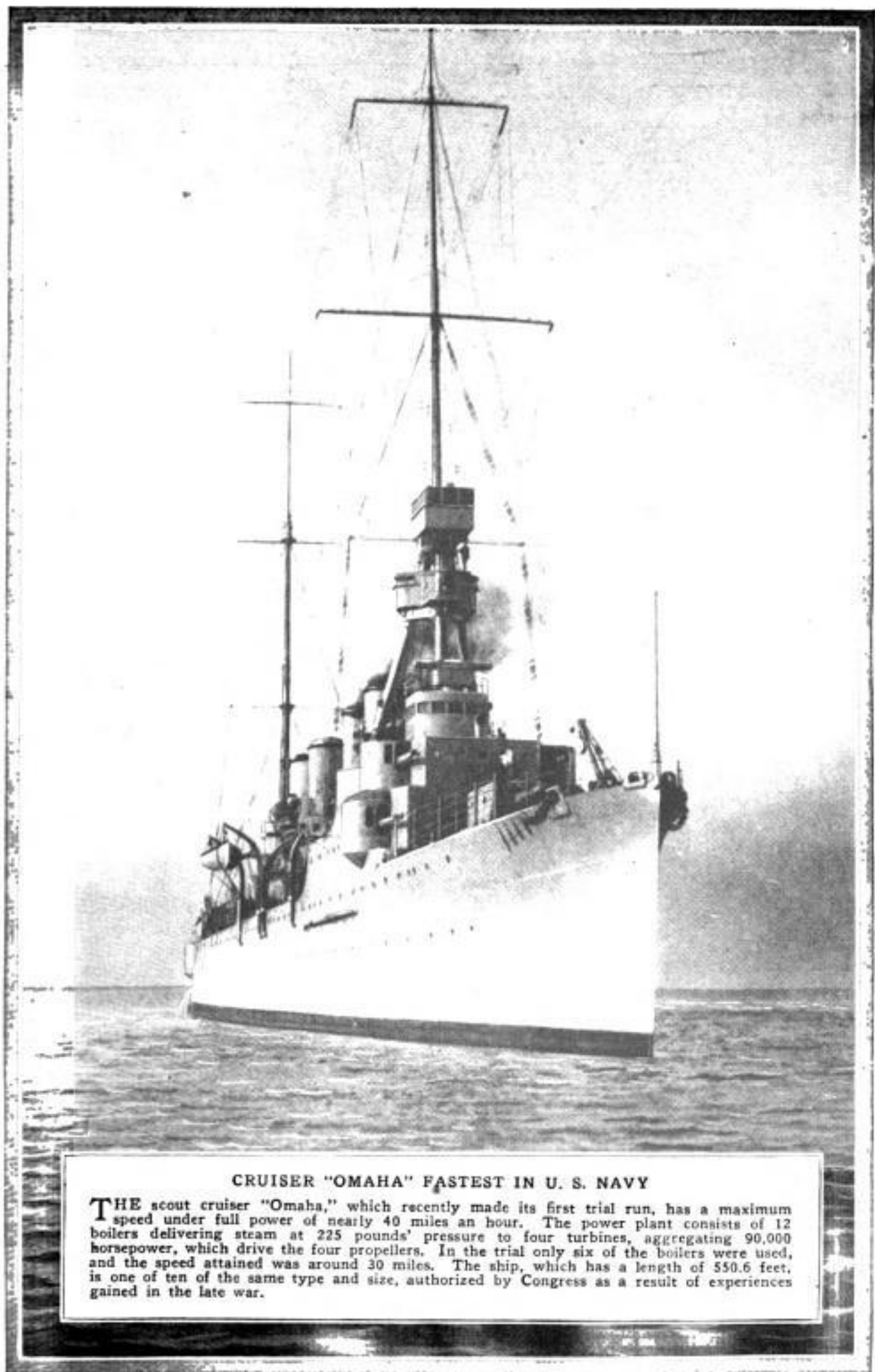


light switch at any predetermined hour. It consists of a small clock suspended by a chain from a special attachment, which can be fastened to the tumbler of an ordinary switch of that type. The

clock is wound in the usual way, and a small rod inserted in the winding key, which is made to receive it. A ring on the end of the attaching chain is then slipped over the rod. At the time for which the alarm is set the winding key revolves through a short quarter turn, thereby releasing the ring. At this moment the clock descends slightly, causing a slight jerk which operates the switch.

CLEANING LINER TURBINE BLADES IS BIG TASK

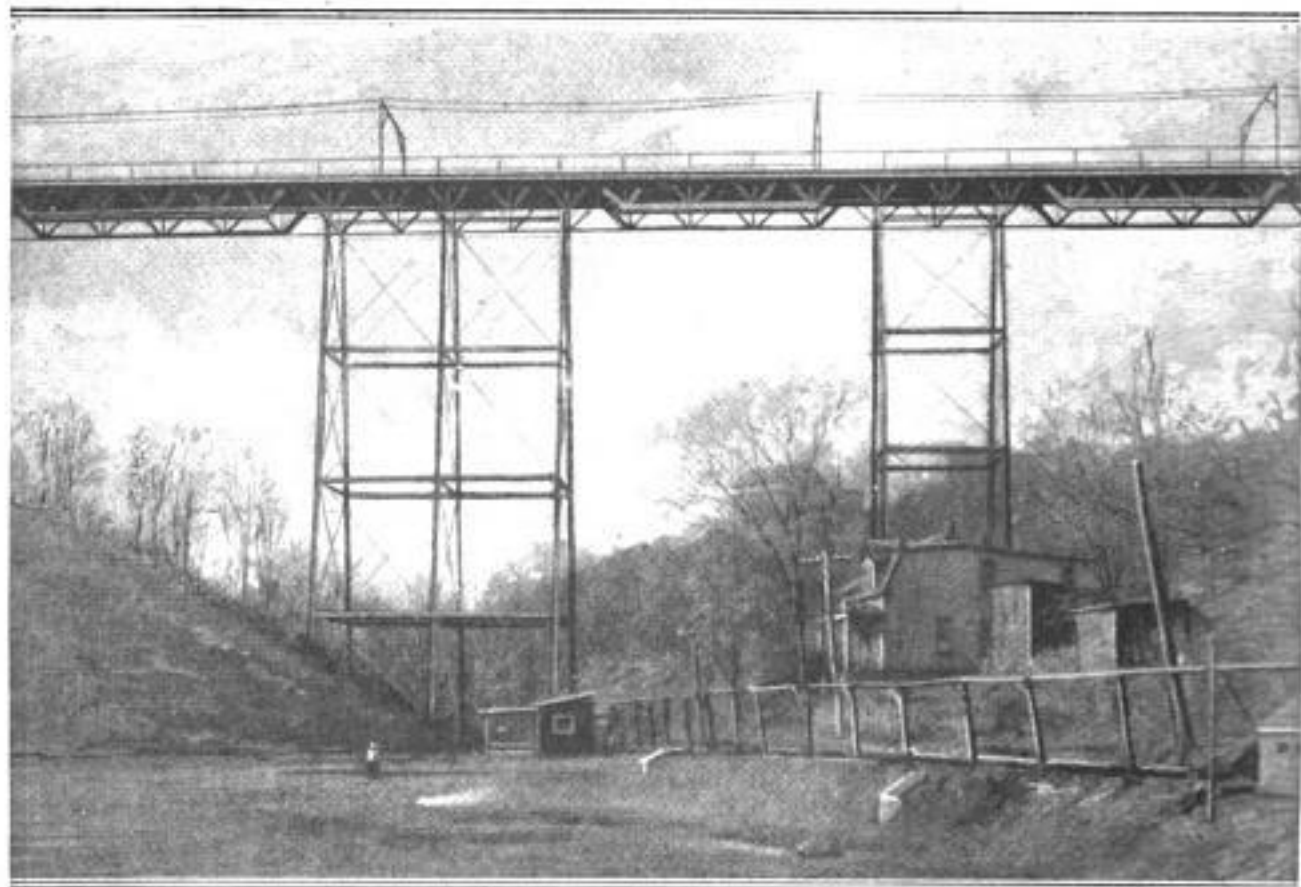
During the overhauling of the steamships "Aquitania" and "Mauretania" at Southampton, Eng., scores of men work on their turbine blades. The "Aquitania's" eight turbines have over 1,000,000 blades and the "Mauretania's" six, 750,000, each requiring careful individual scraping and cleaning.



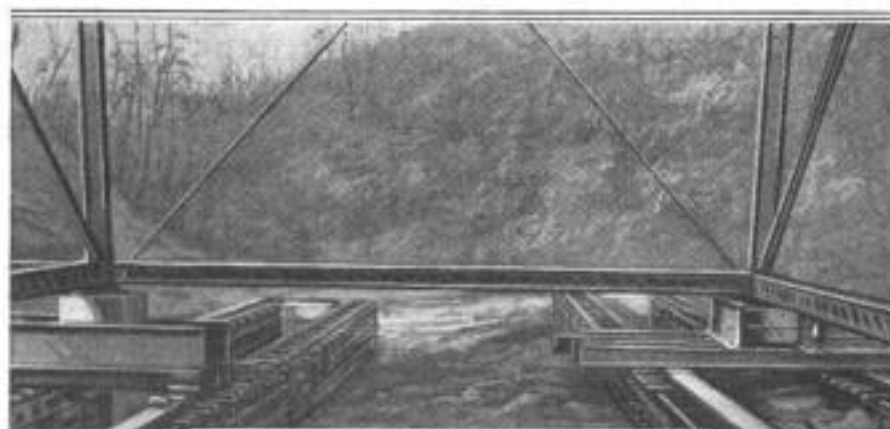
CRUISER "OMAHA" FASTEST IN U. S. NAVY

THE scout cruiser "Omaha," which recently made its first trial run, has a maximum speed under full power of nearly 40 miles an hour. The power plant consists of 12 boilers delivering steam at 225 pounds' pressure to four turbines, aggregating 90,000 horsepower, which drive the four propellers. In the trial only six of the boilers were used, and the speed attained was around 30 miles. The ship, which has a length of 550.6 feet, is one of ten of the same type and size, authorized by Congress as a result of experiences gained in the late war.

HIGH TROLLEY-LINE VIADUCT MOVED IN A DAY



Towering Trolley Viaduct as It Stood before being Moved 75 Feet down a Deep Gully by Pittsburgh Engineers: Note Its Height in Comparison with the Tall Trees, Houses, and Skyline of the Hills in the Background, and the Man Visible in the Middle Ground



Above: I-Beams Bolted to Pedestals.
Below: Load Transferred to
Rollers with Timbers



Moving a 750-foot trolley-line viaduct, 150 feet high, 75 feet toward the lower end of the gully it spanned, in one day, was the feat accomplished by Pittsburgh engineers recently. A mile of rails, 400 steel rollers, 300 jackscrews, 100 tons of steel I-beams, and 140,000 feet of cribbing were used.

Preparations were in progress for more than a month. New concrete pedestals were constructed on the new site; abutments were built up of cribbing and earth fill. On these abutments the tracks were laid in order that car service might be resumed as soon as the bridge was in its new position. In planning the move, the engineers also had to take precautions against the possibility of the high structure being overturned.

The rollers moved on

rails supported on timber cribbing that rested on sills laid on the earth. In all cases direct bearing of the stones under the posts was secured, either through needle beams or through timbers placed directly under the stones. To place these needle beams, large I-beams bolted on the side of the top stone were jacked up and the second stone was broken up.

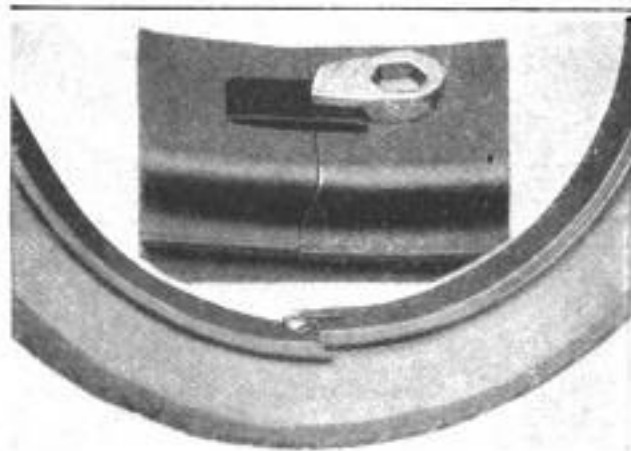
The actual moving started early in the morning and was completed by 9:30 that night.

AERO "AUTO-SLEIGH" SKIMS OVER ICE OR SNOW

A four-passenger air-propelled "auto-sleigh," mounted on wide skilike runners, is said to attain high speed on either ice or snow. The body is built on the order of an airplane fuselage, and is mounted on two sets of runners, those in front turning like auto wheels. The steering wheel and other controls are at the front, behind a low body-wide windshield. To the right of the driver's seat is a seat for a passenger, while two similar seats are set behind. Then, at the extreme back, is the motor, a 90-horsepower model manufactured by an airplane company. The gasoline is fed from a 28-gallon tank in front of the driver's seat. The propeller, specially built, is four-bladed, with the blades 6 feet 4 inches long. Rear springs, resembling a type common on automobiles, is another feature of the body construction. Brakes designed for service on snow or ice slow the "car" when desired.

TIRE CHANGING MADE EASY BY SPLIT-RIM DEVICE

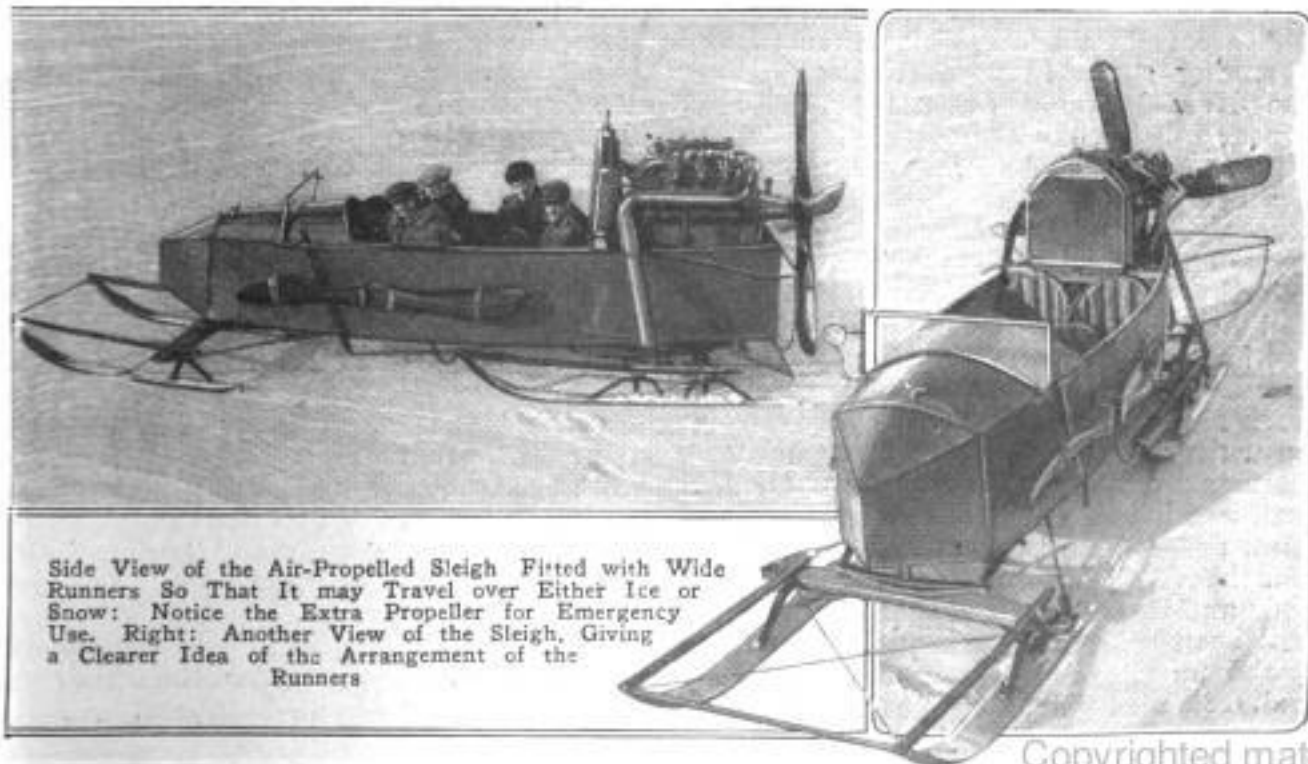
The annoyance of tire changing will be considerably lessened by a new release attachment for use with split rims. A small



A Split-Rim Lock and Release Device: The Upper View Shows the Two Ends of the Rim Locked, and the Lower in Telescoped Position After the Cam Socket has been Turned

rotary cam, provided with a wrench socket, serves to lock the rim and hold the tire in place. To apply or remove the tire, a wrench is inserted in the cam socket and turned through a complete revolution, elevating one end of the rim and greatly facilitating the change. A reverse motion of the wrench forces the rim end back into place, and locks it there.

☐ The steamship "Leviathan" will be equipped with the most powerful searchlight ever used on a merchant ship, attached to the foremast.



Side View of the Air-Propelled Sleigh Fitted with Wide Runners So That It may Travel over Either Ice or Snow: Notice the Extra Propeller for Emergency Use. Right: Another View of the Sleigh, Giving a Clearer Idea of the Arrangement of the Runners

WHEELED MOP TANK FITTED WITH SLIDING WRINGER

An improved mop tank, equipped with a dirt screen near the bottom of the rinsing chamber, and a slidable wringer,



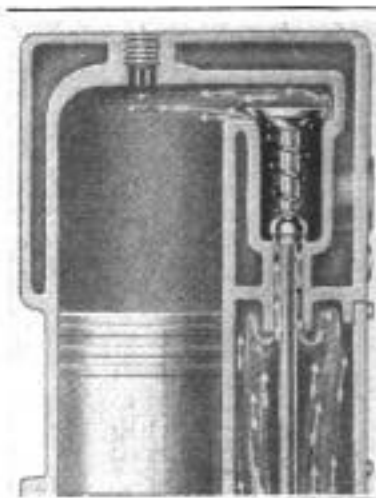
Mop Tank with a Slidable Wringer Operating over Either Compartment, and a Dirt Screen near the Bottom of the Rinsing Chamber

which can be operated either over the soap-water or the rinsing compartment, enables the mopper to do his work with less trouble than usual. The tank is made of sheet metal, is rectangular, and stands 30 inches high. The two compartments, partitioned off at the middle, hold 17 gal-

lons each, and empty by drain gates in the bottom. The screen in the rinsing chamber is a few inches from the bottom, and allows the dirt to fall through and settle. The wringer slides from one compartment to the other on rollers.

VALVE PACKING KEEPS AIR FROM CYLINDERS

Every car owner knows how difficult it is to prevent air from leaking past the stem guides of the intake valves when the piston action creates a vacuum in the cylinders. Freedom from this trouble is claimed for a new type of valve packing, consisting only of a finely tempered steel spring, a pressed-steel cup, and a washer of special felt. The washer fits tightly around the valve stem, the whole being placed directly under the valve.



Freedom from this trouble is claimed for a new type of valve packing, consisting only of a finely tempered steel spring, a pressed-steel cup, and a washer of special felt. The washer fits tightly around the valve stem, the whole being placed directly under the valve.

THE ATLANTIC HEWING A NEW COAST LINE

By W. S. JORDAN

ONE of the Federal government's greatest problems is the rapidly changing shore lines, particularly along the New England coast. At Scituate, Mass., one of the worst sections of the coast, the damage by heavy winter storms has been so great that many attempts to stop the destruction have been made.

At Third Cliff, Scituate, there is danger of the entire cliff being washed away and huge granite blocks were placed at the lower edge to act as a buffer for the waves. These, during a heavy storm are hurled about and gradually broken up until they no longer serve their purpose. Concrete construction was then tried, a wall as wide as a sidewalk being built and sunk deeply into the sand. The concrete was heavily reinforced with 1-inch steel rods and it was thought that the problem had been solved. The first heavy storm broke up the concrete and little of the wall remains. Year by year the cliff is

disappearing, and soon houses at and near it will have to be moved back.

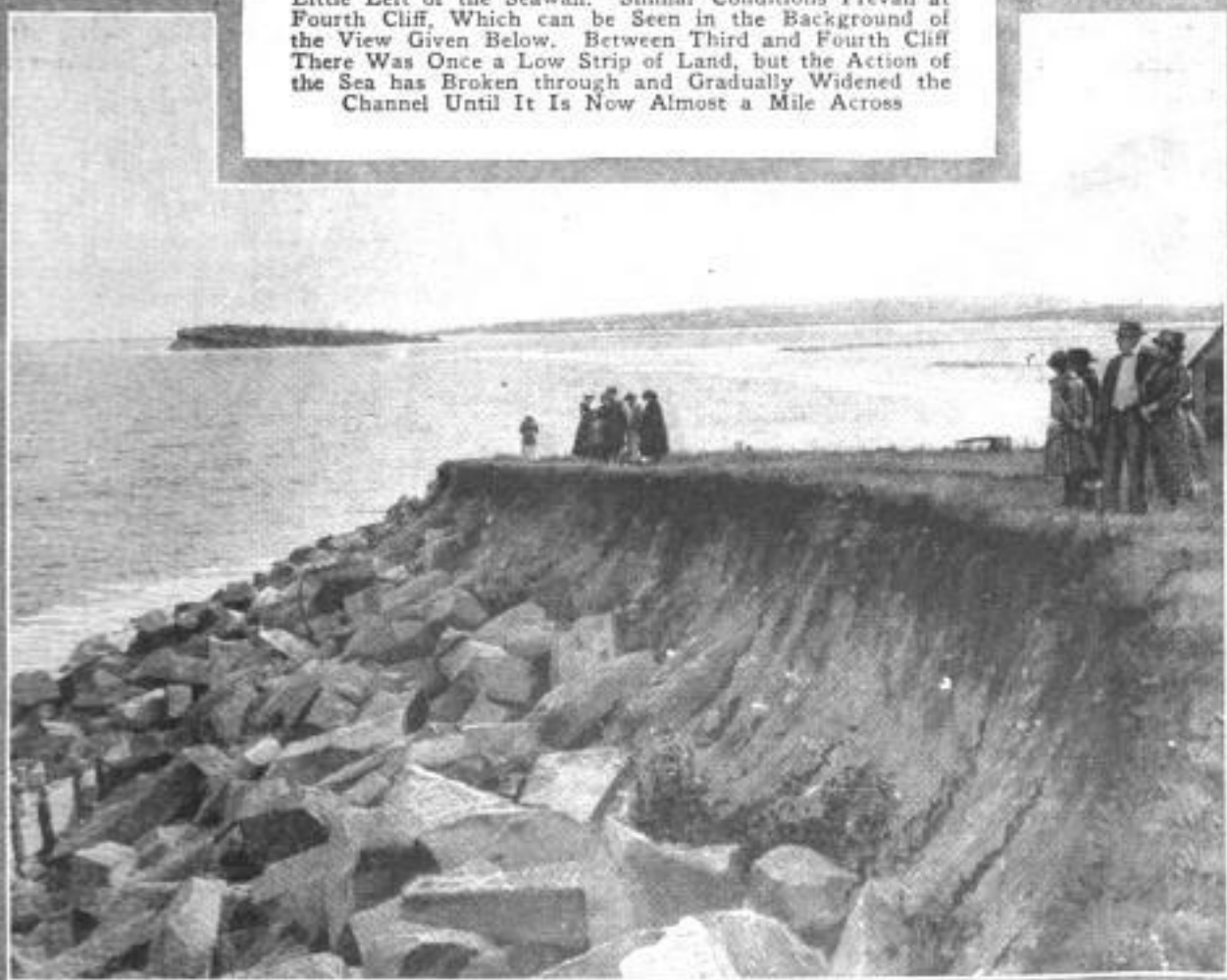
A few years ago, during a severe storm, the water broke over the low strip of land connecting Third Cliff with Fourth Cliff, and opened a channel wide enough for barges. This channel has gradually widened so that now it is almost a mile between the two cliffs, and to reach Fourth Cliff by land it is necessary to travel about 10 miles.

Where previously tugs and barges were obliged to go out around Fourth Cliff and the long beach of Humrock, then up through the river, now the boats go in between Third and Fourth Cliff and up a river to one of the largest sand-and-gravel plants on the Atlantic coast, all of which is the direct result of the work of the ocean.

No doubt the ocean will eventually cover this whole section and the hundreds of summer places will disappear.

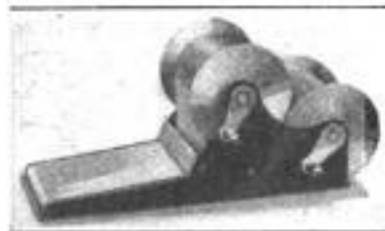


Third Cliff, Scituate, Massachusetts, Which was being Gradually Eaten Away by the Ocean When These Rocks and a Concrete Wall were Placed to Act as a Buffer: However, Even These have Proved Ineffective, as the Rocks are Continually being Broken Apart, and There is Little Left of the Seawall. Similar Conditions Prevail at Fourth Cliff, Which can be Seen in the Background of the View Given Below. Between Third and Fourth Cliff There Was Once a Low Strip of Land, but the Action of the Sea has Broken through and Gradually Widened the Channel Until It is Now Almost a Mile Across



PAPER-ROLL MEMO PAD KEEPS RECORD FOR REFERENCE

A memo desk pad that is fed from a small roll of paper, which after use winds



upon another roll, is one of the latest office appliances. The crank-operated rollers are placed at the rear of the device, and the paper is run from the forward roll, over a hard writing surface, and back under this surface to the rear roller. If desired, the latter can be unwound to refer to previously written data, or the used paper may be taken off and filed.

LICORICE AS THE WORLD'S OLDEST CONFECTION

Many persons remember that not so many years ago, licorice root was a commodity in country stores. After a time, it was supplanted by "black licorice" in stick form, made from the juice of the root and starch. The plant grows, for the most part, on the banks of the Tigris and Euphrates rivers, in Mesopotamia.

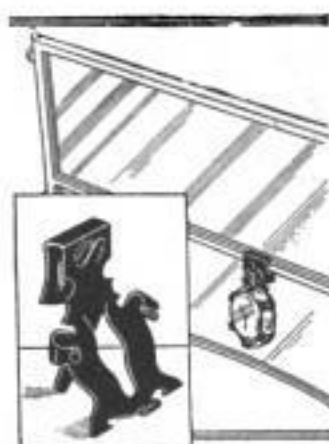
When harvested by native gangs, the root is full of water and must be allowed to dry, a process that takes nearly a year. It is then sorted and classified. Next,

sticks from 6 inches to 1 foot in length are cut and tied into bundles, while the crooked and imperfect pieces are put aside to be used as firewood.

Often the roots are pressed by hydraulic machines into bales weighing 200 pounds or more, in which form they are shipped, after being conveyed by caravan to the seaport. It is in this form that the product is most commonly imported into the United States.

WATCH-HOLDING DEVICE HUNG ON AUTO WINDSHIELD

A new watch-holding device for motorists has been designed to be suspended



from the edge of the lower glass of the windshield, where the watch can be easily seen by persons in the rear seat as well as those in front. The holder consists, roughly, of a hook, arranged with a spring to prevent rattling, and the body proper, which has three clamping

arms for clamping the curved edge of the watch. A finger protruding to the rear from the body gives it a slight forward tilt.



One of the Piles of Licorice Seen in Mesopotamia; This Particular Lot is to be Used in Flavoring Tobacco. Other Quantities, However, are Shipped to America, to be Made into a Confection. It is the Latter Use of the Root Which is, Perhaps, Most Generally Known



Bedroom of Denver Electrical Home: In the Lower Right-Hand Corner can be Seen the Attachment Jacks That Connect the Loud Speaker with the Receiving Set in the Basement

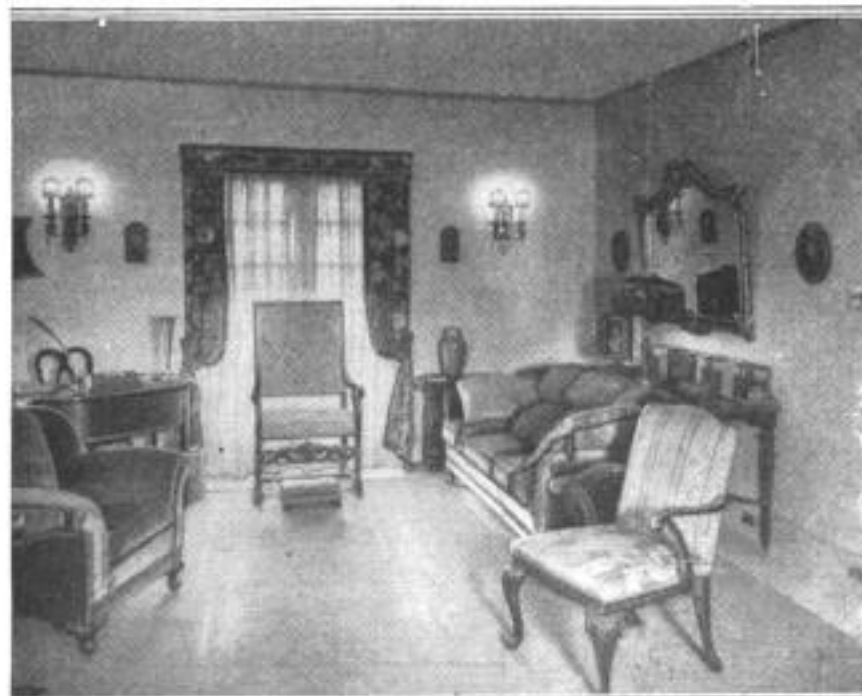
MODEL ELECTRIC HOME HAS RADIO EQUIPMENT

By JOHN T. BARTLETT

WHEN, some months ago, the Electrical Coöperative League, a trade organization of Denver, put up a model electric home, it built, so it is asserted, the first home in the country especially planned and equipped for radio. At only moderate extra expense, provision was made whereby the occupant could enjoy radio with equal ease in a basement den (called the radio room), in the living room on the first floor, or in the bedroom on the second floor. Specially made jacks in the last two rooms, located conveniently in the baseboard, have only to be connected, and music, baseball reports, or other broadcast features, can be heard as well as in the radio room, where the receiving set is located.

In the basement, a 5 or 6-foot space, close to but not connected with the den, contains the storage batteries, the B-batteries, and a rectifier for charging the

former. The receiving set is installed in a combination phonograph and radio cabinet. The loud speaker can be oper-



The Living Room: The Whole House Has 58 Outlets for Conveniences, Including Radio, 57 for Lighting, and 72 Switch Outlets

ated here, or switched to the wires which run to the upstairs rooms. These wires pass through nonmetallic conduit to the jacks located in the baseboards. From

the battery room also two wires run to the jacks. The result is a double jack, which is necessary because loud speakers require battery current.

The aerial is an indoor one, and is located in the attic. It consists of four wires connected at each end and running lengthwise of the attic. The lead is taken off from the aerial at one end, and runs to the radio room. Ground connection is made with a water pipe. This aerial gives excellent results, no interference from other wires being noted.

In addition, the home not only has many of the numerous electrical features with which the public is more or less familiar, but others of a novel character. There is, for example, the "burglar light" provision.

These lights have three functions: First, there is the psychological effect on the occupants of the home, particularly the women. If anything of a suspicious nature alarms them, as sometimes happens, especially when alone, it is most reassuring to be able to switch on the lights and know for a certainty that no one is near the house. Second, if there are marauders, the lights may frighten them away; and third, the lights serve as a danger alarm for neighbors and others.

The burglar lights are cornice lights on all sides of the house. They are controlled either from the kitchen or from the bedroom on the second floor. The lights thoroughly illuminate the vicinity of the home for yards around. Inasmuch

as the electric current reaches the building underground, cutting of wires is less to be feared.

The electric refrigerator is in the breakfast room, between the kitchen and dining room. In a central location beneath, the machinery is installed, and so located that the noise of its operation cannot reach inmates of the home, the floors being of practically soundproof construction.

A garage-door opener is another convenient feature. In a recess on the chimney at one side of the house—about a car length from the door of the garage and within easy reach of the driver—is a steel box with a spring lock. A touch on the push button inside the box opens the garage, and after driving in, the door is closed, while still in the car if desired, by pulling a handle suspended from the ceiling.

An electric ventilating system serves to draw off odors and, in the summer, to keep the upper portion of the home about 10° cooler than it otherwise would be. There are two fans, one 12 and the other 14 inches. One is located over the electric range in the kitchen, eliminating the necessity of a hood, and the other in the attic. Both may be controlled by switches in the kitchen, and the attic fan also from the two bathrooms. There are grills in the ceiling of both bathrooms.

This house contains 58 outlets for the various electric conveniences, 57 lighting outlets, and 72 switch outlets.

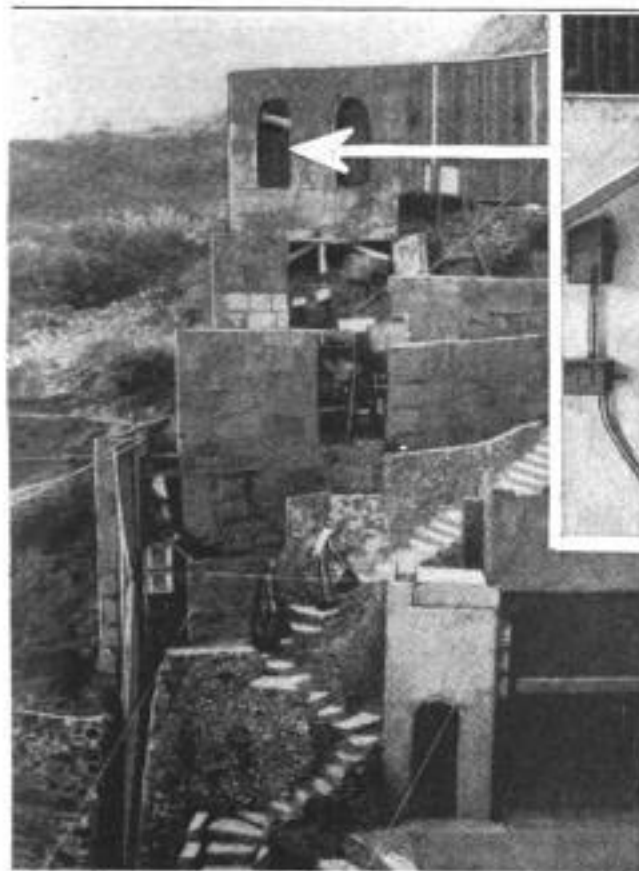
SMALL CAPPING MACHINE HAS SIMPLE ACTION

An automatic capping machine that requires only one operator, occupies but



Capping Machine Requiring Only One Operator, and Taking Up but Small Floor Space: The Caps can be Seen Feeding In on the Upper Level, with the Cartons beneath Them. At the Circular Runway, Holders Pull the Caps into Place

four feet of floor space, and caps 72 containers of either tin or cardboard a minute, is said to be meeting favor with several large cereal and salt mills. The caps are fed into the machine on a slanting belt, while on a lower level another belt feeds the containers from the forming machine. The boxes are carried round by curved holders, and as they come into place, these holders pull down the cap and a spring roller presses it tight. An attachment then forces the containers onto the belt again, and they are carried to the filling machine, after which the other end is topped by the same process. The whole operation takes less than a minute, the cans at no time being touched by human hands.



A Rat-Protected Pipe Organ, Furnishing Music for the Outdoor Stage Seen at the Right, is Located in the Top Structure



The Pipe Organ with the Removable Front Section of the Galvanized-Iron Protecting Case Pulled Up and Out of the Way

OUTDOOR ORGAN IS PROTECTED AGAINST MICE AND RATS

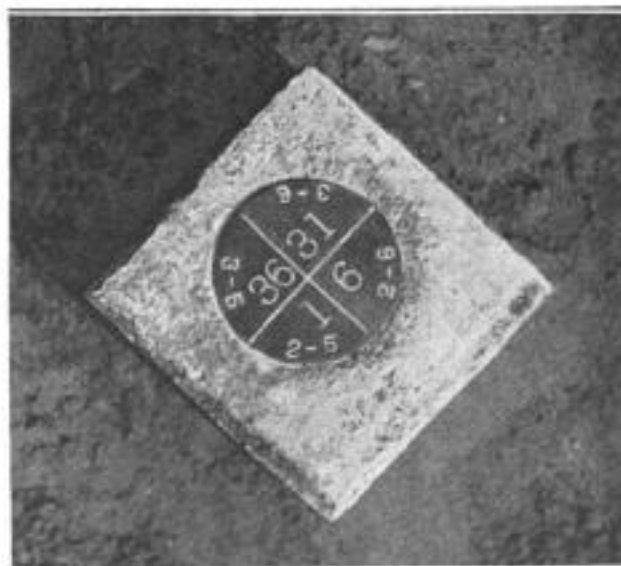
Because field mice and rats had made their way into the interior of and damaged the pipe organ of an outdoor stage located in a cañon near Los Angeles, a new instrument was built 70 feet up the side of the mountain and protected with an easily opened case of galvanized iron. The front of the case is so arranged that, when the organ is to be used, it can be lifted up and folded back out of the way. Weights hung over pulleys make this operation comparatively easy. The jacket also protects the organ from grass fires which occasionally sweep the mountain-side.

NOVEL SURVEY MONUMENTS FOR SOUTHERN TIMBERLAND

Concrete markers to show the intersection of important survey lines are being used to advantage in plotting a large tract of timberland near Laurel, Miss. These markers are $4\frac{1}{2}$ inches square and 17 inches long. In the center is a brass or aluminum plate which is screwed on an iron rod and sunk into the concrete; on this plate the numbers are stamped, the township and range figures being smaller

and placed on the outside, while the section numbers are given in larger figures.

As there are many angle lifes in this region, some of which date back to the old Choctaw Indian purchase boundaries, the result is that there is much confusion in demarcation lines. In the early days, the government would buy and survey a slice of Indian territory running, it might be, from the wigwam of the "big chief" to some large rock, oak tree, spring, or other landmark, and later, other sales would be made; hence the confusion. In



Type of Concrete Marker, Made with a Brass or Aluminum Center Plate, being Used in Plotting a Large Tract of Timberland in Missouri

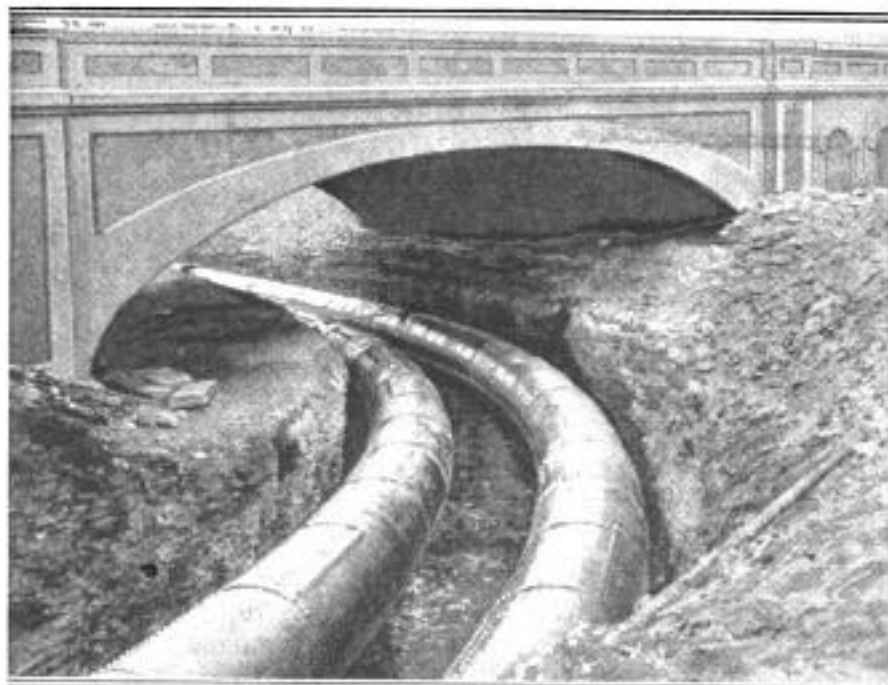
one instance four concrete posts were needed to establish what should have been one corner.

☐ An acid-resisting enamel which has satisfactorily withstood more exacting tests than would be encountered in actual use, has recently been developed.

COVERED WATER RESERVOIR 14 ACRES IN EXTENT

By W. J. LAUBENSTEIN

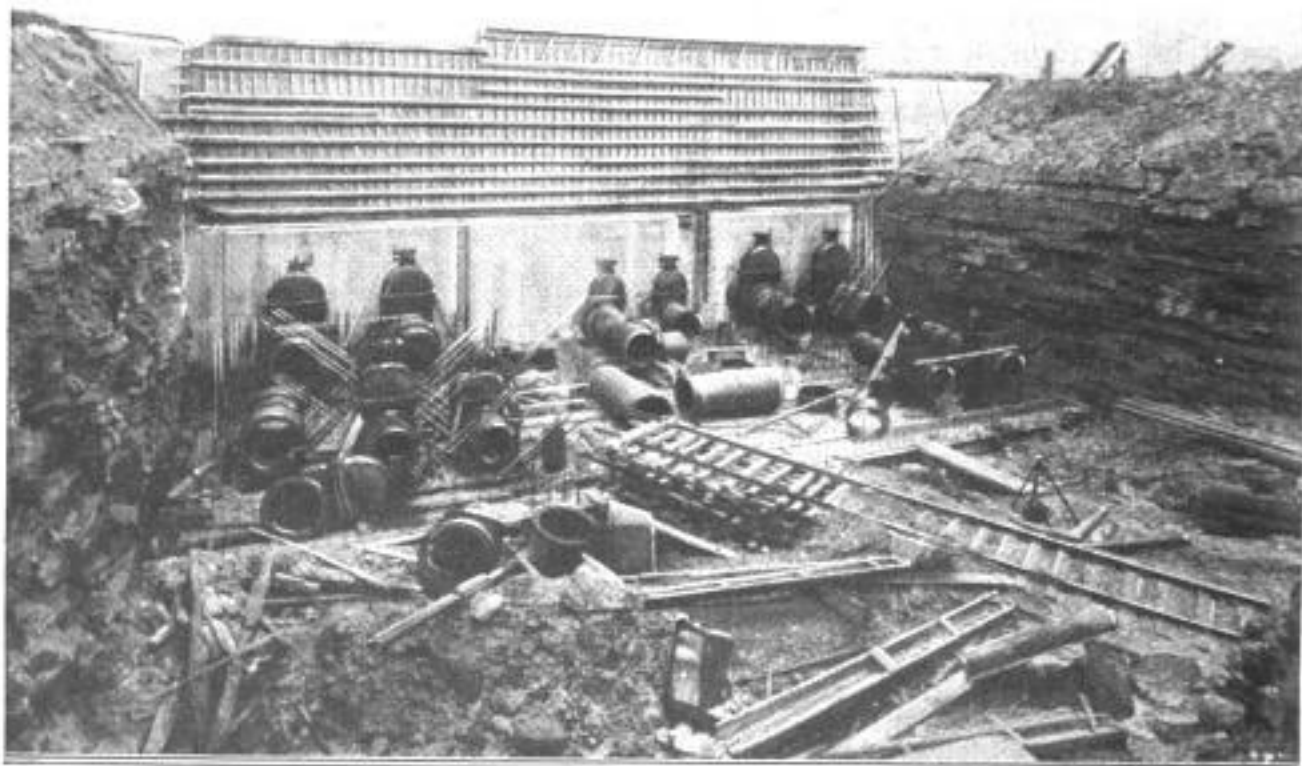
THE city of Cleveland has now almost a fully developed water system. Groined arches, almost cathedrallike in character,



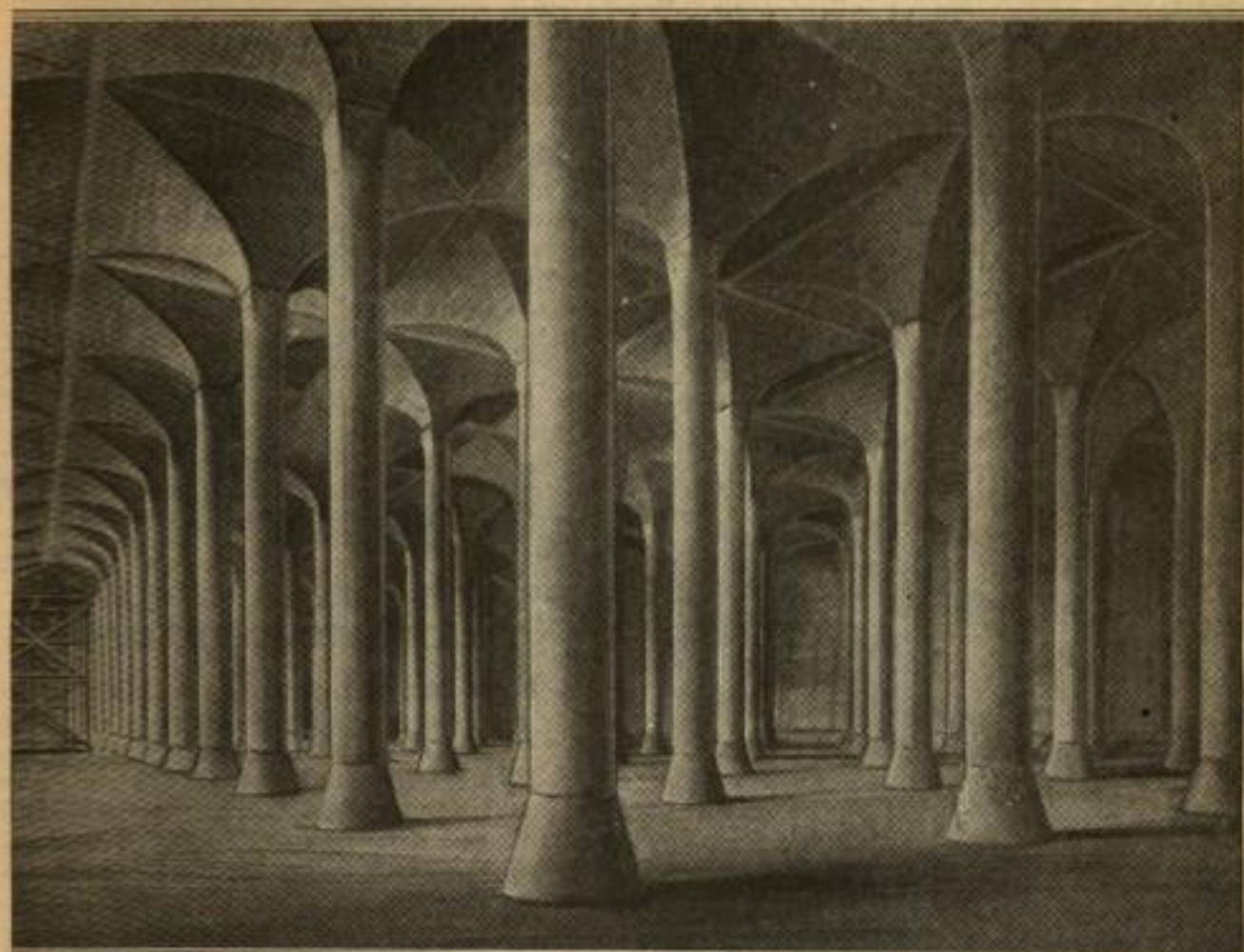
Looking North, a View of Two 60-Inch Steel Mains Rounding a Curve under a Railroad Bridge: These Mains will Carry Raw Water to the Baldwin Reservoir until the Completion of the Filtration Plant

the largest reinforced-concrete reservoirs of the covered type in the world—only a unit, however, in a \$30,000,000 project for eventually to the new Baldwin Reservoir. The present development, costing \$13,000,000, has been undertaken, and is being

carry the roof of the structure, which will be known as the Baldwin Reservoir; these in turn are supported by 1,200 columns, each 40 feet high and 30 inches in diameter. In time the 14-acre roof of this 130,000,000-gallon structure will become the central "floor" of a large municipal park. Water for the system will be pumped from a crib intake $4\frac{1}{2}$ miles out in Lake Erie, and fed to the Kirtland Street pumping station by a connecting tunnel driven through the lake floor. Two 60-inch steel mains will distribute the flow from that point to various mixing flumes, through a filtration plant, to coagulation basins, and



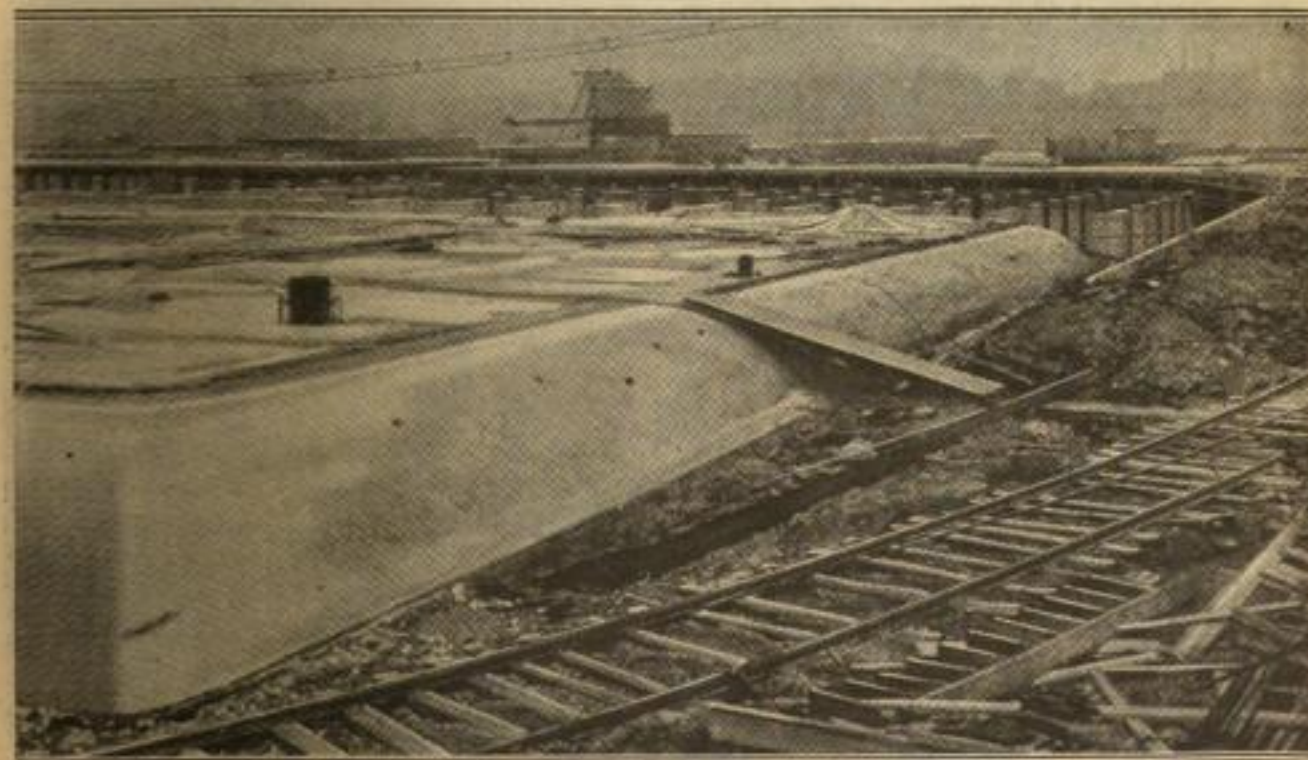
Looking East, a View of the Valve House and Piping for the Baldwin Reservoir, under Construction: Some Conception of the Size of These Valves may be Gained by Comparison with the Surveyor's Instrument, Normally on a Level with a Man's Eye, Which can be Seen Mounted on a Tripod Just South of the Track



A View of the Columns and Roof, from the Inside of the Reservoir: Groined Arches, Which are Carried by 1,200 Columns, Each 40 Feet High and 30 Inches in Diameter, Support the Roof

carried out, by the Department of Public Utilities, and was begun in 1916. When completed, Cleveland, the country's fifth city, expects to compare even more

favorably with other cities than it now does on the question of water supply. It is now the only one of its size in the United States to have fully metered service.



PHOTOS BY COURTESY OF THE DEPARTMENT OF PUBLIC UTILITIES, CLEVELAND

The Roof of the Baldwin Reservoir, from the Southwest Corner: Uncovered Portions, Still under Construction, are Visible in the Background

SCAFFOLD SWUNG INTO PLACE ON FIELD BILLBOARDS

A scaffold intended to be used in working on billboards is so constructed that it can be put in place without climbing



Easily Erected Scaffold, the Two Wooden Uprights of Which Have Adjustable Hooks So That They can be Swung in Place over the Billboard

to the top of the board to place the supporting hooks. In this scaffold the hooks are moved to the proper distance near the top of two long wooden uprights and fastened there. The hooks are then swung in place over the board, and the stage pulled up. A projecting arm on each upright keeps the equipment from touching any of the area to be painted.

AIR PATROL CAUSES ARREST OF GAME-LAW VIOLATOR

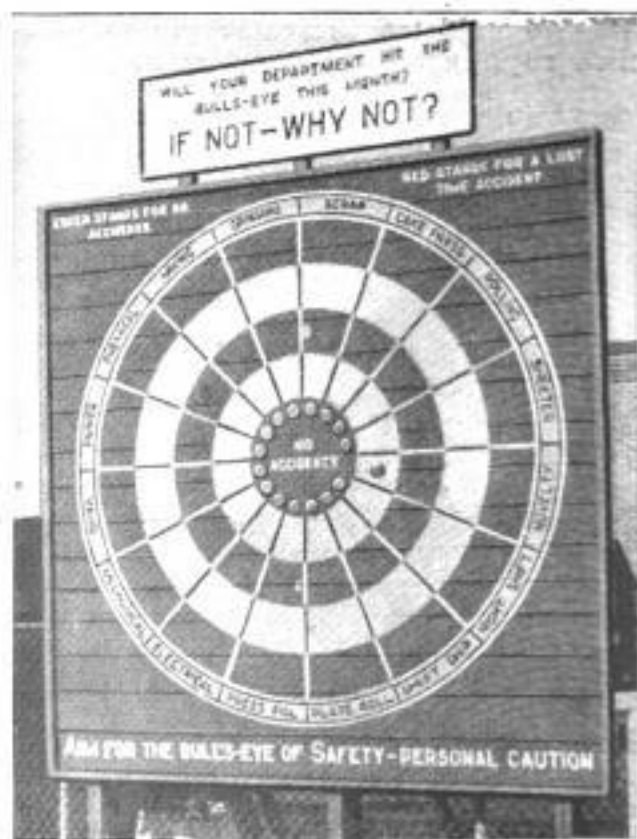
That forest-patrol airplanes may be as useful in the future for enforcement of the game laws as they have been in the past for preventing the destruction of valuable forest property by fire, is indi-

cated by the fact that an airplane flying over one of the national forests of California was recently the means of bringing an outlaw deer slayer into court.

A deputy of the forest service was making an observation flight over the Santa Barbara National Forest. From high in the air he observed a herd of deer browsing in a mountain meadow. A moment later he saw a man creep up and level a rifle at the deer. There was a tiny puff of smoke, and one of the deer fell in its track. The official immediately returned to the landing field, telephoned to all forest officers, and the man was caught.

COMPANY USES LARGE TARGET TO CURTAIL ACCIDENTS

A large target is used by a Massachusetts company to keep the no-accident aim of the concern before its employees. The target is divided into 16 sectors, one for each department in the factory, and a small red disk in each sector is moved toward or away from the bull's-eye, according to the number of accidents in that department for the month. If a department has none, the red disk is replaced by a green disk, which is put on the bull's-eye, the latter being lettered "No Accidents."



Target Used by a Massachusetts Company to Encourage Care and Reduce Accidents in Its Various Departments

TOPPING MACHINE CUTS VARIOUS GRAINS

Horizontal conveyors are used in a type of topping machine adapted for cutting the heads from stalks of Kaffir corn, Milo maize, and other grains. The main conveyor has a gauge rail running along one of its edges, and at its lower end a circular saw is mounted.



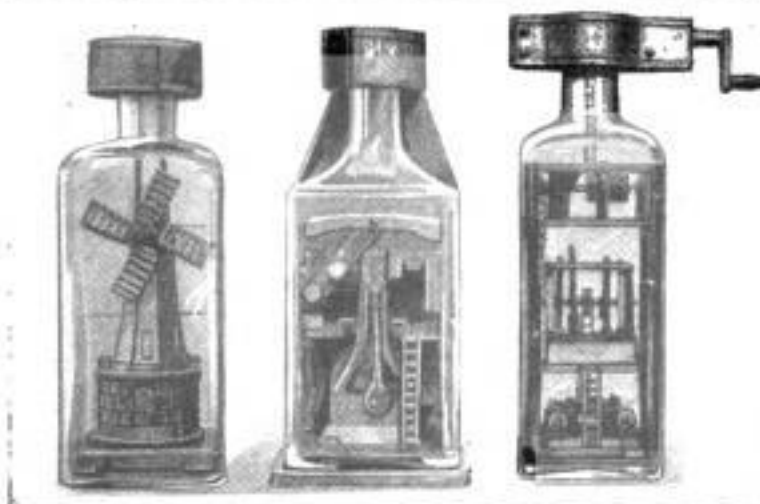
A bar in front of this saw is mounted along the conveyor, and serves the purpose of holding the stalks firmly to it, until their heads are severed and passed along. A small alining conveyor is also used and adds to the convenient adjustment and operation of the machine.



A Topping Machine for Cutting the Heads from Corn, Maize, and Other Grains: Above, the Loading End; Below, View of Both Conveyors, and the Belt-Driven Saw for Cutting the Stalks

ENGINES IN BOTTLES
OPERATED BY CRANK

A model stamp mill, a steam engine, and a windmill, each inclosed within a bottle, and operated by a crank inserted at the neck, have been made by a man in the West. The stamp mill is equipped with a chain drive connected with an engine, and has four stamps and a rock crusher, while the bottle inclosing the steam engine also contains a dynamo, an electric light, and a lathe, pump, vise, and drill press. The windmill is of the common Dutch type.



The Small Mechanical Devices Built within These Bottles can All be Operated by a Crank

GUSHERS BRING OIL BOOM TO ILLINOIS COUNTY

What is said to be Illinois' greatest oil gusher has been opened at a point about



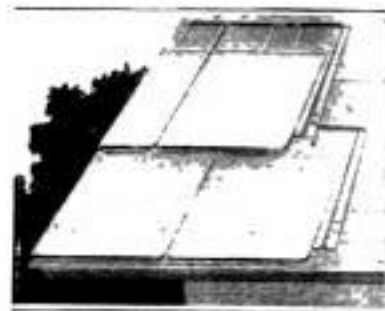
View of "Illinois' Greatest Oil Gusher," Located in Clark County, Now the Scene of an Oil Boom

three miles south of Martinsville, in Clark County. When the well was "shot," the oil sprang into the air some 300 feet, so high that a photographer a fairly good distance away could take only the lower part of the oil pillar. One of the wells first struck in that region is producing 20 barrels per day, and it is expected that when the new gusher gets down to settled production, it will better this output considerably. As a result of these and other finds, an oil boom has started in the neighborhood.

ZINC ROOF SHINGLES AFFORD LIGHTNING PROTECTION

A new type of shingle rapidly gaining favor is made of pure zinc, for which

water-tightness is claimed on roofs of 4-inch or greater pitch. The shingles interlock with each other, and require but one nail apiece, greatly



simplifying their laying. To improve their appearance, the zinc is oxidized at the plant, thereby producing a better color and surface texture. Of particular interest is the fact that, when grounded, this type of shingle affords protection against lightning. Provision is also made for ventilation to prevent the roof from "sweating."

EXCEPTIONAL GRADE FEATURES LOGGING RAILWAY

At High Point, Wash., a small lumbering community situated in the foothills of the Cascade Mountains about 30 miles from Seattle, is located what is perhaps the most remarkable railway in the world.

It operates on grades which in places exceed 40 per cent, and is used for logging purposes. The gauge of the road is about 7 feet, or half again as wide as the standard railway track. The rails consist of poles about 10 inches in diameter, and the car trucks have wide concave-faced wheels to fit the pole tracks. The railway is about half a mile long, and the grade is nowhere less than 10 per cent. Donkey engines are used on the down trip to snub the loaded log cars.

