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SEE PAGE 72

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Complete Line of Consoles
The big new Midwest catalog shows gorgeous line of artistic consoles in the new six-leg design. Ask for catalog now. Get all the facts. Learn how you can save 30% to 50% on a big powerful radio.



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"Am having good results with my 16-tube Midwest. On the short wave I have had most all of the large stations. I get several of the Airport Stations and amateur stations a plenty. Had G6SW, LEX, Buenos Aires, VK2ME, VK3ME Sydney, VE9GW, Bowmanville, Canada, Pointoise, France and Nauen, Germany."

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GERHARDT WINTHER (whose picture is above) lost his job as a Baker. Couldn't find a thing. Savings dwindled. Faced with Charity—or worse. Suddenly he came up smiling in an astonishing new business, that swept him up to prosperity—overnight! Made money from the first day. Now after being in business only 90 days he writes: "When others talk about Depression I can laugh. I make more now every week than I ever made before, my self-confidence has been restored, I can stay at home and take in as high as \$125 a week from my wholesale and retail business. What a business! What a break!"

Winther's is not one isolated example—an exception—No! He is one of fifty! For while this money-making business is so new the public hardly knows about it, all over fifty men have started it in all parts of the country. And in some of the times, they're making money—some only \$50 or \$60 a week, but others up to as high as \$150 and even more. And this astonishing, ready-made business in which I can now start a few more men is so profitable that it is possible to make as much as \$48.40 a day, doing a wholesale business only and letting others do your selling for you.

What's the Secret?

This new business is so simple that you may be inclined to dismiss it with a wave of the hand. But thoughtful men who can analyze its possibilities will see in it a source of real money. It's the Potato Chip Business. But that isn't all. A strange discovery about potatoes has enabled us to build a machine that makes a New Kind of Chip—not like any other potato chip you ever saw or tasted. Even the old-fashioned kind of potato chip has made fortunes for hundreds of men. But now with this new chip, the possibilities are unlimited. It is different in appearance, different in taste, and in addition it has one astounding new quality that sets it entirely apart from anything ever offered before—it is "MINERALIZED."

Nine Vital Minerals

Not many people know this, but Department of Agriculture figures show that raw

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\$10.85 Profit from \$1.95

Cooked the new way, \$1.95 worth of raw materials makes \$12.80 worth of finished products at retail prices netting \$10.85 profit! And the VITA-SEALD machine operates with such incredible speed that \$12.80 worth of chips is only one hour's maximum output! The profit on the same hour's work, if chips are sold at wholesale, is \$6.05. Working 8 hours a day and doing only a wholesale business you can actually net \$48.40 a day on a capacity business. And that requires no retail selling. Even if you did only half this well you would be making \$24 a day profit—or \$144 a week.

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The facts presented here are a bare outline. Limited space permits no more. But if you are interested in this startling business that can bring you a big income of once—in any locality—that can make you independently wealthy in a few short years, you are urged to write for my 16-page illustrated book that presents all the facts in full detail. Immediate action is imperative. This is among the first of my public announcements. Yet, already, over 50 men are on the way to big money. Hundreds of others have written for information. So it will pay you to get this information without a moment's unnecessary delay. No salesman will call on you. And a request for information doesn't place you under the slightest obligation. Send the coupon—or better still, a wire—today, to A. H. Adams, President,

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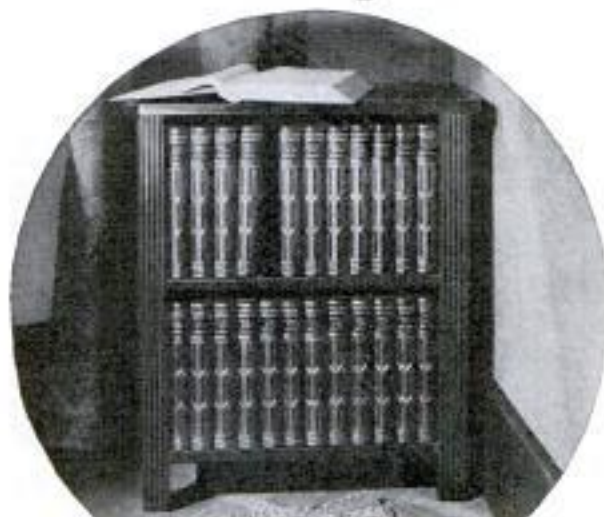
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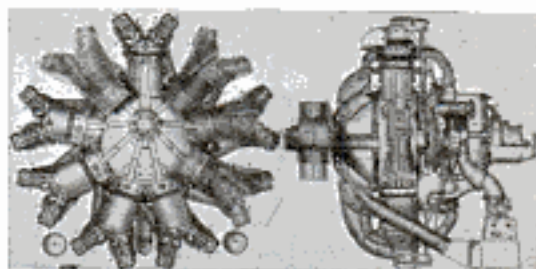
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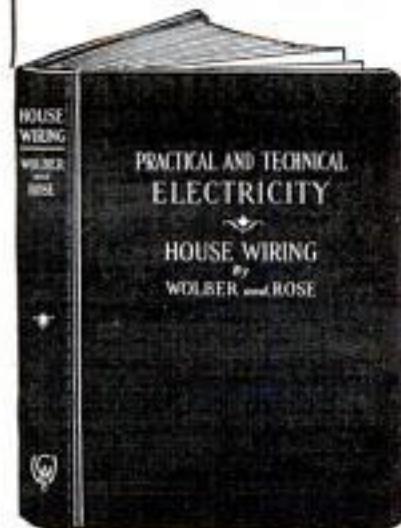
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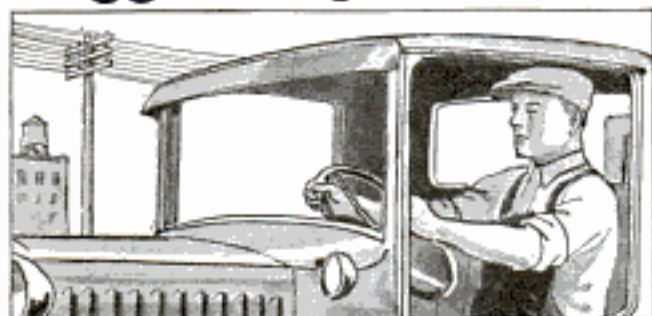
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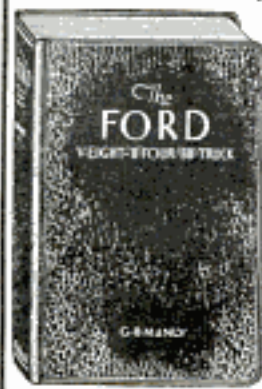
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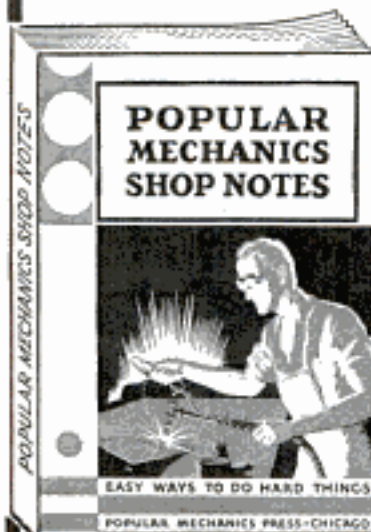
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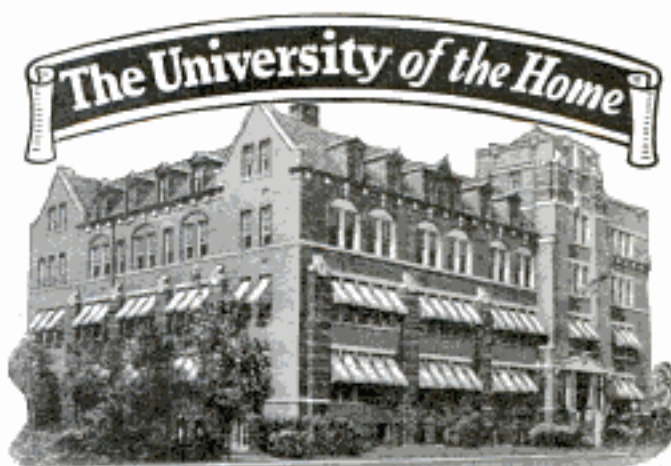
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THOUSANDS OF MOTORISTS today paid for something they didn't get. Were you one of them? Did you pay for a quality brand of oil for your car, and get a weak, dangerous imitation instead?

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Popular Mechanics Magazine

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Vol. 59

JANUARY, 1933

No. 1

031966



Electric-Eye Engraving

THE newspaper reader depends on pictures to bring home the news, but because of the expense heretofore involved in photo-engraving, only about 300 of the 2,000 daily papers in the United States have been able to make their own illustrations. The others either use no pictures or depend on syndicate photos sent in the

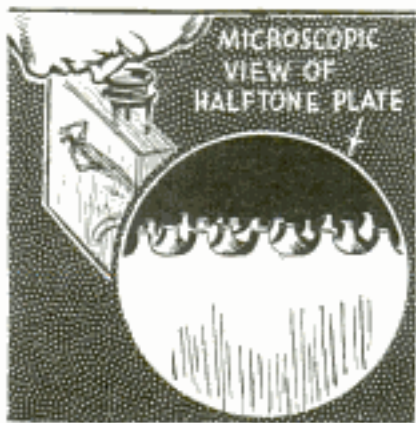
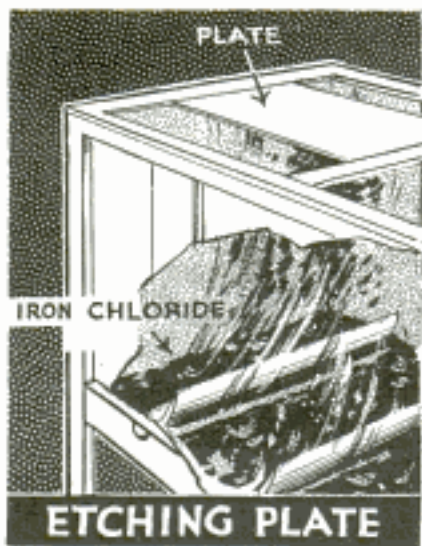
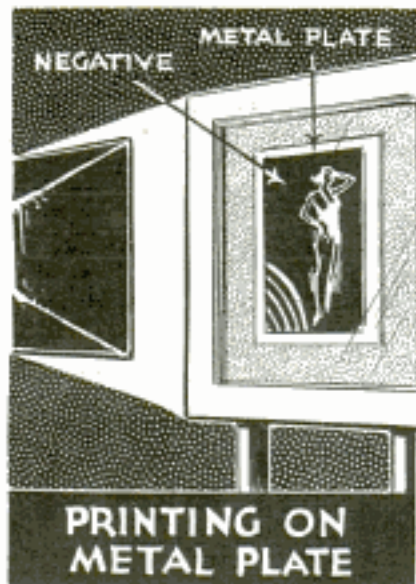
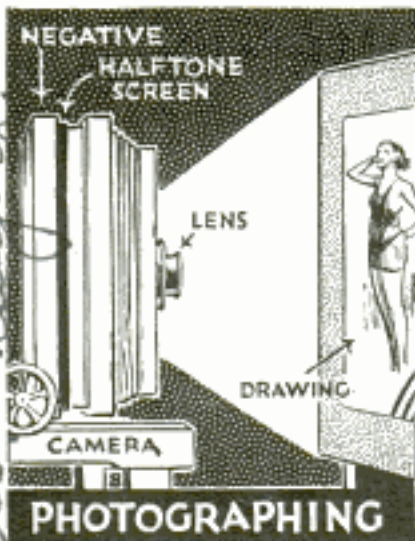
form of cardboard matrices from which type-metal negatives are cast for printing.

Under this arrangement, the smaller paper may obtain a picture of an event of general interest, but is unable to give its readers the local news in picture form. If the latest developments in engraving fulfill the promise they now portray, how-

Cont. Robert Potter, 65 Madison St. New York.

B 1966

International News Photos
235 E 45th New York



Diagrams Showing the Various Operations Necessary to Produce an Engraving under System Heretofore Employed by Photo-Engravers

ever, the small newspaper may soon overcome this handicap.

In New York recently a new method of engraving was demonstrated which is both rapid in action and inexpensive in operation. Its adaptability was shown when the inventor, Walter Howey, took a picture of an audience, developed it on the spot and turned out an engraved cut, suitable for newspaper reproduction, in twenty minutes. To make the cut alone by classical methods would have required two hours. In some ways the process resembles the old method of making wood cuts. The essential advance is that the chiseling strokes of the cutting tool are controlled by photo-electric cells, or "electric eyes," instead of the hand of man.

The old-time maker of wood cuts pushed or drew a V-shaped tool across a wood block in a series of parallel lines of varying width and depth. For white, the tool cut lines deeply and so close together that the entire surface was cut away, would not transfer black ink to white paper, and so printed white. For black, the lines were very shallow and just close enough together to prevent smudging of the ink. For the grays, or intermediate tones, the lines were of varying separation and depth sufficient to provide the necessary optical illusion.

Illusion is the proper term to describe

these grays. If we place dots or lines closer together than 100 to the inch we exceed the limit of the eye to resolve them into their reality; the dots furnish the illusion of grays although the actual colors are black and white. Only in the coarser half tones do the dots become noticeable. In the new method of engraving the illusion of grays is obtained by the spacing of tiny lines eighty to the inch.

The Howey engraver looks like a cross between a small lathe, two dictaphone cylinders and a radio set. Mounted on a common shaft of the lathe-like base are the two cylinders; around one is wrapped the picture to be reproduced and around the other is a thin sheet of zinc on which the engraving is to be cut. The rays from two electric lights are focused on the picture; a thin nozzle-like tube, containing an optical system, focuses a spot of the reflected light on a photo-electric cell, which converts it into electric energy. This is amplified and, when stepped up to a certain point controls the cutting tool.

For white places in the picture the reflected light is strong and the electrical energy from the photo-cell is comparatively great. The cutting tool thus digs more deeply into the zinc plate than for blacks where the reflected light is weak.

Both picture and zinc plate are revol-

ing on the same shaft so that while the photo-cell scans the picture the cutting tool is routing out a record, on the zinc, the depth and width of which is a close approximation to the shadings in the original picture. The finished zinc record resembles a closely cut dictaphone cylinder. The final stage is to remove the zinc engraving and place it directly in the printer's page form.

By current methods the picture is rephotographed by the engraver when covered with a glass screen ruled both ways with very fine lines. For magazine work this screen may be ruled with 150 lines to the inch each way, or with 22,500 tiny windows to the square inch.

When the negative of this engraver's photograph, the original picture plus the fine screen effect, is placed in a strong beam of light, the crossing of lines stops the rays but through each small window the light streams. When this whole group of light points falls on a metal plate, suitably coated with chemicals, the coating becomes insoluble to the action of the etching acids at the little dots.

Wherever the light points do not fall, the acid eats away the plate, leaving the tiny points as raised dots. These dots pick up ink on the press and transfer it to the white paper.

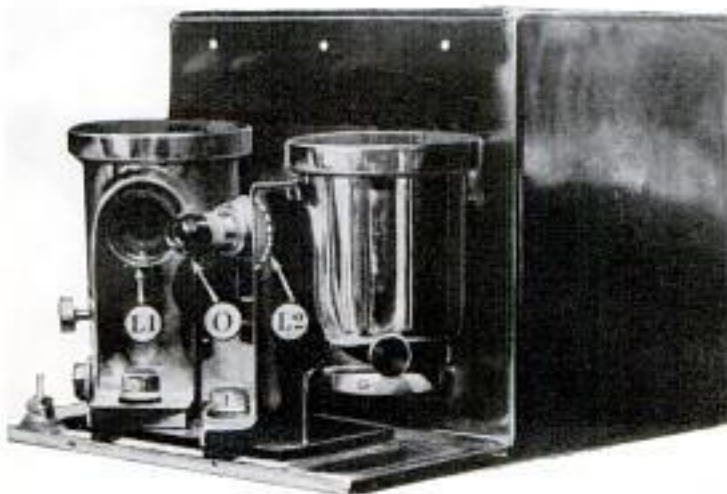
All this necessary rephotographing and



Example of Photo-Engraving Produced by the Rapid and Inexpensive Photo-Electric Process

etching by acids takes time and money. Cutting out these two steps alone gives the new process an advantage in speed of reproduction and cost of manufacture.

The new development can also engrave color plates for the three-color process of printing. The method here is to scan colored pictures three times and make a plate of each scanning. First yellow-colored lights illuminate the picture and the photo cell picks out all the true yellows, or their combinations and engraves them on the zinc plate. Next a blue and finally a red plate is made. Here again the speed and saving of the method are striking; three-color plates have been made in a half hour which would take a day and a half by photo-engraving methods. The cost may be \$20 instead of \$50 or \$100.



Scanning Head of Electric-Eye Engraver; L-1 and L-2 Are Scanning Lamps; O Designates the Optical System

B1829

Jaybit Co. 1475
Broadway New York

B1869



Canyon Where Hoover Dam Is Being Constructed Is Turned into a "White Way" at Night by Dishpan Reflectors behind Lights

TIN DISHPANS USED TO LIGHT HOOVER DAM

Used as reflectors, 10,000 bright new dishpans are helping turn the Hoover-dam canyon into a "white way" at night. The ordinary dishpan was found by contractors to reflect more light and to stand more hard knocks than anything else, so all Hoover dam lights are equipped with the useful household article.

WASTE MADE INTO INSULATION AT LOW COST

Sawdust and coal ashes, held together by a special bonding fluid, are the materials used in a new fireproof, soundproof and waterproof type of insulation. Freight charges are saved, since the contractor may utilize waste materials right on the job. The product can be cast in any thickness or shape to suit conditions in homes, around furnaces and other places where the retention of heat is desired. In one test applied to a three-fourths inch sheet of the insulation material, blowtorch heat required 15 minutes to penetrate it.

Wide World

B1984

Steel River Mfg Co South of New York City

Steel River Mfg Co South of New York City

POINTS WIN GAME WITH NUMBERED CHECKER MEN

By numbering each piece, checkers has been changed into an even more interesting game. Each checker, or man, has a definite value, and when the checker reaches the king row, its value doubles. The game is played for points and is won when one player's checkers are removed from the board. The winner totals the number of points represented by the checkers he has left on the board. The game is played in the conventional way with a few exceptions. If one player is blocked so he cannot move, his opponent wins double, less the total of the loser's checkers. If both players are left with one king each,

after six moves the player whose king represents the largest number of points wins the game, while, if both kings are of the same value, the game is a draw, under a special rule.

Check O. Point



By Numbering the Pieces, Checkers Is Brought Up to Date; This Makes Scoring Possible

Cont. from Black. of Publicity Dept.

Beam Gun Gives Signals for Airplane Pilots

Pilots using the United airport at Los Angeles are being directed by a beam gun which "shoots" signals of light. The gun is intended to make landings and take-offs safer. It resembles a small trench mortar, but has a regular pistol grip and peep sights. When aimed at a plane and fired by pulling the trigger, it



Beam Gun by Which Light Signals Can Be Directed to Individual Pilots; It Is Visible for Twenty Miles



flashes either a red danger or green safety light as the operator chooses. The beam is visible by day or night at distances up to twenty miles and is expected to supplant the starter's flags and night-signal lamps. Its particular merit is that it may be directed at the individual pilot for which the signal is intended, and other flyers are not confused.

B1963

NEW KIND OF TOMATO GROWN FROM TUMOROUS PLANTS

Possibilities of new kinds of plants being originated from tumorous growths purposely induced are held out by results of an experiment conducted by Dr. Dontcho Kostoff, of the Leningrad Academy of Sciences, and Dr. James Kendall, of New York City College. They noticed abnormalities in the internal structures of cells in plant tumors which were of a kind that often goes with the production of new varieties. They therefore produced tumorous tomato plants by injecting bacteria into

the stems. When the tumors developed, the stems were cut off above them to induce the formation of new sprouts. Some of these sprouts arose from the tumors and by cutting them off and rooting them in soil, independent plants were obtained. The new plants do not differ greatly from the parent stock, but the experiment is regarded as significant since it opens a new way of inducing the development of plant varieties.

AUTO TIRE CHAIN WITH CLAWS BUCKLES ON LIKE BELT

B1949

Claws on one type of automobile tire chain firmly grip the road when rain or snow makes the surface slippery. A simple fastener that is as easy to apply as buckling on a belt holds the chain in place. Chafing of the wheel is eliminated by an offset plate and by rubberizing the strap which fastens the side plates. Two strips of chain



equipped with claw links are provided for each

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Science News Letter
9/27/52
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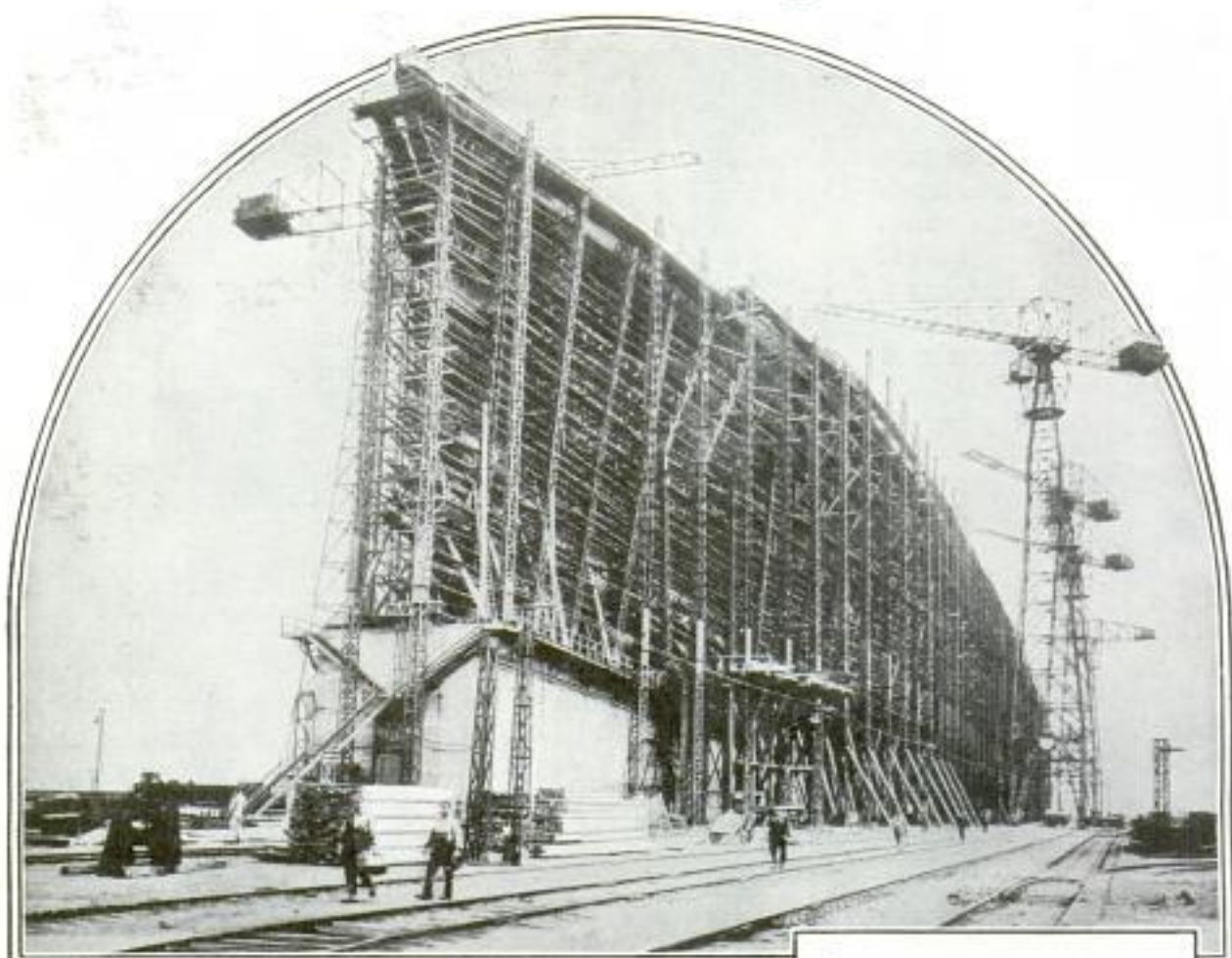
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3 1916 French Line (Clay Morgan,
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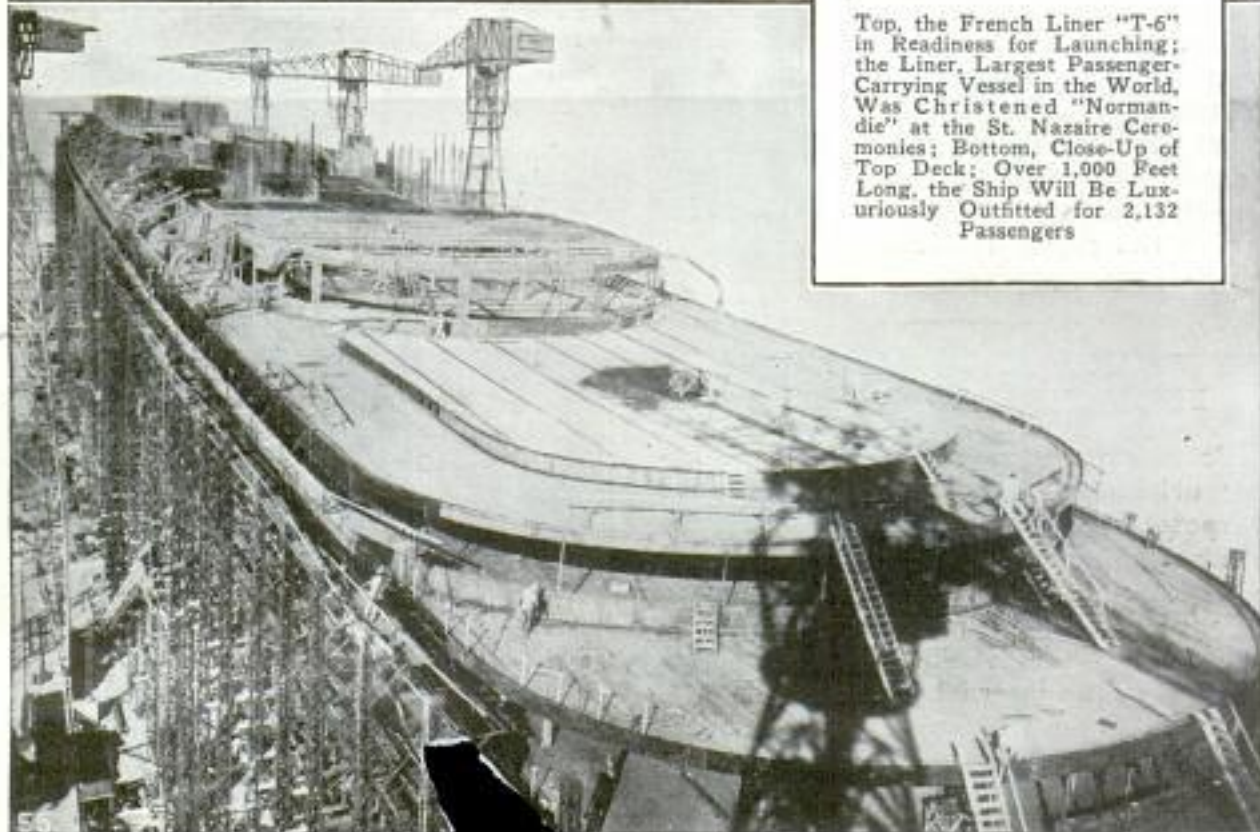
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POPULAR MECHANICS

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Top, the French Liner "T-6" in Readiness for Launching; the Liner, Largest Passenger-Carrying Vessel in the World, Was Christened "Normandie" at the St. Nazaire Ceremonies; Bottom, Close-Up of Top Deck; Over 1,000 Feet Long, the Ship Will Be Luxuriously Outfitted for 2,132 Passengers



see
Nov. 1934, 642.
Dec. 1932, 881

B1976

001932

ELECTROPLATING OF TUNGSTEN PATENTED

New York City

Science Service 4/3/32

After sixty years of unsuccessful attempts to develop a commercial method of electroplating with tungsten, patent papers have been issued to Prof. Colin G. Fink, of Columbia University, on a process in which solutions of tungsten salt are used. The deposit is said to be smooth, hard and coherent and has a high luster. No polishing after plating is necessary if the article is polished before plating. The finished product is not attacked by acids or aqueous alkalis and does not tarnish in the air. Professor Fink's process of plating out tungsten from solutions of tungsten salts in water can be carried out on a commercial scale.



Tile, Bits of Glass and Mirrors Are among the Things Used to Get Colorful Effects in These Unusual Pieces of Pottery

POTTERY IN MOSAIC PATTERNS DECORATED WITH TILE

Bizarre and extremely colorful pottery in mosaic patterns is being produced by a Los Angeles artist who employs bits of tile, glass and even mirrors for decoration. The pottery is being used in gardens and similar places for flowerpots and vases.

George Kester

LIFE WITHOUT ANY PARASITES IS SEEN FOR FUTURE

B1964

As the result of recent experiments at Washington University, St. Louis, a time is foreseen when human beings can be protected against unpleasant and harmful invasions of large parasites as well as disease germs. Immunization of human beings against bacterial diseases has been practiced successfully in medicine, and two years ago it was shown that the rat can be artificially immunized against infection by a tapeworm, and these experiments have now been carried to a point where there is hope of developing a similar protection for man. Rats were treated by injecting a serum from infected rats, and serum from immunized rats also was found to give protection to other animals.

reported to Society for Experimental Biology and Medicine

MECHANICAL PILOT FOR SHIPS GIVES POSITION QUICKLY

B1817

Safe navigation without human aid is said to be possible with a mechanical pilot for ships. Reliable in all kinds of weather, the instrument gives the correct position of the ship at a glance, relieving human navigators for other duties.



This Instrument Shows Ship's Position at a Glance

*Dr. M. de Suer
of Frenchman*

Science News Letter 8/13/32

*Dr. H. M. Miller Jr.
Dr. Margaret L. Gardner*

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 Chicago

Jel. 8
 Brunswick
 4100

Bridge Table with Mechanism Which Shuffles Deck and Deals the Cards

\$25.00 Standard.
 \$40.00 deluxe.



Hammond Electric

BRIDGE TABLE SHUFFLES DECK AND DEALS OUT CARDS

Bridge has been made a simpler game, at least as far as dealing and shuffling the cards is concerned, by a table which performs these tasks automatically. On the underside is a drawer in which the cards are placed. When the drawer is closed the mechanism under the table is started and, after shuffling, the pasteboards are deposited, one at a time, in little compartments in front of each player. When thirteen cards have been delivered to each person, the machine stops.

HOW TO MAKE WOOD BETTER IS SOUGHT BY INDUSTRY

How to improve wood and to extend its uses are problems on which the industry is working. The forest-products laboratory of the department of agriculture is engaged in research of this kind. For instance, a treatment that will greatly reduce wood shrinkage and swelling is sought to remove one of the principal disadvantages of wood. Joints and fastenings, now the weakest parts of wooden structures, need improvement. Wood

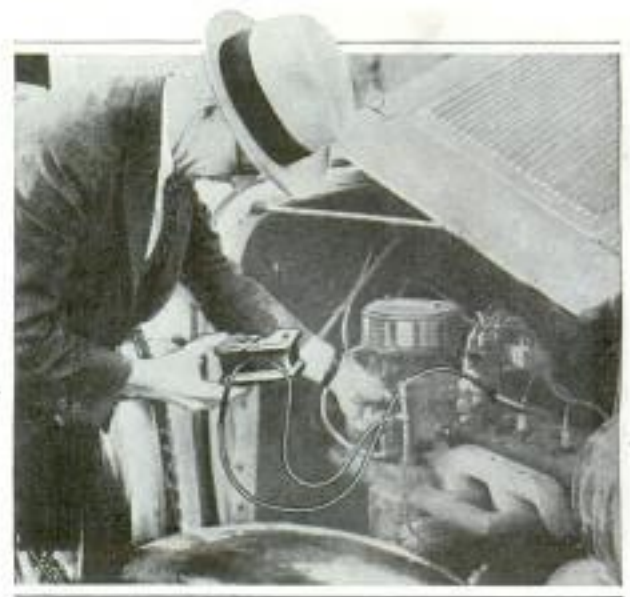
Science Service
 1/2/62

Madison Wis

could be made more attractive by coloring with transparent dyes or treatment with gases, such as ammonia, or the luster might be increased by transparent coatings. Scientific study of wood-working machinery is necessary, such as development of a planer that would leave no marks. These problems are listed by Arthur Koehler, of the forest-products laboratory.

BAD SPARK PLUGS REVEALED BY 1620 TESTER

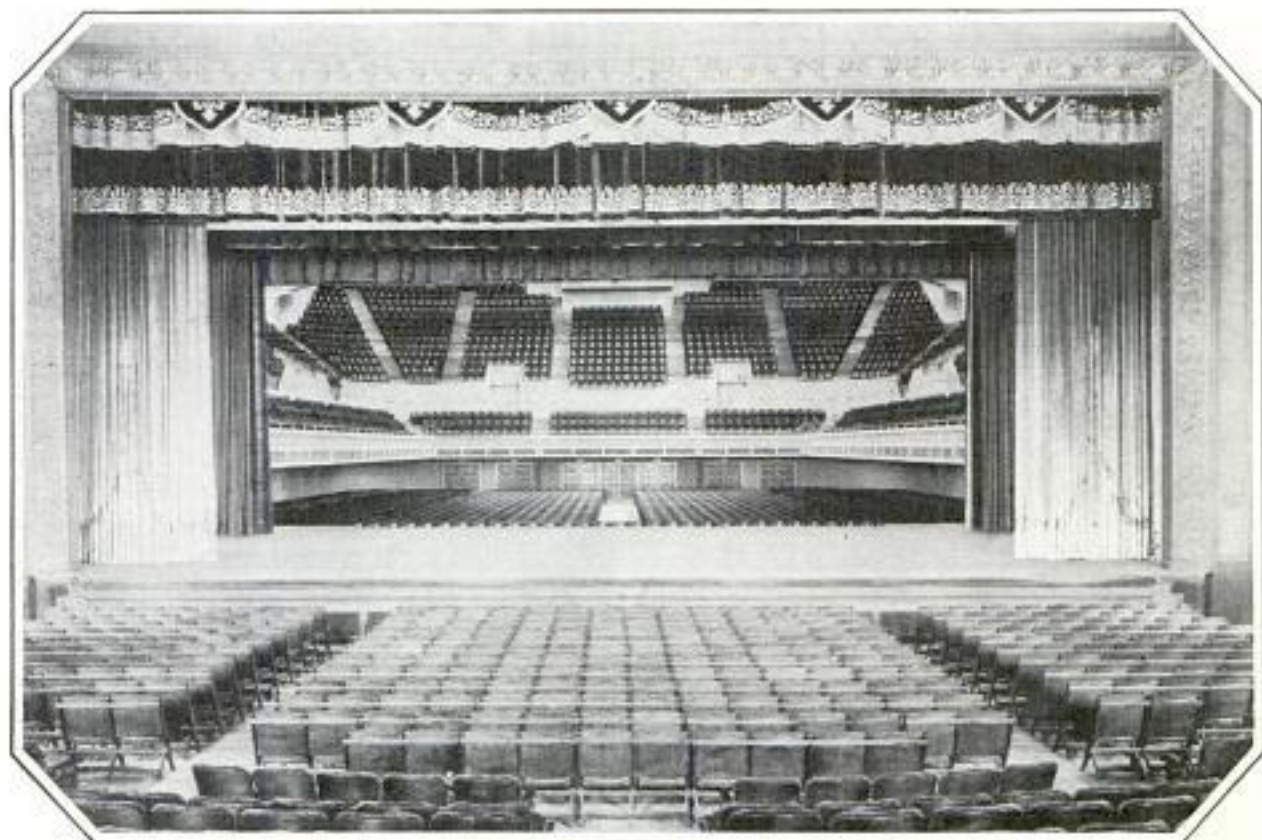
If one of the spark plugs on your automobile engine is missing at any speed, a new tester reveals the trouble immediately. A flasher tube gives a constant bright-red flash through a slot in the case if the spark plug is in good condition. The tester simply clips onto the plug while the engine is running, and an examination at all speeds, from idling to high, is provided. If the flash dims or disappears during the accelerating range, the plug is at fault and should be cleaned or replaced.



Auto Owner Making a Quick Test of the Spark Plugs with New Device

A.C. Spark Plug Co
 Flint, Mich

One Stage Serves Audiences of Two Theaters



Theater and Concert Hall with One Stage Between Them Which Serves Both Sections: Much of the Equipment Is Reversible, but Each Side of the Stage Has Its Own Footlights

Both the main theater and concert hall of the city auditorium in Long Beach, Calif., are served by one stage which is placed between the two sections. Because of this double use, much of the equipment is reversible, but each side has its own footlights. Soundproof and fireproof curtains form the back, according to the side that is being used, but the full use of the entire stage can be had from only one side at a time. However, while a spectacular entertainment is being given on one side, speakers can occupy the apron on the other side of the curtain. To this extent, two audiences can be entertained at the same time in different halls.

GOLD HUE IMPARTED TO SNOW BY YELLOW INSECTS

Golden snow often is seen in the mountains of Glacier national park late in the winter, the effect being caused by great numbers of brilliant canary-yellow insects covering the surface of the snow while others float on standing pools of water,

giving it likewise a golden glow. These colorful little insects, about one-sixteenth of an inch long, exist for a few days only. Collectively they are known as "collem-bola," meaning glue pegs, since they exude a sticky fluid enabling them to adhere to smooth surfaces.

HIDDEN FLAME IN SOLDER IRON IS FED ACETYLENE GAS



Soldering in a high wind and at higher temperatures than usual is possible with an acetylene-operated iron that has its flame concealed in a chamber around the base of the tip. The arrangement enables the operator to

work close to electrical equipment without danger.

R. L. Pontius Co
 15 N. Union, Chicago, Ill.

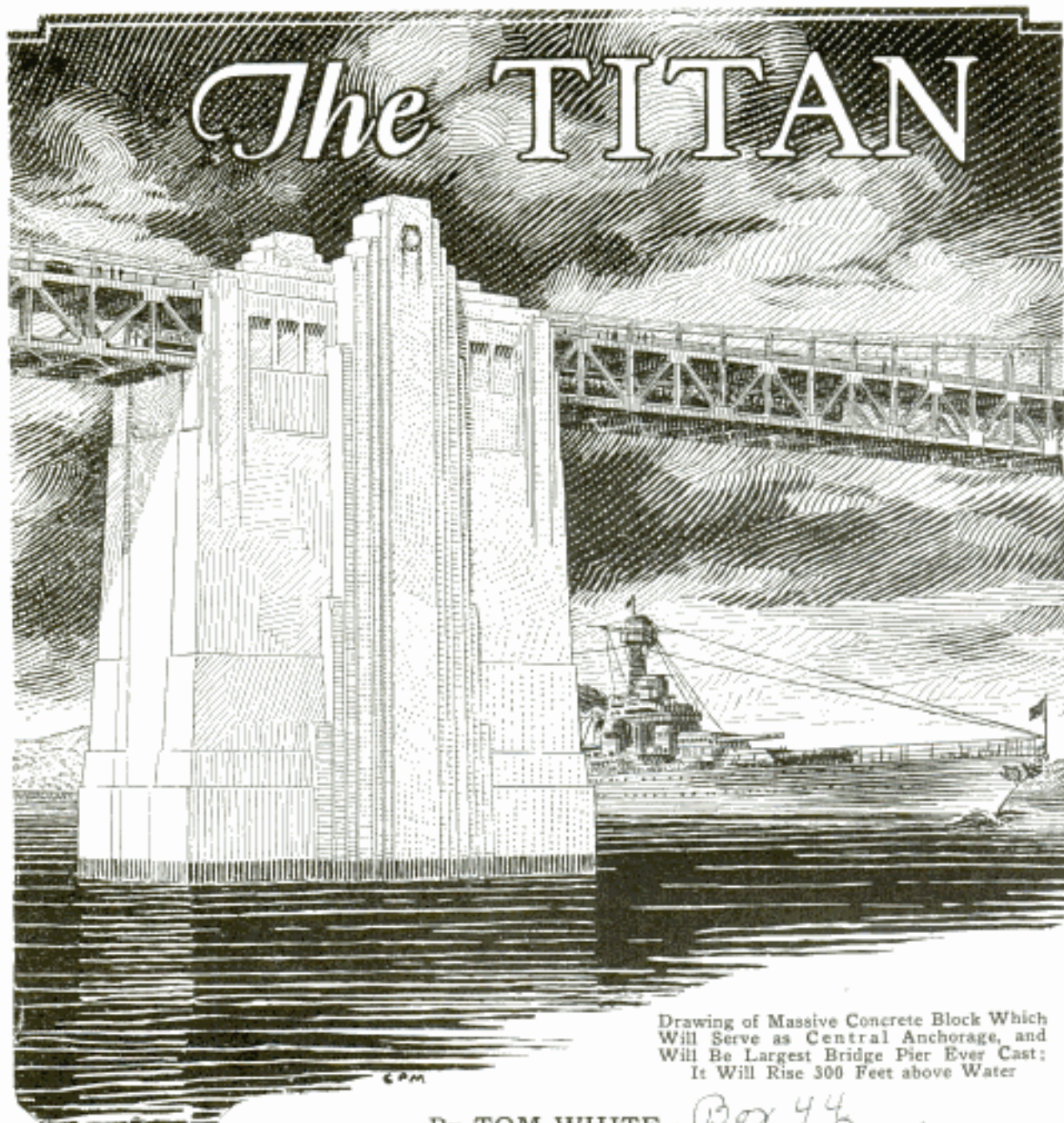
Science Service 1/2/32

© 1915

Contract with Reconstruction
Finance Corp. To be presented
to Legislature Jan. 2, 1933

see June 1933. 904

The TITAN



Drawing of Massive Concrete Block Which Will Serve as Central Anchorage, and Will Be Largest Bridge Pier Ever Cast: It Will Rise 300 Feet above Water

By TOM WHITE, Box 44
Alameda, Calif.

FLINGING monster steel sinews and giant beams far above the mastheads of busy shipping, and spanning a body of water large enough to harbor the combined navies of the world, the aerial highway that is to connect San Francisco and Oakland is the largest undertaking of its kind ever attempted by man.

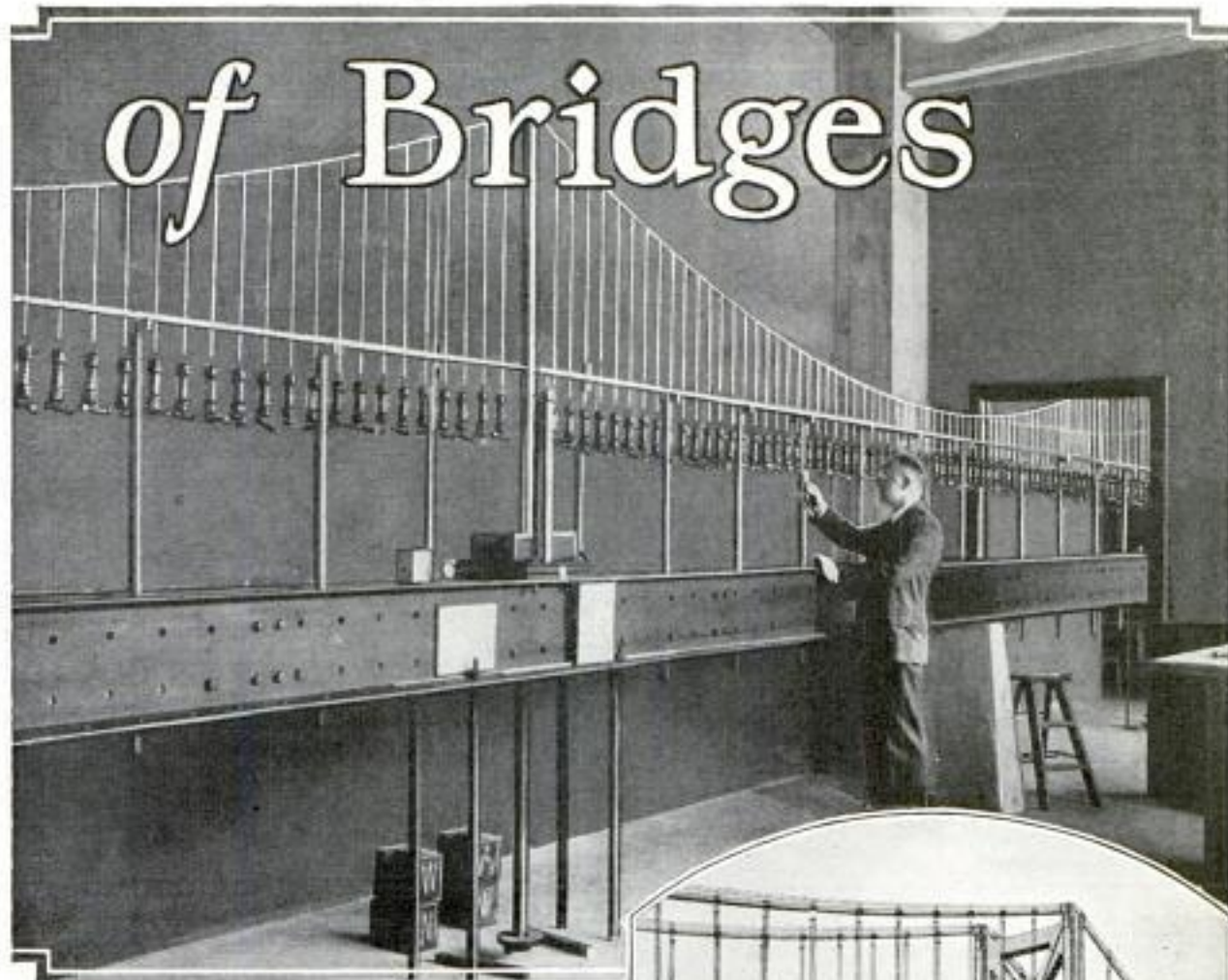
Work on the mammoth structure will start this February and by New Year's Day, 1938, it is expected that traffic will be rolling across the high-flung road of steel. The total estimated cost is \$75,000,000.