The maximum grade upon which even

a geared locomotive can operate is far less, and even then a mechanical "snubbing" device must be used for braking the cars. This physical limitation made necessary the development of the novel railway in use at High Point.

A huge block, known as a "bull block," is attached to the loaded log car, giving the snubbing donkey engine a double purchase on the load. Several trips are made daily, and about 45,000 feet of logs are hauled each day.

Another rather unusual feature of this railway is that no frogs, Y's, or other types of switches are used. Branch tracks are laid up to the regular track, and switching is accomplished by inserting a short length of pole under each wheel.



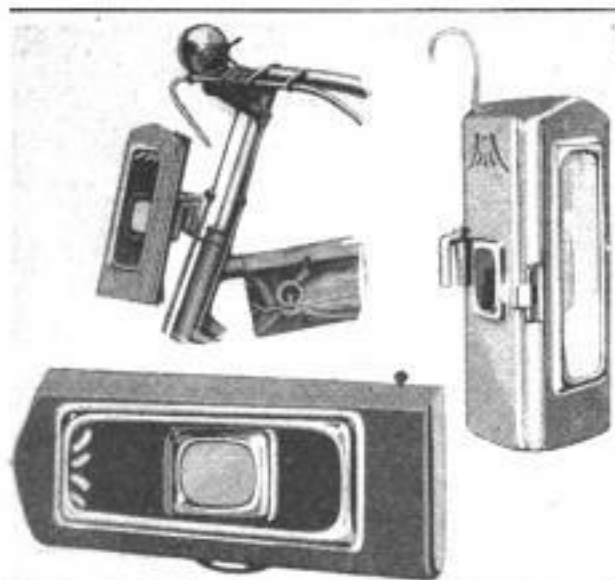
One of the Novel Railway Cars in Operation: This Load of Logs is being "Snubbed" down the Mountainside by a Donkey Engine with a Block Purchase. Note Heavy "Bull Block" at Rear of Car, Which is Fastened with a Choker to the Logs Instead of being Fastened to the Car. The Gauge of the Road is Much Wider than the Standard Railway Track



Section of the Cascade Mountains, in Washington, through Which the Railway Operates: The Track, Which in Places Has a Grade of 40 per Cent, and Nowhere Less than 10 per Cent, is Built with "Rails" of Round Logs and may be Seen Extending Diagonally across the Picture. About the Center is a Load of Logs being Snubbed down the Mountain

JAPANESE FOLDING LANTERN AS BICYCLE HEADLIGHT

A folding lantern as a bicycle headlight has come into use rapidly in the streets



Upper Left: Japanese Folding Bicycle Lantern on Machine. Lower Left: Folded, When Not in Use. Right: Detached for Hand Use

of Tokyo, Japan. It is novel in the fact that it shuts up into small space when not in use, like a collapsible lunch box. It is nickelplated, is easily detachable, and with a hook for a handle may be used also as a hand lantern.

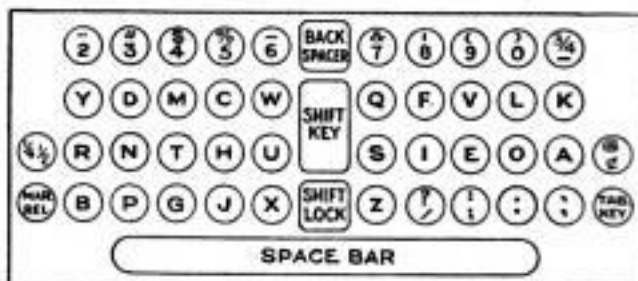
HAZARD ON MICHIGAN ROAD REDUCED BY IMPROVEMENT

The changes for the better in respect to safety and comfort are shown in a Michigan road when it had been made into a trunk highway. Before the work was done, the road was rough and rutty, while a stretch of steep grade and a rail-

road crossing constituted a source of danger. After the improvement, the road is smooth, the approaches to the railroad are of less grade and protected by heavy white fences, and the danger signals stand on the right-hand side. Cattle guards have also been installed.

NEW TYPEWRITER KEYBOARD SUGGESTED BY SCIENTIST

Claiming that the present standard typewriter keyboard was selected before the advent of the "touch system," and that it fails to distribute the work equally among all fingers, a professor of education in a southern college has suggested a new arrangement. His plan, said to have been devised after extensive research, has the middle row reading, R, N, T, H, U, S, I, E, O, A. Running from top to bottom in the middle, he would place the back spacer, the shift key, and the shift lock. The marginal releases would be on either side, where the present shift keys are located. This layout would facilitate finger movement, says the



Typewriter Keyboard Proposed by College Professor Who Claims Present Arrangement does Not Evenly Distribute the Work Required of the Fingers

professor, and, further, would distribute the work of the fingers in proportion to their strength and ability.



Left: Michigan Country Road before Improvement as Trunk Highway. Right: Same Road after Improvement, Showing Smoother Surface, More Uniform Grade, Fences on Elevated Stretch, and Less Danger at Railroad Crossing. Note Cattle Guard and Change of Danger-Signal Position

WIRE BRACING OF FRUIT TREES JUDGED BEST



When Properly Installed, the Wire Bracing should Be Able to Support a Man's Weight, as Pictured at the Left. The Photograph Above Shows an Orchard in Which the Heavily Loaded Limbs are Held Up with Wooden Props, Which Are Not Only Unsightly but Are Also in the Way When the Fruit is to be Picked. To the Right is Given a Close-Up of the Center Ring about Which the Wire Ends are Fastened



Repeated experiments have shown that a properly planned system of wire bracing for fruit trees is highly satisfactory. These experiments have been carried out largely under the direction of L. C. Barnard, of the College of Agriculture, at Davis, Calif. Such a system greatly improves the looks of an orchard by getting rid of the cumbersome wooden props ordinarily used to hold up the heavily loaded limbs. The tree is braced within by means of wires. Each limb is supported by a wire, one end of which is attached to the inner side of the limb by means of a screw-eye, or staple. The other ends of these wires come together at the proper height, where they are attached to a single ring in the center.

In wiring practice it has been found best to have about 200 feet of wire uncoiled along the row of trees so that it can be drawn toward the worker as he progresses from tree to tree. A screw-eye is inserted on the inner side of each of the four or five main branches that he selects. The smaller limbs may be wired to these larger limbs.

After the wire is tied, it is drawn toward the center and then cut off at the right

length. The same operation of wiring is repeated from the screweyes on the opposite side of the tree. The worker secures a washer or harness ring to one of the loose ends of the wire already in place, then he pulls the loose end of the second wire through this ring, making the wires taut, though neither too tight nor too loose. The ring is thus suspended in the center of the tree and the other wires.

It has been found that it is best not to wire the trees while the fruit is on them, as leaves may be shattered and fruit knocked off. A properly braced tree will weather storms in good shape, as the strain on one limb is shared by the other limbs. Furthermore, and this is an important consideration, this kind of wiring does not interfere with tillage or harvesting.

☛ A 6-inch pocket rule, recently marketed, has been made with steel treated so that it will not stain or rust, thus eliminating the difficulty experienced in reading the graduations on rules which become rusty or blackened, and the necessity for frequent cleaning which, in time, makes the marks indistinct.

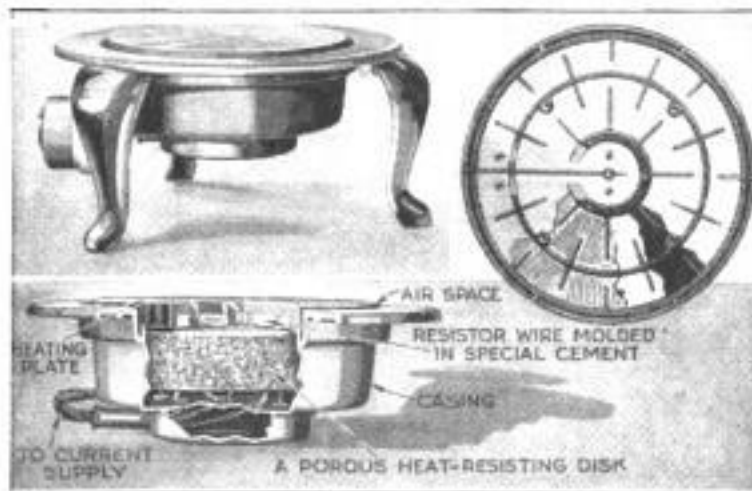


This Marine Corps Sergeant is Assembling the Parts of an Automatic Rifle Blindfolded, While Parts of Other Weapons are Scattered About before Him

U. S. MARINE ASSEMBLES RIFLE BLINDFOLDED

The U. S. Marine Corps is proverbially expert in the knowledge and use of firearms, but there is a gunnery sergeant, Gurdon F. Charsha, at present stationed at Quantico, Va., who has so thoroughly mastered the mechanism of machine guns and automatic firearms that he can take several of these weapons apart and then reassemble them while blindfolded. He has performed this almost unbelievable feat several times. His expert knowledge of machine guns has enabled him to qualify as instructor in machine gunnery at many Marine Corps posts, both at home and abroad.

NEW ELECTRIC RANGE UNIT WITH COVERED RESISTOR



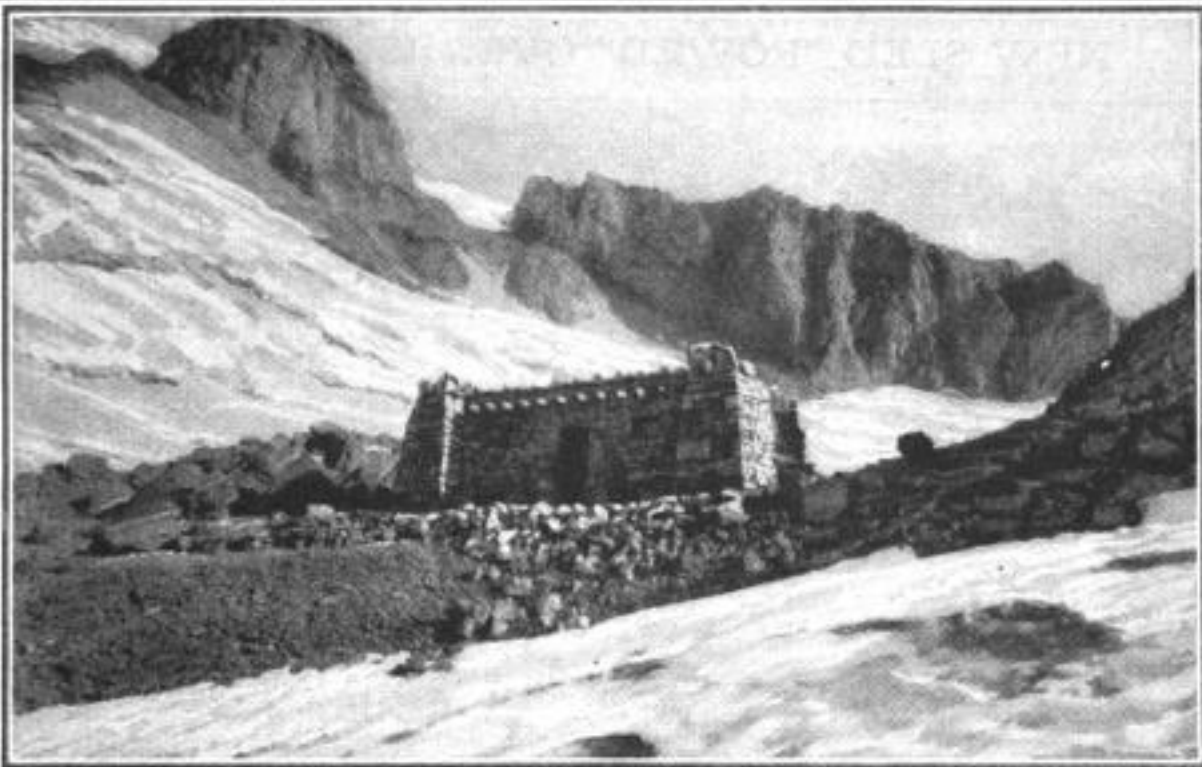
Unit of Electric Range, Showing Resistor Wire Imbedded in Cement, Which Protects It from Liquids, and Overcomes Tendency to Oxidation

A newly developed unit for an electric cooking range is claimed to overcome the weak points of the range in the tendency of the resistor to oxidation and damage of the glowing wire by liquids and grease. This unit has the resistor wire imbedded in a special cement impervious to air, liquids, and grease, while still preserving its insulating qualities. On this account it may be used in places like mines or laboratories, where otherwise the glowing wire might cause danger from fire or explosion. The range units may be converted to independent stoves by attaching three legs to each.

HIGHEST DWELLING IN U. S. ON MOUNT RAINIER

For the purpose of providing shelter for mountaineers who may be overtaken by storms, the United States government recently constructed a novel stone dwelling at an altitude of 10,000 feet, on the south side of Mt. Rainier, Rainier National Park. The location of the shelter is on a sand and pumice-stone ridge at the base of Gibraltar, a famous landmark in the park. The spot is known as Camp Muir, named after a famous explorer who ascended the mountain in 1888, and chose this place for a camp, because it is practically the only spot on the mountain sheltered from heavy winds.

The shelter is built of stones gathered on the site, and the style of architecture resembles that of Indian dwellings of the Southwest. Constructed by the National Park Service at a cost of \$2,500, the building houses comfortably 25 persons, and is equipped with steel bunks, springs and mattresses, two stretchers for use in the event of accidents on the mountain, emergency food rations, first-aid kits, stoves, and fuel oil. The shelter lies on the main route to the summit of the mountain. Last year 3,000 persons climbed as high as Camp Muir, and 418 climbed to the summit of the mountain.



The Highest Dwelling in the United States: Gibraltar Rock, a Famous Landmark on Mount Rainier, Where the Government has Erected This Shelter for Mountaineers, 10,000 Feet above Sea Level: Note the Pyramidal Construction of the Walls to Withstand Snowslides



Looking across Paradise Valley, at an Altitude of 5,555 Feet; The Circle Indicates the Location of the Shelter Cabin, Shown Above, at the 10,000-Foot Level. To the Left of It Looms the Snow-Capped Summit of Mount Rainier, 14,408 Feet above the Sea

NEW SLED "ROWED" OVER ICE OR SNOW



Above, to the Left, Is a Close-Up, Showing How the "Oars" are Arranged on the Sled. The Roller over the Oar Helps to Steady It. The Other Views Show the Oars in the Forward Position and When Extended

A sled that can be "rowed" over ice or snow has proved successful in trial tests. In operating, the rider sits as usual and grasps the handles of two "oars" which extend along the sides of the frame. By a slight upward pull, the toothed metal ends of these members are made to bite into the ice or snow, and the following backward thrust pushes the sled forward. A spring drum and cable return them automatically to their normal position for the next stroke. The arrangement can also be installed on any ordinary sled.

ROUGH ROCKS BAFFLE FLOW OF WATER IN SPILLWAY

An unusual means of slowing the speed of water flowing down a spillway, and of distributing the stream over the spillway floor, has been installed near the Cove plant of the Utah Power and Light Company, in southeastern Idaho.

The water is delivered to the penstock by a 4-mile concrete canal of large size and rectangular cross section. The intake is from a forebay that is held at a nearly permanent stage, and thus the canal automatically carries a fairly uniform head of water.

However, the Cove plant, like all electric plants, must vary its output with the slight but ever-changing demand for electricity through the day. This is done by a series of automatic controls, such, for instance, as the opening and closing of the turbine valves.

That there may always be ample water available for hard pulls, a slight surplus of water is carried in the canal, the overflow being provided for in the spillway, which is located near the penstock. In

time of temporary complete closing of the power plant, the entire canal capacity is diverted through the spillway.

The lay of the land makes it necessary that the spillway have a steep slope, and a river bed and a highway intervening re-



To Reduce the Speed of the Water in This Spillway, Emptying Directly into a Small River, Rocks have been Laid over the Floor, and a Slight Fall and Shallow Channel Built Close to the Junction

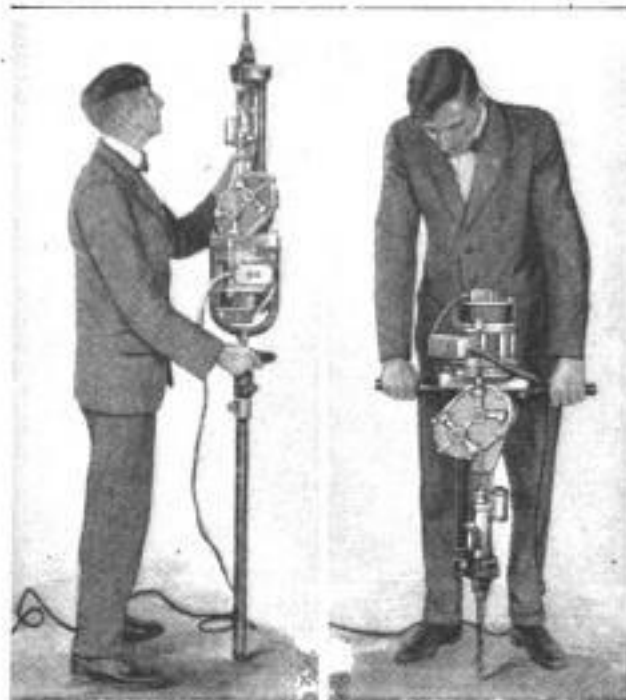
quire that the spillway be concreted to the brink of the river channel. To prevent the discharge from digging a great hole in the river channel, and gradually undermining the spillway and breaking it down back to the point of endangering the main canal, the floor of the spillway has been roughened by laying rocks permanently therein to reduce the speed of

the stream. The flow speed is still further broken by a slight fall under the highway bridge, into a narrow and shallow channel across the spillway floor.

AUTOMATIC STOKER CONTROLS STEAM BOILER PRESSURE

An automatic stoker control has just been marketed which dispenses with an operator and maintains constant steam pressure at any predetermined point by automatic regulation of the fuel feed and draft dampers. The controller consists of a pressure regulator of special design and a variable-speed transmission which it operates. When the boiler pressure drops below the desired limit, the balance lever of the regulator drops, and this action is communicated to a piston which is connected to the transmission, and causes it to operate faster. As a consequence, the stokers feed more fuel to the fire box, and at the same time a greater volume of air is admitted to the dampers. When

tion, and produces compressed air for delivering power at the cutting edge. Being self-rotating, the cutting points are

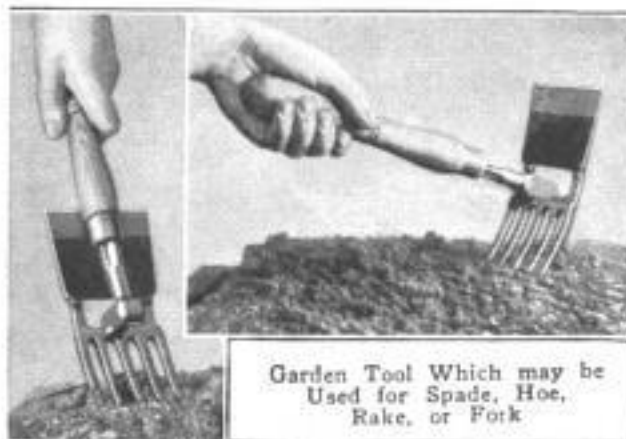


Left: Special Feeding Attachment for "Up-Hole" Work Overhead. Right: In Using the Drill on Downward Work, Its Weight Is Sufficient to Provide Automatic Feed

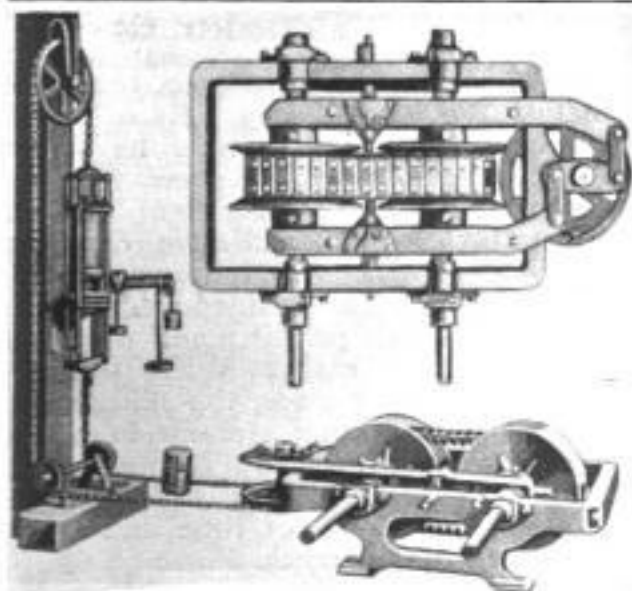
changed constantly, and cuttings are withdrawn from the drill hole automatically. The rate of percussion is 1,000 blows per minute. For holes to be drilled overhead, a special feeding attachment is provided which eliminates fatigue.

SMALL GARDEN IMPLEMENT HAS MANY USES

With its uses as spade, stirring fork, rake, and hoe, a new combination tool will prove a handy implement in the flower and kitchen garden. It is easily changed from one form to another by a locking plate, and will save having and carrying different tools for close work among flowers or vegetables.



Garden Tool Which may be Used for Spade, Hoe, Rake, or Fork



Top View and Installation View of Stoker-Feed and Draft-Control Mechanism, Arranged for Chain Transmission

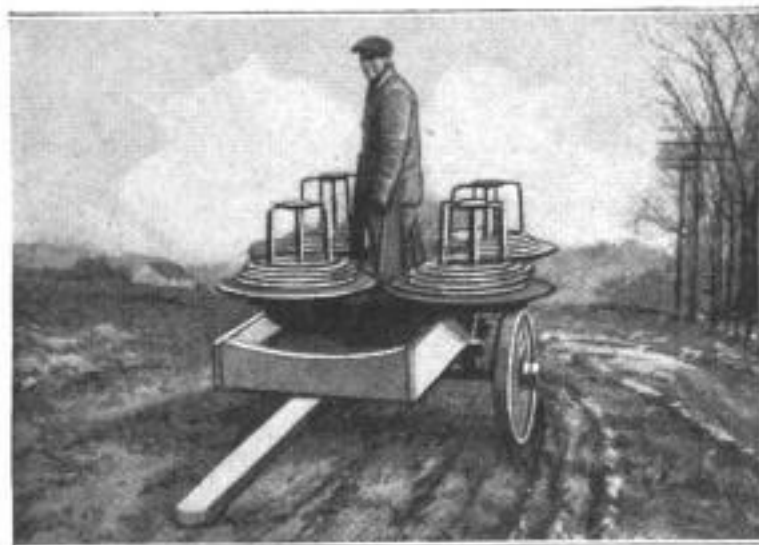
the steam pressure exceeds the desired limit, this operation is reversed, causing the pressure to seek its normal again.

CONCRETE DRILL OPERATED FROM LAMP SOCKET

Those who have had occasion to drill holes in well-made concrete will appreciate various features of a new concrete drill. It is a portable unit, tapping current from any lamp socket for its opera-

MOTORIZING THE JOB OF THE RURAL LINEMAN

In rural communities the stringing of telephone wires is often a thankless job, requiring heavy manual labor in all kinds of weather. The telephone companies, however, are beginning to make use of mechanical aids that greatly facilitate the installation and maintenance of their lines. One method used is to have a truck proceed slowly ahead, carrying the forward ends of wires by means of a contrivance resembling the whiffletree of a wagon. The reel trailer, of course, is left standing behind in the road. To string four to ten wires at the same time, it is only necessary for the linemen to put them over the crossbars at the top of the poles. The truck then goes forward slowly, unwinding the reels and pulling the wires along to the next pole, saving much time and labor.



A. Trailer with Four Wire Reels; the Truck Runs Ahead Carrying the Four Wires from Post to Post

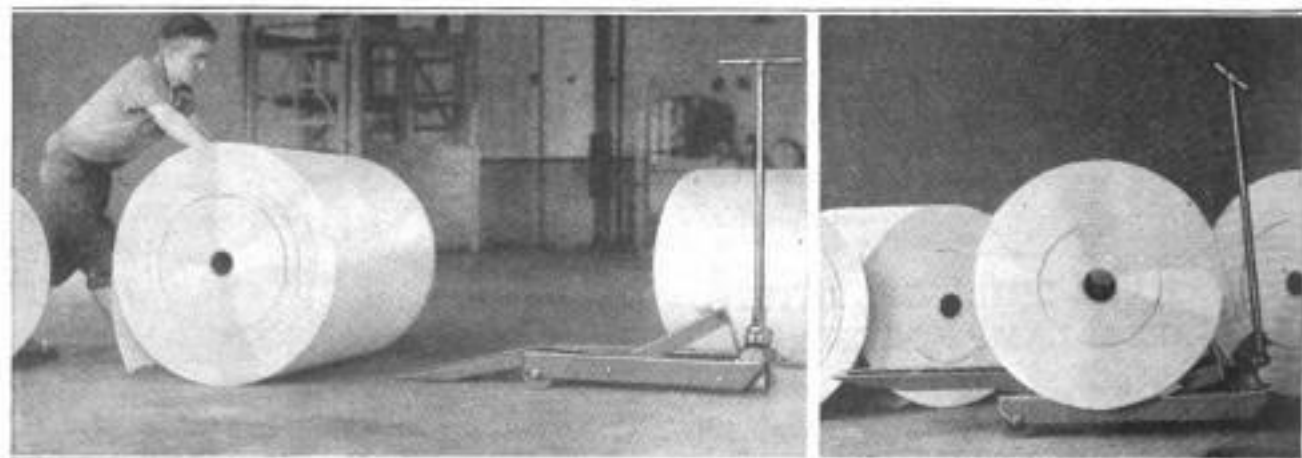
MIRROR PROVIDES WIDE VIEW FOR AUTOMOBILE DRIVER

A recently devised mirror for an inclosed car is installed just above the driver's eyes inside the glass front. Set horizontally at an obtuse angle, the two parts are also adjustable vertically to give the driver a complete vision of the road behind, as well as of the interior of the car. Adjustments are made by means of screws within easy reach of the driver.



AUTOMATIC TRUCK HANDLES HEAVY PAPER ROLLS

The need of a small, compact truck for handling the large, heavy rolls of paper used by modern fast presses has been felt for a long time. To meet this demand, such a truck has been built of structural steel and malleable castings, with roller bearings, and heavy enough to stand abuse. The inclined skids at the back of the truck permit a roll of paper to be pushed up easily. When the roll reaches the proper place, the skids automatically rise, forming a cradle in which the roll may be carried. To unload it, the operator pushes a pedal which lowers the skids. Economy of time and labor are claimed for the truck.



Automatic Truck for Handling Heavy Paper Rolls: Left, Truck Ready to Receive Roll on Inclined Skids; Right, Roll in Position on Cradle, Formed by Automatic Rising of Skids, and Ready to be Moved to Printing Press



The Marunouchi Building, Now Nearing Completion at Tokyo, Japan: It is Said to Be the Largest Office Building in the Orient, and is Equipped with Fire and Ventilating Systems, Bathrooms, and Other Conveniences for the Tenants

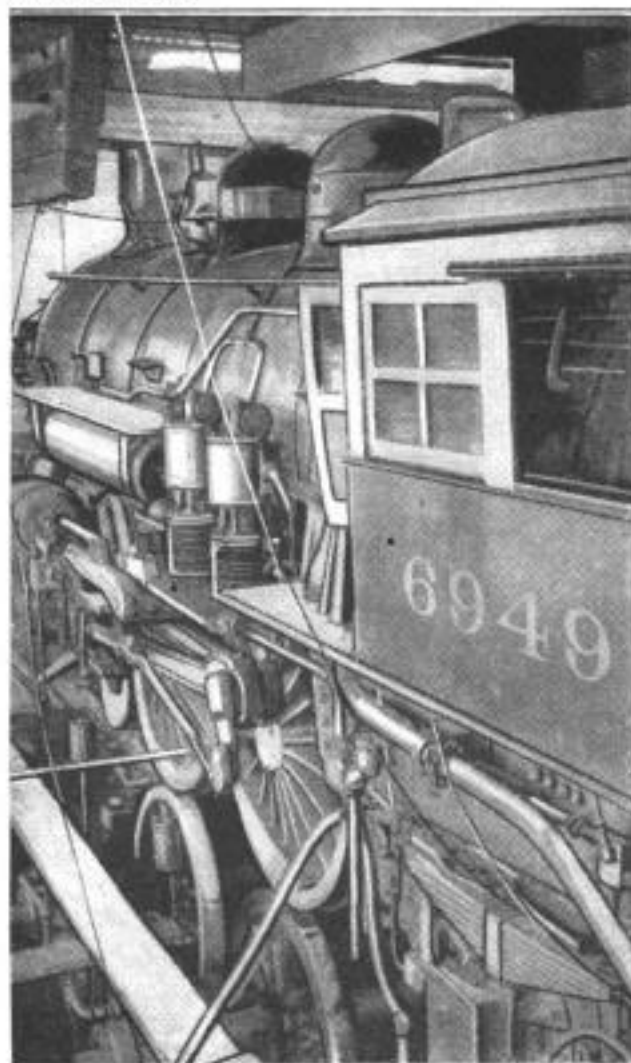
ORIENT'S LARGEST BUILDING NEARING COMPLETION

The Marunouchi Building, now nearing completion in Tokyo, Japan, is said to be the largest office building in Asia. It is an eight-story structure built on a ground area 350 by 300 feet, and is 110 feet tall. The weight of 87,000 tons is supported on piling that extends nearly 100 feet below the ground line. It contains approximately 800,000 square feet of floor space that will be devoted almost entirely to office purposes, and is of fire-proof construction throughout. Modern equipment, such as fire and ventilating systems, bathrooms, and other conveniences for the tenants, has been included, and the building houses its own power plant. It lies opposite the central railway station in the center of the business section, which about 10 years ago was an open field. The work is being done by an American construction firm.

MECHANICAL STUDENTS GIVE LOCOMOTIVE BRAKE TEST

An example of the practical work done by mechanical-engineering students in their senior year is a dynamometer test of a locomotive conducted by a class. The position of the wheels in the pit can be adjusted to permit locomotives of different wheel arrangements to rest upon them. With the drivewheels in motion, the engine is attached to the dynamometer which registers the load as it is in-

creased or diminished by the application of hydraulic-brake pressure to the pit-wheel axles.



Locomotive Resting on Wheels in Pit, While Students Make Tests of Pulling Power

UPPER MISSISSIPPI OPENED BY CANAL AND LOCK

BY CLEVELAND GAINES

AN early revival of navigation upon the upper Mississippi River is expected with the opening of the government's new canal and lock above Davenport, Ia. This improvement will eliminate the dangers of the Rock Island Rapids, opposite that city, and will provide a 6-

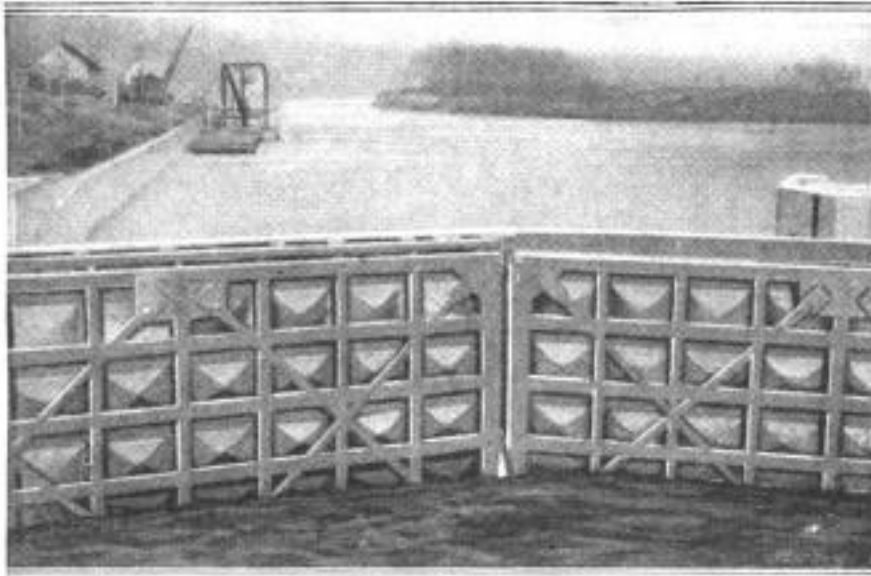
main to be applied, several boats passed through the canal and lock before the river froze over this winter. The lock, to be known as the Le Claire lock, owing to its proximity to the town of Le Claire, Ia., is built of reinforced concrete and steel, and is electrically operated. It will raise boats about 8 feet and is large enough to meet all present demands of the river craft.

The canal and lock were built by the government to save boats the expense of employing special pilots to guide them through the treacherous Rock Island Rapids, said to be the most feared stretch on the upper river, and the graveyard of many river boats.

With the completion of the canal, river craft will enter a lock at Moline, Ill., pass through the Moline canal, cross the river to the Le Claire

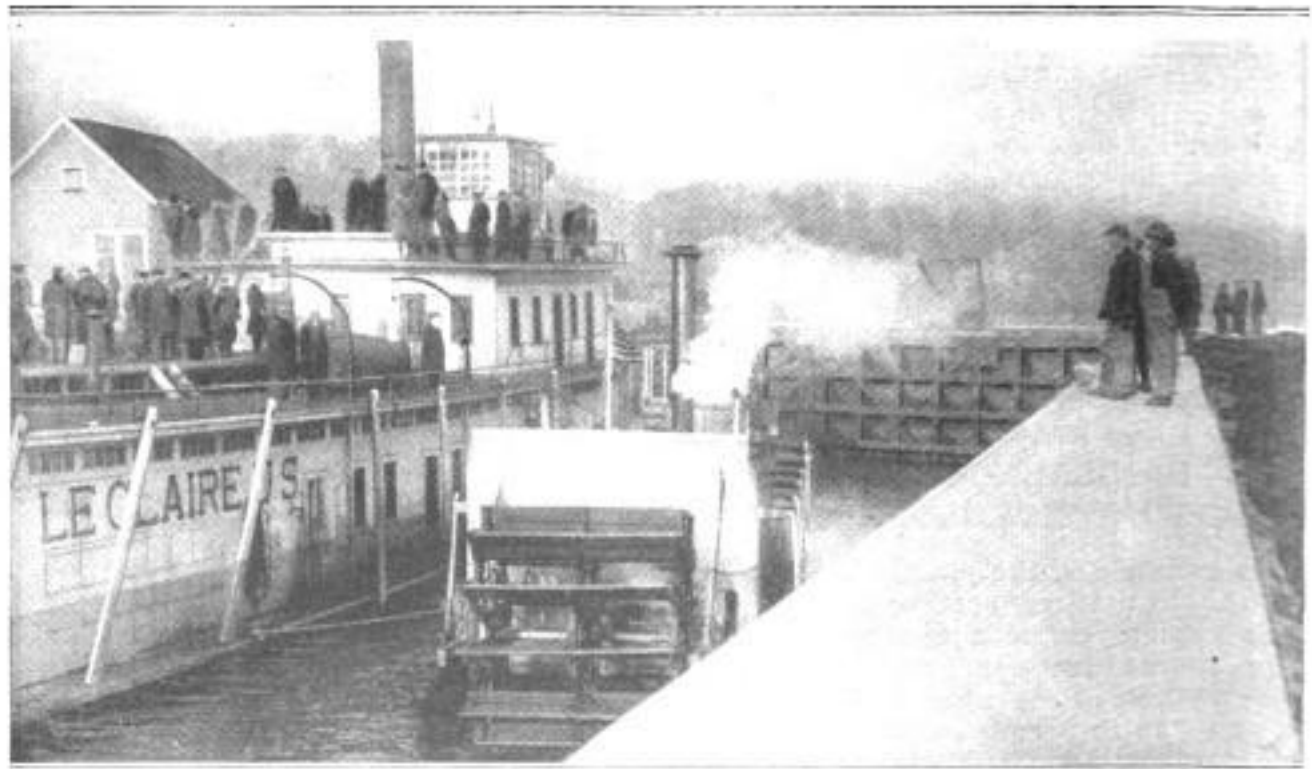
canal and lock, and then continue upstream without hindrance.

It is estimated that approximately \$2.-



Looking Upstream from the Government's New \$2,225,000 Lock at Le Claire, Iowa, Which, Together with the Canal Adjoining, will Make It Possible for River Boats to Escape the Rock Island Rapids

foot waterway from St. Louis, Mo., to St. Paul, Minn. The canal is $4\frac{1}{2}$ miles long and, though a few finishing touches re-



The Government Steamer "Le Claire," First Boat to Pass through the New Le Claire Lock and Canal: On Board Were Government Engineers and Residents of Illinois and Iowa. The Smaller Vessel, Seen to the Right, Is What might be Termed a "River Tugboat"



Another View, Looking Upstream and Showing the Approach to the Lock, the Lower Gates of Which Are Open: To the Left Are the Homes of the Lock Tender and Workmen

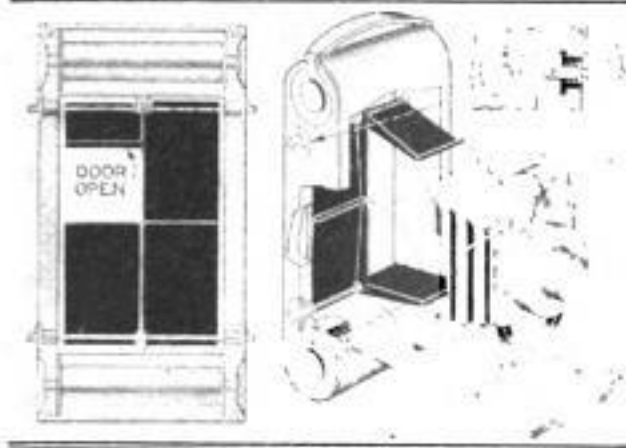
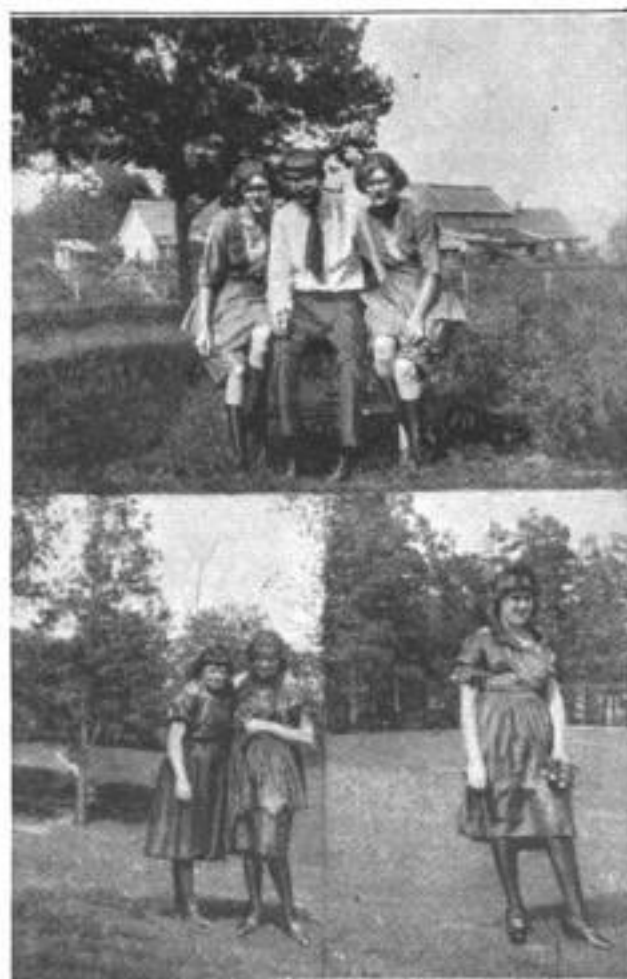
225,000 will have been spent by the government when the improvement is entirely

completed. The cost of upkeep will not be large.

NEW CAMERA DEVICE PERMITS MULTIPLE EXPOSURE

An improved attachment, adaptable to practically all makes of cameras from a hand camera to a motion-picture machine, provides for the making of one or more pictures on the same film or plate. It consists of a number of hinged shutters placed in front of the plate in such a manner that they can be separately dropped down and indicate to the operator the section of the plate being exposed. It can be used in taking several different-sized pictures on the same plate, or in making a number of different views of an object appear in one picture, and for other photographic tricks. The device, which is of light-metal construc-

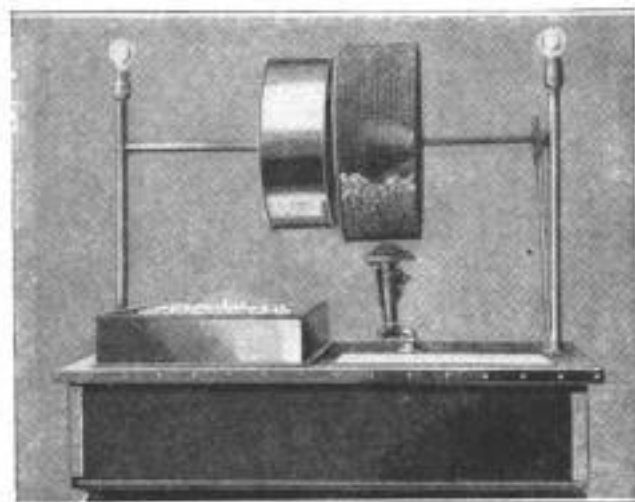
tion, is easy to attach and operate, and does not interfere with the taking of pictures the full size of the film.



Left: Phantom View of Camera Fitted with Multiple-Exposure Attachment; Note the Hinged Shutters and the Device That Indicates Those Left Unexposed. Right: At the Top the Same Girl Appears Twice on the Same Picture, and at the Bottom Are Two More Pictures Taken on the Same Film

MACHINE FOR POPPING CORN HAS SIMPLE DESIGN

A machine for popping corn, recently patented, is simple in design and inexpensive as well. Suspended between two



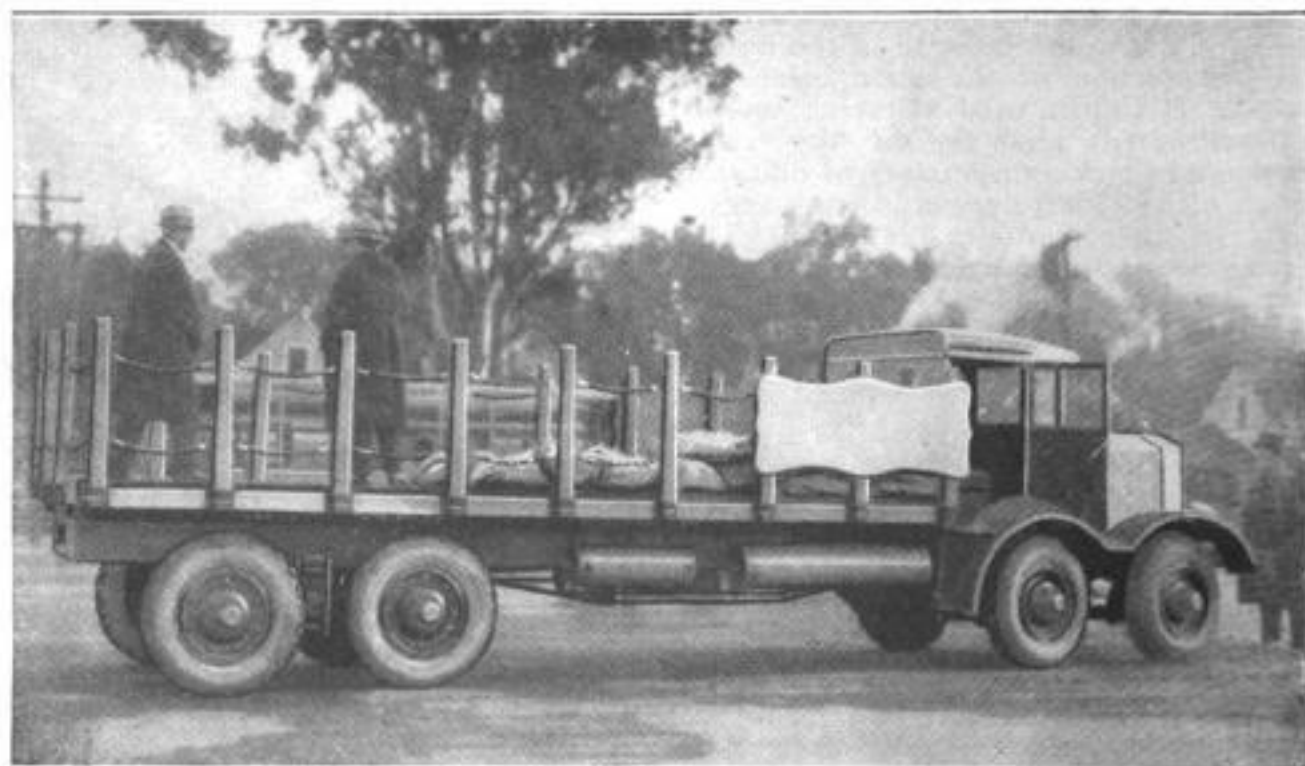
In This Popcorn Outfit, the Corn, Placed in the Perforated Drum, is Finally Popped, Buttered, and Discharged from the Drum at the Left

supports is a driven shaft and on it, as an axle, revolve a popping drum and a buttering drum. The circumference of the popping drum is covered with wire netting. It has a door at the top through which the popcorn is poured, and an internal spiral passage of wider-spaced netting leading from the door to a funnel about the axle. As the corn moves down

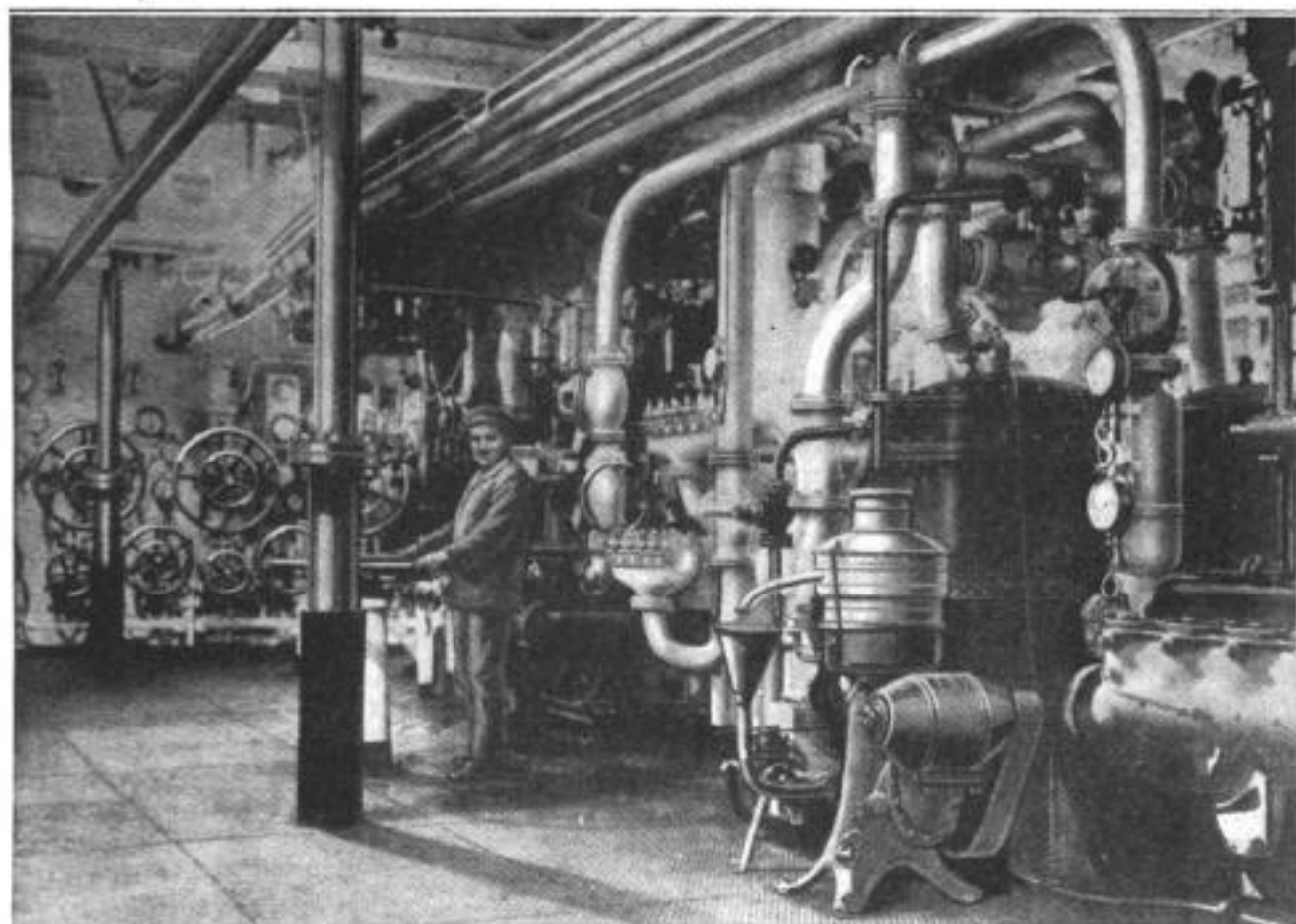
the passage it is heated by a burner placed beneath the bottom side of the drum; through the funnel, it passes by gravity to a perforated cage in the metal buttering drum. The butter, melted by the heat radiated from the burner, is carried up by a series of ribs and dropped through the cage. A door on the outer side of this drum is opened to discharge the contents.

SAN DIEGO MOTOR TRUCK RUNS ON EIGHT WHEELS

An eight-wheel motor truck in use in San Diego, Calif., with a speed of 35 miles an hour, is designed for fast freight service. The chassis is built with four rear driving wheels and four front steering wheels. The two front axles are connected by springs on either side, so arranged that the axles oscillate about a central trunnion bar. Better distribution of weight and greater stability are claimed for the construction, which throws only 55 per cent of weight on the rear wheels, instead of the usual 85 per cent. Owing to the arrangement of the front wheels, steering is not greatly affected if a tire blows out or a wheel comes off. Also, much less pressure in the pneumatic tires is required. This is an application to a freight truck of the principle embodied in the eight-wheeled California motor bus described in the February, 1922, issue of Popular Mechanics Magazine.



New California Motor Truck, Equipped with Eight Wheels, Turning a Corner and Showing the Ease with Which Steering is Accomplished with the Four Front Steering Wheels: The Four Rear Wheels are Used for Traction. Decided Advantages are Claimed for the Eight-Wheel Type



A View in the Engine Room of the Steamship "Majestic": Near the Right and Bottom of the Picture Is the Oil Purifier, with the Slim Spout Directly above the Funnel Top. It Is Similar in Appearance and Operation to a Milk and Cream Separator

CENTRIFUGAL MACHINE CLEANS LUBRICATING OIL

Centrifugal purifiers, similar in principle to milk and cream separators, are coming into use for keeping clean the oil used in the lubricating systems of heavy machinery, a notable installation being that on the "Majestic," the world's largest ship. On a recent trip it was noticed that a leaky brine coil had discharged into the supply tank for the lubricating-oil system of one of the main turbines, and it was feared that several hundred gallons of oil were ruined. The efficiency of the oil was completely restored by running it through the purifier. On another trip, oil badly contaminated from the iron piping, which the German builders were obliged to use in place of the usual brass or copper piping, was cleared of most of the iron oxide and lead that it had picked up, preventing damage to the bearings of the turbine.

☐ A hen's egg, measuring $8\frac{3}{4}$ inches on the longer circumference, and weighing a trifle over $3\frac{1}{2}$ ounces, is said to have been laid by a hen owned by a man in New England.

SMALL BALL OF SEALING WAX PREPARED WITH LADLE

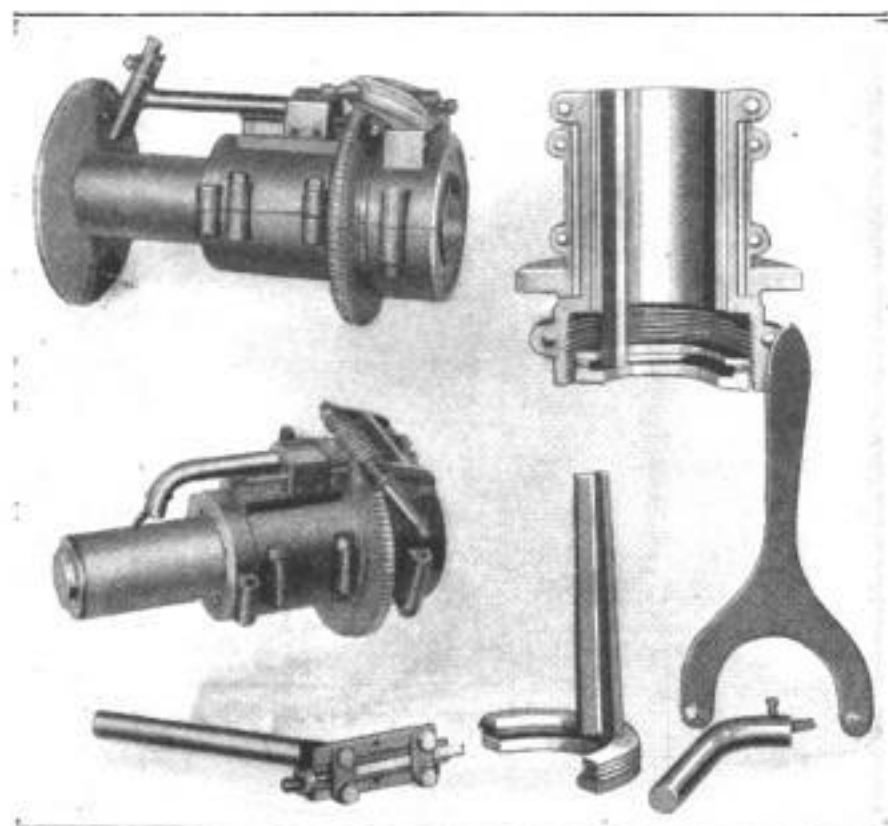
Using an outfit consisting of a small ladle, similar to a molder's ladle, and balls of sealing wax made to fit into the cup, is claimed to be a neater and more convenient way of sealing letters or packets. The operation is simple. The ball of wax



Successive Steps in Preparing the Sealing Wax: Dropping the Ball in the Ladle, Heating It, Pouring the Wax, and Impressing the Stamp

is placed in the ladle, heated over a candle, and then poured over the desired spot.

PORTABLE TURNING MACHINE SAVES TIME



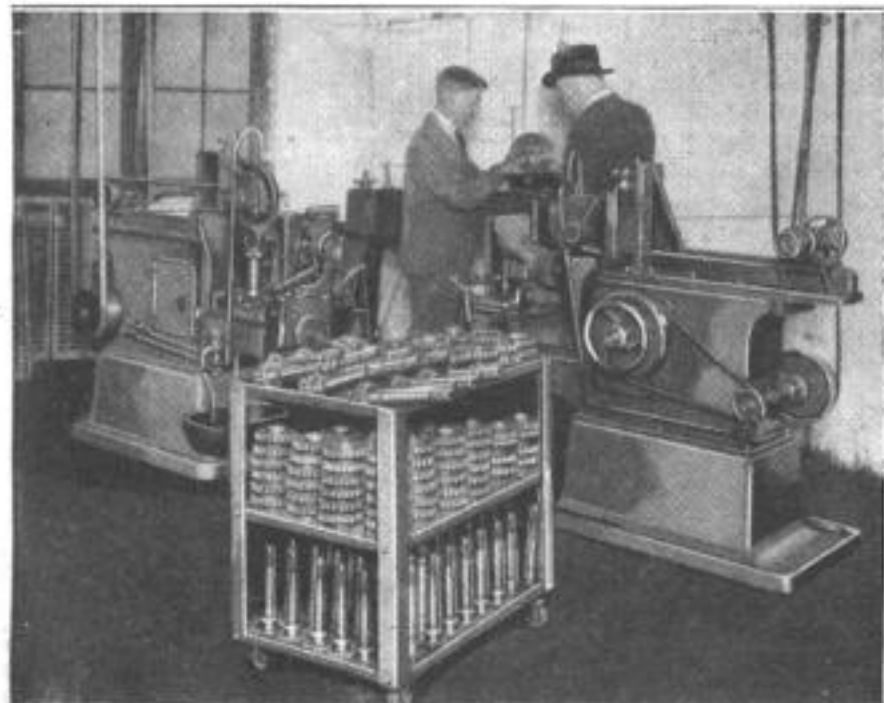
At the Left Are Two Views of the Portable Journal-Turning Machine Mounted Ready for Use. Upper Right: One-Half of the Split Collar. Below: Tool Holders, Centering Device, and Spanner Wrench

A machine has recently been developed for truing up worn journals in place, thereby saving the time and expense in tearing down heavy machinery in order to take the journals to large stationary machines. It consists of a split-collar arrangement that can be easily clamped on the shaft or axle, and it has a centering device that is automatically adjusted by means of a spanner wrench. The tool holder is attached to a sleeve made to revolve by a worm and gear, driven by an air or electric motor. While the machine was made to meet the demands of locomotive repairs, its use can well be extended to other work. One mechanic with a helper can apply the device and operate it.

TOOTH RACK CHECKS ACCURACY OF GEAR GRINDER

Great precision is necessary in the grinding of gear teeth to insure accurate profiles and smooth-running surfaces. In one type of gear grinder, a master tooth

rack meshes with a master gear mounted on the work spindle. A cam arrangement instantly disengages the rack after the grinding wheel has left the work on its return stroke, and during disengagement the work is automatically indexed one tooth. Immediately afterward, and before the wheel enters the work on its forward stroke, the master rack meshes solidly with its mating gear, correcting any possible error in indexing, and also locking and holding the work spindle rigid during the interval that it is being ground. This method automatically compensates for any possible error, and affords a check on each tooth.



At the Left the Master Gear Is Visible Just above the Top Tray of the Material Truck. The Machine at the Right is Grinding an Automobile-Transmission Shaft Pinion



Records of Vibrations Caused by Two Dynamos Running at Different Speeds: Note the Repetition of the "Wave" Action Caused by the Periodical Rising and Falling of the Tremors

HOW MUCH DOES YOUR BUILDING VIBRATE?

BY GEORGE F. PAUL

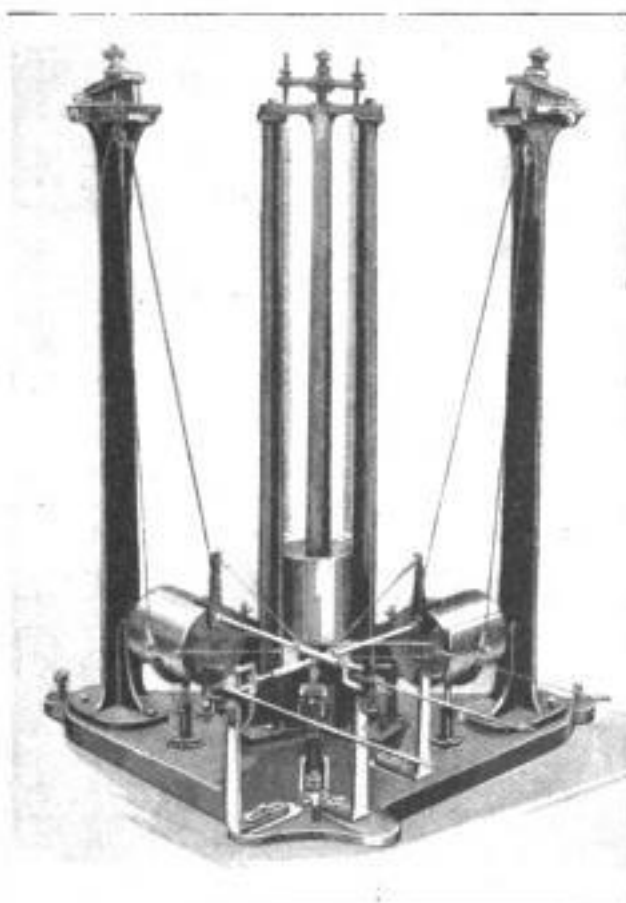
WITH the development of crowded business districts, the problem of vibration in buildings becomes one of increasing importance. Owing to peculiar conditions, these vibrations may become a disturbing feature or even a menace. There have been several instances where transportation companies or manufacturing concerns have been made defendants in suits brought by the owners of buildings disturbed by traffic or machinery in operation. In such cases it has been highly important to determine the amount of vibration produced in the buildings in question under varying circumstances.

To determine these vibrations accurately, Prof. Elmer E. Hall, of the University of California, has developed a special vibration recorder. Any vibration is made up of three components, the vertical component and two horizontal components at right angles to each other. These three components are recorded on the same sheet. The record is made by very light aluminum needles on glazed paper which has been lightly coated with smoke from a kerosene flame. The paper is fastened to a circular drum, the drum being rotated and at the same time moved

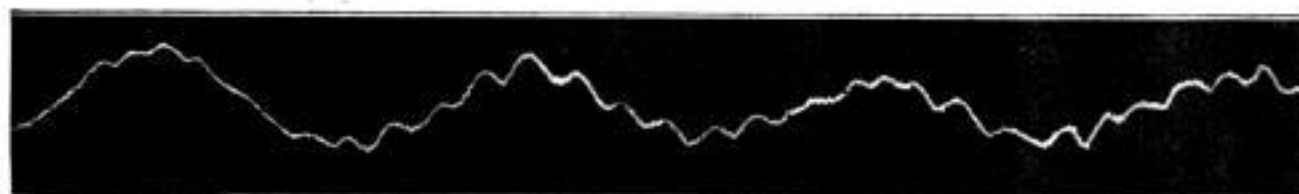
laterally so that for a single record the drum may rotate from 10 to 20 times without the different records overlapping. The rate of the rotation of the drum can be regulated, by the governor

on the driving clock and by interchangeable gears, from one revolution in 24 hours to two revolutions per minute. The principle of the instrument is that of the seismograph or earthquake recorder, the main difference being that in this vibration recorder every effort has been made to make all the moving parts as light as possible, so that inertia may be reduced to a minimum. Friction has been reduced by the use of jewel bearings throughout. The necessary damping is secured by "oil damping." The highest frequency that Professor Hall has recorded with this instrument is 104 vibrations per second.

Experiments along this line have shown some peculiarities. For instance, street disturbances have been found to produce much more pronounced effects than disturbances originating within the building. Tests were made in a reinforced-concrete substation in San Francisco. Here it was found that the really disturbing element was not a motor generator within the



Vibration Recorder Designed by Professor Elmer E. Hall, of the University of California: Note Arrangement of Drums for Recording in Three Directions

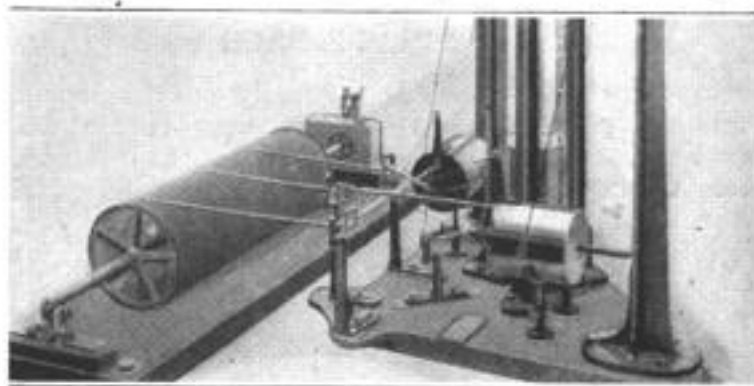


Vibration Record on the Ninth Floor of an Office Building: The Larger Vibrations are Due to the Natural Rocking of the Structure, While the Finer are Caused by a Turbo-Generator in a Near-By Power Station

building, as had been supposed, but the outside traffic. The vibrations produced by a truck load of crushed stone passing over the cobblestone pavement outside were seven times as great as the vibrations produced by the generator.

Another remarkable feature brought out by these tests is that the vibrations in the building adjacent to the one where the disturbing element is housed may be intensified and therefore greater than those in the containing structure. Professor Hall found that the vibrations of a detached three-story brick building that stood near the substation previously mentioned were really greater than at various points much nearer to the generator. His belief is that when a definite amount of energy in the form of a train of waves passes from a structure of compact material, such as concrete, into ground, foundations, and walls that have a lower coefficient of elasticity, the vibrations necessary to take up this energy

where pedestrians are constantly passing to and fro, there is considerable strain on the framework because of this moving load that readily runs up into the



Vibration Recorder Tuned Up to Tell Its Story: The Three Long Aluminum Needles Make a Graphic Record on the Long Horizontal Drum, Which is Covered with a Roll of Glazed Paper

thousands of pounds. Often small machines are operated; elevators are darting up and down with heavy loads that are continually shifting; the wind is pushing with tremendous force against one or two exposed walls,

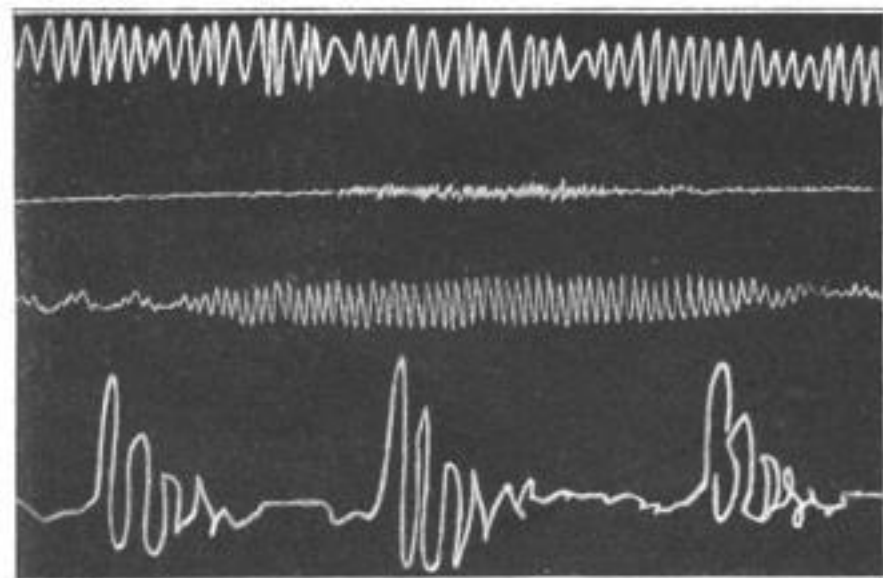
and heavy motor trucks and street cars are doing their full share to add to the general confusion; the stamping of the foot on a floor sets up distinct vibrations that are readily recorded; the rapid wheeling of a loaded handtruck along a hall, or the handling of heavy boxes or containers—all are elements that disturb the poise of the building. In one 14-story brick building in the central district in Chicago, where street traffic is heavy and power plants and printing presses are running night and day, a person standing still on the fourteenth floor

can feel distinctly the steadily timed vibrations of the building. Visitors to the tops of some of the skyscrapers in New York City have felt similar vibrations. In this connection mention may be made of the fact that in earlier days guests at the Palace Hotel in San Francisco were often startled by the tinkling of the glass pendants on the chandeliers.

Sather Campanile, a tall and slender bell tower on the campus of the University of California, has been so designed that it will vibrate every 1.13 seconds. Thus the danger from earthquake shocks has been

lessened, as the tower vibrates like a tree instead of collapsing.

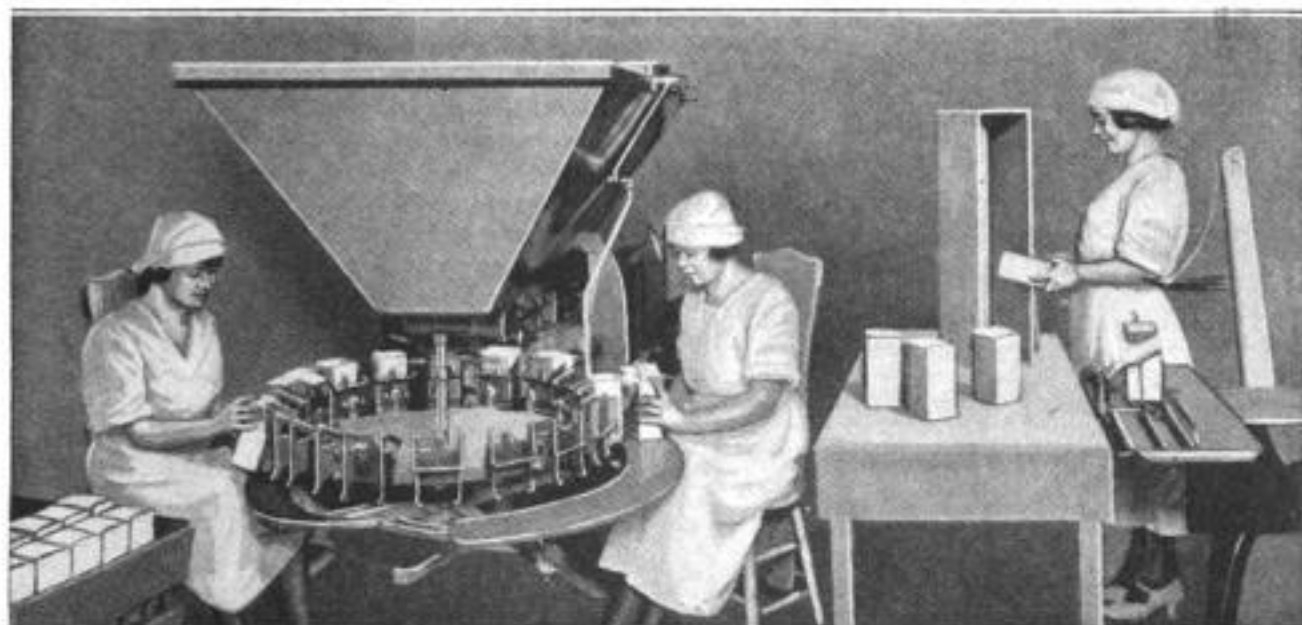
These experiments will eventually lead to the formulation of new construction rules.



From the Top Down: Vertical Vibrations in a Floor Produced by a Small Motor Generator; On the Third Floor of a Brick Building, Showing Vibrations Due to a Moving Truck; Waves Set Up on the Ground by the Parking of a Street Car; Vibrations Caused by Stamping the Foot on a Concrete Floor, Several Feet Away from the Recorder

will be greater than in the structure where the disturbance is produced. Reversing of the conditions will, of course, reverse the results.

In public buildings with wide corridors,



Automatic Ice-Cream Packaging Machine, Which Requires the Attention of Only Two Girls; the One at the Left Putting On Empty Cartons and the One at the Right Removing the Filled Ones:
Bricks of One, Two, or Three Flavors can be Made

NEW MACHINE AUTOMATICALLY FILLS ICE-CREAM CARTONS

A recently developed machine that automatically fills cartons with a measured amount of ice cream, is now being used by some of the larger ice-cream manufacturers. All that is necessary to do is to keep ice cream in the hopper, place empty cartons on one side of the revolving table, and remove the filled cartons from the other side. As the carton approaches close to the filling spout, it strikes a trigger that actuates the filling mechanism, consisting of three plungers and a valve. Bricks of one, two, or three flavors can be made. With this machine, it is claimed, four girls are able to do in two hours, in a more sanitary way, what formerly required nearly four hours' work by eight.

POLICE ADVERTISEMENTS HALT PASSING OF BAD CHECKS

Display-advertising space in the daily newspapers of Long Beach, Calif., is being used by the police department of that city as one of its most effective weapons in checking the activities of bogus-check operators. Almost every day the police buy large display space in which they reproduce spurious paper that had been passed on merchants of the city the day before. A description of the person or persons passing the checks is also given. The end of the first month of the campaign found a decided reduction in the number of bad checks passed.

ELECTRIC-WELDING MACHINES THAT ARE PORTABLE

Two electric-welding machines now appearing on the market are of particular merit on account of their portability. The lightweight welder, weighing only 46 pounds, is intended primarily for rail bonding, and its resistance is built up of nickel-chromium coils, wire-mounted by a patented method on porcelain insulators. The heavier machine weighs 100 pounds, and is also of the resistance type, but possesses a shunt connection which is used when the work is positive in polarity and the electrode negative. With the shunt connection in circuit, the machine has practically the same characteristics as a motor-generator outfit, that is, low voltage, short arc, and uniform welding heat. The welds made in this manner are said to be very tough and easily machined.



Left: Welding Outfit Easily Carried About by One Man. Above: Heavier Machine Having Same Characteristics as a Motor-Generator Outfit

RECIRCULATION SYSTEM HELPS PRUNE DRYING

By providing a recirculation system in their prune driers, orchardists of the Pacific Northwest are reported to have ef-

say, dries the fruit much faster than the dry air.

Under the old system the torrid atmosphere rapidly dried the skins, thereby hindering the escape of moisture from the meat. In the new method, warm air of suitable humidity is driven over the prunes at a velocity of 600 to 700 feet per minute, removing moisture from the fruit as rapidly as it can be drawn without injury to the surface tissues. The temperature under the old system was 170° to 200° F., while only 150° to 160° is maintained in the new driers. The new method leaves the surface of the fruit soft and glossy and the inside a natural yellow. The time of drying is now from 18 to 23 hours, a reduction of almost one-half—and where it used to take



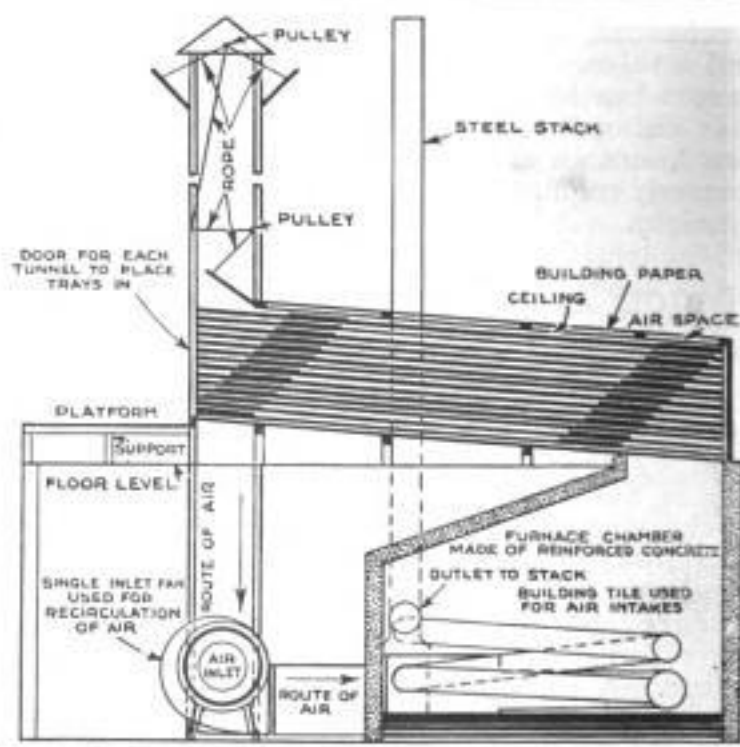
A Prune-Drying Plant in Oregon, Constructed with a Recirculation System for the Air, Which was Developed at the Oregon Agricultural College and is Rapidly Replacing the Tunnel Type of Drier

fecting considerable savings. A saving of one cent a pound in the drying process amounts to \$500,000 in Oregon alone, each year, and this would be a moderate estimate of the benefits of the new drying method, its originators say.

The ordinary prune drier, known as the Oregon tunnel type, operates at relatively high temperature and with dry air, and a considerable part of the heat is wasted up the chimneys. The heat is such that it often caramelizes the sugar, toughens the skin, and discolors the meat of the fruit. The process is both slow and expensive, and much of the fruit spoils before it dries.

In the new drying process, which is the result of several years of experimenting at Oregon Agricultural College, recirculation of the drying air has been found to be the chief remedy for the faults of the old system. Now the air is driven over the fruit again and again by means of a specially constructed fan. But it is not the dry, highly heated air formerly used, for it has been found that moist air at comparatively low temperatures is better for drying prunes. Temperature, humidity, and circulation are all under control in the improved driers. The moist air, strange to

from one to two cords of wood to dry a ton of prunes, now it takes about one-half cord. The new process is being installed in many of the driers of the Pacific Northwest, and it is believed that it will be only a short time until the old method is superseded. The recirculation method is adaptable to existing driers of the tunnel type.



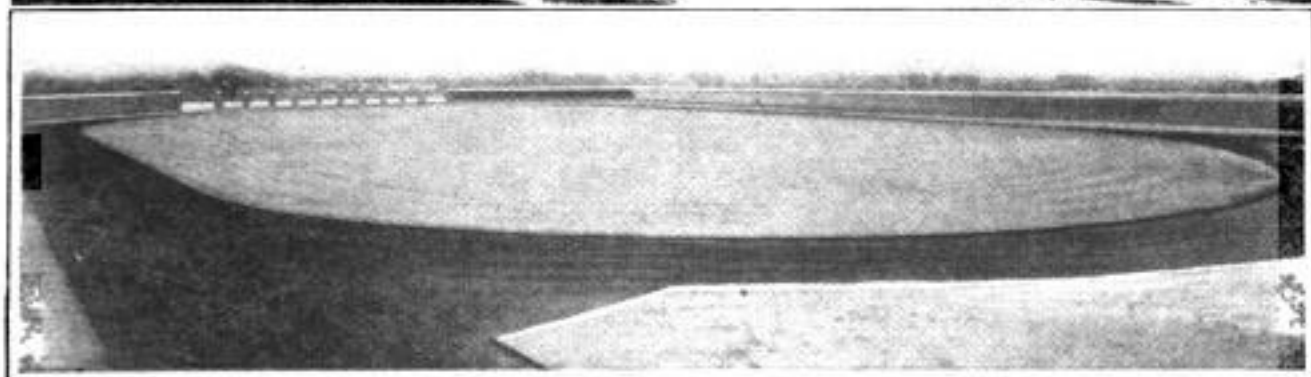
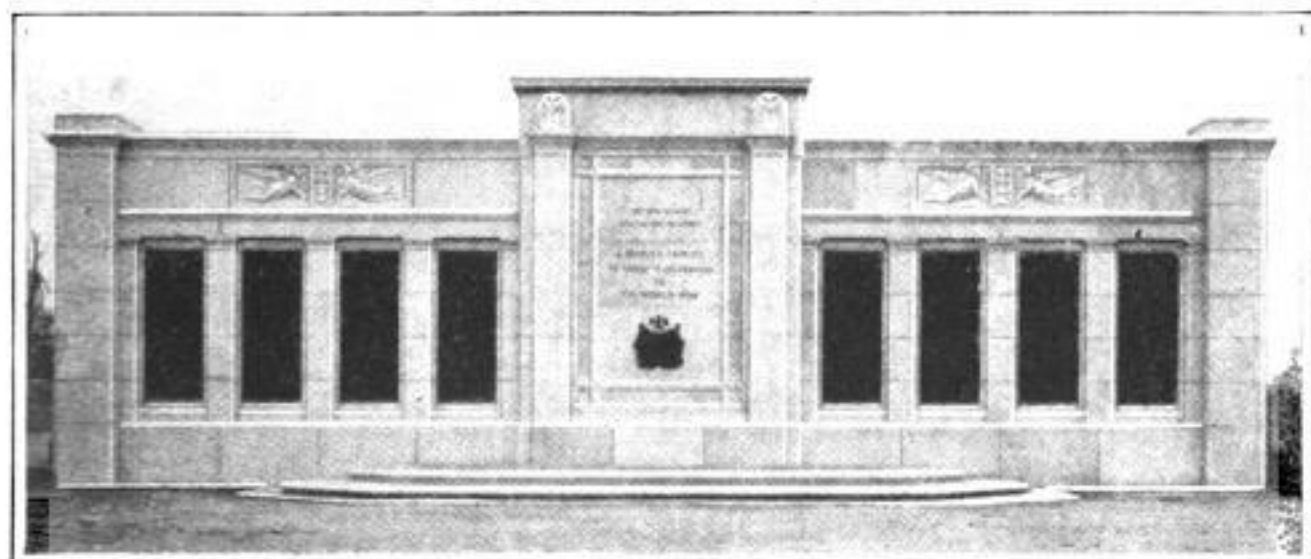
A Cross-Section Drawing Illustrating the New Air-Recirculation Type of Prune Drier, Which has Reduced the Cost and Improved the Quality of the Prunes

SOLDIERS' MEMORIAL STADIUM OPENED IN PHILADELPHIA

Recently completed, the memorial stadium erected by the people of Frankford, a part of Philadelphia, to their boys and young men who took part in the war,

SILVER FOXES IN CANADA GRADED AND BRANDED

A special section of the live-stock branch of the Canadian Department of Agriculture has been created to grade and register silver foxes in the dominion. In



Memorial for Soldiers of Frankford, a Part of Philadelphia, Recently Completed and Opened to the Public; The Upper Picture Shows Façade of Tennessee Marble Bearing Inscription, and Bronze Tablets with 2,400 Names. Below Are Bird's-Eye Views of Façade with Subordinate Buildings, and of Athletic Field

has been opened to the public. The central panel of the façade bears the inscription "The Path of Duty Was the Way to Glory. A People's Tribute to Those Who Served in the World War." Below the inscription is the seal of Philadelphia in bronze, and on either side of the central tablet, bronze panels on which are 2,400 names. The façade is of Tennessee marble. The stadium has an area of 317 by 488 feet, with a grand stand of 10,000 seats. High-school students gave \$8,500 of the \$200,000 total cost.

this way people who wish to buy these animals may be assured of getting good stock. Another scheme devised to further this valuable industry is a system of branding by means of which lost or stolen foxes may be recovered. There are said to be more than 1,000 high-grade animals throughout Canada, the largest farms being on Prince Edward Island. When sold to breeders, they bring anywhere from \$500 to \$1,250 apiece. With such government aid, the industry will undoubtedly grow more important.

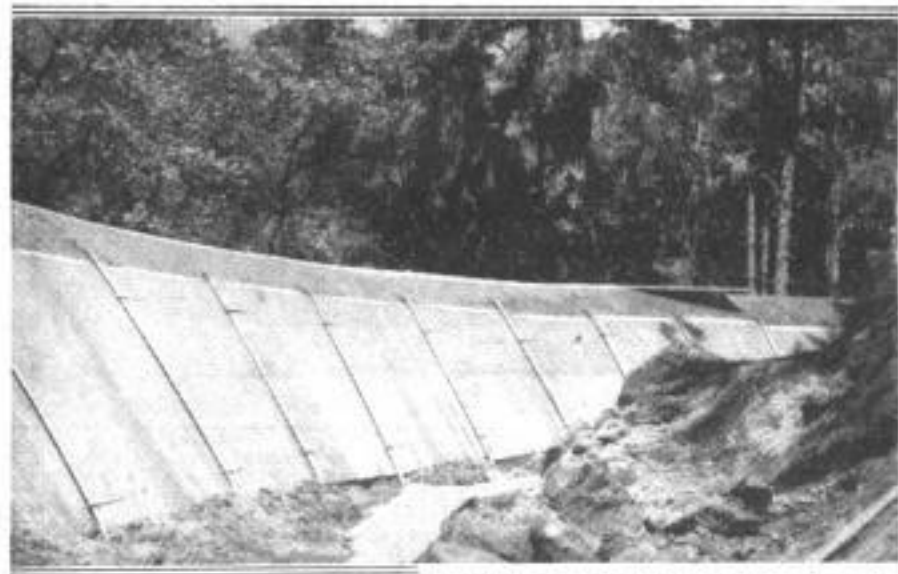


The Manner of Using a Derrick for Handling the Heavy Precast Sections of the Canal Lining, the Steel Forms and Bracing Facilitating Attachment to Derrick Tackle: Note Tub Containers in Left Background

CANAL CONCRETE-LINED WITHOUT DEWATERING

HEAVY leakage in the El Dorado power canal of the Western States Gas and Electric Company in California imposed upon operating officials the difficult task of making permanent repairs without curtailing the flow of water.

This unusual condition was dictated by the fact that the company is an important public utility serving many communities, and the question of uninterrupted and unimpaired service was of



Above: A Section of Canal Lined with Wood Panels to Prevent Erosion of Its Banks; Note How the Panels are Held in Place by Long Pieces of Pipe Straps Passing through Two Loop Straps, and Then into Bottom of the Canal

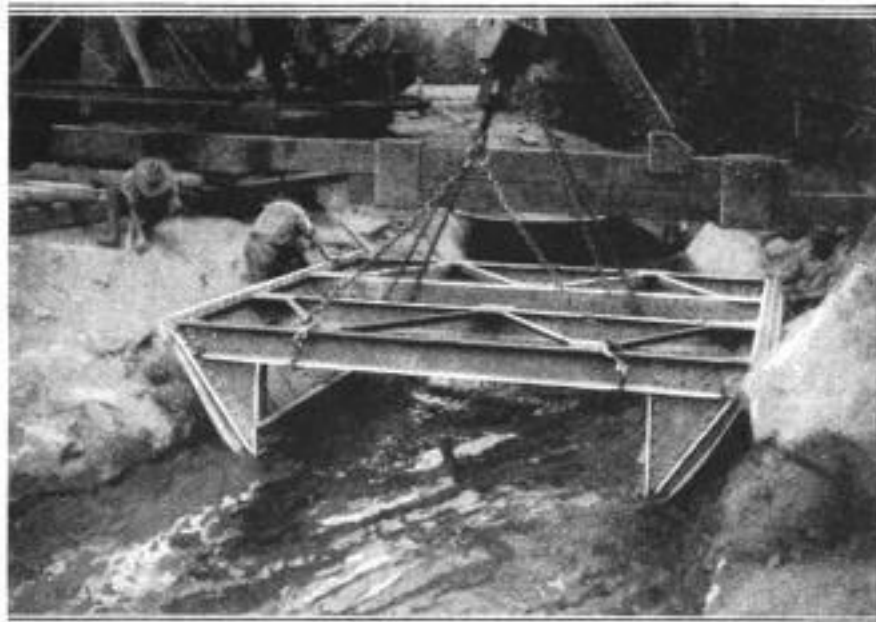
Right: Another Section of Completed Canal Faced with Wood Panels; Note the Tublike Container in the Foreground Which is Used for Floating Materials Down from the Base of Supplies to Any Desired Point



vital importance. Hence, all ordinary methods of repair based upon dewatering the canal were out of the question.

Construction engineers for the company developed a successful method for retarding seepage, which has many features of interest. It was decided that in the bad sections a reinforced-concrete lining was necessary that would conform closely to the curved sides and bottom of the canal. Semicircular steel forms of the required radius were used for pre-casting the concrete, which was sprayed upon their surfaces by means of compressed air. These forms were heavily braced and trussed, for a twofold reason: first, to prevent distortion, or rupture, of the concrete while still plastic or in process of curing; and second, to facilitate the handling and placing, without injury, of the heavy slab after the concrete had set.

Each form was removed only after the segmental section of lining had been eased



Segmental Section of Completed Canal Lining being Lowered into Place: A Tub Container Is Visible Just under the Derrick Footing; Note the Strong Current of the Water at This Point

into its final position in the canal, and was then reused in the same manner. Rapid progress was thus made, without stoppage or decrease of the canal flow.

Equally interesting was the method



A Completed Section Lined with Concrete: The Reinforcing at the Ends of Each Precast Section is Tied In with That of the Abutting Section, Showing a Heavy Dark Line at Each Joint. Note the Adaptability of These Precast Sections for Following the Sinuous Course of the Canal. Before Facing Them with Concrete, the Curved Banks at This Point were Subjected to the Most Severe Erosion

adopted for those sections of the canal where the leakage was considerable, but not considered excessive. At these points the sides were lined with wood panels, 6 feet wide, which were pinned in position by lengths of pipe passing through two loop straps on each panel.

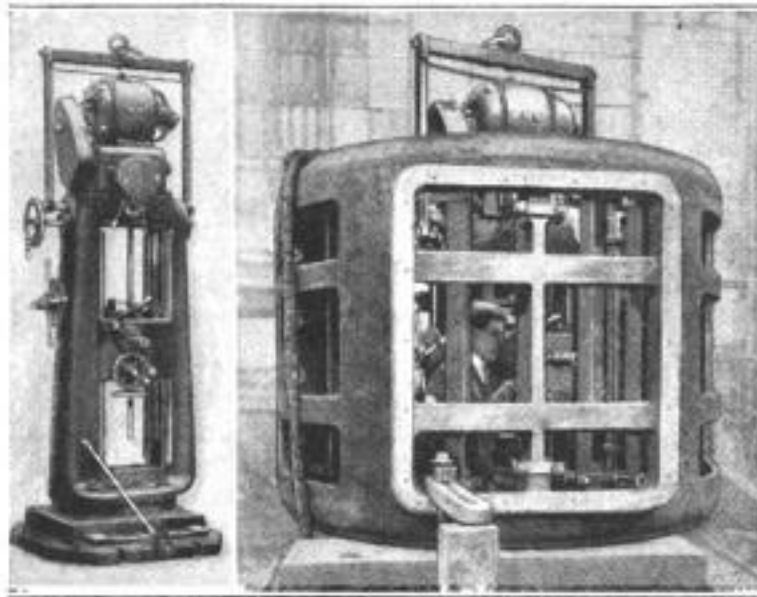
Construction material was floated down

from the head of the canal in round tub-like boats, which, after unloading, were telescoped over each other and hauled back by truck. It is claimed that transportation costs, which would have averaged 25 cents per ton-mile by ordinary methods, were reduced to 2.5 cents per ton-mile by the expedient.

PORTABLE DRILL FACILITATES INTERNAL WORK

In a horizontal drilling machine recently marketed, the advantages of flex-

ibility and compactness have been so



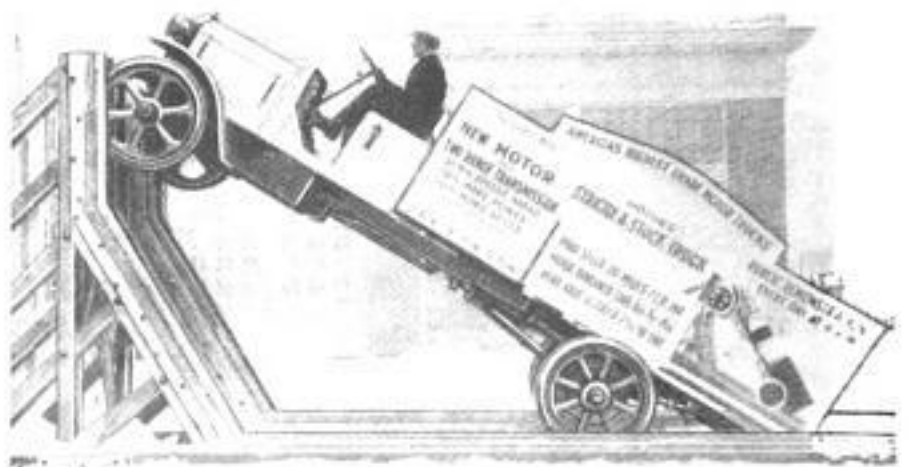
Left: Portable Horizontal Drill, Which is Provided with Adjustments for Vertical, Horizontal, and Circular Travel. Right: The Machine at Work on the Inside of a Large Turbine Casing. Drilling Being Possible without Dismantling the Two Halves

combined as to make it very adaptable for work on the inside of large castings. Vertical, horizontal, and circular adjustments are provided, enabling the operator to make a rapid set-up even with a difficult hole. The unit is entirely self-contained and portable, and will operate inside a circle only $3\frac{1}{2}$ feet in diameter. Especially interesting is the design of the drill head, which has a vertical travel of 3 feet, and slides between the machined surfaces of two columns cast integral with a revolving base. The rotating base greatly facilitates the drilling of radial holes in the same horizontal plane, as this can be done from the same set-up. A dividing plate under the base provides bearing for the entire machine, and is arranged for a backward or forward travel of 12 inches.

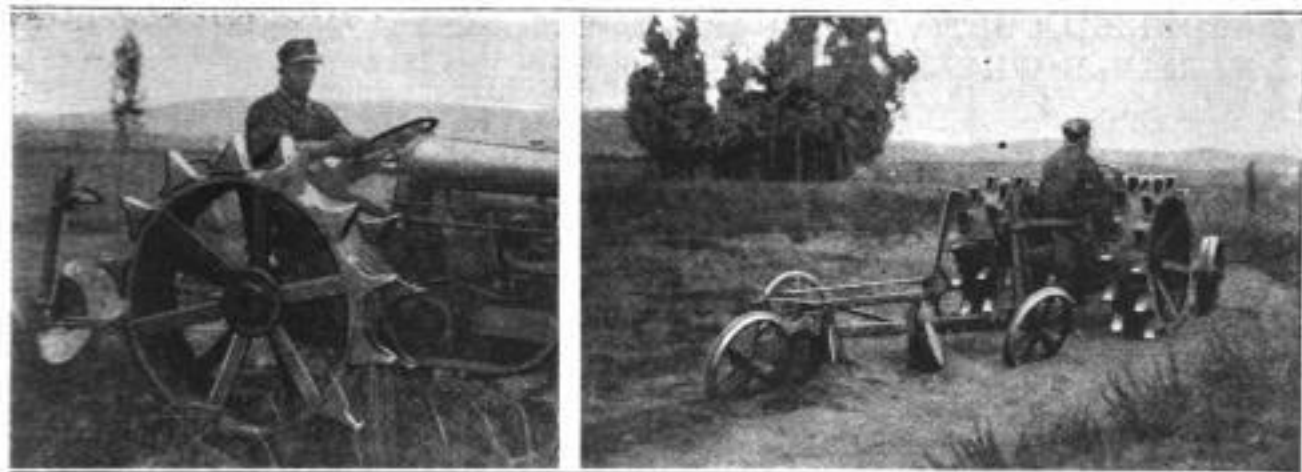
TRUCK DRIVES FRONT WHEELS UP VERTICAL TRACK

In order to visualize in a striking manner the power of a motor truck equipped with a two-range transmission, an automobile dealer hit upon an unusual stunt. A track was built having a 5-foot incline of 60° , and then continued up perpendicularly. The front wheels of a loaded two-ton truck were forced up the incline and then up the vertical track, no power being used except the engine of the truck, the two-range transmission of which gives seven forward speeds. When the power was on, the truck remained motionless, with

its front wheels high up off the ground, and in contact with the vertical support.



This Loaded Two-Ton Truck Forces the Front Wheels up the 60-Degree Incline and Then up the Vertical Track



Left: Wheel of Tractor Equipped with New Form of Lugs, or "Grousers," Which Fit Either Wheel on Inside or Outside. Right: Tractor Pulling Gang Plow in Soft Ground

NEW "GROUSER" GIVES TRACTOR GRIP IN TOUGH SOILS

To give a tractor a grip on tough or soft soils and keep its wheels from slipping, a California company is making a form of lugs, or "grousers," which fit into either wheel of the tractor and to either edge of a wheel. It is claimed that when one side of the grouser is worn away, by changing it to the other wheel, it will give another term of service. Another advantage claimed is the doing away with side thrust. In the California rice fields, where the soil is black adobe underlaid with hardpan, the grousers are said to be of special value.

NEW FOLDING EYESHIELD ATTACHES TO CAP

While some protection for the eyes is necessary in motoring, many drivers and tourists object to the common form of goggles. To overcome this objection, an English manufacturer has devised a folding eyeshield of noninflammable celluloid. It is notched to fit the wearer's nose, fits close to the face, and when not in use, folds out of the way under the peak of the wearer's cap.



Left: Folding Eyeshield Which Takes the Place of Goggles. Right: Eyeshield Folded Up When Not in Use

LIFT STONES OR LOGS EASILY WITH FORKED TONGS

A pair of forked tongs, the prongs of which resemble those of a pitchfork, have



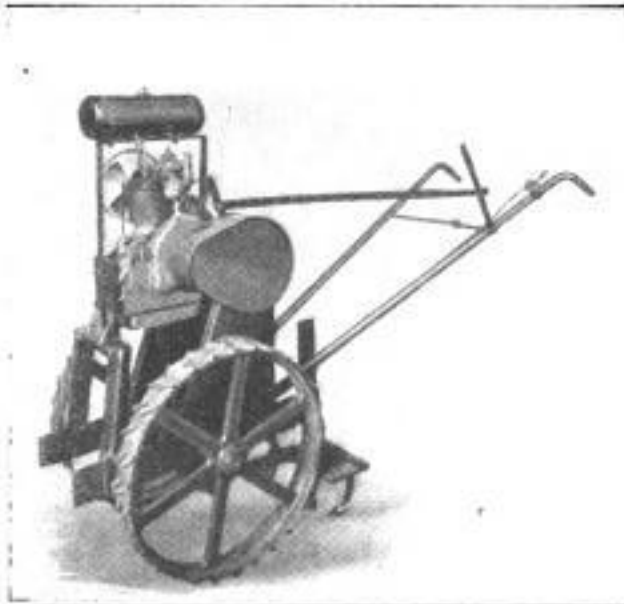
Quebec Farmer's Invention That Saves Stooping to Pick Up Light Loads in Farm Work: Left, Lifting a Log; Above, Raising a Stone

been made by a Quebec farmer for picking up stones and logs lying about the farm. The handles run about 2 feet high, the pivot bolt being fixed just above the heads of the forks.

Iron alloyed with 15 per cent aluminum and heated to redness, acquires a surface that does not scale and is resistant to high temperatures.

MOTORIZED CULTIVATOR HAS VARIABLE WHEEL SPREAD

A new cultivator which has just made its appearance is intended for use on nar-



The Wheels of This Cultivator can be Shifted from 21 Inches Apart to Only 8 Inches Apart, to Accommodate Narrow Rows. It can Also be Used with Only One Wheel

row rows of crops, and is therefore of special interest to truck farmers, nursery-

men, florists, and others whose products grow in this manner. The wheel spread of this little machine is variable, and can be made so narrow that it will cultivate rows only 12 to 14 inches apart, while its vertical clearance permits straddling plants from 24 to 30 inches high. For extremely narrow rows, one wheel can be removed, and the other shifted to the middle of the frame, wheelbarrow fashion. The cultivator is hand-directed and power-driven, with gasoline consumption rated at only $\frac{1}{8}$ gallon per hour.

LEAGUE OF NATIONS TO URGE PROTECTION FOR SCIENTISTS

The right of scientists to share in the benefits derived from the application of their discoveries has received official attention from the League of Nations Intellectual Coöperation Commission. A subcommittee assigned to go into the question has just concluded its studies, and a plan is now being drafted for the legal protection of scientific work. After approval by the commission, and then by the council of the league, the plan would serve as a basis for legislation in the parliaments of the different countries throughout the world.

DYNAMITE FREES ICE-BOUND BOATS

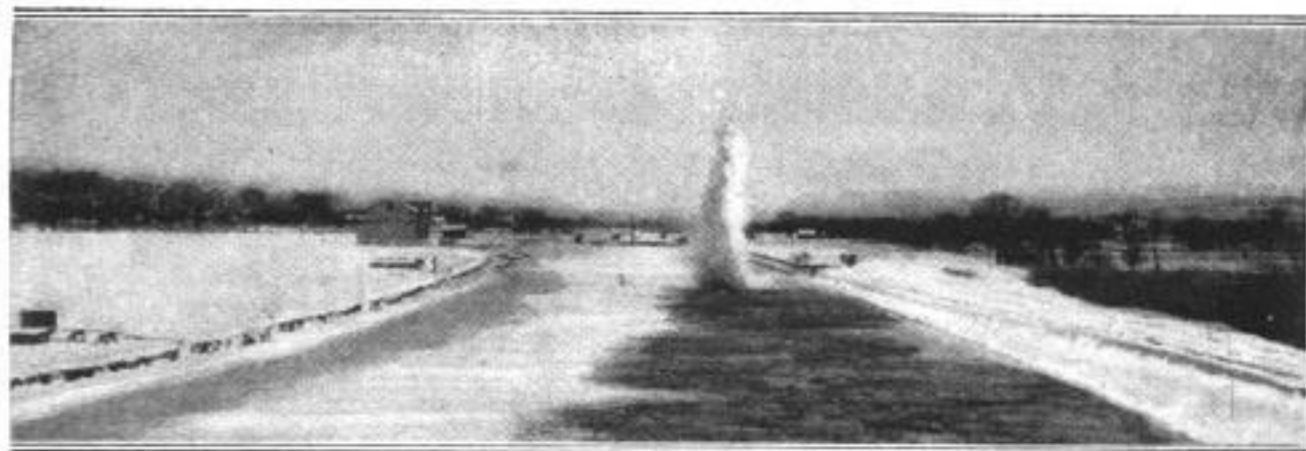
By C. M. NILES

A FLEET of 14 tugs and barges carrying 250,000 bushels of grain from Buffalo to New York, via the barge canal, was caught en route by the sudden coming of winter, and the boats threatened

with destruction, while the crews faced perils unprecedented in canal navigation. The grain fleet pressed forward in spite of dangers and difficulties until further progress was completely blocked by heavy



One of the Ice-Bound Canal Boats being Towed through the Channel of Floating Ice That was Opened Largely through the Use of Dynamite: The Progress Was But a Mile a Day Until the Boats Finally Found Safety at a Canal Lock



Explosion of One of the Dynamite Charges That were Set Off at 40-Foot Intervals for a Distance of Three Miles along the Barge Canal, in Order to Liberate the Ice-Bound Fleet: The Concussion Shattered the Ice, Opening a Channel About 40 Feet Wide

ice at the mouth of Nine Mile Creek. To extricate the grain fleet from this perilous predicament it was necessary to use dynamite. A channel was blasted through the ice for three miles to enable the boats to reach lock No. 20. Holes were made in the ice at 40-foot intervals. Each hole was loaded with a heavy charge of dynamite, connected with wires and exploded by electricity. The concussion effectually shattered the ice, opening a channel about 40 feet wide.

A powerful steam tug then cleared a passage through the floating ice cakes left after the explosion. Backing off twice its length, the tug dashed forward, plowing through the ice till it stopped. This assault was repeated till the way was cleared.

The rate of progress was but one mile a day. The rest of the fleet followed the pathfinder, fighting its way forward foot by foot until lock No. 20 was reached in safety, where the boats were secure against ice and floods until the reopening of navigation.

NONSLIDING DESK PAD MADE OF RUBBER

A new desk pad made of rubber in colors to harmonize with desks of various finishes, will not slide or slip under the



Desk Blotter Made of Rubber, Colored to Harmonize with the Finish of the Desk, Which will Not Slip or Slide under the Writer's Arm

weight of the writer's arm. It is also claimed that the pad will outlast the commonly used desk blotters having leather corners. Except for the color, the general appearance of the new pad does not differ from those now in use.



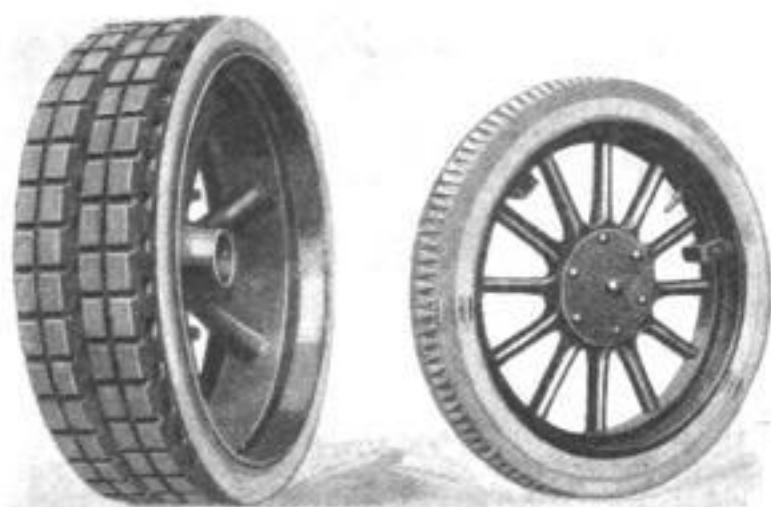
Powerful Steam Barge Assisting in Opening Up a Channel for the Ice-Bound Canal Boats: First Backing Twice Its Length, the Barge Then Dashed Forward, Plowing through the Ice Till It Stopped. The Assault was Repeated Until the Way was Cleared

ANTI-MUD-SPLASHERS COMPULSORY IN EUROPE

The European pedestrian is averse to having his clothes bespattered with mud

by passing vehicles, so much so that the use of devices for preventing splashing by

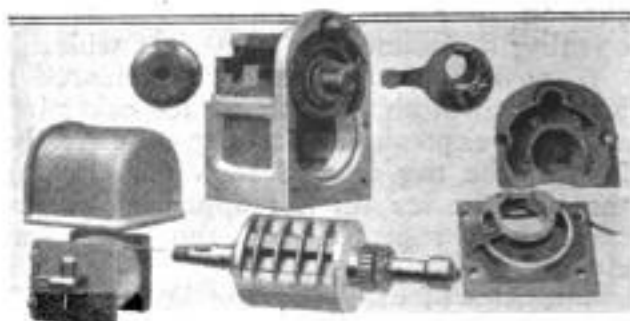
motor vehicles is compulsory in Paris and other foreign cities. One of the latest types consists of a circular rubber flap, 3½ inches wide, which envelops the tire and conforms to its contour. A steel ring holds the flap firmly to the clincher rim, a full inch and a half away, by fitting snugly into a 1-inch molded groove on the inner surface of the flap. The ring itself is wedged in place by hooks driven into the side of the felloe. On large-diameter tires the antisplasher is made in two sections, and the ends joined by hooks.



Left: Mud-Splashing Preventer Installed on a Truck Tire; Note the Molded Groove for Holding the Steel Attaching Ring. Right: This View Shows How Hooks are Used for Splicing Two Sections of the Flap

COBALT STEEL MAKES LIGHTER MAGNETO POSSIBLE

The substitution of cobalt steel, with its higher magnetic efficiency, for tungsten steel used in magneto construction, has made possible an interesting divergence from the usual design. In the new-type magneto, the rotating armature is replaced by a rotating permanent magnet of cobalt steel, which, being considerably lighter for a given capacity, makes the interchange possible. The new stationary armature entirely eliminates the use of slip rings, brushes, and brush holders. In an ordinary magneto a cobalt magnet weighing 12 ounces will replace one that weighed 4½ pounds. A complete motorcycle magneto will now weigh about 3 pounds, and that for an ordinary car about 7 pounds.



The Light Magneto, Assembled and Disassembled: The Only Rotating Parts Are the Cobalt Magnet and Circuit-Breaker Cam



FARMERS, HORSES, OXEN, AND SLEDS MOVE HOUSE

When Albion Rowe, a farmer of Gorham, Me., wanted to move his house a distance of a mile and a half, he called in 25 of his neighbors to help with horses, oxen, and sleds in an old-fashioned "bee." It was a seven-room, two-story house, and it was jacked up and placed on nine hobsleds. Once it was mounted on the sleds, the house moved rapidly to its destination, pulled by 16 oxen and 22 horses.

The only difficulty encountered was in getting the house down hills, when eight oxen, with back chains attached to their yokes, acted as drags and prevented the house from getting beyond control. The event was notable as a revival of the old custom of neighborhood cooperation on so large a scale. Two hours after the house was started, it was in its new location, without a crack or jar.



Maine Farmers Helping a Neighbor Move His House to a New Location: Mounted on Nine Bobsleds, the House Moved Smoothly to Its Destination, without a Crack or a Jar, with the Assistance of Men, Horses, and Oxen. Instances of Helpfulness by Farmers toward One Another Are Common Enough, but a Coöperative Job of This Size Is Rather Unusual

ONE-MAN HYDRAULIC CRANE IS EASILY HANDLED

From England comes word of an interesting hydraulic crane, electric-driven, which is not only self-contained and portable, but can also be operated and moved about by a single man. Mobility in all directions is secured by mounting swiveled wheels on the front end, which in



Portable Hydraulic Crane, Operated Electrically and Used for Piling Goods in Warehouses: In This View the Main Plunger is Telescoped Almost to Its Full Height

turn are fitted in roller bearings. Friction is further minimized in the main plunger by a ball-bearing mounting, permitting the load to be swung completely around in any direction. The source of power—a motor—is worm-gear direct to three double-action pumps. An automatic relief valve, coming into play in case of overload or when the load is at full height, makes the crane practically "fool-proof."

GENUINE ATLANTIC SALMON FOUND ON PACIFIC COAST

For the first time in the history of the Pacific-coast fishing, Atlantic salmon have been taken there. Two adult specimens of the species *Salmo salar* (true Atlantic salmon) were caught a few

weeks ago in the Cowichan River, Vancouver Island, B. C., by Maj. L. C. Rattray, a well-known fisherman who has devoted a great many years to the study of fish and fishing.

The capture is of great importance in view of the fact that for a great many years unsuccessful efforts have been made to establish the Atlantic salmon in northern Pacific waters. The experiments extend over the past 30 years. California tried to acclimatize them by planting the young hatched from eggs sent from hatcheries in Maine. Plants of fry were also made in Oregon and Washington. The two fish taken by Major Rattray weighed 9 and 7 pounds, and it is believed that they developed from fry put out by the Cowichan hatchery.

The Atlantic salmon is one of, if not the gamest sporting fish in the world, and its readiness to take a fly, which is uncommon to the Pacific salmon, makes it a fish greatly to be desired. The different varieties of fish found upon the Pacific coast and generally called salmon, are not really salmon. But to the casual observer they so resemble the Atlantic salmon that when the first settlers arrived on the Pacific coast they gave them the name salmon.

There is a marked difference, however, between the true salmon of the Atlantic and the fish so called of the Pacific. The latter have a larger number of rays in the anal fin, more folds between the gill covers, more gill rakers, and a much larger number of pancreatic glands. The Pacific salmon do not return to fresh water until full-grown and ready to spawn, and all die after spawning. The Atlantic salmon, on the other hand, return before mature to fresh water. They do not die after the spawning, and have been known to spawn several times.

With proof to hand at last that the Atlantic species can be brought to maturity in Pacific waters, the Department of Fisheries and the game and fishing associations will endeavor to propagate the species in large numbers.

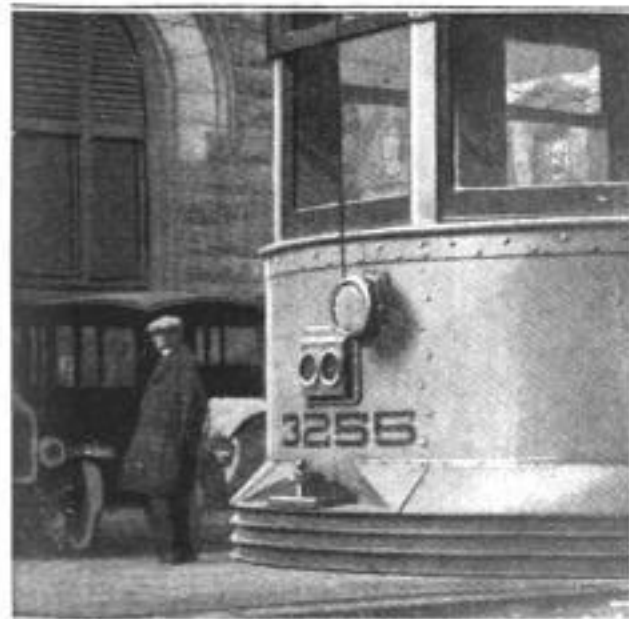
☐ Arrangements are being made with an American engineering company for the construction at a cost of \$15,000,000 of the first of three subways planned for Tokyo, Japan.

NEW YORK TO RIO FLIGHT COMPLETED

The last leg of the 7,000-mile air journey from New York City to Rio de Janeiro, Brazil, was made on February 8, by Lieut. Walter Hinton, formerly of the U. S. Navy, and Senhor Martins of Brazil. The largest crowd ever seen in Brazil greeted the airmen, who were also received in state by Senator Sampaio-Correia, president of the Aero Club of Brazil, in honor of whom the seaplane was named. The flight started on August 17, last year, and was beset by many mishaps, including the wrecking of the first plane off the coast of Cuba. The first ship was a large air cruiser equipped with two 400-horsepower Liberty motors and with large and luxurious sleeping quarters.

NEW FORM OF STOP LIGHT ON CITY STREET CARS

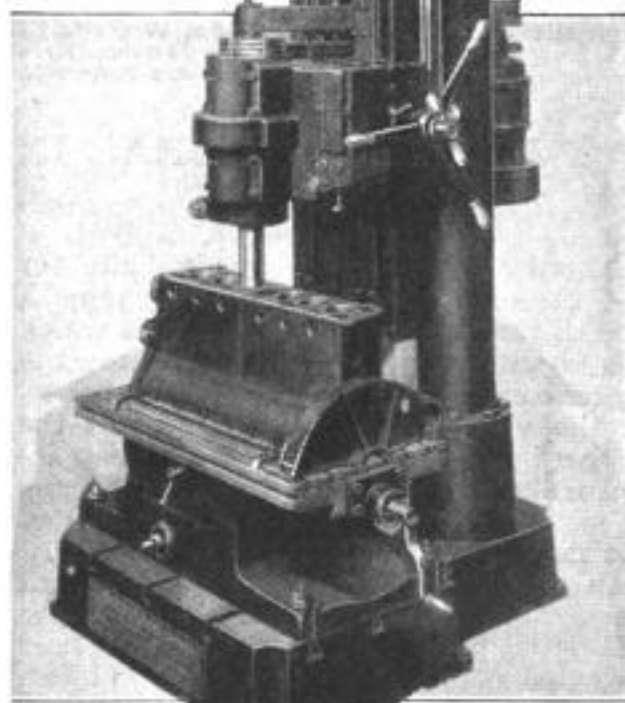
A stop light with red and green units, similar in appearance, but slightly different in operation, to types now common on automobiles, has been installed on street cars in Detroit. The lights are placed in the center of the dash at both ends of the car so as to be easily seen by drivers of autos or other vehicles. When the power is turned on and the car is moving, the green light at the rear shines, but the moment the power is turned off and the brakes applied, the red light flashes and continues to burn as long as the car remains motionless.



Stop Light on Detroit Street Cars: When in Motion, the Green Light Shines, but as Soon as the Brakes are Applied, the Red Light Flashes

VERTICAL CYLINDER GRINDER GUARDS AGAINST DUST

A cylinder grinder of the vertical type, recently placed on the market, has been designed with a view to preventing dust from entering the work and bearing surfaces, thereby maintaining accuracy and prolonging the life of the machine. All the mechanism is located above the grinding wheel.



Cylinder-Grinding Machine. Made Dustproof with Protected Ways and by Locating the Mechanism above the Grinding Wheel

the grinding wheel, so that no abrasive dust can fall into it, and the ways on the vertical column are protected by a canvas curtain, while the longitudinal table slide has sufficient movement in either direction from the center for positioning three cylinders each way under the grinding spindle, without uncovering the ways. The entire mechanism is carried by the wheel head, and is driven by a 2-horsepower electric motor belted directly to the wheel spindle.

☛The best butter-producing cow in the world is "Agassiz Segis May Echo" at the Agassiz experimental farm, in British Columbia, claims a Canadian official. This five-year-old Holstein, he says, in 1922 gave 30,886 pounds of milk, yielding 1,673 pounds of butter, which, in turn, contained 1,338 pounds of butter fat.



Panoramic View of the City of Jalapa, Which is Located in the State of Vera Cruz, Mexico, About 70 Miles from of Which a Spiral Road has Recently been Built. From This Hill can be Seen the Gulf of Mexico, on the Temperate Plateau Lands, and the Cold Sierras. The Hill Is the Principal Defense of

TWIN ROADS SPIRAL INTO CRATER OF VOLCANO

By W. K. BOONE

OF the many spiral roads built for ascending steep mountain summits, one of the most interesting is that which has been recently completed to the crater of the extinct volcano, Macuiltepec, in the vicinity of Jalapa, a city of the state of Vera Cruz, Mexico, 70 miles by rail from the port of Vera Cruz. Jalapa is picturesquely situated on the slope of the sierra which separates the central plateau of Mexico from the Gulf coast, at an elevation of 4,300 feet. To the south of it, the peak of Cofre de Perote rises to a height of 13,419 feet, and, still farther south, that of Orizaba, 18,700 feet, the highest peak in Mexico, and the second highest in North America.

The hill is public property and is surrounded with private estates, in some cases walled in. The new road starts at a point on the national highway to Mexico City that is about a mile and a quarter from the center of Jalapa. For a distance of about half a mile to a gate at the entrance to the hill, the road is on private property, and here it is about 13 feet wide, with a 6-per-cent grade. From the hill entrance to its summit the road is 11½ feet wide, with a maximum grade of 4 per cent, excepting in a few spots where an increased grade of 6 per cent was necessary. This part of the road is all on sidehill cuts, excepting a short stretch of about 328 feet at the end of the first complete circuit of the hill, where it was possible to build the road on the surface without any cutting.

For reasons of safety it was decided to make two one-way roads, one for ascending and the other for descending. Start-

ing from the gate at the entrance to the hill, the road rises easily and gradually, and after spiraling for a circuit and a half, it reaches the low point of the edge of the crater at a distance from the gate of nearly a mile and a half, measured on the road. From this point and for a distance of 1,703 feet the road follows the edge of the crater, making two-thirds of a circuit. Then it leaves the crater and spirals backward on the outside surface of the hill for a distance of 1,312 feet, when the summit is reached at a height of 236 feet above the entrance gate, and 410 feet above the level of the Mexico City highway.

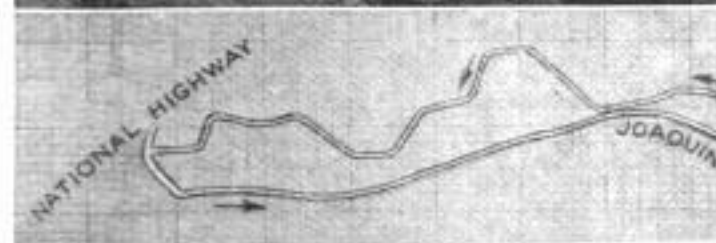
The descending road starts with a grade of 8 per cent, and nearly parallels the last part of the ascending road until it strikes the crater, the edge of which it follows until it reaches the point where the ascending road enters the crater, the whole being a distance of 1,950 feet, the last 280 of which is in the crater with a 10-per-cent grade. This is the only point where the two roads cross. The road then leaves the crater and continues the descent on the hillside, with a grade of 6 per cent for a distance of 980 feet, where it turns a semicircle sharply, and reverses its direction, running spirally around the hillside for a distance of 2,542 feet until it meets the ascending road at a point opposite a hospital, and at a distance of 509 feet from the entrance gate. Between these two points it is a two-way road, but when the entrance gate is reached the roads again separate, and the descending one follows the boundary wall of one of the private estates for a distance of nearly half a mile, with a maxi-



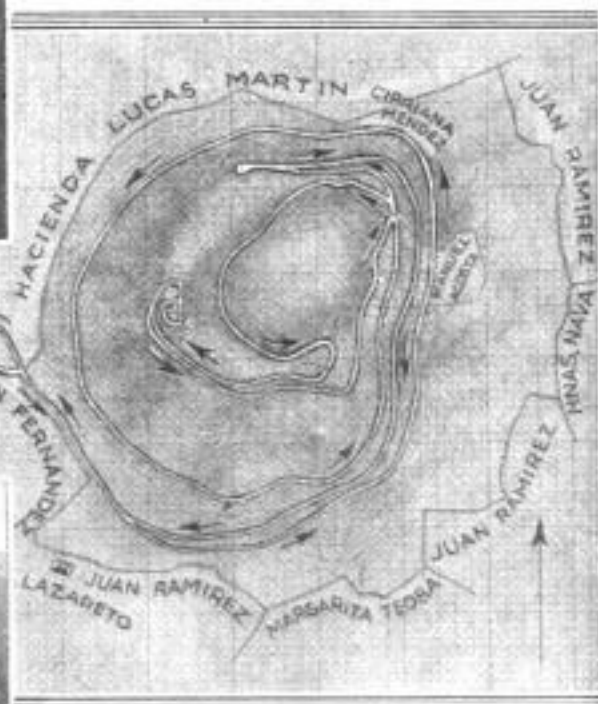
the Port of Vera Cruz: In the Background can be Seen the Top of the Extinct Volcano Macuiltepec, for the Ascent on the One Hand, and High Mountain Peaks on the Other, the View Embracing the Hot Coastal Country, the City, and during the Last Revolution was Garrisoned with Troops and Machine Guns

mum grade of 12 per cent, until it enters the Mexico City highway at a point near that where the ascending road leaves it,

the two roads altogether having spiraled the summit for a distance of a little over 4 miles. The road is of dirt excepting for about 656 feet where it is cut out of basalt rock, and for about a mile and a quarter where it passes over volcanic lava. As it was built so quickly, having been completed within 24 days, for the present most of the cuts have been left vertical, and as yet no side tracks have been provided for the removal of dam-



View Taken from the Watch Tower, Showing Where the Ascending and Descending Roads Cross near the Rim of the Crater



Upper Left: Ascending Road in Crater of Macuiltepec; Note Sharp Slope of Lava Walls, and the Watch Tower for Searchlight and Artillery Erected on Summit during Last Revolution. Above: Plan of Hill, Showing Roads

aged automobiles—of which a large number utilize the roadway—out of the way of the traffic while undergoing repairs.