The big span will not only weld the entire bay district into a metropolitan area

numbering close to 1,500,000 inhabitants, but will close the last gap in the Pacific coast highway system from Canada to the Mexican border.

Far eclipsing anything yet built, both in size and carrying capacity, the San Francisco bay bridge will embody at least two outstanding features that will set it apart from everything of its kind at present existing. One will be its tremendous carrying capacity, which will exceed that of any other bridge in the world; the other the commanding outline of that portion which is to span the deep-water section of the bay. This will actually constitute two gi-

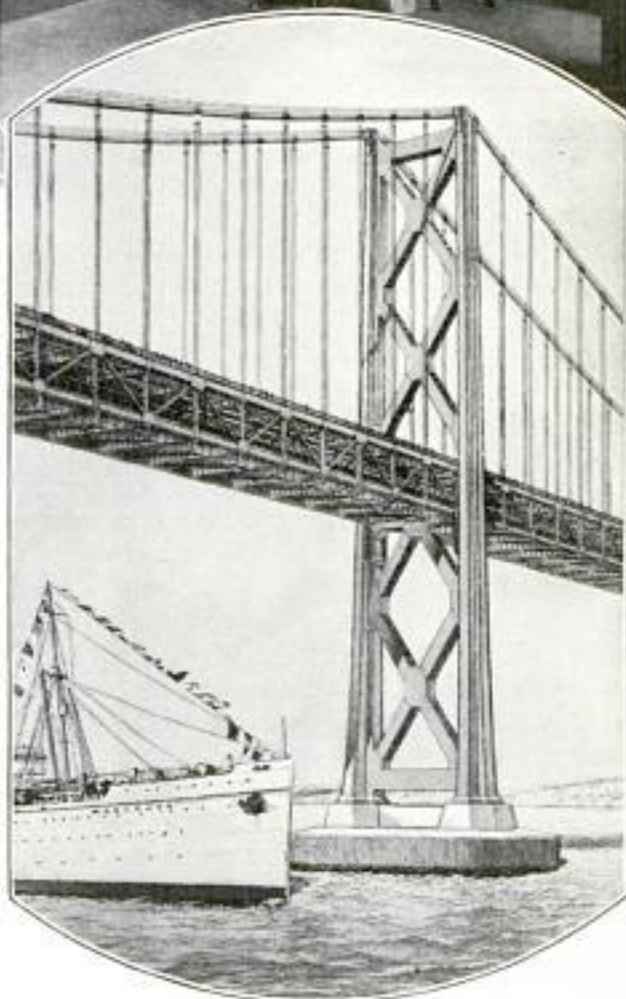
of Bridges



gantic suspension bridges, placed end to end, their midstream junction point being a central anchorage of concrete.

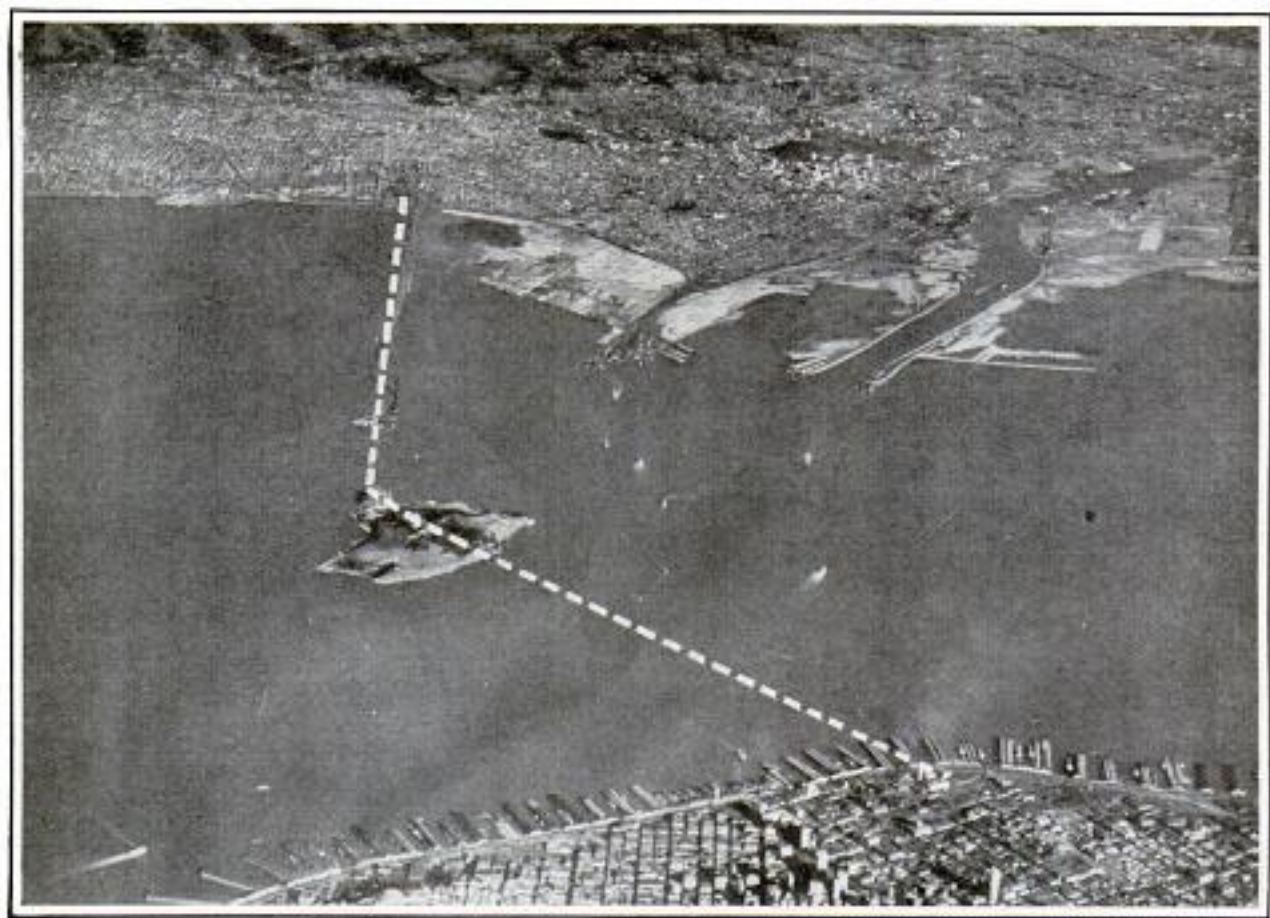
The over-water length of the structure will measure four and one-half miles, to which the approaches will add two and one-half miles, giving a total length of seven miles. The bridge will be divided into two major sections, the mid-bay island of Yerba Buena forming a natural anchorage for 3,000 feet, through 550 feet of which will be driven a tunnel, sixty feet high and eighty feet wide, the largest ever dug to accommodate traffic.

Extending over the main ship channel on the San Francisco side of the island, will rise the double suspension-bridge section that will stretch over that portion of the bay for 9,000 feet. On the Oakland side, where the water is shallower and a greater number of piers can be sunk, the span will be broken up into a 1,400-foot cantilever span, the longest of its kind in this country, five 500-ton steel sections, and twelve 288-foot steel and concrete



Above, Testing a Model of the Bridge with Weights;
Below, Drawing of One of the Giant Towers

631915



© Clyde Sunderland

Dotted Line Indicates Approximate Location of the Bridge; San Francisco Is in the Foreground, with Yerba Buena Island in the Bay and the Oakland Waterfront in the Distance

see map 1915 . 337

units. Over the main ship channel at the San Francisco side, the bridge will offer a clearance of 214 feet at any stage of the tide, enabling America's loftiest steamers to pass underneath with plenty of room to spare.

While provision has been made for adding, at some future time, a second deck to the new George Washington structure spanning the Hudson, the San Francisco bay bridge will carry two decks from the outset. The upper deck is laid out to provide six lanes of fast-moving vehicles and two pedestrian walks; the lower deck will have room for three lanes of auto trucks and two tracks for electric interurban trains. Roadway space on the six-lane deck will measure fifty-eight feet from curb to curb.

The bill of material for the huge span resembles nothing so much as an order on the country's industries to replace a devastated city. The bulkiest items are 180,000 tons of steel, both structural and reinforcing; 1,500,000 barrels of cement; 1,000,000 cubic yards of sand and gravel;

40,000,000 feet of lumber for concrete forms, and 200,000 gallons of paint.

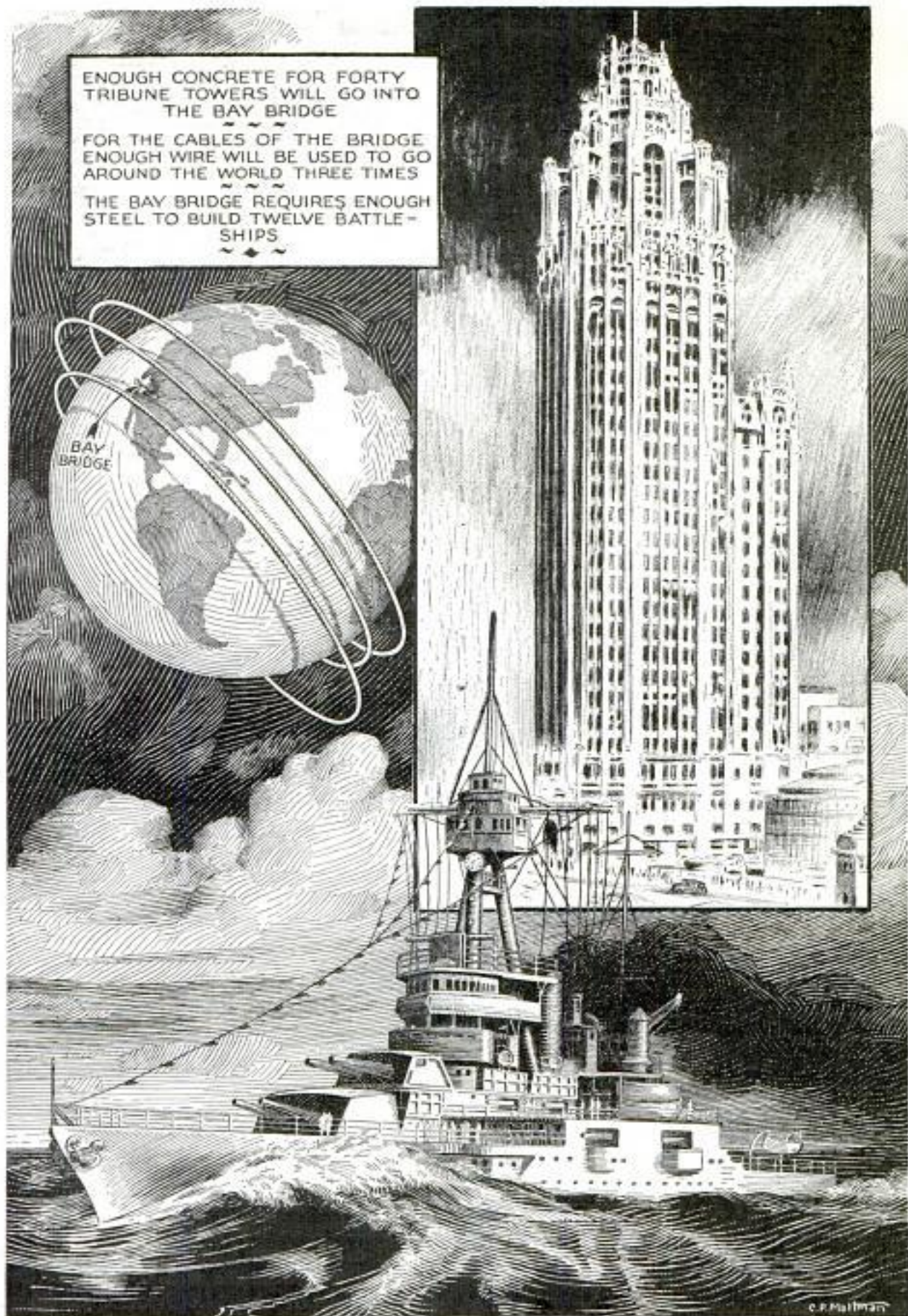
The twin suspension cables will be made up of 18,000 wire strands, three-sixteenths of an inch thick, the finished cables measuring twenty-nine inches in diameter. The total length of all the strands will reach 67,000 miles, equal to two and two-thirds times the circumference of the earth.

The most vital part of bridge engineering lies in the preliminaries, and before any definite plans are drawn the location must be determined. This is done by high pressure "jetting" through the overlying mud, then drilling test holes into the bedrock to determine its character, strength and extent by analyzing the samples of rock brought to the surface in the shape of "cores." Two years ago, the bottom of San Francisco bay between the waterfront and Yerba Buena island was "prospected" by drilling a total of 17,000 feet of test holes. From these drillings it was found that footings for the ponderous structure will rest securely on a rugged foundation of sandstone and shale.

ENOUGH CONCRETE FOR FORTY
 TRIBUNE TOWERS WILL GO INTO
 THE BAY BRIDGE

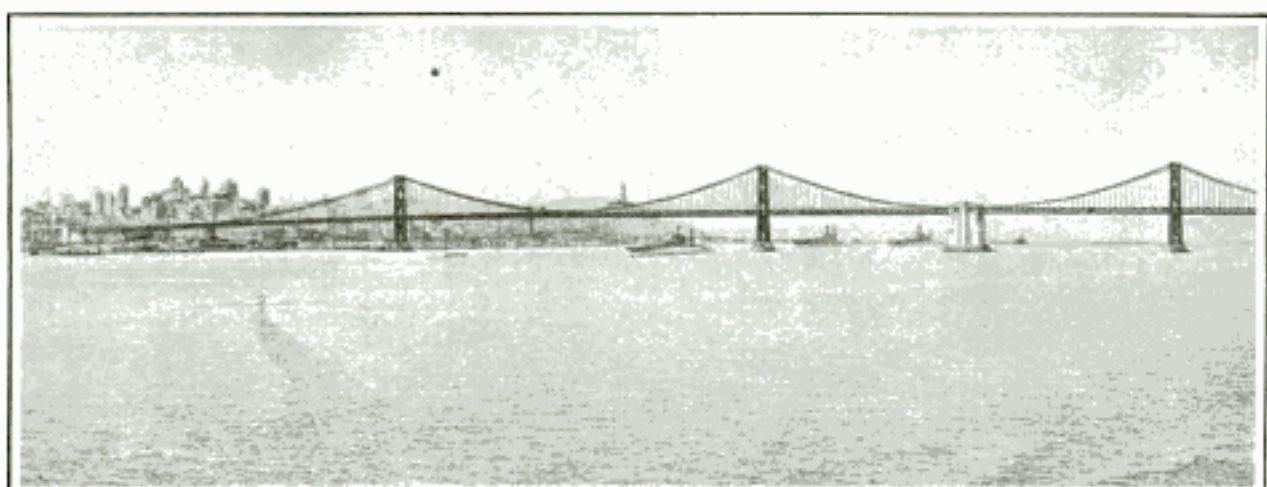
FOR THE CABLES OF THE BRIDGE
 ENOUGH WIRE WILL BE USED TO GO
 AROUND THE WORLD THREE TIMES

THE BAY BRIDGE REQUIRES ENOUGH
 STEEL TO BUILD TWELVE BATTLE-
 SHIPS



This Gives an Idea of the Huge Quantities of Materials Which Will Go into the Bridge—180,000 Tons of Steel, 1,500,000 Barrels of Cement and About 67,000 Miles of Wire for the Suspension Cables

B 1915



The Deep-Water Span from San Francisco to Yerba Buena Island Is Made Up of Two Suspension Bridges Placed End to End with a Massive Central Anchorage of Concrete between Them

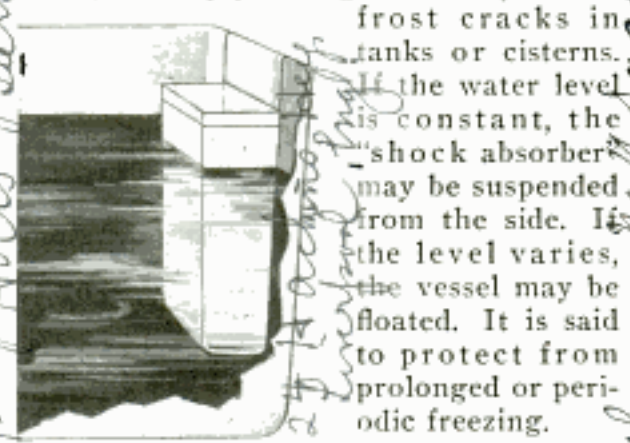
While engineers were sending drill holes into the bottom of San Francisco bay, another sort of preliminary work was going on five miles away in the engineering materials laboratory of the University of California, where there was set up a 100-foot scale model of the new bridge. A miniature cable was hung with weights which correspond in precise ratio to the weight of the bridge structure itself, additional weights being hung under the first row to represent traffic loads. Any deflection was immediately detected and measured. Lateral deflection caused by wind pressure was duplicated with the model by hanging other weights on threads run over tiny pulleys and exerting a sidewise pull on the miniature structure.

mon. There are chemical compounds that some declare to be disagreeably bitter and others cannot taste at all. Similarly, the lemon verbena smells to some and not to others. So science is still seeking ways to aid tongue and nose. Perhaps taste "microscopes" and odor amplifiers may be developed, but nothing of the kind is in sight.

B 1911

"SHOCK ABSORBER" SAVES TANK FROM FROST-CRACKS

By absorbing the expansion of freezing water, an empty air-tight vessel prevents frost cracks in tanks or cisterns.



If the water level is constant, the "shock absorber" may be suspended from the side. If the level varies, the vessel may be floated. It is said to protect from prolonged or periodic freezing.

WAY TO AID TASTE AND SMELL SOUGHT BY SCIENCE

B 2000

While science knows something about taste and smell, it has been able to make little progress in improving or aiding those organs. In fact, science is about in the same state that it was in the Middle Ages, so far as this field is concerned. Telescopes allow us to see stars invisible to the unaided eye; scales weigh masses too large to lift or too small to feel; microscopes bring into range the world of creatures too small to be seen; amplifiers magnify sounds inaudible to our ears, and ammeters measure electric currents too feeble to shock the most sensitive. But our tongues and noses must struggle along without mechanical assistance. "Blindness" to taste or smell is relatively com-

Bolt's "Buretop" 11/13/32

FLOATING FAIR ON WORLD TRIP TO HELP BUSINESS

On a tour of world ports, a floating industrial fair will stop at seventy cities to help business. The project is that of a group of German hardware manufacturers. Eighteen months will be required for the voyage of the 14,000-ton steamship. South America, India, China and Japan will be visited during 1933 and 1934.

No. 11. Report from H. H. B. ... reported by Consul ... H. H. B. ... sailing from Germany.

Scena Seruci 11/7/32

Cap Hote sailing from Germany.

Henry O. Malley

B/821

Commissioner, Bureau

of Fisheries, Dept. of Commerce

Dept. of Commerce 11/6/39

ALASKA SEAL HERD IS ON THE INCREASE

Under the protection of the bureau of fisheries, the Pribilof islands seal herd, now the most valuable in the world, increased more than eight per cent in numbers in the past year. The tabulation, completed prior to the herd's return from the breeding grounds to the warmer regions of the Pacific, showed a total of 1,219,961 as compared with 1,127,082 in 1931. The herd had been reduced to about 132,000 animals when the bureau of fisheries undertook supervision in 1911. Since that time the "harvest" of prime males has increased until in the past few years nearly 50,000 skins are taken annually.

B/1989

THIRTY YEARS' SAVINGS IN WOOD BUILT INTO TABLE

More than 10,000 small pieces of hardwood, representing the savings of thirty years, have been built into an inlaid table by a California carpenter. The design required six months to complete and includes thirty-six different woods.

B/1926

This Table Contains About 10,000 Pieces of Different Woods; the Building Consumed Six Months of Diligent Work



George Estey Highland Park Calif.

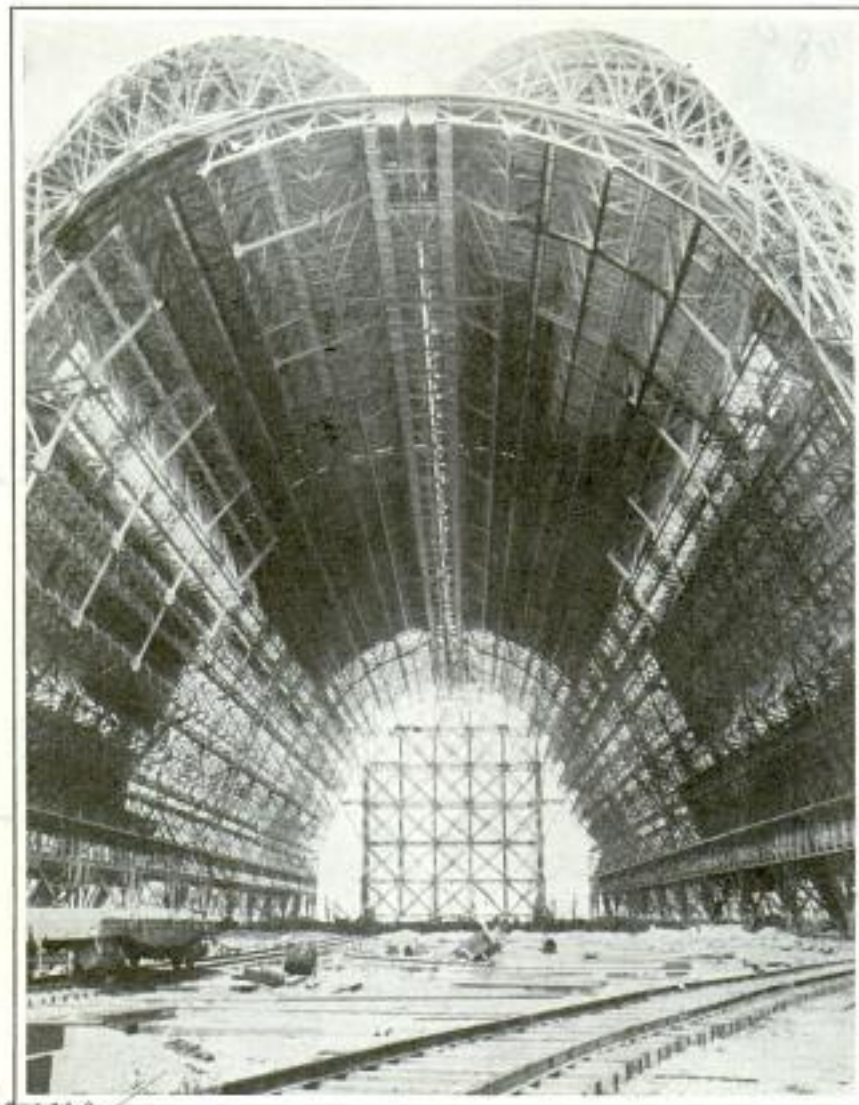


By Opening Out Panel-like Surfaces, the Pilot Can Apply Brakes to Ship Gliding to a Landing

AIR BRAKE HELPS PLANE LAND SAFELY AND QUICKLY

Safer and quicker landings for airplanes have been made possible by a brake that eliminates the dangerous sideslip as a means of controlling speed in coming to earth. The brake is an air-resistance plane that opens on the struts, checking the airplane's speed. The pilot is able to dive for landings without resorting to maneuvers, and to land in a short space. The art of landing is greatly simplified for the beginner, since the brake permits a much steeper gliding angle without excessively increasing the air speed. Most pilots use the sideslip to avoid overshooting the landing area, but inexperienced flyers often meet with fatal accidents in attempting this maneuver. The safest approach to a landing is at a speed sufficiently fast to give ample glide and at a point high enough to clear obstructions on the glide. The air-resistance brake accomplishes this without any risk as to the safety of either pilot or passenger.

113 S. Louise Ave. Los Angeles
Harold E. Banghman
Demonstrated at United Airport, Los Angeles
Monday



Like a Great Hall in Some Mythical Giant's Home, This Mass of Steel Will House America's Largest Airships on the West Coast.

GIANT HANGAR FOR DIRIGIBLES AWAITS BIGGEST CRAFT

Resembling a giant drawing room in a somewhat unfinished state, the huge hangar at Sunnyvale, Calif., awaits the nation's greatest dirigibles, the "Akron" and the "Macon." The structure is the west coast base for the United States' biggest aircraft and is one of the few hangars in the world large enough to house them.

ICE-CREAM VACUUM BOTTLES HOLD COLD TWELVE HOURS

Ice cream can be kept cold at least twelve hours in a vacuum container made of hard glass in a cylindrical shape. Another type of container is fitted with a lid for holding dry ice to refreeze the cream if it melts from being opened frequently.

PIGEONS TO HELP FLYING FOREST FIREMEN

Flying fire fighters in the Ontario forest service will carry homing pigeons in the future to assist them in maintaining communication with headquarters. Successful experiments have been completed recently, showing that the pigeons are valuable aids in districts too remote for radio stations, as well as in case of forced landings. Each plane will carry from two to five birds, to be released by a special trap. The pigeons are of silver and reddish colors which help them escape detection by hawks. In addition, a small leg whistle gives off a formidable sound to frighten foes.

Montague

B1930

BICYCLE DYNAMO FOR LIGHT HAS REGULATOR

Assuring a steady light for the bicycle, a tiny regulator has been fitted to the small dynamo designed to generate power for the electric bulb. The regulator is in the form of a funnel, and its operation is determined by the speed of the tire against which it presses. This construction makes it possible to obtain the same amount of current at all times, the speed of the regulator decreasing as the bicycle speeds up. A reduction in number of burned-out bulbs is certain, since irregular current is detrimental. The funnel contains a spring, forcing the device against the tire with varying pressure.



*Schwann-herman
Cmt. Davis & Rutschbach
had herator 5. B. or ha. h. with int. d. erman*

B1990

see slip

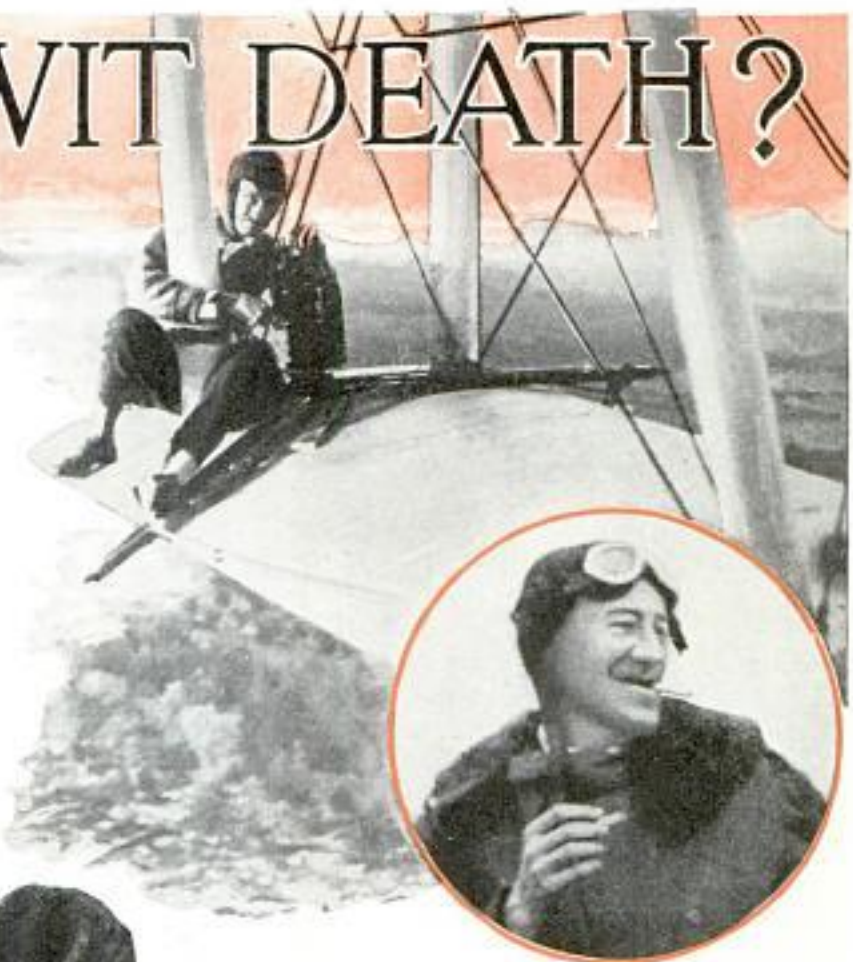
*shown at Leipzig Germany Paul Haupt
reported by Mannheim
Counsel Rast. & Messer. Leipzig*

B 1698

OUTWIT DEATH?

have made your ability to live longer difficult, but the span of life itself has not changed. And science today is concerning itself with offsetting those conditions which prevent man from reaching the century mark.

In 1901, the average healthy young man of twenty-one had a life expectancy of 41.44 more years, or the hope of reaching about sixty-two years.



Airplane Pilots Traveling 100 Miles an Hour Ordinarily Are Safer Than Motorists Going Twenty-Five Miles an Hour—Because They Are More Careful



If You Outwit Death for Fifty Years, You Will Consume 100 Pounds of Medicine

A decade later, a young man of twenty-one had a little more to look forward to,

the life expectancy having risen to 41.92. By 1920, however, science had added nearly three whole years to life, giving a young man of twenty-one an expectancy of 44.15, or the hope of reaching more than sixty-five years. When the figures of the last ten years are tabulated, Doctor Dublin is confident life expectancy will approach even closer to the possible life span.

But how about the 100, 200 and the many-hundred-year-old people occasionally commented upon in the newspapers today? A myth, says Doctor Dublin.

"Granted that a few individuals do pass the century mark, there is, apparently, no authentic information that anyone ever attained an age much greater than 110 years," he declares.

"I have noticed that in localities which do not possess carefully kept birth statistics, old age flourishes amazingly. That is one reason why we occasionally read about a 150-year-old Turk or Bulgarian. Then, too, once a man passes a hundred he is apt to brag about his great age.

10/698



These Bridge Painters and Steeplejacks Probably Are Running Less Risk Than You Do at Home—They Are More Vigilant

Sometimes, even with birth records accurate, a centenarian may bear the name of another person born a great many years before he was.

"Apparently the human body, like the machine in industry, has a fairly definite working life, and each year of activity produces a certain amount of depreciation. That is why your life span is limited."

If you live in the United States, your human machine runs a greater risk of coming to an untimely end than it does in any other civilized country, for this country has an accidental death rate of 80.6 per 100,000 people, without counting homicides. This is nearly twice as high as that of England, while Denmark has a death rate of but 24.5, including homi-

cides. At the very start, therefore, you are under three times the handicap of a Danish human machine.

Where do you run all this risk, at work or at play? You run twice as much risk of meeting death in your home as you do in your business or occupation. Nor has this peril lessened appreciably, for during the last five-year period, it has been reduced but five per cent. That supposed haven of security, the home, is far from secure, for the modern home is the origin of nearly one-third of all fatal accidental injuries which occur each year. In round numbers this yearly toll is 30,000 lives.

The unsafe stairway, the slippery



03 1698.

floor, the skidding rug and the shaky stepladder, all contribute to this toll. Falls account for thirty per cent of the accidental fatalities in the home, burns and scalds for twenty-eight per cent and poisonous gases for fifteen per cent. As for the bathtub, it is not quite the deathtrap of newspaper report. Out of 2,317 falls in the home reported in a survey, only nineteen occurred in bathtubs. By far the largest proportion resulted from tripping or slipping on stairways.



Above, Hunting Deer in This Country Is More Dangerous Than Hunting Big Game in Africa; Left, Daredevils, as a Rule, Are More Careful Than You



of standards. "It is not generally realized what enormous toll is levied each year by accidents as measured by lives lost and serious injuries inflicted. The accidental fatalities have reached an annual total of 100,000, which is far greater than the American lives lost in the world war."

Nevertheless, in its conquest of speed and rapid transportation, science has gone to considerable length to help you outwit death. The elevator, the railroad train, the airplane, even that great toll raiser, the automobile, have become infinitely safer from a mechanical



If the home is such a menace, what risk then, do you take when you step out of doors into the busy world about you? How about the automobile traffic you pass at the corner, the street car or train in which you may go to work, the elevator which takes you upstairs to the office or plant?

"Many lives are being sacrificed daily and certain groups of accidental fatalities are due to modern innovations such as the use of motor vehicles, the railroad train and factory machinery," reports Mr. A. S. McAllister, acting director of the bureau

standpoint. While fatalities arising out of the operation of automobiles, aside from those connected with the occupation of the persons injured, increased fifty-seven per cent between 1922 and 1930, the human factor—not mechanical defects—was largely responsible. Only seven per cent of the fatalities occurred when the car was being used for business purposes, the other ninety-three per cent while it was being used for pleasure.

B1698
22



The watchful eye which science has kept on the rapid forms of transportation of the present day has resulted in multiple safety features, decreased mortality and, as a consequence, in even greater speed. When, for example, it was planned to erect the Empire State building to a height of 1,250 feet, making it the tallest building in the world, modern convenience demanded that the elevators possess greater speed than those in any other building. Considerable planning was necessary to install the elaborate safeguards required to operate the battery of sixty-three elevators at the unprecedented speed of 1,200 feet a minute. Accomplishing this, however, has made the speed practical for other tall buildings with safety and, when still higher buildings are erected in the future, 1,200 feet per minute will be the accepted, safe speed for elevators.

In its efforts to help you outwit death,

protective science has erected several lines of defense along the gigantic battlefront of its manifold activities. But science has yet to devise, for example, a shotgun that will reduce the number of fatalities during the hunting season. More peril exists for you while hunting in November in the civilized United States, than it does during the entire year in the uncivilized jungles of Africa.

"The question of whether male swimmers take greater chances in the water or in boats and canoes, or whether they are more careless than girl bathers, is suggested by consideration of the 7,500 accidental drownings which occur each year in the United States," said Doctor Dublin. "More than six times as many males are drowned as females. Among such male persons drowning ranks as one of the leading causes of death whether by disease or violence."

The human factor of carelessness is just as

(Continued to page 114A)

These Men Are Engaged in So-Called Dangerous Occupations, Yet They Are Taking Less Chances Than You Do When Crossing a Busy Street Corner—and Death Rates Prove It





This Cabin Autogiro Is the Largest Ever Constructed in This Country; Note the Unusual Mounting of the "Windmill" Blades on Top of Cabin; This Feature Is Said to Increase Stability

AUTOGIRO WITH TWO RUDDERS HAS FOUR-PLACE CABIN

Equipped with twin rudders, the largest cabin autogiro built in the United States is powered with a 400-horsepower motor. The cabin has space for four persons.

MODERN TREND IN INVENTIONS TO COMFORT AND SAFETY

That inventors are turning their minds to comfort and safety is demonstrated by records of the United States patent office. Applications for patents of this type have increased during a period when total applications declined twelve per cent. In the past year, there has been an influx of applications for patents on devices designed to make automobiles and railroad trains more comfortable and safer, as well as for others in connection with air conditioning, refrigeration, oil burners, dewaxing oils for automobile lubrication, and alloys and electric clocks. Many applications have come from engineers of established companies seeking to improve their products, while others represent the consumers' ideas. Of the 20,000,000 auto owners in this country, many have ideas for improving the efficiency or comfort of motor cars. From them come such inventions as one for opening and closing car doors by the

driver without leaving his seat and several for refining free-wheeling devices.

LIGHT BEAM GUARDS FOUL LINE IN BOWLING ALLEY

If a player's toe slides across the foul line, a photo-electric cell in a bowling alley detects the error and flashes a warning light. A small beam is focused across the alley so close to the floor that it will be intercepted by nothing except the player's foot. Fouls of only a fraction of an inch are detected by the electric eye. The throwing of the ball does not interfere with the detector because of the speed at which the ball crosses the line.



White Line at Player's Left Foot Represents Light Ray Guarding the Foul Marker

Thomas E. Crockett
Commissioner of Patents
Washington, D.C.

General Electric
Engineers. Schenectady, N.Y.

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B1814.

L. S. Coffey. Electric Torch & Furnace Mfg. Co
Filadelfia Pa Los Angeles Calif

POPULAR MECHANICS



current is rebuilt in one one-hundredth of a second, restarting the arc. The flame has a temperature well above 7,000 degrees Fahrenheit and will readily melt tungsten, tantalum and other hard metals. The torch opens an important field in the manufacture of alloys where high temperature is required without the destructive action of the arc current passing through the mixture of metals, as is the case with the torches in common use. There is little blowing action in the torch, and tungsten carbides, for instance, can be applied in powder form to thin objects, such as the edges of shovels, hoes and grader blades.

HEAT CONTROL IN TORCH HELPS WELDERS

Welding and alloy work is simplified by an arc torch that makes it possible to control the temperature. The torch has a transformer for operating on a 220-volt power line. A current relay is provided, while an electrostatic condenser helps to build up a charge sufficient to ionize an air gap and enable the line current to start the arc. If the flame should be extinguished, the



Top, Welder Holding the Arc Torch; Note Mask Which Is Worn to Avoid Sunburn Effects; Bottom, Several Torches Are Being Used on One Job

The torch can be handled with the bare hands in safety, gloves and masks being used only to avoid sunburning effects.

ELECTRICITY IN AIR IS STUDIED AS AID TO HEALTH

To find whether the amount of electricity in the air has any effect on health is the objective of Prof. Friedrich Dessauer, of Germany. He has constructed a machine which produces minute electrical particles, called ions, and is testing both normal and ill persons in air containing large numbers of ions. There are two types of ions, the positive containing elec-

tricity and the negative lacking electrical energy. Patients suffering from high blood pressure, rheumatism, gout, neuritis, neuralgia, bronchitis, asthma and heart and arterial diseases have shown decreased blood pressure and improved condition after inhaling negative ions at frequent intervals. Positive ions produced headaches and discomfort in healthy persons. It has been found that occupied rooms have fewer ions than the outdoors or unoccupied rooms. Dr. Lewis R. Koller, of

B1935

Science Service

*Com James Montague,
66 Harbor Commission*

00/802

the General Electric company's research laboratory, has developed methods of producing and measuring ions. If the ion content of the air is found to have a real effect on health, the next step will be to add an ion regulator to the heating, refrigerating and humidifying equipments that promise to air-condition the buildings of the future.

ARCTIC "BARRENS" NOT BARREN EXPEDITIONS FIND

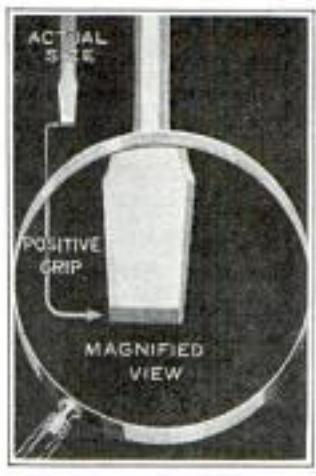
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Contrary to the generally accepted belief, the arctic region is by no means barren, according to evidence furnished by exploration expeditions, missionaries and trappers. Indeed, so profuse is the vegetation that the Canadian government has changed the name of the "Barrens" to "Northern Plains." Flowers of great variety and more than 500 species of plants grow within 400 miles of the north pole. Within the Arctic circle, vegetable gardens flourish with beans, potatoes, beets, radishes and even tomatoes during the short summer season, nourished by the sun which shines twenty hours of the day at that time of year. Experimental farms are being established by the Canadian government in the Arctic to determine which crops grow best in that climate.

POSITIVE-GRIP SCREWDRIVER HAS RIDGED FACES

00831

Positive grip for the screwdriver has been attained by cutting fine serrations or ridges on the driver faces to prevent slipping. This method of manufacture is said to reduce the possibility of the tool jumping out of the screw-head slot. The surfaces are so directed as to exert maximum resistance to any undue motion of the tool. This ridging process does not weaken the screwdriver because less pressure is necessary to drive home the screw.



*Charles Wickbergh
002501, Seattle Wash*

SPEED OF REACTIONS TIMED BY ELECTRICAL RECORDER



Testing Mental and Physical Response of Motorist to Danger by Electrical Timing

Accurate data on the "third dimension of driving"—the reaction of motorists' minds and muscles to recognized danger—may be compiled with split-second accuracy by means of a newly developed "reaction meter." The electrical timing mechanism is connected to two pedals similar to the accelerator and brake of an automobile. Sudden flashing of a neon light constitutes the warning of danger, the signal for the person under test to release the accelerator and apply the brake as quickly as possible. The speed of two vital functions is recorded. Coordination of mind and muscle is indicated by the interval between the signal and the first response, that of lifting the foot from the throttle pedal. Completion of the physical response is shown in the total elapsed time between the warning and application of the brake. Although developed primarily for motoring research, this reaction-timing meter is also adaptable to various industrial uses, it is said, particularly in the examination of operators for machinery in which a high degree of coordination between mental and physical faculties is important.

Tests made by Firestone Tire Co. Akron Ohio

B1492

C. E. Pachter. 6750 Normal Blvd Chicago



The USED

STO
 JRD. 1930 4 DR. SEDAN LIKE NEW. orig. cost \$1,000; reposs. sale for \$200; your car as down pay. bal. 12-24 mos.: 7 day driv. trial: 90 day guar.: open even.

DUPE. -1930 SERIES 400 SED. FULLY chrome equip. spot lit. perf. cond. throughout; reposs. sacrifice for \$225; terms trade.

vd. -'31 DE LUXE COUPE. used. 8 wire whls. side mts. chrome trim cov. rum. seat, heater: cost over \$1,200; reposs. sale for \$575; your car as dn. pay. bal. 12-24 mos. 7 day dr. tr. 90 day guar.

By **C. P. EDWARDS**

HAVE you ever heard of the "decoy car," the "come-on ad," "free gas," and similar rackets as used by dishonest secondhand-car dealers?

Unless you've been a victim, the chances are you have never heard of these schemes. The reason is simple: No one brags of the way in which he got gypped. And hence these dealers reap a rich harvest.

The "decoy car" is an automobile that looks fine but hides some serious defect. Of course it is sold with a fine-sounding, money-back guarantee. With the car paid for, and the guarantee in his pocket, the new owner starts proudly out with his

When You Buy a Used Car

CHECK the motor number with an authorized dealer to determine the age of the car.

Remember that "Money Back Guarantee" may mean a credit on a more expensive car.

Don't forget that "New Car Guarantee" is only against defective parts—not worn ones.

Try the car thoroughly before you sign anything or pay any money.

Before taking delivery, check for tools, curtains, spare tire, gasoline, and similar items.

Compare the price of similar models with at least three reputable dealers.

Watch out for a "boosted" selling price with a "liberal" trading allowance on your present car.

Be sure the seller intends to live up to any offers of "free gas" or "free license plates."

"bargain." Then things begin to go wrong. But the money-back guarantee—fine! Returning to the place from which the de-

CAR RACKET



coy car was purchased, the buyer tells of his troubles. With apparent amazement and sympathy the dealer listens. Then he suggests a wonderful value on which the present car will serve as the down payment.

For the first time, the customer notices that the cars which the salesman had so freely priced verbally, are all marked in code. And he now realizes that the prices do not sound nearly so attractive as they did at his first visit.

However, he has no choice but to buy here—or keep the almost undriveable car he first bought. A little assuring talk from the salesman generally does the trick.

No additional money is needed at the moment to own a really good used car—at a much higher price than was paid for the decoy. With the down payment taken care of, this customer now finds himself driving a good used car. But he paid an exorbitant price.

To bring prospective purchasers into their place of business for the first time, a trick ad is frequently used. This generally describes a popular type of car; tells of its wonderful condition; then quotes a price about fifty per cent below the market price for such a model.

Of course, the dealer's answer to the

It Is Well to Beware of Code-Type Price Tags on Used Cars; This One Says, "Try to Get \$450 but Take \$375 if You Can't"

prospect is, "I'm so sorry. That car was just sold a little while ago. But I have an equally attractive value I'd like to show you."

Then he leads his prospect to the car he thinks he can sell and depends on high-pressure methods to swing the deal.

Thrown in for good measure, as a means of closing the sale, may be several good-sounding but meaningless offers. While some dealers actually do give license plates free, others only make a promise of free plates.

Then what happens is this: The license application is made out. The customer

B 1432



Checking a Motor Number with the Police Is a Fine Way to Keep from Buying a Stolen Car

signs it. The dealer mails it but "forgets" to inclose any money. In due time the application is returned directly to the customer. The customer goes back to the dealer. Then the "fun" begins in earnest. Eventually the customer will get weary and give up—and that is what the dealer wants him to do.

Still another catch is free gas in various quantities. And with this plan there is sometimes, though not always, a catch. The dealer who is offering free gas will have an arrangement with some very inaccessible service station. The difficulty of reaching the place will make it unlikely that the car buyer will ever go after his free gas.

And here is another common obstacle in the way of free gas. This is the coupon

which requires a dealer's signature—and the dealer forgets to sign. As a consequence the gas man is sorry—oh yes, very—but he is unable to deliver the gas.

But probably the greatest racket of all is the boosting of price by pretending that a car is much newer than it is. Some used-car dealers cash in on new-car advertising that features next year's models during the current summer months. Then when the year rolls around, those year-old cars are represented as "this year's models."

Speedometers mean nothing, as everyone knows. But engine numbers mean everything. Before buying a car, it is well to take the engine number and call up a



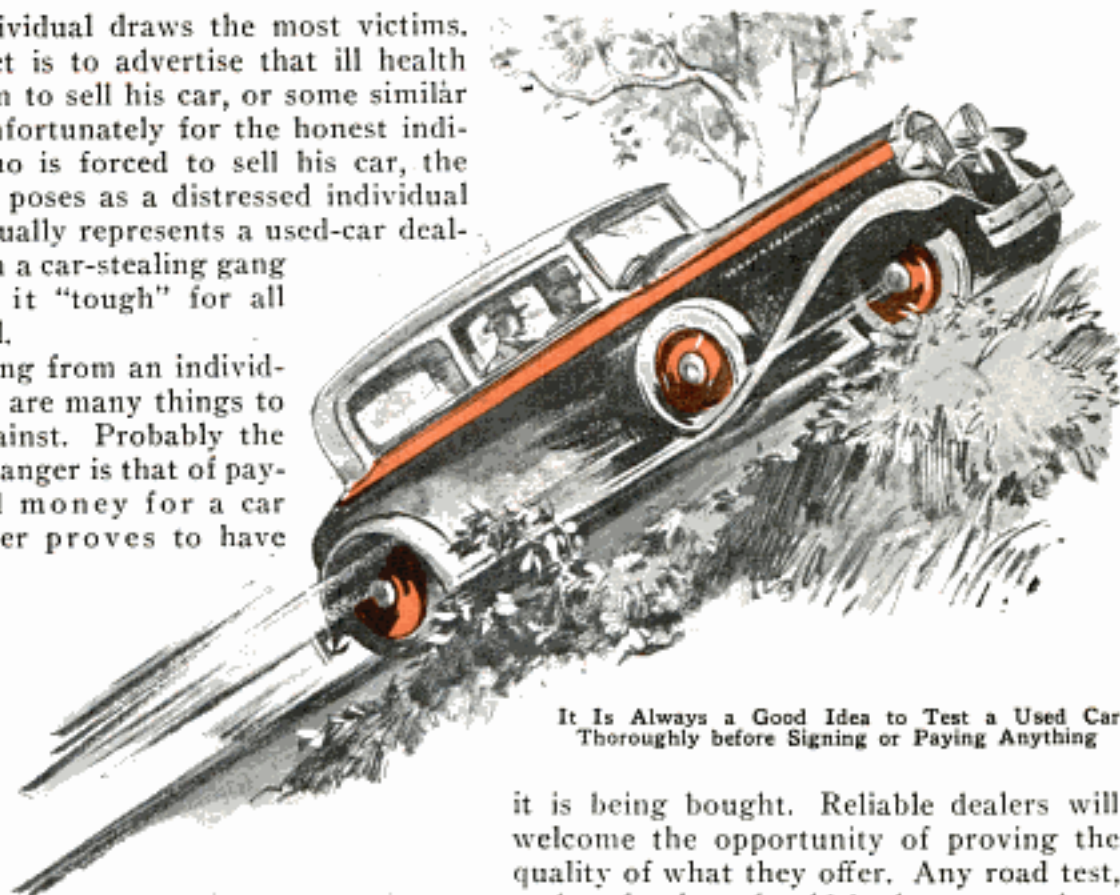
dealer who sells that make of car. He will be able to tell within a month or so of the exact time the car left the factory.

Now as to "repossessed cars," or cars that can be had by "paying the small unpaid balance," remember this: Nobody is giving anything away. All used cars are sold at the market price; in other words, what the dealer can get for them.

Next to the appeal of the dealer who offers repossessed cars, the so called "hard-

luck" individual draws the most victims. His racket is to advertise that ill health forces him to sell his car, or some similar story. Unfortunately for the honest individual who is forced to sell his car, the man who poses as a distressed individual—and actually represents a used-car dealer, or even a car-stealing gang—makes it "tough" for all concerned.

In buying from an individual, there are many things to guard against. Probably the greatest danger is that of paying good money for a car which later proves to have



It Is Always a Good Idea to Test a Used Car Thoroughly before Signing or Paying Anything

been stolen. Of course, the rightful owner can claim his property wherever found, and the innocent buyer is just out of luck. Besides, there is the chance of getting a car on which there is a mortgage. As a rule, mortgages are recorded, but that means little when the car is offered for sale in another town or city than that in which the mortgage was taken out.

And mortgages may be made to cover

it is being bought. Reliable dealers will welcome the opportunity of proving the quality of what they offer. Any road test, to be of value, should be long enough to get the car thoroughly hot, and over a sufficiently varied route to test the car in all ways. Here is a good test:

Check gasoline and oil carefully to note consumption. See that tires are not being run soft, to quiet the car and make it more comfortable than usual. Then start out in traffic. Note how the car idles down. Watch for grabbing clutch or poor brakes. After using brakes repeatedly, get out and



part of the original purchase, service bought, or a radio installed in the car, or anything of that nature. In fact, many a radio set has been installed in a car and the mortgage made out on that car, and then the set has been transferred to another car. If you buy such a car, it is up to you to pay the mortgage in most cases. Be sure your bill of sale states that the car is free of all encumbrances.

A thorough road test of a car is a good plan regardless of the source from which



feel them. One trick on four-wheel-brake

(Continued to page 138A)

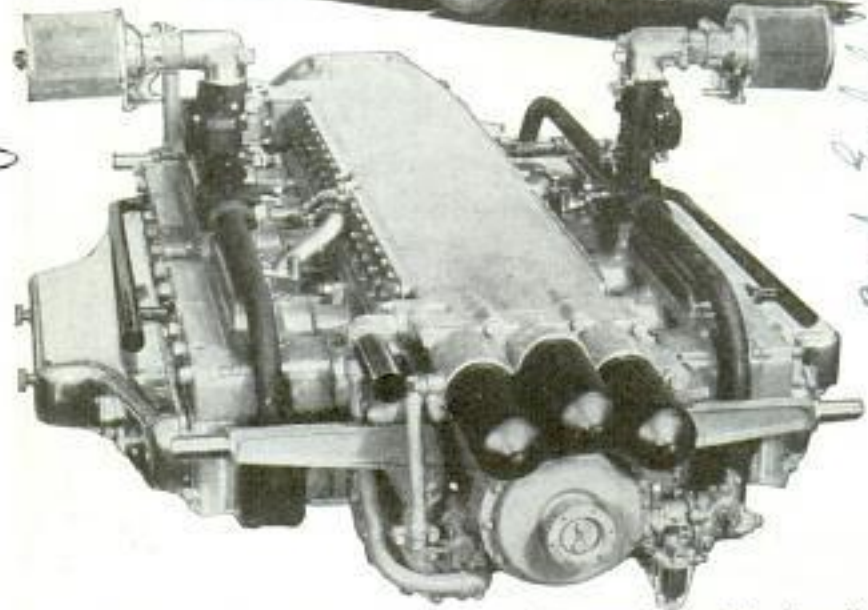
B/R 8.4
The White is
30
842 E 79 St. Cleveland Ohio B/1892

Dr. Henry Kramer,
Botanic Tracts, Vol. 6
Academy of Natural
Sciences' Club

POPULAR MECHANICS

COLORS OF POTTED PLANTS CHANGED BY CHEMICALS

Both engine and bus.



That the color of plants growing in six-inch pots can be changed by administering minute doses of chemicals has been definitely established. Scarlet carnations treated with one part of iron or aluminum phosphate and 1,000 parts of water developed white streaks in the petals. White carnations fed with a solution of potassium or aluminum sulphate showed scarlet streaks. A little of the solution is given the plant every five days. Potassium cyanide in the dilution of one part to 10,000 parts of water caused a rose to have red leaves and green veins, while the other parts turned yellow. The flower-coloring substance is found in all parts of the plant. The coloring in the

Cmd. Eckhardt

Twelve-Cylinder 225-Horsepower Engine for Highway Bus, of Horizontally Opposed Design to Enable Installation under Floor

PANCAKE-TYPE ENGINE FOR BUS INSTALLED UNDER FLOOR

The horizontally opposed or "pancake-type" motor, as it was termed in the early days of automobile design, has staged a comeback in a modern 100-passenger bus. Developing 225 horsepower, the twelve-cylinder engine has an over-all height of eighteen inches, and is mounted under the floor of the coach together with all other elements of the driving mechanism. This type of engine design, virtually ignored for more than a score of years, is said to give the bus the lowest center of gravity of any passenger-carrying vehicle. Weight in the giant motor has been reduced to a minimum through wide use of aluminum alloys in its construction. Its lubrication system employs three pumps, and it is started by two twelve-volt motors. For servicing and repair, the engine can be completely removed from the coach in less than an hour.

root of the radish is the same as that in the flower, while the rose coloring is found in the leaves and prickles as well as in the flower itself.

B/1822

AUTO-LIGHT GLARE IS REDUCED BY FILAMENT SHIELD BULB

Reducing glare without decreasing the efficiency of automobile headlamps, a bulb with the filament shielded is offered as the solution of night-driving problems. Headlamps with this type of bulb afford a continuous field of light, cutting through fog, rain, sleet and snow in a more satisfactory manner than is possible with an ordinary light.



Tri-State No-Glare
Sales Co. 508 Benedum Bldg.
Lres Bldg. Pittsburgh Pa

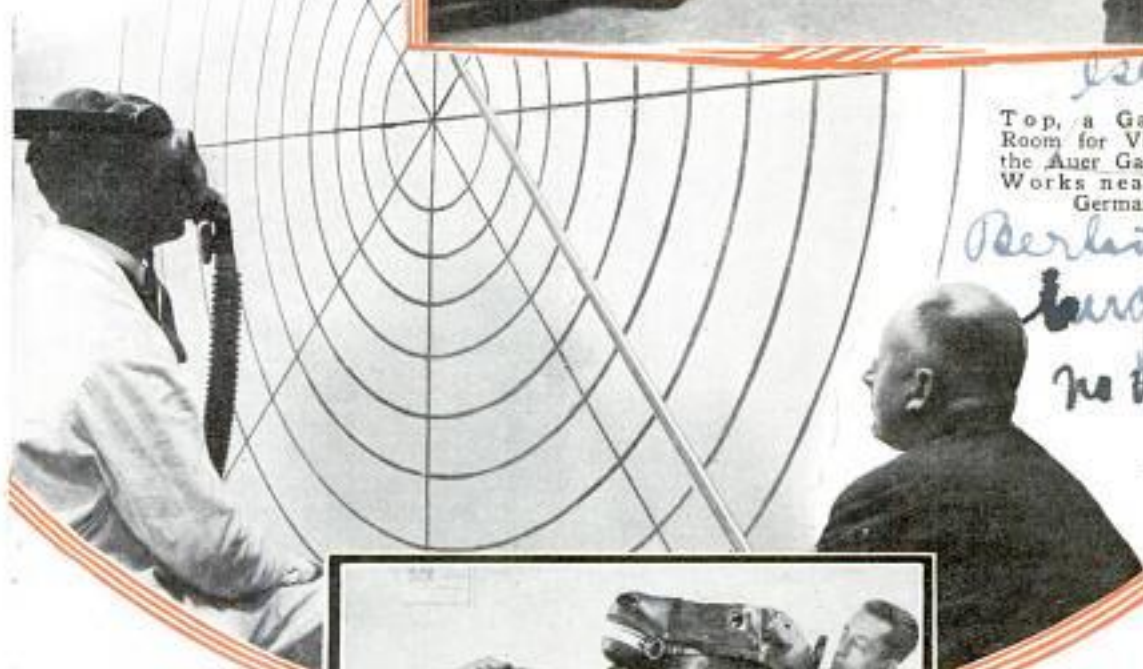
Gas Masks and Lessons in Their Use for All



Fitting Gas Masks on Model Heads so Purchaser May Get Right Size, Just as He Would in Buying a Suit



Top, a Gas-Proof Room for Visitors at the Auer Gas Light Works near Berlin, Germany



Above, Wearer Being Tested for Range of Vision; It Has Been Found That the Gas Mask Does Not Reduce the Range of Eyesight Sufficiently to Limit Everyday Duties



Left, Protective Masks for Horses and Other Animals Are Offered; in Addition, Special Lessons in How to Use the Gas Mask Are Given to All Who Apply at the Auer Factory

German
Berlin Arminia
burg, Germany
no it's a great
kinda.

Keystone

B.A. 3

Cook Miss Sophie Wild / Illinois Testing Laboratories, Inc. / 141 W. Austin Ave Chicago

May 1932



Photographs Taken from Top of Ladder Help to Distinguish Parts of Excavated Ruins

LONG LADDER FOR CAMERAMAN AIDS IN PICTURING RUINS

Excavators in the Orient have found that photographs of ruins help in distinguishing excavated buildings of one stratum from those of another. An extension ladder invented by P. L. O. Guy, field director of the Megiddo expedition of the University of Chicago, enables the cameraman to take photographs of the excavations from the air. Four guy ropes hold the ladder steady in stiff winds. Most of the walls at Megiddo are built of rubble and mud, making it difficult to distinguish different portions.

ASBESTOS BAG FOR ICE CREAM KEEPS CONTENTS COLD

Ice cream, butter and other foods requiring low temperatures can be protected from melting by a waxed-paper bag insulated with asbestos. In tests, ice cream under ninety degrees of heat did not start to melt for two hours. The bag is waterproof and airtight. A similar bag is being used to protect bottles of milk against the weather, dust and animals.

EXHAUST HEAT USED TO TELL MOTOR'S CONDITION

By measuring the temperature of exhaust gases, a new gauge reveals the condition of a Diesel engine. It warns of leaking valves or pistons and faulty lubrication, shows whether cylinders are balanced, reveals improper cooling and measures the engine load.

TWO-WAY RADIO IN SAME UNIT HAS THREE-MILE RANGE

Effective at short distances, a combined radio receiver and transmitter has been produced by the R. C. A. Victor company. Together with a battery unit, the set weighs only twenty-two pounds and is expected to aid police, fire fighters, forest rangers, the army and others to whom emergency and mobile communication is necessary. The unit may be strapped on the back without hampering movements of the carrier. Operation is simple, the change-overs from transmit, receive and telegraph positions being accomplished by flipping a single key switch. Wavelengths below ten meters are used, eliminating the possibility of interference with existing radio services. The range is about three miles, but can be increased.



Radio Receiving and Sending Set; in Circle, Set in Use

ⓘ Soot causes damage estimated at fifteen dollars per person in this country.

B. 1913

Boston & Cedar Co. / 560 W. 29th St. / New York

RCA Victor Co. / 155 E. 24th St. / New York

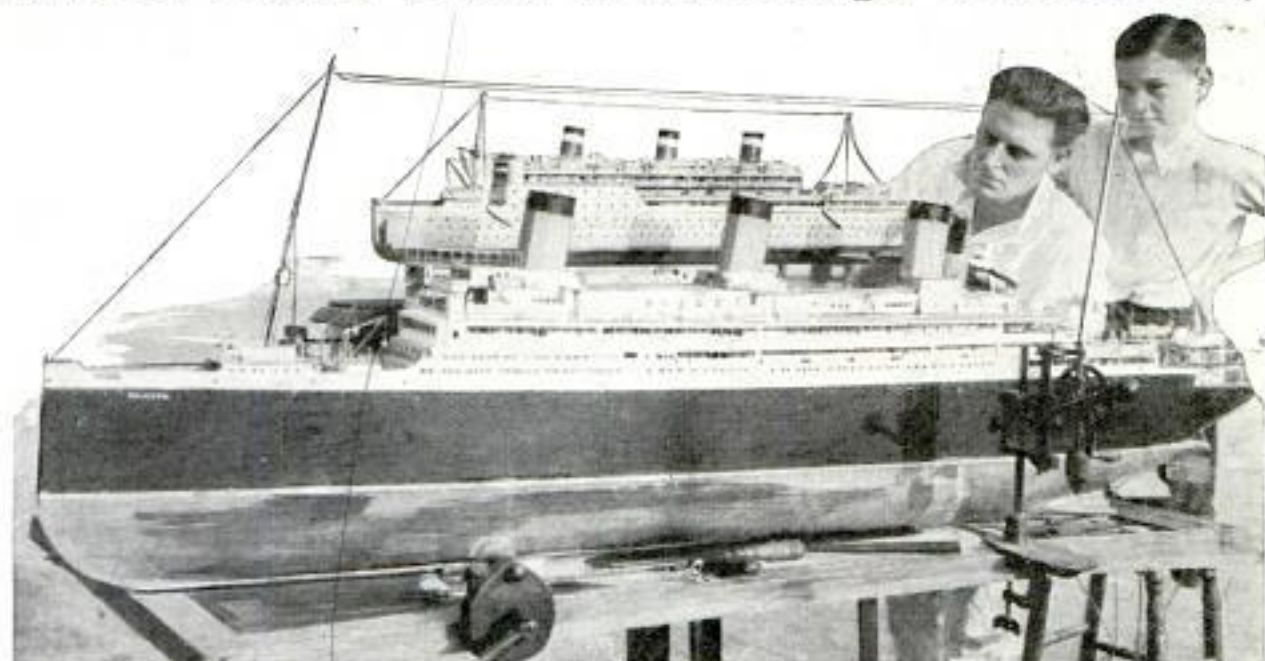
Service news letter 9/10/32

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001885

Charles Windsor
Dalywood Calif

Model Liners Built from Scraps as a Hobby



Built to Exact Scale, This Model of the "Majestic" Is Shown Nearing Completion; in Background Is the "Leviathan" Model; Builder Is Shown at Work While His Son Watches; Scrap Materials Are Used

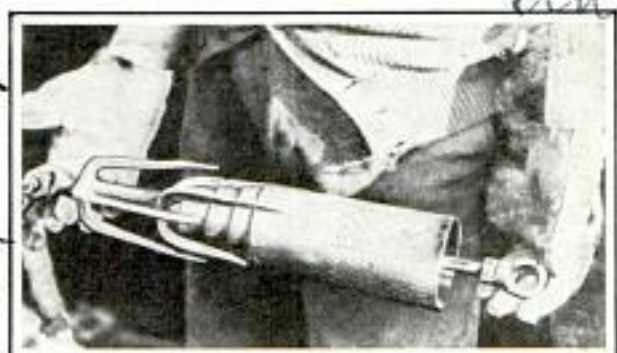
Scrap materials around his home and garage are being turned into model ocean liners by a Californian, so exact in detail that one has been used in a miniature motion-picture set. Tin advertising signs are used for hulls, coffee cans for stacks, pins for railings and small eyelets for port-holes. The builder completed his "Leviathan" model in eight months and it was used in the movies. The "Majestic" is nearing completion.

long arguments over the question after early experiments in Germany had indicated that such might be the case. During recent times, other scientists have found that water animals, ranging from the mosquito larvæ to frogs, are able to soak in a living through their skin.

CEMENT "TORPEDO" LINES PIPES BURIED IN GROUND

B18 36

Water pipes and mains buried in the ground may be lined with cement without disturbing their position by means of a torpedolike tool that shoots the cement on the sides as it travels through the pipes. Springs keep the device centered in the mains, while the body is tapered to a "skirt" studded with holes.



Cement Spreader Is Pushed through Water Main, Coating It without Removing Pipe from Ground

WATER ANIMALS ABSORB FOOD THROUGH THEIR SKIN

B1958

Animals living in the water can absorb food in dissolved and suspended forms through their skins, gills and other surfaces in contact with the water. Dr. E. Harold Hinman, of Tulane Medical school has reached this conclusion after experimenting with mosquito larvæ reared in water put through a filter so fine that it strained out even the bacteria. Therefore the infant insects had no solid food whatever and had to subsist on what they found dissolved or suspended in the water. This is just what the larvæ did. Doctor Hinman is of the opinion that larvæ so fed get their nourishment by absorption through their intestinal wall rather than through the skin. His tests followed

Science News Letter 9/20/32

Quarterly Review of Biology

New Orleans, La.

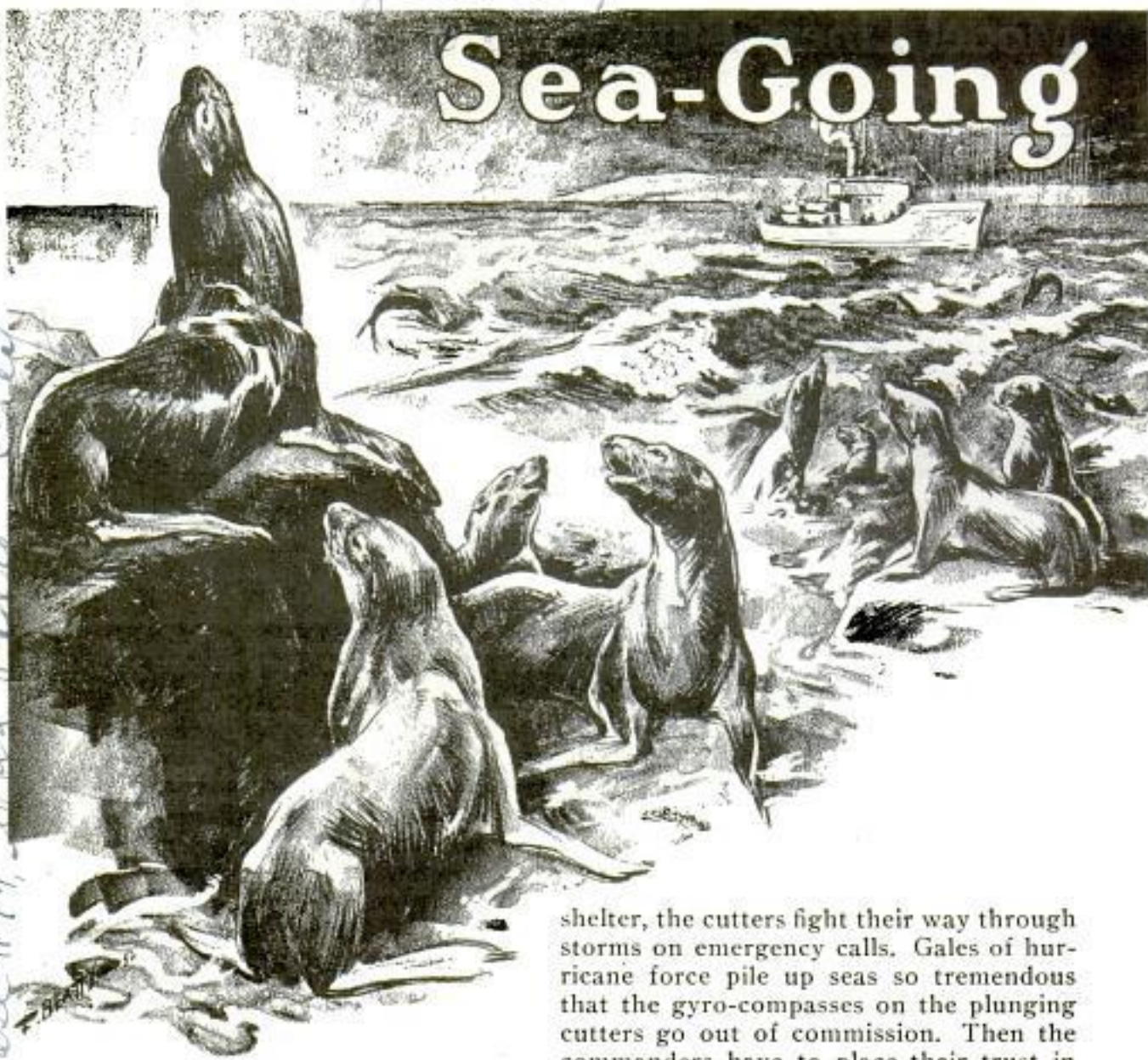
at Sydney

Copyrighted material Australia.

13 1810 Cont. Thos E. Stinson Jr.
 - 45 S. Spring St.
 - Los Angeles, Calif

Sea-Going

Reference: Boatwain, Walter K. Wilson
 Cutter Montgomery Coast Guard Station
 Base #17, San Francisco



DODGING icebergs, battling Arctic gales, and making their way for days through fog so thick the commanders hardly see the bows of their vessels, a fleet of coast-guard cutters every year enacts the role of "the Good Samaritan" in the Bering sea. From the fleet's headquarters at Unalaska, the cutters dash to the rescue of foundering ships, rush doctors and medical supplies to stricken villages, carry mail, transport officials and engage in a multitude of heroic tasks.

By equipping its vessels with the most modern instruments the coast guard has eliminated many of the dangers of its northern patrol. But the elements still have the upper hand, and none of the boats finishes a season without many close calls. When other vessels are running for

shelter, the cutters fight their way through storms on emergency calls. Gales of hurricane force pile up seas so tremendous that the gyro-compasses on the plunging cutters go out of commission. Then the commanders have to place their trust in magnetic instruments that are little better, since the proximity of large masses of



Sailor on Cutter Sweeping the Horizon for Signs of Poachers Who Attack Seal Herd

"Good Samaritans"



Right, Alaskan Survey Plane Being Hoisted to Navy Tender; Below, Area Patrolled by Cutters

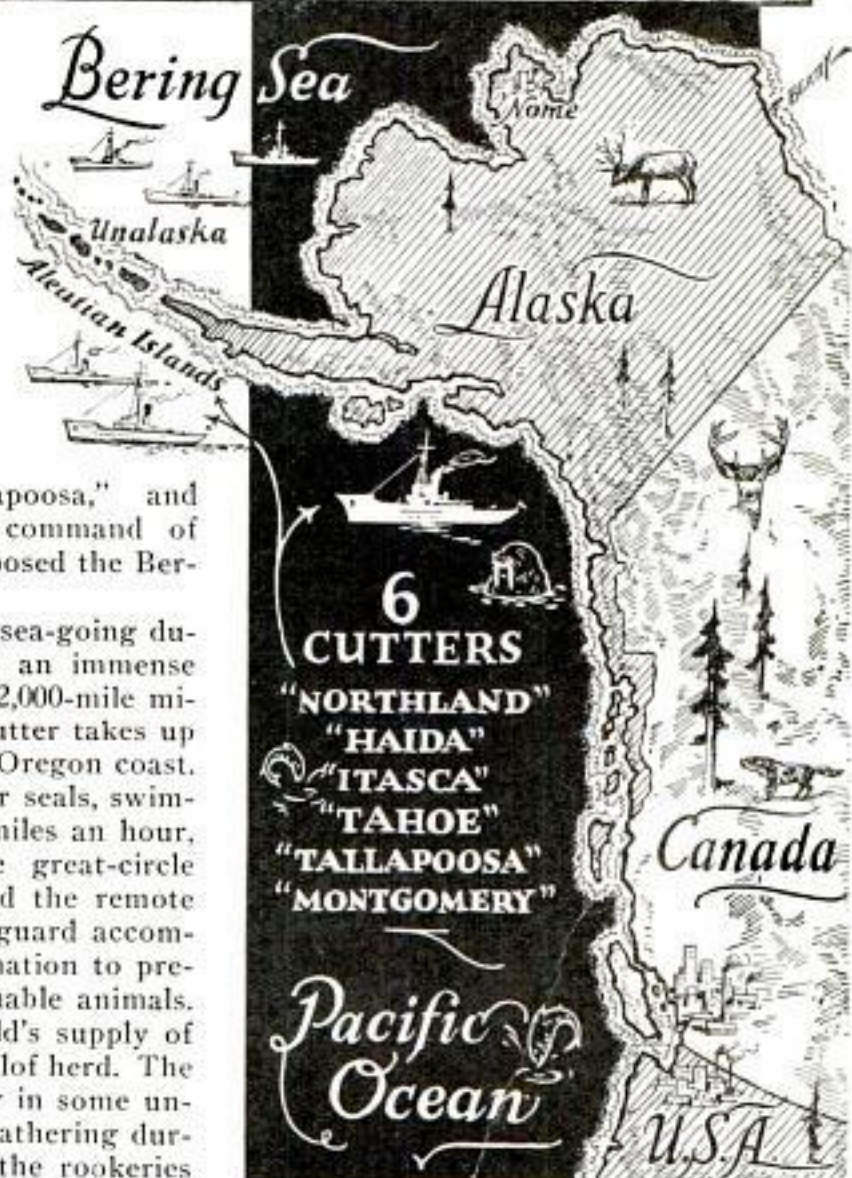


ore under the sea and on the islands create local deflections. If fog shuts down for weeks at a time, as frequently happens, the coast guardsmen must navigate by means of the lead line.

So perilous is the assignment that only picked crews, with an experienced commander in charge, are given the task of protecting the country's northern possessions. This year, the "Northland," "Haida," "Itasca," "Tahoe," "Tallapoosa," and "Montgomery," under the command of Capt. John Boedecker, composed the Bering sea patrol.

The strangest of all their sea-going duties is to act as convoy to an immense herd of seals on an annual 2,000-mile migration. Each April 15, a cutter takes up its station 100 miles off the Oregon coast. More than half a million fur seals, swimming day after day at ten miles an hour, are proceeding on a true great-circle course for Unimak pass and the remote Pribilof islands. The coast guard accompanies the herd to its destination to prevent molestation of the valuable animals.

Practically all of the world's supply of seal fur comes from the Pribilof herd. The seals spend most of the year in some unknown part of the Pacific, gathering during the breeding season at the rookeries





Cutter "Tahoe," and, at Right, Coast-Guard Base at Unalaska, Showing Three Cutters

varied duties that befall the coast guard in the north. For nearly five months, the little 125-foot boat, in command of Boatswain Walter Wilson, was on the go. The season began with a trip to Bristol bay, delivering mail and giving medical assistance to the sailing ships that make up the cod-fishing fleet. A doctor and dentist are on each cutter. Then the native villages along the Alaskan coast were inspected, and federal marshals and school-teachers were transported



on St. George and St. Paul islands in the Pribilof group north of the Aleutian islands. This annual rendezvous almost led to their extinction twenty years ago when unscrupulous sealers decimated the herd. Since then the United States has guarded the seals under an international agreement. Under its stewardship the herd has increased to several million specimens, valued at \$20 each "on the flipper."

The cutters that "ride herd" on the seals prowl in and out of the islands, investigating every craft that approaches and warning them off if they have no proven business in the vicinity. Fishing and commercial ships that pass through the area are forbidden to carry guns. If the coast guardsmen find evidence of poaching, the vessel is seized.

The cruise of the "Montgomery," smallest of all the cutters, furnishes an example of the

to their posts. At many villages, the annual visit of the cutter is the only contact with the outside world.

These duties were followed by a tour of the settlements on the Aleutian islands, where soundings were taken to bring existing charts up to date. After this cruise the "Montgomery" was detailed to the seal patrol. While investigating vessels near the Pribilofs, word was flashed to the cutter that a freighter was overdue. Immediately the "Montgomery" dashed for the treacherous rocks and islands to the south, eventually rescu-



031819

ing the crew of the freighter which had struck a rock and sunk.

Then she was sent to assist the flying boat piloted by Capt. Wolfgang von Gronau on its transpacific hop. The airplane was to refuel at Attu island. Carrying a load of aviation gasoline, the "Montgomery" made her way through the fog to the island and, after arriving, the radio officer broadcast a string of signals at regular intervals. By using his direction finder, Capt. von Gronau was able to fly straight to the fog-shrouded island. After



Giant Crab Caught in Bering Sea Where the Cutters Play the "Good Samaritan"

refueling, the plane headed for the Kurile islands north of Japan, again relying on the cutter's broadcast to keep a straight course. Finally the assistance was over.

By the use of radio and radio telephone, each cutter keeps in constant touch with its base. Nearly every village has a short-wave amateur set and, by these, requests for assistance are dispatched to headquarters, then relayed to the cutters.

The most dangerous of all the cruises is the annual expedition of the cutter "Northland." Each year she fights her way through the Bering strait into the Arctic ocean, carrying supplies to the radio station at Point Barrow. Even in the short season when the trip is possible, it is a

hazardous one, for summer gales in the Arctic compare with winter blizzards off New York. Dodging ice fields and watching her chances to use open leads, the "Northland" creeps mile after mile into the far north. Occasionally an entire tribe is moved along the coast to a point where hunting and fishing are better.

The "Northland" remains in the Arctic until the last possible moment, moving south only when the new ice begins to form late in the summer. By carefully observing the ice drift and taking the temperature of the water, the final day of safety can be predicted. This information is radioed to other vessels to prevent their being ice-bound for the winter.

02.8.35

H. H. Foster
Austin
Texas
03.19.23



These Pylons at Entrance to Electrical Building at World's Fair Are Decorated with Symbols of the Forces of Electricity

PROGRESS OF ELECTRICAL ARTS SHOWN IN PYLONS

Covered with bas-reliefs symbolic of the forces of electricity, twin pylons stand guard at the water-gate to the electrical building erected for the 1933 Century of Progress world's fair. The building will contain exhibits showing the advances in electricity.

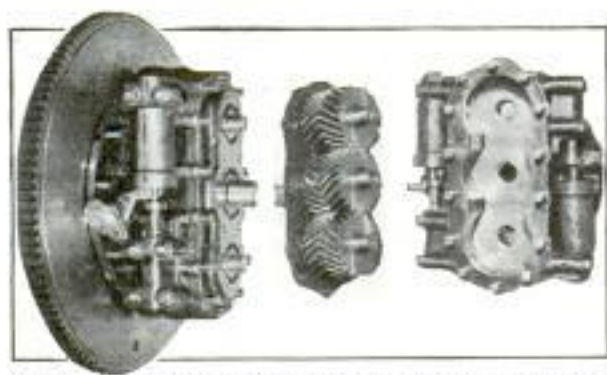
SWISS BUILD BIG POWER LAKE

By damming Grimel glen at an altitude of 6,155 feet, engineers have created a new lake in Switzerland. Although a thing of beauty, the lake was made to run three power plants of 282,000 horsepower. It contains 300,000,000 cubic feet of water and is three and one-half miles long. The dam is 300 feet high and 110 feet long.

"SLIPPING" CLUTCH TO END GEAR SHIFTING

Slippage between motor and driveshaft of the automobile is employed in a new automatic transmission to increase the power. The principle is like that used many times by autoists as they attempt to drive up a steep hill in high gear. When the car slows down, the driver pushes in his clutch, races the engine and then releases the clutch, thus utilizing the momentum of the moving parts of the engine to jerk the car forward. If the ordinary clutch is used in this manner very often, the resulting heat will ruin it. However, in the automatic transmission, a large oil-circulating gear pump is used. Outlets to this pump and the one formed by three gears are so restricted that there is only three per cent slippage between engine and driveshaft

when oil is permitted to flow freely. This is the high-gear position. If the motor is subjected to a strain, the control mechanism shuts off part of the oil supply and permits the engine to race. Then another slug of oil enters the unit and the engine's momentum is imparted to the driveshaft, but without jerking. The action of the de-



Oil Pump and Gears in Automatic Transmission Convert Slippage into Power for Auto

H. H. Foster
Austin, Texas
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02.10.55

Swiss New Lake - 10/29/32

reported by Asst. Trade Com. *B1970*
Carl H. Boehrer

Batavia POPULAR MECHANICS

vice is so fast that engine racing and car jerking are smoothed out into what appears to be a continuous flow of power.

CIGARET COUPONS ARE USED AS MONEY IN JAVA *B195*

Cigaret coupons are being used as currency by the natives of Java. Food, clothing, phonograph records and even automobiles may be purchased with this form of money, which has come into use as the circulation of actual currency steadily declines. The coupon has acquired real value to the extent that many individuals now carry on a brokerage business in this form of tender. Only the domestic manufacturers inclose coupons in their packages, resulting in a decline in sales of American-made cigarets.

Not nearly

B1921

HUNTING COAT WITH LIFE VEST OFFERS GREATER SAFETY

Nearly every conceivable need of the hunter is met in a jacket which is equipped with a removable life vest for use when the nimrod ventures in or on the water.



Hunting Coat with Removable Life Vest: It Has Four Game Pockets and Several for Shells

The vest is easily detached when not needed. In addition, the coat has four large game pockets, two accessible from the front and the others from the rear; two large shell pockets on each side, and also a waterproof container for watch, duck call, tobacco, and hunting license.

American Pad + Textile Greenfield Ohio



Race-Track Patron Placing Bet in Automatic Bookmaker; Electricity Operates Machine

COIN-IN-THE-SLOT BOOKMAKER TAKES BETS AT RACES

Bets at English race tracks may be made on an automatic bookmaker. The patron drops a coin equivalent to the American 50-cent piece into the win or place slot, turning a disk to the number of his horse. The machine prints and issues a ticket to the patron while a totalizer adds up the bets and calculates the amount due each holder of a winning ticket. Both machines are operated by electricity. The bookmaking device covers up to forty entrants in a race.

Go. Ltd. 139 St. James St. London, S.W.1, England.
Bell Punch
W. U. Sagenharian.

FOSSILS TAKEN FROM "ICE BOX" THOUSANDS OF YEARS OLD *B1959*

Animal bones and plants have been removed from a natural refrigerator that has preserved its contents 100,000 years, or since the Ice Age. The "ice box" consists of a series of beds of frozen muck overlying gold-bearing gravel in Alaska. To get at the gold, a mining company brings water ninety miles across the country to melt the frozen muck. This uncovers the bones, tree stumps and other objects. Prof. Albert S. Wilkerson has sorted out bones of the mammoth, giant bison, extinct horses, caribou, moose and rodents from the mass taken from the muck.

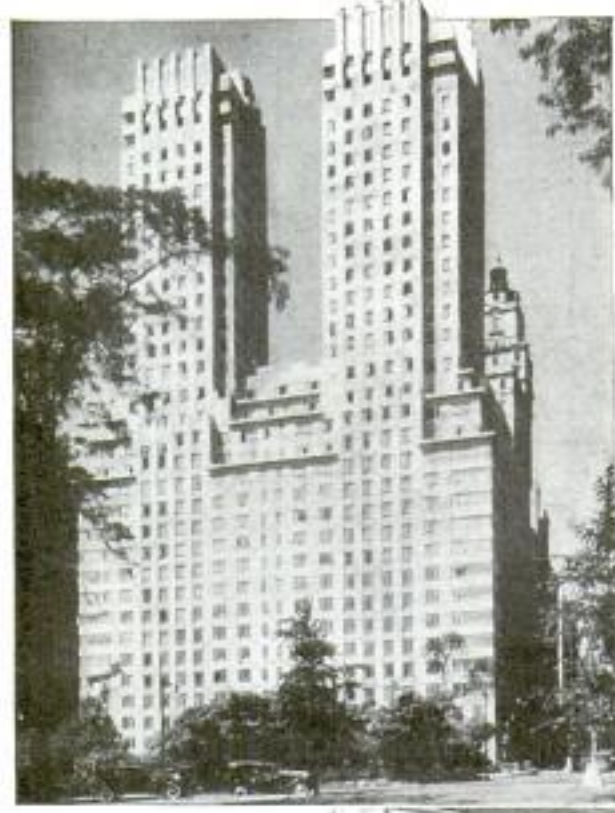
Science News Letter 9/11/52

reported to American Museum of Natural History

Alaska Agricultural College and Forest Experiment Station Fairbanks, Alaska.

B1895 Starrett Bros + Ekerdt, Inc.
 350 5th Ave
 New York City

Cornerless Houses Have Invisible Supports



In apartment houses and hotels, as the Majestic in New York, the cantilever appears in the sun parlors of the suites, especially those at the "cornerless" wall angles. Tenants can therefore have delightful and unobstructed views. As the glass admits the ultraviolet rays, they may acquire healthy tan when the sun is shining, and they and their plants and flowers will flourish in its life-giving vitamins.

NO LARGE INDUSTRY EXPECTED FROM STEEL HOMES

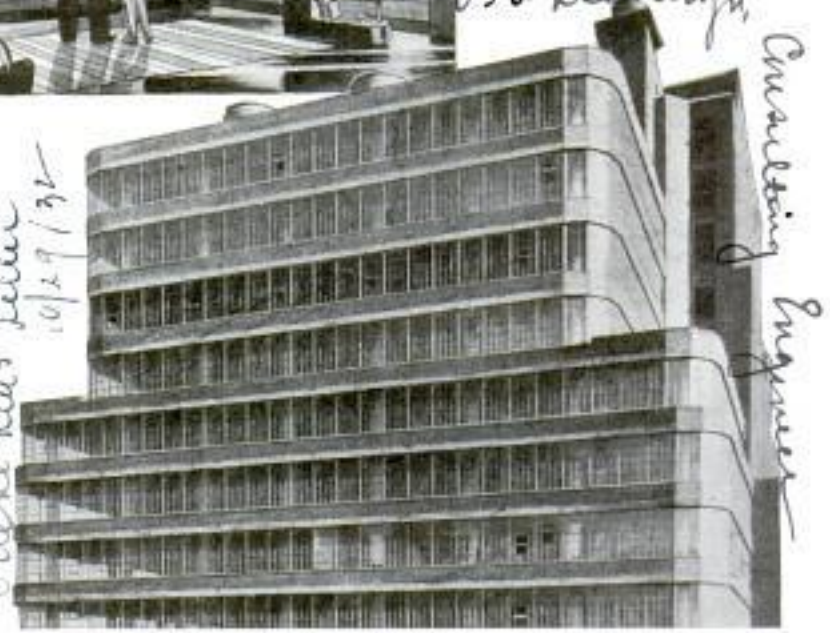
B1953

While steel residences are springing up all over the country, the United States Steel corporation has decided that the mass production of standardized steel houses will not become a big new industry. Study of fifty-six systems of steel construction was made, and this led to the conclusion that houses of individual design using standardized steel units will furnish the chief demand for steel for home building.

New types of buildings without solid corners have come to American cities. At first glance, they seem to lack means of support. As their outside walls are mostly glass, however, one can peer through them and learn the secrets of their stability. In one kind the outer walls hang curtainlike from the eaves; in the other, they are balanced on a bracket or cantilever. Many advantages are claimed for the cornerless structures. In factories, for instance, plenty of daylight close to the all-window sides is available, and without the shadows cast by exterior columns and corner piers of brick or stone. Storekeepers can display their goods for the window shoppers without having their schemes of decoration limited by posts.



See here? Better 10/29/32



Dr. J. Cleveland
 Creating Support

Examples of Buildings without Solid Corners of Masonry for Support; Outer Walls Are Either Balanced on a Cantilever, or Suspended from the Top of the Structure Like a Curtain

30 Church St
 New York
 Copyrighted material

Schenedady My 3/20

HOME AIR CONDITIONER FOR COMBINATION WITH FURNACE

B1938

Designed to be used in conjunction with its recently introduced oil furnace, an air-conditioning unit for warm-air heating systems has been developed by the General Electric company. In operation, the air-conditioner blowers draw air from the basement which is filtered, heated, moisture-treated and forced up through the conventional warm-air ducts into the house. When cooled to room temperature, the air returns to the basement through a grille on the first floor. The blowers are of sufficient capacity to completely recirculate the air in the home five to ten times per hour during continuous operation. Air temperatures at the room register outlet are relatively low, varying around 130 degrees.



Matching Eyes of Live and Stuffed Animals with Glass Imitations Is This Artist's Job; She Serves Many Sportsmen

GLASS EYES MATCHED FOR ZOO AND FOR HUNT TROPHIES

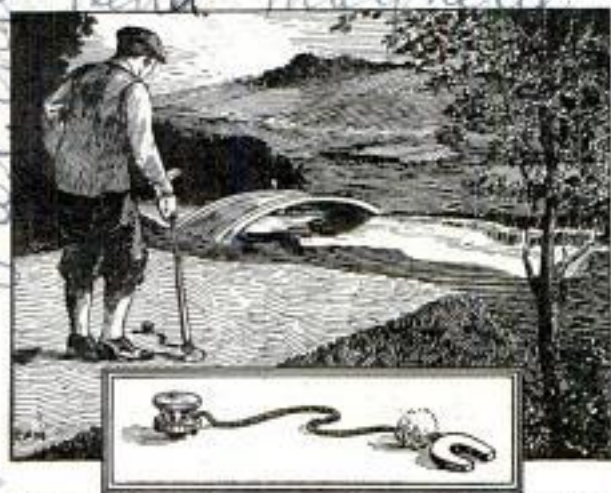
Matching glass eyes for living animals, as well as for stuffed and mounted trophies of the hunt, is the unusual occupation of Miss B. Lempie, of Los Angeles. Often there comes a call to furnish a single eye for animals in southern California zoos, while sportsmen all over the world send their stuffed and mounted animals to be supplied with lifelike glass eyes.

GOLF TEE AND MAGNET LIFTED WITHOUT STOOPING

B1649

Golf tees can be lifted from the turf after a drive without stooping by using a small magnet attached to the tee by a cord. At the top of the wood shaft a metal button is screwed. Picking up the tee then is only a matter of inverting the club and allowing the magnet to attach itself to the metal. Iron clubs do not require the button. The magnet is rustproof, and the tee is easily replaced if broken.

Send magnet



This Golf Tee with a Magnet Attached Can Be Lifted by Lowering Metal Shaft of Club to the Magnet

FUEL VALUE OF CORD OF WOOD EQUALS TON OF COAL

B1965

Experiments conducted by the forestry department of a Michigan college reveal that a cord of dry wood contains heat value equal to one ton of anthracite coal. It was estimated that one pound of hard coal contains nearly twice as much heat as one pound of dry wood. It is popularly supposed that green wood is better for fuel than dry wood since it burns longer, but the tests showed dry wood gives off more heat, and wood from trunks of trees contains more heat units than that from limbs. Best results were obtained in a furnace by leaving a bed of ashes on the grate and burning the cord wood on top of the ashes.

If all the soap used annually in the United States were equally distributed, each person would receive twenty-five pounds.