A View at the Site of a Stadium under Construction at Jalapa: This Is the First Stadium Built in Mexico and the Second in Latin America. It Has a Capacity of 30,000 and was Made by Filling a Swamp That Was a Breeding Place for Mosquitoes

The view from the summit of this extinct volcano is exceedingly impressive, extending in some directions for a distance of 130 miles, and in any direction not less than 30. On the one hand is a splendid view of Vera Cruz and the Gulf of Mexico, while on another hand the peaks of Cofre de Perote and Orizaba tower majestically aloft. Within view are altogether 17 cities, towns, and residences of private estates, while at a distance of 15 miles are plainly visible two waterfalls about 750 feet high. All are

made more attractive and beautiful by the rarefied atmosphere of such an elevation.

The city of Jalapa has under construction a stadium—the first one in Mexico and the second in Latin America—that will hold 30,000 people. The site for the stadium was a natural amphitheater surrounding a swamp that has been filled in, thus destroying what was formerly a breeding place for mosquitoes. An automobile road leading to the United States is also being built.

VIENNA FUNERAL CARS HAVE TWO TIERS



Part View of Interior of New Austrian Funeral Car: Caskets may be Put In or Taken Out from Either Side of the Car

Municipally owned funeral cars are used on the street railways of Vienna, Austria, by the city authorities for the rapid transportation of dead persons to the burial grounds. The cars are similar in appearance to a street car, but are divided into two levels for convenient placing of the caskets. The lower tier is subdivided for six caskets, but the upper tier is undivided, and will take more. The cars run to a central cemetery.

OLD CANNON BALLS PROVE CORROSION FACTS

An illustration of the ravages and effects of corrosion, or ordinary rusting, is furnished by the following facts, which have been long but probably not widely known. Cast-iron cannon balls, which, after being 291 years in the sea, fell to pieces red-hot when exposed to the air, are described in one of the manuscripts acquired by the Association of Manufacturers of Non-corrodible and Anticorrosive Products. These cannon balls were raised from the wreck of the "Mary Rose," sunk off Portsmouth, Eng., in 1545, and were recovered 291 years later. Similar cases are on record, showing that rust is a form of combustion.

This instance of spontaneous combustion is mentioned, among several others, by Dr. Newton Friend in the Carnegie Scholarship Memoirs, published by the Iron and Steel Institute, and is taken from an account of the occurrence published by Wilkinson in 1841. As is well known, when exposed to the combined action of air and water, ordinary cast iron readily rusts, becoming coated with a porous mass of ferric oxide, or red oxide of iron.

If corrosion has proceeded for some time, the underlying layers of rust are usually dark green to black in color, owing to incomplete oxidation. As the resulting product is rich in free graphite or carbon, the metal is said to have been graphitized. This "ferrous oxide," as it is also known, is unstable in air at ordinary temperatures, and is oxidized to the ferric state, the chemical reaction being such that it involves a development of heat. Therefore, when the cannon balls referred to had become dry, the ferrous oxide was spontaneously converted to ferric oxide, and at the same time the metal became extremely hot on account of the large amount of the lower oxide which had accumulated. This interesting and simple explanation of the phenomenon

tells the story of what rusting really is, whether moderate or carried to extremes. It is essentially a flameless combustion.

SUMMONS LOCKED TO AUTO BY SEATTLE POLICE

Inclosing a summons for a violation of traffic ordinances in a small metal container that can be locked to the auto



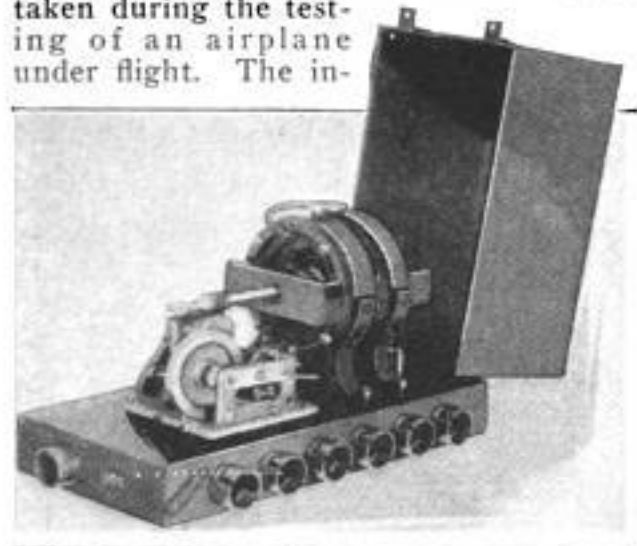
Police Officer Locking New Summons Device to Door of Car: Imprinted on the Lock, as Shown Below, Is a Notice to Report to Police Headquarters, While, within It, is Placed the Summons Proper

steering wheel or door handle, is being tried out in Seattle. The only key to the lock is kept at the police station, where the motorist must report within 24 hours. Advantages claimed for this plan are that the summons cannot be ignored or "lost," as could the slips formerly used; that it eliminates the issuance of bench warrants for overdue offenders, and that no "friend" can attempt to "square" the matter.

☛ A new comet, first discovered in October last year and now approaching the sun, has the peculiar characteristic that its tail extends toward the sun instead of away from it, according to observations made at the Yerkes Observatory. Science can at present offer no satisfactory explanation of this uncommon circumstance.

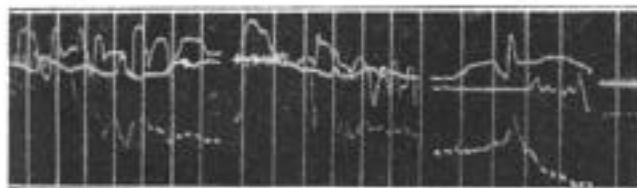
NEW APPARATUS SYNCHRONIZES FLIGHT RECORDS

A new piece of apparatus is being used for synchronizing the instrument records taken during the testing of an airplane under flight. The in-



Motor-Driven Device That Simultaneously Marks a Point on the Chart of Six Recording Instruments Used in Testing Airplanes

struments developed by the National Advisory Committee for Aeronautics, all re-

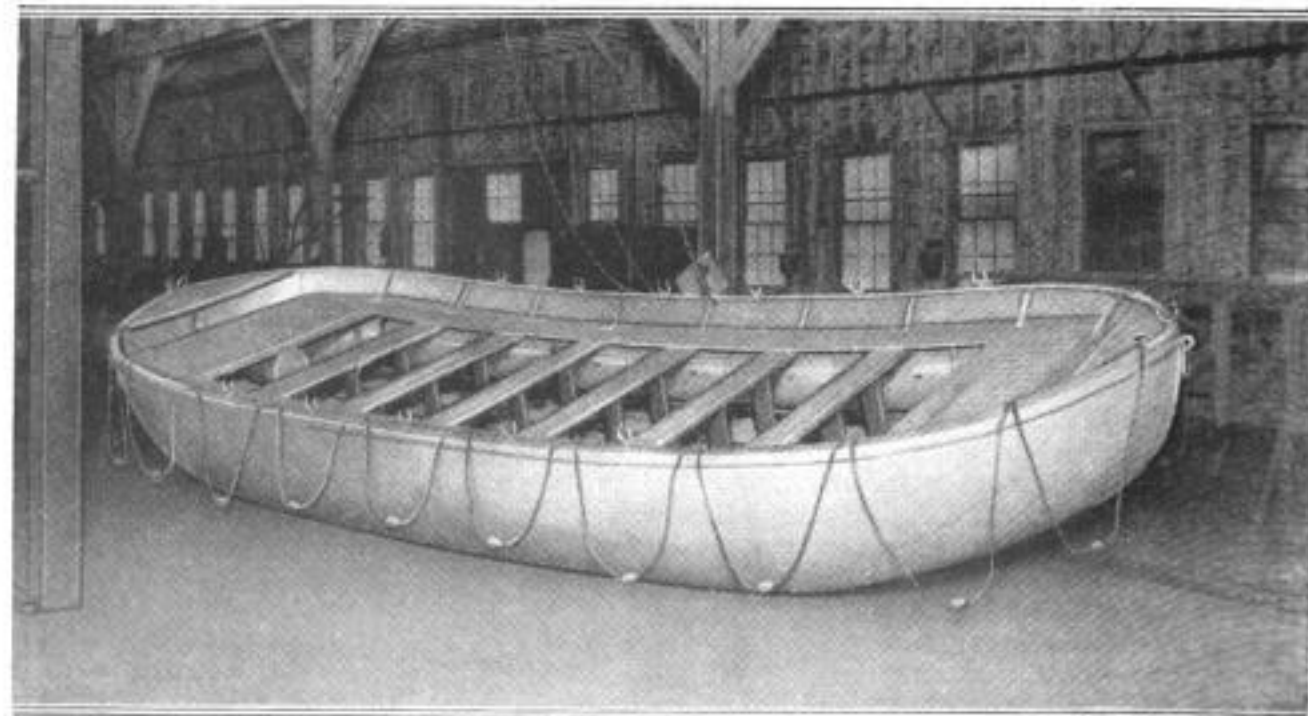


The Vertical Lines on This Chart Represent the Timing Lines Made by the Flash of Light from a Lamp on One of the Recording Instruments

cord by photographic means. Under this method small electric lamps placed in the instruments, are all flashed together at regular intervals, and throw a sheet of light through the film-drum slits, marking vertical timing lines on the film records. The new apparatus is a motor-driven chronometer consisting of geared balance wheel and escapement, to the spindle of which is attached a commutator that opens and closes the lamp circuits. The device is used in studying points in airplane control, where the sequence of events is too swift for personal observation.

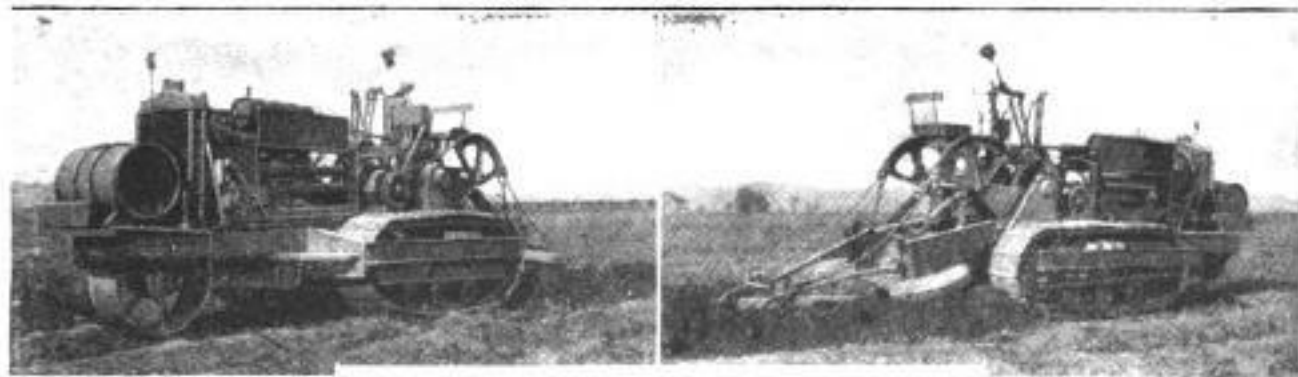
CLAIM NEW NESTING LIFEBOAT BETTER THAN OLD TYPES

Built with its sides almost perpendicular, and with specially constructed braces, a new nesting lifeboat is said to have so rigid a frame that when loaded to its full capacity of 65 persons and suspended from the davits, the deflection of the keel is but a small fraction of an inch. With a similar load in water, the freeboard, or distance from the water line to the top of the side, was estimated at 24 inches, and when the whole load was shifted to one side the freeboard on the low side was found to be 7 inches. Because of the peculiar shape of the boat, it is claimed that several of them can be nested much closer than usual, and that it can be launched more readily.



New Nesting-Type Lifeboat, Said to Nest Much Closer than Usual, and Launch More Readily: The Frame Is Exceptionally Rigid. Loaded to Its Full Capacity of 65 Persons, and Suspended from the Davits, the Boat's Keel Sags Only a Small Fraction of an Inch

MONSTER PLOW TURNS TEN-FOOT FURROWS



Tractor Pulling Largest Plow Ever Built: A 120-Horsepower Internal-Combustion Motor Furnishes Power

What is said to be the largest plow ever built—a plow that turns a furrow 10 feet wide and works on the rotary principle—has been recently developed and tested in actual work. Furrows are turned

by two gangs of plows, each gang operating with a circular motion to turn part of the furrow, while at the same time their rotation serves completely to pulverize the plowed soil.

An internal-combustion engine of 120 horsepower furnishes the motive power. In order to plow deeply, the machine is



What Farmers Call "a Good Furrow": Soil Turned over by Monster Plow, without Further Preparation by Harrowing or Disking

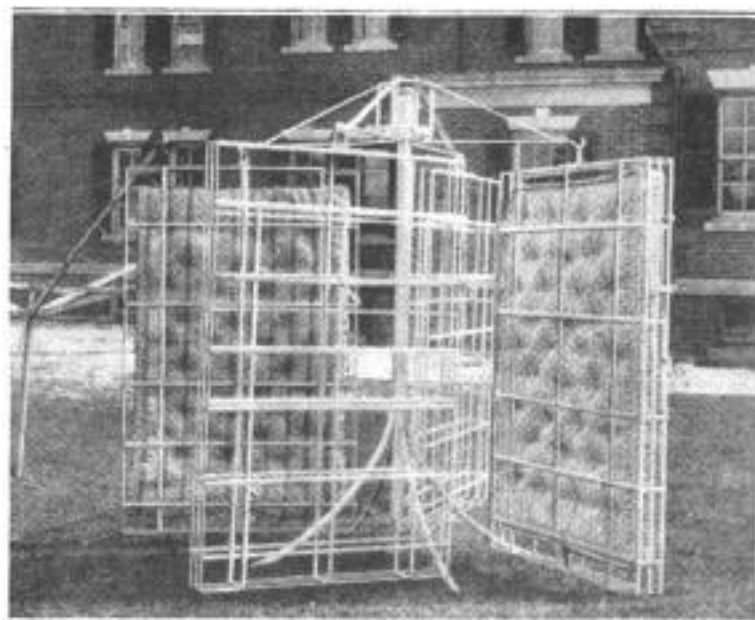
to two feet. Under favorable conditions, the plow can turn over about 25 acres a day. It was first used in Porto Rico and is expected to find its use in tropical sugar plantations of 50,000 to 75,000 acres. A smaller size with capacity of a furrow 4 to 5 feet will be built for western wheat farms.

Rear View, Showing Plow in Operation While Turning Furrows from a Few Inches to Two Feet in Depth

very heavy, and to keep it from sinking into the ground, track-laying wheels are used. It is operated by one man, who has close at hand the levers necessary to regulate the depth of furrow from a few inches

DESIGN REVOLVABLE FRAMES TO AIR MATTRESSES

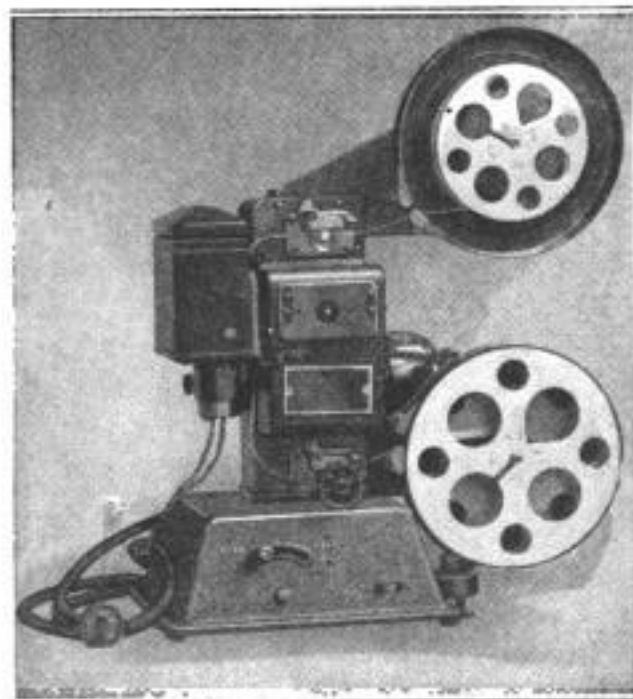
Four mattresses at a time may be quickly and easily aired with a new device consisting of a central vertical column with four projecting arms from which are suspended four metal cages, each holding one mattress. These containers are swiveled so that they may be turned about the suspension point, or the whole unit may be swung about the central column. In this way each mattress gets the full benefit of the sun in much shorter time than with older methods. The method is said to prolong the life of the mattresses, as filling is revived and ticking preserved by the air.



Mattresses Held Upright in Steel Frames and Exposed to Air and Sunlight with New Device for Quickly and Thoroughly Airing Them

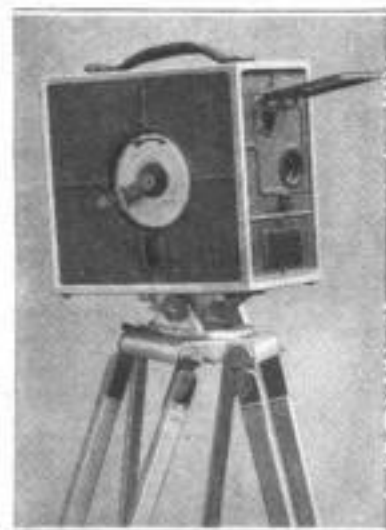
NEW MOTION-PICTURE OUTFIT FOR AMATEURS IS SIMPLE

Movies in the home may soon be an accomplished fact, judging from the re-



The Projecting Machine for Showing Moving Pictures in the Home: It is Motor-Driven and Entirely Automatic in Operation for the Convenience of Amateur Picture Exhibitors

cent development of an amateur outfit for taking and projecting pictures. The camera weighs but 7 pounds, and is said to be relatively as simple to operate as the camera of everyday use. Five pictures of



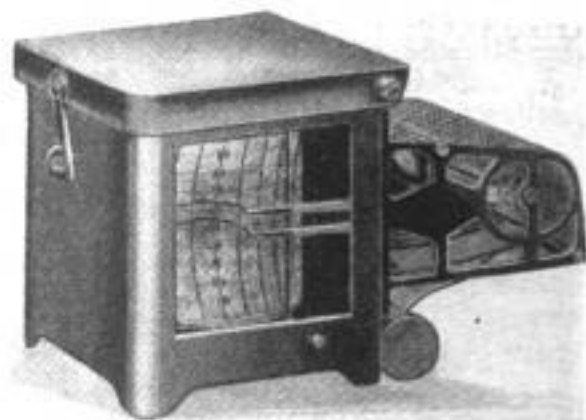
amateur film occupy the same length as two of standard film, so that 400 feet of reel are equivalent to the standard 1,000-foot reel. As a safety feature, the film has been made nonflammable, eliminating completely a serious drawback to the use of ordinary film by amateurs. An indicator shows the quantity of reel used, in feet. The projecting machine is motor-driven, and will throw a 30 by 40-inch picture at a distance of 18 feet, and 40 by 54-inch, at 21 feet. Its operation is entirely automatic.

IRRIGATION SCHEME INVOLVES NOVEL FEATURES

A project for the irrigation of 15,000 acres along the northwest coast of Porto Rico involves some unusual features. Numerous sinkholes, in the flooded area of the storage reservoir, will be sealed up with clay. Because bedrock is too far below the surface to make feasible the construction of a masonry dam, the dam will be built of earth. It will be 120 feet high and about 1,200 feet long on top, and the material will be sluiced into place toward the center, from embankments at the upstream and downstream sides.

GRAPHIC TEMPERATURE RECORD INDICATES HUMIDITY

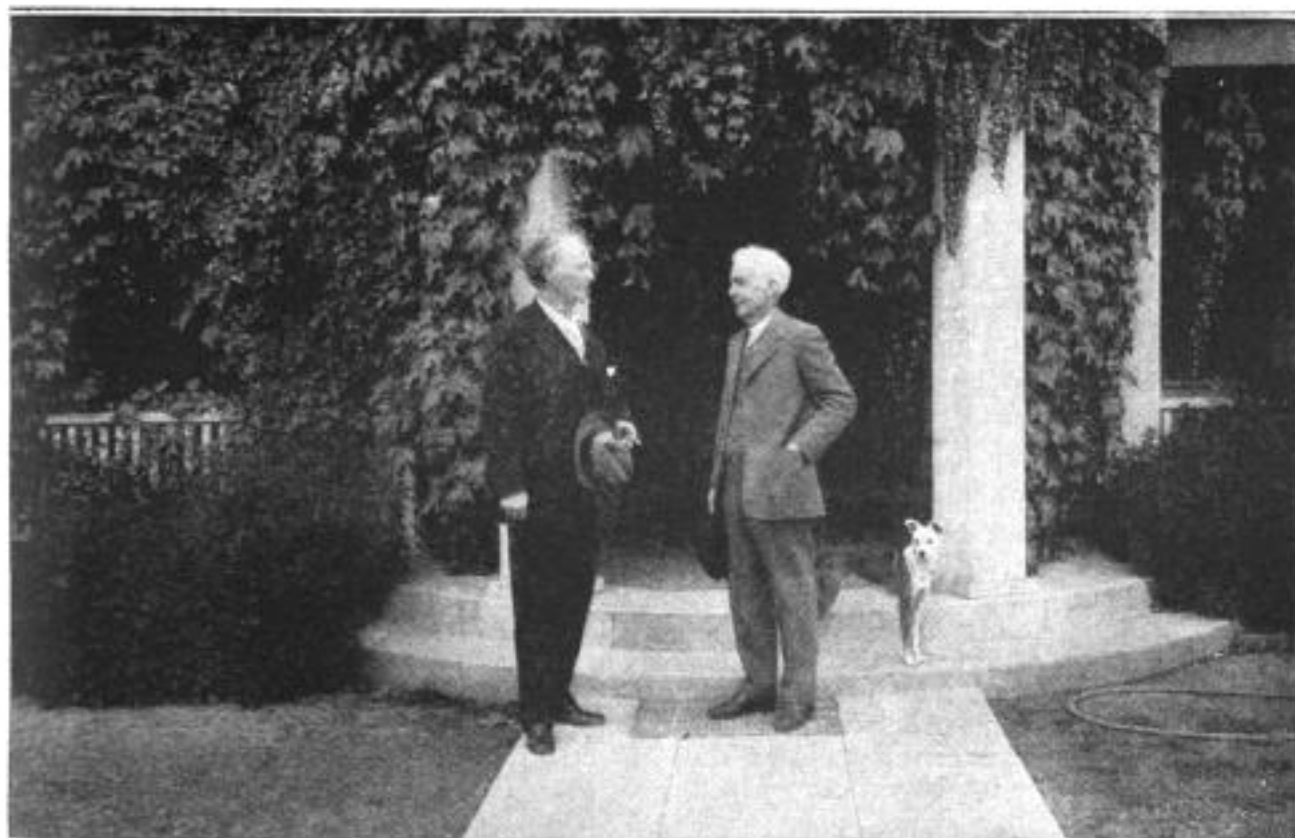
In certain industries, such as textile and silk mills, and also in hospitals, mines, and laboratories, atmospheric conditions are of considerable importance. A simple temperature and humidity recorder just developed indicates graphically, on a clock-driven chart, the desired data. The instrument has two bimetallic strips and two pens, and one strip is kept moist by constant contact with a linen sheath dipped in water. Obviously, the moist strip will record a



The Graphic Recorder of Humidity: Being Set 10 Degrees Apart before Moistening, There Is No Danger of the Pens Interfering with Each Other's Record

lower temperature than the dry one (except when the air is saturated with water vapor); consequently the difference between recorded temperatures can be converted into terms of humidity percentage through accompanying tables.

☛ A process by which wool, unsuitable for spinning, can be made into a furlike material is said to have been found by an Australian inventor.



Luther Burbank, at the Right, Standing in Front of His Home at Santa Rosa, California, Conversing with Ignace Paderewski, One of the Many Famous Men Who have been Interested Guests at Burbank's Home and Experimental Plant Farm

BURBANK'S PLANT CREATIONS TO BE PRESERVED

BY RAMON JURADE

THE plants created by Luther Burbank in half a century of plant breeding, crossing, and developing, are to be preserved for the benefit of future generations and for the use of students of plant eugenics for all time. Though Mr. Burbank has trained no one to take up his mantle as the master plant breeder, the more than 1,000 different improved plants which he has developed from wild varieties and from common domestic species, never will be allowed to revert to their wild or primitive state.

The city of Santa Rosa, Calif., where the plant wizard began his work, has purchased a tract of 40 acres of rolling land, just on the outskirts of the town, and is preparing to convert this into a botanical garden as a living memorial to Luther Burbank, and containing only specimens that he has created.

The city paid \$32,500 for the land, and is now raising \$500,000 with which to establish and maintain the garden, and to build within it a museum of relics, motion pictures, manuscripts, books, phonograph records, and other Burbankiana. March 6,

Mr. Burbank's birthday, was selected by the people of Santa Rosa, whose fruit-laden hills are largely the result of the plant magician's work, to honor him permanently. This spring, too, they will celebrate the golden jubilee of Burbank's experiments with a fête that



Burbank's Home at Santa Rosa, California, Wherein are Carried On the Studies Relating to His Work of Plant Breeding

will last at least three days, and to which will come official delegations from a majority of the Pacific-coast states. At this celebration, the new botanical gardens, to be known as Burbank Park, will be dedicated, and Mr. Burbank will plant the first tree in it.

This memorial garden will be particu-

larly fortunate in that the man in whose honor it is being established will supervise the planting of all his productions in it. Men who have worked with Mr. Burbank on his four experimental farms are to have charge of the garden, and it will be open to students of plant breeding of every nationality, a soil school in which they may conduct experiments on new plants from all parts of the world, or extend and amplify the improvements already made in known varieties by Mr. Burbank. It is the hope of the Santa Rosans to make this the center of plant breeding and development of the world, following out Mr. Burbank's idea that the remedy for the present lack of interest in farming, and scarcity of men and women willing to live on, and cultivate the land, must be met by such improvement in crop-producing plants that the few can produce as much as the many did before the improved crop plants were developed.

In this experimental garden will be all the many varieties of the Burbank plums, which are responsible for the founding of at least one city—Vacaville, Calif.—and which have covered the hills and valleys of entire counties with their orchards. These plums have been developed to withstand rough picking, hard handling, long shipment, and exposure in markets. There will be an improved cherry, with clusters containing from 5 to 10 times as many individual fruits as are now produced by commonly grown cherries; also several improved prunes, much larger, even, than the noted French prune; a new quince, larger than the largest apple, and tender and juicy, intended to be picked and eaten fresh from the tree, as well as cooked or preserved, as is the ordinary quince, and, in addition to these, a number of varieties of the "plumcot," that curious cross between the plum and the apricot. Among the fruits will be found several berries, including blackberries with no thorns, white blackberries, sunberries looking like huckleberries, but growing on a bush not unlike a tomato plant, and ever-bearing strawberries, on which fruit is produced every month in the year.

Of trees, the largest will be the black walnut, developed by crossing the wild American black walnut with the Persian walnut. This produces a wood as fine-grained and dark as the wild black walnut, yet requiring only 10 years to attain a height of 40 feet and a diameter of 3 feet, as compared with 50 to 60 years for the development of the wild tree to the same

size. This tree also produces a sweet, edible nut, with a thin shell, unlike the heavy and hard-shelled wild walnut. A chestnut which begins bearing at six months and is in full bearing at two years, as compared with 12 to 15 years for the commercial chestnut of today; improved almonds, pecans, hazelnuts, and other similar producing trees and shrubs, will also have a place in this garden.

Among the vegetables, probably the most unusual will be the result of the crossing of the potato and the tomato, which bears its tubers above ground. This is not a commercial plant, but is a curious vegetable freak. There is also the Nicotunia, a cross between the tobacco plant and the petunia, resulting in a plant which produces tobacco and petunias at the same time. Another is a very large and early tomato, from which the skin slips without scalding. Asparagus with tips as large as bamboo shoots, yet as delicate, crisp, and finely flavored as any asparagus of smaller size ever grown in a hothouse; artichokes with blossoms 14 inches in diameter, nearly 4 feet in circumference, and chives, those small relatives of the onion, with blossoms as beautiful and as fragrant as freesias, used for border plants, yet eaten when the flowers die, are other varieties of vegetables that will be cultivated. The Burbank potato, his greatest development, also will be there.

Among grains, there will be an improved and hardy wheat, which has invaded Canada, and in its inclement climate has taken the prizes from the wheats which have been grown there for years; beardless barley and beardless oats, and a grain which produces pearl barley, a regular "breakfast-food plant," as well as the original Mexican grasses from which corn was developed, and other foreign forage and fodder grasses which Mr. Burbank has proved to be of value in their natural state or has improved into plants suitable for service in the temperate zone. An interesting plant of this kind is a new lippia for lawns, which resists drought, dies hard, and can be grown in the most arid regions, with very little water.

To this garden Mr. Burbank will bring more than 150 varieties of flowers which he has developed, improved, or created. There will be roses by the score, some of them developed 30 years and more ago, but still popular favorites all over the United States, and an evening primrose, with flowers $5\frac{1}{2}$ inches in diameter, developed from the little 2-inch blos-

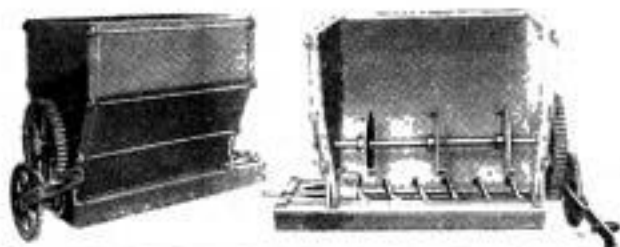


A Corner of the Grounds That will be Converted by the City of Santa Rosa into a Botanical Garden for the Preservation of the Various Plants, Trees, and Shrubs Which have been Developed by Luther Burbank in His Half Century of Work in Plant Breeding

som of the California wild evening primrose, which grows so abundantly in the mountain meadows. Other samples of Burbank's wizardry will be blue petunias, larkspurs as large as roses, a new amaranthus, or flame flower, which shows a mass of crimson leaves all summer; perennial sweet peas, zinnias like dahlias, and improved and large dahlias, too; sunflowers with stalks only 3 feet high, so short that the strongest wind cannot blow them down, and with their flowers 14 and 15 inches in diameter, turned away from the sun, toward the ground, so that the birds have no opportunity to filch the seeds; California poppies of white, pink, red, flame color, and all the shades of yellow common to the wild specimens of this beautiful flower; and crossbreeds of poppies, which look like peonies, and a giant verbena which has a fragrant odor. Yet these are only a few of the thousand or more plants of almost as many varieties, which will go to make up this unusual botanical garden, intended not only as a memorial to the foremost plant eugenist of his time, but as a perpetual free school for plant breeders of future years.

AUTOMATIC MACHINE FEEDS ABRASIVE MATERIAL

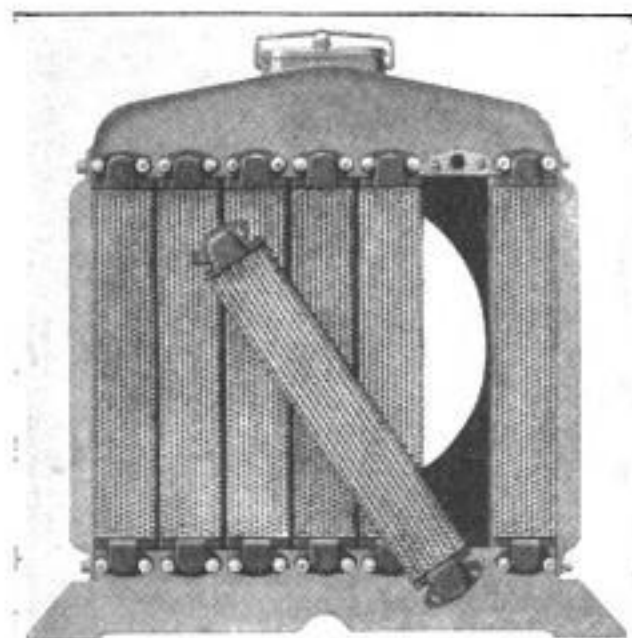
A new machine for automatically feeding abrasive materials, such as chilled shot, crushed steel, or sand, to gangs of stone saws, rubbing beds, and polishing machines, does this work uniformly and at the proper rate. The feeder is a hopper-shaped device holding about six wheelbarrows of sand, and has an agitator and a helical screw mounted on horizontal shafts near the bottom. These are gear-driven by means of a ratchet-and-pawl mechanism, so that the rate of delivery can be regulated to any desired amount.



Automatic Machine for Feeding Abrasive Materials: Left, Outside View; Right, Inside View, Showing the Agitator and the Helical Discharge Screw

SECTIONAL RADIATOR HAS SPIRAL FLOW OF AIR

A radiator built in sections so that, if any one unit is damaged, a new one may



New Radiator Built in Sections So That If Any One Unit is Damaged, It may be Replaced at a Minimum of Expense and Time

be substituted at a minimum of expense and time, has been designed for use with gasoline engines. One other advantage claimed for this radiator is the construction of the cores, each of which contains a small spiral. These spirals serve to increase the cooling capacity by giving the upward-flowing air a centrifugal action.

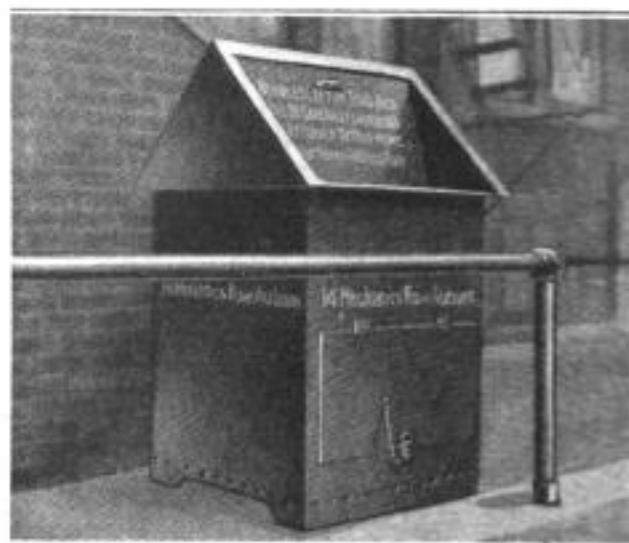
HEAVY AIR RIFLE SHOTS BULLETS LIKE REAL GUN

Looking like a real rifle and with a force sufficient to kill small game at 100 yards, a new high-pressure air rifle is being introduced. It has a peepsight at the rear of the barrel, and blade sight at the point, and the barrel is as strongly made as that of a powder rifle. It shoots bul-

lets, and a machine for bullet making is to be produced to go with the rifle. Its cost is, of course, considerably greater than that of the ordinary air rifle. The advantages of a real rifle for practice are claimed, without its noise and danger of accident.

LAUNDRY-COLLECTION BOX SAVES PATRONS' STEPS

The latest innovation in the laundry business is a collecting box for the benefit of patrons. It is constructed after the style of the newspaper mail boxes which have been in use for many years, but considerably larger. These boxes are placed at convenient points, and collections made from them daily. All a patron of the laundry need do is to drop the bundle of soiled linen, bearing the owner's name and address, into the box. It is collected and delivered at the home address. A Maine laundry uses one of these boxes at the entrance of a shoe factory employing



Box for Collecting Laundry Bundles That Operates like a Mail Box: The Self-Closing Cover Admits Bundles, While Making It Difficult to Remove Them

about 2,000 workers. The arrangement has proved satisfactory to the laundry and its patrons.



Newly Introduced Air Rifle That Is Larger and Heavier than the Common Air Gun, and Kills Game at Short Range, without Noise: Lock, Stock, and Barrel Look like a Rifle's, and the Principal Difference Is in the Interior Mechanism



The "Ann Arbor No. 3," a Car Ferry of the Ann Arbor Railroad Which Recently Underwent an "Operation" by Which the Length of the Boat was Increased 48 Feet and the Carrying Capacity Made One-Third Larger: The Vessel Plies between Frankfort, Michigan, and Manitowoc, Wisconsin

RAILROAD SHIP CUT IN HALF AND LENGTHENED 48 FEET

Emerging from a floating drydock 48 feet longer than when it entered, the "Ann Arbor No. 3," a steel ferry-boat of the Ann Arbor Railroad, is again in active service. Its new length is 307 feet and its carrying capacity is increased by about one-third. The procedure was, briefly, as follows: The vessel was put in drydock, cut in two, 48 feet of plate riveted between the two sections, new crew and passenger quarters constructed, and then again put to sea. The boat carries the cars of the railroad company between Frankfort, Mich., and Manitowoc, Wis. Two high-powered triple-expansion engines driving two four-bladed, solid-type propellers, constitute the power equipment of the vessel.

LUMBER CAMP TRANSFORMERS MOUNTED ON SLEDS

In a large lumber camp of the Northwest, where much electrically driven machinery is used for yarding the lumber and for other purposes, the power trans-

formers are mounted on strongly built sleds. In this manner the transformers can be skidded from one location to another in the summer as well as when the ground is snow-covered.



These Transformers, Which Supply a Large Lumber Camp with Electric Power, are Mounted on Sleds and Easily Moved

NOVEL METHODS OF CONSTRUCTION USED



CONCRETE-filled caissons are to be used as foundations for the \$2,300,000 state dock terminal at San Francisco, each 20 by 50 by 6½ feet. The caissons are first cast on shore, one end sealed with concrete and the other with plank. Each has three compartments running lengthwise. The caisson in the picture is



ready to be towed to place.

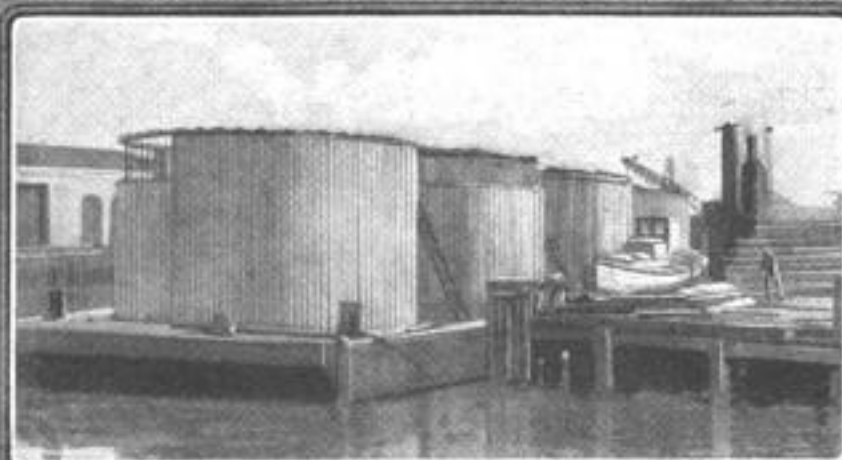
A floating derrick and cables are used in placing the caissons in position. They are up-ended and water admitted. While the caissons sink, they are guided by the derrick and cables to the right place. Holes are knocked in the sealed end with a ram and



the planked end removed.

After the caisson has been up-ended, with the lower end resting on the bottom of the bay, several piles are driven through the bottom to anchor the caisson, and a layer of concrete is poured through pipe in the derrick, forming a seal around the piles.

Five to ten days

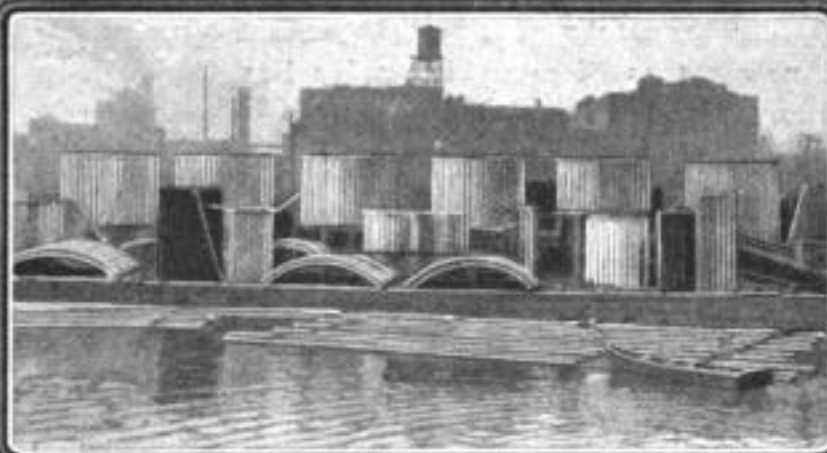


later, the water inside the caisson is pumped out, the caisson cleaned and roughened, and filled with concrete. The next step is making, on shore, concrete cylinders, to be divided into arches that are placed between the cement-filled caissons. Each cylinder makes four arches of equal size.

IN BUILDING SAN FRANCISCO'S SEAWALL

After the cylinders are divided, the arches are placed on barges, painted, and given time to age before being placed in the water. They will connect the caissons, which now are in reality solid-concrete piers, thus forming a curtain wall to hold back the fill.

For convenience in



placing the arches between the caissons to form the curtain wall, and to insure perfect alinement and solid construction, the side edges of the arches and the corresponding edges of the caissons are formed to make a tongue-and-groove joint.

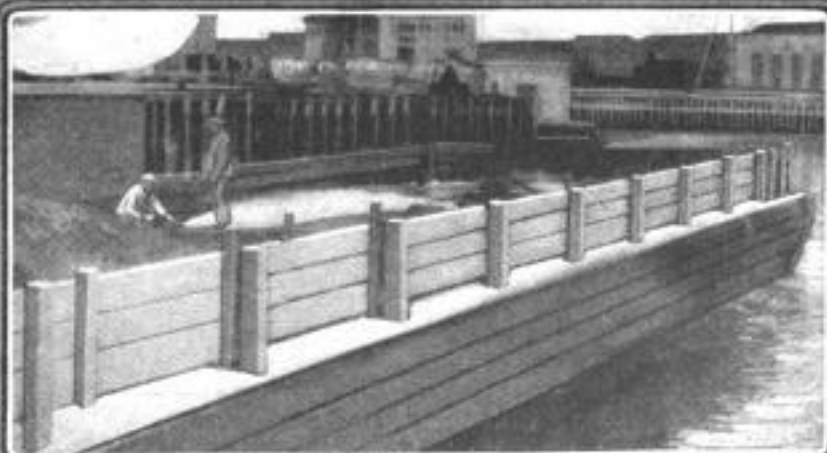
After the caissons and arches are in



place, they are filled with rock dumped from a motor truck into a barge, which is towed to the seawall. The spaces between the caissons and arches are also filled in. The caissons make practically solid piers of concrete, and the spaces inclosed by the arches hold broken rock.



The caissons and the rock-filled spaces make up the seawall. The area back of the wall is filled with sand to the top of the piles. Sand is loaded into barges by a large pump on a pile driver connected with a 100-horsepower motor. Six thousand piles were used.



VANE WHEELS VERSUS TWIN SCREWS FOR SHIPS

A new means of propelling ships has just undergone successful tests in competition with a twin-screw vessel, 100 feet long. Vane wheels, the new propelling



The 11-Foot Vane Wheels Temporarily Installed on a Vessel Designed for Twin Screws: Although Badly Handicapped by This Condition, the Wheels Proved Superior in Rigid Competitive Tests

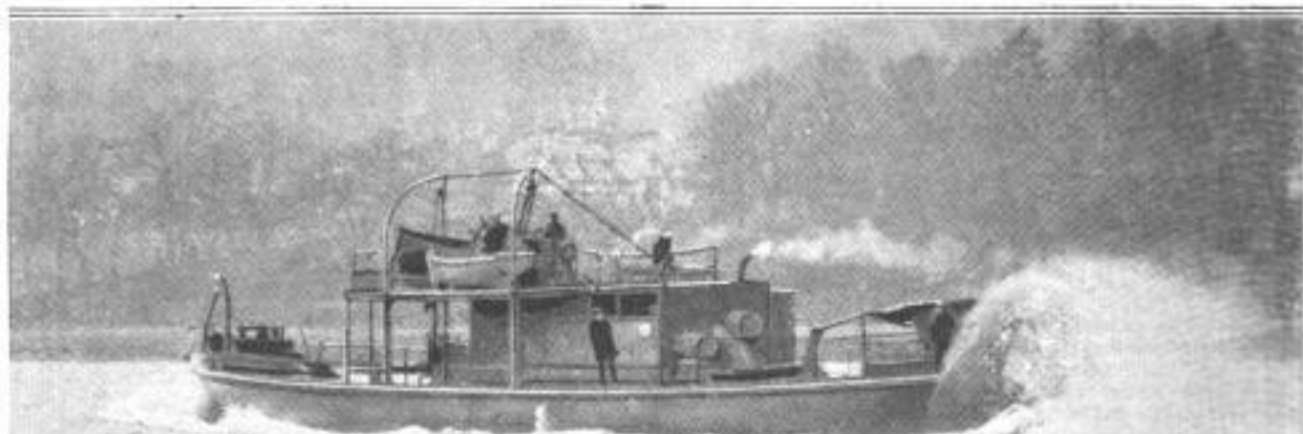
means employed, are partly immersed wheels, whose shafts and hubs are above water and substantially in the line of travel. The vanes are fitted to the spokes of the immersible portion, and are, of course, so pitched as to cause the wheels to exert a forward thrust when they turn. In order to avoid undesirable steering effects, the wheels are made of exactly the same dimensions and are then symmetrically located with respect to the hull itself. Following considerable experimental work, actual tests were carried

out with a vessel originally designed for and fitted with twin screws; first with its screws and then with vane wheels driven by a temporary arrangement from the engines. A speed of $10\frac{1}{3}$ miles per hour was maintained in both cases, but careful observations taken during the test interval showed 41 per cent less power consumption when vane wheels were used. Great maneuvering power was also displayed, the vessel being capable of turning rapidly in its own length with practically no advance. The high propulsive efficiency of the vane wheels is attributed to the fact that the hubs, being out of water, do not offer resistance as the ordinary screw propeller does. Avoidance of immersed supports, such as bosses or brack-

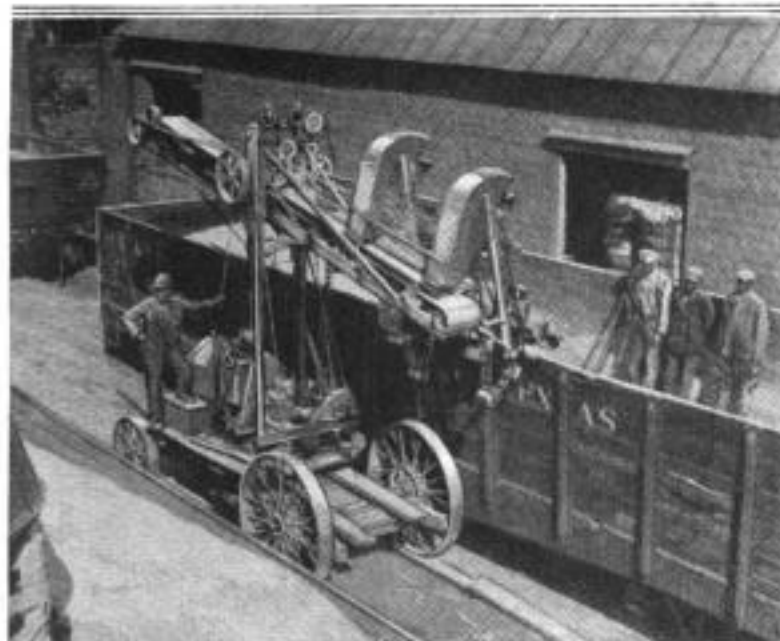
ets, also tends to increase the efficiency of the vane-wheel propeller.

PORTABLE RIG UNLOADS BULK MATERIAL FROM CARS

A recently patented arrangement for unloading bulk materials, like sand, gravel, crushed stone, and coal from open-top railroad cars, is reported to have a capacity of three 50-ton cars in eight hours, and to reduce the unloading cost to less than one-half of the cost by hand



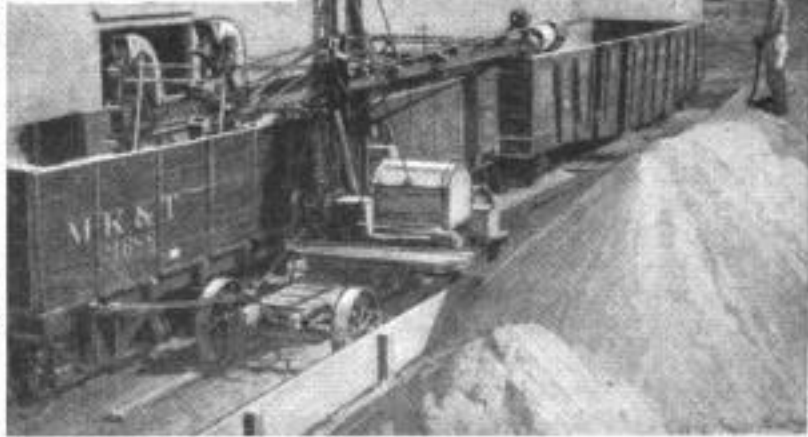
Vane-Wheel Propellers in Action: Heavy Belting was Arranged Temporarily for Transmitting Power from the Engines. By Incasing the Vane Wheels above Water in a Specially Designed Housing, It is Hoped to Eliminate Entirely the Heavy Spray



Left: Conveyor and Elevators Raised to Clear Top of Car, and Ready to be Swung into It; Note That Lower Portion of Elevators is Folded Up. Above: Rig Unloading Sand



Above: Bottom of Elevators and Feed Screw Loading Nut Coal. Right: Elevators Lowered into Car

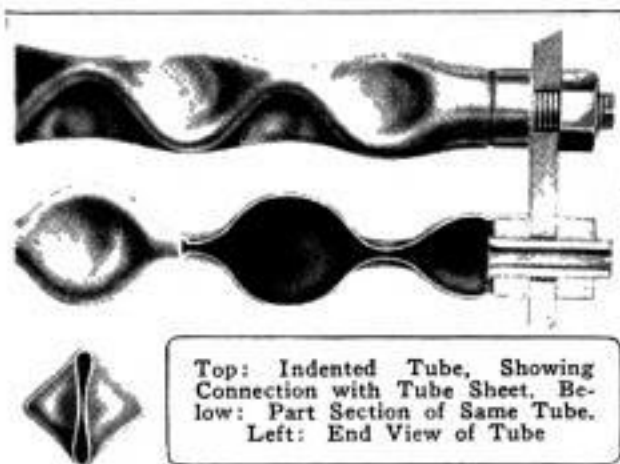


methods. It consists of a heavy wagon type of truck, on which are mounted the gasoline engine and driving gear, and a vertical ladder that carries a belt conveyor. At the lower end of the conveyor are fastened the supports for two parallel-chain-type bucket elevators, which in turn support a horizontal screw conveyor. In operation, the wagon propels itself alongside the car to be unloaded and, by means of the turntable on the platform, swings the elevator legs over the side and down into the car, where the revolving screw forces the material to each of the two elevators. These deliver it to the belt conveyor, by which it is dumped on the ground or into a waiting truck. The rig is entirely self-contained.

INDENTED TUBE SHOWS HIGH HEAT TRANSMISSION

There is being introduced a new idea in apparatus used for the transfer of heat from steam to water or between other fluids that do not come in direct contact with each other. In place of the ordinary

straight tube, one is used in which there are a series of indentations, the alternate dents being preferable at right angles. Tests have shown that steam at 212° F., passed through such a tube, heated water twice as fast as when passed through



Top: Indented Tube, Showing Connection with Tube Sheet. Below: Part Section of Same Tube. Left: End View of Tube

a plain tube. An attendant advantage is the expansion for which the formation of the tube provides, thus reducing the tendency to leakage or fracture.



Duck Blind Made by Dynamiting a Hole in the Sand and Piling a Few Tumbleweeds around the Rim of the Pit: Building the Blind in Any Other Way would have Consumed Quite Some Time. With the Aid of the Dynamite, the Entire Job was Completed in Only 10 Minutes

DUCK HUNTERS USE DYNAMITE TO MAKE BLIND IN SAND

Dynamiting was the novel means by which two hunters built a duck blind on a sandy peninsula in California, recently. The land being exceedingly low, a blind could not possibly have been built at the desired point without digging a pit. Accordingly, shovels being unavailable, this task was attempted with an oar. However, little progress could be made in the hard-packed sand with this implement, and a short time later the idea of using dynamite was conceived. A broken oar was used to make a hole in the sand to a depth of about 4 feet, and into this opening three sticks of dynamite were

placed. The hole was then filled in and the fuse lighted. In about a minute there was a heavy explosion, and the pit was ready. The hole thus blasted was ample to afford concealment for the two hunters, who further augmented the natural appearance of their blind by placing a few tumbleweeds around the top. Only 10 minutes was taken for the entire job.

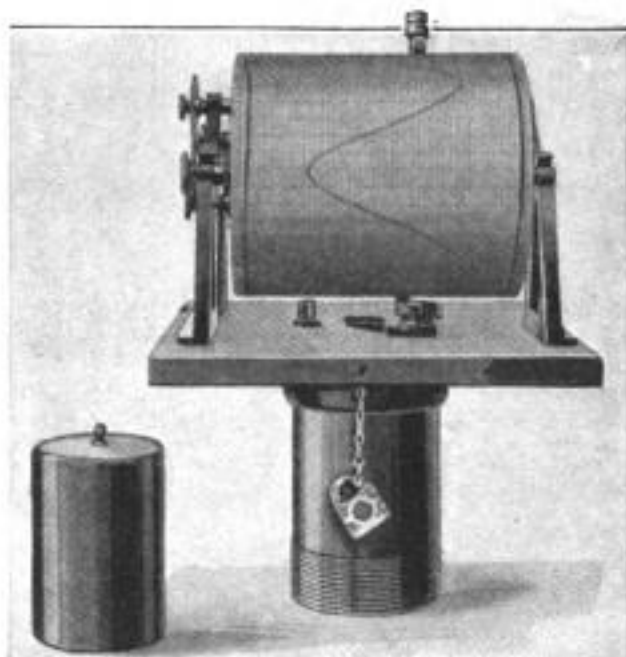
More than 400 bison, bought from a private owner by the Canadian government, were recently shipped from Ravalli, Mont., to Wainwright, Alta. En route the restive animals completely smashed the lower walls of some of the cars—this in spite of the fact that the sides had been strongly reinforced.



How the Dynamite-Built Blind Looked from the Water: Note That It Has Much the Appearance of the Weed-Covered Dunes about the Island. The "Ducks" Seen in the Foreground of the Picture Are, of Course, Decoys Used to Attract the Real Ducks

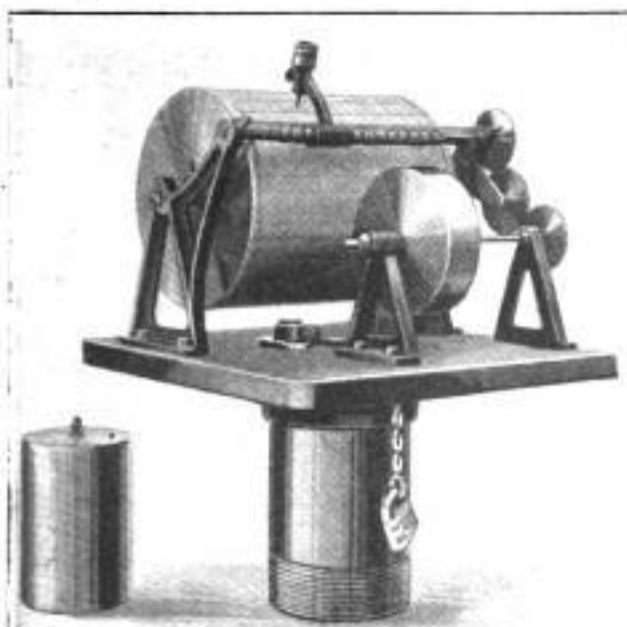
AUTOMATIC TIDE GAUGE WEIGHS ONLY 25 POUNDS

The United States Coast and Geodetic Survey is responsible for a new type of tide gauge which is entirely self-contained and automatic in operation, and records its data graphically on a clock-driven chart. This new instrument, easily carried about from one gauge station to another by one man, is said to be far superior to existing tide gauges, which require the building of a platform and shelter prior to installation, as well as elaborate equipment for their maintenance. A flat



Portable Tide Gauge Developed by the Coast and Geodetic Survey: Readings can be Made Directly at Any Two-Minute Interval for 10 Days

spring, one-hundredth of an inch thick and 18 feet long, is the means used for carrying the rise and fall of a metallic float to the writing arm. Tests made at an experimental installation in the Potomac River at Washington indicated that the tidal observations recorded were as accurate as those obtained from the large cumbersome gauges. In addition to its timesaving qualities, the new instrument will also eliminate the need of a paid observer.



Tide Gauge Installed by Mounting and Leashing It on a Pile or Tripod: The Float, When Inserted in the Piping, is Then Connected to the Pulley Shown

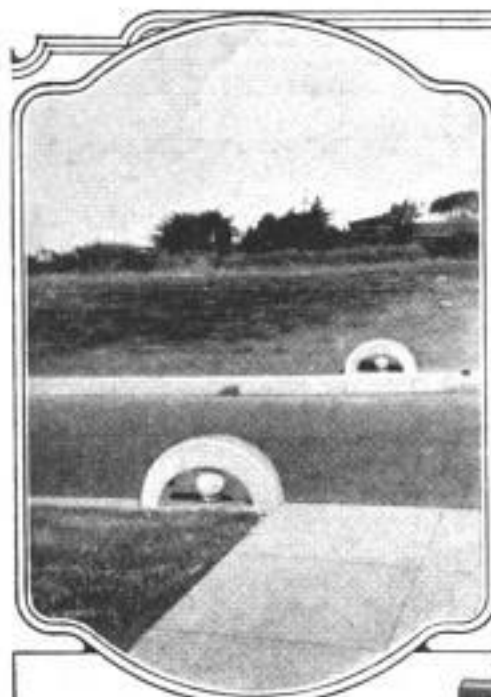
STUDENTS LEARN TO GLIDE WITH NOVEL PLANE

The operation of motorless airplanes is being taught to German students, by means of a novel plane that is provided with a double-rocker device which rests upon the ground. In the early stages of his instruction, the student must learn to balance his machine on this unstable foundation, by operating the controls. He is then permitted to practice with a plane not resting on the ground.



German Glider Student Learning to Operate a Motorless Plane Which Rests on a Double-Rocker Arrangement: The Pupil Thus Learns to Balance the Machine by Operating the Controls

CIVIC FEATURES THAT PROMOTE THE COMFORT



Desiring to Preserve the Moonlight Effect Reflected by the Sea, a California Man Covered the Electric Lights along the Roads with These Concrete Shields



Symbolic Group Which is to be Erected in Nashville, Tennessee, as a War Memorial to the Soldiers of the American Expeditionary Forces: The Work was Recently Completed at the Sicilian Studio of George Zolnay, an American Sculptor. A Club Donated the Necessary Funds



Rooming House in Small Town in the Mohave Desert, Built like a Garage So That the Ends may be Left Open to Permit Circulation of Air

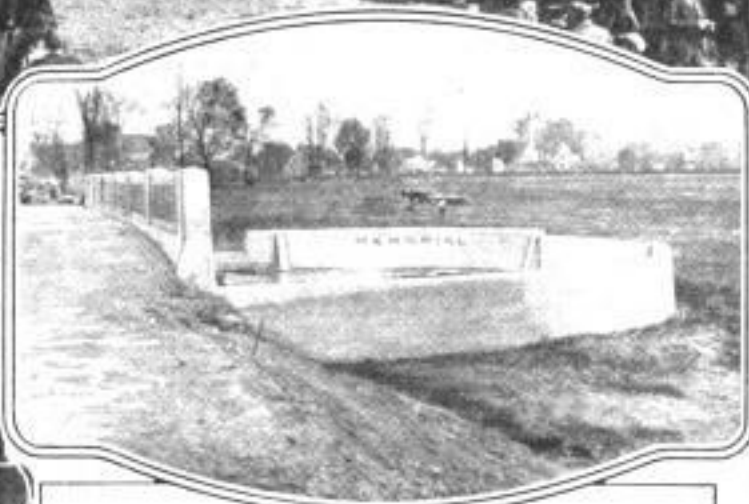


This Cross, Visible to Passing Tourists, Is a New Addition to the Strange and Beautiful Garden of Napoleon St. Pierre, of Vancouver, British Columbia, Which was Previously Described in the April, 1922, Issue of Popular Mechanics Magazine

AND ENJOYMENT OF VISITORS AND RESIDENTS



Crowds Thronging the Barbecue Given by Governor Walton of Oklahoma on the Day of His Inauguration: Under the Sign, "Coffee," Are Four Tanks, Each Holding About 10,000 Gallons. Below Are Two Fire Engines Used in Cooking the Beverage



An Artificial Lake, Covering About 50 Acres, is being Constructed at Woodstown, New Jersey, as a War Memorial. Building the Concrete Bridge and Horseshoe Dam, Shown Above, Were the First Steps Taken

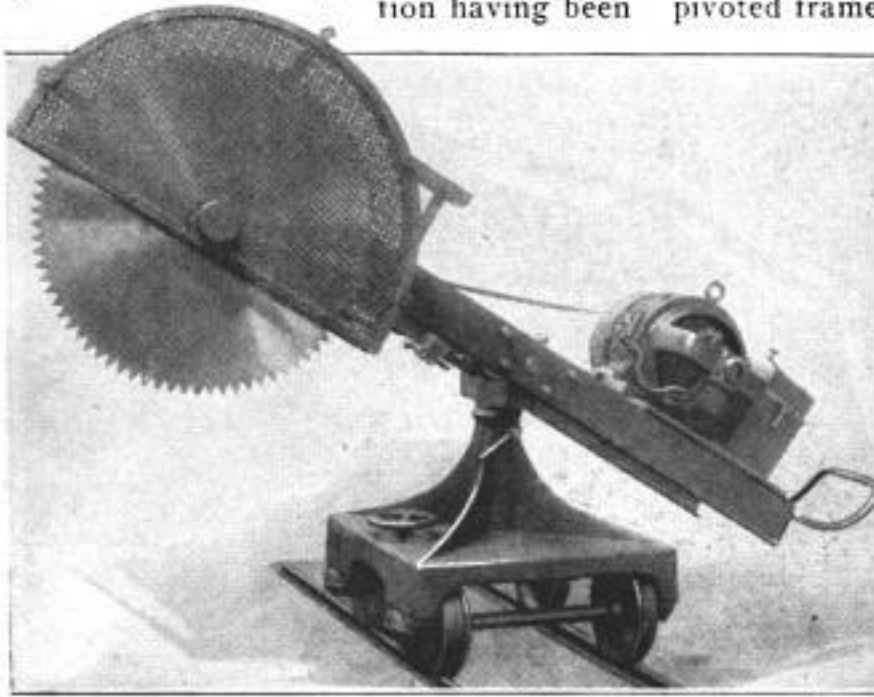


Part of the Boardwalk, Built by the City of New York at an Estimated Cost of About \$2,000,000, Which was Recently Opened at Coney Island, the Well-Known Amusement Resort of the Metropolis

PORTABLE CUT-OFF SAW IS EASILY HANDLED

Various interesting features have been embodied in a portable cut-off saw developed abroad recently, particular attention having been

paid to accessibility of adjusting parts and convenience of operation. The operating parts are carefully balanced on a pivoted frame, the bed of the motor being provided with sliding blocks, to vary the balance if desired. The pivot frame itself is swivel-mounted over a center pin in the main truck frame, and can be locked against turning, as well as against up-and-down movement. A convenient handwheel permits locking of the wheels when working. The saw is about 44 inches in diameter, and will make cuts up to 16 inches in depth. Adjustable screws are provided on both sides of the pivot block for limiting the depth of cut to any predetermined depth within the range of the machine.

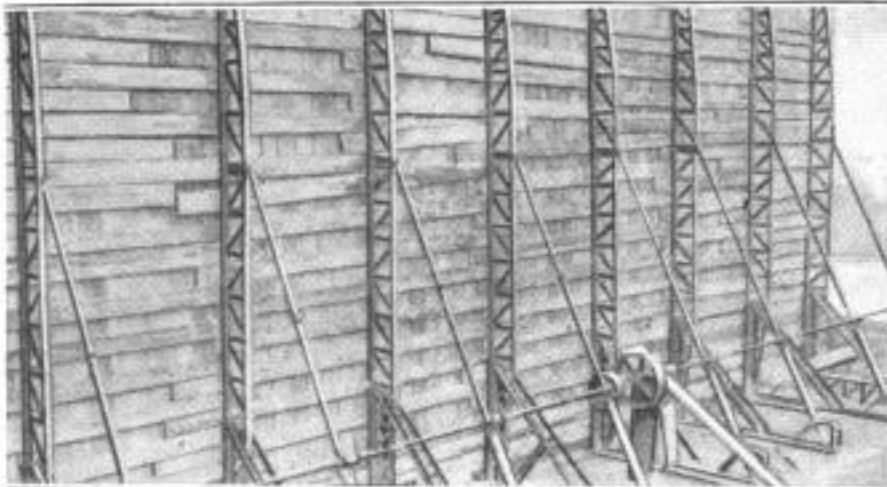


The Portable Cut-Off Saw Ready for Work: It can be Tilted and Swiveled to Any Convenient Angle, Adjusted for Depth of Cut, and Locked on the Rails

CONCRETE WALLS MOLDED BEFORE BEING RAISED

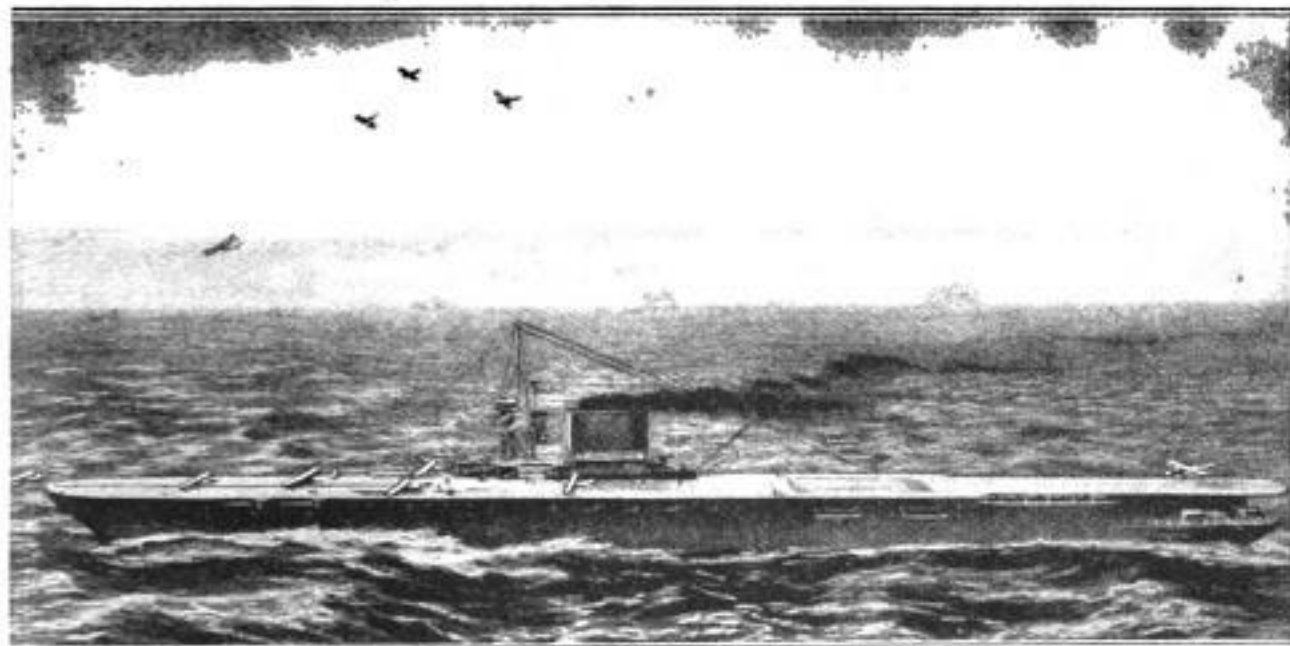
Smaller concrete houses have for some time been built by casting the walls in forms laid on the ground, and then raising them into position with jackscrews. The same method has now been successfully applied in building a clubhouse in Wash-

ington covering half a block. The 150-foot, three-story wall was raised into position in about an hour. A square shaft was geared to each of the screws, and power applied with a pulley on the shaft of a slow-speed motor. With this method, after the walls are in place, square forms are built into the corners and filled with cement, which closes around reinforcing rods projecting from each wall into the corners.



Erection of a Clubhouse in Washington with New Method of Concrete Construction in Which Units are Cast on the Ground and Then Raised to Position: Above, Three-Story Wall Raised with Shaft and Jackscrews; Right, Finished Wall in Place





BY COURTESY OF THE GENERAL ELECTRIC CO.

Big Airplane Carrier as It will Look When Completed: The Electrically Operated Power Plant, Which Is Large Enough to Serve a Modern City of 700,000 People, will Drive the Ship through the Water at a Speed of Nearly 40 Miles an Hour

TWO BIG AIRPLANE CARRIERS BUILDING FOR U. S. NAVY

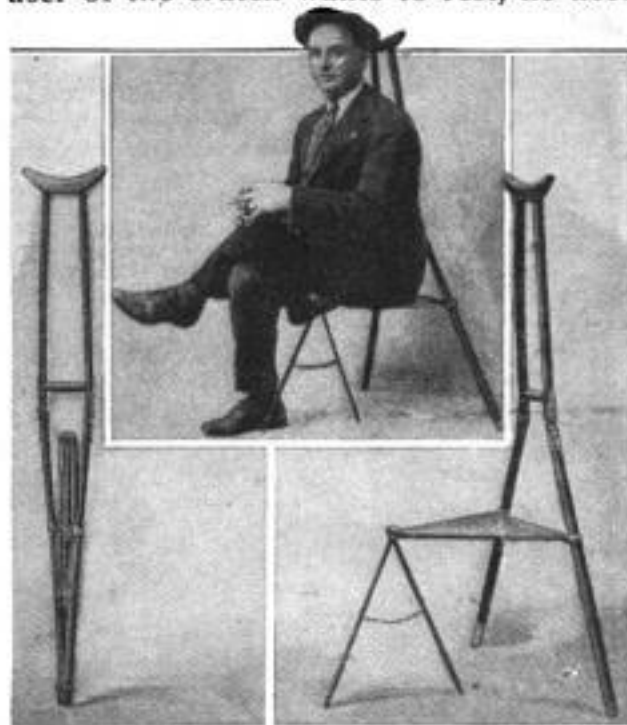
Two ships, said to be the longest naval vessels in the world, are now under construction for the U. S. Navy, and while the arrangements below decks are not being announced, it is understood that airplanes in great numbers will be cared for in each ship. There will be provisions for hoisting the planes to the flying deck, which will be unbroken except for the funnel inclosure set at one side of the hull. The ships will be completely equipped for sending and receiving radio messages. Each ship will be electrically driven and will have a power plant of 180,000 horsepower, which would be sufficient to serve a city of 700,000 people, and which will propel the more than 33,000 tons through the water at a speed of nearly 40 miles an hour. The ships will have a length of 850 feet, a beam of 105 feet, and four propellers, each driven by two 22,500-horsepower motors.

MODERN HOTEL WITH BATHS AT JERUSALEM GATE

The old and the new will rub shoulders when a modern hotel with baths is finished and thrown open to the public at the ancient Joppa Gate of Jerusalem. Work will begin next summer, and the hotel will have 500 rooms and 200 baths. Jerusalem has but two hotels, and the additional accommodations of a convent and a German hospice, or travelers' refuge, are insufficient for 5,000 tourists annually.

COMBINED CRUTCH AND CHAIR HANDY FOR INVALIDS

A novel crutch which may be converted almost instantly into a chair is the product of an Iowa inventor. When the user of the crutch wants to rest, he need

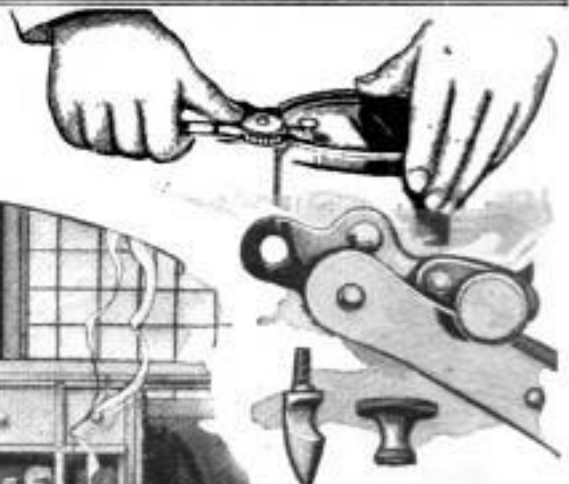


Left: Convertible Crutch Folded for Walking. Above: Man Seated on Chair. Right: Crutch Unfolded for Use as Chair

only spread the divided crutch leg, pull out a folding seat, and set a short leg in place. The weight of the whole is $2\frac{1}{2}$ pounds, and the change from crutch to chair or back again is made in about 10 seconds.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

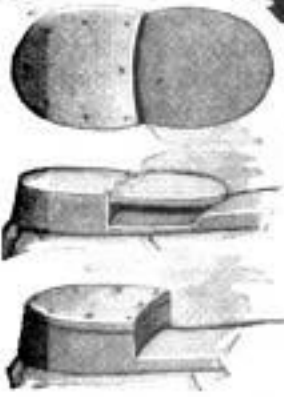
Toothbrush with the Brush Itself Removable, So That, When One End Becomes Worn, It can be Taken Out, Reversed, and the Opposite End Used: The Bristles can Also be Separated for Cleaning



Can Opener That Cuts Easily and Smoothly, and Has Interchangeable Blades



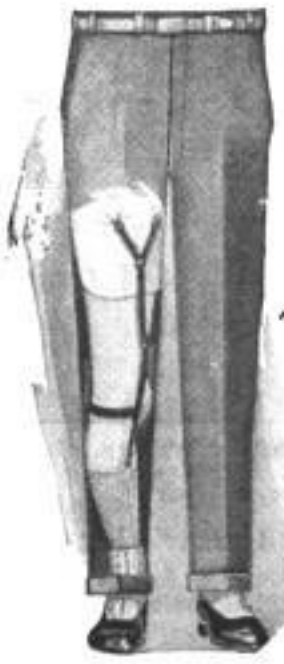
Convenient Kitchen Cabinet, Which Has Compartments for Kitchen Necessities, and Which can be Made into a Breakfast Table with Little Trouble



The Outer Lift of the Rubber Heel, Shown to the Left, is Secured by Means of Hinges



This Baby Car Has a Protecting Rim about the Seat and can be Easily Folded



Sirup Dispenser Made of Glass, through Which the Liquid can be Seen

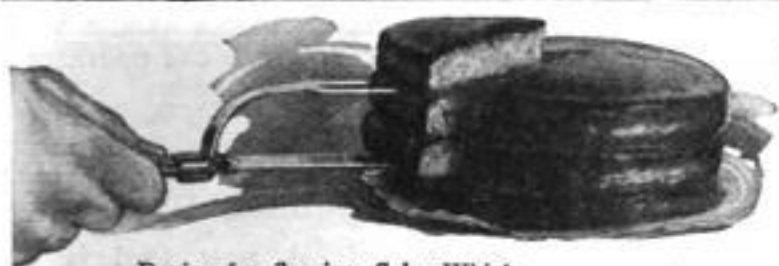


Garter Intended for Men with Crooked Legs, Which Holds the Socks Up and Makes the Trousers Hang Straight



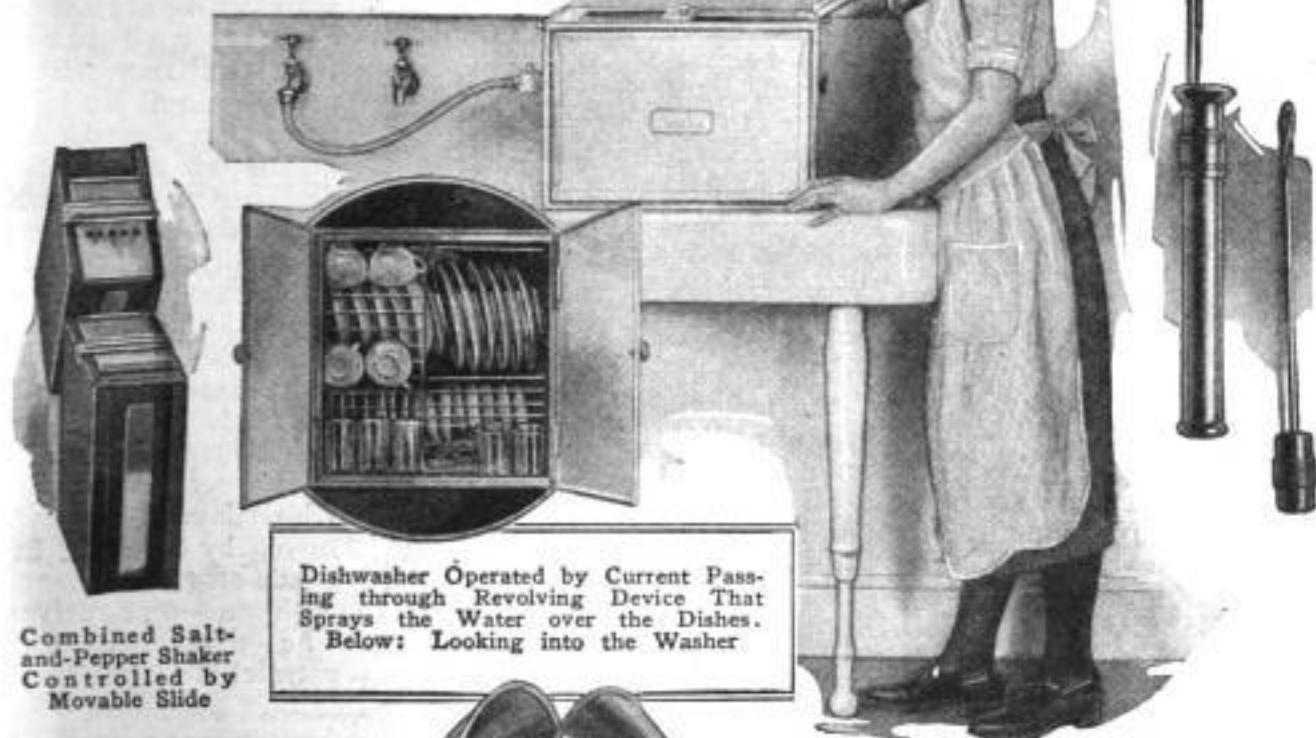
Toothpaste Cap That Closes Automatically by Means of a Spring When Released

INTENDED FOR THE HOME AND ITS MEMBERS



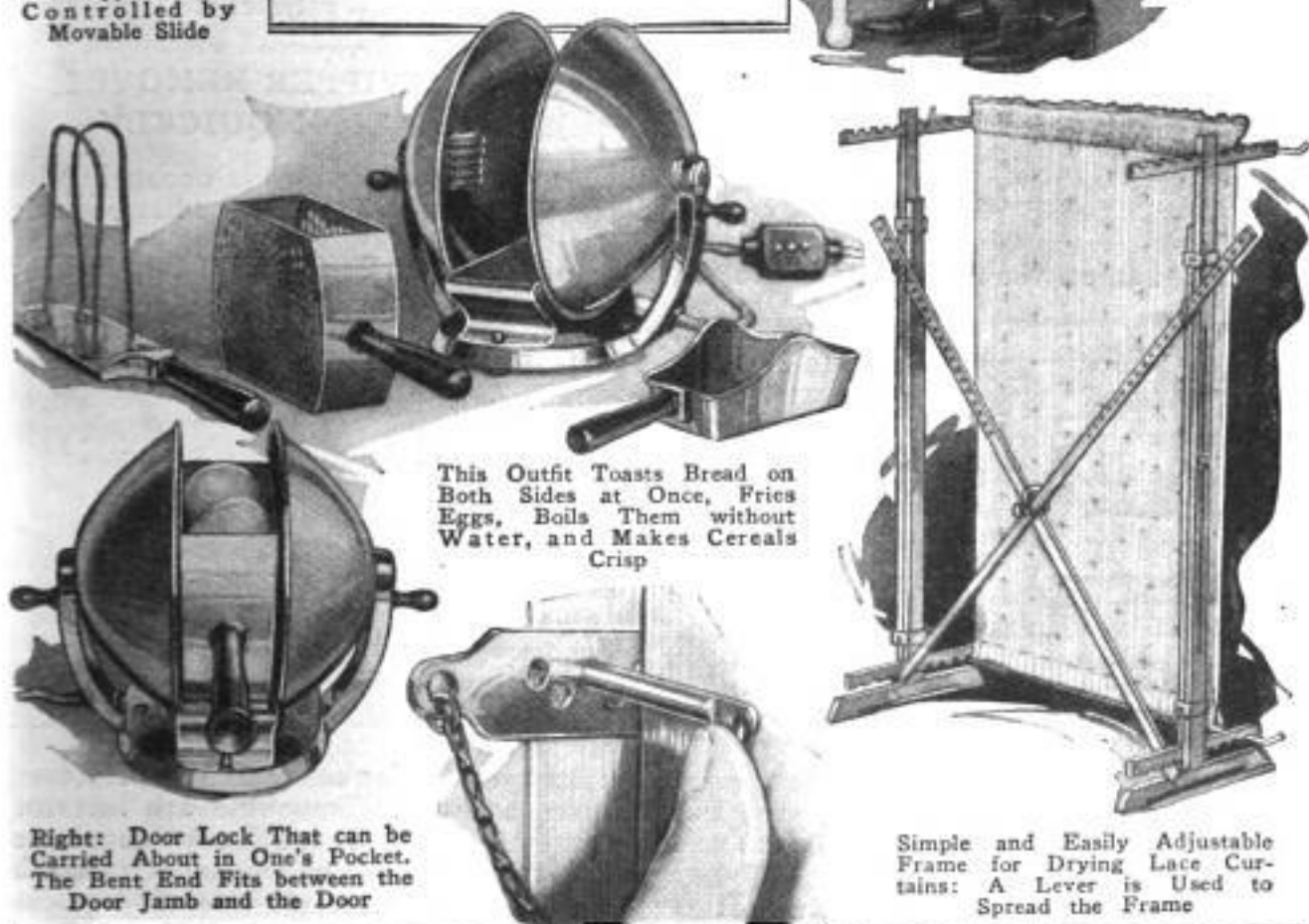
Device for Serving Cake Which Makes It Unnecessary to Use the Fingers

Handy Needle Intended Especially for Cleaning Pipe Bowls



Dishwasher Operated by Current Passing through Revolving Device That Sprays the Water over the Dishes. Below: Looking into the Washer

Combined Salt-and-Pepper Shaker Controlled by Movable Slide



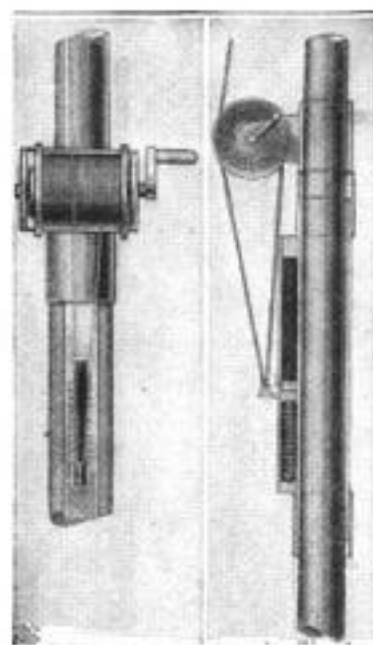
This Outfit Toasts Bread on Both Sides at Once, Fries Eggs, Boils Them without Water, and Makes Cereals Crisp

Right: Door Lock That can be Carried About in One's Pocket. The Bent End Fits between the Door Jamb and the Door

Simple and Easily Adjustable Frame for Drying Lace Curtains: A Lever is Used to Spread the Frame

WEIGHT OF FISH CAUGHT TOLD BY ROD SCALE

The fisherman can tell the weight of a fish he has caught before taking it off the

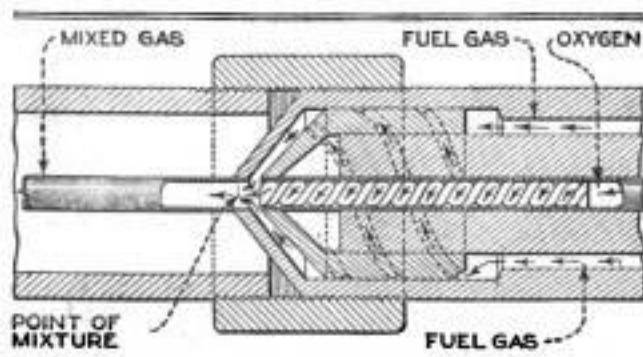


line by means of a newly invented reel attachment. A small spring scale is affixed to the rod a few inches behind the reel, and the line is run to the scale hook and thence out along the regular guides. With the reel held immovable, the weight of the fish at the end of the line immediately registers on the scale, all this, of course, being done after the fish has been lifted from the water.

With the reel held immovable, the weight of the fish at the end of the line immediately registers on the scale, all this, of course, being done after the fish has been lifted from the water.

NEW CUTTING TORCH USES VORTEX TYPE MIXER

A new torch for cutting and welding metals, is designed for the purpose of efficiently using a mixture of fuel gas and oxygen. The mixing takes place at the apex of a shortened conical chamber which the oxygen enters from a central tube. The oxygen is given a whirling motion to the left by baffles placed at the end

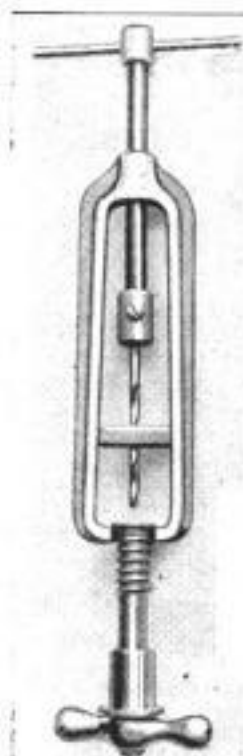


New Cutting Torch in Which the Fuel Gas and Oxygen Whirl in Opposite Directions, Producing a Uniform and Intimate Mixture

of the tube. Fuel gas is fed through a series of spiral grooves surrounding the chamber and is given a rotary motion to the right. The mixed gases are led out through a tube to the burner tip. It is said this arrangement prevents flash-

backs when the tip comes in contact with the metal. The torch has a handle with a ventilated grip that keeps the operator's hand comfortable.

COMBINATION VISE AND DRILL FOR PLUMBERS' USE



A new tool is on the market for plumbers and maintenance men in apartments, hotels, and large institutions where many plumbing fixtures are used. By means of a specially designed vise and drill, corroded screws can be drilled accurately and removed from faucet stems, when the washers have to be replaced. The fact that this can be done quickly and easily will be appreciated by all who have been annoyed by breaking the heads off rusted screws with a screwdriver. The drilled hole is parallel to the stem.

WIRE STRIPPER REMOVES INSULATION QUICKLY

A motor-driven machine occupying but 4 by 10 inches of bench space has been designed for

quickly and cleanly stripping the insulation from ends of electric wire and cord. The operator inserts the wire in a long bushing, presses a pedal and withdraws the wire stripped, with its copper strands twisted tightly for convenient use. Rotary knives within the machine are instantly adjustable while in motion to accommodate different sizes of wire which may be inserted. The device is said to duplicate easily the work of five men.

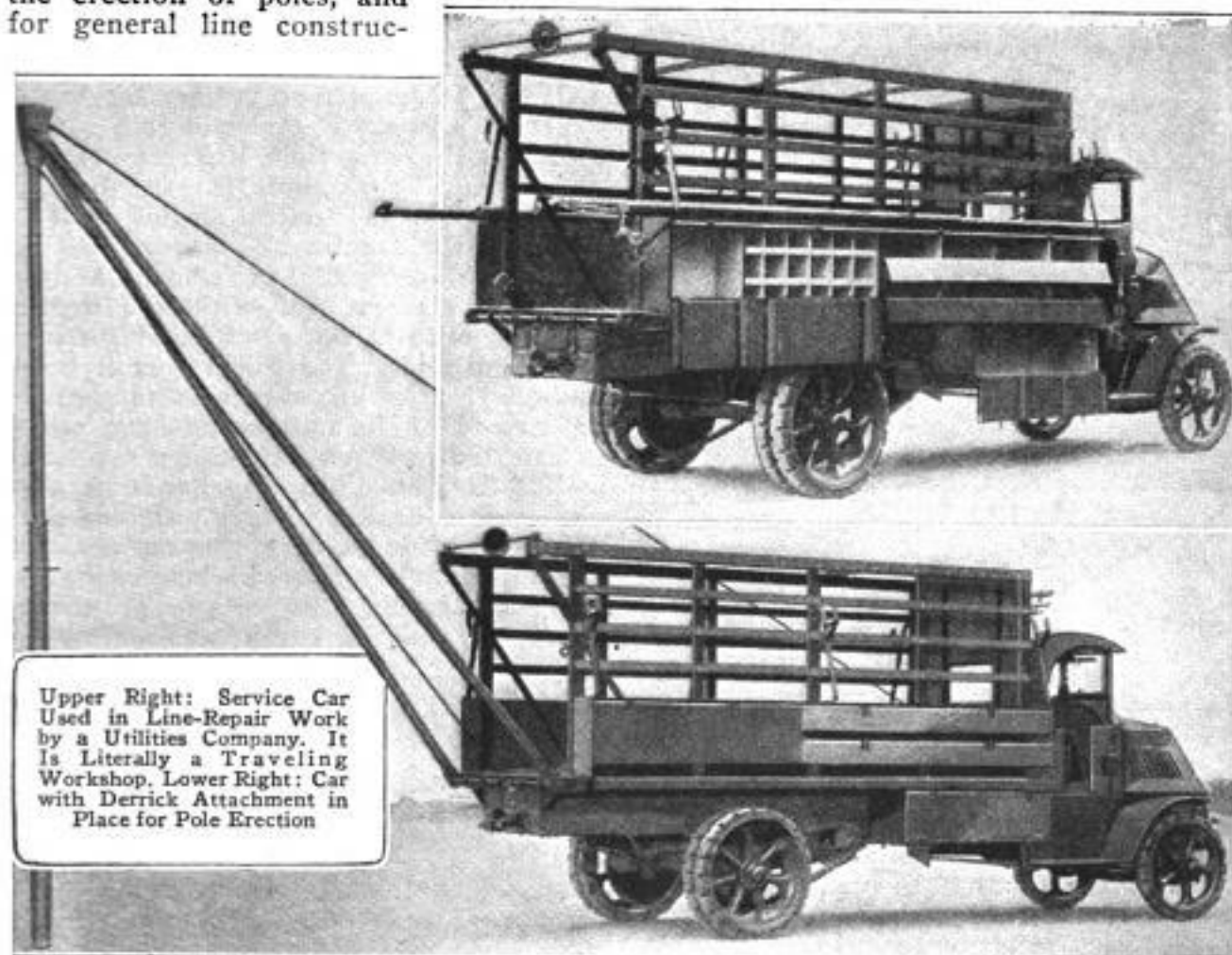


COMBINED WINCH AND DERRICK FOR LINE-REPAIR WORK

The lineman's work has been greatly facilitated by the use of a derrick-and-winch combination for cable pulling, for the erection of poles, and for general line construc-

HOT BAFFLEPLATES HELP BURN GAS ECONOMICALLY

Burning artificial gas with economy is the object of a new type of burner for use in furnaces and steam and hot-water boil-



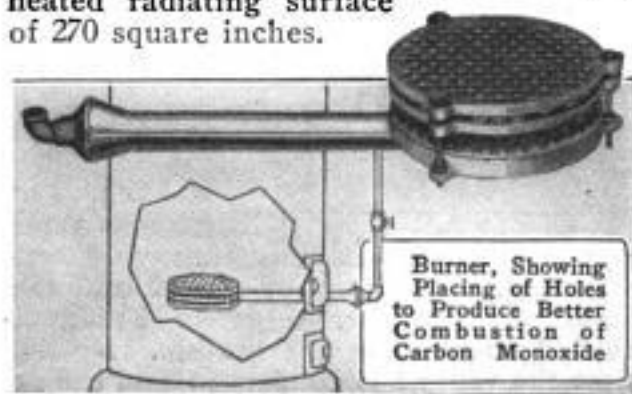
Upper Right: Service Car Used in Line-Repair Work by a Utilities Company. It is Literally a Traveling Workshop. Lower Right: Car with Derrick Attachment in Place for Pole Erection

tion, recently put into service by a Brooklyn company. It is in the form of a motor truck with a winch on the floor of the car, and a derrick that can be readily swiveled to its rear and is long enough to erect the poles. The body of the car is equipped so as to make it practically a transportable repair shop. Every inch of space has apparently been utilized.

SHIP BURNS CARGO AS FUEL TO REACH PORT

The British steamship "Penrhelyd," running short of fuel, several hundred miles from the American coast, solved the problem in a practical way. The captain ordered part of the cargo of cork to be burned. In all, about 450 bales were used before reaching New York. Other ships in the same predicament had to send calls for assistance, the expense involved being far greater than that of the cork consumed.

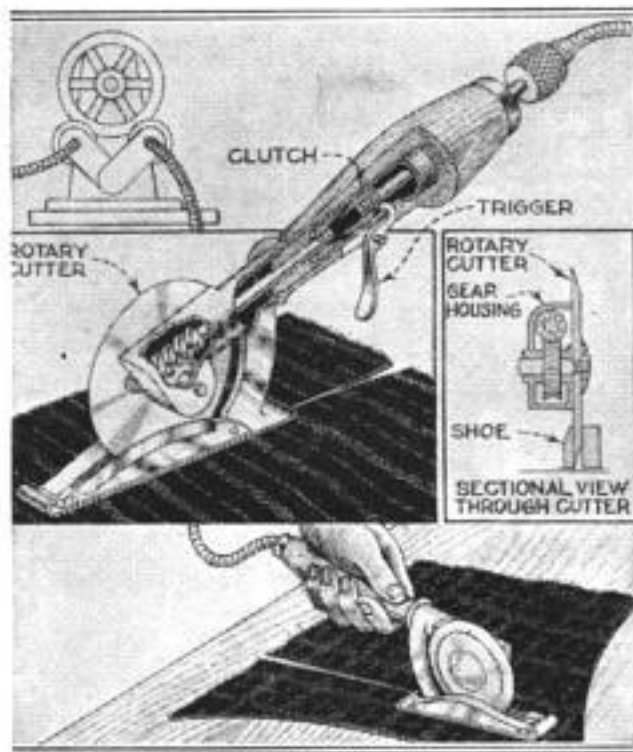
ers. Heretofore an objection has been the tendency of the gas burner in a boiler or furnace to form carbon monoxide. The burner illustrated is made with two plates drilled with holes immediately over the gas outlets. These are so placed as to present a staggered path for the flow of gas, holding its elements in a high temperature long enough to allow full combustion. The plates also give a highly heated radiating surface of 270 square inches.



Burner, Showing Placing of Holes to Produce Better Combustion of Carbon Monoxide

CUTTING TOOL FOR TAILORS HAS FLEXIBLE DRIVE

A recently patented hand tool for the convenience of tailors in cutting cloth by hand, is driven by a flexible shaft similar

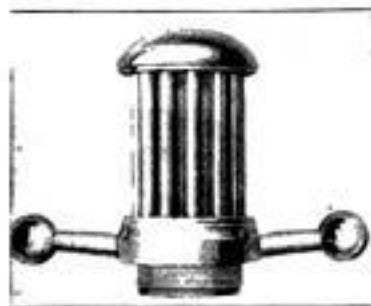


Top: Drive for Flexible Shafting for Operating Two Rotary Cloth Cutters. Center: Cutter Mechanism. Bottom: Rotary Cloth Cutter in Use

to those used on dentists' engines. The rotary cutter is carried at the end of a suitable handle that is provided with a trigger for operating the clutch, inside the handle, that starts and stops the knife. A shoe that slides along the surface of the cloth serves as a guide for the cutter.

AUTO RADIATOR CAP CONDENSES STEAM OR ALCOHOL VAPORS

Radiator caps continue to stimulate the inventive minds of automobile enthusiasts.

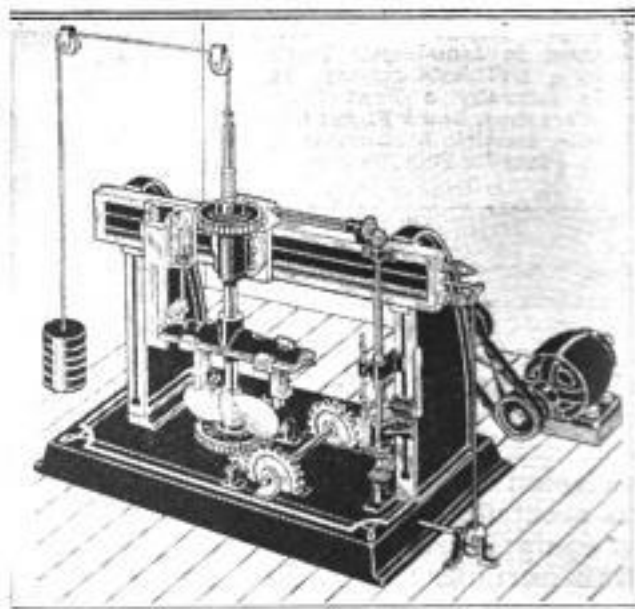


The latest one to appear screws on in the usual manner, and is designed to condense steam in summer or alcohol vapor in winter. The gaseous vapor rises to the top chamber through a central tube, where it is by-passed into two rows of 20 copper tubes to a funnel-shaped chamber at the bottom. By this time the vapor has condensed, and the re-

sulting liquid is fed through small pipes back to the radiator. The estimated condensing capacity of the cap is about two gallons of liquid per hour.

MECHANISM FOR BORING MILL FACES PROPELLER BLADES

For facing propeller blades, a machine that can be adapted to various pitches of different propellers, and will face several blades at the same time, has recently been patented. The machine is used in conjunction with a vertical boring mill of standard construction. The revolving table of the boring mill is removed and replaced by a worm gear, with an extension hub below to fit the pivot bearing of the revolving table. The worm gear is counterbored on its upper side to receive the lower end of the tapered bushing, which is inserted in the hub of the propeller to be faced. Above the propeller is installed the cutting head, which is provided with tool posts for holding the cutters, and can be suitably adjusted when facing the propeller blades. By means of change gears, the machine can be adapted to any



Standard Boring Mill Fitted with Attachment for Machining Propeller Blades: The Mechanism Is Adaptable to Blades of Different Pitch

required pitch in the propeller, and will face simultaneously as many blades as there are tool posts.

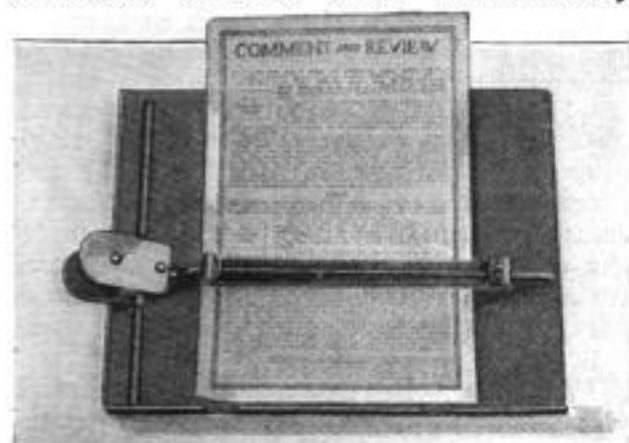
☞The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

SAFETY-SUGGESTION CARDS USED BY RAILROAD

As part of its program toward reducing accidents, the Union Pacific Railway has printed safety-suggestion cards which are available to all its employes. These cards are used in writing safety ideas, and are passed on to the head of the department who, in turn, no matter how simple the suggestion, sees that it reaches the superintendent's office. Then special meetings of officials and employes are held, ever so often, and the suggestions examined. In this way the subject of "Safety First" is kept "live" at all times.

HANDY LINE GAUGE SLIDES ON COPY-HOLDER FINGER

For measuring the length of lines on printers' proofs wherein the line lengths are irregular, a gauge has been devised for placing on the finger of the copy holder of a typesetting machine. By its aid the work can be done much more readily



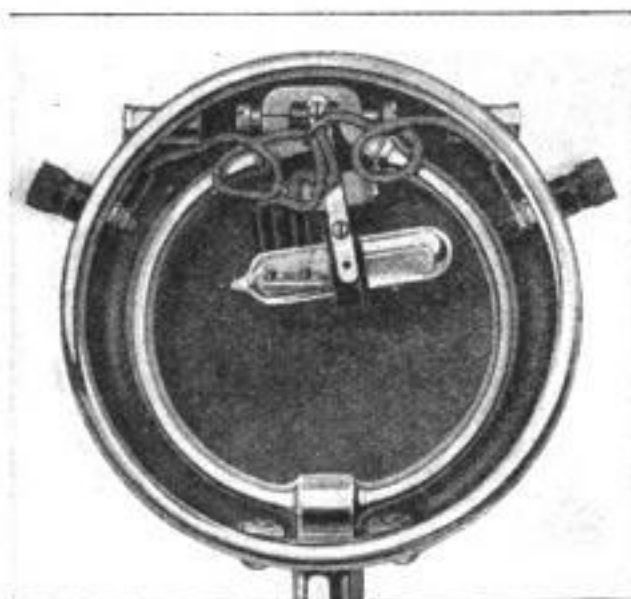
The Line Gauge on the Copy-Holder Finger Aids the Composer in Measuring the Length of Lines When Correcting Proofs

than with an ordinary line gauge. The new gauge is about 6 inches long, and being about $\frac{1}{2}$ inch wide, it holds the proof firmly on the copy holder, making it easy for the operator to slide the gauge along the finger and read any measurement. The flat face of the gauge is graduated into 33 picas.

MERCURY SWITCH PREVENTS CONTACT CORROSION

To avoid the trouble with automatic electric-control devices, due to oxidation and corrosion by open arcking, a manufacturer has devised a mercury switch. In the control tube shown, the current is transmitted through a sealed glass tube

containing mercury and inert gas. It is adapted to clocks, gauges, and to systems generally where an automatic electric con-

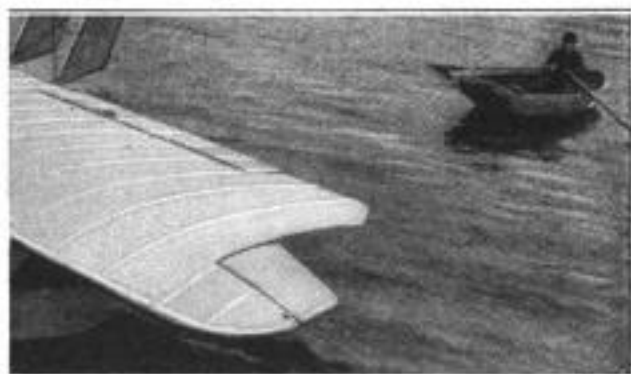


Mercury Control Tube, of Making or Break ing Circuit by Mercury Touching or Exposing Contacts

trol and delicate contacts are required. It is adapted also to either direct or alternating currents.

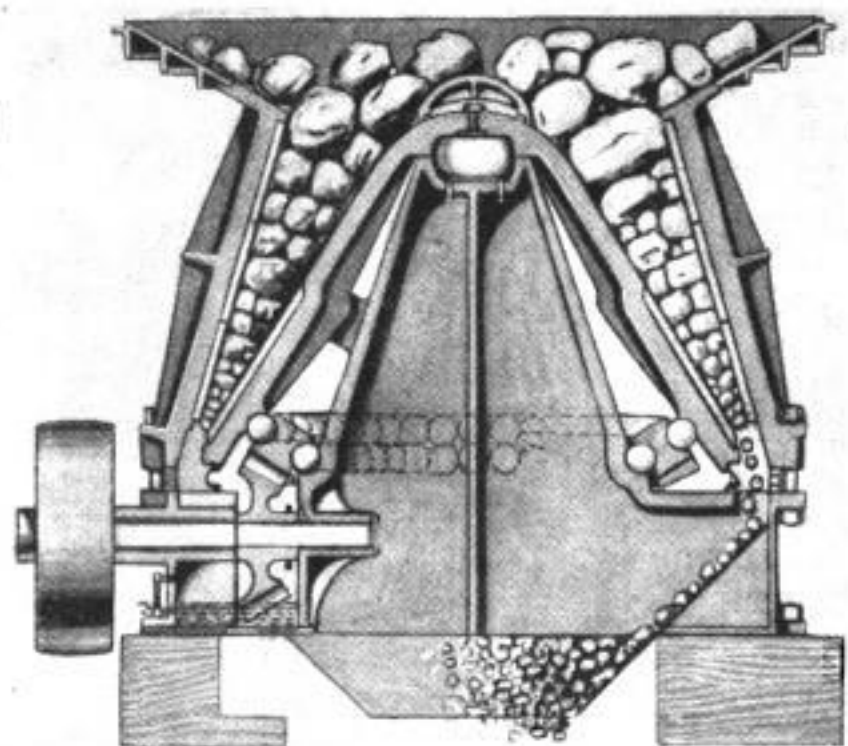
NEW CONTROL IDEA IMPROVES MONOPLANE OPERATION

A new type of monoplane was successfully demonstrated in trial flights off New York City the other day. A small section of the leading edge, at each end of the wing, is extended beyond the tip, and to it is hinged the pressure-equalizing flap, which is controlled through levers and cables by the pilot. The plane so equipped was found to be very responsive in overcoming wind puffs when flying under ad-



Monoplane Wing with Extended Tip and Hinged Control Flap, That Makes the Plane Very Responsive and Easy to Operate

verse conditions, and showed a reduction in the power necessary for the pilot to operate the control stick.



New Stone Crusher of the Gyrotory Type, in Which the Crushing Mantle does Not Revolve: It Features an Unobstructed Feed Opening, Simplicity of Construction, Low Weight, and Shortness

STONE CRUSHER IS OF SIMPLE DESIGN

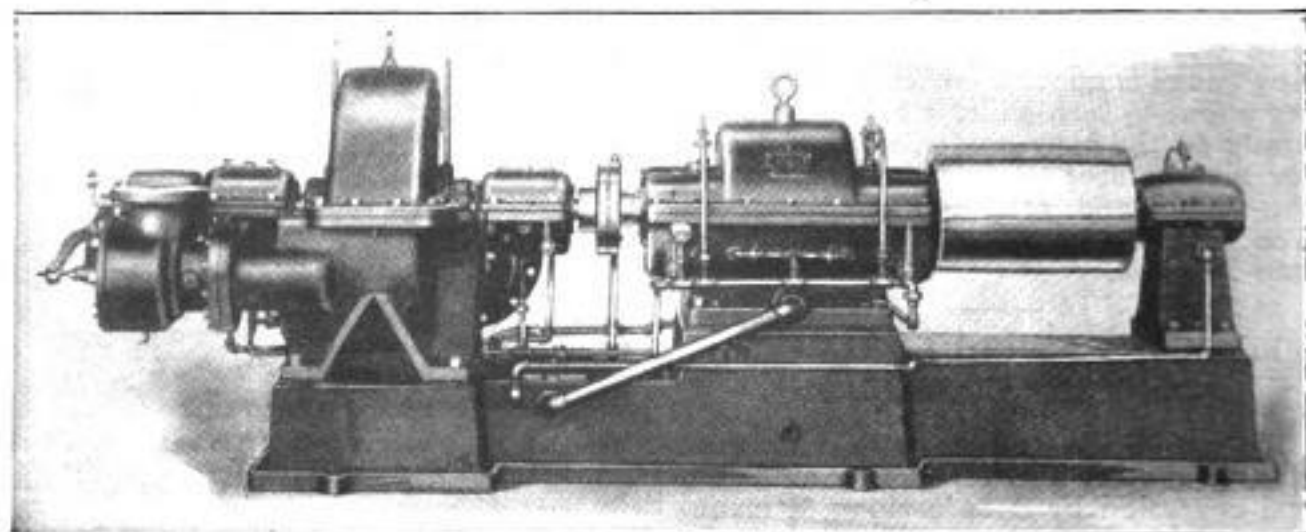
A new stone crusher of the gyrotory type is of unusually simple construction. The crushing cone is suspended from the top of a stationary central pillar, and is given its gyrating motion by means of a series of balls running in the outer and eccentric race of a large horizontal gear wheel, which is driven by a pinion on a short pulley shaft. Among the interesting features of the design is the unobstructed feed opening, which increases the capacity and reduces the tendency of the rock to bridge at the mouth of the crusher. It is adjustable to crush various sizes of stone.

SMALL EXTRACTION-TURBINE UNIT NOW AVAILABLE

High-pressure turbines of the extraction type, which permits the bleeding from any stage of reduced-pressure steam for heating or process purposes, are now being made in small units. They are designed for hand or automatic control of the amount of steam extracted, and are simple to operate. Turbine, reduction gears, and pulley are compactly

mounted on a common base, and the turbine and gear cases are horizontally split for convenience in making adjustments or repairs to the working parts. Heretofore the advantages of the extraction type of turbine have been limited to the users of comparatively large-sized units.

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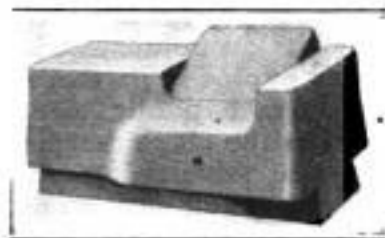
Extraction or Bleeder Type of Steam Turbine, Which Forms a Compact Unit with the Reduction Gears and Pulley: It is Rated at 200 Horsepower, and Drives the 20-Inch Belt Pulley at 850 Revolutions per Minute. The Width and Height Are Each 3 Feet 6 Inches, and Length 10 Feet

EIGHT HOURS FIVE MINUTES NEW GLIDING RECORD

All duration records for gliding were recently broken by a French pilot who made a sustained flight of 8 hours 5 minutes. An altitude of 600 feet above the crest of a hill was reached. Sailing low at the approach of darkness, he called to his comrades to light signal fires, and kept going until a fine rain made further flight inadvisable.

TILTING HAMMER DIE IS SELF-ADJUSTABLE

A tilting hammer die has just been developed which is specially applicable for forging tapered work, such as chisels,



calking tools, and railroad spikes. One end of the die is provided with a tilting face which is free to move

on a fixed axle. By shifting the angle of the work and striking a light blow, the operator adjusts this tilting face to the required angular position relative to the top die of the hammer, and any taper can be produced.

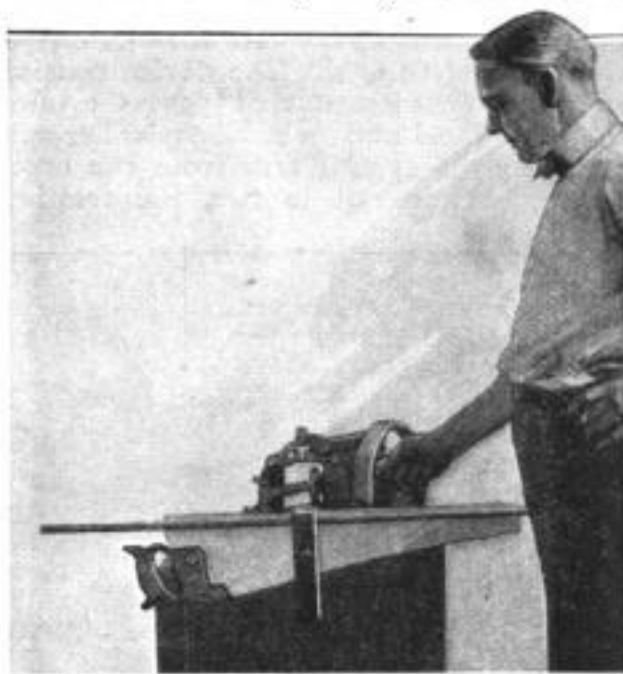
AUTOMATIC PLUMB-LINE BOB SAVES TIME



To save surveyors and engineers the time and trouble of waiting for the plumb line and weight on their tripods to become stationary, a self-adjusting plumb-line bob has been designed. It is adjustable to any height by a self-contained mechanism. The strong cord winds up or down automatically, and by a slight turning of the cap, it can be held or released for retaining or adjusting the measurement. For convenience, when the bob is not in use, the line can be wound up and the bob held in place under the instrument.

AUTOMATIC MACHINE FILES SAWS IN FIVE MINUTES

Speed and accuracy are claimed for an automatic saw-filing machine which operates as well on hand, meat, and band saws.



Operating a New Automatic Filing Machine: The Clamp at the Front Holds the Saw, and a "Sash" Holds and Automatically Operates the File. Band Saws and Meat Saws are Filed Also

The saw is held in a clamp, while a frame or "sash" holds the file during the forward or cutting stroke. It is then lifted for the backstroke and advanced automatically. The machine operates by hand or power and will file a handsaw in five minutes.

BURROWING BLADE DESIGNED FOR CLEANING SEWERS

A spiral-shaped blade designed to burrow its way through obstructions has been made for cleaning sewers. The blade rotates on a small metal rod which in turn is fastened to the regular rod

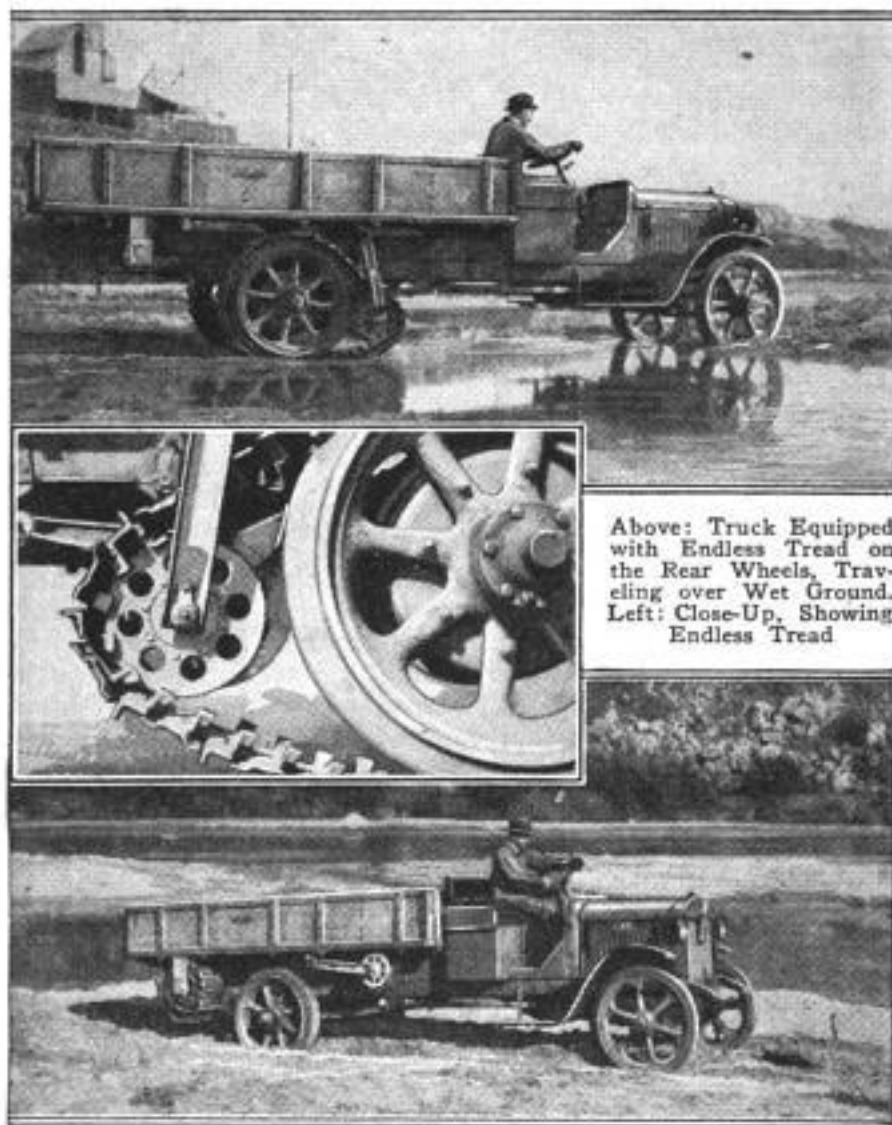


Types of the Spiral-Shaped Blades Designed for Cleaning Sewers: Note, Also, Sections of the Piping with Which the Devices are Pushed

lengths and pushed forward as the cleaning progresses. If required, the device may also be pulled backward.

DEVICE PROVIDES TRACK FOR TRUCK WHEELS

A modified form of track layer that can be attached to the wheel of any type of motor truck when approaching soft ground, and is readily detached when not needed, is among the late innovations in the automotive field. The device consists of an endless tread that passes around the rear wheel and an auxiliary roller suspended by a special arm from the truck frame. When not in use, the tread is



Above: Truck Equipped with Endless Tread on the Rear Wheels, Traveling over Wet Ground. Left: Close-Up, Showing Endless Tread

Illustrating How the Track-Laying Device Appears When Not in Use: It can be Quickly Brought into Service to Help a Truck Out of a Rut or Mud Hole, in an Emergency

coiled up on a spool hung under the rear platform.

NEW CENTRIFUGAL-PUMP IDEA SEPARATES AIR AND WATER

In a new centrifugal pump, designed primarily for marine use where the rolling of the ship causes considerable air to be mixed with water, the air and water are

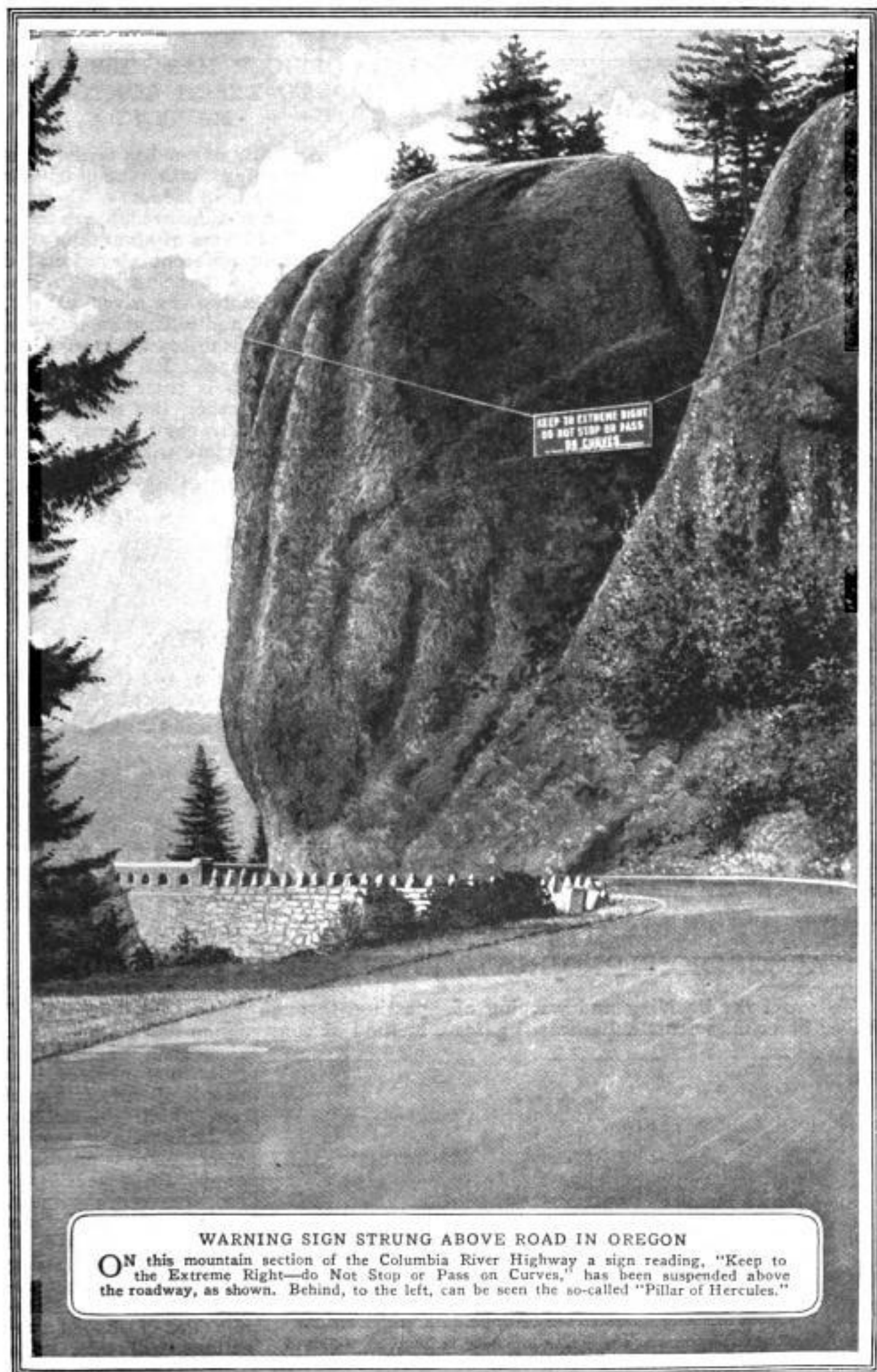
separated and each handled by suitable pumps. Just before the mixture reaches the pump inlet, it passes over a weir, where most of the air is automatically liberated and is removed by a small reciprocating pump, while the centrifugal pump deals with the water.