Imp. George Co. London

Michigan

Carl William Guhan 4756 Harbut Ave Detroit Mich

Als. Spalding Bros 211 S State Chicago

National Soap Co. Copyrighted material

B 1879

FLYING



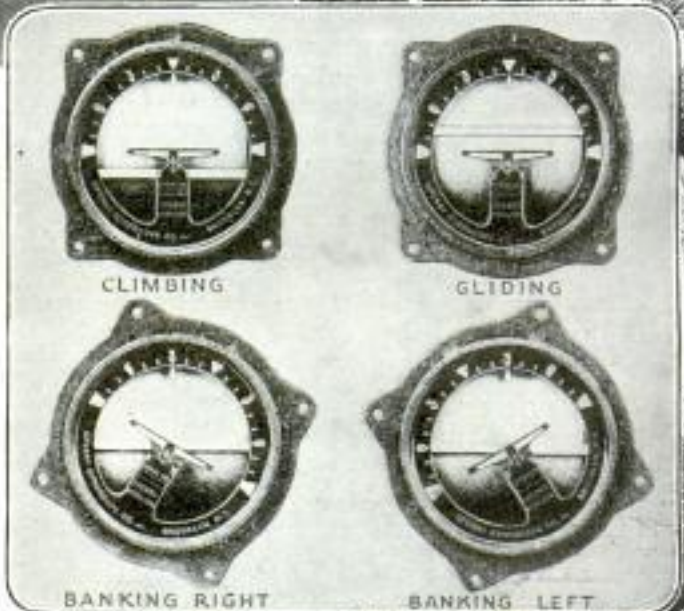
Pilot in Hooded Cockpit Ready to Try His Skill at Flying by Instruments; Right, the Artificial Horizon Which Shows Relation of the Ship to the Natural Horizon

HIGH above the airport at Oakland, Calif., a student flyer with less than fifty hours in the air is soloing. He is trying desperately to execute figure "eights" in a cross-wind, and is having plenty of trouble. On the ground a flying instructor gazes up at the fledgling, grimaces impatiently, and speaks into a radio telephone.

"Oakland Boeing school calling airplane '587-K,' Oakland Boeing school calling airplane '587-K,'" he barks. "Zoom for recognition. Your eights are not right. Hold your point closer. Correct more for the crosswind. All right, now, try it again. That's all."

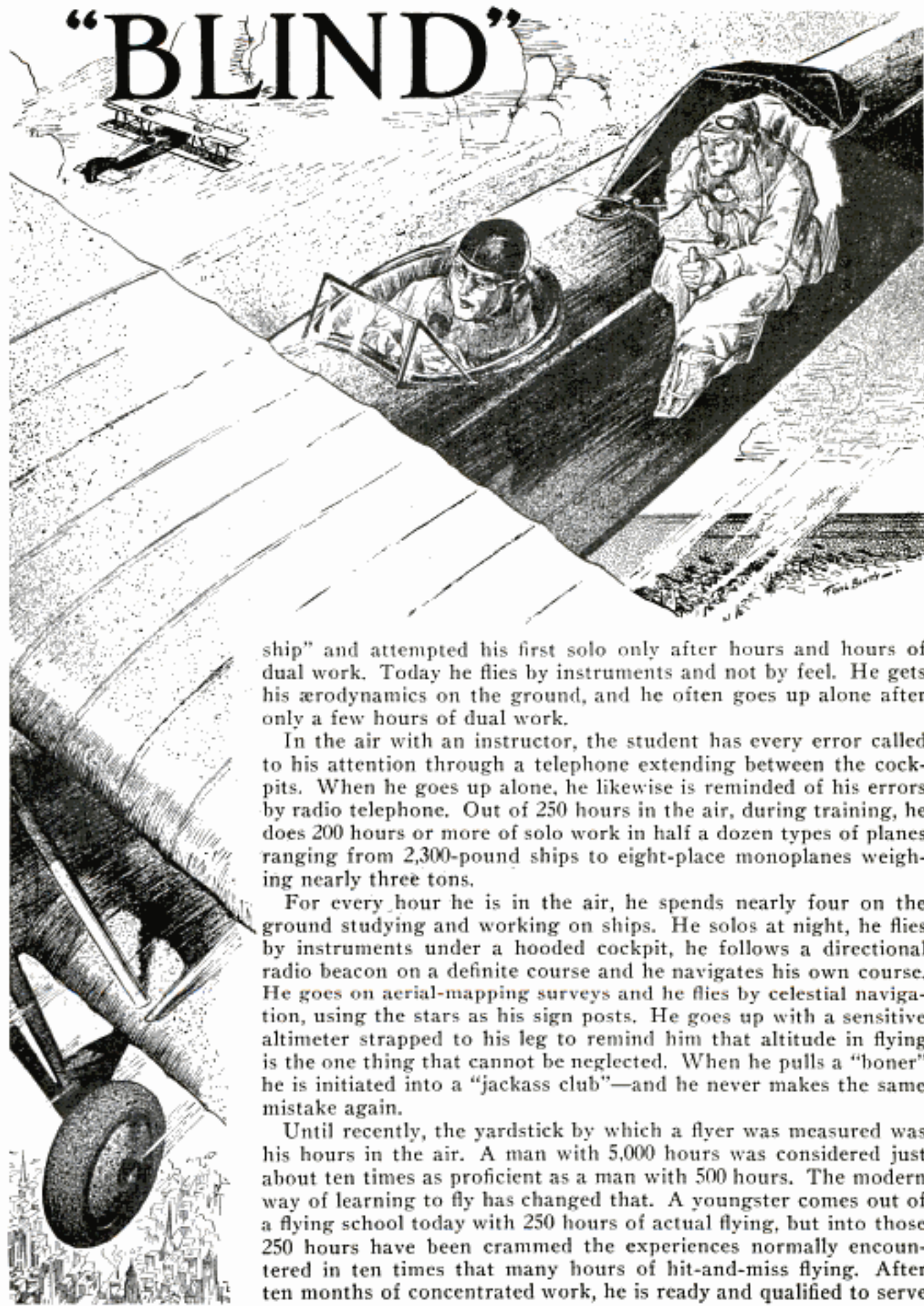
The student overhead does no "talking back" for it is a one-way phone and he is on his own. He attempts another eight, and another, and another. He now knows what was wrong with his first ones, for his instructor has just told him to correct his bank and make allowance for wind drift. When his teacher on the ground is satisfied, the novice and his flying schoolhouse are ordered down.

Such is the modern method of training future transport pilots at the Boeing school of aeronautics. A few years ago the young aviator went for flight after flight with an instructor to get the "feel of the



B/18/19

"BLIND"



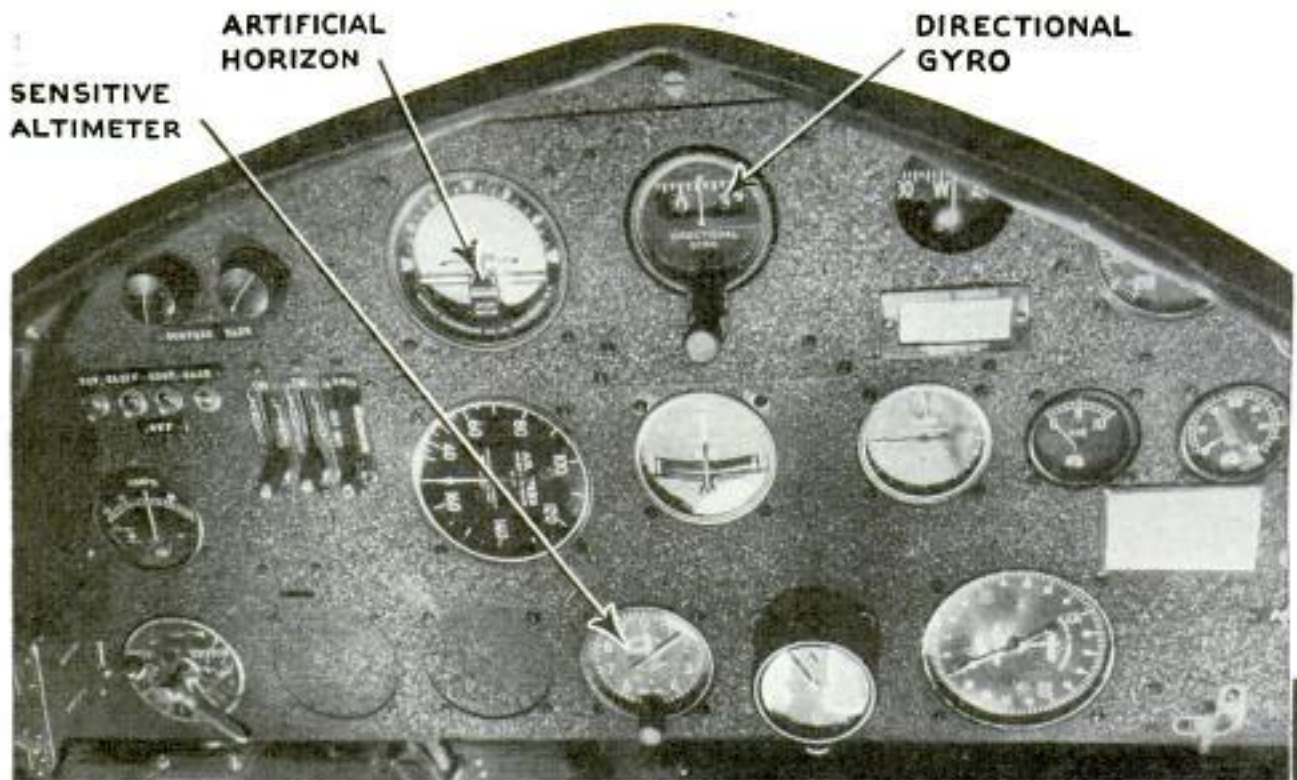
ship" and attempted his first solo only after hours and hours of dual work. Today he flies by instruments and not by feel. He gets his aerodynamics on the ground, and he often goes up alone after only a few hours of dual work.

In the air with an instructor, the student has every error called to his attention through a telephone extending between the cockpits. When he goes up alone, he likewise is reminded of his errors by radio telephone. Out of 250 hours in the air, during training, he does 200 hours or more of solo work in half a dozen types of planes ranging from 2,300-pound ships to eight-place monoplanes weighing nearly three tons.

For every hour he is in the air, he spends nearly four on the ground studying and working on ships. He solos at night, he flies by instruments under a hooded cockpit, he follows a directional radio beacon on a definite course and he navigates his own course. He goes on aerial-mapping surveys and he flies by celestial navigation, using the stars as his sign posts. He goes up with a sensitive altimeter strapped to his leg to remind him that altitude in flying is the one thing that cannot be neglected. When he pulls a "boner" he is initiated into a "jackass club"—and he never makes the same mistake again.

Until recently, the yardstick by which a flyer was measured was his hours in the air. A man with 5,000 hours was considered just about ten times as proficient as a man with 500 hours. The modern way of learning to fly has changed that. A youngster comes out of a flying school today with 250 hours of actual flying, but into those 250 hours have been crammed the experiences normally encountered in ten times that many hours of hit-and-miss flying. After ten months of concentrated work, he is ready and qualified to serve

03/879

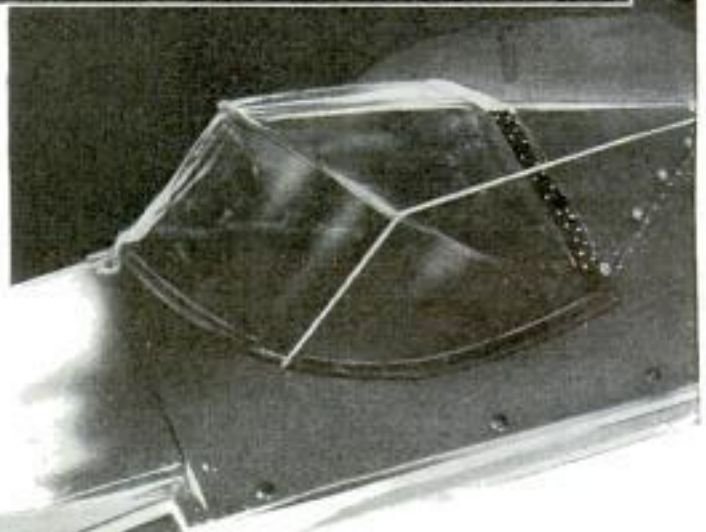


Above, Arrows Point to the Three Supplementary Instruments Which Enable a Pilot to Fly "Blind"; Right, Trainer Ship for Teaching Instrument Flying; Note Hooded Cockpit; Below, Instructor on Ground Talking to Student in Air

as copilot on a big passenger ship, and after a couple of years of piling up hours, he may even become pilot of a transport.

This new type of pilot during training can and has flown from Oakland to Reno under a hooded cockpit, and has known by instruments alone that he was at his destination. Two students began their flying by climbing under the hood and using instruments alone to supply them with information while in the air. Others have navigated a ship for hundreds of miles and reached a predetermined destination with only the aid of instruments and maps—no "peeking" over the side.

Pilots trained to fly "blind," new instruments making such flying possible, and improved and faster ships are speeding up the airways schedules. United Air Lines, for instance, has spent ten months with five ships with hooded cockpits training 150 seasoned pi-



lots to fly by instrument preparatory to placing in service a fleet of sixty twin-engined low-wing metal monoplanes. Such ships, carrying ten passengers, will go from New York to San Francisco in twenty-two hours, or less, instead of twenty-seven.

What does this mean to the fellow who hops a plane in a hurry? Suppose he leaves Chicago for the Pacific coast, a 2,000-mile trip. He can spend virtu-

031819

ally a full business day in Chicago, departing late in the afternoon. The next morning he is in Los Angeles or San Francisco, with most of the day before him. If he requires only a few hours for business, he starts back the same evening, arriving home less than forty-eight hours after his departure.

Perhaps part of his 4,000-mile journey was made in rain, clouds or fog. His ship is equipped for instrument flying,



Above, Flying Instructor and Student Conversing over Inter-Cockpit Phone System While in Flight



movements—forward, sideways and up and down—but there are three rotational or angular movements about each primary axis—pitch, roll or bank, and turn.

To fly by instrument, the pilot must know amount as well as rate of motion. In vertical motion, the rate-of-climb indicator has been in use for years as the sensitive instrument for this dimension. Now the sensitive altimeter, showing

(Continued to page 140A)

and his pilot considered it safe to fly in weather he might not have attempted previously. At present, however, the three instruments which enable a pilot to fly a transport blind are intended almost exclusively for emergency use and constitute just one more safety factor. Airline companies hope that the ability of all their pilots to fly by instrument, plus more weather knowledge, eventually will enable a ship to proceed in safety in almost any kind of weather except when ice is forming or in cyclonic conditions.

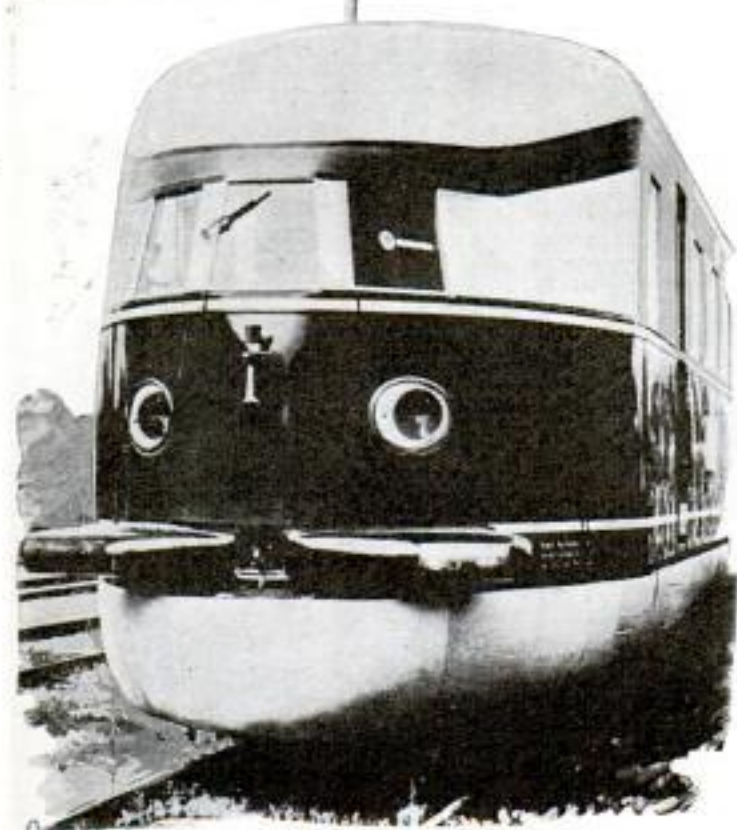
The three instruments enabling blind flying, with which all passenger ships are now equipped, virtually duplicate three others long in use. An aircraft in flight has six possible degrees of freedom which the pilot must control and which his instruments must interpret if he is to fly by them alone. There are three primary



Student Pilots Navigating a Course for a Pilot Who Follows Directions They Give Him

031799

Air Resistance Is Reduced to Low Point in This German-Built Rail Car



FAST GERMAN ELECTRIC TRAIN IS STREAMLINE DESIGN

Capable of attaining a speed of ninety miles per hour, a Diesel-electric train, recently put in service between Berlin and Hamburg, offers an interesting adaptation of streamlining for railroads. The metal cars are so shaped as to offer the least possible air resistance. Wheels are covered by the body shell. Lights are recessed, and even the buffers are designed on airfoil lines.

BUTTERFLY ALTERS ITS COLOR AS MEANS OF DEFENSE

Since they have no teeth or claws to defend themselves from enemies, some butterflies have developed protective coloration. The Kallima inachis of India closely resembles a leaf. It can emit offensive odors. The butterfly beauty is colored like a leaf. Its scales...

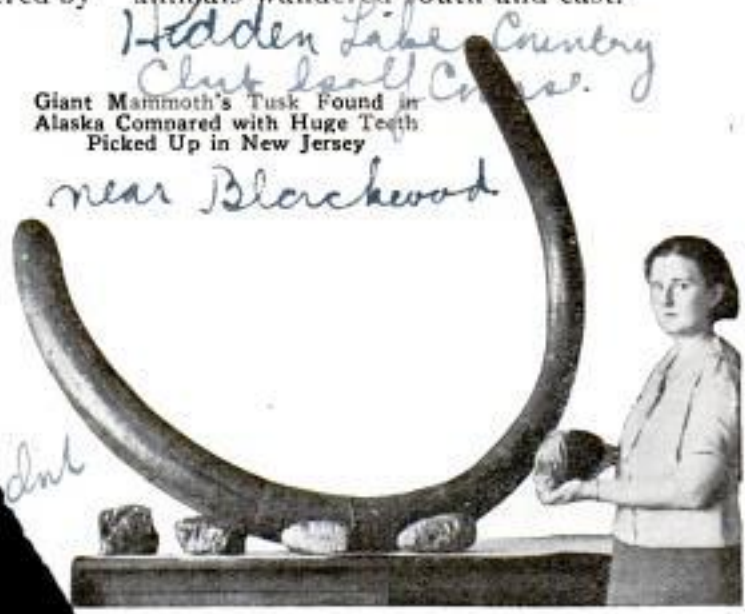
their coloring from the sun by reflecting and refracting light. Some wing scales, although colorless, produce interfering light waves of great beauty. The world's largest butterfly is one found in New Guinea. It has a wing spread greater than that of many birds. In contrast, the pygmy blue of Los Angeles has a wing spread of less than one-half inch. Australian natives roast one kind of butterfly, picking off wings and legs and grinding the bodies into meal for butterfly pancakes. Southern California has 477 species, probably more than any other part of the United States, while Brazil is noted for the abundance of different species, far more numerous than in any part of this country.

9/8/0

MAMMOTH ONCE ROAMED U. S. RELICS PROVE

Teeth from three to five inches long that once lined the mouth of a mammoth have been unearthed in New Jersey, proving that these giant creatures once roamed the eastern part of the United States. A great tusk from a mammoth has been found in Alaska, showing that the monsters wandered far afield. It is believed that the mammoth crossed to Alaska from Asia when a land bridge joined the two continents in the Pleistocene epoch, and that the giant animals wandered south and east.

Giant Mammoth's Tusk Found in Alaska Compared with Huge Teeth Picked Up in New Jersey



Carl Leo Tiedle, 618 S. Main St., Santa Ana, Calif. B 18 40

A. W. Meyer, Long Beach
401 W. Hill, Calif. 47

POPULAR MECHANICS

All-Wood Clocks Carved by Hand as Hobby



Left, Windmill Clock with Works Exposed; Center, Cathedral Model with Symmetrical Towers; Right, Another Unusual Clock Held by the Artist

Carving all-wood clocks by hand is the hobby of a California watchmaker. More than a year's work in spare time is represented by some of the clocks, into which are placed as many as seventeen different kinds of wood. One model in the form of a locomotive starts up mechanically on the hour, its wheels revolving and whistle blowing. More than 1,000 pieces of wood were used in this clock. Other models include a Dutch windmill, a steamboat and a cuckoo clock.

are building their butter-tub wrecks and sinking them in Fire island inlet as an invitation to sea bass, blackfish and others.

B 18 30

TRIPLE LOCK ON HAND LUGGAGE HAS CONTROL AT CENTER

Hand luggage with a new type of lock affords excellent protection for clothing in addition to greater ease of operation. Both end catches are controlled by the lock in the center. Five-tumbler locks, with no two keys alike, are supplied.

ARTIFICIAL WRECKS IN SEA ATTRACT FISH

B 19 42

Fishing grounds are being created close to port by boatmen who are making artificial "wrecks" to attract fish. Thousands of butter tubs, filled with concrete in which are stuck old pieces of wood, have been sunk in New York harbor. The vicinity of wrecked ships offers excellent fishing because fish gather there to feed on marine growths. So the New York boatmen

Shred Island inlet



Locking Mechanism under the Handle of Luggage Also Controls the Catches at Both Ends

M. K. Bitterman
1419 Elmdale Chicago

Carl Eckhardt

Copyrighted material

*Isaswerke Bichroux & Co
 Dergogenwath
 Aachen (Aix-la-Chapelle)
 Germany*



Flexible Glass Bending under Weight of Three Persons without Breaking

Science News Letter 7/10/32 3196

SAME KINDS OF PLANTS GROW IN ARCTIC AND ANTARCTIC

Many plants growing in the lands farthest south are identical with, or closely related to, those around the north pole. How did these far southern plants get across the tropics, where they cannot live, to settle where they are today? Formerly it was considered that the migrant plants moved southward across the tropics during the ice age when the tropics were narrower and possibly not so hot as today. But scientists have learned that many of these plants got south before the ice age, and so have advanced another theory. They know that there were lofty north-and-south mountain chains in both hemispheres in pre-glacial times, and they now believe the plants moved southward along the mountain ranges, thus negotiating the torrid belt in safety.

Wire Wood

"RUBBER" GLASS WHICH BENDS OFFERS GREATER SAFETY

One German factory is producing flexible glass which bends like rubber under pressure. This "rubber" glass is intended for automobiles and other applications where there is danger of injury from shattering or splintering. In tests, a piece of the glass, four feet long and one foot wide, supported three persons without breaking, although it sagged much as a sheet of flexible metal would.

BATTERY TRAIN PROMISES CHEAP TRAVEL

Cheaper transportation is promised by a battery train in use near Dublin, Ireland. Tests show the cost of operation on an eighty-mile run is slightly more than one and one-half cents per mile. The electrically driven coach has accommodations for 150 passengers. A 9,000-mile test indicated that the life of batteries used in the train will be about twenty years.

*Patent 235,587
 22 May 1906
 Dublin Ireland
 James J. Barnes
 Dublin Ireland*

VOICE RECORDER AIDS POLICE WITH CONFESSIONS

Audible records of examination of suspects by police and confessions in the prisoner's own voice, are an aid in crime suppression made possible by a portable recording apparatus. By presenting to the court a "speaking transcript" of the defendant's statement, the confession is less liable to attack on grounds of falsification, it is believed.



Voice Recorder and Reproducing Unit Used by Police in Taking Statements from Prisoners

*Radio Receptor Co
 106-7th Ave New York*

B1873

Boat Church Trains Children of Bargemen



This "Floating Church" Travels German Streams; Children Are Shown Going Aboard.

Med. World
 Children of German bargemen, who pass up and down the nation's waterways more than 100 times in a year, are given religious training in a floating church. This boat, carrying a minister and a missionary, travels the same waters as do the barges, tying up for Sunday services. In their quest for education, these children sometimes attend as many as twenty schools within twelve months. Authorities have solved the problem by issuing a school passport to each pupil as he leaves for another school. In this way, the pupil may resume his studies without interruption.

B1905
SULPHUR UNDER LAKE IS MINED BY STEAM AND AIR PIPES

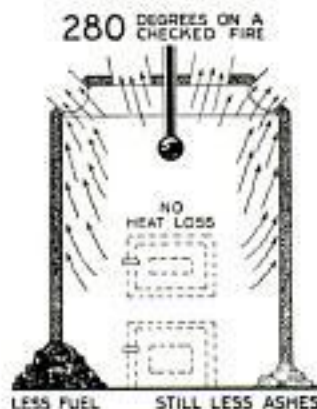
Sulphur deposits beneath the bed of a Louisiana lake are being mined by means of steam and air-pressure pipes. One pipe carries steam down to melt the sulphur, another contains compressed air to force the molten mass upward, while a third provides an outlet from the deposits to the surface. There the liquid sulphur passes through a machine which removes foreign substances, and into a vat where it solidifies. Between 300 and 400 tons of sulphur a day are brought to the vats by the pipe system, which was devised after

*Jefferson Lake Sulphur Co.
 New Iberia, La.*

it was found that the lake water would not permit mining by the usual process of driving a shaft.

B1824
FURNACE JACKET SAVES FUEL BY REDUCING HEAT LOSS

By adapting the thermos-bottle principle to the furnace, fuel bills may be reduced and the usual high temperature of the basement lowered. A jacket made of heat-insulating material is placed around the furnace, much as a person wears an overcoat. This



jacket prevents heat from escaping into the basement, sending more to the rooms above. This makes it possible to operate the furnace on checked draft most of the time, lowering fuel consumption. Maximum temperature

at the top of the furnace is 280 degrees, compared with 175 for an uninsulated plant, while the basement temperature is said to be reduced by thirty degrees.

*Progress Paint Co.
 Insulating Material
 Cleveland, Ohio*

The MAGICIAN



movie in the making had called for insects, elongated fingernails and trick daggers, the director would have torn his hair, cursed the author and substituted something else. Today he tells the property man and finds the items waiting on the set when he is ready to shoot the picture. A little later, in your favorite theater, you guffaw at the grasshoppers, shiver as a siren wields the stiletto, and discover the fingernails adorning the hands of an Oriental actor.

For the property custodian has become the movie director's idea of Santa Claus. The director may need a hairpin or a hippopotamus, a bullwhip

By H. W. MAGEE

THE property man on the movie lot is filling an order from a director.

"Twenty grasshoppers, ten Chinese fingernails and a lady's stiletto with a disappearing blade," he reads from a long list of items.

"All here," checks his assistant.

"O.K., send 'em over to stage six and make it snappy," instructs the "prop" custodian, meanwhile scanning a requisition for a funeral wreath and four jail keys.

A few years ago, if the script for a



Above, Scene from a Recent Movie, Showing an Example of the Property Man's Work; Below, One of the Property Boxes on a Set



Above, Another Scene with Some of the Things the Prop Man Supplies;
Below, a Mummy Case and a Quarter of Beef in the "Prop" Building

or a Bunsen burner, a champagne label or a cobra. The property man supplies them. He goes through some files, opens a few drawers, sends an order to the furniture storehouse, telephones a zoo or a snake farm, and produces anything from fleas to elephants or from 1924 Connecticut auto-license plates to a complete set of period furniture.

Take the matter of the grasshoppers. Twenty healthy hoppers were needed for atmosphere in a Will Rogers picture. The prop man sent out six assistants and they spent a week with nets catching a score large enough and active enough to satisfy the director—but the grasshoppers were there when the scene was to be filmed.

Properties in the movies is the general term applied to almost everything except the actors and the stage sets. A pincushion

032892



auto-license plates—anything that he believes might possibly be called for. He card-indexes hotel keys, legal papers, old calendars, clocks and even perfume bottles.

After many years, each studio collects a large assortment of furniture and furnishings of all periods and designs. This, likewise, the property man classifies and places in storage. After assembling furniture, bric-a-brac and thousands of other items for years, the property man finally has in his files virtually everything used by mankind from ancient to modern times. He can go to his storehouse and haul out a mummy case, or he can furnish a butcher shop because he had occasion to do so years ago and had a hunch to save the equipment.

How much space would it require to store one or more examples of everything ever produced by man? The property department of

is a prop. So is a king's throne. The prop man can supply both. He hangs the pictures on the walls, gets the furniture, places the bric-a-brac, and if a banquet is to be filmed, he even furnishes the food. He can dig up an authentic copy of a cablegram from Guatemala, or make a bouquet such as was worn by a bride of 1868. He is ready to furnish a boatswain's whistle, an Australian boomerang, a baggage check from a Berlin hotel or a Denver newspaper ten years old.

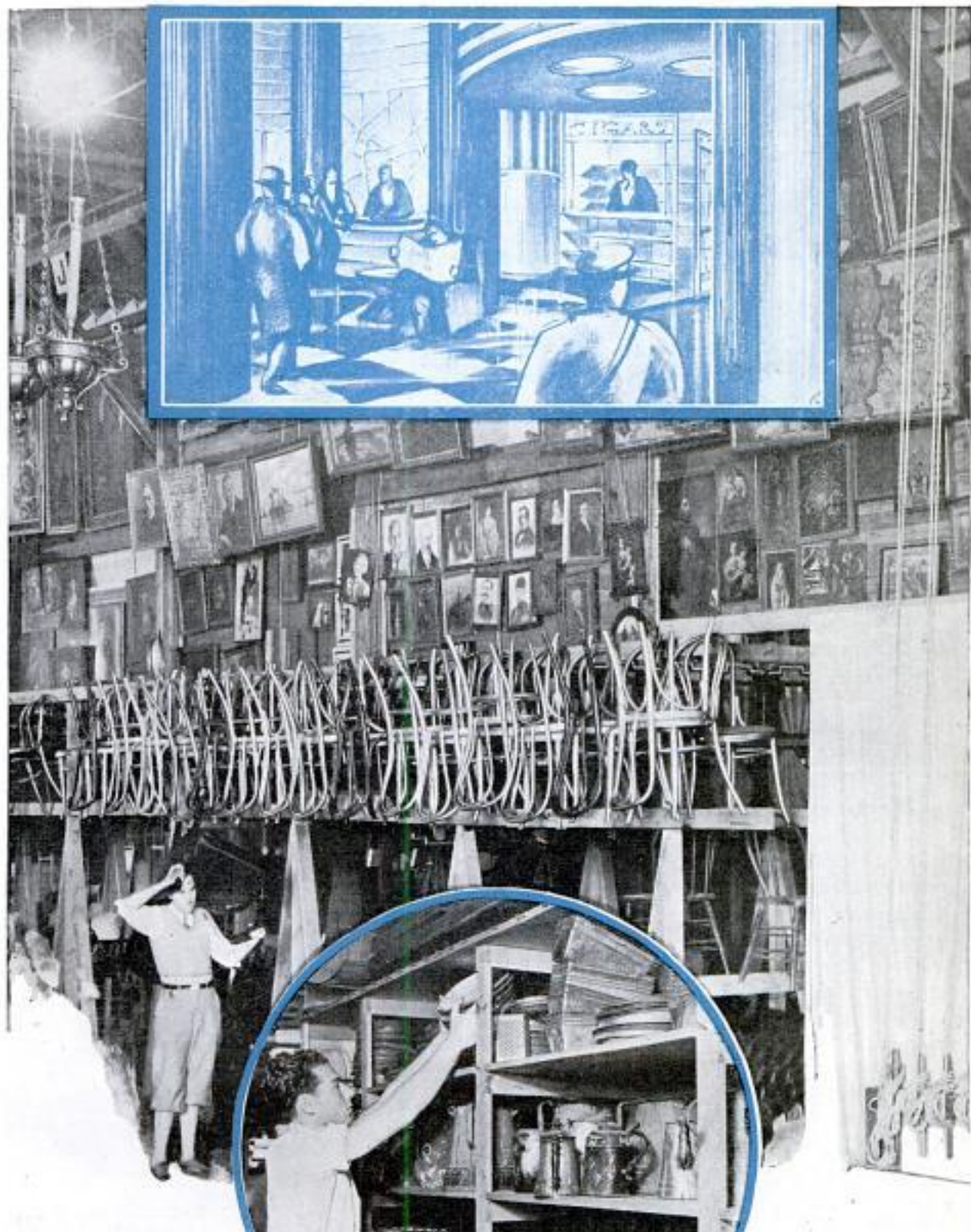
Where does this human Aladdin's lamp obtain his material? In the first place, he is an inveterate collector, and he saves everything he collects and classifies it. He gathers letter heads, postage stamps, old newspapers,



Above, Company Property Box with Some of Contents; Center, Lamp Room in Prop Building; Below, a Corner of the Artificial Flower Shop

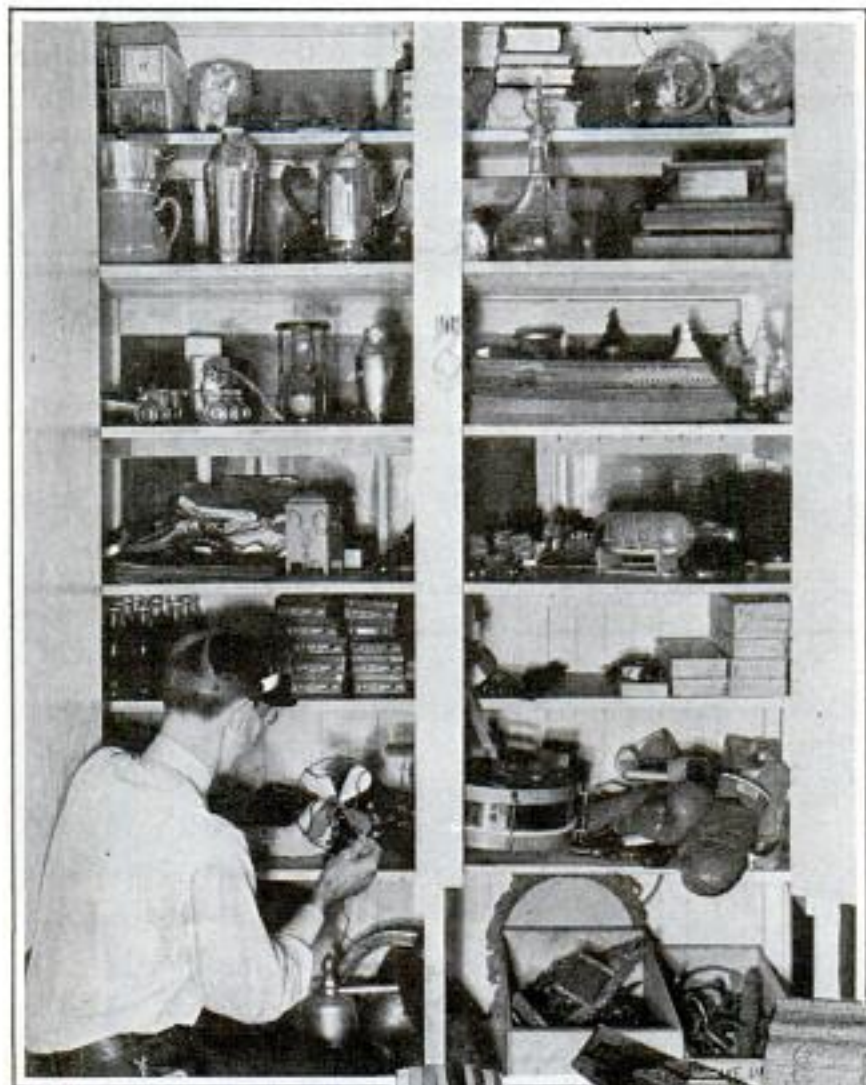
B1842

Movie 'Prop' Man Can Furnish Hut or Palace



Above, One Corner of One Floor of the Property Building; Chairs, Small Pictures and Bric-a-Brac Are Stored in This Section, Each Piece Being Carefully Numbered and Catalogued by the Prop Man

Left, Room Where Kitchen Utensils Are Kept; Here the Property Man Can Pick All the Articles to Furnish the Lean-To Kitchen of a Mining Camp or the Kitchenette of a Fashionable Apartment



the Metro-Goldwyn-Mayer studios, one of the largest, occupies a four-story brick building. It is crammed to the roof, and the props have overflowed onto a huge stage adjacent to it. In these two storehouses are hundreds of thousands of props, some used in nearly every production, some not brought from their filing cases once in ten years.

The property department produces every flower used in the movies because natural blooms do not survive the heat from the strong lights. So adept is the flower man, that he makes a rose out of paper that possesses everything a real rose has—the petals even feel like real ones. He has



Above, How Many Articles Can You Identify in This Cabinet in the Prop Building? Below, Jail Keys and a Collection of Metal Cabinets

few gray hairs to his head. There was the demand for cockroaches, for example. The director wanted six and the prop man thought happily of an insect-exterminating company which delivered to him half a dozen emaciated specimens, each about

also taken a lesson from the bootlegger and has copies of liquor labels by the thousands. With such an assortment of stickers, it is a simple matter for him to equip a bar room in a few hours by pasting the proper labels on his supply of empty bottles.

When he is stumped—he does not carry such items as combine harvesters or army tanks—he calls on the rental department. This department canvasses the scores of rental houses, some of which specialize in animals, others in jewelry and still others in furniture. The rental department leases or buys outright such items as the property man cannot produce.

Insects always add a

031842

3/10/81 Built by S. M.

Cooperating with Aluminum

Pa.

Company of America

Alcoa Bldg
Allsburgh, Pa.
Esulf Bldg

half an inch long. "We want big ones," said the director, waving the half-starved crawlers away, so the property man snooped about Los Angeles cafes until he found what he sought in the basement of a fashionable restaurant. He swore himself to secrecy, and even today he carries locked in his breast the hiding place of California's biggest cockroaches.

Dried lizards did not cause him much trouble. He went to a Chinese herb doctor, but when a director wanted caterpillars out of season, he had to send two men sixty miles into southern California for them. He has also delivered centipedes, scorpions and live bats on request, but resorted to subterfuge when a cobra was requisitioned. There was not a cobra in southern California, but he found a fine specimen of python, made a hood for it and the python doubled admirably for the hooded cobra.

Each movie in the making has its own individual property man who goes over the script carefully and makes a list of every item needed for each scene. He obtains and signs for all this equipment at the property department, and is responsible for the return of all. At the close of work each day, he gathers up from the set all the "stealables," the small items that might be pilfered, and returns them to the property room, replacing them next day.

The company prop man also has a miniature property department of his own—a property box mounted on wheels. Each of these boxes, twenty-four by forty-two by twenty inches, contains more than 1,000 items including virtually every small article for which there may be a hurried call. A glance into one of them reveals such assorted items as a whiskbroom, sash cord, hairpins, first-aid kit, mirror, alcohol stove, shoe brush, flashlight, matches, cloth cleaners, make-up box, soap, paste, nails, powder puff, police whistle, razor, shaving brush, and even a box of insect killer.

When the prop man forgets or comes unprepared, his company may lose thousands of dollars and he is likely to lose his job. As a result, he trains himself to have always at hand the odds and ends for an emergency. So simple an article as a pair of scissors promptly produced has

(Continued to page 138A)



Weighing Only Half as Much as Wood, This Aluminum Ladder Has Wheels for Easy Moving

ALUMINUM EXTENSION LADDER HALF OF WOOD'S WEIGHT

Constructed of aluminum alloy, a new extension ladder weighs only 172 pounds, less than half as much as a wooden ladder of similar dimensions. A platform with guard rails is provided at the top, while the ladder is supported by a set of aluminum legs. This brace is removable. The legs are so pivoted that when the ladder is folded, it may be moved about on auxiliary wheels attached to the bottom. Open, the ladder is forty-four feet long and folded, twenty-five. Tests have revealed that it possesses strength enough to meet all service conditions.

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

B 1843 Noah's Ark - owned by
Otto Fockemaand, Animal dealer

56

POPULAR MECHANICS

Hamburg Germany

Hundred-Year Floating Zoo Is Noah's Ark



Finnish Bark, 100 Years Old, Which Was Fitted with Cages and Converted into a Noah's Ark, the Animals Being Obtained from a Hamburg Zoo When It Went Out of Business; Left, a Monkey Cage



This Modern Noah's Ark Has Been on the Move for Three Years and Brings Its Animal Show to Remote European Ports Where a Circus Never Has Been Seen; on Its Deck and in the Hold, Are Cages Containing 200 Mammals, Birds and Reptiles, Including Lions, Tigers, Wolves, Bears, Monkeys, Tortoises and Snakes; the Rigging Offers the Monkeys a Welcome Field for Their Activities; Above Is a Goat Which Has Found a Shelter in the Ark; Left, a Kangaroo Which Always Attracts Attention

W. A. W. W. A.

*U. S. Gypsum Co.,
300 W. Adams
Chicago*

B 841

METAL FOIL GIVES BOARD BETTER INSULATION

05/883

Insulation qualities of gypsum wallboard are said to be greatly increased by the addition of a thin layer of aluminum foil. Tests with a sample of three-eighth-inch thickness demonstrated that the addition of the foil provided resistance to temperature change equaling that of an extra half inch of standard fiberboard. The aluminum facing also lends itself to interesting decorative treatment.

BUS PRODUCES ITS OWN FUEL GAS AS IT RUNS

001737

Wood gas, the fuel on which a new type of German automobile bus operates, is produced in a small plant installed on the back of the vehicle. Sawdust, chips and shavings of wood are used in the plant. While wood gas is not a new thing, its manufacture while the bus runs is the goal toward which the inventors have been striving. Resembling gasoline in efficiency, the fuel is said to be safer and cheaper.

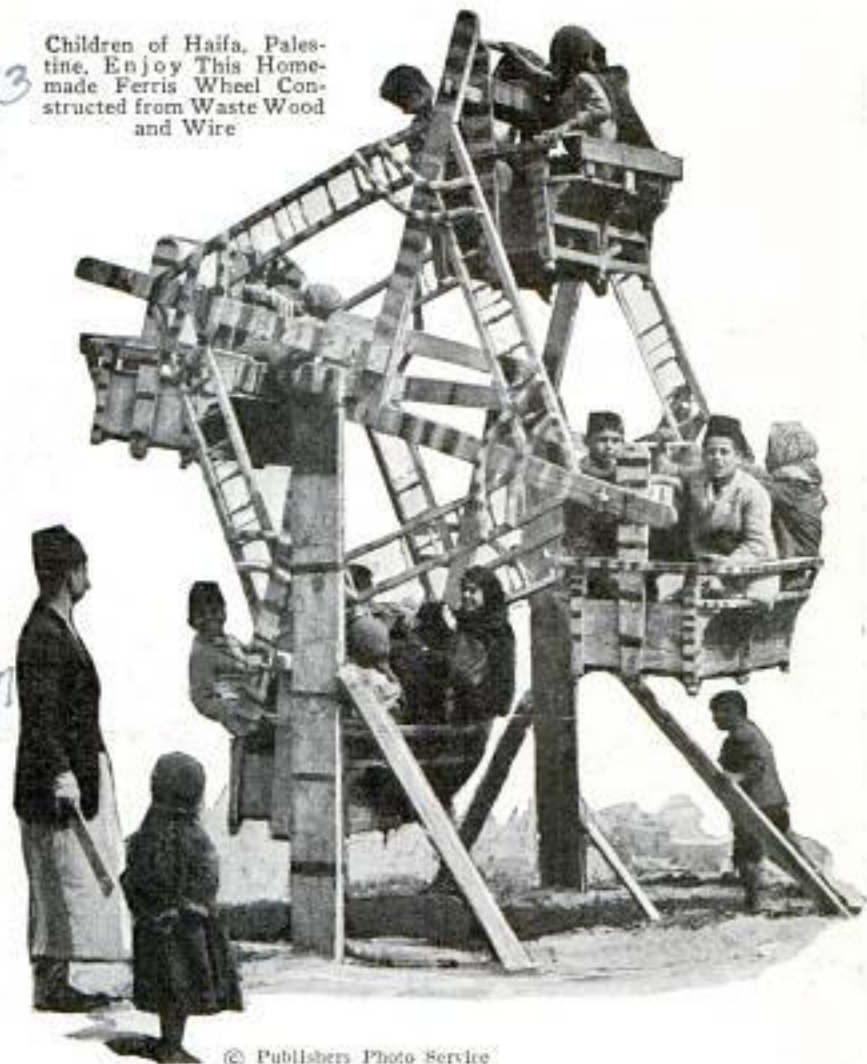
Carl Hans St. Kulybach



Tanks on Rear of Bus Are Part of the Vehicle's Wood Gas Manufacturing Plant

*in Munster
Germany.*

Children of Haifa, Palestine, Enjoy This Homemade Ferris Wheel Constructed from Waste Wood and Wire



© Publishers Photo Service

CRUDE FERRIS WHEEL IS BUILT FOR PALESTINE CHILDREN

Homemade and operated by hand, a small Ferris wheel on the outskirts of Haifa, Palestine, provides amusement for children of that port city. The device has four seats and is constructed almost entirely of wood. Haifa, on the Bay of Acre at the foot of Mount Carmel, is modern and has about 25,000 population.

ROOM HEATED BY WALL PAPER WITH ELECTRIC ELEMENT

03/852

Wall paper with an electric element has been tested successfully as a means of heating a room. The device consists of a thin sheet of insulating material through which run electrical heating elements connected to a power source. Attached to the ceiling, the heater is switched on automatically when the temperature of the room falls below a predetermined point.

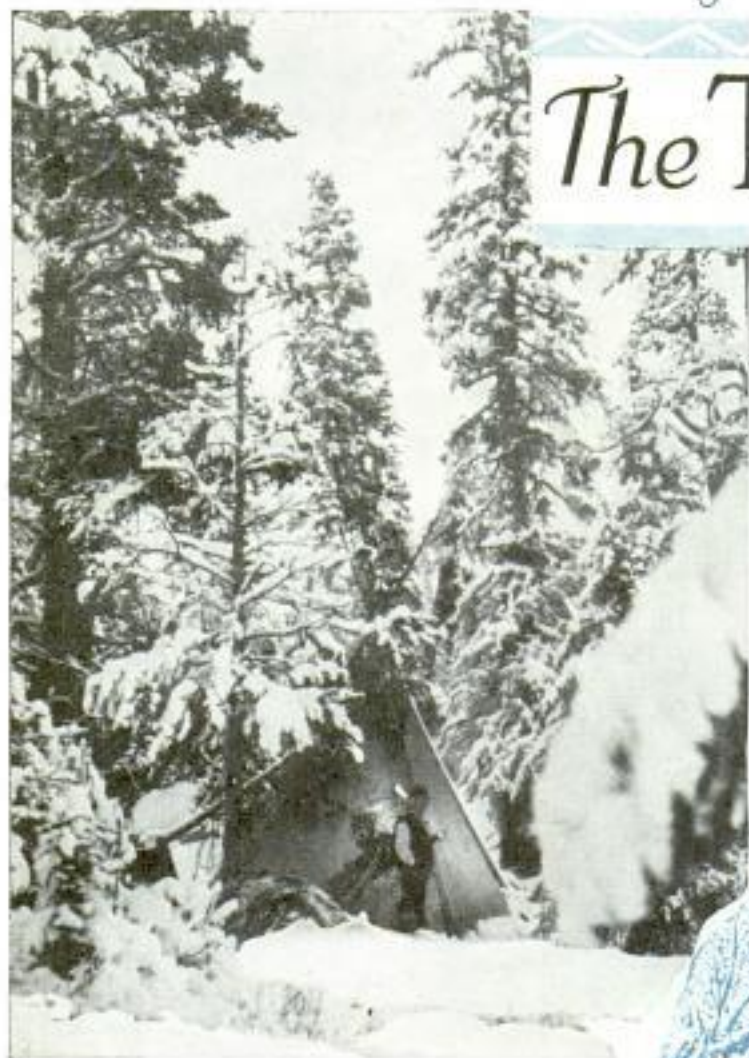
Richard

*Canadian Pacific Line
Duchess of Richmond*

The Lubrae Mfg Co. 4 Bloomington Place London. W.C.1 Eng

26 June 1933 1947

91272 Carl W. Isage,
Rehoboth, N.Y.



The THRILLS

be porous and loose. Wool is best for conserving body heat; being a nonconductor, it prevents the heat from escaping. Two suits of thin underwear or two shirts of wool are warmer than one heavy garment, since the air space between them will carry away the moisture, a conductor of heat, while the wool retains the heat. A long coat is a burden to the winter hiker. Keep the knees free. A heavy flannel shirt and a suede



Top. Pitching Tent in Heart of Spruce Forest Adds to Comfort; Shelter Fire for Winter Camp

CAMPING in the snow is gaining in popularity as more people discover the thrills of following the white trail to a sheltered spot in the forest, beside a comfortable fire. Only a few years ago, overnight hikes and winter camps were practically unknown. Today thousands of people, old and young, are found enjoying week-end or one-day tramps over winter trails, a noon-day meal beside a quickly set fire, and the night of refreshing sleep in the forest.

Whether the camper travels on skis, snowshoes, or plods along through the snow with ordinary boots or moccasins, he will need to make greater preparations than in the summer, especially in the matter of clothing, the right kind of sleeping bag, blankets that really keep out the cold and suitable protection from all weathers that may be encountered when a quick change in temperature occurs.

The commonest mistake is wearing too much clothing for winter hiking. It should

or leather windbreaker is usually sufficient to keep warm. It is always poor judgment to wear a too heavy outer garment, which causes the body to overheat with exertion and induces a cold when resting. A medium-weight woolen shirt is good in severe weather, and a heavy lumberjack may be worn over it. Besides this, use a loose-fitting coat of buckskin, which does not catch on limbs and branches. A woolen pull-over is the best kind of a head protector, as it can be adjusted to differ-

of WINTER CAMPING



ent temperatures. In the matter of breeches, winter campers have a wide difference of opinion, according to location and severity of climate. Some prefer the corduroy garment, others the Hudson's Bay mackinaw plaid breeches, others whipcord, Bedford cord and the cotton khaki and woolen khaki material. For average

travel, a good quality of cotton khaki may be worn over two pairs of woolen underwear, while for rough country in cold weather, corduroy of a heavy type is very serviceable. In severe weather, plaid mackinaw, full and not tight and stiff, makes a good all-around



Hiking to a Winter Night in the Open, and Trappers' Fire for Frying and Boiling

pair of breeches. Footwear is very important. The first object is to keep the feet dry and warm. Treat the outdoor boot or shoe with oils to make it waterproof. For snow country, a moccasin boot, or "pac" as it is called, twelve inches high, is excellent. Do not make the mistake of selecting footwear that is too large, as this causes blisters. Chafed heels may be

relieved by rubbing soap into the socks, or by sticking adhesive tape on the bare parts. An entirely different type of sleeping bag is needed. A good plan is to make an outer cover of heavy canvas, to keep the



the ground, about five feet apart, forming a line at right angles to the wind direction and leaning as though the wind had blown them over a little. Brace the logs by use of forked sticks or by sticks placed between the ground and notches cut with an ax in the uprights. Against the timbers or stakes, pile three or four other



Fire for Baking; Noon-Day Lunch over Tiny Camp fire, Center, and a Handy Crane, Below

bag dry and help conserve body heat. Slip the bag into the canvas, roll it and carry it this way, to avert getting the bag wet in the woods. It should be fur-lined. If woolen blankets are used, select loosely woven ones rather than the tight-knit type, which is not so good a protection in the open, and be sure to pile on plenty of blankets, as the temperature often varies widely between sundown and sunup.

Select a camp site that is handy to water and well protected by trees and shrubs—right in the center of a clump of evergreens, if possible—on a high and dry knoll of land.

A reflector fire is used in open camping. If two stumps or trees are not available to build against, drive two heavy stakes into



logs, one on top of the other, and, if you wish, hew off the edges to insure a tight fit. Then put two short firedog logs at right angles to the lowest one in the pile, and across these lay a long log so that it

91272

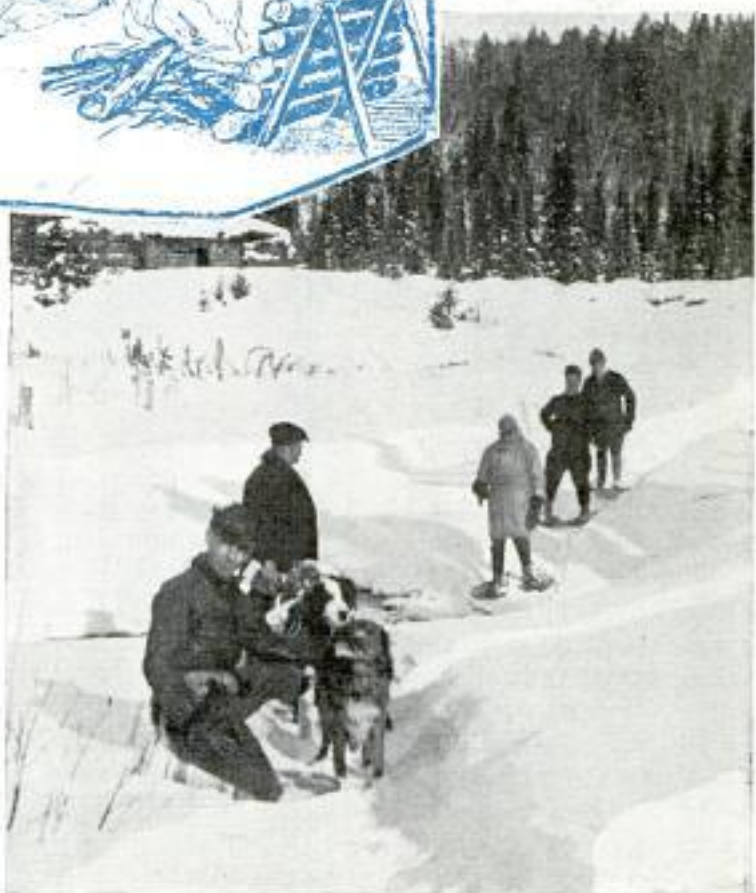


Winter Camping Party Setting Forth into Canadian Wilderness, Above; Arrangement of Tent and Shelter Fire for Maximum Warmth, Left

is a few inches in front of the reflector. Build your fire under this stick, and feed it by placing fuel between the cross log and the reflector. Cook the food before this fire.

It is possible, also, to camp in comfort, even in north country, with the tepee, selecting six or eight poles tied together at the top, over which a canvas is placed, with an opening at one side and at the top. The fire is placed in the center, and the campers, placing their bags around the fire, near the walls, will be comfortable.

The camp quarters, of any type, may be floored with evergreen boughs of spruce or pine, on which the beds are spread. A goodly supply of boughs, a foot to twenty inches deep, insures a bed as comfortable as can be found. For firewood, dead branches from a standing tree are much better than wood found on the ground. Scoop the snow away from the place where you build the fire, so that its melting will not extinguish the flame.



A Group of Campers on a Snow Hike

301806 American Rolling Mill Co
Middletown Ohio

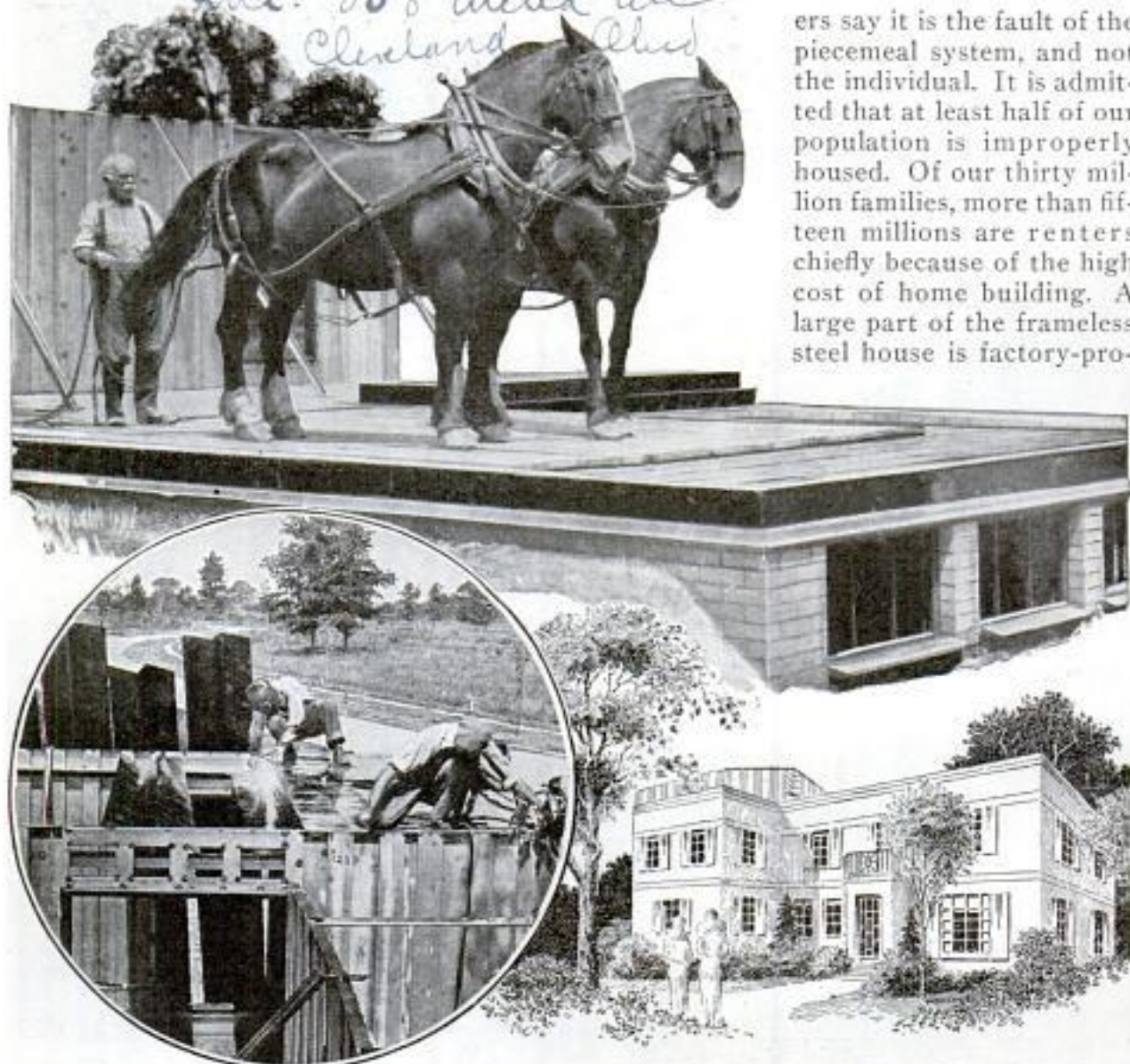
62

POPULAR MECHANICS

also Mr. Muts to Clark insulated steel

Frameless Steel House Offers Better Home

ave. 308 Euclid Ave
Cleveland Ohio



ers say it is the fault of the piecemeal system, and not the individual. It is admitted that at least half of our population is improperly housed. Of our thirty million families, more than fifteen millions are renters chiefly because of the high cost of home building. A large part of the frameless steel house is factory-pro-

Above, the Floor of the Frameless Steel House Is So Strong That Engineers Estimate It Would Support Twelve Teams Like That Shown; Below, Workmen Putting Down the Second Floor

A frameless steel house, which may ultimately point the way to cheaper and better homes, has been completed near Cleveland by the Insulated Steel company, in co-operation with the American Rolling Mill company of Middletown, Ohio. Engineers believe that this new method of construction is a marked advance toward the factory production of low-cost homes. As the weight of the structure is carried by the walls, the erection of the conventional structural frame is unnecessary. For centuries, houses have been built largely by hand. The department of commerce estimates that fifty-three per cent of the cost of building a house is wasted. Build-

duced. There is no waste, field cutting nor fitting. The walls are made of steel sheets. Boxlike corrugations, or channels, two inches deep by six inches wide, are pressed lengthwise into the sheets to give them strength and rigidity. In erecting the house, the lower floor was completed first. Then the first-story walls were set in place and welded to a foundation cap and the floor. The second floor was next completed, followed by the second-story walls, the roof and the parapet walls. As it was erected a floor at a time, no scaffolding nor extension ladders were needed. The exterior is heavily insulated against heat or cold, and is covered with porcelain-enam-

B 1758

eled shingles. It will never require painting, and a bath with the garden hose will quickly restore its original luster. The interior of the wall will be finished with gypsum lath, on which two coats of plaster will be applied. On the roof a small solarium is located, and the remainder of the roof area furnishes a safe playground for children. In the winter, the roof can be flooded and used as a skating rink.

B 173

ADJUSTABLE WINGS INCREASE PLANE'S EFFICIENCY

Shorter take-offs and landings, faster climbing, higher maximum speed and greater safety in every phase of performance is claimed as a result of an adjustable wing for light-weight monoplanes. By changing the angle of incidence according to the aerial maneuver, the center of lift always can be kept over the center of gravity, it is said, and thus increase efficiency and safety.



Repairing Damaged Mexican Wax Miniatures; Smallness of the Figures Requires the "Surgeon" to Use a Magnifying Glass for the Work

Keystone

LITTLE MODELS ARE "PATIENTS" IN MINIATURE SURGERY

One Los Angeles man makes a living by serving as surgeon to valuable Mexican wax miniatures. The making of these miniatures is becoming a lost art, and those now in existence are being carefully preserved and placed in museums. The specialist in miniature surgery works with a magnifying glass in repairing the broken arms and legs of these tiny figures.

A. J. Smith



Monoplane with Adjustable Wing Which Enables the Pilot to Change the Angle of Incidence at Will

OIL TO PROTECT AUTO'S FINISH FROM SUNSHINE

Protection of the finish on automobiles from sunshine will be offered in a new linseed oil that resists ultraviolet light. Auto finishes become sunburned as truly as does the human skin. This effect, visible in dulled luster and cracking, has been traced to a gum that absorbs so much ultraviolet rays that an automobile coated with the gum finish apparently glows with a bluish fluorescence. The new linseed oil, which is a substitute for the gum and plasticizers in auto-finishing paints and lacquers, shows little effects after long exposure to sunlight.

B 1890

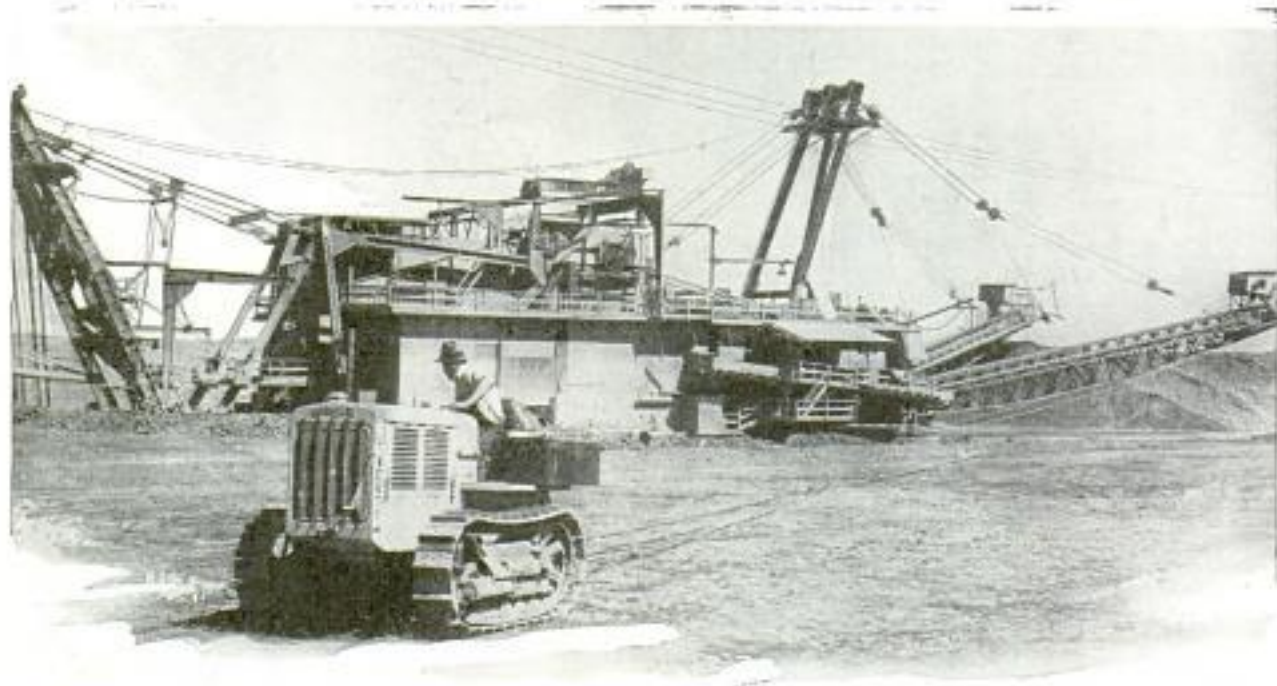
Quincy Daily News 10/20/20

*Chas. I. Gerald Co.
Heinrich, 3724-30 St. W. Wash. D.C.*

Chemistry Dept. Lehigh University, Bethlehem Pa.

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Gold—Giant Dredges Uncover New Treasure



Tractor Tugging at One of the Mighty Dredges Which Mines Gold on a Wholesale Scale by Sifting, Filtering and Washing Hundreds of Tons of Earth in a Single Day

National Gold Co

Picture a mighty \$3,000,000 floating city operated by many men on a clocklike schedule, that sifts, washes and filters hundreds of tons of earth a day, sucking out more gold in an hour than a hundred forty-niners gathered in a lifetime. That's the difference between the old and the new in gold-mining methods, as seen today in the old mother-lode country north of Sacramento, where the world's most famous treasure hunt was staged eighty years ago. This modern gold-dredging city until recently depended for two important operations upon mules to pull the mighty cables that move the dredger forward for each new bite. Now, the animals have been replaced with endless-tread tractors. In a flat valley, miles from the mountains, and from the nearest natural body of water, these dredgers dig their rich harvest. So huge are these giant machines, they must be built on the ground where they are to do work, after a large area of gold-bearing land is determined by prospecting. Geologists explain the existence of gold here as follows: "Rivers running through mountains rich in gold deposits have, by ages of erosion, carried tons of silt to the valley floor. Prospect borings show this deposit to be sixty to eighty feet deep, much of it rich

in gold. The problem remained to take gold out in paying quantities at a cost low enough to make the operation profitable." At first, the idea of dredging was little more than a dream. The first dredger was small compared to the newest "boat city." Tons of steel, machinery and lumber are transported to the scene of operation and work of building begins. Water is run in from a near-by well or stream. Electric current to power the big 450-horsepower motors is carried in on a special line. When water fills the artificial lake which surrounds the completed dredger, it is floated into position for digging. The stern of the boat is anchored, while the front end swings in a semicircle. When the buckets have scooped up all the earth within that radius, the tractor moves the entire boat forward eight to ten feet.

"AIR BRICKS" YIELD OXYGEN TO COMBAT GASES

Oxygen, chemically retained in small, lightweight briquettes, has been made available for aviators, divers, mine workers and others subject to rarefied air or noxious gases. When slightly warmed, the "air brick" gives off its oxygen in a steady gentle stream.

Technical 9/15/32

German invention
Make unknown
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**HERRING TYPES
 DEPEND ON
 HABITAT**

Herring vary in size and strain according to the waters in which they live, according to recent investigation made by the Canadian government. The female grows more rapidly and attains greater size than the male, it was found. As a table delicacy, the herring is enjoyed quite as much by fur seals as by humans. Experiments showed that seals ranked herring first in preference, with salmon and pilchards next in favor.

*Can
 B. 8 49
 fish scientist*



German Children Racing on Motor Rollers; the Vehicles Resemble the Scooters Used by American Boys, but Are Equipped with Motors

club

**SWIMMER IS AIDED
 BY SAIL RIGGED
 TO BODY**

By attaching a sail to his body, the swimmer can make longer trips through the water without tiring. A German invention provides the necessary means for fastening the sail to the swimmer and for holding it in position.



When Bather Tires or Starts on a Long Swim, He Raises This Sail to Help Him Along

**SCOOTER OPERATED BY MOTOR
 OFFERS FUN FOR CHILDREN**

German children are having speedy races with vehicles known as motor rollers which are constructed like the scooters popular with American children, but in addition have small motors to provide the power. The rider gets under way by pushing with one foot, then depends on his engine. In a recent race, the five-year-old winner achieved a speed of two and one-half miles an hour.

**FORTY-FIVE MILLIONS CROSS
 CANADIAN BORDER**

B/848

More than 45,000,000 persons—a total equal to approximately one-third the population of the United States—crossed the international border between United States and Canada during 1931. The great majority of that number were motor-car passengers, while railways and ferries carried about 3,000,000 persons, according to statistics compiled by the Canadian government. Heaviest flow of international traffic was found between Detroit and Windsor, Ontario.

*Mr. Schone Trauer
 Berlin.*

*Com. James Montague
 608 Harbour Commission
 Bldg. Toronto 2, Ont. Can*

03718 Com. H. Clairouin, 90,
Rue de Breuille,
Paris VII France



Above, Captive Wild Elephant Tied to Trees in the Jungle to Hold Him Temporarily; Below, Elephants Enjoying a Bath in a Cool Stream, a Form of Diversion That the Beasts Like Immensely



By ATTILIO GATTI

NATIVES of the Belgian Congo had told me extraordinary tales of catching wild elephants alive, and when a group near my camp found traces of a great herd of these beasts, and decided to trail them, I begged to be allowed to go along.

The hunting group was composed, according to inviolable tradition, of sixteen natives—four armed with guns, eight having only a coil of rope each, and four porters carrying bundles of strong cable. For a week they followed the trail until the herd finally stopped to pasture. The time for action had come. The chief sent out a scout who reported there were two young elephants in the herd.

The hunters were after the young ones, and at the scout's report they became highly excited. The chief divided them



ELEPHANT HUNTERS

into three groups, each moving silently along a different path. The leader set out alone and I followed. After an hour we came to the edge of a glade overspread with small trees whose tender leaves had attracted the pachyderms. I at first could see no sign of either beast or hunter.

Then suddenly four or five huge male elephants appeared, gigantic ears flapping nervously. The silence was broken by several gun shots and



Above, the Fellow Deep in Thought Is the Chief Hunter Who Has Heard Elephants Are Near By, and Is Pondering a Plan of Attack; Below, a Herd of Pachyderms on the March

immediately the whole herd came into view, agitatedly milling about.

Soon I heard other shots, indicating the hunters were approaching closer. With each sound, the elephants quickened their pace, trunks and ears waving in infuriated protest. Now and then a bull trumpeted shrilly, and bolted from the main herd. This meant that the men with the ropes were at work. They allowed females and baby elephants to pass by, but when a male approached, they leaped out, shouting and brandishing arms and ropes until he was frightened away. Finally, most of the bulls had disappeared and I made my way gingerly toward seven or eight beasts

standing on my left. Suddenly four hunters with guns jumped from the grass near them, shouting and firing into the air. I now saw the group was composed of four bulls, two females and two babies. Under the noisy attack, the animals sought to escape, the babies tumbling behind the adults with many squeals and grunts of distress. The hunters were close on the heels of the babies, and as if by magic, the men with the ropes sprang from the jungle grass in front of the smaller one.

One native seized the small tail and hung on for dear life, another leaped on the rump, and the rest encircled him with ropes. Soon the little fellow, trumpeting

B418
68



Native Chief Haranguing His Warriors Before the Elephant Hunt Begins

desperately, was helpless. The rest of the herd gathered some distance away, apparently undecided what to do. There was a great waving of trunks and ears and a concert of angry trumpeting as the baby called for help, but the natives had been busy meanwhile. The prisoner was anchored to two large trees and then the porters brought a long cable which was fastened about his body.

The frightened youngster then was deserted as the hunters executed a second maneuver designed to trap the other baby.

Finally, the second elephant, a male about ten years old, was isolated and partly imprisoned, when the bulls and females made a counterattack.

The gun men heard the oncoming herd, shouting in the air to frighten the elephants, however,

came lumbering on. The chief recognized the futility of resistance and ordered his men to release their victim.

The beasts had made their charge from three-quarters of a mile away, but their speed was disconcerting, and now the hunters, discarding their ropes, turned and ran fanwise, hoping to scatter the animals. I had been so absorbed that I was a bit late in heading for the bush and soon found I couldn't keep up with the natives. What was still more alarming, I heard a tremendous crashing at my back. One big bull had selected me for his attentions and was gaining rapidly.

I had promised the governor of the province not to kill an elephant except to save my life. My life was now at stake. The bull was gaining, I was out of breath, and there was not even a big tree handy. I swung around, waiting until the bull was fifty yards from me, then, as I prepared to pull the trigger, only thirty yards away. I aimed at the brain—a difficult shot. But luck was with me and my bullet found that little spot, no larger than a plum, in



B 4/8

fore I left, he was conscientiously working all morning long, pulling wagons, pushing down trees, and loading. Slow, comical and solemn, the youngster labored at his tasks, always good-humored and obedient. When noon came he was pastured, and, at night, came the exquisite pleasure of

the armor of the powerful head bones. The bull crashed to the ground.

Our little captive was an African elephant, and until a few years ago it was believed impossible to tame this species. Today they are trained almost as easily as their Asiatic cousins.

The captive was named "Reginald" and led a life of ease for two months when he was virtually domesticated, used to the sight of whites and natives and convinced that they meant him no harm. The natives meanwhile sang a chant, the burden of which was that he be well cared for and fed, but must work for his keep.

Then he was taught the significance of certain words and commands, and, later, the work he was expected to perform. Be-

bathing in the river for an hour or two.

My last sight of "Reginald" was in the pool. He was full of mischief and intent on making a fool of himself. Drawing up a trunk filled with water, he squinted a roguish eye and aimed at the ear of a dignified bull. His aim was good, and when the bull whirled trumpeting with rage, "Reggie" squealed in delight and all but fell headlong as he scampered out of range of a flailing trunk.

African Elephants, Distinguished from Their Asiatic Cousins by the Larger Ears and the Convex Shape of the Forehead



Natives of the Belgian Congo on a River Frequented by Elephants; the Beasts Like to Bathe and Play in the Water, So, in Elephant Country, a Stream Is a Good Place to Look for Them



Cleaning Compound Is Driven by High Pressure against Spark Plug without Danger of Damaging the Porcelain

SPARK PLUGS EASILY CLEANED BY AIR PRESSURE

Spark plugs are cleaned quickly and efficiently by an air-pressure machine that causes no damage to the insulators. A special cleaning compound is blown against the plug in such a manner that carbon and oxide coatings are removed from the insulator and the plug shell. A one-piece plug can be cleaned in a few seconds, while it is unnecessary to take apart the two-piece plug, saving much time. Tests necessary in production of the cleaner were carried out by using 20,000 plugs. Automotive engineers reveal that dirty or badly worn spark plugs cause a loss of one out of every ten gallons of gasoline.

ATTENTION TO SMALL INJURIES HELPS PREVENT INFECTION

Serious infections may be prevented by prompt attention to trivial injuries. Dr. Allen B. Kanavel, of Northwestern University medical school, says that many patients who now have useless hands would have been spared had small pin and needle punctures, scratches and bruises been properly treated. Infections from cattle hairs are common among those handling cattle, Doctor Kanavel says in telling how

these hairs have scales that tend to migrate under the skin when they have entered through some cracked callous. Then minor abscesses develop which, if opened, heal. These are followed by repeated abscesses and disability often extending over a period of months. If the hair had been removed promptly, the infection would have been prevented. Another minor injury usually neglected is that due to indelible pencils. Doctor Kanavel says that, if the point of such a pencil is permitted to remain in the palm or if it is crushed while under the skin, infection probably will result from chemical action of the dye, which causes death of tissues around the point. German children are forbidden the use of indelible pencils because of frequent loss of eyes from infection.

031791
MODERN COUSINS OF DINOSAUR EXHIBITED IN LONDON ZOO

Two of the most interesting inhabitants of the London zoo are a pair of reptiles believed to be the closest living descendants of the dinosaurs of prehistoric times. They are known as Komodo dragons and are found only on islands in the Java sea. Their tails are short but the creatures may measure as much as ten feet long, and somewhat resemble crocodiles.

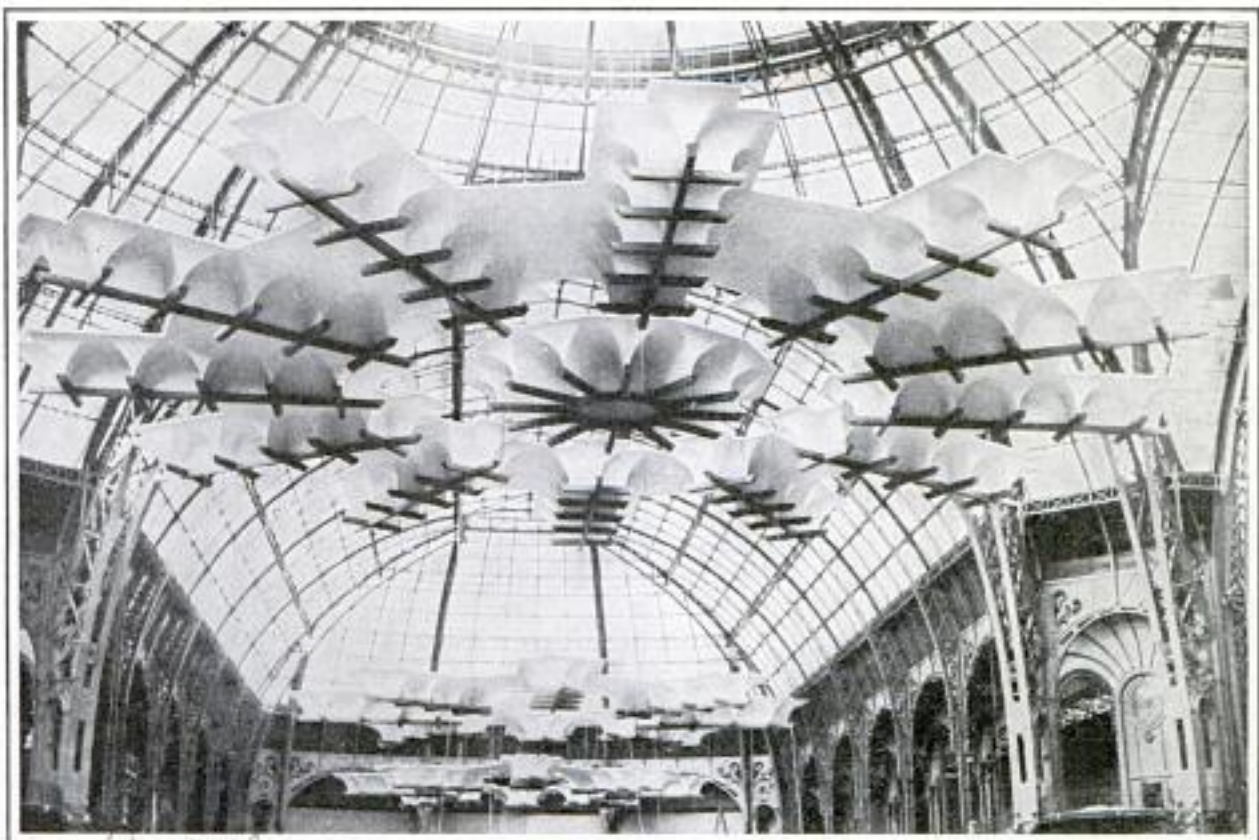


Photo by W. S. Pili
Two Dragons in the London Zoo Which Are Believed to Be Closest Living Relatives to Dinosaurs

same name 10/18/32

Chicago.

B1740



© The Times
Artistic and Unusual Lighting Effects Are Obtained from This Illumination System Recently Installed in the Grand Palais; Note the Oddly Shaped Reflectors in Which Electric Bulbs Are Concealed

HIDDEN BULBS IN REFLECTORS LIGHT GRAND PALAIS

Unusual lighting effects have been obtained in the Grand Palais, Paris, by concealing rows of electric bulbs underneath white, curved reflectors. While the new system provides a brilliant light, there is no glare. The reflectors serve the double purpose of efficient light diffusion and decoration.

MYSTERIOUS LAKE IN A CAVERN CHALLENGES EXPLORERS

Mysteries of a large underground lake in the Ozark mountains challenge explorers. A few persons have ventured out on the surface for almost a mile, but apparently they were as far from the opposite shore as they were from the starting point. Others have tried to explore the shore line, working their way more than a half mile at the risk of suddenly stepping off into a gorge hidden by the water. But nothing definite has been learned about the size or the source. One peculiarity of the lake is that its air apparently is as

pure to the distance explored as at the hill-side opening to the cavern. No bats or other underground creatures have been found. The mystery lake is located near Climax Springs, Mo., twenty-five miles from a railroad.

B837

GLASS RING INCREASES LIGHT FROM ELECTRIC LAMPS

Illumination from an electric bulb may be doubled and even tripled by means of an attachment tested by the optical institute of Paris. The



device is a glass ring of triangular cross section. The front face is slightly dished to reflect some of the light from the lamp, while another part is refracted. This results in concentration of the light on a smaller surface, greatly increasing the glow. The ring is held around the bulb by three hooked prongs attached to a band.

Arch. Mrs. J. H. Ellis, 7 Wood. Kansas

Camden, Benton County, Mo.

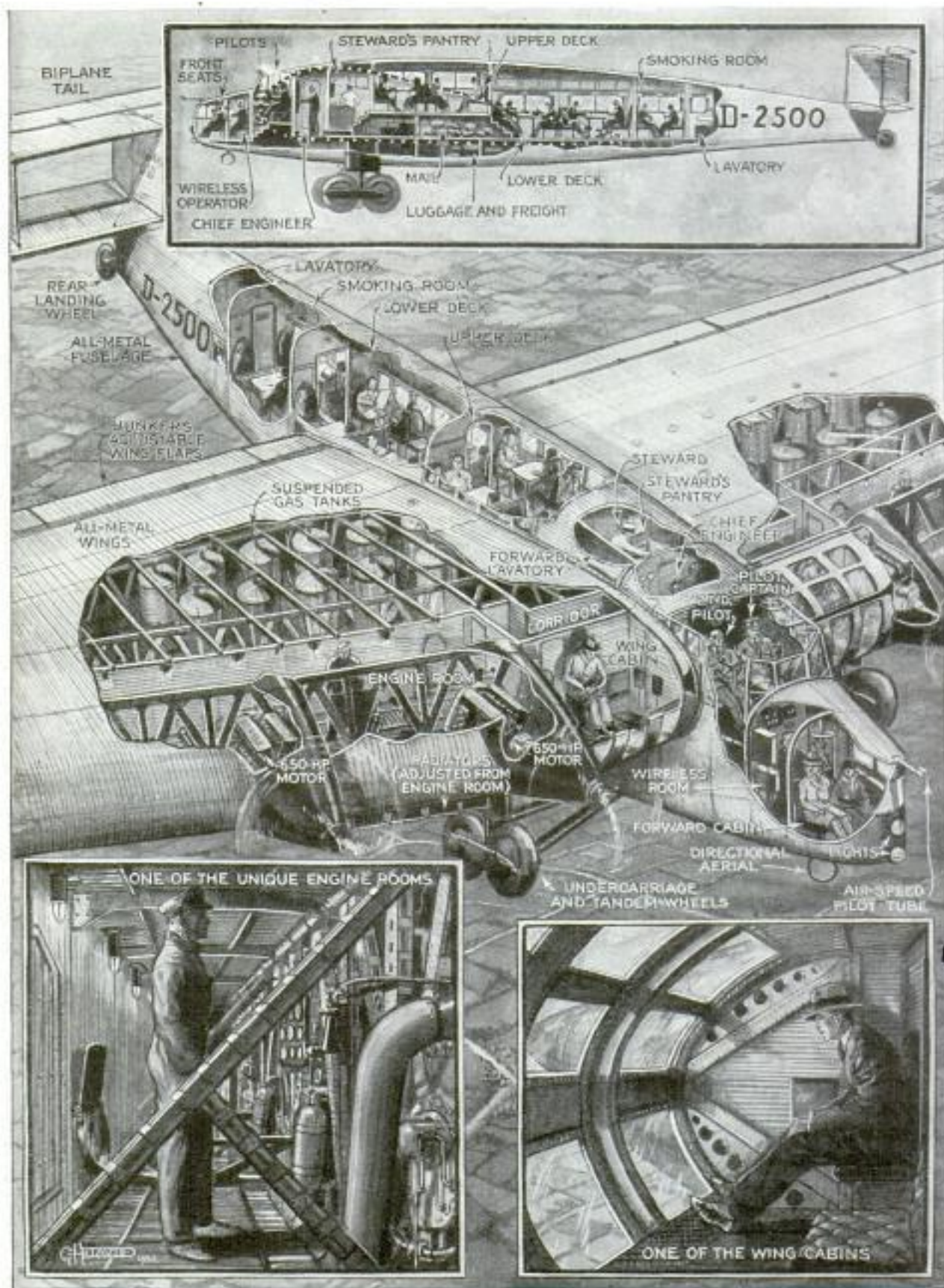
Je Sais Tout, Oct. 1932

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Societe Pilux, 179 rue de la Pompe, Paris France

Ob 1401, Cont. Is. H. Davis Esq
 Limiers Hillside Road
 72 POPULAR MECHANICS
 Ewell Surrey Eng

Giant of the Air—the Latest German Liner



Thirty-Four Passengers Are Carried in the Double-Deck Cabins, Wings and Nose of This Huge German Plane, Which Has an Engine Room Resembling That of an Ocean Liner

PLANE WITH TWO-DECK CABIN
CARRIES THIRTY-FOUR

Thirty-four passengers and a crew of seven are carried on Germany's latest air liner, the Junkers "G-38," now in service between London and the continent. The all-metal ship at first was designed for freight, but plans were altered, and today it has a double-deck cabin for passengers, while others are carried in the wings and even in the nose of the craft. Four 650-horsepower water-cooled motors supply the power, and these are tended from an engine room in either wing. Twenty-two fuel tanks are also carried in the wings. The engine-control room resembles that of an ocean liner, and besides the pilot and copilot, the crew consists of an engineer, two mechanics, a radio operator and a steward. There is a special wireless room and in the nose is a tiny cabin seating two passengers, who have a splendid view from this position. The monoplane has a cruising speed of 115 miles an hour and a landing speed of fifty-eight miles. It is fitted with adjustable wing flaps to give better starting and landing performance, and the undercarriage consists of two pairs of wheels in tandem. Fully loaded, the craft weighs thirty-one tons, and, in flight, it resembles a flying wing, since the wing area dwarfs the size of the body. The greatest height inside the wing is over six feet.

B140



Emptying Insects from the Handle of a Bug Catcher

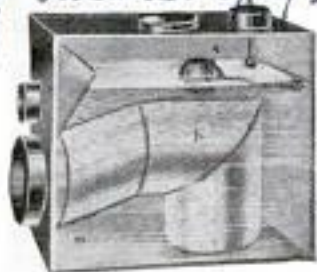
"BUG SPOON" CATCHES BEETLES
AND OTHER INSECT PESTS

For catching Japanese beetles, potato bugs and other insect pests, a "bug spoon" has been devised to facilitate picking the crawlers off vines, flowers and vegetables. It resembles a coal shovel, except that the sides are cupped to form a scoop and the handle is hollow. The beetles drop off when foliage is agitated, and the handle is long enough to reach foliage above the head. Shaking leaves on which the beetles rest causes them to fall into the scoop and from there into the hollow handle. When the handle is filled, a cork in the end is removed and the contents are dumped into a can of kerosene.

W. A. Rabbits, Chester, Pa.

HUMIDIFIER FOR ANY FURNACE
RUNS ON WASTE HEAT

Utilizing the waste heat that ordinarily is lost up the chimney, a new humidifier for steam, hot-water or warm-air furnaces provides pure and healthful air for the home. It is installed as a part of the smokestack to make use of waste heat. Silent in operation, the device has no moving parts except a simple float valve, and the process of humidification is carried on automatically. Water is supplied from the city system, the amount being controlled automatically by the demand for moisture.



Out of business 6/10/33

B/50

METAL "GLASS" WINDOW PANES
MADE IN GERMANY

Aluminum window panes, skylights and household articles of glasslike transparency now are being produced in Germany, according to report by the United States department of commerce. Although, in the course of manufacture, much of the metallic nature of aluminum is lost, it still retains the primary character of the raw metal, it is said.

Water of the Pacific ocean contains less oxygen than water of the Atlantic.

B184

Dept of Commerce 10/4/32

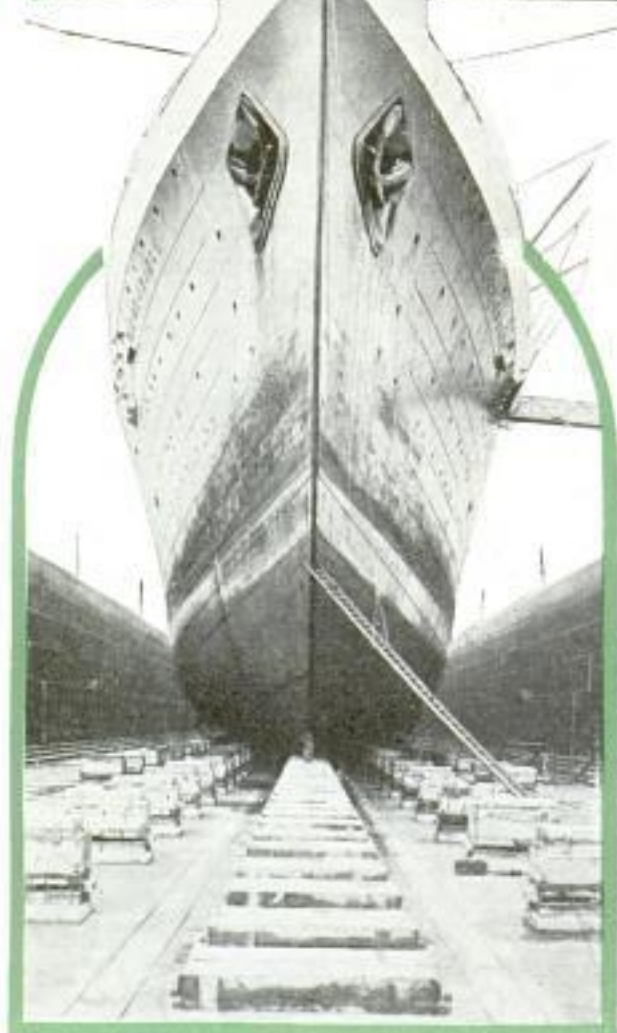
not being made. 2/2/33

612 Adams St. New York

Health & High Humidifier Co. 672 1/2 Mechanic Ave.

Consult. Sydney B. Redden, 11 South St. Portland, Maine.

B1741 French Line, 19 State St
New York



Above, Men Operating Valves as the "Ile de France"
Gets under Way; Below, the Ship in Drydock

By DON GLASS *man*
55 W. 16th New York

WHEN Father Neptune ties off the handle and stirs up the devils of the sea, give me the engine room of a transatlantic greyhound for solid comfort. Here, only a few feet above the ship's double bottom, night and day are one. To cheat seasickness, ride the keel of a ship.

Now realize, if you can, that this hull is rushing through a turbulent sea, turning aside mountains of water and pushing forward 50,000 tons of ship and humanity. And all you hear are brawny engines pounding a dogged rhythm; gasping compressors, throaty pumps, whirling shafts and spinning wheels.