AIR-FRICTION BOMB PROVES TO BE A "DUD"

The dropping of air-friction bombs from air craft, for advertising, or other aerial-demonstration purposes, bids fair to come under legal ban, due to a near-accident which occurred in Los Angeles, Jan. 19, this year.

An airman was flying over the city dropping air-friction bombs, which were exploded in the air to attract public attention to the plane carrying certain advertising displayed upon its wings. One bomb, however, proved to be a "dud." It crashed down upon the athletic field of the southern branch of the University of California, burying itself in the ground right in the midst of a squad of students rehearsing for a football game, but fortunately without hitting anyone. One student, an ex-soldier who had seen service in France, promptly dug the dud out of the ground, and hurled it aside. The bomb was scarcely eliminated from the midst of the players when it exploded with a detonation that shattered the windows of the gymnasium near which it was tossed. No one was hurt, but the incident points to the

menace of such demonstrations being carried out over cities or other inhabited territory. As long as duds occur in the use of aerial explosives, which will probably be always, such dropping of aerial bombs cannot be carried out without danger to people on the ground. The city council has therefore been called upon to amend the existing ordinances to forbid such aerial demonstrations over the city.



WARNING SIGN STRUNG ABOVE ROAD IN OREGON

ON this mountain section of the Columbia River Highway a sign reading, "Keep to the Extreme Right—do Not Stop or Pass on Curves," has been suspended above the roadway, as shown. Behind, to the left, can be seen the so-called "Pillar of Hercules."



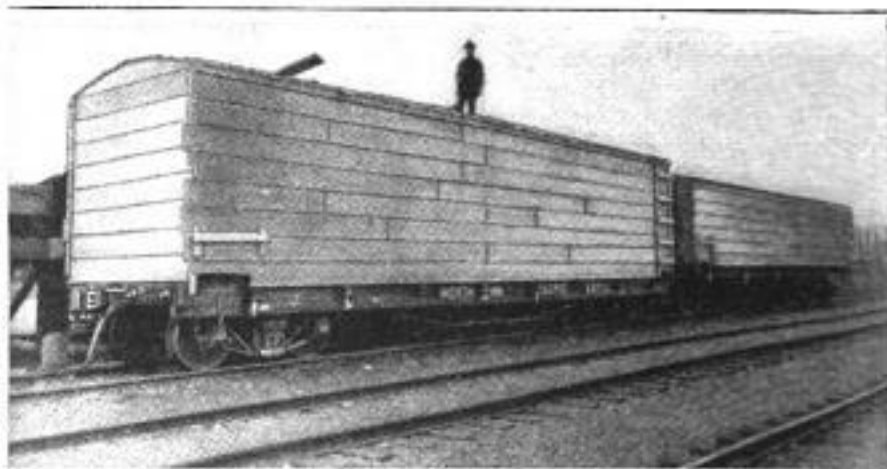
The Lines Like Knurls in a Knot Are in Reality Layers of Aluminum Used in a Military Contour Map

OFFICER HAS NEW PLAN TO TEACH CONTOUR MAPPING

An army officer has a new plan for teaching contour-map making to high-school students. The first step is a sectional relief map composed of layers of aluminum representing different elevations of the terrain to be mapped. The student notes the river valleys, lowlands, and hills, then makes a tracing of the lowest layer on a sheet of paper. Each layer from the bottom is traced in succession, and when the student finishes, he has a contour map which he can compare with the original relief.

FLAT CARS MADE INTO BOX CARS

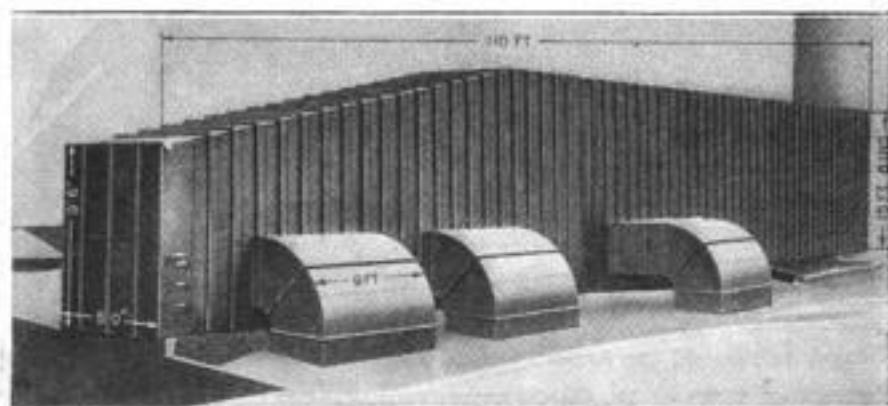
Rather than wait indefinitely for the regular box cars, a lumber dealer in the Northwest ordered some available flat cars, and with these as a foundation built his own box cars. The improvised top sections were patterned closely after the tops of the ordinary box car. Closed cars are needed in the lumber business for shipping kiln-dried wood.



Homemade Box Cars Converted from Flats in an Emergency by a Lumber Dealer, Who Built On the Tops: The Usual Doors and Fixtures Are Absent, as Well as the Lettering

"ACCORDION" PROJECTIONS ON BOILER BREECHING

To avoid the buckling and warping of boiler breechings from superheated gases passing through them, the "accordion" method of construction has been devised.



The Accordionlike Appearance of a Boiler Breeching is Given by V-Shaped Projections, Pressed into the Soft Open-Hearth Steel from Which the Breeching is Built, to Provide for Expansion

It consists of V-shaped projections pressed into the soft open-hearth steel from which the breeching is built. In smaller power plants engineers are able to prevent buckling by reinforcement, but in the larger plants the great volume of superheated gases passing through make such measures ineffective. Naturally the V-shaped projections will take up a great expansion.



Concrete Curbs and Gutters

BY JAMES TATE

BUILDING a fine cement driveway or wide walk, without providing gutters, means the eventual formation of irregular and disfiguring natural gutters, with the attendant possibility that the driveway will be undermined. Where the driveway is below grade, a curb is especially necessary, and, besides acting as a retaining wall for the higher grade, prevents vehicles from being driven accidentally over the edges of fine lawns.

The simple curbs shown in Figs. 1 and 2 serve excellently for edging gravel walks and drives, where gutters are either

not thought necessary, or already provided. The method of making the forms for these curbs is quite clear from the drawings; 1 by 8-in. boards are used for the sides, 1 by 2-in. stuff for the cleats, and 2 by 2-in. for the stakes. When placing the concrete in the forms, the trowel or spade should be well worked up and down between concrete and form; this allows the moisture to run to the form, and is a great help in obtaining a smooth finish.

The curbs should not be made all in one piece, but the forms should be di-

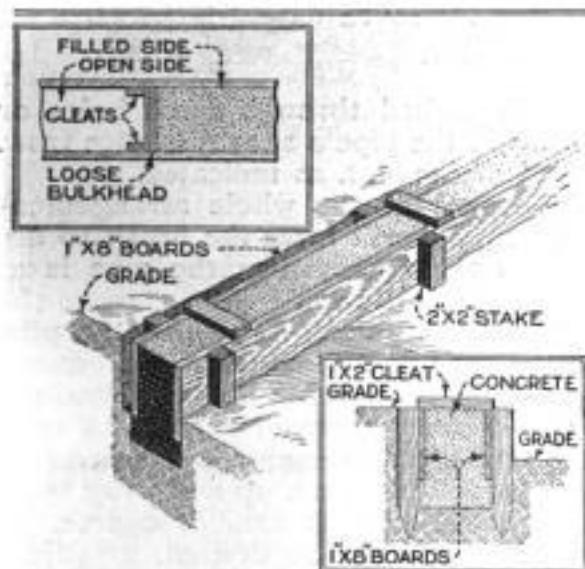


Fig. 1

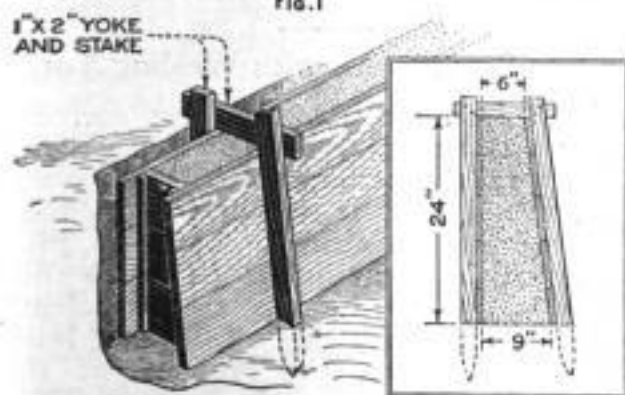


Fig. 2

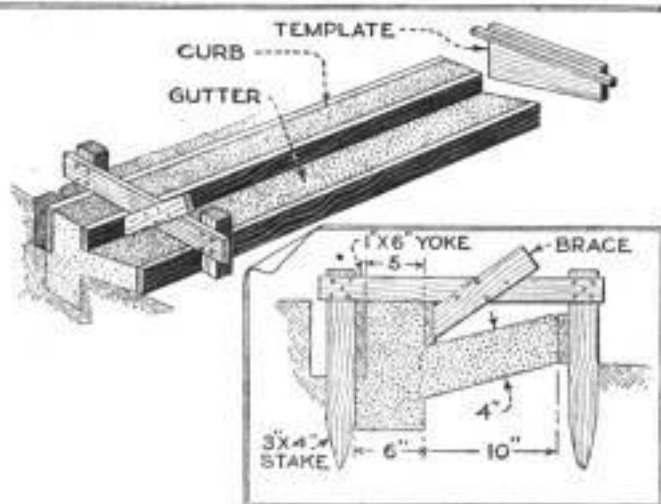


Fig. 3

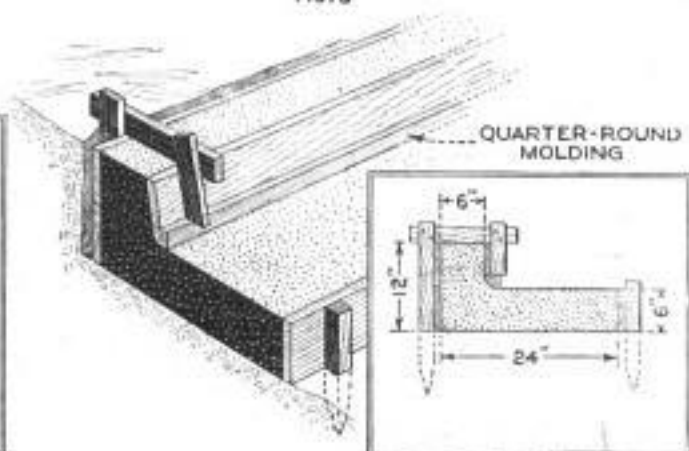


Fig. 4

Figures 1 and 2: Simple Forms for Making Curbs without Gutters. Figure 3: Curb with Sloping Gutter Cast Integral with It. Figure 4: Another Form of Combined Curb and Gutter

vided into sections, each 7 or 8 ft. long, by means of loose bulkheads, as shown in the detail, Fig. 1. The concrete is placed in alternate sections, then, when it has just begun to set, the bulkheads are removed, and the remaining sections filled—first filling the joints between the sections with three thicknesses of tar paper, to allow for expansion.

The concrete used in all the work illustrated should be mixed in the proportion of 1 part Portland cement to 2 parts of sand and 4 parts of clean gravel or broken stone, mixed to a "mushy" consistency.

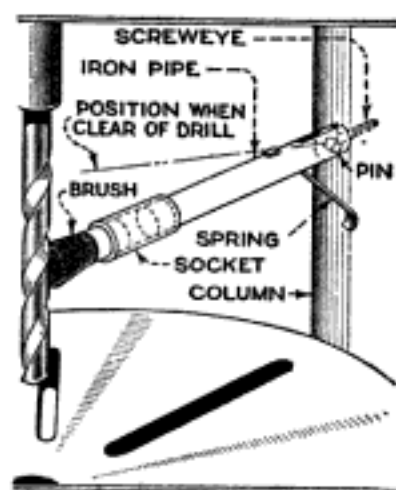
When building a new driveway or walk, the curbs and gutters shown in Figs. 3 and 4 should be used.

When making the form shown in Fig. 3, the facing board—that is, the board forming the face of the curb proper—should be beveled at the bottom to conform to the slope of the gutter, and should be braced securely, as shown, every 3 ft. A template, made as indicated, will aid in forming the gutter, after which it should be finished by troweling. The foundation should be carried below the driveway grade, to prevent undermining.

Cleaning Drill Flutes

When drilling deep holes in metal, considerable trouble is encountered in keeping the flutes free from chips. The small hand brush usually used for this purpose is unsatisfactory, owing to the difficulty of holding it rigidly against the drill when the latter is revolving. To overcome this, the rigid brush holder shown in the illustration has been found satisfactory.

The handle of a stiff, round bristle brush is sawed off, leaving only the portion that holds the bristles. This portion is screwed into a pipe socket, and a short length of pipe is screwed into the other end of the socket. The pipe is slotted at the opposite end, to fit over a screw-eye in the drill-press column; a pin passing through both holds them together. To complete the job, a flat or round-wire



The curb and gutter shown in Fig. 4 may be built with a sloping face, as shown in perspective, or with a straight face, as in the detail. The advantage of the sloping face is that automobiles may be stopped quite close to the curb without danger to tires or rims. Even in the straight form, however, the faces of the form should be given a "batter," or taper of about $\frac{1}{2}$ in. to enable the form to be removed easily. The outer corners, in all curbs, should be rounded, as a sharp edge is easily chipped, and may soon become unsightly.

Any rough or porous places in the work may be filled, when the forms are removed, with a mixture of 1 part cement and 1 part sand. The exposed surfaces should be finished with a wood float and a wide brush.

The forms should remain in place at least 24 hours—longer if possible—and, as soon as the concrete has set hard enough not to become pitted under sprinkling, it should be sprinkled, at frequent intervals, for at least two days. The more frequent and prolonged the sprinkling, the better; some authorities favor keeping the concrete wet for seven days.

spring is pushed through small holes or slots cut in the pipe a short distance from the end of the slot, as indicated.

The length of the whole arrangement is such that it will force the brush to dig well into the flutes when the pipe is at right angles to the drill. When using, the operator presses lightly down on the pipe each time the drill is withdrawn from the hole. This forces the bristles into the flutes and clears them of chips. As soon as the pressure on the pipe is released, the spring forces the brush up and away from the drill. The brush can, of course, be screwed in and out as desired, to adjust for wear and for various sizes of drills.

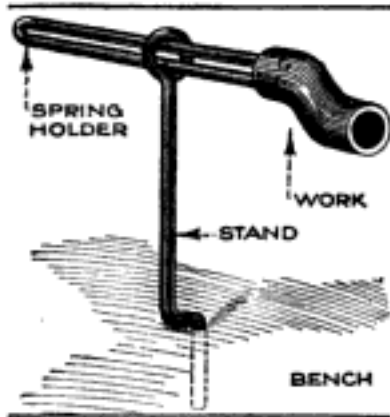
Cutting Small Work with Welding Torch

Small iron work can be cut conveniently with an oxyacetylene welding torch when a regular cutting torch is not available, or when it is not desired to take time to make the change. To do so, play the flame along the line to be cut so that the metal is heated almost to the melting point; then, by shutting off the acetylene, slightly increasing the pressure of the oxygen, and going over the line again, the metal will be cut as nicely as it can be done with a regular torch.—Ralph M. Rausch, Milan, Mich.

Holding Castings While Painting Them

The illustration shows an easily made device for holding small hollow castings while painting them. This work is always found more or less "messy" in a shop not equipped for it, and the holder was devised to eliminate the necessity of handling the castings either during or after painting.

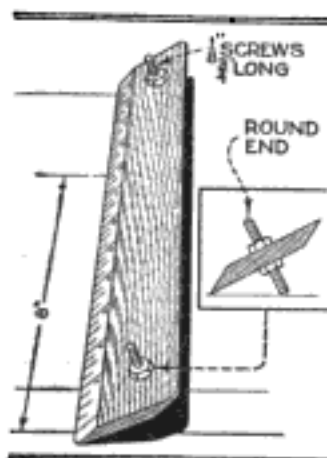
Ordinary round-steel rod is used for the two parts of the holder, which are bent as indicated. The stand fits into a hole in the bench. The other part, the spring holder, fits loosely in the eye formed at the top of the stand. Although the work shown in this particular



example is an offset bend, it is obvious that the same device can be used for any shape of casting, provided there is a hole in it somewhere. In operation, the casting is slipped over the ends of the spring holder where it is securely held while being painted. The job can be turned around in any direction desired, and can be dropped into a box when finished by pressing the two branches of the holder together. Thus, at no time need the workman actually touch the work.—Harry Moore, Montreal, Can.

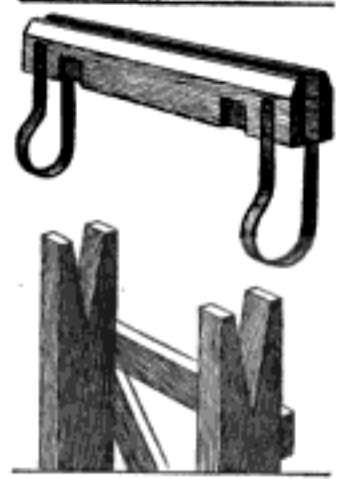
Improvement for Draftsman's Scale

By equipping his scale with a screw on each end, as shown, the draftsman will find that he can manipulate it much more easily, and that it brings the graduations closer to the line being scaled. Drill a hole in each end of the rule and insert the screws, tightening them in place with nuts on each side, as indicated. The heads of the screws are cut off and both ends rounded.—C. Bryan, Chicago, Ill.



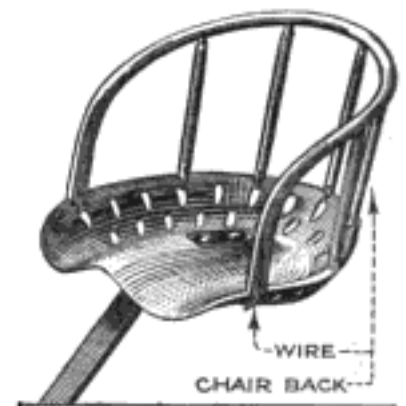
Saw-Filing Clamp and Vise

Using the ordinary wooden clamp to hold a saw while sharpening the teeth, one usually finds it difficult to keep the bars parallel while placing the clamp in the vise or filing stand. This objectionable feature is overcome by using a saw-filing clamp and vise of the type shown in the illustration. The bars are held parallel to each other at all times by means of $\frac{1}{16}$ -in. flat iron strips, bent to the shape indicated. Two beveled grooves are cut on each bar, to fit snugly into the vise, which consists simply of two 2 by 4-in. pieces, with the ends cut as shown, and securely braced.—F. M. Arthur, Bethune, South Carolina.



Making a Tractor Seat Comfortable

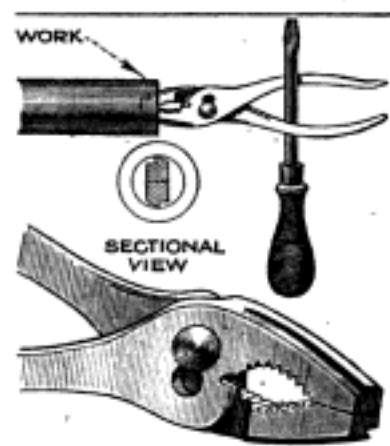
An excellent method of preventing "that tired feeling" with which the tractor operator is so familiar, is to equip the seat with a back taken from a discarded kitchen chair. A small hole is drilled through the lower end of each stile, and soft wire is used to fasten it to the seat. To prevent the back from working out of place, the lower end of each stile should be cut to fit against the curved rim of the seat. Care should be taken not to have the back too straight.—Dale R. Van Horn, Walton, Neb.



Ⓜ A new tube should be used in a new casing; an old tube is much more likely to give way than a new one, and when it does, the tire is usually run flat for some distance before the fact is discovered, which so reduces the life of the tire that a new tube is a paying investment.

Pliers Used as Reamer

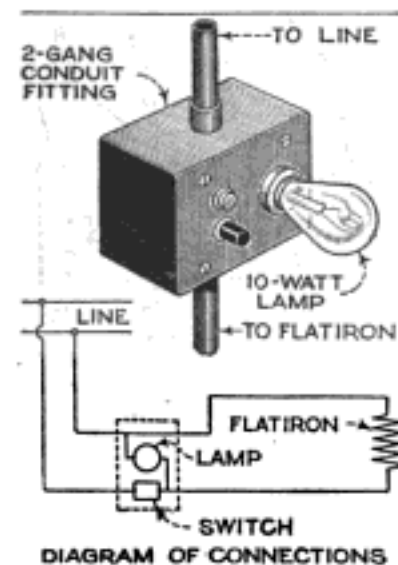
Cutting edges formed on the nose of a pair of pliers are particularly useful



to electricians and to pipe fitters, for the purpose of trimming off the burr from the inside edges of conduit and pipe. This is done, in conduit to avoid abrading the insulation of the conductors while pulling them through, and, in the case of pipe, to prevent material from catching on the burrs, and choking the pipe. The nose of the pliers is ground as shown in the illustration. For light burrs, the pliers can be turned by hand; for heavier cutting, more leverage can be obtained by using a screwdriver, placed between the plier handles as indicated.

Lamp Shows When Current Is On

In laundries and elsewhere where electric irons and similar appliances are used, there is more or less danger of fire due to



an overheated iron, as it is not always possible to tell whether or not the current is turned on or off, unless an indicating switch or lamp for each iron is used. Of these, the lamp is preferable, as it can be seen from a distance. A simple arrangement, used in a large laundry, consists of a 10-watt incandescent lamp, preferably of the carbon-filament type, shunted around the switch in parallel with the flatiron so that both are operated by the same switch. In a conduit installation, a two-gang body, fitted with a single-pole flush switch and a flush

screw socket, as illustrated, presents a very neat appearance. The wiring diagram shows the method of connecting. If desired, the lamp can be protected from being accidentally broken by inclosing it in a perforated sheet-iron cylinder, fastened to the front plate by means of small angle irons.

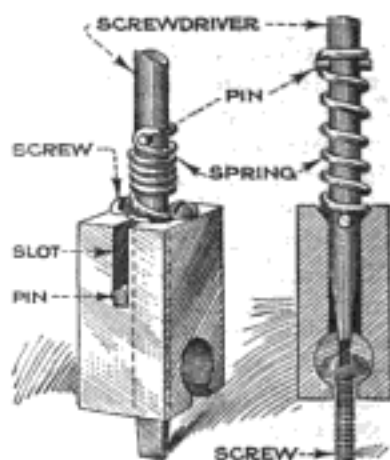
Placing Screws in Deep Slots

In the final assembly of a machine used in the printing trade, it was necessary to screw a number of round-head screws into the bottom of slots where the hand could not reach. To do the job, the special screwdriver illustrated was used. A loose sleeve, of square stock, was drilled lengthwise to fit the shank of the screwdriver. At right angles to this hole, near the bottom of the sleeve, a hole large enough to fit the heads of the screws was drilled, and a slot, breaking into the hole, cut across the bottom of the sleeve. A slot is also milled halfway down the sleeve, running into the lengthwise hole, as indicated.

A pin, driven into the shank, fits in this slot, and keeps the blade of the screwdriver in line with the slot in the bottom of the sleeve.

A slight countersink is cut in the lengthwise hole, at the top, to accommodate the bottom coil of the tension spring shown; this coil is held down in the countersink by two small round-head screws, and the other end of the spring is looped around a pin driven through the shank.

Normally, the blade of the screwdriver projects as shown at the left; when it is necessary to place a screw in a slot, the sleeve is pulled down and a screw slipped into it, as at the right, the tension of the spring holding it tightly. When the screw has been started in its hole, a slight side pressure slips the sleeve off, and the screw is then driven home as with any ordinary screwdriver.



Use the smallest milling cutter possible—the cost is lower and less power is needed.



DESIGNING SOLENOIDS

By Curtis Ralston



[This article was written in response to a number of requests from our readers. The author has endeavored to present the subject in as simple and understandable a manner as possible, and we hope that the article will prove of value to the large number of readers interested in the subject.—Editor.]

ONE of the simplest of electromagnetic devices is the solenoid. Almost every experimenter in electricity has occasion, early in his experience, to build some kind of solenoid or electromagnet, and, while it is no trick to make "some kind of a coil," there is considerable science involved in getting just the right coil for a particular purpose.

By a solenoid, or "plunger magnet," we mean a coil of wire, nearly always used with a plunger of iron which moves lengthwise inside the coil. The difference between a solenoid and a common or "lever" electro-magnet is that in the electro-magnet the moving part of the iron circuit is somewhere outside of the coil, as shown in Figs. 1 and 2, while the solenoid has the moving part inside the winding, as in Fig. 3. The solenoid may have an almost complete iron magnetic circuit, as in the "ironclad" type shown in Fig. 4, but as long as the air gap is inside the coil, and the core itself is movable, it is, properly speaking, a solenoid.

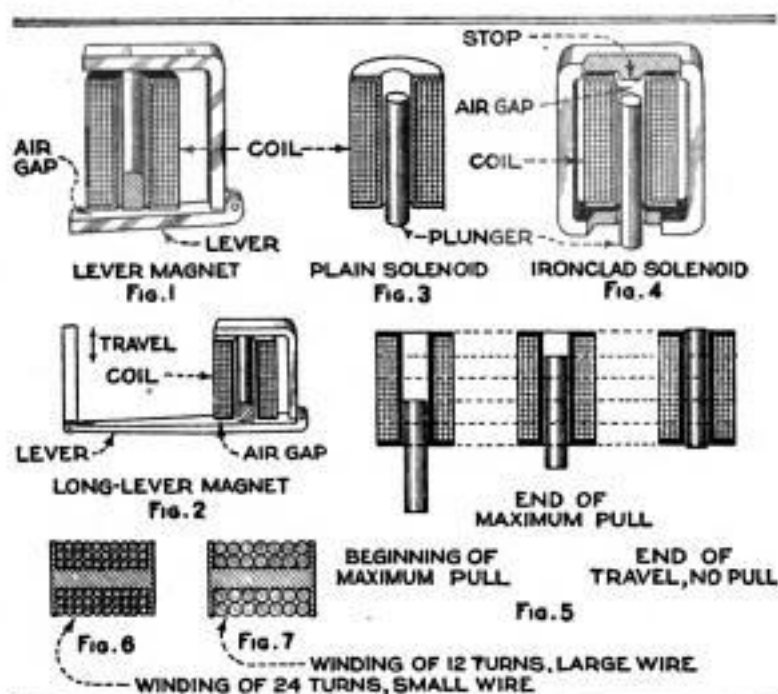
The first thing to know about solenoids is when they should be used, rather than lever magnets. This depends chiefly on the distance it is necessary to move the part actuated by the plunger. If only a small movement is necessary, as in a relay or electric bell, the lever magnet is better, but whenever more than a small

fraction of an inch of movement is necessary, the solenoid becomes useful. This does not mean that more work is obtainable from the solenoid than from the lever magnet, because, with the longer travel, it is found that the number of pounds pull is lower. That is, with the solenoid the same effect is obtained as if a lever magnet with a long lever, like Fig. 2, were used—only the awkwardness of the long lever is avoided.

Before the solenoid is designed, then, it is necessary to know two things: how far the plunger must be pulled (in inches), and how hard it must be pulled (in pounds). Knowing these things, the proper coil for the work can be designed.

The question of distance is much the simpler of the two, and may be answered by this rule: Any "plain" sole-

noid (one having no iron in its construction but the straight plunger) will exert its greatest pull on the plunger as soon as the latter has entered to a distance of two-fifths of the length of the coil, as shown at the left in Fig. 5. It will keep on pulling, just as hard, until the plunger has entered a distance of about four-fifths, as in the center, Fig. 5. By this time the plunger is beginning to reach its "goal," and its pull gradually weakens, until it is all the way in, as at the right, when it ceases to pull at all. So that, in



Figures 1 and 2: Common Types of Lever Magnets. Figure 3 Shows a Plain, and Figure 4, an Ironclad Solenoid. Figure 5 Illustrates the Action of the Solenoid on the Plunger, and Figures 6 and 7, the Relation between Coils of the Same Size, but of Different Windings

general, a coil should be made about twice as long as the distance the plunger is to be pulled. The plunger should be at least as long as the coil, but making it any longer will not give any more pull.

Taking up, next, the question of how to get the necessary amount of pull, we shall consider for the present only the plain solenoid; the possibilities of the ironclad type will be explained later. Just as the travel of the plunger is governed entirely by the length of the coil, so the pull is governed by the cross-sectional area of the iron plunger, and by the ampere-turns supplied per inch of coil length.

So far as the size of the plunger is concerned, it may be readily understood that the pull varies directly as the area of its cross section. If the diameter of the plunger could be doubled, without changing the coil, four times the pull would be obtained; this cannot be done, of course, as any increase in the size of the plunger increases the length of wire necessary to go around it. But care can be taken to use a plunger big enough to fill the hole through the coil, leaving just enough clearance for a "sliding fit"; if this is not done, current is wasted.

It can be said, then, that there is a certain pull for each square inch of area in the iron; the intensity of this pull, or the number of pounds per square inch of force exerted, is governed entirely by the "ampere-turns per inch." Providing the right ampere-turns per inch by the cheapest winding that is safe, is the main problem in solenoid design. To determine it accurately by ordinary calculations involves a good deal of "cut-and-try" figuring, but by making a few assumptions which simplify the conditions, it is possible to bring the design of solenoids down to a fairly simple basis.

It will be noted, in the above introduction, that nothing has been said about voltage, current, or resistance. The reason for this is something the reader should get firmly fixed in his mind: The strength of any magnet coil does not depend on the voltage or the current applied, except so far as these change the ampere-turns per inch. Solenoids can be wound with any size of wire, to operate on any desired voltage. Let us consider, in order to make these relations clear, two coils of exactly the same size, but wound with different sizes of wire, Figs. 6 and 7. Fig. 6, having a certain size of wire, can stand a certain voltage applied to it without becoming hot enough to endanger the insulation. Fig.

7 is wound with wire just twice as large in cross-sectional area; it thus has half the length of wire of the first coil, and one-fourth the resistance. But it will carry twice as many amperes, so that the proper voltage to apply to it for the same heating effect, is one-half the voltage required for the first coil. The power in watts, being the product of volts and amperes, will be the same in each case. The second coil will have half as many turns of wire as the first, so that the ampere-turns will be the same for both. It may be seen from this comparison that any two coils of the same size, but wound with different sizes of wire, will use the same power and give the same ampere-turns, provided they carry the same amount of current per square inch of cross section of wire. That is to say, when we know how high a "current density" (or amperes per square inch) we can use, we can tell how many ampere-turns a given size of coil will require—and without as yet considering the actual volts, amperes, or size of wire to be used.

Current densities in the field windings of large dynamos seldom run over 1,000 amperes per square inch, but since the small coils we are dealing with here have relatively a great deal more radiating surface, we can safely run up to 2,000 and even 3,000 amperes per square inch for very small coils. The figures given in the table for the various coil diameters are computed by allowing about .6 watt for each square inch of cylindrical surface on the coil.

Knowing the current density, and having assumed, for simplicity, that a winding depth equal to the plunger diameter will provide a high enough flux density for the purpose, one can proceed to calculate the magnetizing force in ampere-turns per inch, and, from this, the amount of pull which the solenoid will give at the current density used in it. This "solenoid pull" is the magnetic attraction between the wires of the coil and the plunger, and is the only force present in a simple solenoid like Fig. 3. However, commercial plunger magnets are usually made with an iron shell, as shown simply in Fig. 4. Here there is not only the solenoid pull, but in addition the pull developed between the two magnetic poles formed in the iron, at the stop and at the end of the plunger. This "end pull" depends on the length of the coil and the air gap, so, in order to show about how much it amounts to, we assume, in the table, that the coil is twice as long as its outside diameter, and that the air gap is

equal to the plunger diameter, as in Fig. 4. Examining the figures in the table, on the line showing the end pull, it can readily be seen that, even with this short air gap, the increase in pull by adding the iron shell, at these low flux densities, hardly pays for the additional complication, so that the "best bet" for the amateur builder is the plain solenoid.

Going on to the actual winding data, the first thing to know is the watts of

to use a larger size of wire than that indicated by calculation, but a larger quantity of wire is then required to keep the current consumption down, making a heavier, bulkier coil.

The above discussion refers, of course, particularly to direct current. Alternating current is not so satisfactory for any kind of magnet, and, particularly for the plain solenoid, it is very hard to arrive at any general winding rules. The note be-

WINDING DEPTH EQUAL TO PLUNGER DIAMETER

DESIGNING DATA	HOW FOUND	ALL LINEAR DIMENSIONS IN INCHES				
		.250	.375	.5	.750	1
PLUNGER DIAMETER = WINDING DEPTH	T (ASSUMED)	.250	.375	.5	.750	1
PLUNGER AREA	$A = .7854 T^2$	.049	.110	.196	.442	.785
OUTSIDE DIAMETER OF COIL	$D = 3 T$	.75	1.125	1.5	2.25	3.00
LENGTH OF AVERAGE TURN	$L = 6.28 T$	1.57	2.36	3.14	4.72	6.28
CURRENT DENSITY (AMPS. PER SQ. IN.)	$d = 1800 \sqrt{I}$	3,200	2,610	2,260	1,850	1,600
CURRENT DENSITY, REDUCED FOR SAFETY	d	3,000	2,400	2,000	1,600	1,400
AMPERE-TURNS PER INCH OF LENGTH	$ni = .6 T d$	450	540	600	720	840
SOLENOID PULL IN POUNDS	$P = .006 T^2 m$	.17	.46	.90	2.43	5.04
END PULL IN POUNDS (ASSUMED COIL)	$p = A \left(\frac{2.0ni}{2680V} \right)^2$	.05	.16	.36	1.16	2.81
% INCREASE DUE TO IRON SHELL	$\% = \frac{p}{P}$	29%	35%	40%	48%	56%
WATTS REQUIRED PER INCH OF LENGTH	$W = .00000256 T^2 d^2$	1.44	2.08	2.56	3.68	5.01
CIRC. MILS FOR 1-IN. COIL AT 1 VOLT	$M = 1,273,000 \frac{V}{d}$	610	1,000	1,630	2,930	4,550
WIRE REQUIRED PER IN. OF LENGTH	LB. = .21 T L	.082	.186	.33	.75	1.32

To find the circular mils required for any desired length of coil, and for a certain voltage: Multiply the length by the figure opposite M in the table, and divide by the voltage.

For 6 volts a.c., use next size larger than for 6 volts d.c.

For 110 volts a.c., use three sizes larger than for 110 volts d.c.

Winding Data and Formulas Used in the Design of Experimental Solenoids: It must be Remembered That the Table is Intended to Serve Only as a Guide, and the Figures Given in It are Intended for the "Average" Coil, Making a Certain Amount of Calculation Necessary in Each Special Case

power that will be consumed in each inch of length, at the current density used. From this we find a very useful figure which is called, in the table, "circ. mils for 1-in. coil, at 1 volt," or M. This number is really not very reliable for coils shorter than their diameter, but its importance lies in the fact that from it we can find very quickly the wire size to use in a coil of any length, for any voltage. To do this, simply multiply the number M by the length of the coil, in inches, and divide by the volts to be used, as indicated in the note. The answer is our wire size in circular mils; to find the nearest wire-gauge number, consult a table of B. & S. (or A. W. G.) wire sizes.

In selecting a wire size, remember that using too small a wire will cut down the strength of the magnet; using too large a wire, while giving greater strength, will cause more heating. However, in cases where accurate design is not as important as the possibility of using a size of wire one happens to have on hand, it is well to remember that a smaller wire can be used with less weakening effect if the wire length (or winding depth) is also decreased, though overheating must be guarded against. Similarly, it is possible

low the table gives suggested windings for the common 60-cycle alternating-current voltages, but they are to be taken only as very rough approximations. Much depends on the length, the quality of iron, and the thickness of the laminations, for in order to get a satisfactory a.-c. magnet for continuous operation, it is necessary to use a "laminated" plunger, such as one made of a bundle of fine iron wires, insulated from each other by dipping in varnish. It will also be found that the a.-c. solenoid is rather noisy.

The results obtained by the use of the table apply to coils that are to carry current steadily. If the pull is to be applied only occasionally, and especially if the solenoid is wired so as to break its own circuit as the travel is completed, then considerably higher current densities may be used, with corresponding increase of pull. If, for instance, one wants a plunger to pull 5 oz. a distance of $1\frac{1}{2}$ in., with an automatic instant break in the circuit, it is pretty safe to use a $\frac{1}{4}$ -in. plunger and to increase the current density to 6,000 amperes per square inch instead of 3,000. This should give .34 lb. of pull instead of .17, and the watts required will increase in proportion to the

square of the current density, giving 5.76 watts per inch instead of 1.44. For $1\frac{1}{2}$ in. of travel we shall need a coil about 3 in. long, so that our total power requirement will be 17.3 watts. The actual change to be made in finding the size of wire is simply that, instead of using 610 for M as in the table, we use 1,220. Multiplying this by the length (3) and dividing by 32 (if we are designing for a 32-volt farm-lighting system) gives 114 as the number of circular mils in the size of wire we shall require. The nearest wire size is No. 29, with 127 circ. mils; it would hardly do to use No. 30 (100 circ. mils), especially on account of "space-factor" considerations.

This space factor is something we have said nothing about so far; it means the proportion of the cubic inches of winding space which is actually occupied by copper, rather than by air or insulation. For simplicity, we have assumed throughout these calculations that the space factor will be about .6, though it really runs a little higher for the larger wires and down to .4 for No. 30 wire. The weights of wire given in the table are all figured for a factor of .6; the consequence is, that when one tries to wind the specified amount of wire onto the spool, it will be found, if the wire is small, that the coil diameter grows larger than the table shows. This should be allowed for in preparing the spool, and there will also be some weakening of pull if the wire is small, due to extra space occupied by insulation. But it is better to allow a

little for this than to complicate the calculations.

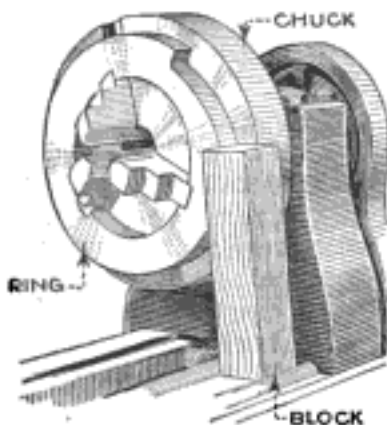
Little need be said as to the spool for winding a solenoid, except that the tube on which the wire is wound must not be of iron, steel, or "tin." Thin brass tubing or paper makes a good spool, with ends of fiber or cardboard; wooden spools will do, but are not very efficient because of their thickness. The most important thing in winding any coil is to maintain an even tension, so as to get the turns perfectly "bedded." If they are not wound evenly and closely, a weaker pull will result.

It is well to remember that smaller wire can be used instead of larger by connecting several lengths in parallel. For instance, a $\frac{1}{2}$ -in.-plunger solenoid, 4 in. long, for 2 volts, would take a large wire according to the table: 1,630 times 4 divided by 2 gives 3,260 circ. mils, or No. 15 wire. Instead of winding 4 times .33 or 1.32 lb. of No. 15 wire, two windings, each containing .66 lb. of No. 18 wire (1,624 circ. mils), can be used, connected in parallel. It makes no difference how the two windings are placed on the coil, so long as they are connected to help, and not "buck" each other.

Too great accuracy is not to be expected at any point in the design process here outlined, as a number of approximations are involved, and the thickness of the spool between coil and plunger is neglected. But the table should enable any amateur to design a solenoid to fit his needs with sufficient exactness.

A Lathe-Chuck Remover

Various clumsy makeshift methods and devices are used to remove lathe chucks from the spindle, such as pounding with



a soft hammer, or using a block of wood held beneath one of the jaws, which is brought down against the block sharply. It is obvious that any such treatment to one jaw will very quickly

throw the whole chuck out of line and weaken the jaws besides. The drawing illustrates a chuck-removing device that

has the merit of being simple and yet highly effective. It consists of a steel ring, the outer diameter of which is almost as large as the chuck body. The inside of the ring is slotted to fit over the chuck jaws, and its outside is cut away to form a tooth on the edge of the remover.

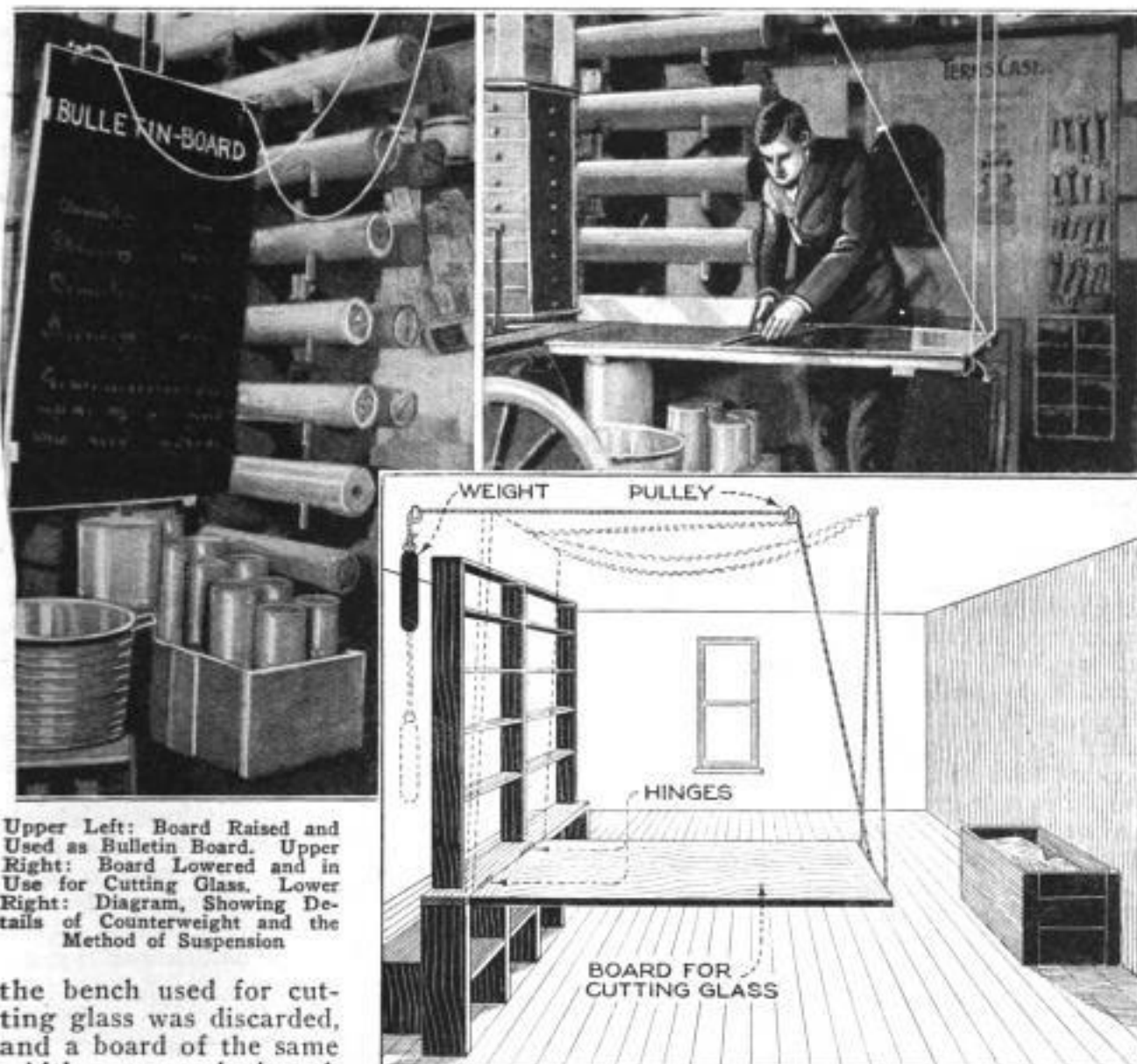
It will be seen from the drawing that the device sits back against the face of the chuck, making it a solid fixture, while the large diameter of the ring gives it a good leverage. When it is desired to remove the chuck, the ring is slipped into place, and the jaws are screwed outward tightly into the equally spaced slots. Then, with a piece of hardwood resting on the lathe bed in a slightly inclined position so that its end rests against the edge of the ring, the lathe is reversed, causing the tooth to come into contact with the wood. In this manner all three jaws of the chuck take the strain and it is not so likely to be injured.

Board Substituted for Workbench

In a hardware store where it was necessary to use all the floor space available,

Keeping Cable Clamps from Slipping

Considerable difficulty was experienced in keeping a cable from pulling out of the



Upper Left: Board Raised and Used as Bulletin Board. Upper Right: Board Lowered and in Use for Cutting Glass. Lower Right: Diagram, Showing Details of Counterweight and the Method of Suspension

the bench used for cutting glass was discarded, and a board of the same width was substituted, which, when not in use, could be raised to a vertical position, and the exposed side used as a bulletin board. One end of the board was attached to the edge of a shelf by means of hinges. The other end was counterbalanced by a sash weight, suspended as indicated. The strain of cutting, and any weight on the board, was taken by two stout ropes attached to the outer corners of the board, and to a screw-eye in the ceiling.—K. W. Williams, Rochester, N. Y.

☐ A short chalk line, held taut with both hands over a glass or metal surface in which it is impossible to drive a nail or tack, can be snapped very easily by the teeth, if a short length of string is attached to the center of the line.

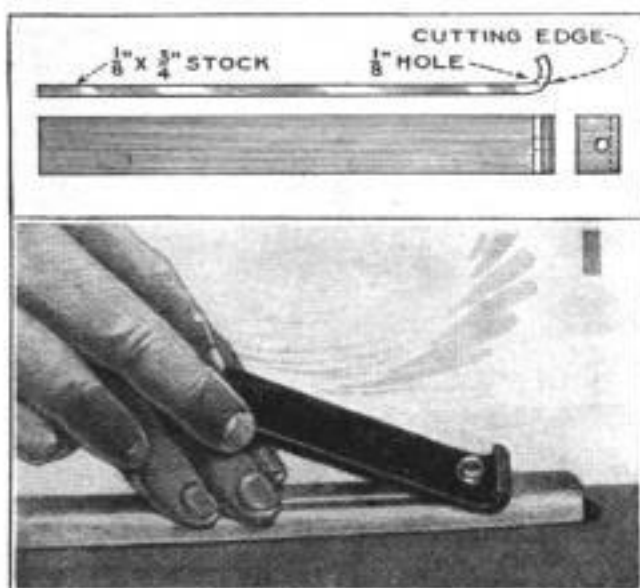
clamps that held it to a clamshell bucket, the trouble not being due to the weight of the bucket, but rather to the "yanking" it received. After several fruitless attempts, the problem was finally solved in the following way:

The end of the cable was bent around the shackle pin, and the clamps were attached as usual and screwed up as tightly as possible. A piece of tin was wrapped around the clamps, to form a mold, and the space inside was filled with melted babbitt, after one end had been closed with asbestos. A small piece of resin was dropped into the mold before pouring.

No stronger joint than this could be desired; the clamps are still immovable after six months' use.—A. S. Jamieson, Springfield, Mass.

Tool Makes Solder Shavings

It is possible to do a much neater job on small and sweated work if solder shav-



Above: Tool for Cutting Small Shavings from Solder.
Below: Tool in Use, Showing How It is Held

ings are used instead of large pieces, because the correct amount of solder necessary for a successful joint can be more readily determined. If lumps of solder are used, there is danger of getting too much solder on the work, as one lump too much makes a considerable difference, which is not the case with shavings.

The illustration shows a simple tool used to make solder shavings quickly. It is made from an old flat file, or from a short length of steel, about $\frac{1}{8}$ by $\frac{3}{4}$ in. One end is heated and bent over as indicated. A hole is drilled in this end so that its lower edge is in line with the upper face of the tool. When the tool is held at an angle, as shown in the drawing, and pushed over a stick of solder, a thin shaving is cut.

Sign for Office-Building Window Washer



The sign shown in the illustration is used in a large Chicago skyscraper to indicate the whereabouts of the window washer. The sign is hung on the outside of the corridor door of the room in which the washer is working. To locate the window washer, it is not necessary to go into every office on the floor, but merely to glance along the corridor.—E. M. Scott, Chicago, Ill.

The sign shown in the illustration is used in a large Chicago skyscraper to indicate the whereabouts of the window washer. The sign is hung on the outside of the corridor door of the room in which the washer is working. To locate

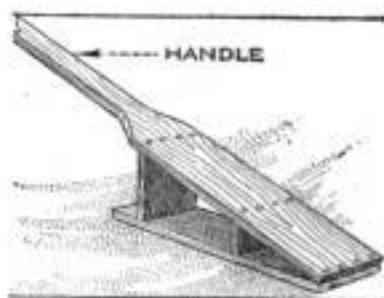
Adjusting Clutch on Light Car

When adjusting the three clutch fingers on the high-speed clutch of a light automobile, it is necessary to turn the motor over to bring the fingers to the top where they are accessible. As it is difficult, when using the crank, to determine when these points are reached, the following method will prove of considerable assistance:

Jack up one of the rear wheels and release the hand brake, thereby throwing in the clutch. The latter can now be turned over by stepping on the spokes of the wheel, until the proper position is reached.—E. T. Gunderson, Humboldt, Ia.

Leveler for Concrete

Efficient work in leveling concrete can be done with the homemade implement shown in the drawing. The workman is not

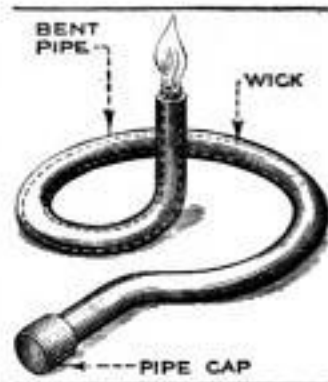


obliged to walk in the wet concrete to manipulate this tool, as is the case with the levelers usually employed; hence it is particularly desirable for the worker not having a pair of rubber boots. The tool is made from pieces of wide board nailed together as illustrated. The length of the handle is, of course, determined by the area to be leveled.

A Simple Torch

A simple torch that is very serviceable for many purposes can be made in a short time from a length of pipe, bent to the shape indicated.

The pipe is threaded on one end, and is fitted with a cap that can be unscrewed to fill the torch with fuel. A cotton wick, about half as long as the pipe, is twisted into the other end. The circular form of the torch prevents it from upsetting and allowing the oil to run out.



Novel Method of Bending Small Moldings

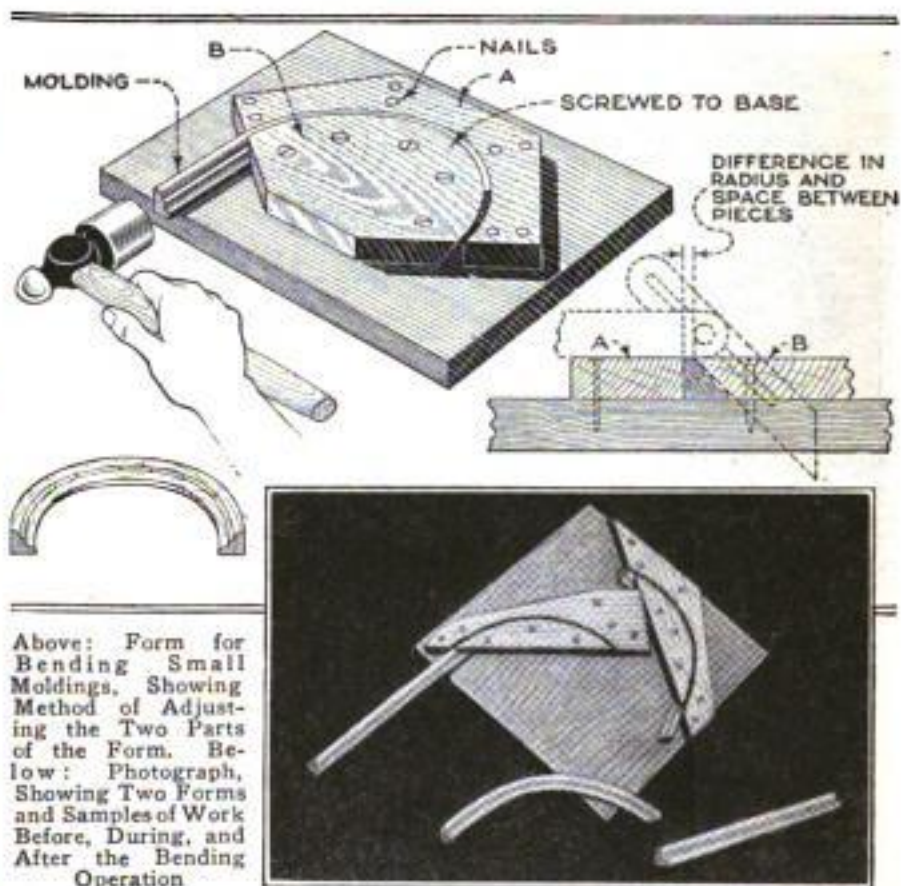
A simple, but very effective method of permanently bending small moldings to any desired curvature is illustrated in the drawing and photograph. By this method the work can be accomplished without using steam, and without kerfing or cutting the molding.

From a piece of hardwood, preferably of the same thickness as the height of the molding, the block A is cut. A curved portion is sawed out along the same radius as the desired curvature on the outside of the molding. Then, by placing a piece of the molding against this edge, and using a bevel, it can easily be determined at what radius and bevel to cut the block B, which is of the same thickness as A. The beveled edge is necessary in case of triangular molding, to prevent it from becoming twisted in the form. Both

blocks are then firmly fastened to a wooden base, care being taken to set them the proper distance apart. It is desirable to use screws in attaching the block B to the base, since the pressure of the molding will have a tendency to raise the edge. The screws, however, should not be put too close to the edge, as a slight projection will block the passage and ruin the molding.

The form now being ready for use, the molding to be bent should be soaked

thoroughly, preferably in hot water, to make it pliable. After beveling the end,



so that it will not catch, the molding is slowly forced into the form by tapping it lightly with a hammer. It will be rather difficult to drive the molding the first quarter or third of the way, but by using care and patience, a good job will be sure to result.

After the molding has dried thoroughly in the form, it can be removed by loosening the block B, and it will be found to have been distorted very little, or not at all.—Francis Wilkin, Pittsburgh, Pa.

Correcting "Second-Gear" Trouble

One of the most frequent sources of trouble experienced by owners and drivers of a certain six-cylinder car, is the stripping of the teeth on the "second gear." This trouble is always attended by the bending of the spline shaft, and although the car can be run on low and high gear, the operation is unsatisfactory.

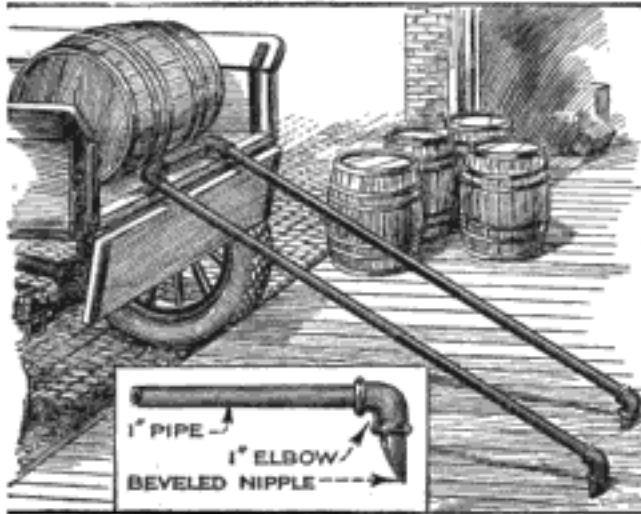
One man, after experiencing trouble of this kind several times, made an investigation to determine the cause. He found that the gear box, which in this make of car is bolted to the rear-axle housing, was

fitted with soft-metal bushings, which soon wore away when the lubricating oil ran too low. This allowed too much play in the shaft on which the second gear was mounted. As the gears are all made with the stub-form tooth, this excessive play caused one gear to crawl up on its mating gear, so that eventually the gears rode on the tooth tops, with the result that the shaft was bent and the gear stripped.

To correct this, all the bearing holes of the shaft were bushed with the best grade of bronze bushings procurable, and thereafter the gear box was kept well filled with lubricant at all times.

Substantial Loading Skid

The loading skid shown in the illustration has been specially designed for loading barrels, and is free from the objec-



A Substantial Skid, Especially Convenient for Loading or Unloading Barrels: As the Barrels Rest on Two Points, They Tend to Roll Straight

tionable features found in most types of skids. It is made of lengths of 1-in. wrought-iron pipe and four elbows, and is substantial enough to bear a weight of 350 lb. without bending permanently. One of the advantages of this type of skid is that a man can stand between the two runners to push the load up. Another advantage is that there are two bearing points for the barrels, which makes the task of guiding them much easier. The lower ends of the skid are fitted with nipples, beveled to a point; these prevent the skid from slipping or spreading. The skid is comparatively light, and can be placed in position quickly.

Aluminum Hones

Cast-aluminum hones are now being used in a western shop to take the place of the ordinary hones, as aluminum has an abrasive quality of particular usefulness for fine work. These hones are better in many ways than the ordinary hones, owing to the fact that no lather, oil, or compound is needed to make the aluminum "take hold" of the steel. The tool is merely rubbed on the bare metal in the usual manner.

Aluminum hones may be made in any shop by melting the aluminum in a bab-bitt ladle and pouring it into a plaster or sand mold with a cavity 2 in. wide, 5 in. long, and $\frac{1}{2}$ in. deep. When the metal is cold, it is polished on a grindstone, or on a grinding disk covered with medium-grade sandpaper. If desired, a hone can

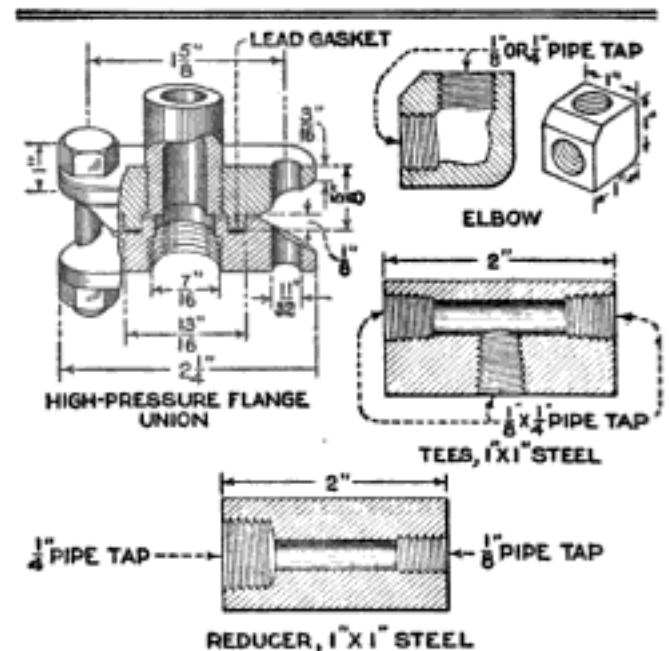
be made by cutting a square or rectangular piece out of a discarded aluminum crankcase, or other cast-aluminum article that has a flat surface. The aluminum can also be cast in the form of a common whetstone or a heavy butcher's steel, for use in sharpening kitchen knives and other tools.—David Baxter, Hutchinson, Kansas.