Myriad instruments shine through brassy faces; steel levers, shafts and wheels have a silvery luster. The background is white—immaculately white. The engine room is as bright as Broadway; and for all the attention ordinarily given to these numerous devices, the ship seems to be running herself by intuition, driven forward by her 64,000-horsepower engines.

Monsieur Yves Miossec, chief engineer of the "Ile de France," has fraternized with ship machinery for twenty-five years. His unseen hand controls these wheels. The machinery must run continuously for

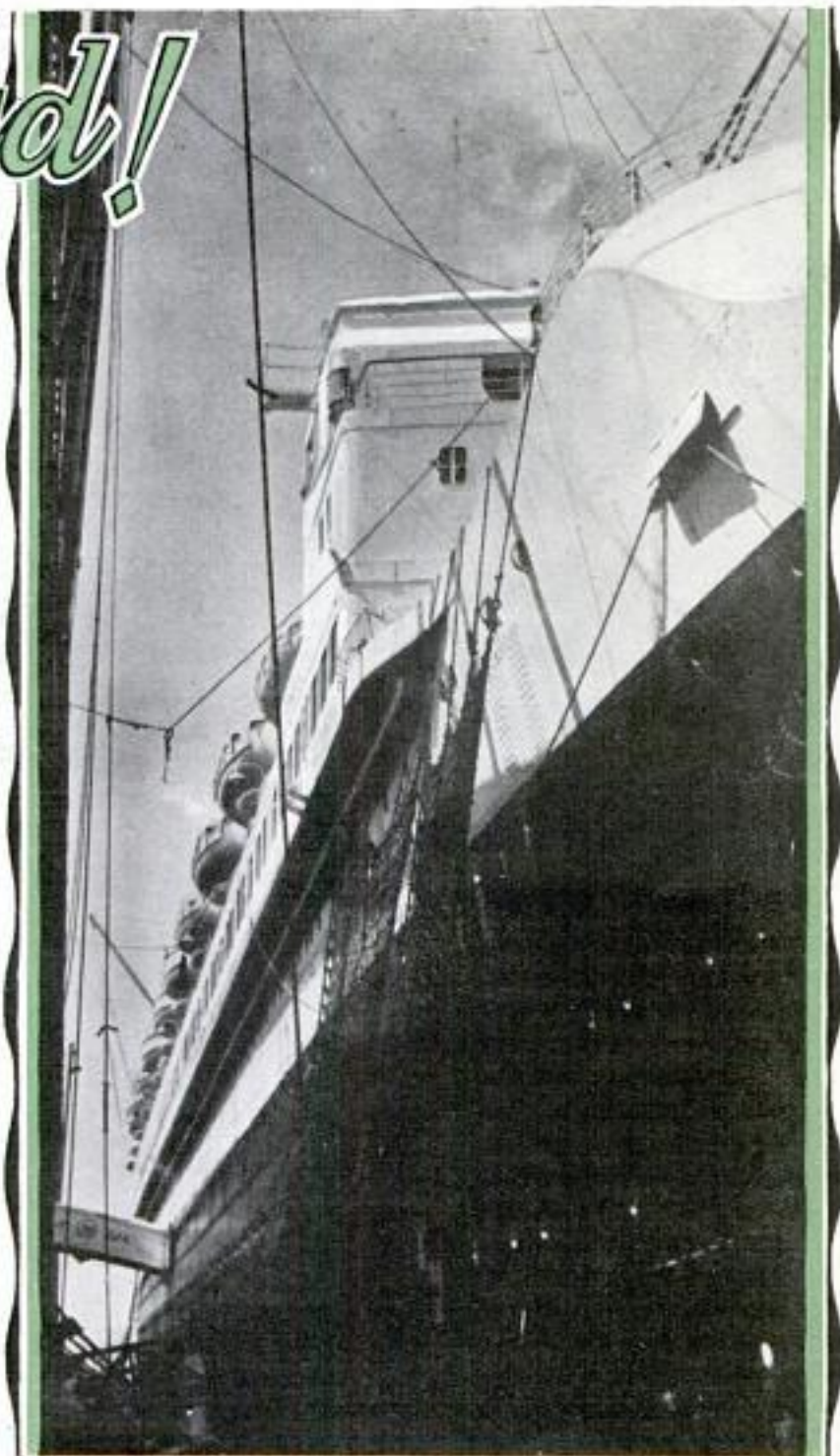
Ahead!



136 hours to make the 3,293-mile trip from New York to Havre.

What happens in the engine room of a super-ship when she races from continent to continent? Assistant engineers stand by for orders by telephone and telegraph coming from the navigating bridge. They are always prepared to man the valves controlling the four turbines, which can be operated as a single unit or in pairs.

The fresh water used for steam is condensed by 16,000 tons of icy water gulped in from the ocean each hour. And if the fresh-water supply fails, a salt-water distillery begins at once to manufacture 350 tons of fresh water daily. Two salt-water pumps, reserved for fire fighting, have a capacity of 400 tons per hour. And four small pumps, with a capacity of 240 tons per hour, supply salt water for bathrooms and the sanitary service. Below the engine-room floor are the great storage and ballast tanks in the double bottom. They contain enough liquid to fill several swimming pools. They hold 7,000 tons of oil which the engines consume at the rate of twenty-eight tons per hour. Nine thousand tons of oil, costing \$60,000, are burned on a round-trip voyage. Also, 2,800 tons of fresh



A Striking View of the 46,000-Ton Liner at Her Pier; This Close-Up Gives an Idea of the Height of the Greyhound of the Seas

water are carried in the double bottom.

There are four boiler rooms and thirty-two boilers contain steam at the desired pressure. Only twelve stokers attend the 128 furnaces, as compared with forty-two stokers required on coal-burning ships of similar size. The oil leaves a red-hot residue in the bottom of each furnace, but there are no ashes to clog the air.

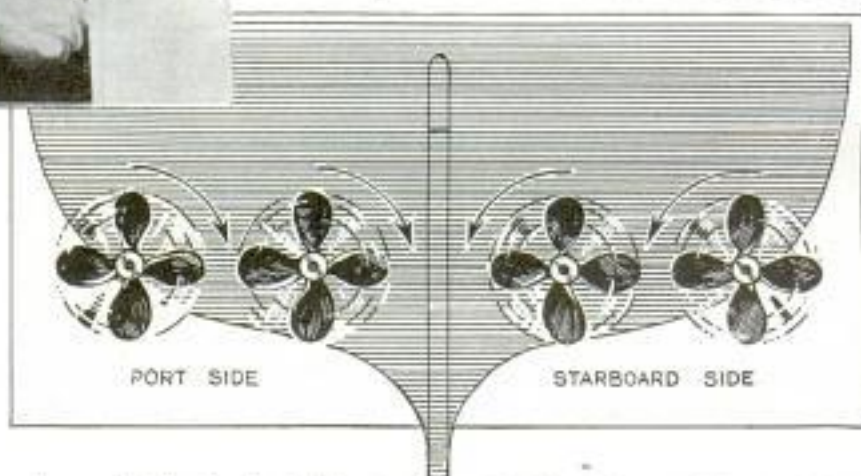


Hot? No hotter than the sundeck on a summer day. The temperature ranges from 100 to 110 degrees Fahrenheit. There are cold spots in the engine room, just as in the kitchen. And these spots are so cold they can set your teeth chattering and make you want an overcoat. Two refrigerating engines chill sixteen compartments for storing fish, fruit, ice cream, butter and eggs. But in the stern, where the four propeller shafts, twenty inches in diameter, spin in their bearings, you may be chilled to the marrow by closer contact with Father Neptune.

What is more grim, more daring than the churn of four twelve-foot propellers turning 230 revolutions per minute and driving forward a giant ship at the astonishing speed of twenty-four knots? You are actually twenty feet below the ocean level; if one of those three-quarter-inch plates collapses under the crushing pressure, you would be smothered instantaneously. Overhead, 1,000 passengers repose

the utmost faith in these bronze demons turning at the ends of steel shafts 183 to 235 feet long. Water seeps through the packing around the holes where the shafts issue into the sea—one ton of water per hour. This water is worth having, for it cools the sternmost shaft bearings and keeps the tempered steel tough. Pumps dispose of the leakage promptly.

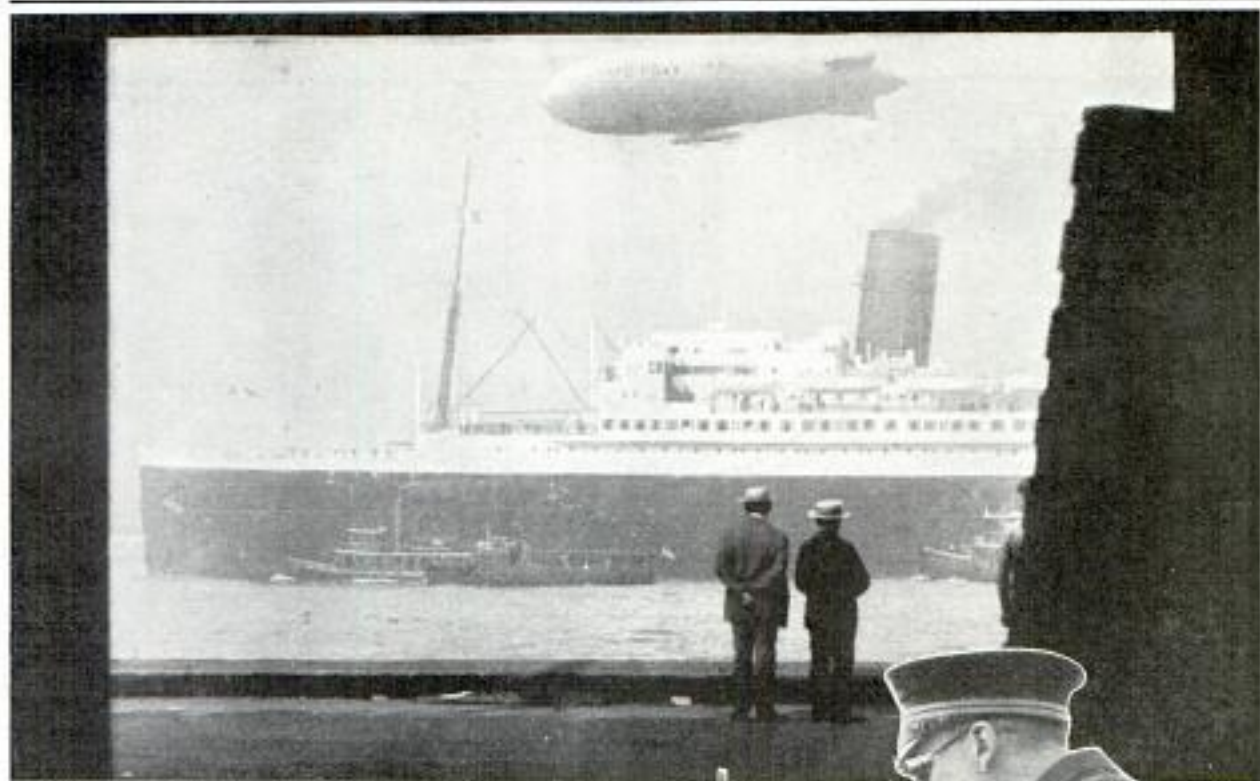
The connection between the engine room and navigation bridge is very close. In a storm, the captain may direct that liquid ballast in the tanks be shifted from the port to starboard side. When the ship passes through the iceberg zone, the engine room receives a regular inquiry about the temperature of the sea water. The Gulf stream, 300 miles from New York, is eighty degrees Fahrenheit; 800 miles from New York it is seventy-eight degrees. Where the ship lane leaves the Gulf stream, near the Newfoundland Banks, the temperature falls to two to four de-



Above, the Captain of the "Ile de France"; Below, Diagram Showing Direction of Propellers on a Four-Screw Ship Traveling Astern

grees below freezing. Icebergs are suspected if the mercury drops to four below. In spring, the temperature off the coast of France is around fifty degrees Fahrenheit. In summer it rises to sixty-one to sixty-two degrees. While passing through the fog banks, the bridge often warns the engine room to stand ready for a sudden stop.

The tensest moments in the engine room are when the ship maneuvers in a harbor. Two men are posted at the telegraph, one at the telephone, one at the port maneuvering wheel and one at the starboard maneuvering wheel, while the chief engineer and two assistants see that all functions



Above, the Liner Coming into Port; Right, Bridge Officer Sighting Direction of Distant Object

properly. About ten decks above the engine room, the ship's executive officers are directing the ship on her course. The master of this vessel never touches an instrument. All his wishes are carried out by assistants. He is, above all, an observer, a supervisor. He issues commands, listens to reports and thinks.

Without stopping his ship, he receives constant information about the configuration of the ocean bottom from an instrument which measures the echoes of wireless waves. And when he enters a port in a fog, he sees the lighthouses with his ears—through the radio direction finder.

While watches on the bridge keep their vigil, the radio room hums with singing tubes and wires: The daily weather report from NAA, Arlington; time signals from the Eiffel tower; orders from company headquarters and messages to passengers.

And in the middle decks, 1,000 passengers are being served and protected by another 400 trained men. Several hundred more are engaged in preparing and handling food. The captain's representative in all these various functions is the chief purser, a very important individual on board a ship. He is lord over the state-



room and dining service and director of social activities. He keeps the ship's account books as well.

Of what value is freight to an express ship? In the golden years of 1928-1929, freight yielded only one-tenth of the total revenue. At present it yields about eighteen per cent. Express ships carry comparatively small amounts of freight. They want shipments which can afford a premium for speed. And that, of course, is why greyhounds are chosen to carry the mail, and also why banks and governments hire them for carrying many millions of dollars worth of gold annually.

The revenue derived from both passen-

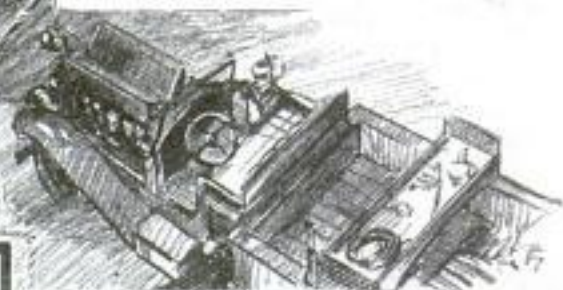
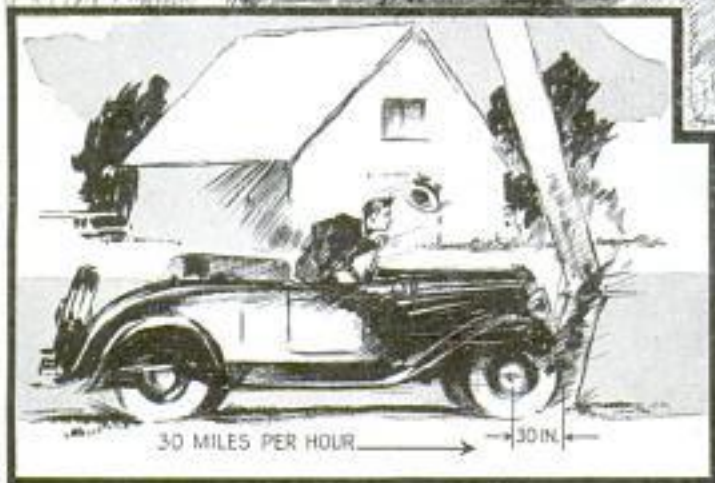
(Continued to page 132A)

What Happens in a Head-On Auto Crash



Top, Right, Experimental Accident; Left, Driver's Impact in Thirty-Mile-an-Hour Crash Equals That of Four-Story Leap

When an automobile collides head-on with another car or some other obstacle, the margin between safety and death is about twenty-eight inches. The auto comes to a complete stop in about thirty inches and the driver receives the entire benefit of that distance, since he is supported to a great extent by the steering wheel. On the other hand, a passenger is thrown forward at almost the full speed of the automobile, and when the car stops, the passenger's body has only about two inches of cushioning forward motion to diminish the shock. The differ-



ence between the thirty-inch buffer for the driver and the two-inch cushioning effect for the passenger is twenty-eight inches. The injuries received by the passenger in the extra twenty-eight inches his body must travel after the auto stops often result in death,

State College, Pa. B 1729

while the driver escapes with slight injuries. That is the explanation H. L. Yeagley, physicist of Pennsylvania State College, gives for the large number of passenger deaths in head-on collisions. After seeing an auto traveling thirty miles per hour crash into a concrete abutment, Yeagley measured distances related to the accident. He found the car stopped in twenty-four inches and the steering wheel, which supported the driver, bent forward six inches to act as a buffer for the driver, who was only slightly bruised. This impact, says Yeagley, is the same as that received by a person jumping from a four-story window into a firemen's net. The result is not serious. Statistics show that head-on collisions constitute eighty-five per cent of all fatal auto accidents and that, in nine out of ten, the passenger is killed while the driver escapes with his life.

at Carbone's Garage



see 887 - Dec-1934

ville. Orger

Inventor Proves Her Costume Is Fireproof by Stepping into the Flaming Bush

GIRL WEARING FIREPROOF SUIT TESTS IT IN FLAMES

Wearing a suit claimed to be fireproof, the French girl, who invented it, presented a spectacular test by stepping into the flames of a burning bush. Later, she permitted the clothing to be soaked in alcohol and set on fire while she wore it. The girl and the suit were uninjured.

COPPER-IRON CURE FOR ANEMIA IS GRANTED PATENT

Patents have been granted the discoverer of a copper and iron compound intended to prevent and to help cure certain types of anemia. Prof. Edwin B. Hart, of the University of Wisconsin, found that copper has properties which unlock the powers of iron necessary to restore the hemoglobin content of the blood to the proper level. The copper and iron compound was used in raising the blood content in 100 cases of secondary anemia from sixty-four to eighty-four per cent in four weeks.

PLASTER MODELS OF SKULLS MADE FOR DOCTORS

Plaster models of human skulls are being made for the medical profession by Leon Cirri, of Los Angeles. Exact duplicates of the real skulls are polished and given a bonelike finish. About 3,000 of the models are produced each year, going to all parts of the United States.

B833



Finishing Touches Make These Plaster Imitations Resemble Real Skulls from Which They Were Modeled

Florentine Art Mfg. Co. 1320 E. Florence Ave. Los Angeles, Calif.

Madison U.S.

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Verada Grammer 10/20/32

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 Springfield, Mass.
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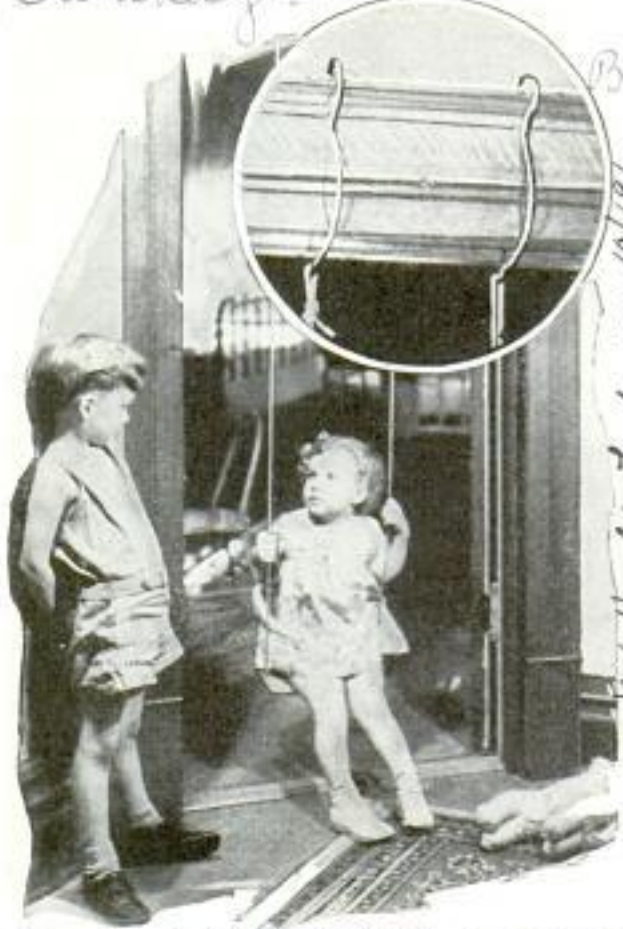
Experiment by South Aluca
 Scientist B. F. J. Schouland
 and P. J. Wilgore

POPULAR MECHANICS

**MYSTERY RAYS FROM STORM
 PENETRATE IRON**

Mysterious rays, capable of penetrating eight-inch iron twenty to forty miles away, are generated by thunderstorms. An instrument that registers the passage of cosmic radiations was used in detecting the new rays, an electric pen making a mark when a ray passed the detector. More marks were made by the pen during the one-hundredth of a second duration of lightning flashes than before or after. While there was evidence of the rays at stations twenty to forty miles from storm centers, the rays were not registered when the detector was directly under the storm. Scientists believe the rays are migratory electrons, particles of electricity shot upward from the storm. The earth's forces are believed to have caused the particles to travel in a wide circle, perhaps touching the stratosphere before bending to dive to earth.

318 5
 My Deula Tribune. 10/19/32



Indoor Swing for Children Which Attaches to Top of Door Casing; It Is Adjustable in Height

**ADJUSTABLE SWING FOR CHILD
 ATTACHES TO DOOR CASING**

Without installing any screws or other permanent fixtures, an indoor swing for children can now be set up in a few minutes in any room provided with a door casing. This swing is equipped with two double-spring wire hooks which attach to each side at the top of any door, the hooks having points to prevent slipping. The height of the swing seat is adjustable.

SEVEN WONDERS OF MEDICINE

Seven wonders of modern medicine are listed by Dr. Bowman C. Crowell, of the American College of Surgeons, as: immunity or resistance to diseases; giving relief from pain; preventing wound infection and blood poisoning; knowledge of vitamins and food values; light and ventilation; treatment by feeding liver to anemia patients; giving insulin to diabetics and thyroid-gland extract to cretins, and periodic health examinations to prevent the effects of certain diseases, such as cancer.

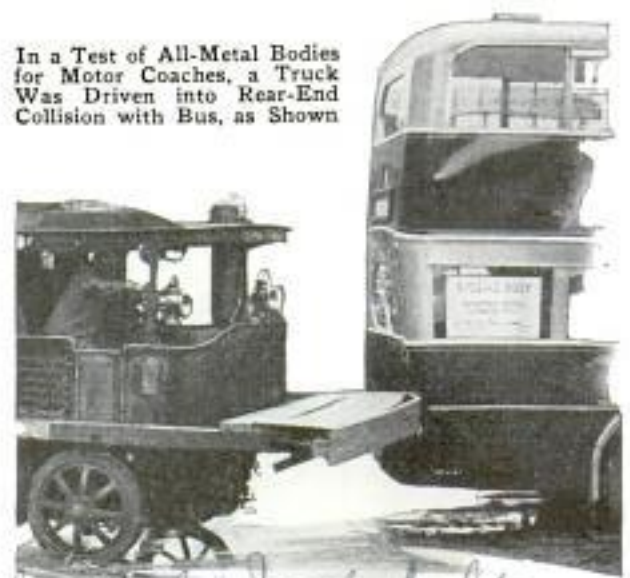
Science & Medicine
 11/8/32

Associate Director

**ALL-METAL BUS BODY GUARDS
 PASSENGERS IN CRASH**

All-metal bodies for automobiles and busses have been tested for use on motor vehicles in England. In a recent demonstration, a truck equipped with heavy oak bumpers was driven into a rear-end collision with a bus protected with the all-metal body. Damage was confined to the point of impact, instead of being transmitted through the whole bus, as would have been the case if the usual wood and metal body had been used.

In a Test of All-Metal Bodies for Motor Coaches, a Truck Was Driven into Rear-End Collision with Bus, as Shown



Built by Metropolitan
 Cammell, Birmingham
 England

B-1846 Smith Engineering Co
198 2 W. 74th St

Cleveland Ohio

Variable-Pitch 'Prop' Aids Air-Speed Record

Maj. James H. Doolittle and His Record-Breaking "Gee-Bee" Racer; Below, Gearing Which Actuates the Controllable-Pitch Propeller with Which the Plane Was Equipped



When Maj. James H. Doolittle established a new land-plane speed record of 294.39 miles per hour, much of the credit for the performance of his "Gee-Bee" monoplane was given to the controllable-pitch propeller with which it was equipped. By altering the angle of the blades after leaving the ground, Major Doolittle increased the speed of his midget ship by a sufficient margin to bring victory. The controllable-pitch propeller performs, for airplanes, much the same function as the transmission in an automobile. In taking off and climbing, decreasing the pitch gives the effect of operating in "low" gear with maximum pulling power. After attaining altitude, the pilot may literally "shift into high" by increasing the pitch, to gain maximum speed. This ability to adjust the angle of propeller blades during flight is a valuable advantage for high-

altitude flying as well as for straight speed performance. As the air becomes more rare, the bite of the propeller may be increased to provide a grip approximating that of sea-level flying. Given the controllable "prop," supercharged motors and adequate equipment for instrument flying, transport planes are enabled to travel four or five miles above the earth.

B-1929

LONG-DISTANCE WATER METER REPORTS BY TELEPHONE

Constant and accurate reports on water flow, varying pressures, reservoir levels and position of sluice gates and control valves are available through a long-distance water meter known as a "chronoflo-

fluidmeter" which registers its readings by telephone. A recent test of sending continuous and complete reports successfully spanned a distance of 500 miles. The operation of transmitting readings over telephone lines does not interfere in any way with regular phone conversations, nor is "telemetering" interrupted by it.

Builders Iron Foundry, 1108 Westminster St. Providence, R.I. Copyrighted material

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Machine gun equipment
Aerial Machine & Tool Corp
591 Hudson St.
New York City

WING to



By **CORLEY McDARMENT**

Langley Field Va
THIRTY big bombing planes roared overhead. It was a close formation, and each plane appeared to have its wings locked with an invisible measuring stick close behind the wings of the machine in front in the giant diamond-shaped group.

"That kind of flying sure looks easy," remarked a spectator to an aviator standing beside him. "All you have to do is keep in your place."

"Ah," replied the aviator, "that is the hardest kind of flying in the world. Every pilot in that formation is working with every muscle and nerve in his body. They can stand the strain for only a certain number of minutes at a time."

"But what about the pursuit planes?" asked the spectator. "The pursuit pilots don't have to be so careful, do they?"

"Yes they do," asserted the aviator. "If the pursuiter's touched wings when diving

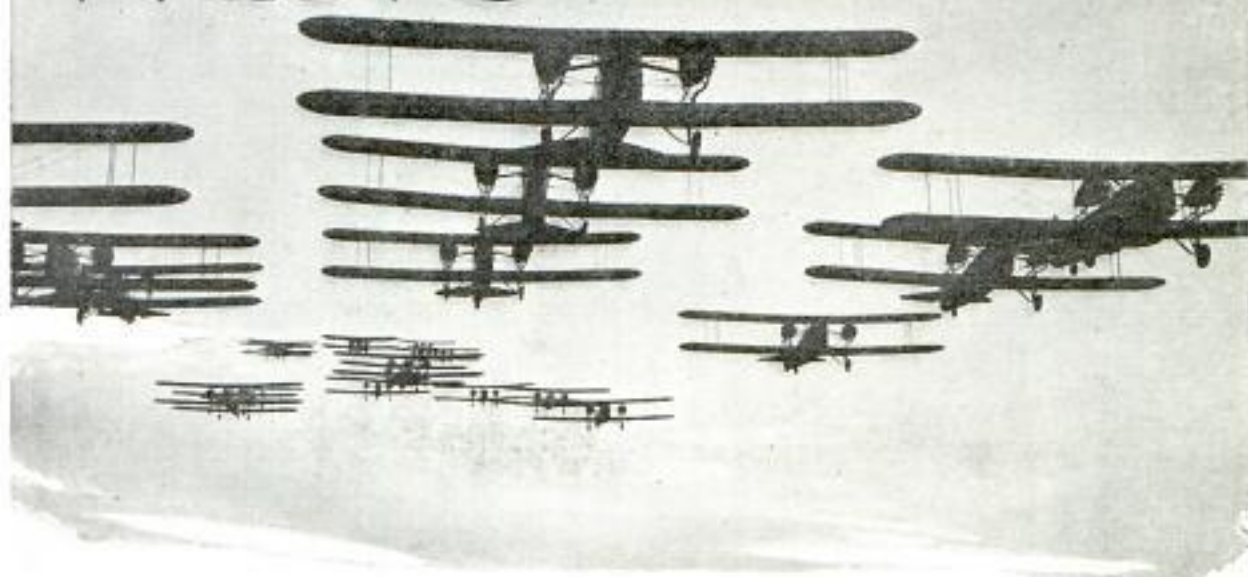
Machine Gunner in Rear of Bomber, and a Staggered or "Stair-Step" Formation of Pursuit Planes

at 200 miles an hour, the planes would fly to pieces like a chicken coop in a cyclone. Sometimes their wings fold over the cockpit so the pilots can't jump out."

The airman spoke the truth. Formation flying is the hardest and most hazardous kind of flying. It looks easy to the public because it represents the finished product of weeks and months of steady practice. It looks easy just like playing a piano looks easy to a person who has never tried it.

No musician is more skillful with his fingers and other muscles than the expert

WING



Part of a Group of Twenty-Seven Bombers Doing Their Daily Dozen; Imagine the Potential Destructive Force If Each of These Ships Were Loaded with a Ton of High Explosives

formation flyer. A real formation flyer, like a musical genius, seems to be born with special ability along this line. Some aviators never acquire the knack of flying in close formations, while others catch on to the trick with a fair amount of practice. And these "natural" formation pilots are never satisfied unless they are laying their wings in close behind the ailerons of a plane ahead.

There is a fascination and thrill about formation flying that no other kind of the art gives.

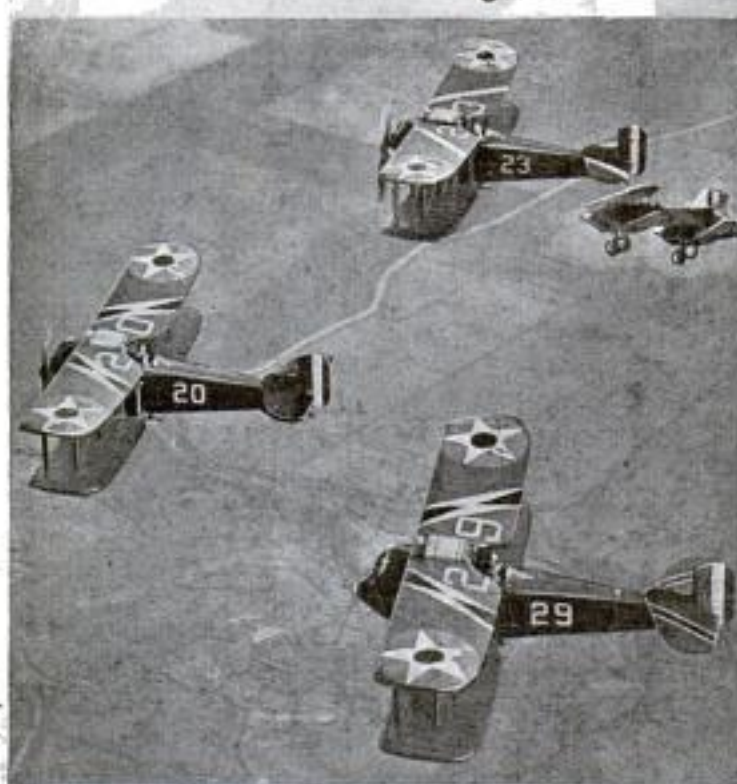
Some pilots get panicky when they see other planes closing in around them and will break away in a big zoom. These "wild boys" are usually well known by other pilots. They are given a wide berth when they start "breaking," and when they are in formations, they are herded out to the edge positions where they can "scram" if things get too hot.

The reason so few accidents result from close and dangerous formation flying is that only the crack pilots are put into the key positions. There can be no practice flying in the big finished formations that

A Group of Bombing Planes Nearing the Ground, Preparatory to Making a Landing in Close Formation, Always a Delicate Maneuver Fraught with Danger



B1762



the public usually sees. It is like parachute jumping—you've got to be perfect the first time you try it. The pressure of an ounce with one finger on a throttle of a 7,000-pound bombing plane can wreck a whole formation. No pilot likes to think of the result if a motor should suddenly stop on a "locked-in" bomber in a big formation. This has never happened.

When a pilot is flying in close formation, he has no time to notice anything else. He dares not even glance at his instruments. In bombing formations, the mechanic, or copilot, watches all the instruments and switches the gasoline tanks when they become empty. The pilot is a dynamo of energy and a machine of delicate automatic action. His eyes must tell his hands and feet exactly what and how to do as well as when, without going



through a conscious mental process. There can be no delays or "hang-fire" ideas in this work. The action is always now.

In order to get a fraction of a second's advanced information on what the plane ahead is going to do, pilots often watch the rudder and ailerons of the machine and follow the action of these with their own plane controls. This gives greater unison. Sometimes pilots do better than that. They are in so close that they can watch the pilot in the front plane manipulate his controls. But this is done only by the "hottest" of the "hot."

Top, Well Protected Pursuit Formation, and, Below It, Bombers in Bad-Weather Formation; Bottom, Pursuit Planes Hunt in Packs of Threes

One ticklish thing about watching the controls of a plane ahead and trying to fly by them is the action of air bumps. These bumps, or great billows of air waves, will often lift the leading plane fifty feet above those behind and slow its speed down. Meanwhile all the other planes are crowding rapidly in upon it, and when they strike the air billow, each one in turn goes up. About that time, the lead-



Left, Pursuit Planes in Formation over Sacramento Valley; Above, a Group of Army Pilots, Each an Expert at Formation Flying

ing plane has slid down the big air wave and is fifty feet below the other planes. Extremely close formations are seldom attempted on very gusty days. Good formations cannot be held in rough air.

The stair-step formation, however, can be held better in rough air than any other kind. This formation is one in which the

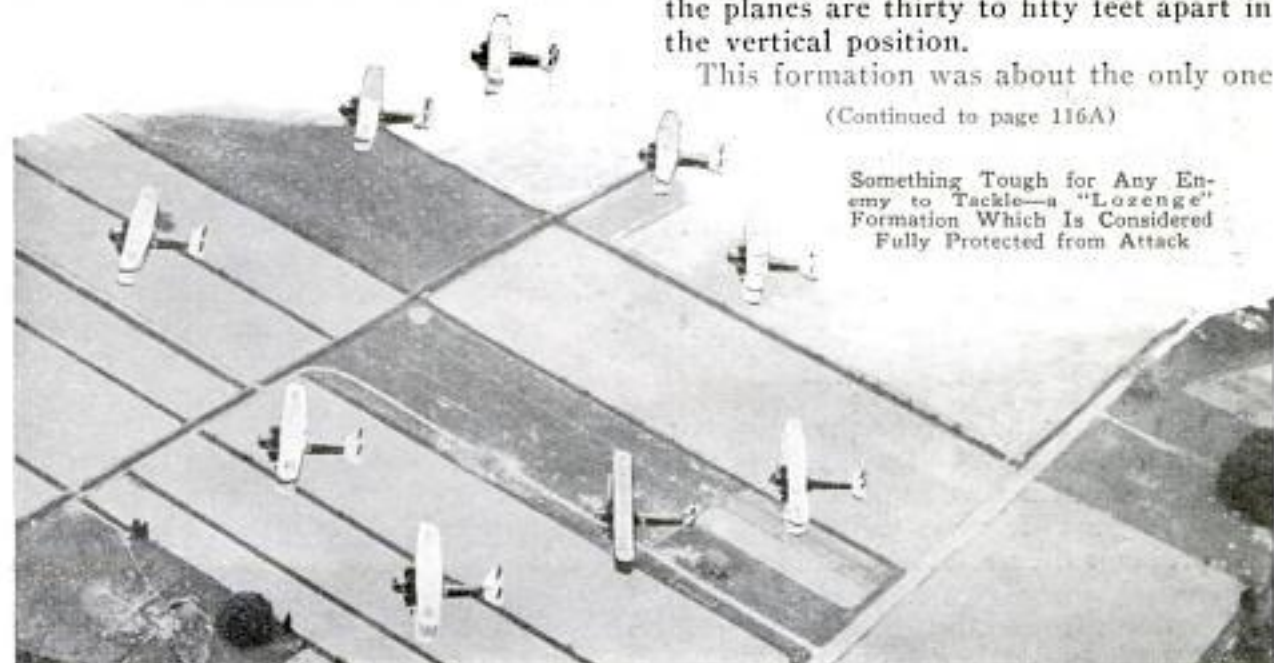
leading plane is the lowest in the group, and all others are riding behind and slightly above those in front.

A stair-step V-formation can be made to look very good from the ground because the planes can appear to have their wings very close together, when, in fact, the planes are thirty to fifty feet apart in the vertical position.

This formation was about the only one

(Continued to page 116A)

Something Tough for Any Enemy to Tackle—a "Lozenge" Formation Which Is Considered Fully Protected from Attack



B. 7.5

Columbia Note Coach
Lines due.

3873



Transmitter for Police Patrol Autos Is on Seat beside Detective Using Microphone

POLICE BROADCAST FROM AUTO TO SPEED UP WORK

Broadcasting from police-patrol autos is made possible by a small transmitter that occupies no more space than the ordinary storage battery. Tests show that the transmitter will save time in calling ambulances, in reporting various phases of police work and by eliminating the necessity of communicating with headquarters by telephone. At present, police autos are equipped only with receivers. Due to regulations of the Federal Radio commission, the new transmitter cannot be used in police cars, but the Los Angeles police department has applied for permission to install it in all patrol cars.

DRUG TO RELIEVE CANCER PAIN IS NOT HABIT-FORMING

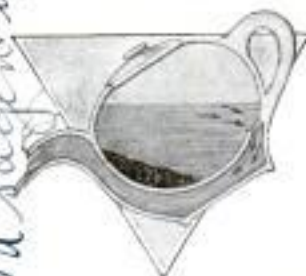
Five times as powerful as morphine, a new drug has been found particularly useful in cases of cancer that cannot be treated by surgery. It gives relief from pain and prolongs the useful life of the patient, who can be up and working. The drug, called dihydromorphinone hydrochloride, is not habit-forming.

SEATS BECOME BEDS AT NIGHT IN LUXURIOUS MOTOR BUS

Sleeper motor coaches, embodying a more ingenious utilization of available space than has been offered heretofore, are now being placed in service on long-distance schedules. These sleepers have upper and lower berths accommodating twenty-eight passengers and seats for daytime travel for forty-four persons. The engine is located in the rear, at right angles to the body, and can be easily removed for repairs or replacement, and the passenger aisle runs the length of one side, allowing berths to be placed crosswise, instead of lengthwise of the coach. As in Pullman cars, the seats are made into berths at night, the underseat portion of the upper tier providing head room over the lower seats. Each central compartment can be made up into three single and one double berth, and a rear compartment has room for three single beds. The space under the driver's cab is a baggage compartment reached by a door resembling a radiator on the conventional type of car. Lighter baggage is stowed under the aisle floors, and additional hat and parcel space is provided in overhead racks. The coach has a radio in every compartment, running water, washrooms, a ladies' dressing room, electric fans and a system of forced ventilation. There is no regular frame, the body being self-supporting, and the use of light alloys has reduced the weight more than two tons, as compared with a car of conventional construction. The coach is thirty-three feet long, eight feet wide and ten feet high.

TEAPOT WITH DOUBLE BOTTOM HOLDS BACK THE LEAVES

Designed to hold back the leaves, a teapot with a double bottom has a filter between the first compartment into the second, or the sump. When the pot is tilted, the leaves fall from the filter while the tea is poured. The sump fills again, however, before the leaves fall back as far as the filter.



Line of Los Angeles Police Dept

Wide World

B192

Will suggest to you

Dr. W. H. Miller 10/29/37

Dr. Walter Alvarez
Mayo Clinic, Rochester, Minn.
High St Church
Shropshire, Eng.

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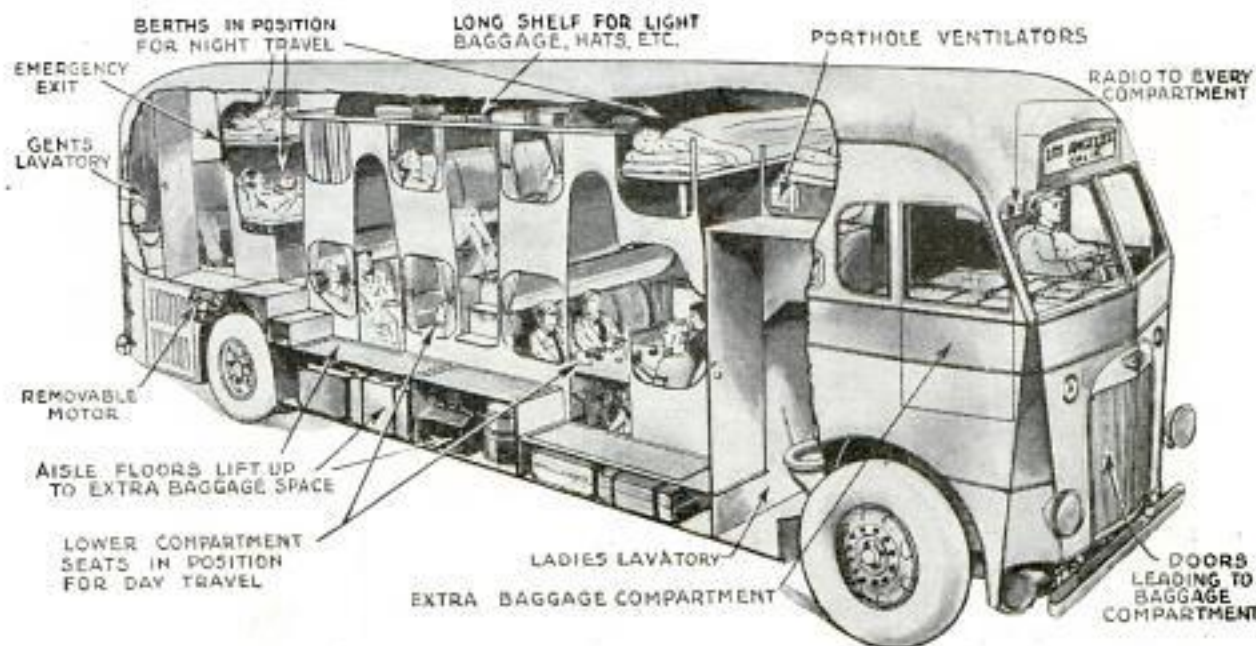
Sleeper Motor Coach Has Two-Story Berths



Above, Removing Motor from Sleeper Coach; Engine Is Mounted in Rear, at Right Angles to the Body

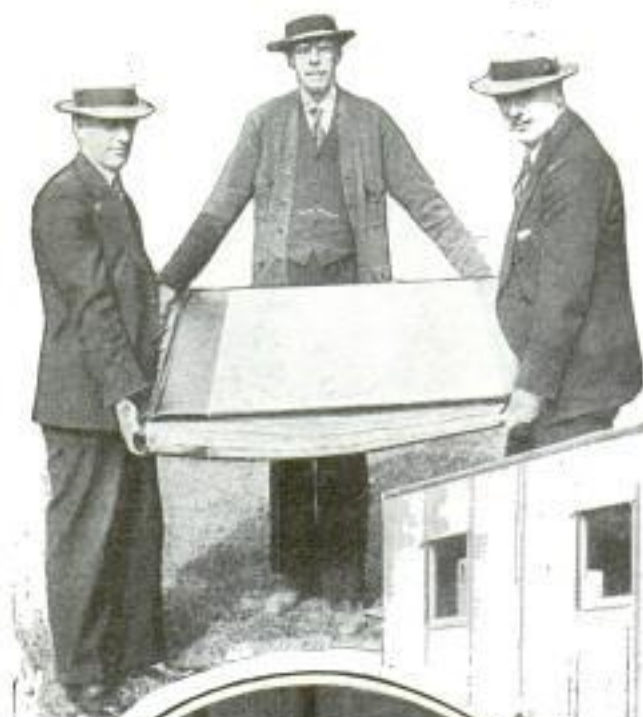


Above, One of the Compartments of the Motor Coach Made into Berths for the Night; Left, in the Daytime the Compartments Are Spacious Enough for Four Persons; Below, Drawing of the Double-Deck Arrangement; Note Baggage Space in Front and under Aisle Floors



B 827 Emily H. P. Webb
Lane City, Iowa

Books Fixed on Spot by Bindery on Wheels



are available during the day and safely locked in their vaults at night. One book the binder came across required three men to carry it from the courthouse vault to the special equipment he had rigged up to rebind this giant of books. It is three feet square and approximately five inches thick. On the other hand, in a little pill-box he keeps a leather-bound replica of a thousand-page ledger. This midget is one and one-fourth by seven-eighths inches in



Automobile Truck Equipped as a Book Bindery and, in Circle, the Binder at Work in His Shop on Wheels; at Top Is a Big Book He Repaired Contrasted with a Midget Volume, Shown at Left

George Bowdler

A BOOKBINDER in Iowa operates a completely equipped one-man bindery which is mounted upon an old automobile chassis, giving him a portable shop with a floor space of seven by twelve feet. This tiny bindery contains a standing press, sewing bench, backing machine, workbench, storage space for stock, a dozen type cases, and other equipment. Specializing in rebinding county record and abstract books, he moves his shop from one county seat to another, binding the books where he finds them. This method permits keeping the records where they

size and contains 350 onion-skin pages. It was made in spare time during five years.

ACETIC ACID MADE FROM WOOD BY A DIRECT PROCESS

Acetic acid now is being produced direct from wood. The process means a great saving for the wood-distillation industry because the product of the direct process is of sufficient purity to be used commercially without further refining. It is employed chiefly in the manufacture of solvent esters used in making lacquers.