Small High-Pressure Fittings

The use of standard fittings is out of the question for hydraulic or ammonia work as they will burst under the pressures to which they are subjected. It is advisable, therefore, for the experimenter to make special fittings of steel, of which a few examples are shown in the illustration.

Flange unions, consisting of a male and a female flange, are made in sets and are bolted together with $\frac{5}{16}$ -in. bolts. They are tongued and grooved as indicated, a little play being allowed to facilitate assembling. In the bottom of the groove is placed a thin lead washer that will squeeze and spread tight when the bolts are drawn up. These flanges are made of 1 by $\frac{5}{8}$ -in. flat steel, drilled and tapped as required.

Elbows are readily made from a cubical piece of 1-in. stock. The inside corner is beveled, and the outer one rounded, as



Details Showing Construction of Small Fittings for Hydraulic or Ammonia Work: Owing to the Pressures Involved, Standard Pipe Fittings cannot be Used

shown. Holes are then drilled at right angles to each other, and are tapped to the size required.

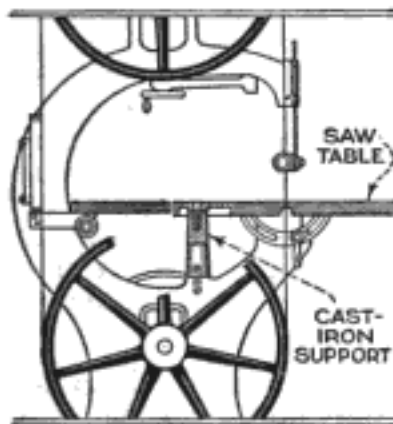
Tees are made of 1-in. square stock,

2 in. long, the through hole being drilled a little out of center, which will allow a longer thread in the short hole at right angles to it. These tees are very strong and at the same time appear neat.

Reducing sleeves are made of 1-in. round or square stock, drilled and tapped as shown. With the above four kinds of fittings, almost any pipe line for hydraulic or ammonia work can be built up.

Indicator for Bandsaw Table

When using a bandsaw on accurate work, it is very provoking to the operator to find, after he has finished his sawing and the damage has been done, that the "other fellow," who used the saw before



him, left the saw table tilted a few degrees, the result being that the work is not cut at right angles to its surface. A table that is tilted so little will not attract the attention of the workman unless

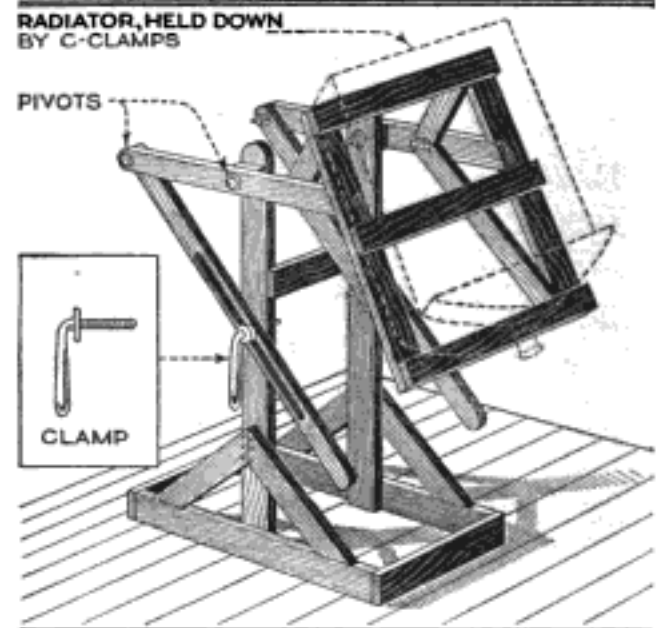
it is provided with some sort of indicator to show the angle of the table.

A simple indicator for this purpose, that never fails to keep the workman informed, is a 1/2-in. stud, fitted in the cast-iron table support and through the table, as shown in the illustration, so that its end is perfectly flush with the surface of the table when the latter is horizontal, but is below the surface when the table is tilted in the slightest degree.—M. E. Duggan, Kenosha, Wis.

Convenient Radiator-Repair Stand

The greatest loss of time in the repair of automobile radiators is not usually encountered in the application of the solder, but in moving the radiator and fastening it in the best position for work. For this purpose an adjustable stand, made of 2 by 4-in. and 1 by 3-in. lumber, is very handy. The frame that holds the radiator is pivoted to the uprights, and has two slotted braces, provided with clamp screws, so that the frame may be locked rigidly when set. The radiator is clamped to the frame by means of ordinary C-clamps, in any position desired, as

the movable frame may be set at any angle from vertical to horizontal. If the



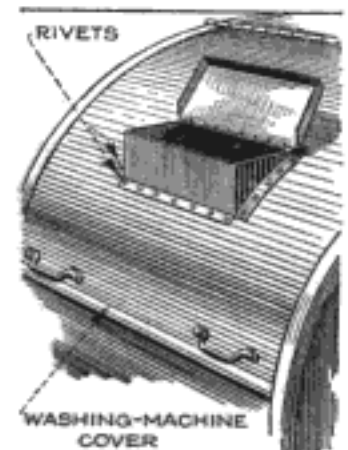
A Repair Stand Used in Soldering Radiators: It can be Adjusted to Any Angle That Is Most Convenient for the Workman

base is provided with swivel casters, the convenience of the stand may be further increased.—G. A. Luers, Washington, District of Columbia.

Attachment for Washing Machine

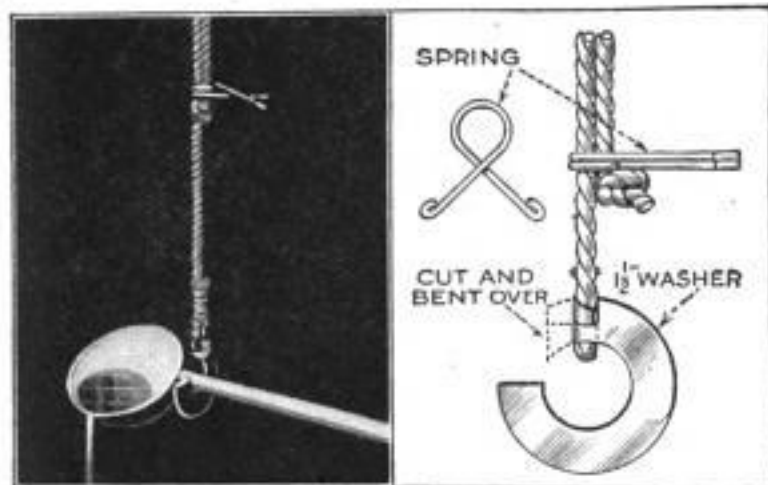
Cylindrical washing machines, in commercial or private laundries, are equipped with sheet-metal covers that must be loosened and raised each time a small quantity of water or washing compound is added, or when it is desired to look at the clothes. As the attendant is required to lift the heavy covers innumerable times during a day's work, the total energy wasted in this way is quite considerable.

To eliminate this unnecessary labor, a large laundry fitted small "doors" on the covers of the machines, as shown in the illustration. A rectangular hole was cut in the center of the cover, and a hopper-shaped box, equipped with a lid, was riveted over the hole. This arrangement permits a full view of the interior by merely lifting the lid, and allows water and washing compound to be poured through the door.



Sling Support for Pouring Babbitt

When pouring babbitt with a ladle, much of the metal is splashed around



A Sling Support for the Babbitt-Pouring Ladle Eliminates Much Waste Due to Splashing, and Also Helps the Workman to Maintain a Steady Flow

before the workman succeeds in directing it squarely into the hole. This is usually due to the fact that the ladle handle is grasped at the extreme end as a precaution against burns. By supporting the ladle with a sling, it has been

found possible to pour the babbitt without splashing, and to maintain a steady flow, with a consequent smooth finish in the work. The arrangement shown in the illustration makes a very satisfactory support.

A rope is slung over a pulley, or staple, above the babbitting bench; one end is knotted, and a hook is attached to the other to support the ladle. If a hook is not available, one can easily be made from an ordinary 1½-in. washer, by cutting away part of it, making a cut through half the width, and bending the two ears thus formed around the knotted rope, as shown. A piece of spring wire is wound into a few small coils, of such a diameter that they will grip the doubled rope securely, to keep it from sliding, and the spring is

placed on the rope. When the ends of the spring wire are pressed, the grip is released, allowing the rope to be adjusted for height. If the rope is fixed near the center of the table, any position can be reached by swinging the rope around.

Kerosene Tank for the Grocery Truck

A gasoline tank, taken from an old or wrecked car, is just the thing for carrying kerosene on a grocery truck, as shown in the illustration. A petcock is soldered at one end, preferably at the right side, as the truck usually stops at the right side of the road, and this end of the tank is therefore low. By using such a tank, the necessity of carrying



A Gasoline Tank from an Old Automobile Serves to Carry Kerosene on a Grocer's Truck, Thus Eliminating the Possibility of Spilling Groceries

several small cans in the truck, with the possibility of spoiling the groceries by

spilling kerosene on them, is eliminated. If desired, another tank can be fitted for carrying gasoline, or the one tank can be divided into two sections by means of a partition, and another petcock soldered onto the new section thus formed.

Remedies for Dusting Concrete Floors

Boiled linseed oil and a sodium-silicate (water-glass) solution are two simple remedies that can be used, at small expense and without much trouble and time, to prevent the dusting of concrete floors. The linseed oil is applied in one or two coats. It penetrates the concrete and tends to bind the loose particles together. It also prevents water or other fluids from being absorbed.

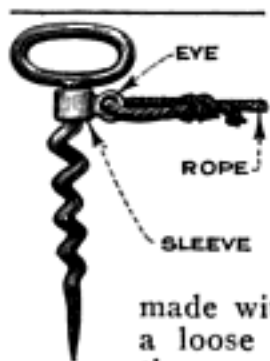
The sodium-silicate solution has been successfully used in many instances. The preparation consists of one part of 40° Baume sodium silicate mixed in 3 or 4 parts of water. The more porous the floor the less water is necessary. Before applying this mixture, the floor must be thoroughly cleaned with a scrubbing brush and clean water. As soon as the floor is dry, the solution is evenly applied over the surface with a whitewash brush. When dry, the floor is again washed with clean water and a mop, and after this,

another application of sodium silicate is given as before. A third coat is given the floor in the same manner.

It is better, however, to prevent concrete floors from dusting by laying them correctly than to apply remedies later. A dusty concrete floor is caused by too lean a mixture in making it; by using too little water in the mixture; by troweling too much over the surface, or by permitting the surface to dry out too quickly.

For the best kind of floor, use a mixture consisting of 1 part cement, 2 parts sand, 4 parts pebbles or broken stone, and enough water to make a "quaky" mixture. After laying the floor, trowel the surface just enough to smooth it. If the water stands on top, do not use either sand or cement to dry it up, but allow it to evaporate. The floor should be allowed to dry for a week; no draft should be allowed to touch it, and the temperature should be kept as constant as possible.

A Swivel Picket Pin

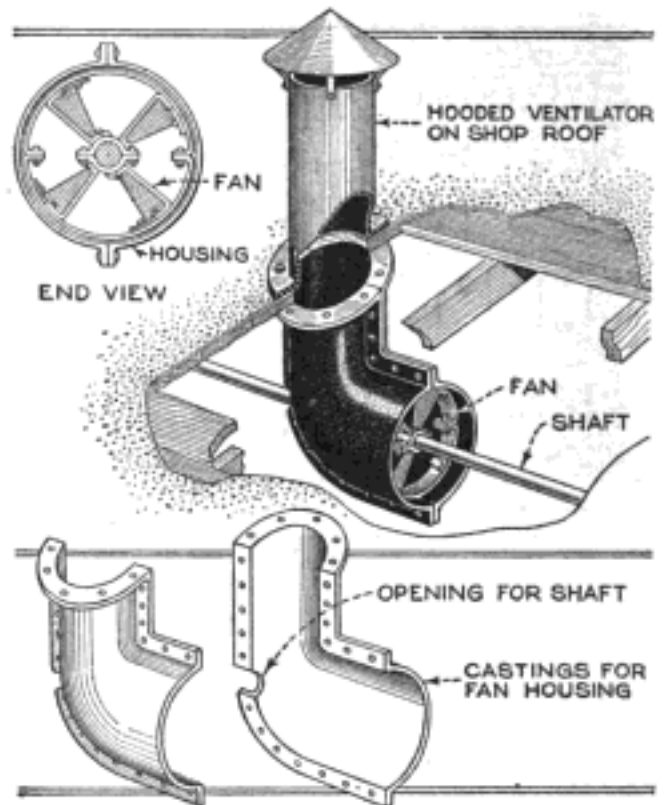


The use of a swivel picket pin, of the type illustrated, eliminates the usual trouble of having the tether wind around the pin, or having the pin jerked out of the ground. An ordinary picket pin is made with an oval-ring head, and a loose sleeve with an eye for the rope welded to it is placed around the pin just below the head; the body of the pin is then forged like an auger. This permits one to screw the pin into the ground without any difficulty, and makes the use of a hammer unnecessary.—C. M. Brown, Marion, Ia.

Shop Ventilators Driven from Line Shaft

An effective ventilation system is of vital importance in any shop, to provide healthful working conditions for the employes, which in the end means increase in production. Instead of purchasing and installing an electrically driven exhaust system, a similar system, just as dependable, can readily be made in the small shop, and run in connection with the line shaft at a very small cost. The only equipment necessary is the sheet-metal hooded ventilators on the roof, sheet-metal pipes leading down to the cast-iron housings in which the fans are located, and, of course, the fans themselves, which

are made of heavy sheet steel, and the housings. The fan casings are cast in two parts, as shown. The fans are also made in sections, and bolted together to facilitate assembling on the shaft. There are

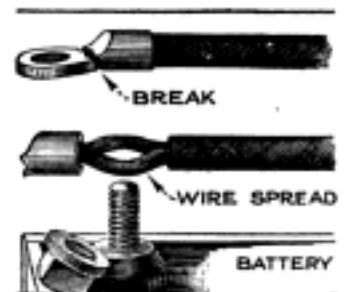


An Exhaust Ventilation System Driven by the Shaft: The Equipment Expense Is Small, and the Upkeep does Not Add to Shop Production Costs

no bearings or hangers required with this arrangement, and therefore, no particular care or attention is needed. As the system is operated on the shafting, the upkeep does not add to production costs.

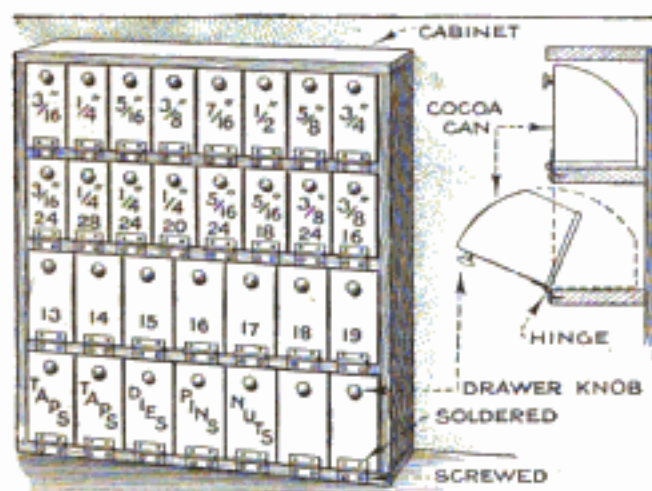
Emergency Connection on Battery Terminals

When one of the soldered connectors on a storage battery breaks at the shoulder of the terminal, an emergency repair can easily be made. The insulation of the wire is cut off for a distance of about 2 in. behind the broken terminal, as indicated. The twisted wire is then separated into two strands and forced over the battery terminal, after which the nut is tightened solidly as before. While such a connection is not as secure mechanically as it should be, it will serve satisfactorily until a permanent repair can be made.



Substitute for Drawers in Small-Parts Cabinet

Anyone who has ever attempted to make a small-parts cabinet, knows how



A Small-Parts Cabinet Made from $\frac{1}{4}$ and $\frac{1}{2}$ -Pound Cocoa Cans: It Holds Considerable Material and Looks Neat

tedious is the job of making the drawers. In order to eliminate the drawer problem, one mechanic has fitted up his small-parts cabinet with tin-can bins, which are, in a way, better than drawers.

The frame of the cabinet is made of wood, and is fitted with four shelves. Common cocoa cans, of $\frac{1}{4}$ and $\frac{1}{2}$ -lb. sizes, are cut as indicated, and small brass hinges are soldered to the lower front edges of the cans, and screwed to the shelves. Small knobs are fastened to the tops of the cans. A space of $\frac{1}{4}$ in. is left between the cans, so that, when pulled out, they will not rub against each other.

The feature of such a cabinet is the fact that one can get an article out of the cans much more quickly and easily than by digging into drawers with the fingers. While containing a large quantity of material, the cans take up very little space, as the slides that are necessary with drawers are eliminated. The cabinet as a whole presents a neat appearance, if arranged symmetrically and constructed correctly. The cans may be labeled in any manner desired.

Rounding Off Square Corners on Cement Work

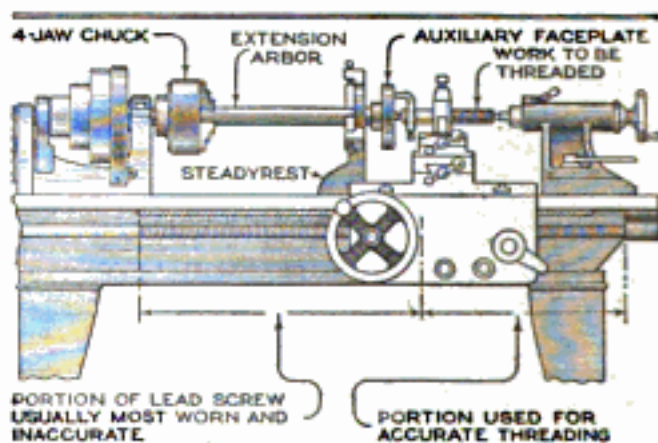
If no beading tool is at hand, a bead may be put on cement work with the hollow half of an ordinary curling iron, which may be purchased at any 5 and 10-cent store. The two halves of the curling iron are separated, and the slight shoulder on the hollow half, through which the rivet passes, is snipped or

ground off, or the iron may be bent at this point, to prevent the shoulder from scraping the cement.—Stanley Barnett, Iron Mountain, Mich.

Threading with Unused Portion of Lathe Lead Screw

Many small engine lathes are equipped with a lead screw as the only means of moving the carriage, which means that the screw is constantly used for all work and not for threading only, as would be the case with a lathe provided with a feed shaft as well as a screw. Consequently the lead screw will soon wear and become unfit for really accurate threading. Most of the wear will come upon that portion adjacent to the headstock, since the majority of the work done is on short pieces. The portion of the lead screw at the tailstock end of the bed, therefore, will usually be found to be in good condition, and when an accurately threaded piece of work, relatively short in length, is needed, it is well to make use of this part of the screw.

One method of doing this is shown in the illustration; an extension arbor is threaded on one end, and an auxiliary faceplate screwed on. This end is tapered for a 60° lathe center, or an accu-



To Cut Accurate Screws on a Lathe That Has No Feed Shaft, and on Which the Headscrew is Worn, an Auxiliary Arbor and a Faceplate are Used

rate universal chuck is screwed on in place of the faceplate. Just behind the faceplate or chuck, the end of the arbor is supported in the lathe steadyrest and the other end either in a four-jaw independent chuck, or provided with a dog with means for holding it firmly against the driving plate. In this way the headstock spindle is extended and the work threaded in the usual way, but the carriage with the threading tool will be fed along near the tailstock end of the bed, and the work will be more accurate.

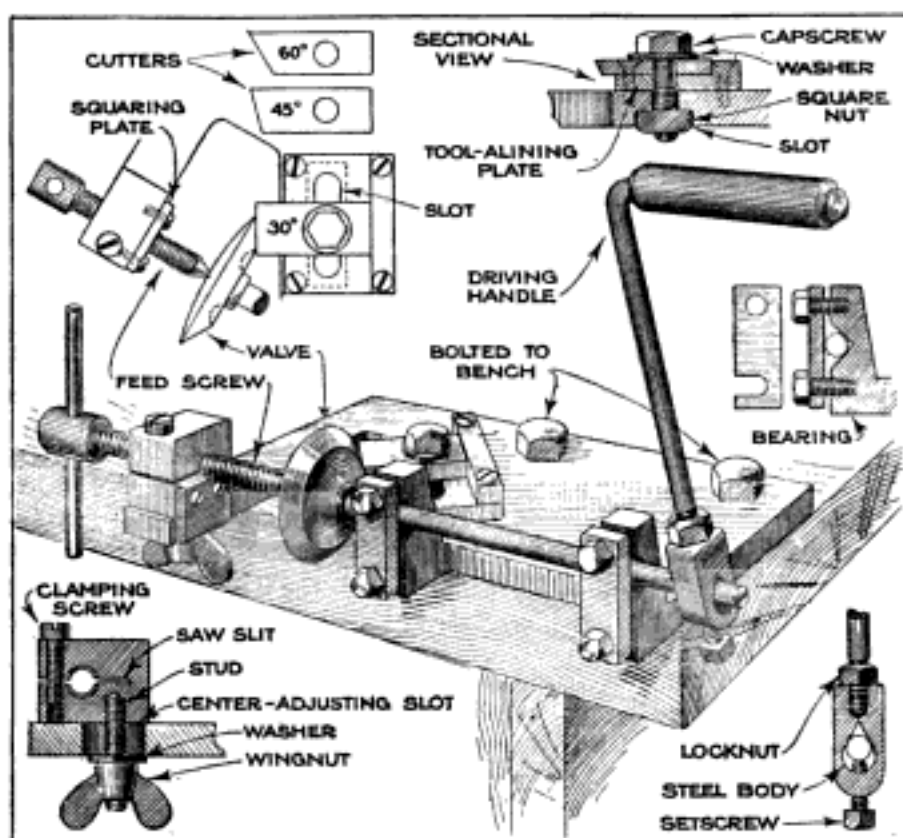
Poppet-Valve Turning Fixture

While there are many types of valve-facing fixtures obtainable, the device illustrated can be built from scrap parts at practically no expense. There is only one adjustment on this fixture and that is the combined feed screw and tail center, the position of which may be varied to fit valves of different sizes.

The base is made from a simple casting, or a slab of $\frac{3}{8}$ -in. iron or steel plate can be used. In the case of a casting, the base and bearing lugs are cast integral with it, but if a built-up base is decided on, they will be made from steel and riveted in place. These bearings are drilled and tapped for $\frac{1}{4}$ -in. cap-screws, the vees accurately cut, and fitted with latch-type clamp plates, as shown in the detail, for the caps of the bearings, and to make them adjustable for any size of valve within the capacity of the fixture. The latch plates have one plain hole, and the other is slotted out so that it is not necessary to remove the caps each time a valve is inserted or removed. The tailstock, carrying the feed screw, is made, as shown at the lower left, so that it may be aligned with the center hole in the head of the valve after the latter has been tightened in its bearings. Feed against the cutting tool is effected by turning the screw, which forces the face of the valve against the edge of the tool. The tailstock is held

square by the squaring plate fastened to the front side of the bracket. A stud and wingnut are used to clamp the tailstock to the bracket.

The cutters are clamped to an aligning



Refacing Automobile and Other Internal-Combustion Engine Poppet Valves on an Adjustable Fixture That can be Assembled from Easily Obtained Materials: It can be Bolted to the Edge of a Bench

plate as illustrated; this plate is either built up or machined from a solid piece of steel, and is fastened to the base, with small flat-head screws, at an angle of 30° to the valve stem. The cutters are made from $\frac{3}{16}$ -in. tool steel, hardened and ground to the shapes shown. A dog for turning the valve is made of steel, and provided with a setscrew; the handle proper is made from $\frac{5}{16}$ -in. drill rod, bent and provided with a loose pipe handle. —J. V. Romig, Allentown, Pa.

Welding Automobile Springs

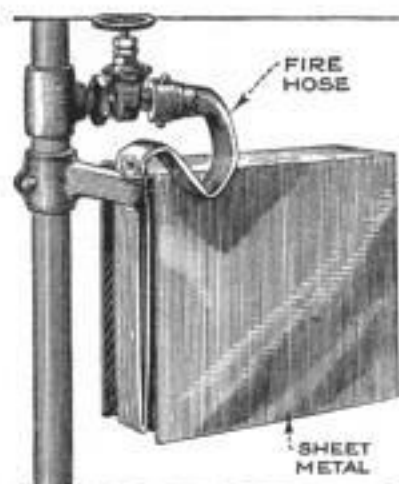
Automobile springs present special difficulties to the acetylene welder because of the unusually severe strains set up by the unequal expansion and contraction of the metal. Hairline cracks frequently appear radiating from the finished weld.

A good method of welding springs is as follows: Bevel both pieces at the joint in the usual manner, and after clamping in position, play the torch flame along the center of the spring for a distance of about 3 in. on both sides of the joint, un-

til the metal is heated to redness. This insures even expansion throughout the width of the spring. Starting from the center of the groove, proceed partly to fill it in both directions to the edges, afterward filling completely in the same manner. If the weld is carried straight across from edge to edge, the edge first welded will cool sufficiently to warp the spring. Automobile springs should not be welded except in cases of emergency, as the repaired spring is never as strong as before, nor is it usually so well hardened and tempered.

Cover for Fire-Hose Rack

The appearance of a fire-hose rack in office buildings and schools can be made



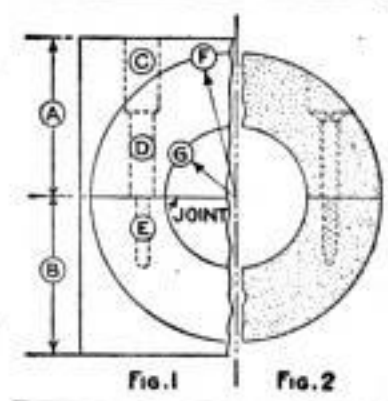
much more presentable by providing it with a heavy tin or light galvanized-iron cover of the type shown in the illustration. The cover is open at the bottom and one end, and is slipped over the hose in the manner indicated.

As it fits loosely, it can be quickly removed whenever necessary.

Homemade Wooden Pulleys

There are times when a wooden pulley is needed in a hurry for temporary or permanent use. Much time and labor can be spent on the making of these pulleys, or they can be easily and quickly made, depending on just how the maker goes about the job. Turning the circumference and boring the hole is a waste of time. A small pulley can be cut and shaped on the bandsaw in less time than is required to set up the job on a lathe, and a pulley cut on the bandsaw in the way described in this article will answer the purpose just as well as one turned.

In the making of a wood pulley it is



common practice first to turn it and drill the hole, or to saw the pulley on the bandsaw and then to drill the holes for the clamping screws. When doing this, considerable trouble is experienced,

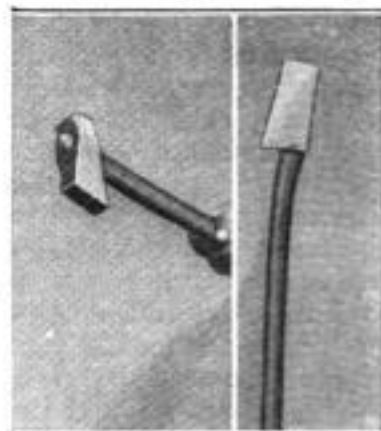
both in holding the halves together while drilling the holes, and in drilling them.

The method here described is an improvement over the old one. Two pieces of wood, A and B, of the exact width of the pulley, but about $\frac{3}{8}$ or $\frac{1}{2}$ in. larger than the radius of the finished pulley, are

temporarily fastened together with four spots of glue and held in a clamp until dry. The two circles F and G, which represent the circumference and the bore of the pulley, are drawn on the ends of the glued blocks with a pair of compasses. The holes E, for the clamping screws, are laid out and drilled before the pulley is cut. For narrow pulleys, only one of these screw holes is drilled on each side of the center. The holes are counterbored as shown at C and D in Fig. 1. The screws are next driven in until the heads come below the circumference of the outside circle F, and the pulley sawed, on this circle, on the bandsaw. The screws are then withdrawn and the two blocks pried apart so that the inner circle can be sawed out. The halves of the pulley are then ready for final assembly on the shaft, as shown in Fig. 2. In the case of a pulley made to fit a shaft of small diameter, the bore of the pulley may be shellacked or varnished and then sprinkled with emery.

Tightening Hoops on Wooden Tanks

The photographs show two useful tools for driving up, or tightening, the hoops on wooden tanks. The one on the left-hand side is made from an old sledge hammer, the sides of which are ground concave. It is used to hammer the hoops tight.



The second and larger tool is made from an old buggy axle. An iron head, of the shape shown, is welded on one end. This tool is used to pull or push the hoops down when they cannot be reached with the hammer.

Locating Concealed Piping

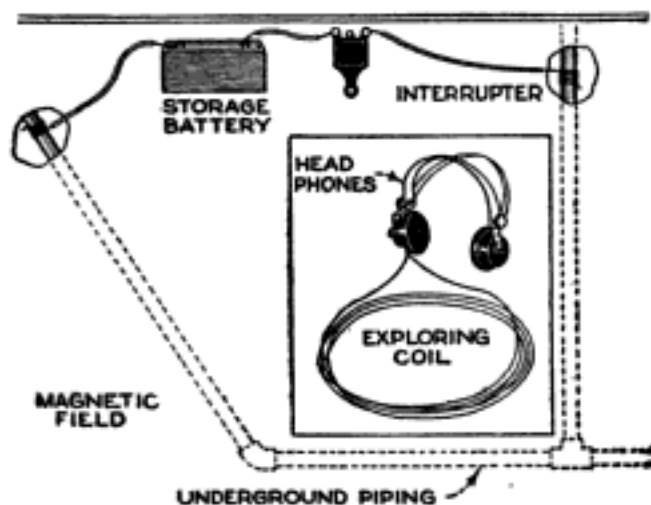
After all traces of ditches where water piping has been laid have disappeared, and information concerning the exact location of the piping is not available, one faces a difficult problem when it is necessary to locate the whole length of piping in order to make a tap at a certain point.

As the beginning and ending of the piping is generally accessible, the course of the remainder can easily be determined

by the simple method of passing an electric current through the piping and then traversing the area above the pipe system with a pair of telephone receivers connected to a coil of wire. The piping is located directly underneath the points where the loudest buzz is detected in the head phones.

A storage battery and an interrupter are connected in series across the ends of the piping, as shown in the diagram. A common buzzer or doorbell makes an excellent interrupter to be used with a 6-volt battery. The coil of wire that is connected to the headset is 1 or 2 ft. in diameter, and consists of 50 to 100 turns of ordinary bell wire.

The interrupted electric current flowing through the piping sets up an intermittent magnetic field around it. When the "exploring coil" intercepts the magnetic lines of force, an electric current is induced in the coil. As this induced electric current is intermittent, due to the intermittent nature of the magnetic field, the diaphragm of the receivers will vibrate, causing a buzz. This buzz will be loudest when the exploring coil is as near to the piping as possible and parallel to it. Receivers used in radio work are more



A Method of Determining the Location of Underground Water Piping, When All Traces, Except the Above-Ground Heads, have been Lost

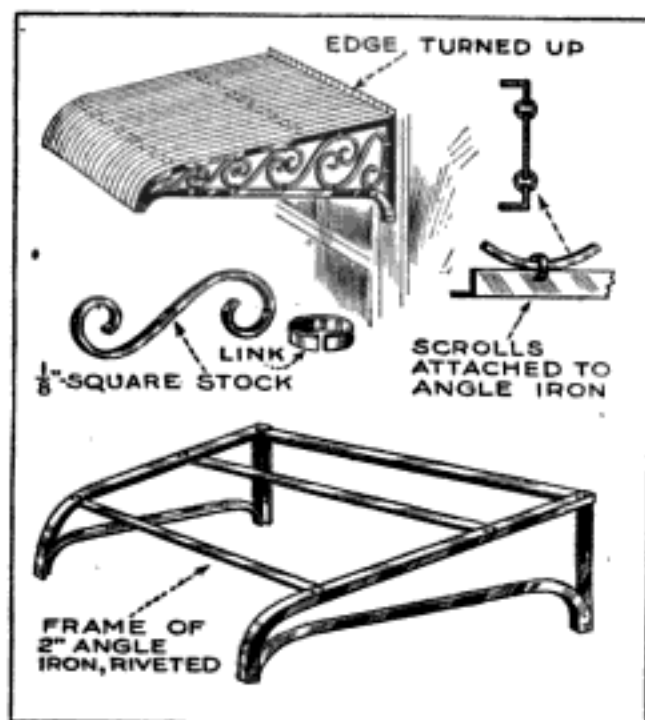
sensitive than ordinary telephone receivers.—Philip G. Benholz, East Orange, N. J.

Ingredients for Concrete

Concrete cannot be expected to be any better than the materials used in preparing it. The cement, even in strong mixtures, is only a small part of the total bulk, and it will not make strong sand of clay and mud, nor tough rock of crumbling stone. For this reason a good grade of sand and gravel should always be used.

Corrugated Iron Used for Awning

The illustration shows a permanent awning erected above the doorway of a



A Permanent Door and Window Awning That Requires Practically No Attention and Presents a Very Attractive Appearance

shop. It adds considerably to the attractiveness of the shop and has also the advantage of requiring practically no attention beyond an occasional coat of paint.

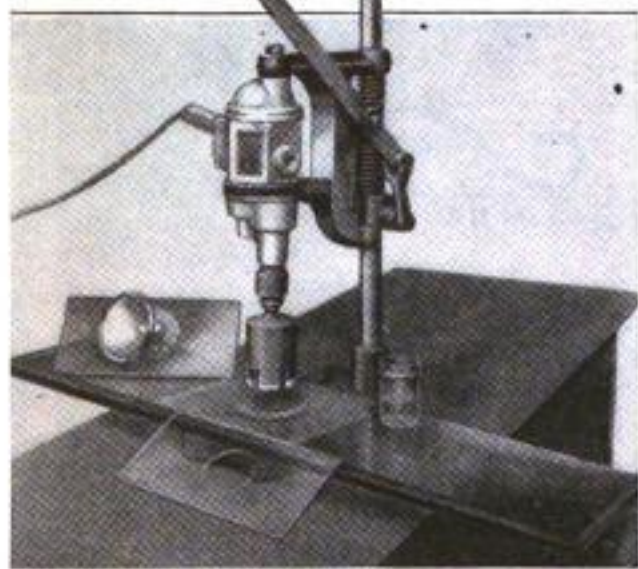
The framework consists of two brackets made of 2-in. angle iron, braced with flat crossbars. The corrugated-iron top is rolled at its edge to conform to the curvature of the supports and is attached to the crossbars with small bolts. Light bar stock, $\frac{1}{8}$ in. square, is bent into scrolls as shown, and these are fastened to the angle-iron brackets, and to each other, by links made of the same material.

Mulching Young Fruit Trees

With the approach of spring many gardeners will be seeking some sort of mulching material for their berry bushes and young fruit trees. Sawdust will no doubt be used extensively, as it is easily obtainable. In applying it, however, great care must be taken not to spread it in layers more than 2 in. thick, as the sawdust heats the roots greatly when spread to a greater depth than this; it has been known to scald the roots to such an extent that the plants eventually died. Small chips, shavings, or wood pulp, when available, provide a much better mulching material than sawdust.

Drilling Holes in Glass

The photograph shows how large-diameter holes are drilled in glass windshields for the installation of spotlights that swivel in a fitting mounted in the glass of the windshield itself. The tool is merely a brass tube that has been



Method of Drilling Circular Holes in Windshields for Spotlights: It Requires Only Three Minutes to Cut a 3-Inch Hole in the Glass

notched on the cutting edge, as shown, and is used with an abrasive. The brass tube is mounted on a disk, fitted with a $\frac{1}{2}$ -in. shank, which is held in the chuck of a portable electric drill mounted on a drill stand. The operation of drilling the hole in the glass requires but three minutes. The abrasive used is No. 60 carborundum, made into a paste by the addition of water.

Cleaning Out Crankcase with Oil Gun

In many cars that have a force-feed oiling system, only a small quantity of oil in the crankcase is actually consumed, but the oil must, nevertheless, be renewed occasionally, as a very little gasoline in it makes it unsafe, and it becomes dirty and unfit for lubrication. During cold weather, considerable gasoline finds its way past the piston rings, owing to the fact that the choker is used freely. This means frequent crawling under the car to get at the drain plug, a job that is particularly unpleasant at that season.

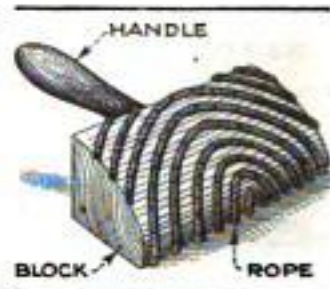
In trying to find a more convenient method, a driver hit upon the scheme of pumping the oil out by means of a pump, and found this method entirely satisfactory. A short length of flexible tubing is

clamped to the nozzle of an oil gun, and the other end is inserted through the oil-gauge hole. It is possible to reach the lowest part of the crankcase with the flexible spout. After the oil is all out, a couple of gunfuls of kerosene, squirted against the wire-gauze screen around the pump, will clear it of sediment.—J. G. Brown, Evanston, Ill.

A Homemade Wood Grainer

In order to do an artistic and natural job of wood graining, variety and irregularity of grain must be introduced. To do this, one must provide himself with a complete set of grainers of different sizes and designs, and this proves rather expensive where only an occasional job is done. However, excellent grainers, that I have found just as good as the purchased ones, can be made of material easily obtainable, as illustrated.

The block is a piece of quarter-round molding, of any desired size. Pieces of small, hard rope, preferably sash cord, are fastened to the curved surface of the block by means of brads, in the manner indicated. The heads of the brads are sunk into the rope so that there will be no danger of marring the surface of the work while graining. The rope will



absorb some of the paint the first time the grainer is used, but after it is filled, it will be found to give better satisfaction than the rubber-faced grainers commonly used, as the rope wipes cleaner and leaves a more natural impression. A hole is drilled in the block and a handle is fitted into it. The length of the block is determined by the width of the boards to be grained.

In use, after the ground color is applied, the grainer is drawn slowly along the board toward the operator, and at the same time gradually rocked over. Graining compounds, to imitate any wood, can be purchased in small quantities and at reasonable prices from any color house.—John L. Dougheny, Toledo, Ohio.

☞ Setscrews can be tightened without the usual danger of twisting them off, if the heads are lightly tapped with a hammer while drawing them tight with the wrench.



Homemade Light Shades

By D. R. VAN HORN

ATTRACTIVE homemade light shades in many color combinations and various shapes, that closely resemble those on the market, are shown in the photograph. They are made of cretonne, starched stiff.

The method of making them is very simple. Cut a piece of figured cretonne about 6 in. wide and 13 in. long. The piece used should

of double thickness. Carefully form a cylinder or square from this, taking care not to soil it. Overlap the edges about $\frac{1}{2}$ in., and baste them together with thread. To hold the shade in shape and to at-



Left: Cutting the Cretonne and Backing. Upper Center: Starching the Cretonne, Previous to Applying the Backing. Upper Right: Shade Finished and in Place. Lower Right: Group of Completed Shades

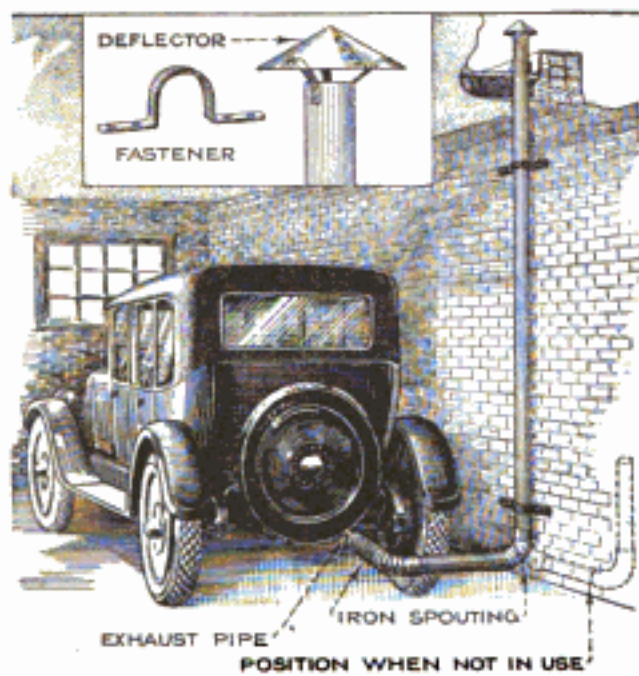
have a strong contrast of light and dark colors. Give the reverse side of the cloth a liberal application of thick starch, prepared in the usual manner, with a bristle brush. Then cut a piece of white cotton cloth, $5\frac{1}{2}$ in. by 13 in., and lay this over the piece of cretonne while the starch is still wet, allowing the cretonne to project $\frac{1}{4}$ in. on each side. Turn the edges of the cretonne over the cotton, and press both with a hot flatiron, which will dry the starch, and leave a translucent fabric

tach it to a light fixture, cut a circular cardboard disk to fit tightly in the end. In the center of the disk cut a hole, just large enough to admit the screw end of a lamp. Carefully turn the screw end of the lamp through this hole, and then screw the lamp into the socket.

Shades made in this way cost very little, and a number of them can be turned out in a short time; the four shades shown in the photograph were made in a half hour.

Disposing of Exhaust Gas

When running an automobile engine in a closed garage, the accumulating exhaust gas becomes so dangerous that it is



A Simple but Effective Method of Disposing of the Dangerous Exhaust Gases That Accumulate While Running the Automobile Engine in a Closed Garage

necessary to provide some adequate means for disposing of it. An effective method of doing this is shown in the drawing.

Lengths of 3-in. spouting are used to convey the gas from the exhaust pipe to the outside of the garage. A single length is fastened vertically along the wall and projects about 1 ft. through the roof. A deflector or hood is fitted over the top end. Two short lengths of spouting are fitted loosely in connecting elbows, as illustrated, allowing them to be moved to suit various positions of the cars. The end can be swung against the wall when not in use, as indicated by the dotted lines. No packing is necessary in the space between the exhaust pipe and the spouting, owing to the suction caused by the ascending gas.—G. A. Luers, Washington, D. C.

Telephone Receiver Replaces Housebell

The common electric bell is intended to operate on direct current, furnished by batteries. When the bell is operated from a step-down transformer connected to an alternating-current lighting circuit, an irregular bell action, usually accompanied by sparking at the contact points, will be noticed, since the current applied to the

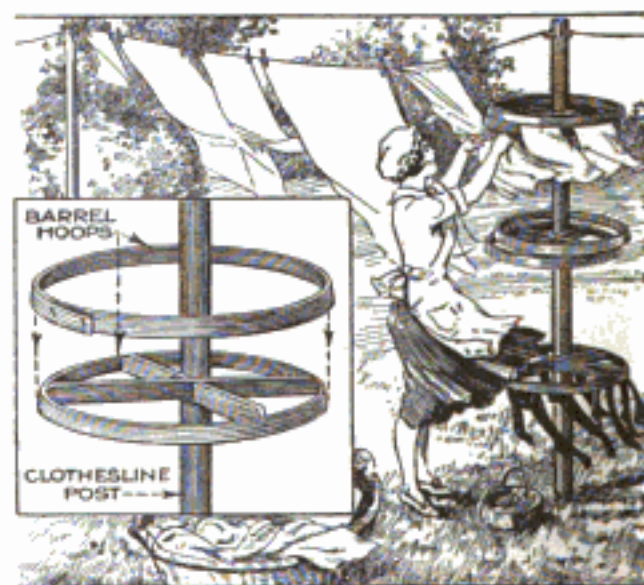
bell varies from full voltage to no voltage, at a rate depending upon the current frequency.

To overcome this trouble, the writer has replaced the bell with a common 70-ohm watchcase telephone receiver, with entirely satisfactory results. The receiver emits a distinctive note, that can be heard clearly throughout the average house, but is not in the least annoying. The character of the sound also eliminates the confusion that often results when the doorbell and the telephone are located in the same room.—Thos. W. Benson, Philadelphia, Pa.

Clothes Rack for Small Pieces

Handkerchiefs, stockings, and other small pieces are often troublesome articles to hang on the line, on account of the many clothespins required to fasten them, and also on account of the time consumed. The simple holder illustrated lessens the amount of work considerably.

Three barrel hoops are mounted by means of crosspieces on one of the clothesline posts, as indicated. Three other hoops, slightly larger, are slipped over the post so that they can be pulled



A Novel Clothes Rack for Small Articles That has been Found to Be a Timesaver on Washdays: The Articles are Clamped between the Barrel Hoops

down over the stationary ones, to hold the small pieces securely between the two. If desired, the hoops may be mounted so as to revolve around the post in the same manner as a revolving clothes reel.

When the kitchen-sieve screen rusts through, cut it off, and fasten a double thickness of cheesecloth or muslin to the rim with strong thread.

Novel Lighting Fixture

The simple indirect-lighting fixture shown in the illustration makes an attractive addition to any room.

The fixture resembles a small flower box and is built to fit around a common wall socket; it is 12 in. long, 4 in. wide, and 4½ in. deep, and is made of ¼-in. wood. Small brackets, 3 by 3 in., cut to a neat design

with a scroll saw, are used to support the box. A 3 by 6-in. rectangular hole is cut in the bottom, and a piece of frosted glass is laid over the hole. The ferns, which may be either real or

artificial, are held in two ordinary jelly tumblers, filled with soil. The light will be thrown both upward and downward, as shown in the photograph, producing a novel effect.—W. J. Langan, Freeport, Ill.



Sealing-Wax Filler for Cedar Chests

Anyone who has built a cedar chest knows the difficulty of filling the holes in

the knots. A mixture of sawdust and glue is sometimes used for this purpose, but this filling always has a "grainy" appearance, totally unlike the texture of the knot. Brown stick shellac is also used in many cabinet shops, but is not very satisfactory, as it seldom matches the wood prop-

erly. Sealing wax seems to give better results than the fillers just mentioned, and as various colors are obtainable, it is possible to make a mixture that will match any tint of cedar. The best combination to use is dark brown, red, yellow, and lavender, mixed in varying proportions, as found necessary. To apply it, run it into the hole with a piece of hot iron, allowing sufficient time for the hot wax to work into the crevices. When cool, smooth down with a hand scraper and fine sandpaper. After the surface has been varnished, the wax can hardly be detected.—Edwin M. Love, Alhambra, California.

Self-Watering Hanging Basket

Many persons never use hanging flower baskets or pots indoors because they must either be taken down to be watered or some receptacle must be put under them to receive the dirty water that drips from them.



However, all this trouble can be easily overcome by imbedding a porous cup, taken from a wet-battery cell, or similar porous container of small size, in the center of the basket and filling it every few days with water. The

slow seepage through the cup supplies sufficient and uniform moisture to the roots around the cup without the danger of dripping, which is always the result of too much water. Besides cleanliness and convenience, improved plant health results from this method of watering.—Gordon H. Sears, Salt Lake City, Utah.

A Novel Indirect Electric - Lighting Fixture, That Resembles a Miniature Flower Box, can be Built around an Ordinary Wall Socket. It Throws the Light Both Upward and Downward

Simple Seat Cover

A handy seat cover, saving on clothes and softer than the wooden seat, can be made from a piece of corrugated fiber board cut to the shape shown in the illustration. A slot is cut near the outside, across the corrugations, and the cover dropped over the back. The "cushion" thus improvised is both economical and comfortable.—T. Freeman, Beaumont, Tex.



A Homemade Storage B-Battery

By EDWIN J. BACHMAN

STORAGE B-batteries will eliminate many of the "frying" noises that are heard in the phones of the radio set. The batteries are easily constructed, at small cost, and they are much more economical than the common type of B-battery, as the charge will last for several months, and they may be recharged from the house-lighting circuit.

The first requirement is the cells; these are 1 by 6-in. test tubes, obtainable from most drug stores at about 5 cents each. If a detector alone is used, 10 cells will be sufficient, as this number, at 2.25 volts per cell, provide 22.5 volts. If amplifiers are used, 20 or more cells will be needed. These may all be mounted in one base, if desired, but it is better to mount them in 22.5-volt units. It is this unit that is illustrated and described.

The stand shown in Fig. 1 is the type used by the writer, as it is simple and quickly made. The vertical board is drilled with a $\frac{1}{2}$ -in. wood bit, as indicated, and the test tubes are fastened with rubber bands, $\frac{1}{2}$ in. wide, cut from an old inner tube and passed through the holes. Fig. 2 shows another form of wooden stand, a little more elaborate in design.

Those who are familiar with the use of concrete may make neat-looking and substantial bases from this material, as shown in Fig. 3. A simple box form is used; the ends are nailed to the bottom, and 10 wooden plugs, turned to the dimensions shown in the detail, are also nailed to the bottom. The sides are loose, to facilitate removal of the cast, and are held in place by C-clamps, as indicated. The concrete used is mixed in the proportion of 1 part Portland cement to 2 parts sand. This is mixed with water until it is of a "quaky" consistency, then the interior of the form, and the plugs, are greased or oiled, and the form filled. Short pieces of clean iron wire may be laid in the concrete, about $\frac{3}{4}$ in. apart, as the latter is deposited. The concrete should be allowed

to set for at least 24 hours before the form is removed, and afterward the cast should be wrapped in wet burlap, and kept wet for three or four days before being used.

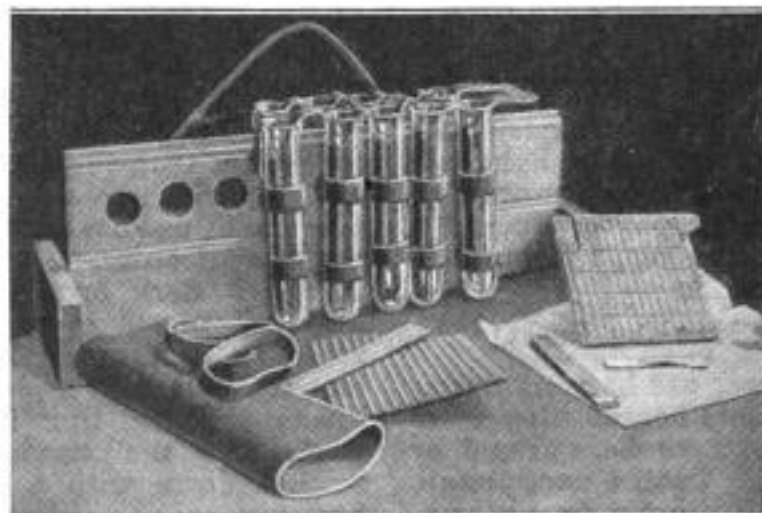
The battery elements are made from standard-size automobile battery plates. Two positive plates and two negative ones will be required; one plate will make six or eight of the small elements, according to the size of the plate. The elements are $\frac{5}{8}$ in. wide, and are cut with a hacksaw, the blade being turned at right angles to the frame. To saw the elements without crumbling the active material in the grids, they should be clamped between two boards, in a vise, as shown in Fig. 6.

The connectors are $\frac{1}{2}$ by $2\frac{1}{2}$ -in. strips, cut from $\frac{1}{32}$ or $\frac{1}{16}$ -in. sheet lead; heavy

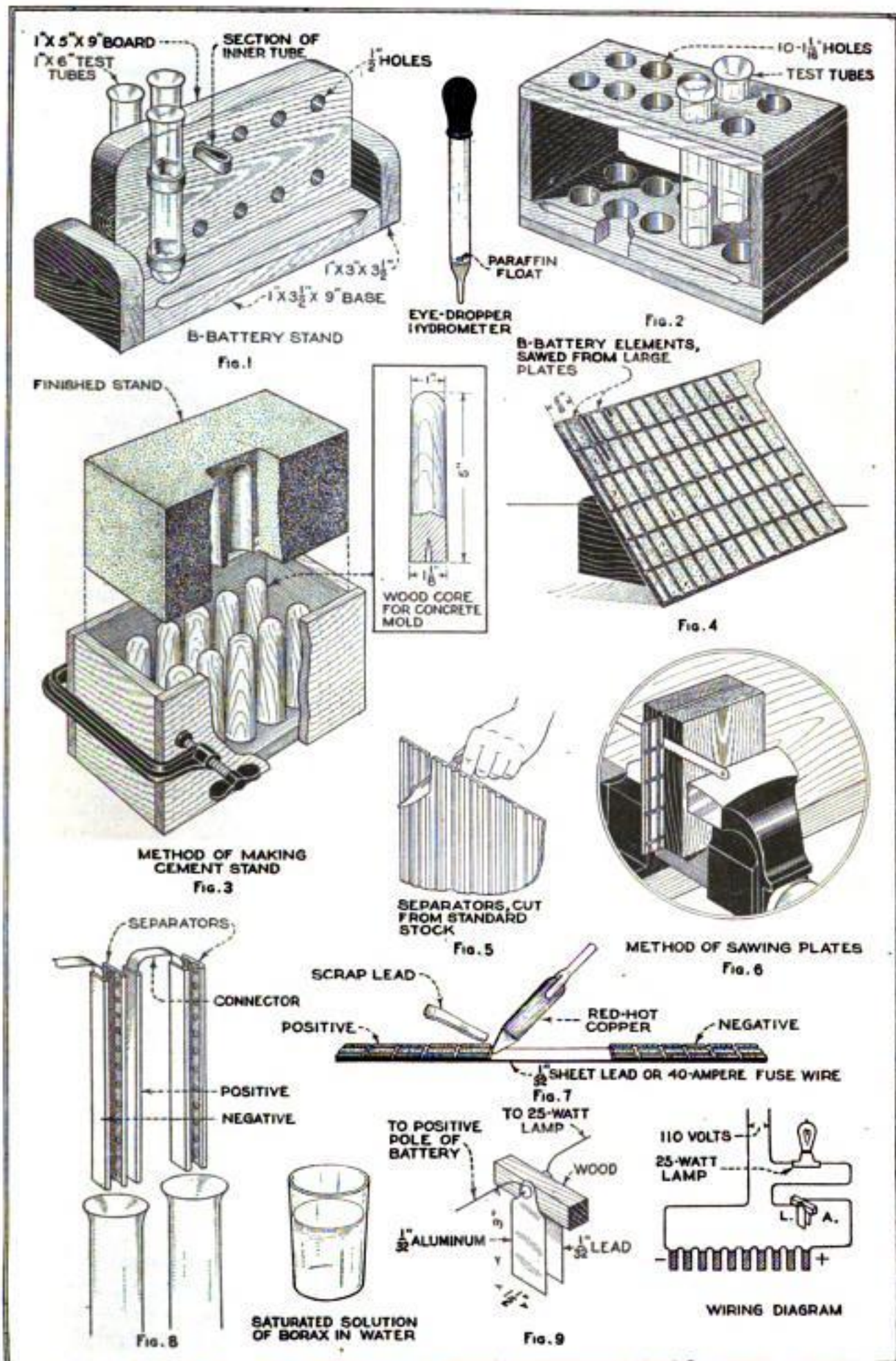
fuse wire may be used if sheet lead is not available, but wire solder cannot, nor should the connectors be joined to the plates with solder.

A positive (brown) and a negative (gray) element are laid on a board, with a connector between them, end to end, as shown in Fig.

7. They are then joined, by means of a red-hot soldering copper, using small pieces of lead as "solder." Care must be taken that the lead strip and elements are scraped clean, and that the hot bit is not kept in contact with the surfaces too long, or the metal will flow away. This operation will likely be found somewhat difficult at first, but a little practice will soon teach the knack. Eight pairs of plates are connected in this manner; the four remaining have strips welded on independently. The two at one end of the battery are connected by a cross strip, as shown at the right in the photograph, after the battery is assembled. The two remaining strips are the terminals of the battery. If the battery has been assembled properly, one element in each cell will be positive and one negative, the elements connected by the cross strip will be positive and negative, one terminal



View of 22.5-Volt Unit and Material Used in Its Construction: The Rough Stand Shown Is Quite Suitable for Experimental Use



Figures 1 and 2 Show Simple and Easily Made Wooden Stands for the B-Battery. Those Who Have Cement at Hand may Prefer the Solid, but Neat Stand Shown in Figure 3. Figures 4, 5, and 6 Show How the Elements and Separators are Cut from Standard Plates, and Figures 7 and 8, How the Elements are Connected and Assembled. Figure 9 Shows a Simple Rectifier for Charging the Battery from Alternating-Current Mains

strip will be connected to a positive, and one to a negative plate.

The connectors are now bent as shown in Fig. 8, and the elements placed in the tubes; each plate in a cell is separated from the other by a strip cut from standard separator stock, and the connectors should keep the elements suspended clear of the bottom, so that sediment cannot short-circuit them.

The electrolyte is mixed in a glass jar, by first pouring in some water, then slowly pouring in pure sulphuric acid, testing with the hydrometer until it shows a specific gravity of 1.280° B. Never pour the water into the acid. After cooling, the electrolyte is transferred to the cells by means of the hydrometer; enough should be put in to cover completely the active material in the elements.

While a large hydrometer can be used for testing the electrolyte at first, it cannot be used for testing the cells, as it would draw off all the solution, even if the nozzle could be inserted far enough to reach the liquid. It is necessary, therefore, to make a miniature hydrometer, in order to test the cells.

A new eye dropper will serve nicely, when fitted with a small float. Work a small piece of paraffin in the fingers until soft, then dip it in some lead filings, and place it in some 1.270° electrolyte. If it floats buoyantly, add filings; if it sinks, shave off some of the leaded wax, and add a little clean wax. Some electrolyte with a specific gravity of 1.260° should be mixed and the float tried in this; it should just float, and no more, when in the 1.280° and 1.270° electrolyte, and sink when placed in the 1.260° liquid.

When the battery is being charged, the electrolyte should be tested frequently; the float will sink rapidly, at first, but, as the charging is continued, the float will

become more and more buoyant, until, when the charging is completed, it will float as it did in the full-strength electrolyte. The charging must be kept up until the electrolyte in all cells shows the same specific gravity. The little float, it may be remarked, should be made cubical or pyramidal in shape, so that it will not close the small opening in the eye-dropper nozzle, and prevent removal of the liquid.

The simple rectifier used when charging from an alternating-current circuit is shown in Fig. 9. It consists of a tumbler containing a saturated solution of borax in water, a strip of wood, one aluminum and one lead plate, each $\frac{1}{2}$ by $1\frac{1}{2}$ by 3 in., and a couple of screws. The plates are suspended in the borax solution, the wood strip resting on the tumbler edge, and connected in series with the battery and with a 25-watt lamp, as shown in the wiring diagram. Care must be taken that the positive terminal of the battery is connected to the aluminum plate.

To charge from direct-current mains, no rectifier is necessary, the 25-watt lamp alone being used. The positive line from the mains, through the lamp, must be connected to the positive terminal of the battery. To find which is the positive line, add a few drops of sulphuric acid to a glass of water, and dip the bared ends of the wires into the water, keeping them well apart; the wire giving off the fewest bubbles is the positive. Another test is to stick the ends, about 1 in. apart, into the freshly cut surface of a potato; a green spot will show around the positive wire.

To protect the stands, if made of wood, from accidental splashes of acid, they should be painted with asphaltum paint or varnish, and the connectors and exposed joints should be kept well covered with vaseline, to keep them from becoming corroded with the acid fumes.

Hinges for Screen and Storm Doors

Where screen doors take the place of storm doors, and vice versa, the exchange can be effected in a few moments, without removing the hinges from jamb or door, as is customary if both doors are provided with butt hinges of the same size, fitted with removable pins. The parts of the hinges on both doors must, of course, be set in perfect alinement with the corresponding parts of the hinges on the jamb of the door. To make the exchange, remove the pins from the hinges, take off the door, replace it with the other

door, and replace the pins. It is advisable to use three hinges, and they should be oiled occasionally to prevent rusting, which would make it impossible to remove the pins.