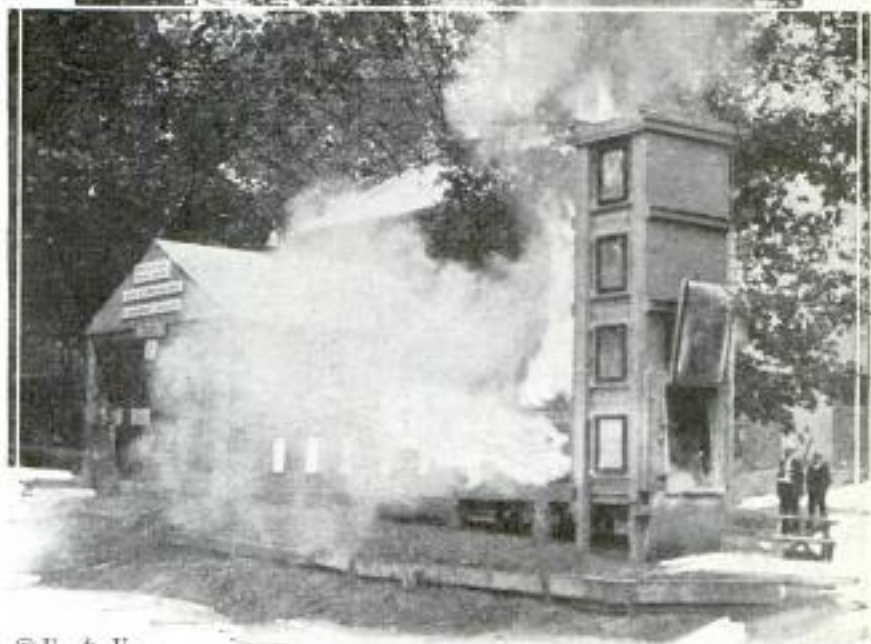
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Science Times 8/1/22

Feb 22, 10/29/32

MICE FARM MAKES MONEY SELLING TO HOSPITALS

By breeding mice for medical research, one Englishman has turned his spare time into money. A good price is paid for a mouse with a lump on it, for this animal helps in cancer research. Healthy mice bring much less and are sold by the dozen. All kinds of mice are bred—chocolate, lilac and tan, silver and tan, champagne and tan, black-eyed whites, piebald and red. In ten years, this mouse farmer has raised between 30,000 and 40,000 of the little rodents in his backyard. While a mouse will produce from seven to nine litters in nine months, the breeder permits only three or four litters. After nine months, the mouse is considered too old to keep and is sold.



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How to Prevent Dust Explosions Is Taught by Demonstrations Like This; the Building Is a Small-Scale Factory

EXPLOSIONS OF DUST STUDIED TO PROMOTE SAFETY

Startling explosions of dust are staged by scientists of the department of agriculture in tests designed to promote safety conditions. One such blast shattered the doors and windows of the model testing chamber, showing the terrific force stored up in apparently harmless dust particles.

at National Safety Conference

AMPHIBIAN PLANE WITH TREAD CAN LAND ON MARSH

Equipped with wheels, pontoons and chain treads, a German plane is ready to land on any surface, land, water or marsh. The treads make it possible for the plane to pull out of soft, muddy ground. These three types of gear are provided for emergency landings on overland flights.

B1783

SHARK CREDITED WITH SAVING WORLD FOR VERTEBRATES

Sharks are credited by Dr. Augustus F. Foerste, of the Smithsonian Institution, with saving the world for the vertebrates, the animal group which includes man. Nautiloids, an alien group, once bossed the seas, able to overcome any foe with their strangling tentacles and parrotlike beaks, for attack, and shells for defense. But their reign ended. Doctor Foerste, after studying fossil nautiloid shells, suggests that sharks ate the nautiloid eggs and young faster than they were produced, thus bringing about their downfall.

B1956



Wide Work
Chain Treads on This Amphibian Plane's Wheels Help Pilot in Landing and Taking Off from Marshy Ground

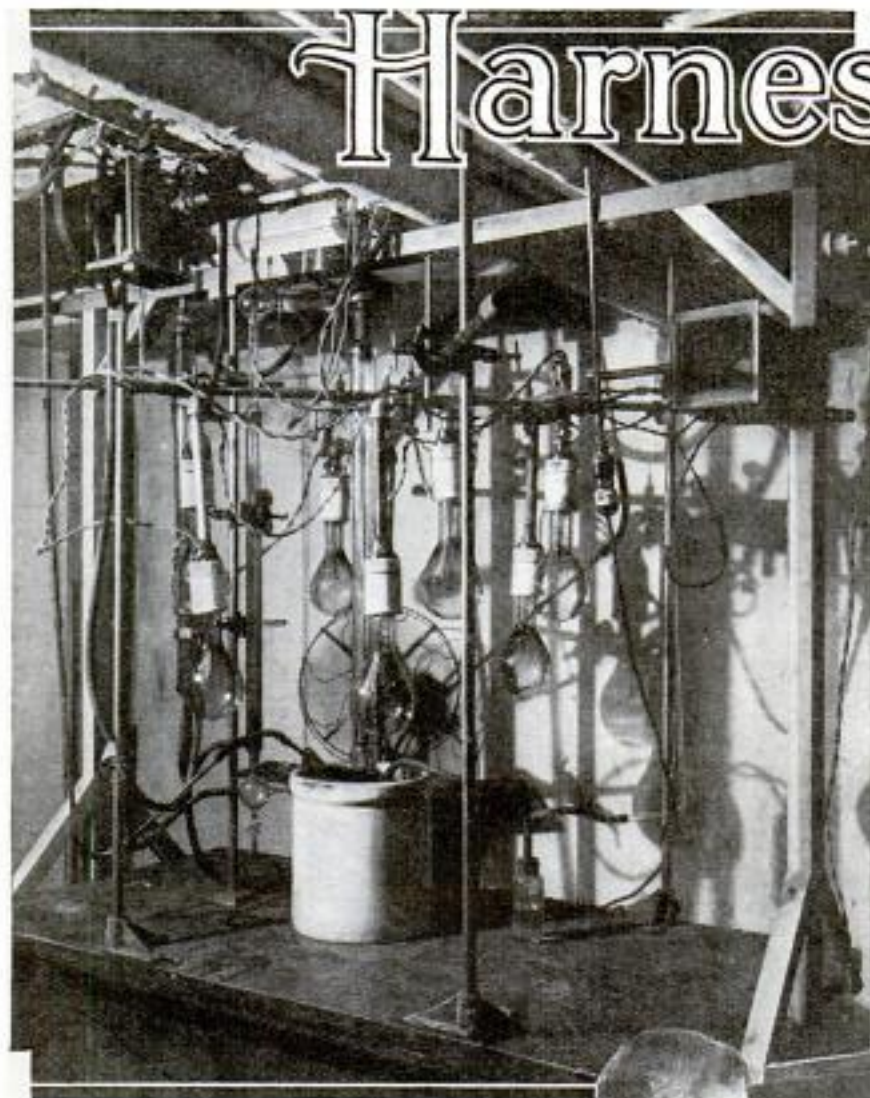
Shunat Herman Arkiane
Exhibition

Journal News Letter
10/29/32

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B1709

Harnessing



the wife of the director. Each day of the year that the sun shines—and it shines some 300 days on Montezuma—their routine is unvaried. They rise with the sun and make their observations during the morning hours, spend the rest of the day computing the results, and at nightfall telegraph a report to Washington.

All supplies, including water, must be hauled up the mountain from a

By DR. C. G. ABBOT
Secretary, Smithsonian Institution

Washington de P.
ON a desolate mountain in northern Chile, two men and a woman today enact the modern roles of the ancient sun worshipers. Their cabin stands on Mount Montezuma, 9,000 feet above sea level, and the three persons and a geranium are the only living things on the eminence which supports neither tree, shrub, grass, bird, beast, reptile nor insect.

The men are the field director of one of the solar observing stations maintained by the Smithsonian Institution and his assistant. The woman is



Top, Growing Wheat under Controlled Conditions of Light, Humidity and Temperature; Below, Doctor Abbot Analyzing Curves with the "Brass Brain"

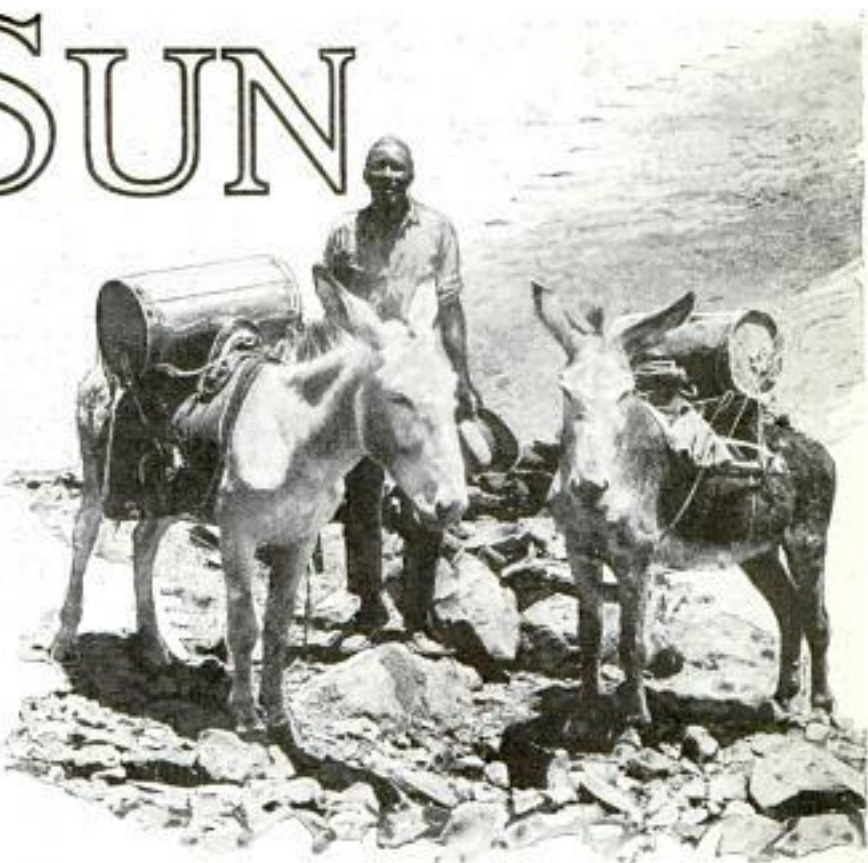
town ten miles distant, so once a week one of the trio makes an auto trip down Montezuma and comes chugging back at

31709

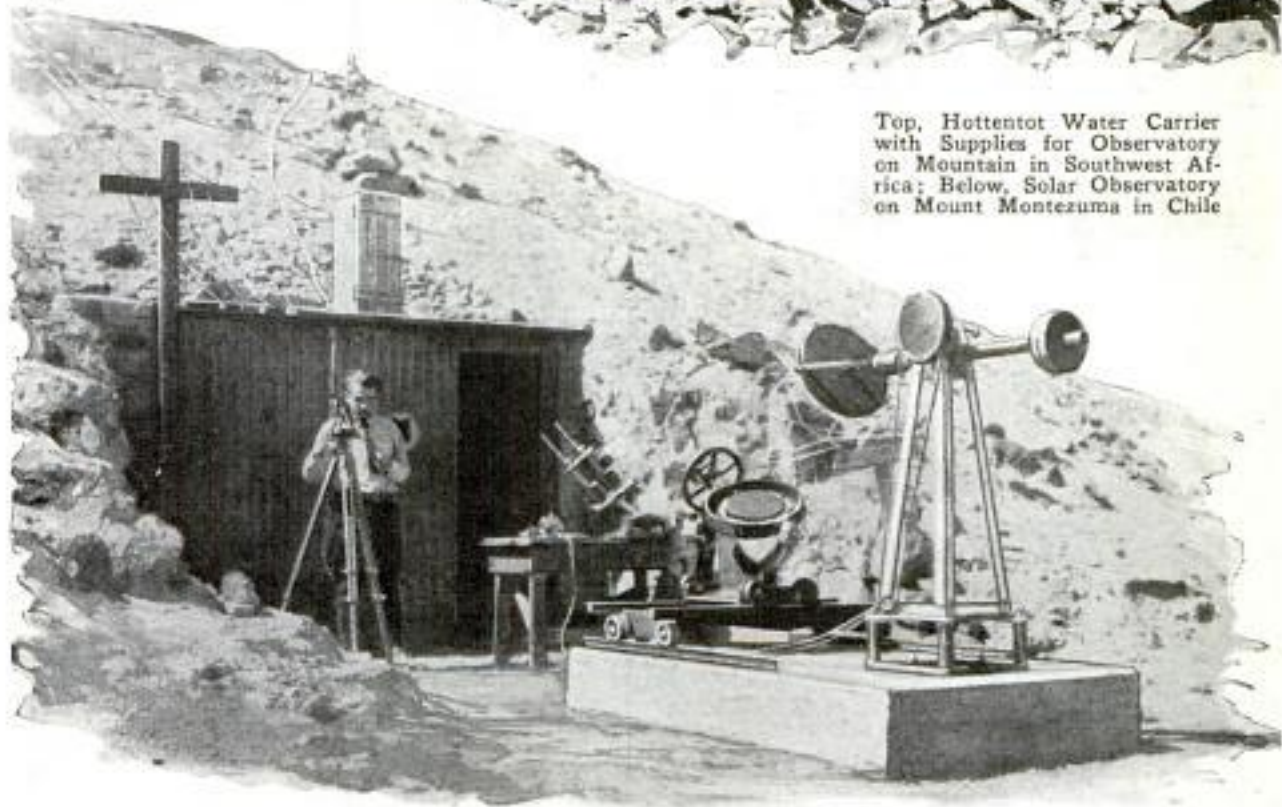
the SUN

night with food and two precious casks of water. This water must serve for seven days for drinking, cooking, washing and developing photographic plates. With the waste water they nourish a geranium to remove a bit of the desolation. They have games and books, a radio and music for relaxation, but not much time to relax.

From lonely outposts such as this, science is prying into the secrets of the



Top, Hottentot Water Carrier with Supplies for Observatory on Mountain in Southwest Africa; Below, Solar Observatory on Mount Montezuma in Chile



sun with a view to using the knowledge and harnessing its energy to further serve mankind. Long ago it was realized that nothing more fundamental than the sun could be investigated because light, heat, power, weather and life itself depend on it. So for forty years the Astrophysical Observatory has been trying to find out

more about the sun. It has measured the intensity and variation of the sun's rays in Washington, on high mountains in California, Arizona and North Carolina, in Algeria, the Cape Verde islands, southwest Africa, in Egypt near Mount Sinai where Moses received the law, and every day for many years in the nitrate desert

031909



growth. Climate here on earth has been found to vary in cycles over considerable periods, somewhat as the seasons move in cycles through the year. As these cyclic changes are mainly due, as I now believe, to the effect of periodic changes in solar radiation, the making of long-distance weather forecasts will perhaps soon be realized.

Should meteorologists be able to predict the fat years and the lean years in advance, just as Joseph is said to have done in Egypt, the economic importance of such forecasts can hardly be over estimated. It would have meant millions of dollars to American farmers, for instance, if they could have obtained ad-



Center, Observing a Solar Eclipse More Than Thirty Years Ago; Above and at Right, Two Views of Doctor Abbot's Solar Cooker Which Bakes Bread

of Chile. It has sent free balloons up more than fifteen miles and measured solar radiation there, where ninety-six per cent of the atmosphere is left behind.

By studying the amount of atmospheric absorption of solar rays, and the amount and variation of solar radiation, a foundation has been laid for a new kind of weather forecasting, for utilizing the sun's energy for power, and for speeding up plant



vance information that 1930 was to have

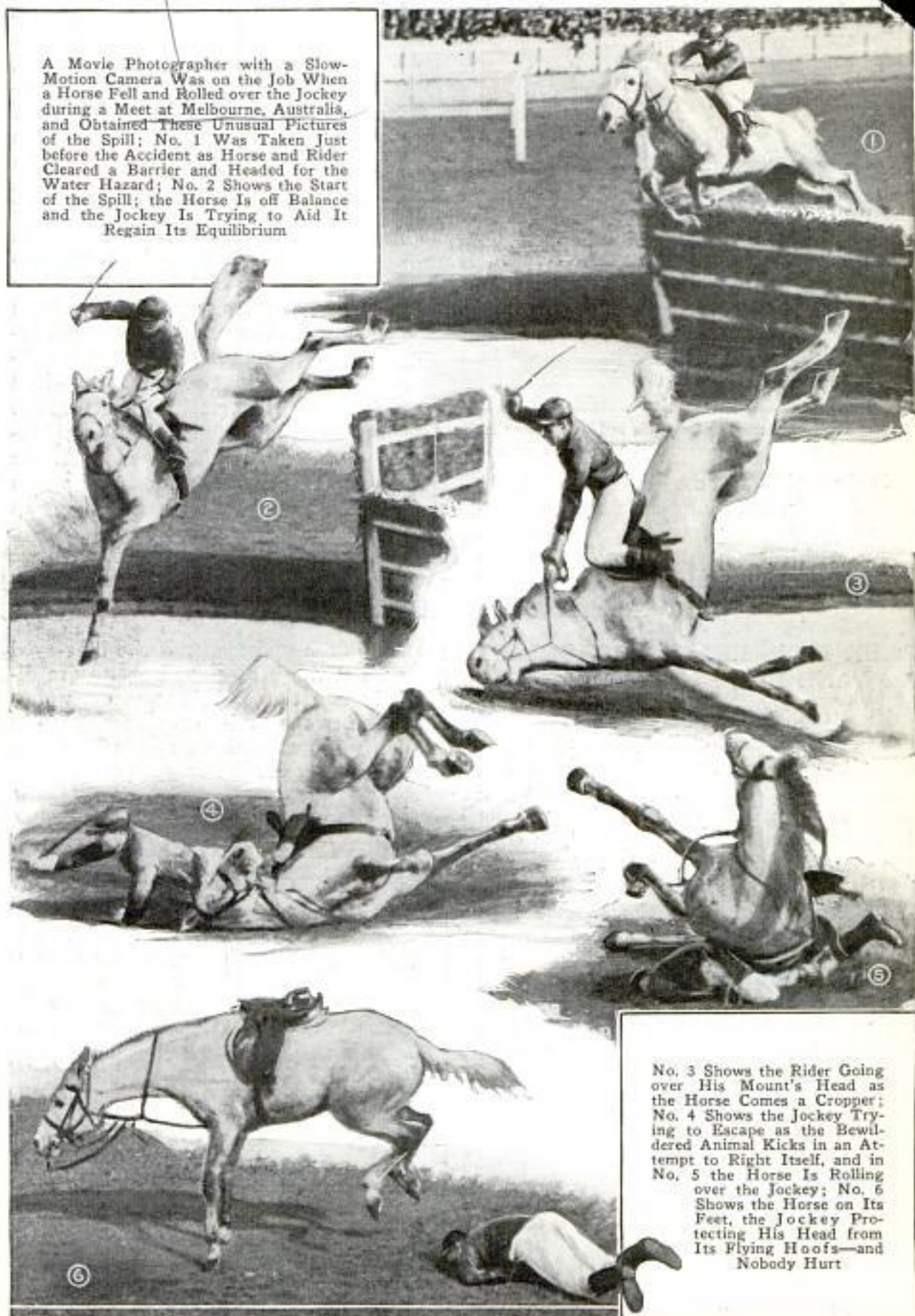
(Continued to page 120A)

031874

at Royal Academy
POPULAR MECHANICS

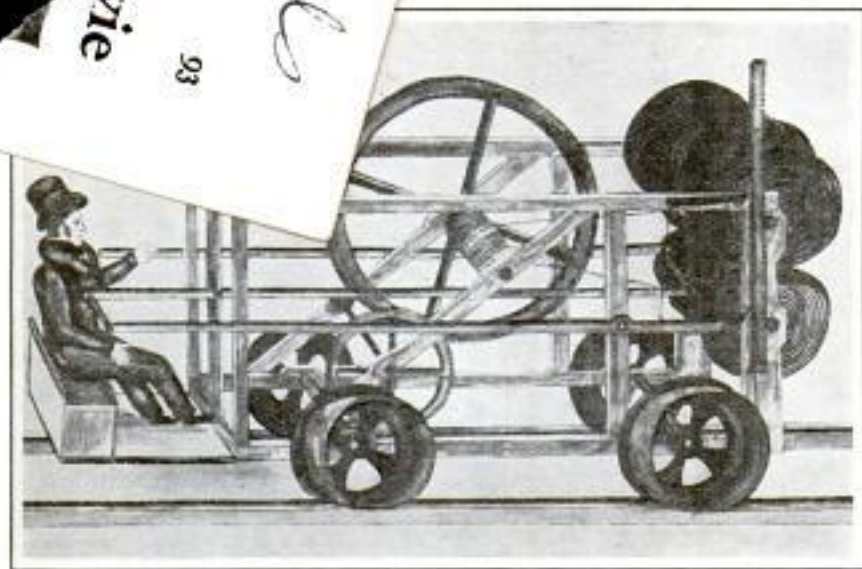
Unusual Spill Caught by Slow-Motion M.

A Movie Photographer with a Slow-Motion Camera Was on the Job When a Horse Fell and Rolled over the Jockey during a Meet at Melbourne, Australia, and Obtained These Unusual Pictures of the Spill; No. 1 Was Taken Just before the Accident as Horse and Rider Cleared a Barrier and Headed for the Water Hazard; No. 2 Shows the Start of the Spill; the Horse Is off Balance and the Jockey Is Trying to Aid It Regain Its Equilibrium



No. 3 Shows the Rider Going over His Mount's Head as the Horse Comes a Cropper; No. 4 Shows the Jockey Trying to Escape as the Bewildered Animal Kicks in an Attempt to Right Itself, and in No. 5 the Horse Is Rolling over the Jockey; No. 6 Shows the Horse on Its Feet, the Jockey Protecting His Head from Its Flying Hoofs—and Nobody Hurt

's Great Mechanical Oddities



striking than the spring-power locomotive car, invented by George W. Duncan in 1834. This locomotive, the drawings of which have just come to light again after almost a century of obscurity, was propelled by powerful springs, which were, in turn, wound up by a series of levers. The driver wound up the springs and the springs drove the locomotive. This was an attempt to run a full-sized locomotive of the time as the child runs its toy locomotive today. In the

Spring-Power Locomotive Invented in 1834; Note the Huge Springs at Front and Apparatus for Winding

In the archives of the Franklin Institute, Philadelphia, are found records and models of many queer inventions, as well as those which have revolutionized industries. None, however, is more unusual or

front were the huge springs, mammoth steel affairs. From these there was a chain drive to an axle which in turn worked a series of gears. The whole was a huge alarm clock, as it were.

BLUE EYES REALLY COLORLESS AND NOT BLUE AT ALL

The question, "Why are blue eyes blue?" has been answered. Blue eyes are not blue at all, but actually are colorless, biological research has revealed. There is an absence of pigment in the outer layer of the iris, so the inner layer is exposed. It contains a whitish substance, but the reflected light makes this appear blue because in the scattering of light, the shorter rays are scattered more readily, and these short wavelengths are in the blue spectrum. If longer waves were scattered more readily, blue eyes, as well as the sky, would appear yellow. Biologists have also found that brown eyes are present in people living where there is much brilliant sunlight. The dark eye, or brown pigment protects the retina against too much light from the sun. Blue-eyed parents of pure blue-eyed stock transmit blue eyes to their offspring. A blue-eyed and brown-eyed couple of pure stock have brown-eyed children, but only three-fourths of the grandchildren will have brown eyes and the rest will have blue. The blue-eyed

grandchildren will transmit the blue-eyed factor, but the brown-eyed group are divided in two classes in a ratio of two to one. The two-third group transmit genes for both brown and blue eyes, the rest transmit genes for brown eyes only.

HEATED WATER-FILLER HOSE DEFIES COLD WEATHER



Water-filler hose, electrically heated and controlled by a thermostat, offers a solution to one of the outstanding winter problems of gasoline-service stations. As soon as the temperature falls below forty-five degrees, electrical current is automatically switched

into the heating element which extends the full length of the hose. Current required is approximately that of a single light bulb.

*William's Kerckhoff
Biological Laboratories*

*The 36-5 Product
Co. 10th floor, here
Copyrighted material*

card
movie
93
10/29/32
05/18/97
25.00
W. Mathwin, c/o Cherokee, Claremont, Ala
Pasadena, Calif
d.w. Car

Science News Letter 03/18/32
10/9/32

03/95
**RADIO AIDS NERVE STUDY
BY GAUGING IMPULSES**

Radio tubes and the general mechanism used in modern radio have been used in studying the nerves. Nerve impulses travel from three to 300 feet per second and appear to be electrical. It is possible to separate a single nerve fiber from the hundreds with which it usually is trunked and attach to the fiber a wire leading to an electrical recording instrument. But single nerve impulses are so weak that it was difficult to detect them for a long time. Radio amplification now magnifies these weak impulses more than 100,000 times, so that they register themselves. It has been found that a weak stimulus will cause only a few reports to be sent to the brain from the sense organs. But strong stimuli rouse every nerve fiber to carry its message. Prof. D. W. Bronk, of the University of Pennsylvania, points out that such a stimulus also has the effect of speeding up the frequency of the nerve impulses.



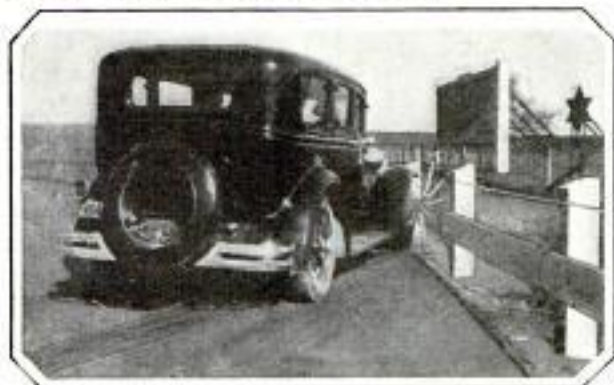
Every Period in United States History Can Be Identified by Articles in This Collection of Candlesticks

Islandale, Calif
**CANDLESTICKS OF ALL NATIONS
COLLECTED IN AMERICA**

Candlesticks of all nations and of many periods have been collected in America by Adolph Stack. The holders range from those of colonial America to the modern silver candelabra. In the collection are specimens of silver, pewter, brass, clay and copper from all parts of the world. The most valuable piece is over 300 years old and comes from India. The holders are kept fitted with candles for display.

03/85
**SPRING BUMPER GUARD RAIL
KEEPS CAR IN ROAD**

Resilient steel-spring highway guard rails, which absorb shock with minimum damage, similar to the bumpers of an automobile, are now in service in some sections of the country. When struck by a skidding motor car, they pillow the shock and return to their normal position with a tendency to deflect the car back to the road. They are shatter-proof.



Auto Striking Steel Road Guard Which Acts Like Bumper in Deflecting the Car

**BETTER TREES ARE BEING BRED
FOR FUTURE FORESTS** 03/19/60

Pine and walnut trees are being bred like corn and wheat by the Institute of Forest Genetics, at Placerville, Calif., in order to produce better forests. To get new and faster-growing pines, the institute has resorted to hybridization which requires the bagging of cone-forming flowers after pollinization to keep alien pollen away. The bags are fitted with windows so progress of the young cones can be watched. Another technique recently developed is the bud-grafting of pine trees, heretofore considered impossible. As a result of this work, tree seeds may be chosen from selected individuals.

Lloyd Austin, director
Copyrighted material

Inthill Spruce Co
76 C.W. Pike, Chicago

Severance 9/18/32

B. 1847 Carl Welker



© London News Agency

This Novel Carriage Delights Visitors to Madeira Island: Note That Wheels Are Replaced by Runners Which Slide over the Cobblestone Streets More Smoothly Than One Would Imagine

OX-DRAWN CARRIAGE ON SLEDS CARRIES MADEIRA VISITORS

Visitors find an unusual means of transportation in picturesque Funchal, on Madeira island. It is the bullock carro, a carriage with wicker armchair seats and a canvas top, with sledlike runners and drawn by oxen. Designed by an English army officer for his wife's use in 1848, the bullock carro still appears on the cobblestone streets of the town.

FLYER TWO MILES UP CAN SEE OVER A HUNDRED MILES

From an elevation of 10,000 feet, or about two miles, airplane passengers can see an area of 132 miles on all sides, as great as the states of Illinois or Iowa. This area represents a domain of 50,000 square miles, larger than the states of Indiana, New York, Ohio or Pennsylvania. From an elevation of 100 feet, objects on the ground thirteen miles away are visible, while at 1,000 feet, the view extends forty-one miles in all directions. In the far

west, United Air-Line pilots have reported sighting mountain peaks 150 miles away in good weather, while at 10,000 feet, the sunrise can be seen more than ten minutes before it is visible on the ground.

DECORATIVE DESIGNS OF METAL PRESSED INTO PLACE

Applied by pressure of 1,000 pounds to the square inch, metal figures are combined with laminated materials for decorative purposes. The thin metal designs are pressed into a base made of absorbent paper soaked in synthetic resin varnish. Heat to 300 degrees Fahrenheit is used while pressure is being applied, so the metal is vulcanized into the paper sheet. This process was used in the manufacture of water coolers.



B. 1921

United Air Lines Bulletin
Formica Corporation
Co. 4614 Spring
Lorain, Cincinnati, O.

Sub Puts 10/15/32

Barr + Stroud Ltd.
3, 7, 5 Glasgow
Scotland

POPULAR MECHANICS

FAILURE OF FISH TO SHOW AGE PUZZLES SCIENCE

Do fish die of old age? No one knows the answer to that question, although it is logical to answer "yes." But no observation of old age in fish has ever been recorded. Some members of the carp family have lived in captivity more than 100 years without showing signs of senile decay, as do land animals, which experience deterioration of arteries, muscles and various other organs. Of course fish die "natural" deaths from disease, parasites and larger fish and run the constant risk of being stranded or dashed to death on rocks and passing boats or ships. Life in the depths is perilous, so perhaps no fish is able to live out whatever its span of life should be. Whether fish sleep is another question that science never has been able to answer definitely. Fish often are seen motionless at the bottom of shallow streams and near the shore, but whether they are sleeping or remaining quiet, either in wait for prey or to escape the eyes of larger fish, has not been determined with any degree of finality. The probability is that fish do not sleep like land animals, because their eyes are lidless and therefore the creatures cannot close them. Dr. C. P. Bidden, of England, says the male plaice probably dies at the age of eight years, but there is no evidence that the female dies except when caught. The female matures at six or seven, while at twenty-five, she is seventy per cent longer and five times heavier.

536 Golden Gate Ave

FLASHLIGHT FOR DIAL PHONES AIDS IN NIGHT CALLS

Night calls on dial telephones are facilitated by a flashlight that is attached to the instrument in such a manner that it will cast an even glow over the whole dial. The flashlamp uses standard batteries and bulbs which are easily replaced.



Winton "Oceania"
San Francisco, Calif



Courtesy American Braille Press
Device for Turning Printed Letters into Sound Being Used by Blind Girl

15 Virginia St. Westminster
Hills London England
P.O. Box 2000

BLIND READ BOOK PRINT BY EAR WITH LUMINOUS "EYE"

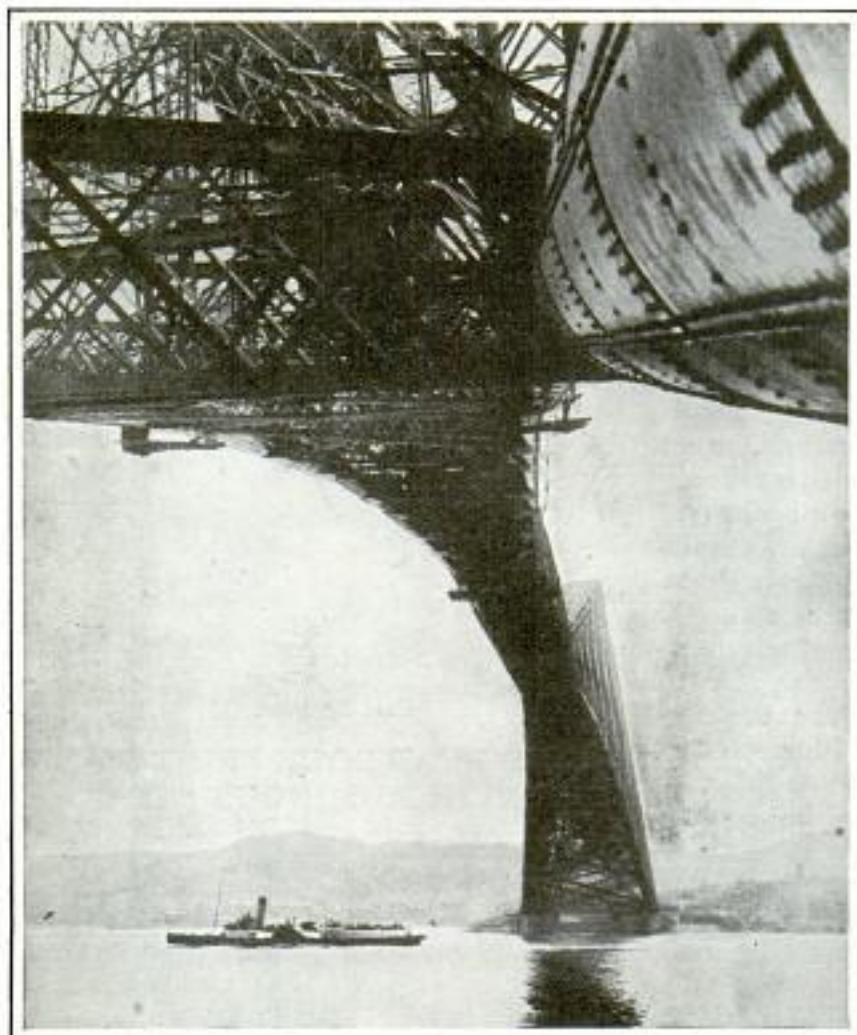
Aided by a luminous "eye," the blind may learn to read printed matter by ear. A device which turns the black letters into sound by means of the luminous eye, or small electric light, has reached an advanced stage of development, enabling blind persons to read an ordinary book after several months of lessons. As long as the eye travels only over white paper, there is no sound, but black, or printed, letters cause definite tones that are heard in the earphones. Six notes forming the device's sound alphabet are like the sol, do, re, mi, fa, sol in music. A letter is really turned into music; for instance, capital "V" is a melody of sol, fa, mi, do, re, mi, fa, sol. The letter tracer is regulated so the operator may read at any desired rate of speed that suits him best.

UNTREATED POSTS IN SERVICE FOR EIGHTEEN YEARS

Fence posts of untreated white cedar, osage orange, black locust and catalpa have been found to be in a serviceable condition after eighteen years of service. Sassafras, white oak, black walnut, black ash and honey locust yield about the same length of service when treated with creosote. Untreated, their normal serviceable life ranges from five to fourteen years.

Mission Agricultural
Experiment Station
Columbia, Miss

031726



A Force of Fifty Men Is Constantly Employed Painting This Bridge over the Firth of Forth

FORTY YEARS' PAINTING JOB ON FORTH BRIDGE

One job that never is completed is that of painting the great bridge which crosses the Firth of Forth, near Edinburgh. Crews of workmen are constantly employed applying the protection against the ravages of the elements. It requires three years for a force of fifty painters to work their way from one end of the bridge to the other—and then it's time to begin all over again. The total surface to be covered is approximately 135 acres.

STUDY HABITS OF BLIZZARDS AT "WINDIEST SPOT"

Atop Mount Washington, N. H., highest point in New England and said to be the windiest spot in America, a weather station has been erected to study wintry gales and blizzards. The expedition, spon-

Scene Service 10/6/32

sored by the New Hampshire Academy of Sciences, is equipped with especially designed instruments to combat the severe conditions which exist at the top of the mountain. To prevent ice from forming on the revolving wind gauge, a heated anemometer has been developed. Due to freak air currents which often carry snowflakes up one side, across the top and down the other side of the mountain, shielded gauges with receivers constructed from furnace pipe have been laid at various points on and around the summit of the peak. The party is equipped to spend the entire winter in isolation.

031724

TILE IS CUT LIKE WOOD FOR EASY INSTALLATION

Easily installed because it can be sawed and drilled like wood, a new wall tile is available for home or office. The tile consists of a heavy coating of porcelain over compressed fiber. Because of the cushioning effect of the fiber base, the tile can be struck a sharp blow without noticeably scarring the finish. Easily sawed and drilled, the material can be fitted about plumbing fixtures, woodwork and doors and windows speedily. A variety of colors is available.



Fitting This Tile Is a Simple Task Since the Material Can Be Sawed and Drilled

Marsh Wall Tile
Ever-White

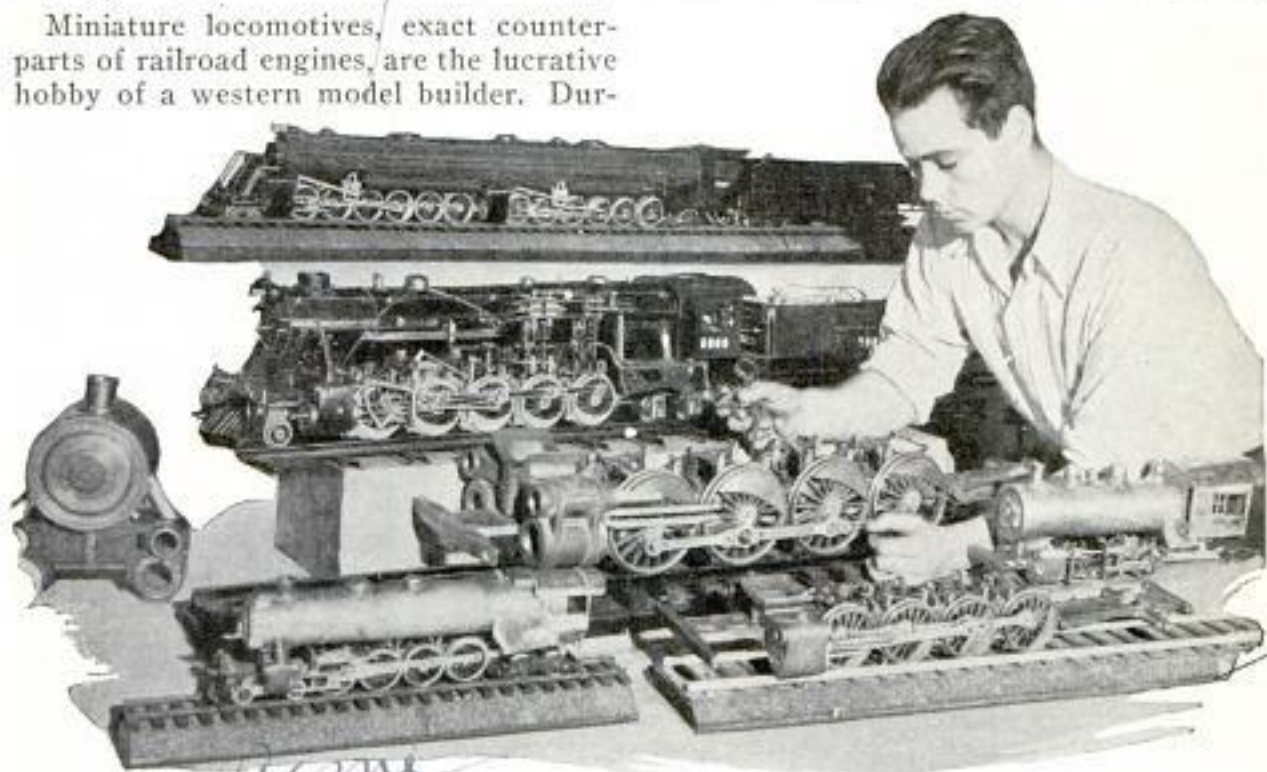
Madam, Sumner & Co. Akron Ohio

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*Renneth Lee War
Los Angeles Calif*

Engines That Run Win Fortune for Youth

Miniature locomotives, exact counterparts of railroad engines, are the lucrative hobby of a western model builder. Dur-



Working Models of Modern Locomotives Which Are Eagerly Sought by Collectors at \$1,200 Each; All Are Complete to Smallest Detail and One Has Power to Pull Rolling Weight Equal to Fifteen Men

ing the past few years, he has built and sold fifteen of these models at an average price of \$1,200 each. Constructed on a scale of one-quarter inch to the foot, these miniature locomotives are complete even to air pumps, superheaters and air brakes. One of the latest is capable of generating 100 pounds of steam and has sufficient power to pull a rolling load equal to the weight of fifteen men. All are duplicates of standard, well-known types of engines and are eagerly sought by wealthy collectors. At present, he is working on a complete train for the Chicago Century of Progress exposition.

"AMERICAN INCH" IS SHAVED TO EFFECT NEW STANDARD

The American inch unit of measurement has lost two-millionths of its former length in order that precise measuring in the United States and England may be done on the same basis. The new definition of the inch is now 25.4 millimeters—a difference of about one-eighth inch in a mile as compared with the former American standard. This infinitesimal alteration

was made necessary by modern precision manufacturing and the confusion arising from varying standards in the two countries. Gauge blocks now are made correct to within one-millionth of an inch. Both the U. S. bureau of standards and the national physical laboratory of England will certify industrial gauges on the new basis.

LIVE RUBBER ABSORBS SHOCK IN FLEXIBLE COUPLING

Resilient rubber between layers of wear-resisting fabric carries the power load imposed upon a flexible coupling and neutralizes shocks which otherwise would be transmitted from the power unit to the operating machinery.

The coupling is so compact in design as to be practically free from "flywheel action," and because of its inherent tendency to equalize load distribution, specific pressure is kept far below safe maximum.



*Service Service
10/22/32*

*Longway Co. Inc.
325 W. Ohio Chicago*

B1723

B3859

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031790



Launching Motorboat from Deck of Submarine; the Craft Is Waterproof and Submersion Does Not Damage It

SUBMARINE HAS BOAT "ISLAND" FOR WATERPROOF CRAFT

America's largest submarine, the "Dolphin," is equipped with a waterproof motorboat which is housed in a special boat "island" on the open deck. The boat can be launched in a few minutes when the submarine comes to the surface, and submersion does not damage it, because no water can enter.

LIFE OF AUTO TIRE AFFECTED BY SAND AND WEATHER

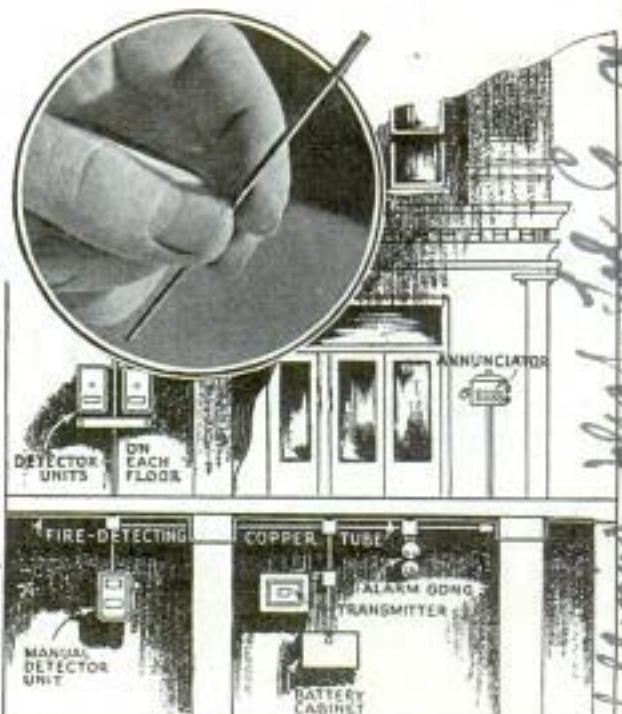
Sand and weather affect the life of automobile tires to a great extent, often causing a big reduction in mileage. Because the sand on Florida roads is sharper than that near Akron, Ohio, the Florida autoist will get only sixty per cent of the tire mileage that the Akron driver gets. The Arizona auto owner can expect sixty per cent more tire mileage than the Akron man because Arizona sand is so smooth it causes little wear. Burgess Darrow, of the Goodyear Tire and Rubber company, points out that the temperature at which a tire operates also may affect its wearing

qualities. He estimates that motor-coach tires, which give 28,000 miles in Ohio, Michigan and Minnesota, will last only 20,000 to 22,000 miles in southern states, since the heat tends to break down the rubber.

031765

COPPER TUBE DETECTS FLAME AND SOUNDS ALARM

For quick detection of flames, an alarm system with a sensitive copper-tube element has been produced. The tube, which is less than one-twelfth of an inch in diameter, is placed along or around the ceiling or roof. In case of fire, air in the tube becomes heated and expands, forcing out a diaphragm at each end and closing an electrical circuit. A transmitter automatically sends the alarm to a central station and the fire department, while an annunciator on the outside of the protected building indicates to firemen the floor or section of the building where the fire originated. There are no parts to replace after an alarm, since the diaphragm returns to normal position and opens the circuit.