Vinegar Cleans Aluminum Ware

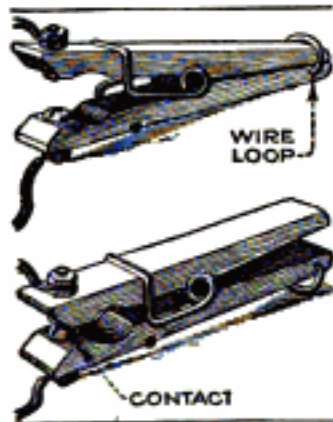
One of the best and cheapest cleaners for aluminum ware is ordinary vinegar. Pour a few ounces of vinegar in each utensil to be cleaned, then heat, and scour the surface. This will impart a beautiful luster to the ware.—Mrs. G. E. Hendrickson, Argyle, Wis.

Starting Small Gas Engine in Cold Weather

About an hour before using my engine, which drives a washing machine, I place well-heated soapstones, taken from the fireless cooker, about the cylinder, taking care not to touch the wiring in any place. By doing this, the cylinder is thoroughly warmed so that the motor starts the first or second time it is turned over. In homes where soapstones are not available, flatirons will serve the purpose very satisfactorily.—Mrs. F. D. Burke, Downers Grove, Ill.

Simple Switch Made from Clothespin

The simple switch shown in the illustration is made from a clothespin, and is very handy for one who is using temporary circuits while experimenting, and therefore does not desire to purchase commercial switches.



To make a switch of this kind, drill a small hole through each jaw of the clothespin. Push screws through these holes from the inside, so that the heads will be in contact when the jaws are closed.

The threaded ends of the screws are equipped with nuts to serve as binding posts. A small ring is fitted to the other end of the clothespin, as shown, to hold the jaws apart when it is desired to keep the switch open.

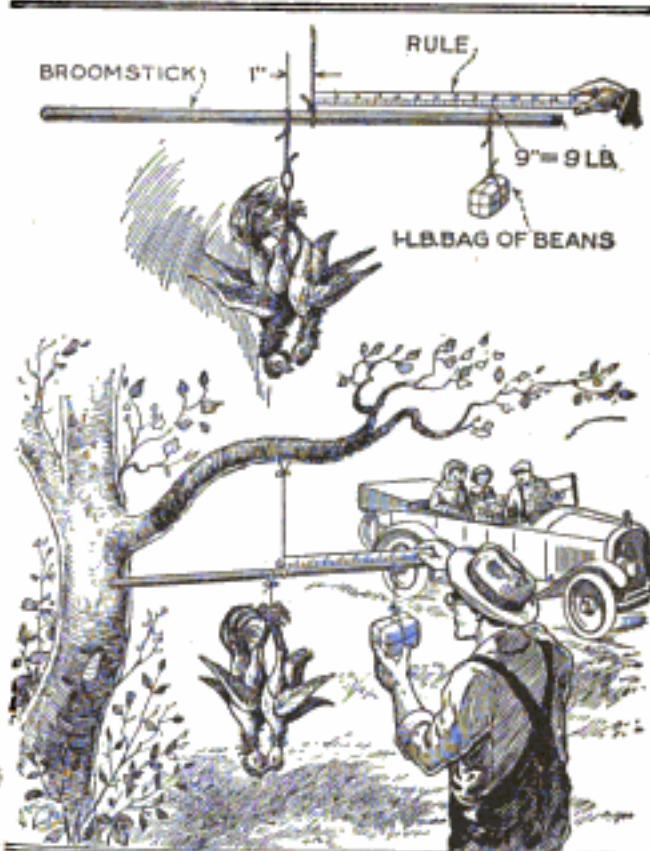
If a number of switches are located together, circuits can be broken very easily by clamping the jaws on a strip of mica that is fastened in a position most convenient for this purpose.—L. B. Robbins, Harwich, Mass.

A Homemade Banjo

The illustration shows a homemade banjo that has a shallow tin pan for a body. Although this instrument is not intended to compare with manufactured ones in construction and finish, it has a good tone quality and volume. A homemade banjo of this type is within the means of every amateur musician, as it can be made for less than a dollar.

The instrument consists of a 10-in. shal-

a loop at the end, and hung over the broomstick exactly 1 in. from the sus-



Method of Weighing Accurately without a Scale by Using Simple Leverage Principles: With the Use of a Rule, Objects can be Weighed to the Ounce

pension cord. For a weight on the other side, an unopened bag of beans, weighing exactly 1 lb., was used. The graduations for weighing were read on a rule as indicated, each inch being equal to 1 lb. and each $\frac{1}{16}$ in. equivalent to an ounce.—J. V. Romig, Allentown, Pa.

Binding Posts Made from Spark-Plug Cores

Snappers for Soft Collars

A soft collar can be kept in position very neatly by sewing small-size snappers to the underside of the collar and to the shirt, as shown in the illustration, care being taken to get the halves directly over each other. This method of fastening the ends of the collar is preferable to using a bar pin or buttons, as the snappers are invisible, and can be fastened or unfastened instantly.—Robert Lee Bird, Roanoke, Va.



strip will be connected to a positive, and one to a negative plate.

The connectors are now bent as shown in Fig. 8, and the elements placed in the tubes; each plate in a cell is separated from the other by a strip cut from standard separator stock, and the connectors should keep the elements suspended clear of the bottom, so that sediment cannot short-circuit them.

The electrolyte is mixed in a glass jar, by first pouring in some water, then slowly pouring in pure sulphuric acid, testing with the hydrometer until it shows a specific gravity of 1.280° B. Never pour the water into the acid. After cooling, the electrolyte is transferred to the cells by means of the hydrometer; enough should be put in to cover completely the active material in the elements.

While a large hydrometer can be used for testing the electrolyte at first, it cannot be used for testing the cells, as it would draw off all the solution, even if the nozzle could be inserted far enough to reach the liquid. It is necessary, therefore, to make a miniature hydrometer, in order to test the cells.

A new eye dropper will serve nicely, when fitted with a small float. Work a small piece of paraffin in the fingers until soft, then dip it in some lead filings, and place it in some 1.270° electrolyte. If it floats buoyantly, add filings; if it sinks, shave off some of the leaded wax, and add a little clean wax. Some electrolyte with a specific gravity of 1.260° should be mixed and the float tried in this; it should just float, and no more, when in the 1.280° and 1.270° electrolyte, and sink when placed in the 1.260° liquid.

When the battery is fully charged, the shown in the drawing. A

piece of sheet copper, 1 in. square and about No. 20 gauge, is cut across diagonally. The two triangular pieces thus formed are soldered to the copper ends of a fixed grid condenser, and also to two brass paper fasteners, as shown. A

narrow strip of strong paper, dipped in India ink, or blackened well with a soft

lead pencil, is inserted between the ends of the paper fasteners. By pulling more of the inked strip between the fasteners, the resistance is increased; by drawing the strip taut, the resistance is decreased. —Earl B. Forrester, Boston, Mass.

Forcing Thick Liquids from Barrels

To tap molasses, heavy oil, or any thick liquid from a wooden barrel, or such similar large container, drill a small hole in the top and screw in an inner-tube valve that has been cut off about 2 in. from the tip. Air can then be pumped in with a tire pump, and the liquid forced out by pressure. This method of tapping is of special usefulness in the winter when these liquids are most "sluggish."—Wallace Stanton, Glen Ellyn, Ill.

Repairing a Bucksaw

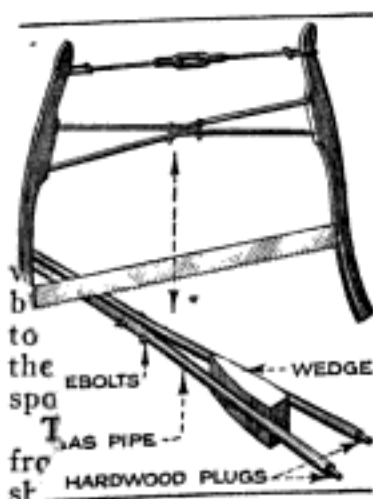
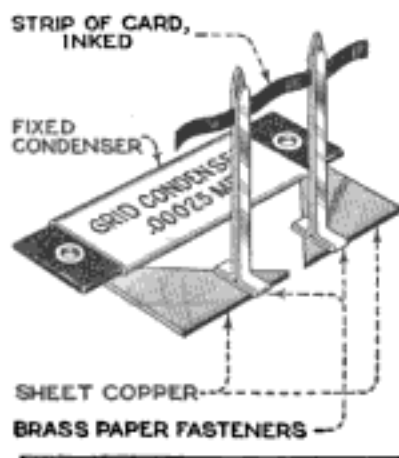
When the crosspiece of a bucksaw warps or breaks, a good way to repair it is to use

two pieces of $\frac{3}{4}$ -in. gas pipe the same length as the crosspiece. Make plugs of hardwood and drive them into the ends of the pipe, allowing them to project about 1 in. Drill two holes near the center of the pipes, about 3

in. apart, and bolt the pipes together with steel bolts. Make two wooden wedges and drive them between the pipes, to bend them into the shape of the crosspiece, then glue the plugs into place in the frame. The finished crosspiece will never warp or break.—E. W. Petty, Tillamook, Oregon.

Long-Handled Trowel for Transplanting

By removing the "working end" from a common garden trowel and fastening it to a spade handle, a tool is obtained with which a small plant can be taken from the ground easily and set in another hole dug with the same implement. The setting out of a large number of plants in this manner, is no longer a hard, back-tiring task.



Painting Fruit Trees to Kill Borers

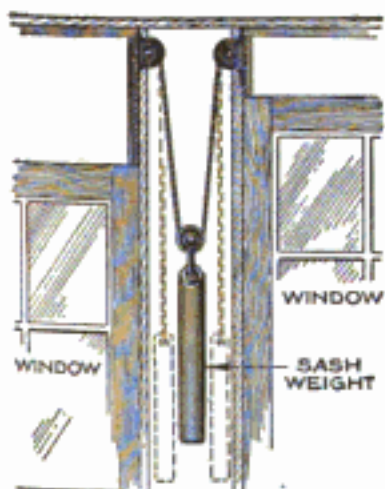
When borers or other wood-burrowing insects attack young fruit trees, the amateur orchardist usually sets forth with the paint can and brush to apply "first-aid" treatment. In many instances the trees die, and the owner attributes the loss to his failure to attend to them in time. This may be correct, but the loss may also be due to the ingredients of the paint.

Most ready-mixed paints contain driers of some kind that are injurious to the trees. The safest and best mixture for painting trees, and the one recommended by experienced orchardists, is white lead and raw linseed oil. This mixture is liberally applied to the trunk from a few inches below the surface of the ground up to the first branch, the soil being removed to allow the paint to be applied below the surface.—G. E. Hendrickson, Argyle, Wis.

Sash Weight for Double Windows

The troublesome interference of adjacent sash weights in double windows can be eliminated by substituting one heavy weight for the smaller ones and arranging it in the casing as shown in the illustration. Obviously, the weight should equal the combined weights of the smaller ones.

A pulley is attached to one end of the weight, as shown, and a single length of sash cord passed through the pulleys, and attached to the windows in the usual way.

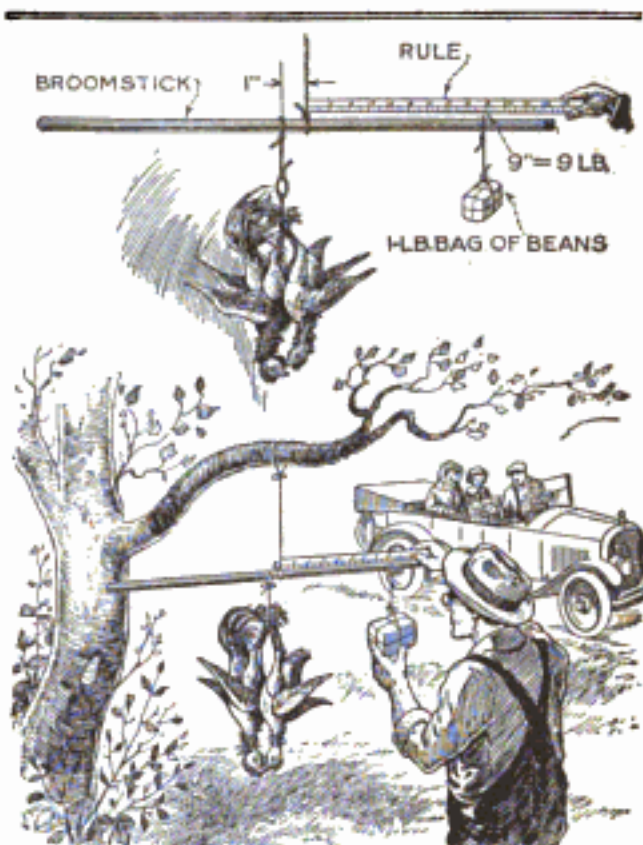


An Improvised Scale

Finding that he had no scale handy when selling some chickens to a passing motorist, an ingenious farmer improvised one, as shown, with which he was able to weigh as accurately as is possible with a common scale, even to the ounce.

The device consisted of a broomstick balanced on a suspended cord, as shown. Two chickens were tied to a cord having

a loop at the end, and hung over the broomstick exactly 1 in. from the sus-

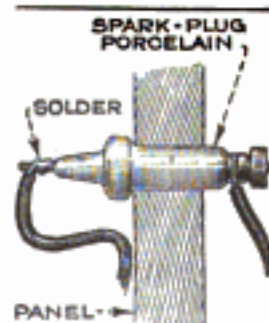


Method of Weighing Accurately without a Scale by Using Simple Leverage Principles: With the Use of a Rule, Objects can be Weighed to the Ounce

pension cord. For a weight on the other side, an unopened bag of beans, weighing exactly 1 lb., was used. The graduations for weighing were read on a rule as indicated, each inch being equal to 1 lb. and each $\frac{1}{16}$ in. equivalent to an ounce.—J. V. Romig, Allentown, Pa.

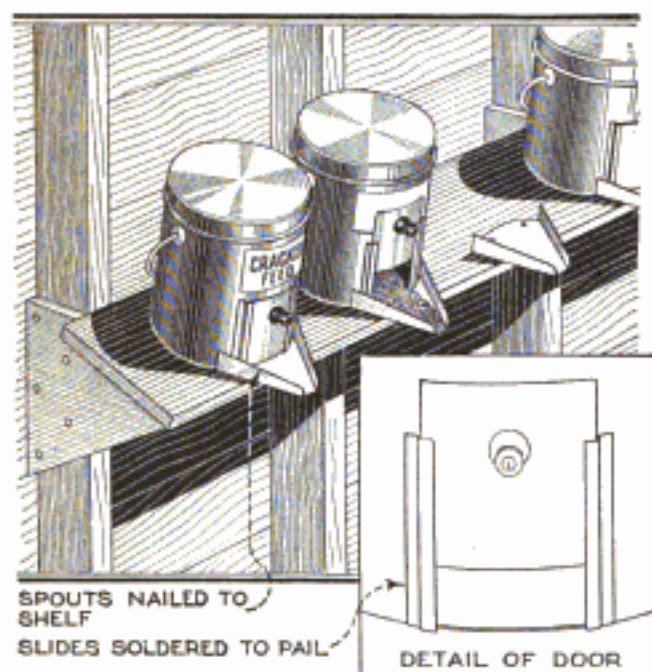
Binding Posts Made from Spark-Plug Cores

Porcelain cores from old spark plugs provide neat and inexpensive binding posts for high-voltage work. They are especially useful for amateurs and those engaged in experimental work. To mount one on a panel, as shown in the illustration, drill a hole a trifle smaller than the diameter of the neck so that the core can just be forced through, up to the shoulder, without danger of splitting the wood; this will insure a tight fit. Solder the permanent lead, if there is one, to the end of the electrode, and use the other end as any other binding post.



Feed Bins Made from Tin Pails

Discarded lard pails, arranged and mounted as shown in the illustration, provide excellent feed containers for the



Tin Pails, Equipped with Sliding Doors and Arranged on a Sloping Shelf, Provide Excellent Feed Bins in the Henhouse

poultry; they keep the feed dry and free from dirt, and prevent mice and rats from getting at it.

A square or rectangular opening is cut in the side of the pail near the bottom, as shown, and is fitted with a tin sliding door. The slides are bent and soldered to the sides of the pail, as indicated in the detail. Spouts, made from pieces of light galvanized iron, are bent to the shape shown, and are tacked to the front edge of the sloping shelf. The pails are set in these spouts so that the feed will slide down the spout and into a receptacle below. Due to the slope, chickens will never choose the shelf or the tin cans for a roosting place.

By providing a separate pail for each kind of feed, there can be no confusion or mixing of feeds, if each can is properly labeled.

Attachment for Sawhorse

Anyone who has had occasion to use a bucksaw knows how tiresome it is to hold one knee or foot on the work to steady it. With the attachment illustrated, this necessity is entirely eliminated, and it is possible for the workman to assume a much more comfortable position while sawing.

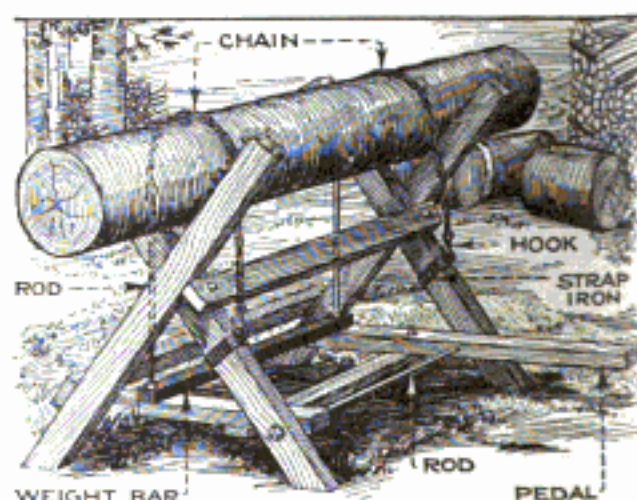
The crutches in which the log rests are

provided with teeth, made by cutting the heads off long screws, and driving them into small holes drilled in the crutches, the points of the screws being uppermost. The arrangement that forces the log down onto the teeth consists of a heavy iron bar, a little shorter than the distance between the crutches; this is drilled at the ends, and two rods, threaded on one end and flattened and drilled at the other, are passed through the holes, through two lengths of 2 by 4-in. stuff, and fastened by nuts on each side.

One of the 2 by 4-in. pieces is extended, as shown, to form a pedal; the other is cut off just in front of the crutch leg, and is joined to the pedal by a crosspiece of lighter material. Both 2-by-4's are pivoted on a rod running through the legs.

Chains, long enough to pass around the largest log to be sawed, are fastened to the upper ends of the rods, which should be long enough to reach the middle of the log; the other ends of the chains are provided with hooks, which can be slipped through holes drilled in flat-iron straps bolted around the front legs.

In use, a log is placed in position, the chains are thrown over, the pedal depressed, and the chains hooked. The workman can then stand comfortably, with both feet on the ground, to use the



Attachment for Bucksaw Horse That Holds the Logs Steady, Allowing the Sawyer to Assume a Comfortable Position While Sawing

saw. When one length has been sawed off, the pedal is depressed, and the log dragged forward for another cut.—H. Webster, Spear Hill, Manitoba.

By wiring the taillight to a separate switch, the headlights can be turned out, and the taillight kept burning, when parking the auto, head to the curb or at an angle, thus avoiding waste of battery current.



COMBINATION POOL AND LIBRARY TABLE

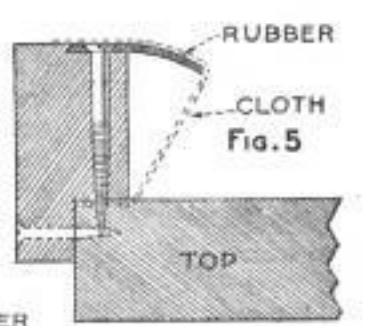
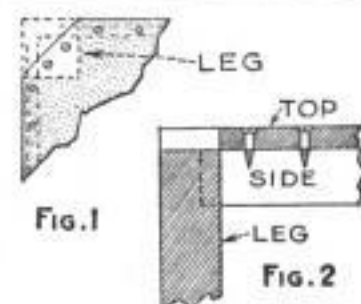
By J. E. Holstrom



A SMALL pool and billiard table in the home affords pleasure and recreation for youngsters and grown-ups alike. In the average home, where floor space is rather limited, a combination pool and library table is, of course, preferable to separate tables, but the price charged for such is, for the average man, prohibitive. Where the library is provided with a large table, it may be converted into a combination table; this can usually be done without spoiling the appearance of the table in any way, by anyone who has

2. Before fastening this top, however, the corners were sawed off, the triangular space left at each corner serving as a pocket; the pockets measured about 4 in. on each side. After the top was attached, it was covered with green billiard cloth, drawn tightly over the surface and tacked on the edges.

Oak strips, 1 by 2 in. in size, were then rabbeted and screwed to the edges, so that they projected about 1 in. above the top. Fig. 5 shows the method of attaching these strips. Before driving in the



Upper Left: Table with Upper Top in Place, Used as Library Table. Lower Left: In Use as Pool or Billiard Table. Upper Center: Removing Library-Table Top. Lower Center and Right: Constructional Details

a slight acquaintance with carpenters' tools and their use. The photographs show a table of this kind as converted by the writer, all of the work being done in one Saturday afternoon.

The fine quarter-sawed oak top was first of all removed, and another top, slightly smaller in size, fastened in place. The edges of this top were cut even with the outer sides of the table legs, and it was made of good hardwood, 1 in. thick, secured to the frame and legs with wood screws; the holes for these are counter-sunk, and the screws driven in until flush with the surface, as shown in Figs. 1 and

screws, holes were drilled for them, to prevent splitting the wood, and, after assembling, the corners were bound with sheet copper to strengthen them.

A rubber strip, about 2 in. wide, and about $\frac{1}{8}$ in. thick, was used instead of regular pool-table cushion-rubber, which could not be obtained easily. The rubber strip was tacked on as shown in Fig. 5, the inner portion of the wooden strip being rabbeted with a plane so that the rubber was flush with the surface of the wood. However, if one does not wish to go to this trouble, a wider strip of rubber might be used, and extended over the

strip to the outer edge. A strip of the billiard-table cloth was then glued and tacked over the edge, as shown in Figs. 4 and 5, and drawn tightly down so that the rubber was slightly curved, in order that the balls would rebound readily from it. The other edge of the cloth strip was fastened between the wooden strips and the table top. The table was then ready for use, and these improvised cushions have proved very satisfactory.

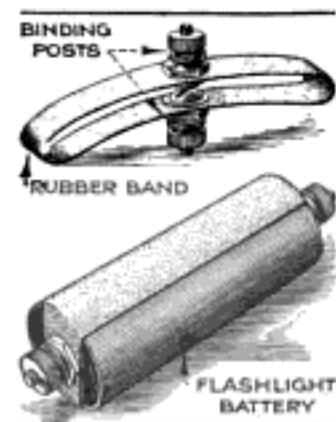
Instead of having pockets 1 in. deep as was the case with the table shown in the photographs, it would be better to provide regular leather or canvas pockets, about 4 in. deep, if the construction of the table permits. It is also advisable, with the shallow pockets, to provide stop cushions in the corners behind the pockets; for this purpose strips of leather or canvas, sewn into the shape of long, narrow bags, filled with sand, and thumb-tacked to the edge strips, may be used. In order that billiards may be played as

well as pool, it is necessary to make the pockets flush with the top, and to provide the corners with rubber cushions as on the sides; the triangular corners, sawed off the top, were utilized, in this case, to fill in the spaces, being covered with cloth as shown in Fig. 3, and provided with strips to carry the rubber cushions. However, the exact make-up of the corners must be left to the discretion of the builder, as it depends, to a great extent, upon the construction of the table.

The original table top fits nicely over the top that is used for playing, and its weight is sufficient to keep it in position. As a pool table thus made is smaller than the regular-size pool or billiard table, smaller cues and balls are used. The oak strip is smoothed down with sandpaper on the outside, and is stained and finished to match the rest of the table. The balls, cues, and bridge may be left in place on the lower top when the original one is replaced.

Terminals for Flashlight Batteries

Flashlight batteries are very often used for other purposes than that for which they are intended, owing to their convenient size. It is, however, not an easy matter to connect them properly without the danger of loose contacts or short circuits, unless a special attachment is used.



A simple connector, that eliminates the above-mentioned troubles, can be made from material that is easily obtainable and requires but a few moments' work to assemble. All that is necessary is a wide rubber band, which may be a piece of inner tube, and

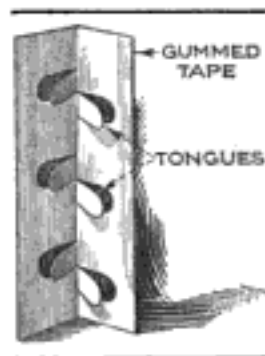
two binding posts, equipped with nuts. Two small holes are punched in the rubber band directly opposite each other, as indicated. The binding posts are pushed through the holes and are tightened down with the flat locknuts. The band is then drawn over the battery so that one contact touches the brass tip or the positive pole, and the other contact touches the bottom or negative pole of the cell. Wires are attached to the binding posts as usual. —Geo. E. Perkins, South Bound Brook, New Jersey.

Emergency Auto Fuses

While out duck hunting, the fuses that controlled the automobile lights were burned out. Being 30 miles from the nearest garage, and not having any kind of fuse wire on hand, the tinfoil of a cigarette package was rolled into the shape of a fuse, and substituted. It was found to work satisfactorily, and was used until a new fuse of the proper size could be procured.—Louis A. Portland, Miami, Florida.

Backs for Torn Leaflets

Paper leaflets, such as three or four-leaf catalogs, sheet music, and the like, that usually tear along the fold, can be mended by providing gummed-tape hinges, cut as indicated. The tape is cut to a length equal to that of the back, folded lengthwise in the center and then cut with scissors, as indicated, so that several tongues are formed. The body portion of the hinge is gummed to the outside

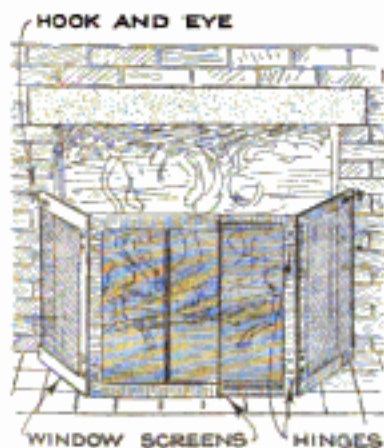


cover pages, but the tongues are turned to the inside between the covers. To these tongues the inner leaves can then be stuck, a proper number of tongues being, of course, provided.

Safety Screen for the Fireplace

An unscreened open fireplace is very dangerous where there are small children. Moreover, where wood is used as fuel, another source of danger is present, as sparks and embers are likely to be thrown out upon the carpet, igniting or damaging it.

To guard against these dangers, a screen should be provided. A homemade screen, that is just as good as a purchased one, can be made from

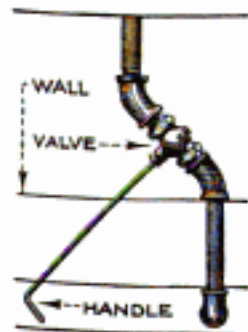


two ordinary metal window screens of the adjustable type. One of the screens is taken apart, and the two parts are hinged to the other screen, as shown in the illustration. Hooks

are provided on the ends, to engage with screweyes, driven into wooden plugs set in the mortar between the bricks of the fireplace. The hooks and eyes keep the screen from falling, or from being pushed over accidentally. When the screen is placed in position, it is impossible for small children to get near the fire. As the width of the center screen can be varied, the fire screen thus made will fit any fireplace of ordinary size.—F. E. Leitch, Brooklyn, N. Y.

Nonfreezing Sill Cock

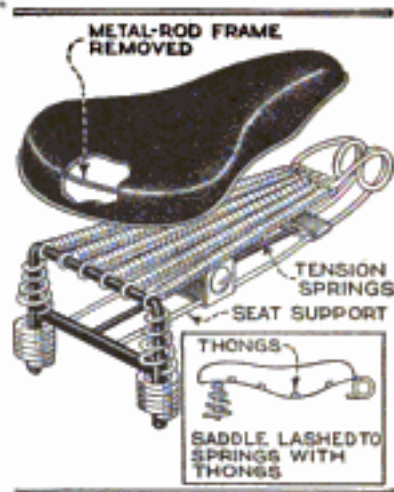
Ordinary sill cocks, or faucets, cannot be used outdoors in cold weather because the water freezes in them very easily. This trouble may be entirely eliminated by fitting a valve or cock in the pipe at a point inside of the building, several feet from the wall. The valve is fitted in the line with two short nipples and two 45° elbows, as shown in the illustration. A rod is fastened to the valve handle and extends through the wall so that the valve can be operated from the outside. The sill cock previously used should be replaced with an elbow.



—E. T. Gunderson, Humboldt, Ia.

Additional Saddle Springs for Motorcycle

Army dispatch riders on motorcycles were provided with wide leather belts to offset some of the back-breaking discomforts of riding fast over rough roads. In order to obtain similar comfort without resorting to the use of such a girdle, a Virginian altered the saddle of his motorcycle as indicated in the illustration.

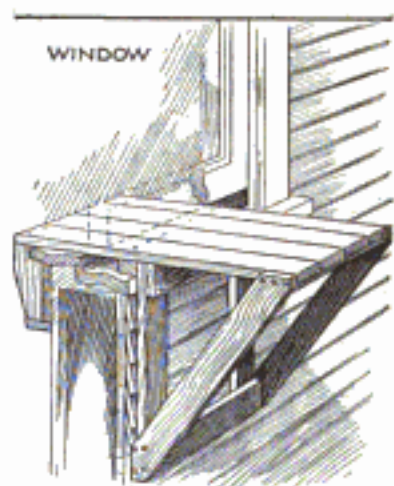


The leather seat was removed and six long coil springs, similar to screen-door springs, but heavier, were substituted for the solid brace bars that connect the front pommel spring to the crossbar of the rear coil springs. The seat was then lashed to these long springs by means of rawhide or leather thongs. This made a very comfortable seat.

A Window-Washing Platform

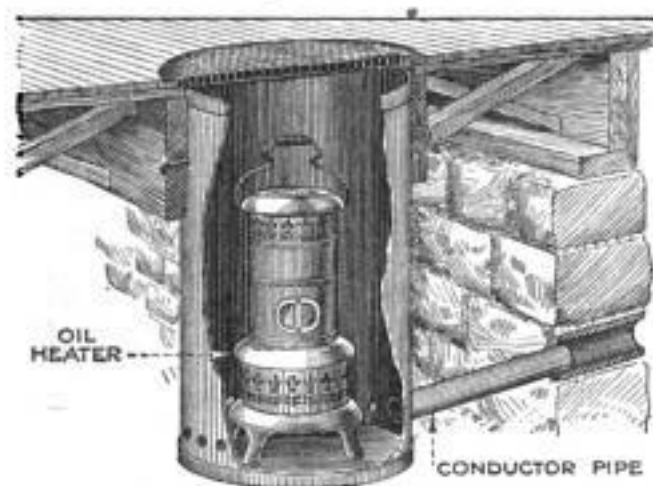
The simple platform illustrated, which can be constructed by anyone, proves of considerable assistance in washing the outside of windows, a task that is usually difficult to perform and is accompanied by more or less danger, especially above the first floor of a building.

The platform is quite safe and may be made to fit any window sill. The brace that rests against the outside of the building bears most of the weight and therefore leaves but a slight strain on the inside fastening, which should fit snugly under the sill. The parts should be fastened together with wood screws, for the greatest security consistent with rough construction.—Roy D. Hudson, Marion, Ind.



Novel Oil-Heater Installation

When an extra room is added to an old house, it is often found difficult to heat it from the existing furnace. The illustration

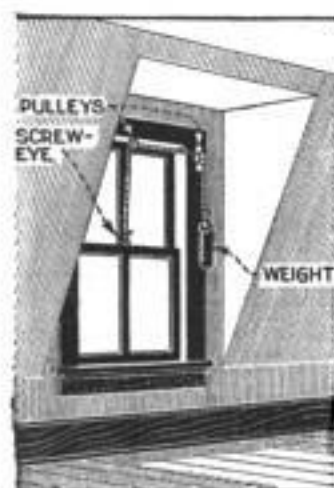


Considerable Floor Space is Saved by Arranging an Oil Heater under the Floor in a Suitable Container. A Hole is Cut in the Floor and Fitted with a Register

tion shows how an oil heater has been arranged to heat such a room. The heater is placed in a discarded flour can, suspended between two floor joists as shown. A circular hole, cut in the floor directly above the heater, is fitted with a register that can be removed to lower the heater into the can. To furnish draft, a number of 1-in. holes are punched in the flour can, near the bottom, or if desired, a single pipe for outside air, arranged as shown, can be used.

Sash Weights for Attic Windows

In old houses, attic windows are usually not provided with sash weights, which makes it necessary to use a prop to keep them open. It is of great convenience, and only takes a few moments' work, to



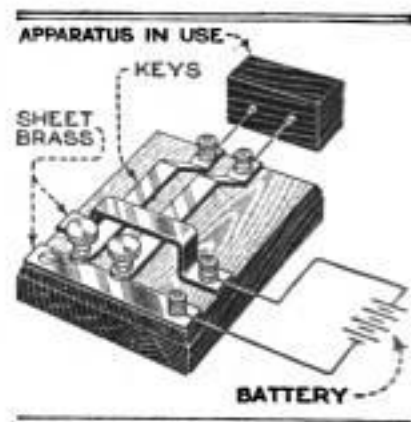
provide a permanent sash weight, so that the window can be opened as far as desired or lowered with little effort. The pulleys and weight are articles that can usually be found in the "junk box," and therefore the cost of the arrangement is practically negligible. A screw-eye is driven into the

center of the lower sash, and the pulleys are fastened to the casing at the points indicated. A length of sash cord, or clothesline, is brought through the pulleys and is tied to the screw-eye and weight, as shown. The weight must, of course, be just as heavy as the sash, in order to counterbalance it properly. Although the weight is not concealed, it is entirely out of the way.

Handy Reversing Switch

The illustration shows a simple switch that can be used to reverse the direction of the flow of current through an electrical device, where the reversal is only momentary. It can be readily made from sheet brass, $\frac{1}{2}$ in. wide and $\frac{1}{32}$ in. thick. The exact dimensions make little difference, so any available material can be used in the construction. The construction of the switch is obvious from the drawing. The

key knobs may be short pieces of doweling, attached by means of flat-head screws. Common dry-cell terminals and nuts are soldered on each key lever and contact strip.



The current supply must be connected to the contact bars and not to the key levers; otherwise a short circuit will result. A moment's study of the diagram will make clear the principle of operation. When a key is depressed, current enters at the bridging bar, flows over one of the keys to the apparatus in use, and then back again over the other key and lower bar to the battery or generator, as long as the key is held down in contact with the lower bar. By pressing the other key down and allowing the first one to rise against the bridge, the current will be reversed.

Dimming Socket Regulates Fan

Many small electric fans are not equipped with a speed-regulating switch, but it has been found that the speed can be readily controlled by screwing the fan plug into an ordinary dimming socket, such as used for bedroom lights. In this way it is possible to operate the fan at five different speeds.

Auto Wheel as Brush Screen for Culvert

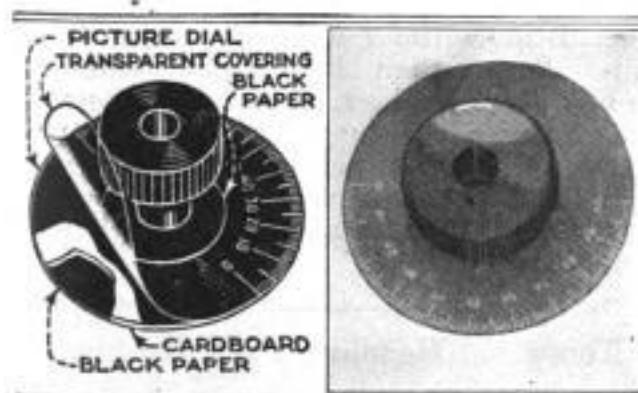
An old auto wheel of the clincher type, with all but three of the spokes removed, makes an excellent brush guard in the upper end of a small farm culvert.

The wheel is set in the form when the culvert is made, and the concrete poured in the usual way. It has been found that the spokes are strong enough to withstand the impact of pieces of wood large enough for stovewood, and will prevent these from passing into the culvert and clogging it, while allowing small pieces to pass through.

Homemade Radio Dials

The neat homemade radio dials shown in the illustration, although perhaps not quite as durable as manufactured ones, are just as serviceable, and quite handy when commercial ones are not readily procurable.

Cut out the face of a dial, printed full-size in an advertisement, or cut a circular piece of thin glazed paper about 2½ in. in diameter, and graduate it neatly. Mount this on a piece of cardboard with glue. Remove the emulsion from an old photo film, with hot water, to make it transparent. Glue this film over the dial face, and a piece of black photo paper on the back side of the dial. Place the dial under pressure while drying, so that it will not warp. After the glue is dry, trim the edges, and give the black photo

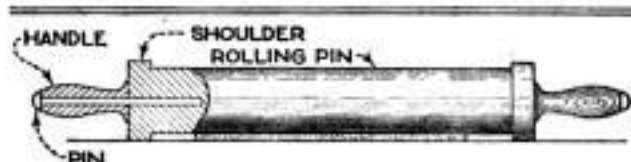


Radio Dials That can be Readily Made of Scrap Material and Are Just as Serviceable as the Purchased Ones

paper on the back of the dial two applications of shellac, to protect it from moisture. Drill a hole through the center of the dial, the same size as the hole in the knob, and glue the knob to the dial. The knobs can be purchased at a very small cost, or can be taken from discarded pot lids.—Walter Chas. Mitchell, Jersey City, New Jersey.

Rolling Pin for Pie Crust

The rolling pin illustrated has been found by a Wisconsin baker to be very convenient for rolling out dough to the



A Rolling Pin, Made with a Shoulder on Each End, Is of Considerable Assistance in Rolling Dough to the Proper Thickness for Pie Crust

proper thickness for pie crust. The pin is made with a shoulder at each end, and loose handles, running on pins driven into holes drilled in the body. It requires only a few minutes' work on a lathe to turn a pin of this type, and if desired, the handles may be turned solid with the body. The difference between the radii of the shoulders and body is equal to the desired thickness of the crust.

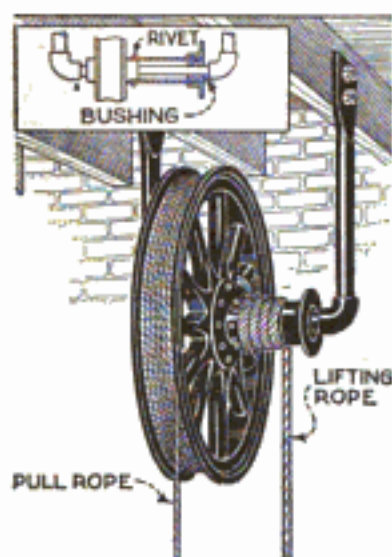
Temporary Repair for Broken Gasoline Pipe

To effect a temporary repair on a broken gasoline pipe, the motorist generally attempts to tape it. This method is not very effectual, however, as the gasoline soon dissolves the adhesive in the tape. A much better repair can be made by using the stem of the oilcan.

Remove the stem and force the tapering end into one part of the broken pipe; then push the other part of the pipe into the large end of the stem. As the stem tapers, a tight fit will result. The arrangement can be held together securely with tape. A repair thus made will serve well until the pipe can be soldered or replaced.—Glenn Baker, Pomona, Calif.

Simple Differential Hoist

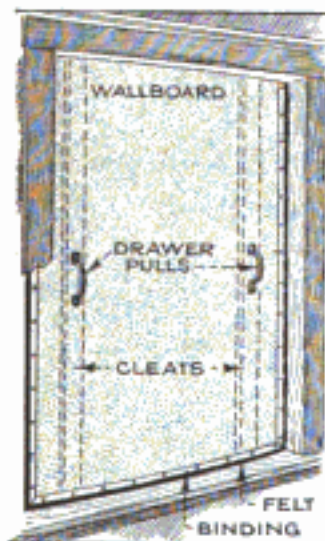
The owner of a private garage seldom uses a hoist often enough to justify the purchase of one, although, when he does need it, he usually needs it badly. The conversion of an old auto wheel into a hoist, as shown, is an inexpensive solution of the problem.



A clincher type of wheel is used, and a length of sash cord is wound around the rim. A section of pipe, one end riveted to the hub and the other end fitted with a flange and bushing, forms the winding drum, and a strong rope, fastened to one of the wheel spokes, and wound around the drum, is used as the lifting rope. The support for the hoist is made of pipe and fittings attached to the roof beams of the garage. The hoist thus improvised has ample lifting capacity, making it easy to hoist one end of a car.

An Inner Storm Window

The illustration shows a removable inner storm window that has been found to be very effective as an insulator against cold. It is specially useful to those who live in the open country, where houses are exposed to the full blast of the wind.



The window is made of wallboard. The length is $\frac{1}{4}$ in. less than the inside height of the window casing; the width, however, is about $\frac{1}{4}$ in. greater than the inside width

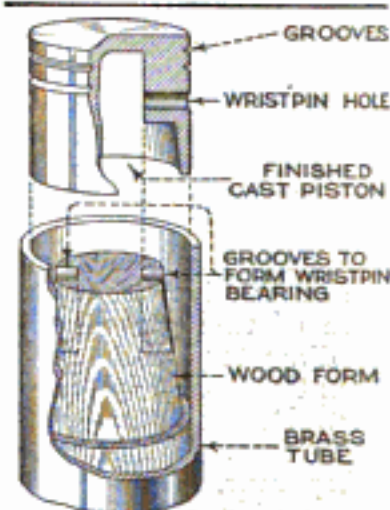
of the casing, so that the board must be sprung a little to fit it into the opening; it will be found to fit firmly against the casing when released. A layer of felt is tacked around the edges of the board, to

prevent marring the casing. Two drawer pulls should be provided on the wallboard near the edges, as shown; they are attached by screws driven through the wallboard into wooden cleats placed lengthwise on the other side, as indicated by the dotted lines.

Making Pistons for Model Engines

To minimize the amount of work required in the building of model gas engines, when using brass tubing for the cylinders, it is an excellent idea to cast babbitt pistons right in the tubing.

A wooden core piece of dry white pine is turned to the shape shown, and carved out for the wristpin bearings. The larger end of the wood core is made a tight fit in the tube. The tube wall is well smeared with white lead before pouring the babbitt,



and the metal should not be too hot when it is poured. When cool, the piston and core can be pushed out of the brass tube, and the core can then be removed from the piston without difficulty. The wristpin holes are then laid out and drilled.

For small engines, rings are not essential, but grooves, turned in the pistons as shown, will greatly increase the compression, and act as a very good substitute for rings. Babbitt and brass work well together.

Tongs for Handling Plant Seedlings

Being unable to obtain, at the stores, such a thing as long wooden tongs for garden use in putting small flower or vegetable seedlings into the holes made for them, a pair was made by fastening two wooden strips to the handles of a spring clothespin. A little piece of wood was first glued between the jaws of the pin to prevent them from closing entirely and pinching the plant. For aster seedlings, or any such small plants, the device worked very nicely.—A. K. Hinkley, Rowley, Mass.

Photography through a Field Glass

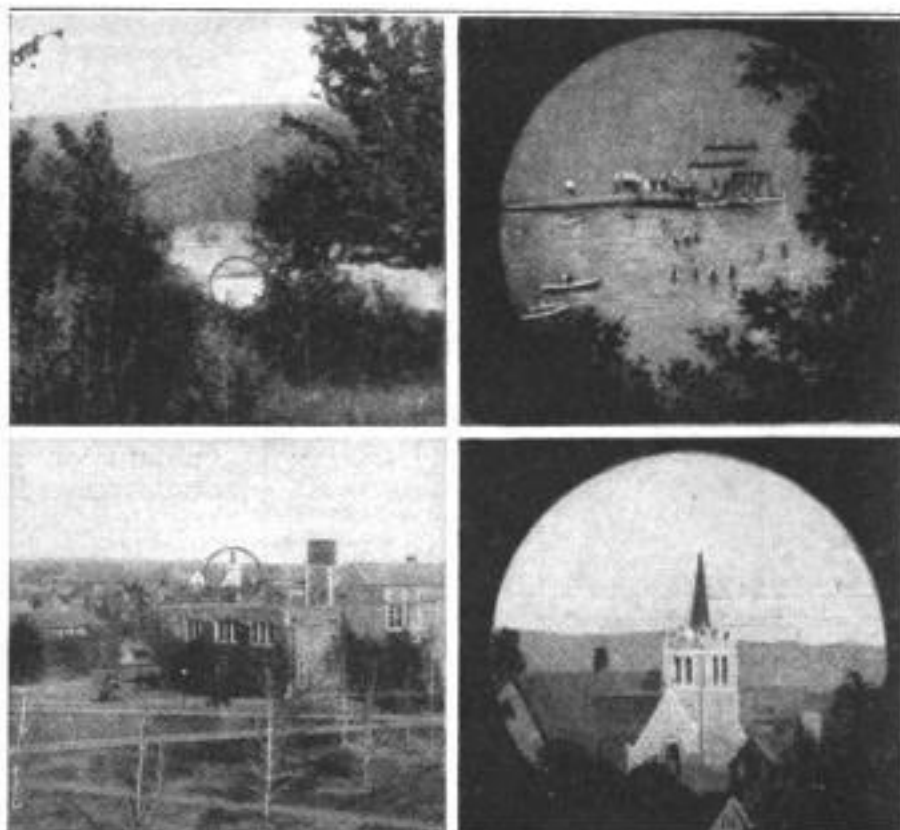
A "hiker's" equipment usually includes both field glass and camera, the use of each offering its own particular delights, with the difference that the camera records what it sees, but the field glass does not. Many people are not aware of the fact that the two can be used in conjunction as a powerful telephotographic device, with which distant scenes can be photographed greatly enlarged.

The upper and lower left-hand photos show views taken with an unaided camera. The corresponding right-hand photos were taken by carefully holding the focused field glass in front of the camera while the exposure was being made.

The adjustments of both camera and field glass are simple. Set the focusing device on the camera to read 100 ft. Remove the plates from the camera and put the ground glass into position. In the case of a film camera, take off the back of the camera before inserting the film and stretch a strip of waxed paper or tracing cloth in the position usually occupied by the film; the waxed paper serves as a ground glass. Open the camera shutter and direct the camera toward the distant view; this will be sharply focused on the ground glass as the camera is set for the "universal" range beyond 100 ft. Now hold one barrel of the field glass tightly against the camera lens. Maintaining this position, adjust the field glass until the desired spot of the distant view is brought into proper focus on the ground glass. To make a permanent record of this adjustment, scratch a mark on the draw tube of the field glass. These operations once carefully carried out need never be repeated.

In making a telephotograph at any time afterward, simply set the camera to focus at 100 ft. Set the field glass to the scratch on the draw tube, and hold it firmly in position against the camera lens. Point the combination toward the subject to be photographed, and make the exposure as usual, but two or three times as

long as ordinarily. It will be found best to use the tripod to steady the camera. Instead of using the camera finder, look directly through the barrel of the field glass, not in front of the camera lens,



Photographing through a Field Glass: The Circles in the Left-Hand Photos Indicate the Spots Photographed, and the Right-Hand Photos Show the Same Spots Enlarged on the Negative

which can be done easily unless the camera is a large one. In sighting through the glass, the eye may have to be held several inches behind the lens, due to interference of the photographer's head with the housing of the camera.

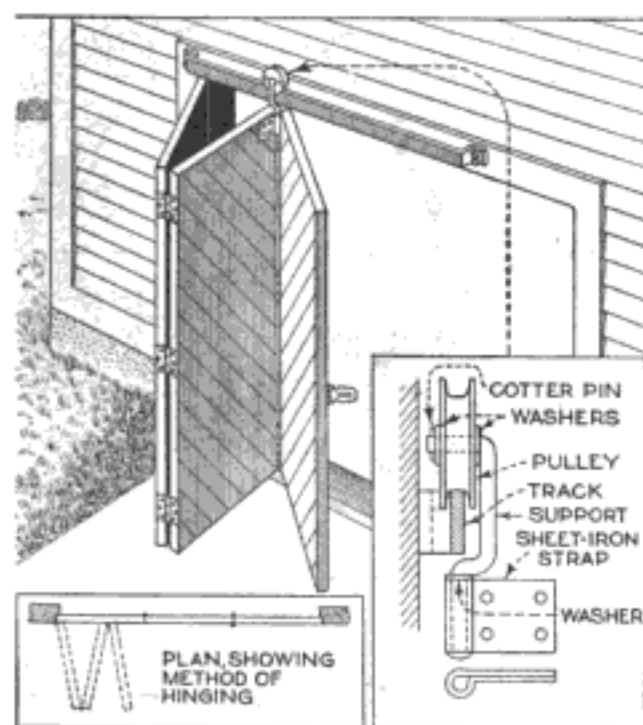
A photograph taken in this manner cannot, of course, be expected to have a larger view than can be seen while looking through the glass. The light entering the camera through the field glass will be confined to a circular area on the plate or film as shown.

Removing Varnish from New Plowshares

When new plowshares, shovels, spades, etc., leave the factory, they are covered with a waterproof varnish that is usually difficult to remove. A solvent that will quickly remove it can be made by mixing one tablespoonful of concentrated lye in one quart of water. The best method of applying this is by means of an old broom, as brushes are ruined by the lye; and as the solution is injurious to the skin, rags should not be used unless tied on the end of a long stick.

A Three-Fold Garage Door

The illustration shows how three ordinary single doors are converted into a triple-folding door for the garage. This



A Three-Fold Sliding Garage Door That Is Superior to the Common Swinging Type Where Space Is Limited, and That may be Hung inside the Garage

door is superior to the conventional swinging garage doors in places where space is limited, and it can, if necessary, be hung inside the garage so that there will be no possibility of snow or ice interfering with its opening or closing.

The doors are hinged to each other with butt hinges, and the edge of one door is hinged to the door jamb. An iron track, made of 2 by $\frac{1}{4}$ -in. material, is attached over the doors, as indicated, and a grooved swivel pulley, fastened to the edge of the center door, runs on the track. The pulley is an ordinary sash pulley, fitted with a round-iron hanger that swivels in a sheet-iron strap. An advantage of this type is that the doors will not close of themselves as is so often the case with swinging garage doors.

Cleaning Radiators

Choked and corroded radiators are often the cause of poor circulation, with the inevitable result of overheating the engine. An excellent and cheap cleaner was recently discovered by a Maryland farmer, who had experienced considerable heating trouble with one of his tractors. Instead of using a small quantity of muriatic acid, which does the work well but

was not available at the time, a substitute acid, consisting of cider vinegar, was used with as good results. The vinegar was left in the radiator for about 15 minutes and then drained out. It was surprising to note the effect of the vinegar on the scale; a thick brownish liquid, filled with scale and rust, poured out of the radiator cock. Clear water was used afterward to flush out the radiator.

Greasing Automobile Fan

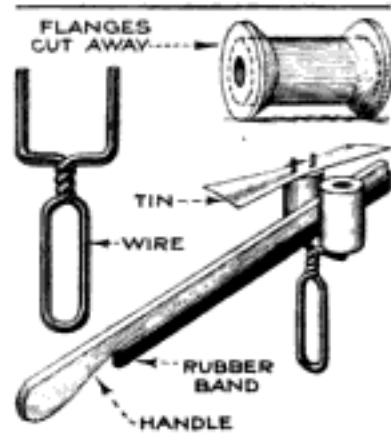
The fan on a light automobile is greased by removing a plug and filling the fan hub with grease. Very little pressure can be applied with an ordinary grease gun, however, before the grease backs out.

Any of the grease cups on the steering column or rear axle can be removed and screwed in to take the place of the plug, when it is desired to fill the fan.

Flying Toy Needs No String

An ordinary flying toy, made from a spool and a piece of tin, was found unsatisfactory, due to the entanglement of the string that was used to operate it. A flying toy, of similar nature, but dispensing with the string, was devised to overcome the difficulty, and was found to work equally well.

A piece of heavy wire is bent to the shape indicated. The flanges of two ordinary thread spools are trimmed off, and two small nails, with the heads clipped off, are driven into the end of one of the spools to hold the "propeller." The propeller is cut from a piece of light tin and twisted as indicated, like the blades of a fan. A thin lath is cut down as shown, and a stout rubber band is stretched over the blade portion.



To operate, place the spools and propeller in place, insert the rubber-covered blade between the spools, and pull it out quickly. The friction of the rubber band against the spools will cause them to rotate quickly, and the propeller will rise into the air.

PRIZE OFFERS AND ANNOUNCEMENTS

CLOSING DATE FOR PULITZER PRIZES FEBRUARY FIRST, NEXT YEAR

Columbia University, under the will of the late Joseph Pulitzer, will again award numerous prizes and scholarships, the majority for excellence in journalistic or literary work. Included among the annual prizes is an award of \$1,000 for the best American novel of the year, \$2,000 for the best book on the history of the United States, and \$1,000 for the best volume of verse published by an American author.

In the newspaper field are included prizes for the best editorial, for the best example of a reporter's work, for the best history of service rendered to the public by the American press, and for the best cartoon published during the preceding year. Two traveling scholarships are also provided, one to the student of music in America most deserving of an opportunity to study abroad, and the other to the art student in America considered most promising.

Nominations of candidates must be made in writing before Feb. 1, 1924, on special forms which may be obtained by addressing the Secretary of Columbia University, New York City.

LUMBER ASSOCIATION SEEKS IMPROVED METHOD OF MANUFACTURING

For the best method, newest machine, or device, which will in application result in the greatest saving of time, labor, or expense in the lumber-manufacturing industry, the National Lumber Manufacturers Association will award four prizes ranging from \$1,000 to \$50. All suggestions must reach the Technical and Research Department of the association, International Building, Washington, D. C., before March 15, 1923.

A single prize for a similar purpose, given in 1922, was won by William H. Mason, of Laurel, Miss., who developed a new method for the extraction of pitch and its by-products from pine. The process was installed in several large mills, and proved quite successful.

ARMLESS PHYSICIAN, MARTYR TO X-RAY, IS HONORED FOR HEROISM

The use of both arms lost through years of work under the X-ray, Dr. Charles Vaillant, one of the first French physicians to devote himself to the study and development of Roentgenology for the benefit of mankind, was recently accorded the "cravat" of the French Legion of Honor, the Carnegie hero medal, and the gold medal of the city of Paris, in recognition of his sacrifice in the cause of science. Both the cravat and the city of Paris medal are rarely conferred on any but the head of a state, or a diplomat.

The doctor lost the little finger of his right hand in 1919, at which time he was told that if he persisted in his work, he was in danger of losing his whole hand. He kept on, nevertheless, and as a consequence lost one finger, then another, until his whole right hand was gone; then the fingers of his left, and finally the whole right arm to the shoulder, and the left nearly to the elbow.

MORE HUMANE SLAUGHTERING DEVICES SOUGHT BY AMERICAN SOCIETY

That cattle and other animals may be slaughtered with the least possible suffering, the American Society for the Prevention of Cruelty to Animals is offering a prize of \$10,000 for a new device or apparatus which will best accomplish this end.

A second prize of \$5,000 is to be given by the society for a new method which will decrease or entirely eliminate the suffering involved in treating and securing the animals prior to the use of the knife, as practiced in slaughtering for the Jewish market.

Circulars, giving full particulars of the competitions, which close April 30, this year, may be had by addressing the society at 50 Madison Ave., New York City.

AMERICAN INSTITUTE OF CHEMISTRY FOUNDED IN NEW YORK CITY

An American organization similar to the Institute of Chemistry of Great Britain, and the Canadian Institute of Chemistry, was founded, recently, at a meeting of New York chemists. It is to be called the American Institute of Chemistry, and will enroll only those among the nation's chemically trained men who can measure up to certain requirements in education and experience. With this qualification for membership, the institute will endeavor to perform for the chemist the same service as the American Bar Association for the lawyer.

FOUR-YEAR UNIVERSITY SCHOLARSHIP FOR BEST ESSAY ON HIGHWAYS

A four-year university scholarship, valued at not less than \$4,000, or \$1,000 annually, is to be given by the Highway Education Board for the best essay written by a high-school student on "The Influence of Highway Transport upon the Religious Life of My Community." All students of high-school grade, whether in public, private, or parochial schools, are eligible to compete. Essays are not to exceed 700 words in length and are to be submitted to the proper school authorities not later than May 1, this year.

BUREAU OF STANDARDS HAS VACANCIES FOR CHEMISTS AND PHYSICISTS

Vacancies for a laboratory assistant, senior grade; junior engineer; junior physicist; junior technologist, and junior aids of first and second grades, have occurred in the organization of the Bureau of Standards and will be filled from among those qualifying in examinations to be held in the near future.

Positions with the government as laboratorian, and as structural engineer and draftsman, are also open.

Those contemplating taking any of these examinations should write the Civil Service Commission, at Washington, D. C., for Form 1312, stating in the same letter, just what examination is being considered.

WAR NURSES AND EX-SERVICE MEN TO RECEIVE SCHOLARSHIPS

Women who served in the nurse corps of the army or navy are to receive 30 university and college scholarships, and ex-service men 230, according to the provisions of the will of the late La Verne Noyes of Chicago. Twenty of the scholarships for the nurses are allotted to the Teachers College of Columbia University, New York; five to the George Peabody College for Teachers, Nashville, Tenn., and five to the University of California, Berkeley, Calif.

The 1923-24 scholarships for ex-service men are distributed among 22 universities and colleges. Northwestern University, Evanston, Ill., has been provided with 100, the Lewis Institute of Chicago, 40; other allotments include Amherst, Illinois, and Cornell.

Applications should be made to the college direct.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute. The Franklin medal is for workers in technology; the Elliott-Cresson is for original research work and invention; the Howard N. Potts is for important development of previous discoveries and inventions. Each award consists of a gold medal with a diploma. There are also a silver medal, and a Certificate of Merit awarded for meritorious discoveries, and cash premiums for certain work in optics.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Research Thesis by a Woman: Prize \$1,000; announced October issue, 1921; awarded annually; address, Dr. Lillian Welsh, Goucher College, Baltimore, Maryland.

When answering prize offers please mention Popular Mechanics Magazine

Annual Commercial Airplane Contest for "Italy's Great Trophy": Announced July issue, 1922; address, Aero Club of Italy.

Best Treatise Regarding Immortality: Prize \$1,000; announced January issue, 1923; closes Dec. 1, 1923; address, Contest Editor, 2 West 47th Street, New York City.

Awards to Further Science of Electricity: Medals and prizes, amounting in all to about \$20,000; announced February issue, 1923. For particulars address General Electric Company, Schenectady, N. Y.

For Best Paper on Technical Phase of Aeronautics: Prize \$125; closes March 31 of each year; announced February issue, 1923; address, Royal Aeronautical Society of England, 7 Albemarle St., London, W. 1, England.

For Best Work by American Chemist: An annual award of \$25,000; announced February issue, 1923; address the Allied Chemical and Dye Corporation, New York City.

Articles on Chemistry: Prizes \$50 and \$25; announced January issue, 1923; closes May 1, 1923; address, Secretary, Canadian Institute of Chemistry, Toronto, Ont.

Names for Great Lakes Steamers: Two prizes of \$50 each; announced February issue, 1923; suggested names must reach the company before the opening of navigation season in 1924; address the Detroit and Cleveland Navigation Company, Detroit, Mich.

For Best Studies in the Economic Field: Four prizes from \$1,000 to \$200; announced March issue, 1923; closes June 1, 1923; address, Prof. J. Laughlin, University of Chicago.

Literary Contest by the New Pearson's Magazine: Nine prizes totaling \$1,500; announced March issue, 1923; closes May 1, 1923.

Traveling Scholarships: Twenty, to be given by the American-Scandinavian Foundation; announced March issue, 1923; address applications to Secretary, 25 W. 45th St., New York City, before March 15, 1923.

Motorboat Race, Miami Beach, Fla., to Havana, Cuba: Prizes \$10,000; announced March issue, 1923. Write Miami Chamber of Commerce.

Essay on Economic Subject: Prizes \$1,500; announced March issue, 1923; address the Simonds Economic Prize Contest, 470 Main St., Fitchburg, Massachusetts.



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BIRD'S-EYE PICTURE OF PARACHUTE JUMP PRESENTS UNUSUAL VIEW

IN this unusual picture of a parachute jump, made at Ormond Beach, Fla., the parachute appears like a huge mushroom poking its head through the surf. Although it looks as though the parachute jumper had fallen into the ocean, the wind really carried him safely to land. The automobiles lined up along the beach and the crowd who came to get a thrill, look like so many bugs to the eye of the camera, which was in an airplane 3,000 feet in the air.

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