Top, Copper Tube Which Is Secret of Fire-Alarm System; Bottom, Typical Installation

031801

Akron Ohio

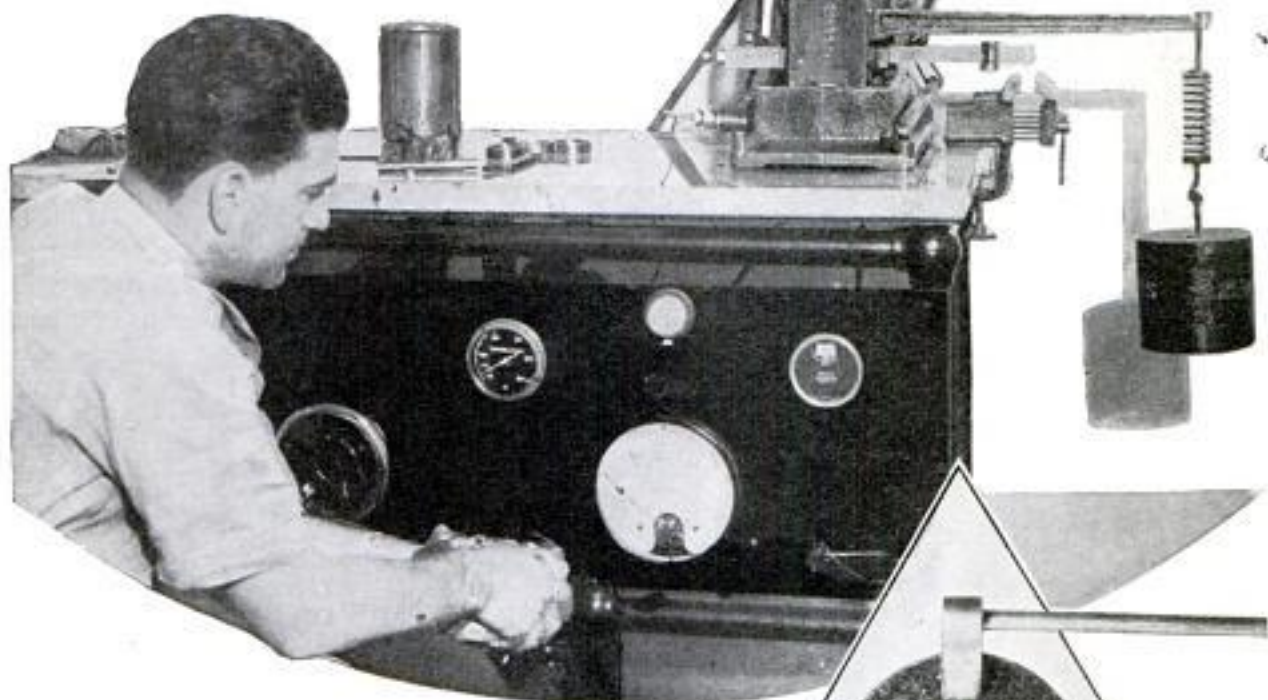
Aluminum Dept. Tube Co. Akron Ohio

Daeno Service 1921/32

American District Telegraph Co 155-6th Ave

B 1415

SPARE *the* OIL and SPOIL *the* MOTOR



By JOSEPH D. MOUNTAIN

DO you know that the motor of your car uses from three to seven times as much oil at sixty miles per hour as it does at thirty?

Do you know that one grade heavier oil will reduce your top speed about five miles per hour and lower your gasoline mileage?

Much lubrication research has been directed lately toward this matter of correct body, or viscosity, of motor oil. A few years ago most manufacturers offered only three grades of oil, light, medium and heavy. Now some brands are furnished in as many as seven grades. Because of the increase in engine power and speed and the closer clearances in modern engines, the trend is not only toward more grades of oil but also toward the more exact specification of those grades.

The old designations of light, medium and heavy are not exact enough for eco-



Top, Machine for Testing Greases in Bearings; Bottom, Dirt from Oil Filter; Note How Magnet Picks Up Metallic Particles

*Pennzoil Co. 7 Grades
200 Mill Road Buffalo, N.Y.*

Oil City, Pa.

631415

200
100
50

*Timken Wear and Lubricant Tester.
Timken Roller Bearing Co. Canton, Ohio.*



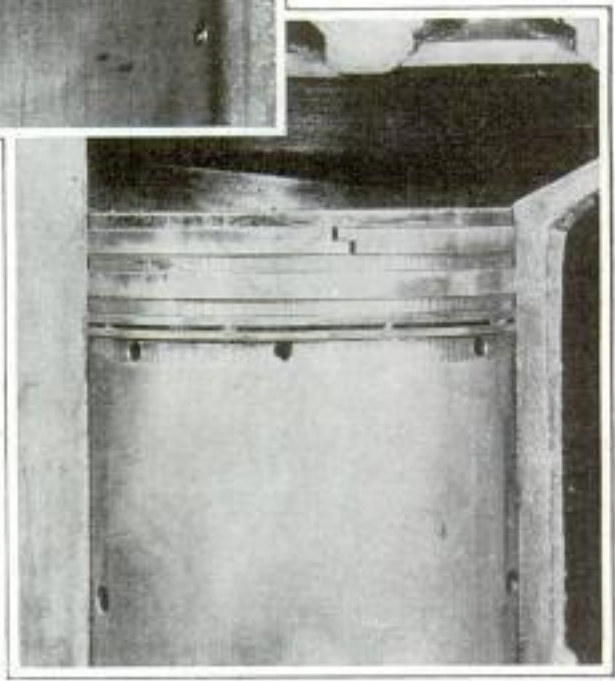
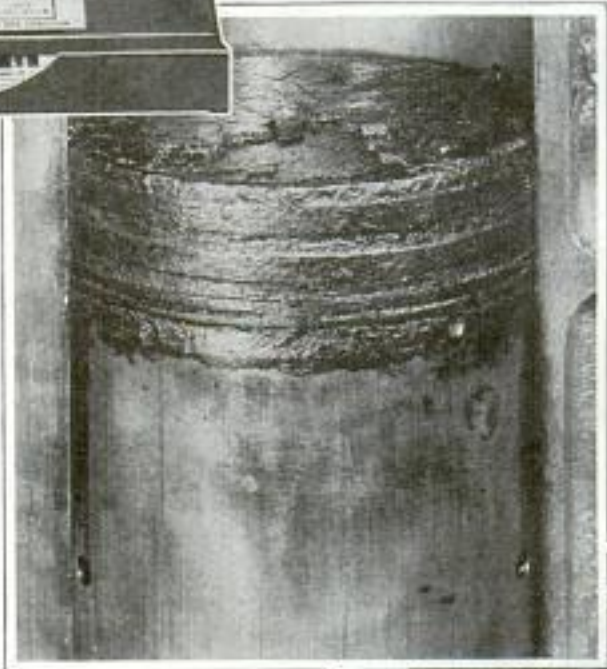
nomical and efficient lubrication. In this system, one maker's medium grade may be actually lighter than the light grade of another company. The Society of Automotive Engineers, in an effort to improve this situation, have established a series of numbers and specified standards of viscosity for each one. The lightest oil is described as "SAE 10." The next heavier oil is "SAE 20," the next "SAE 30," and so on up to "SAE 70," the heaviest at present offered. These numbers refer only to the viscosity of the oil and have nothing to do with its quality as a lubricant. Molasses is thick, like an oil of high viscosity, but is useless for lubrication.

Viscosity, however, is of the utmost importance for several reasons. The best oil in the world is of no value unless it can get to the bearing surface it must lubricate. This rules out all oils which are so viscous that they do not get into the bearing in time to prevent excessive wear. Since half the wear in an engine occurs during starting—before the oil is warmed up—this means dollars to the owner.

About thirty per cent of the area of an automobile engine is bearing surface; therefore, the lubrication problem is of prime importance. The quicker the oil can be made to flow into the bearings, the less wear there will be during the starting period. This demands an oil which will be fluid and fairly thin at starting temperature. On the other hand, the oil must maintain its viscosity—it must not thin out—under the higher temperature at which the bearings normally run.

Another item governed to a considerable extent by the viscosity of the oil is the gasoline mileage. Would you spend 65 cents in order to save 9 cents? Not if you know it, but this may be what you are doing if you are using the wrong grade of oil. Tests show that an oil, one SAE number heavier than is correct for the car, will result in an increase in gasoline consumption of about eight per cent.

In a 500-mile test of different oils, a
(Continued to page 128A)



Top, Pistons Sinking through Oil Show Differences in Viscosity; Center, Piston Rings Fouled with Carbon from Wrong Grade of Oil; Bottom, Clean Pistons, Showing Openings in Rings

101708 Cass from Company E
71st Infantry

POPULAR MECHANICS

103

New York National Guard

Guardsmen Play War Games with Toy Army

105 & 3rd New York

Article in Infantry Journal July 1932

Strategic movement of troops, artillery aircraft and supplies is being taught New York national guardsmen with a set of toy soldiers and complete equipment. Infantry, field and coast artillery, engineers, cavalry, medical units, machine-gun, signal, tank and anti-aircraft battalions are manipulated in the war games in accordance with rules that conform to training regulations and practices of the United States army. The toy-soldier set was conceived by Sergeant Clifford Shoemaker, while he lay in a hospital in France during the world war. Shoemaker was a private in the third division at that time. By moving about the



How Each Unit of an Army Moves against the Enemy Is Taught by These Small Figures of Soldiers and Complete Equipment for War



small figures, the students are able to put into practice almost any military theory.

5 W 95th St. New York

YULE TREE TRADITION GROWS TO BIG INDUSTRY

13/825

Children of Russia have no Christmas tree, Santa Claus and yuletide merrymaking being distinctly forbidden by soviet authorities. But, elsewhere in the world the Christmas tree has become so popular as to promote a large industry. In the United States alone, several million dollars are annually invested in trees, tinsel, electrical illumination and other trappings. Some of the American firs are shipped as far as the Canal Zone where snow is unknown. Ordered many months ahead of the season, they are packed in the refrigerator compartments of ships and transported to the tropical climate. At the other extreme of temperature, Point Barrow, Alaska, there is plenty of snow but no trees. Inhabitants of that place must either have their trees brought in or content themselves with a framework of wood and wire covered with gaily

colored paper. Even some animals have their own Christmas trees. At the farm maintained by the Horse Aid society of New York, the horses under its care have their own Santa Claus with a tree erected on a hillside and gifts, principally edible. In Kensington garden, London, a woman provides a Christmas tree for the squirrels.

GAS-TANK LOCK IS CONTROLLED BY IGNITION SWITCH

13/801

Controlled by the ignition switch, a new lock for the caps of gasoline tanks offers the autoist more protection against the fuel thief. The lock works by electricity from the auto battery, guarding the gas tank when the ignition is off and releasing the cap

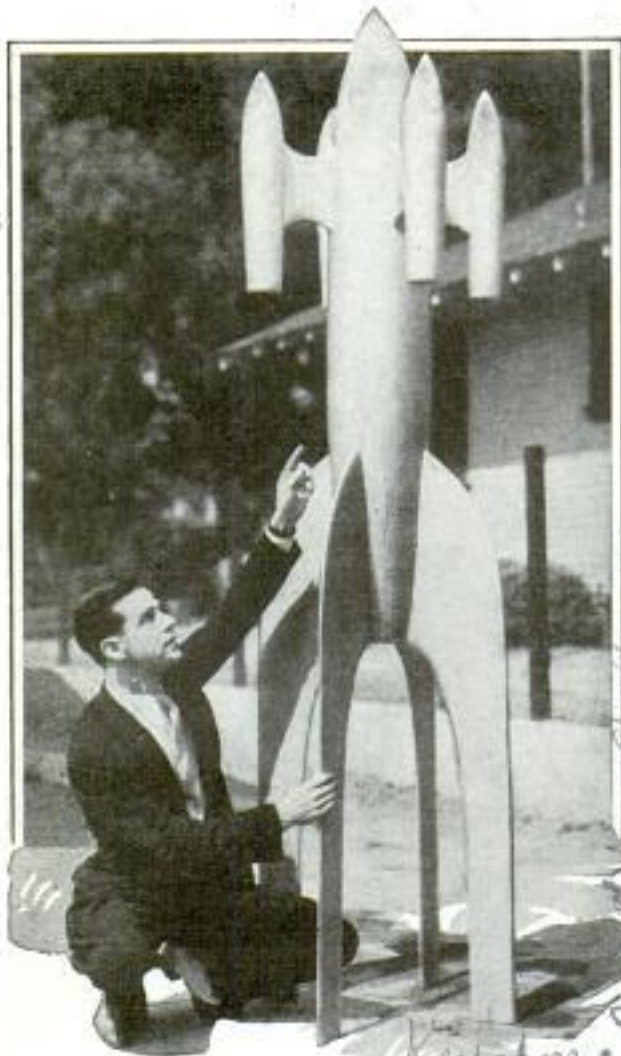


when the switch is turned on. All metal parts are chromium or cadmium-plated to prevent rust.

Mr. W. E. Farberstein
606 & E. Third Bldg. Pittsburgh Pa

247 The Cloughall Ave
Brooklyn N.Y.

B175



Wooden Pattern of a Rocket Which the Inventor Hopes to Send on Flight into Space

FULL-SCALE MODEL OF ROCKET IS CONSTRUCTED OF WOOD

After two unsuccessful attempts to send a gas and powder-propelled rocket to the moon, a California inventor has completed a wooden pattern of a third rocket intended for a long-distance trip into space. He expects to propel this missile with gas manufactured from a German weed and claims the experiments are laying the groundwork for a rocket airplane which he hopes will be capable of crossing the continent in less than six hours.

CONCRETE CANOPY TO PROTECT ANCIENT INDIAN RUINS

For protection of the famous adobe Indian ruins of Casa Grande in Arizona, a giant steel and concrete canopy, or "umbrella," is being constructed. The ruins are the remains of a building erected by

prehistoric Indians probably 700 to 800 years ago and abandoned 500 years ago. The shelter over the ruins is not a walled building but is like an umbrella, covering the ancient structures and extending far enough to protect them from driving rains. The big problem lay in holding the concrete canopy down against the enormous lifting force created by an upward wind velocity of thirty-four miles an hour. This is the first time the United States National Park service has attempted to protect a prehistoric Pueblo ruin in this manner.

GIANT VOICE DIRECTS CARS IN CITY TRAFFIC

"Number 3096 move over to right of center line and slow down;" "Number J-197, your left rear tire is going flat." Motorists traveling through Stratford, Conn., may be surprised to hear a voice directing their driving, apparently from thin air. The voice of the law does come literally out of the air, through a system of loud speakers by means of which an officer in a roadside booth takes the place of several motorcycle police.

DIAL PHONE LOCKS TO PREVENT LONG-DISTANCE FRAUDS

Unauthorized long-distance calls cannot be made on dial telephones equipped with a new locking device. If such a call is placed, the phone becomes inoperative until the receiver is returned to the hook. Local calls may be made without interference. A key is provided for unlocking the phone, when any call can be made.



Only Local Calls Can Be Made on This Telephone Fitted with a Lock on the Dial

Maurice Poirier, Glendale, Calif

Servo Service
10/10/32

Mr. Byron J. Wall
Raymond Alta, Can

B177
B178
B179
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31987



Effigies Standing in a Moscow Park Intended to Represent Three "Enemies" of the Russian Workers; the Figures Portray the Clergy, the Militaristic Element and the Fascists

EFFIGIES OF SOVIET "ENEMIES" DECORATE RUSSIAN PARK

Soviet Russia calls the attention of its people to organizations or doctrines considered antagonistic to the country by caricatures and effigies. The Park of Culture and Rest in Moscow today is decorated with a number of such effigies intended to represent three "enemies" of the workers—the church, the militarists and the fascists.

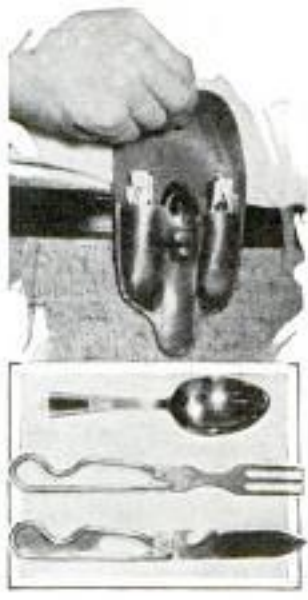
31808

TWIN AIR CHAMBERS AID DIVER EXPLORING DEEP SEA

Twin air chambers in a new type of diving suit make it possible for the deep-sea explorer to remain on the bottom over extended periods and to ascend quickly without suffering ill effects from the sudden change in pressure. The inner chamber supplies fresh air while the outer chamber is inflated to allow the diver control over his movements. This outer jacket helps resist the tremendous pressure of the deep sea, thus eliminating the dangerous effects that usually result from too speedy ascent. Air within the suit is controlled by valves in the helmet, which has two chambers and is of unusual design. In a test, the wearer descended 165 feet, remained on the ocean floor an hour and then ascended to the surface in less than four minutes. Usually, the diver must be brought up in stages, requiring about one

hour and forty minutes, to gradually reduce pressure. If the air line should be severed, the diver is able to make adjustments that will permit him to reach the surface and retain sufficient air to breathe fifteen minutes.

KNIFE, FORK AND SPOON IN KIT FOR CARRYING ON BELT



Contained in a case for carrying in a convenient position on the belt, a knife, fork and spoon combination set has been produced for the woodsman, camper or tourist. The handles are of tempered wire, shaped to fit the fingers. The knife also is provided with a bottle-cap remover.

The Popular Mechanics' Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished.

Chas. E. A. Cofford
 J. Cantor, Sydney Australia

31622
 George Schrade
 46, Wynnum St. Brisbane Aust

New CONVENIENCES



Above, Aluminum Pie Pan with a Hexagonal Rim; the Six "Ears" Make It Easy to Pull the Pan from the Oven or Lift It While Hot



Left, Electric Comb Which Applies Hot Oil to the Hair; Solid Teeth Furnish the Heat, and Shorter, Hollow Ones, Connected with an Oil Chamber, Apply the Oil, Thus Preventing Clogging

Child's Toothbrush with a Policeman for a Handle; Children Are Taught That the Officer Is Guarding Their Health



Above, Coffee Container with Spring-Steel Clip and Pliable Gasket in Cover Which Seals Top



Left, Finned Shell Which Fits over Ice-Making Compartment of Electric Refrigerator and Lessens Frosting; Right, Fruit-Juice Extractor with a Crank Which Operates Plunger to Squeeze Out Juice

for your HOME



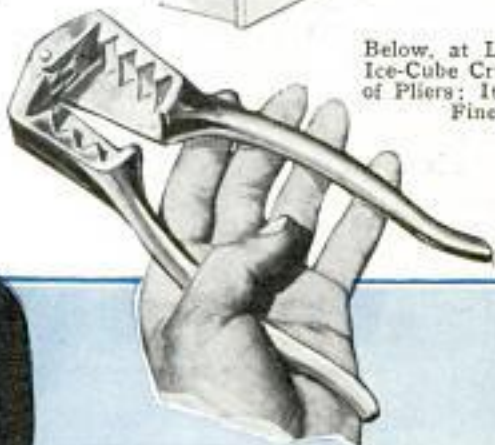
Left, Number Clips Which Are Hung on Drinking Glasses Aid in Locating Your Own When It Stands on a Tray with Others; Right, Valve Which Can Be Attached to Any Can Containing a Liquid



Left, Electric Fly Trap Which Attracts Insects by Sweetened Vinegar Placed in Base; When They Light on the Coil, They Are Electrocutted



Below, at Left, Aluminum Ice-Cube Crusher Like a Pair of Pliers: It Breaks Ice into Fine Crystals



Left, Swinging Bracket Notched to Hold Five Ordinary Coat Hangers in Such a Position That All Are Visible; the End Holds a Hat



Right, Handy Cream Whipper That Operates from a Water Faucet, the Water Pressure Being Sufficient to Revolve the Blades Rapidly

TRAVELING MAN'S

By ARTHUR KENNEDY



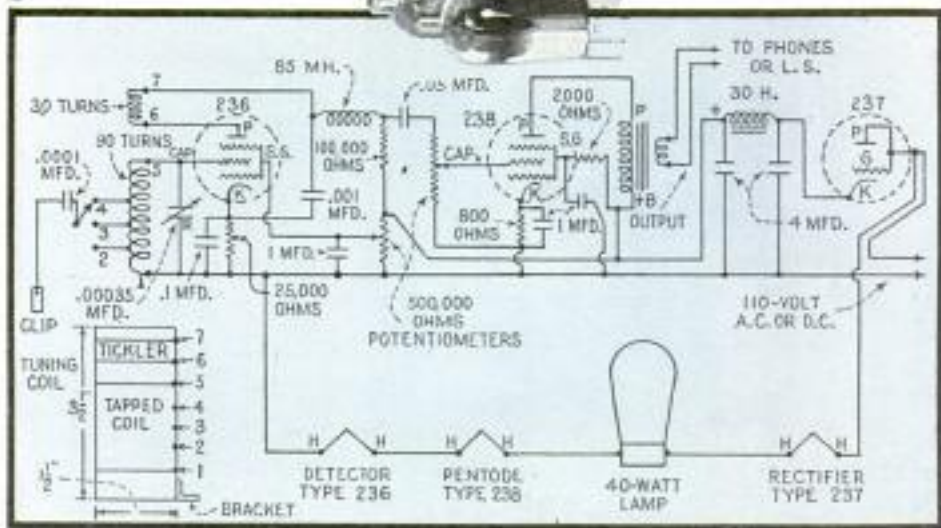
THIS three-tube portable receiver was designed principally for listeners who are forced to travel a great deal and whose home is a hotel room. This does not mean that the receiver would appeal only to the traveling man. It is suitable for use in hospital wards, students' quarters, or anywhere headphone reception is preferable to a loud speaker. It has sufficient volume, however, to operate a small speaker if desired.

The cost is quite low and the layout very simple for a compact receiver of this description, which works equally well on a.c. or d.c. line supply. The completed receiver is only 7 in. wide, 6

in. high and 7 in. deep, including the control knobs at the front. It is self-contained, the only external connection being a clip on a flexible lead to be fastened to a radiator. No batteries are used, and the power to operate the set is derived from any convenient electric outlet. It will operate on either 25, 60 or 133 cycles, or direct current, without making any changes in the set. When using d.c., it may be necessary to reverse the plug in the wall socket so as to obtain the correct polarity.

The simplified layout diagram, on page 109, supplies all details for laying out the various parts on the metal base. This base is made from

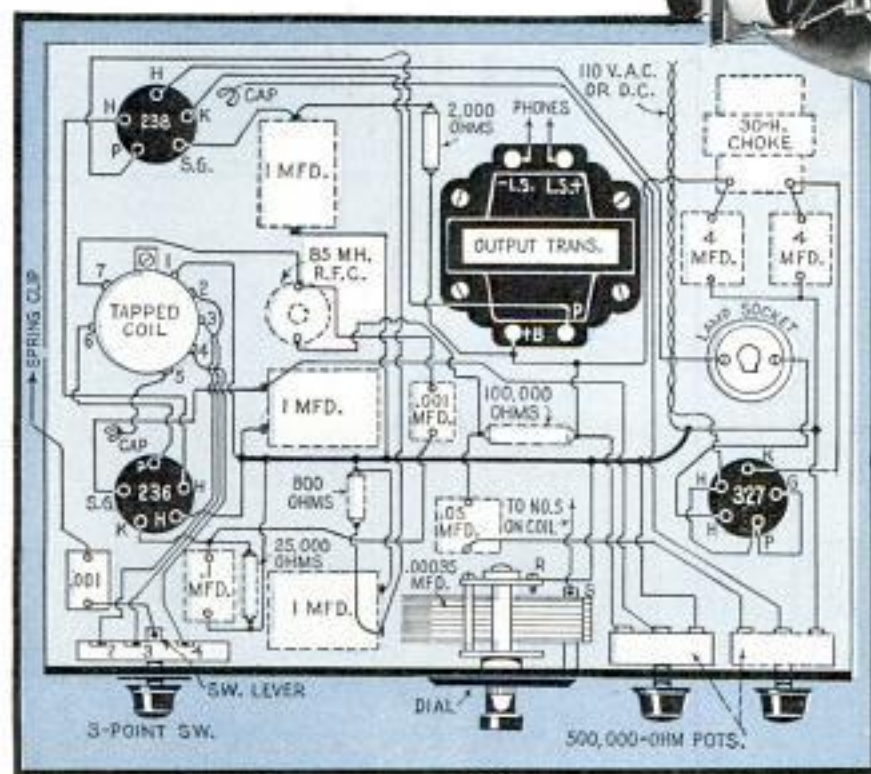
a sheet of aluminum or eraydo, $\frac{1}{16}$ by $6\frac{1}{8}$ in. by $10\frac{1}{2}$ in. The ends are bent over to form a base, $2\frac{1}{4}$ in. high. The schematic diagram, on this page, shows the experienced builder the circuit details at a glance, but anyone that can use a soldering iron can easily follow the simplified wiring di-



PORTABLE RECEIVER for either A.C. or D.C.

agram on the opposite page. In the schematic diagram it will be noted that the tube heaters are shown below for clarity. It is best to wire the heaters and the 40-watt lamp first. One side of the type-237 tube, which is used as a rectifier, is wired directly to one power lead, and the other side of the rectifier-tube heater goes to the 40-watt lamp. This is done in order that the cathode and the heater may not have too great a potential difference across them, which would shorten the life of the tube. The other tubes also are wired to hold the potential difference at a minimum.

The tapped input coil to the detector may be a commercial type, but the home-made variety, shown at the lower left of the schematic diagram, is preferable. It is wound on a fiber or bakelite tube, $3\frac{1}{2}$ in. long, and the outside diameter is $1\frac{1}{2}$ in. No. 28 gauge s.c.c. wire is used for both coils, and they are wound in the same direction. The large coil is tapped every 10 turns for the first 30 turns. The smaller winding is started $\frac{1}{2}$ in. from the grid end of the large winding, which goes to the



cap of the type-236 tube and the stator of the .00035-mfd. tuning condenser. The receiver will not regenerate unless wired just as shown. Regeneration is controlled by a 500,000-ohm potentiometer.

The by-pass and filter condensers should be of the type rated for 110-volt d.c. The $\frac{3}{16}$ -in. bakelite front panel is 7 in. long and 6 in. high. The assembly should be as

(Continued to page 134A)

Vacuum-Tube Wave Trap for Closer Tuning

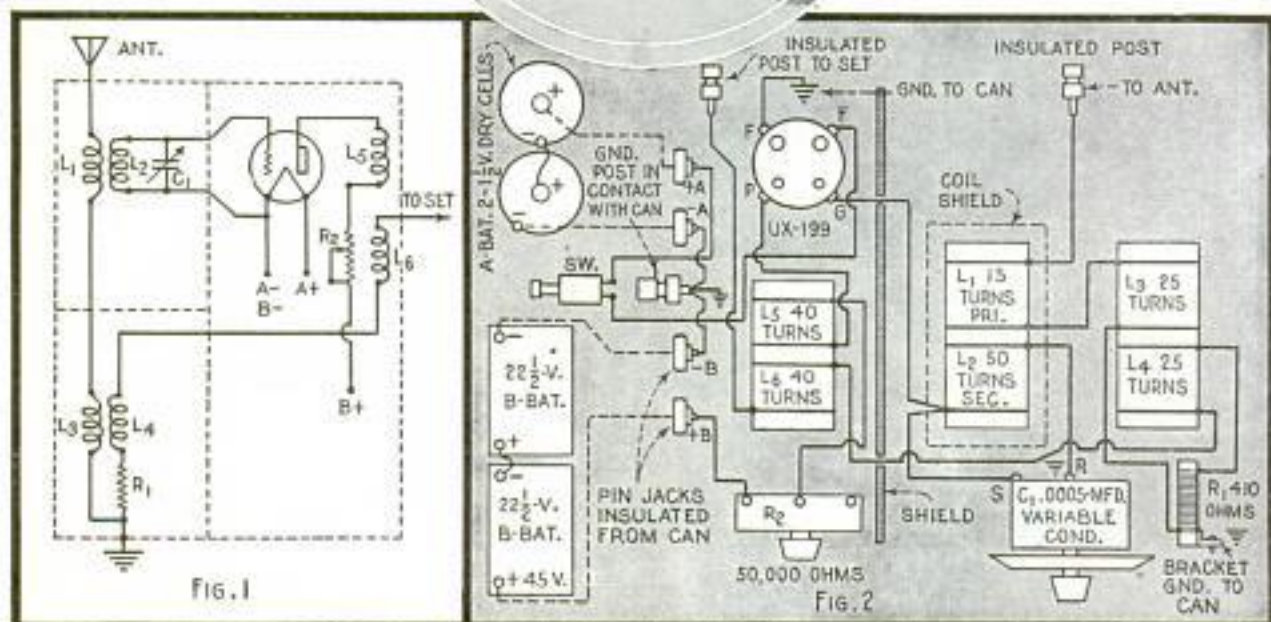


Radio listeners who have receivers that are not selective enough to eliminate a troublesome local station or separate two stations on adja-

cent channels, can construct a wave trap that will go a long way to prevent such interference. The trap described here was made from odds and ends for some interference tests at the government constant-frequency monitoring station at Grand Island, Nebr. The results were very satisfactory and the writers, who constructed the instrument, believe that there are many radio listeners not provided with selective superheterodynes who can use the trap to advantage. Most of the parts will be found in the experimenter's

junk box or may be salvaged from an old receiver. This wave trap is different in design from the usual instrument familiar to radio builders. The schematic diagram is given in Fig. 1 and the simplified wiring diagram in Fig. 2. Instead of acting on the absorbing principle, it bucks, or balances out, the undesired signal. The interfering signal is picked up from the antenna coil L_1 by the tuned circuit L_2-C_1 and is amplified by the tube. All signals coming in on the antenna are transferred to the receiver input through the coils L_3 and L_4 . A part of the amplified undesired signal is fed back into this same circuit through coils L_5 and L_6 in such a manner as to entirely buck all of that signal and yet permit all others to

(Continued to page 136A)

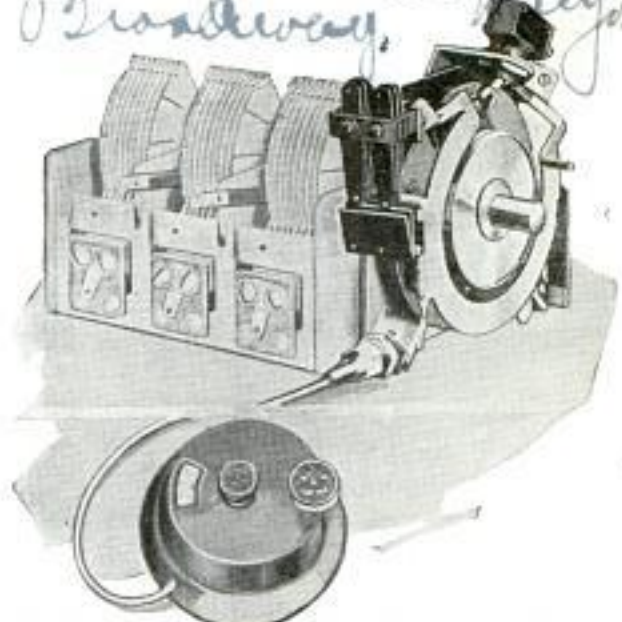


Light relay
Dec. 1930
B.P.R. 157

Radio Vision Research
Laboratory, 1501 111
Broadway, New York

Mounting Short-Wave Condensers

When mounting variable condensers in short-wave receivers, it is best to fasten the condensers rigidly to the base of the set, upon which the rest of the equipment is mounted, rather than on the front panel. The reason for this is that, during the process of tuning, the weight of the hand on the dial will cause the front panel to move slightly. This movement disturbs the connections between the condenser and the inductance coil. The condenser shaft should also clear the front panel.



Top, Remote-Control Mechanism Mounted on the Tuning-Condenser Shaft and, Below, Cabled Control Unit

Photo-Cell Relay in Kit Form

Many interesting experiments may be made with this simple photo-electric cell which is easily assembled from instructions supplied with the outfit. The kit includes the photo cell, relay, pentode tube, potentiometer, metal base and other small parts required. The unit may be used for

Simplified Remote Control Easily Installed

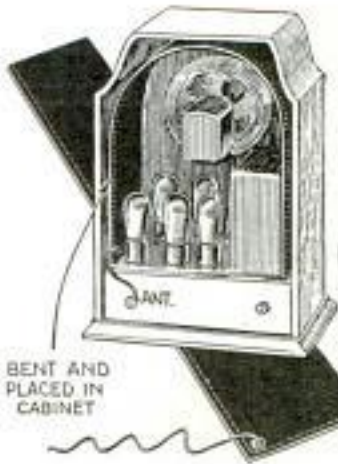
Operating independently of the tuning mechanism of the set, this remote control permits the operator to tune the receiver at the dial or 25 feet away as desired. It may be used to turn the set on and off at the remote point and also provides a means for controlling the volume. It is operated through one cable connected between the radio receiver and the remote point. It is easy to install as there is no motor or electrical contacting device connected with the apparatus. Suggested points for the remote control are the kitchen, invalid bedside, easy chair or on the porch.



Complete Photo-Electric Cell Relay Assembled from Kit

Antenna Fits Inside Cabinet

This strip antenna may be easily bent and installed in any midget receiver. It is also practical for use in consoles, portable and auto sets where a standard antenna is not available. To connect, it is necessary only to fasten the wire to the antenna post on the receiver.



BENT AND PLACED IN CABINET

practically any photo-cell relay application such as turning on auto parking lights, opening garage doors and for burglar-alarm systems.

Uses for Old Tube Bases

Bases removed from old radio tubes are not only useful as plug-in coil forms but are also convenient for cable plugs, adapters for testing equipment, soldering-iron rests and similar radio-workbench applications.—Herbert D. Smith, Sanatorium, N. C.

For further information on any radio construction article write to the radio department; this service is free.

1111 Center St

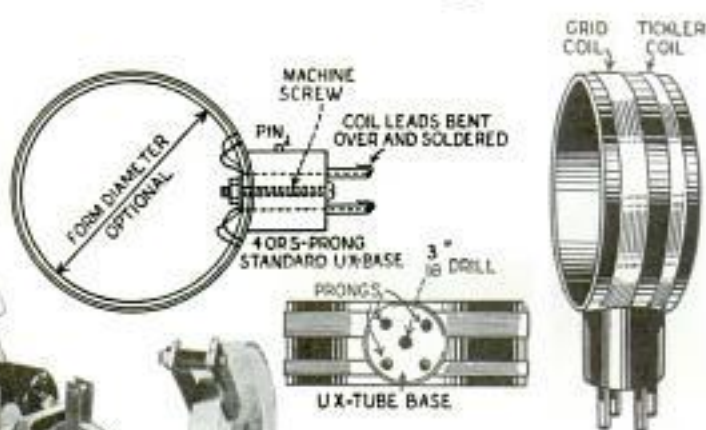
411 Center St Chicago

Build Radio One
1932 855 St. Cleveland Ohio

Herman A. De Vry, Inc.
~~*558 Wacker Drive Chicago*~~

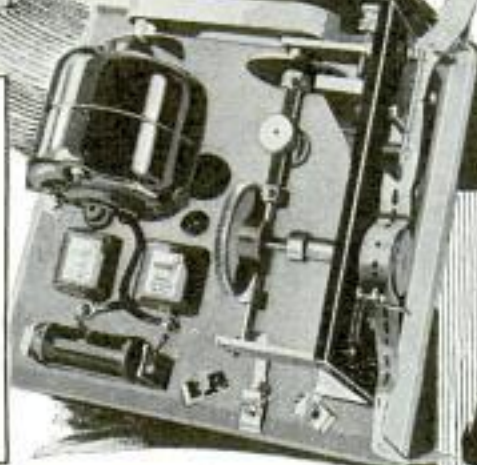
PRACTICAL Ideas

*Revue Heterographe Co
433 East 13th Street
Cedar Rapids, Iowa*



This Handy Plug-In Coil Form Provides Ample Winding Surface for All Short-Wave Coils; the Bakelite or Fiber Tubing Is Fastened to an Old Tube Base by Means of a Brass Machine Screw as Detailed Above

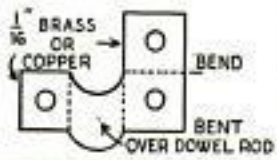
Operated from a Light Socket, This Automatic Code Teacher Brings to the Home and School a Tireless Master Operator; the Equipment Includes About 75 Feet of Prepared Tape Together with a Key Sheet of the Transmitted Signals; No Buzzer or Batteries Are Required



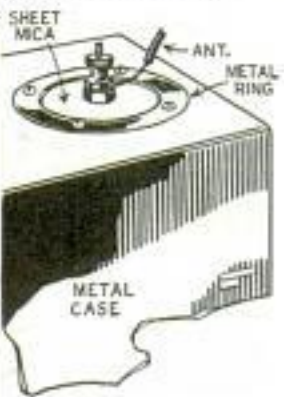
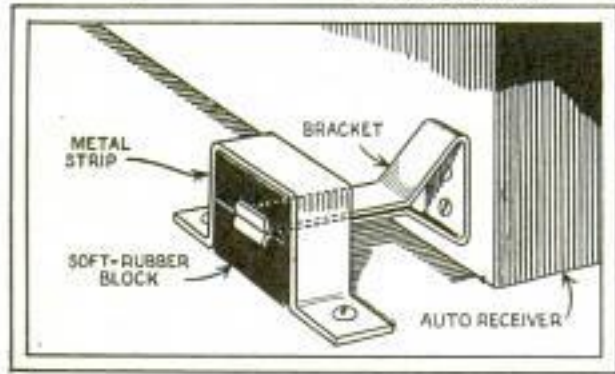
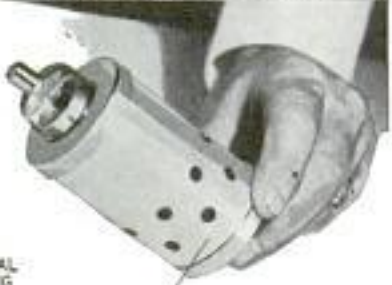
Below, Observing the Operation of Half-Wave and Full-Wave Tube Rectifiers; the Fan Speed Is Regulated to Show a Definite Dark Interval Which Otherwise Appears to Be Constantly Lighted



Left, Copper or Sheet-Brass Clamps, Bent and Drilled as Shown, for Holding Shielded Connecting Cable to Metal Chassis, Also Provide Good Ground Connection for the Braided Wire Shield



Lower Left, Homemade Shock-Absorber Mounting Bracket for Auto Radio, Two of Them Will Support the Average Auto Set

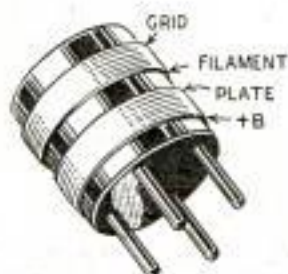


Left, a Good High-Frequency Insulator for Bringing Out Antenna Lead from Portable Transmitter Case; the Mica Sheet Is Firmly Held by the Metal Ring, and the Terminal, Located at the Center, Is a Brass Machine Screw and Thumbnut; Above, Aluminum Shield for the New-Type 58-Tube Which Has a Dome-Top Bulb

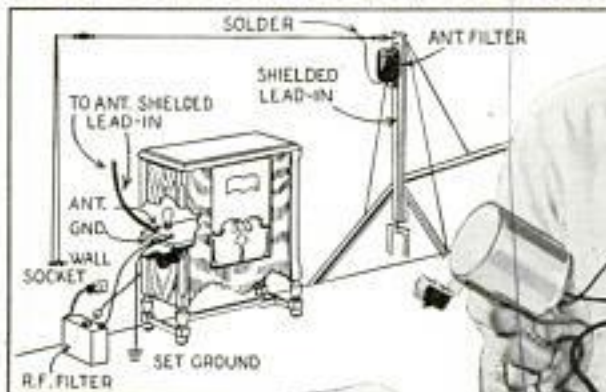
*National Company
Copyrighted material
Chas. G. Sherman
Waltham, Mass.*

for the RADIO EXPERIMENTER

Dillinger
Amble
9-15
John Heuschmann
Co. Canton, Mass



When Winding Short-Wave Coils for the Condenser at Hand, Remove Turns from Grid End if Inductance Is Too High but Coupling Correct; from Filament End, if Coupling Is Too Tight; from Plate End to Reduce Regeneration and Loosen Coupling, and from Positive-B End to Reduce Regeneration without Affecting Coupling



Above, Antenna and Line Filter for Eliminating Man-Made Static from Any Radio Receiver; the Ground Used with the Tobe Filterette Should Be Independent of All Building Wiring Grounds; the Connections Are Shown; Left, Adapters for Using Five-Prong Tubes in Four-Prong Sockets



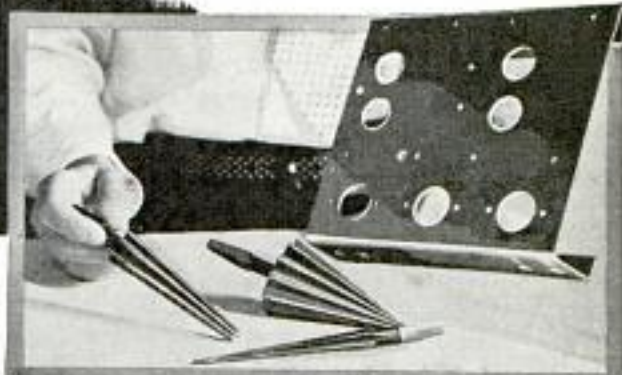
Right, an Inexpensive Soft-Rubber Kneeling Pad Makes a Good Shock Absorber for Table Receivers Subject to Shocks and Vibrations Which Cause Howls and Microphonic Noises



Holes for Mounting Wafer-Type Sockets, and Terminal Openings for Shielded Coils, Easily Cut in Metal Bases by Drilling Small Holes and Enlarging Them with Reamers



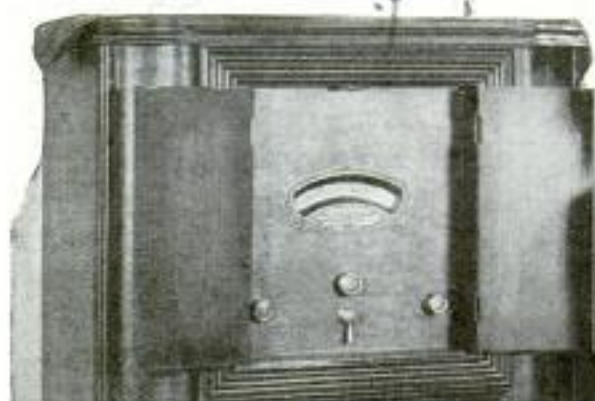
Isolantite Blocks for Crossing, or Transposing, the Feeder Leads of a Doublet Receiving Antenna to Prevent Undesired Pick-Up; Construction Details for This Antenna, Which Is Rapidly Becoming Popular, Will Appear in an Early Issue



Alden byg to Rochester Mass

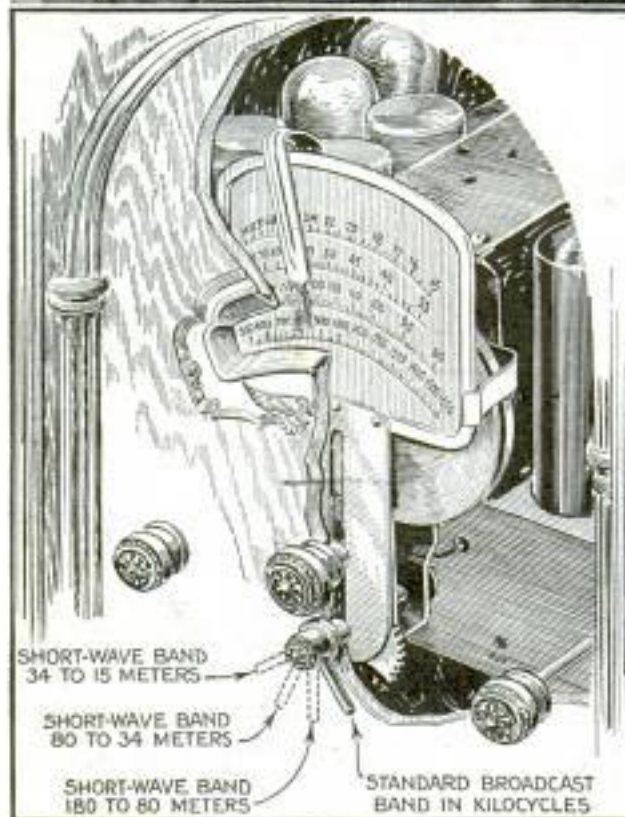
Isolantite Corp
of America, 551-5th Ave New York

Above, Console Installation; Below Details of Simplified All-Wave Tuning Dial



Automatic volume control. A 57-type tube is employed for the first detector, and 58-type tubes are used for the r.f. amplifier, second detector and intermediate-frequency amplifier. The two pentode tubes in the output and an 80-type rectifier tube complete the layout. Extra-large power transformers are employed, and all parts are completely shielded to minimize outside interference. As there are more than 200 foreign short-wave stations now broadcast-

ing programs regularly, the popularity of the all-wave receiver is increasing. With a receiver of this description, stations located in Indo-China, Germany, France, Japan, Spain, England, Australia, Italy, Holland and Africa are heard frequently by listeners in America.



All-Wave Receiver Has Magic Dial

No mental calculations are necessary to tune this 11-tube all-wave set which employs a dial that groups wavelength ranges on four separate scales, interchangeable instantly as desired. One master station-selector knob controls the tuning of all four dial scales and the stations within the range of each. It can be operated at both normal and extremely low speeds for sharp tuning. Employing the new 56, 57 and 58-type tubes, this receiver includes automatic and manual volume control; two-speed tuning; local and distance switch and pentode output tubes in push-pull. One 56-type tube is used as the short-wave oscillator, one as a broadcast oscillator, one for the third detector and one for au-

Time Switch Turns Set On or Off

Only two screws are required for mounting the compact radio time switch shown below the control knobs of this midget receiver. It may be quickly connected in series with the filament or 110-volt line, depending upon the type of set. It may be set to turn the receiver on or off at intervals of 1 minute to 50 hours. A similar switch is designed for mounting on the instrument board of any automobile to turn on the parking lights at any predetermined time during the owner's absence. This compact time switch has many other applications.



Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are always available without charge.

M. H. Stappes chm
 Hartford Conn
 Copyrighted material

Kits from Joseph S. Ott
3335 Eastwood Ave
Chicago



Jimmy Doolittle's

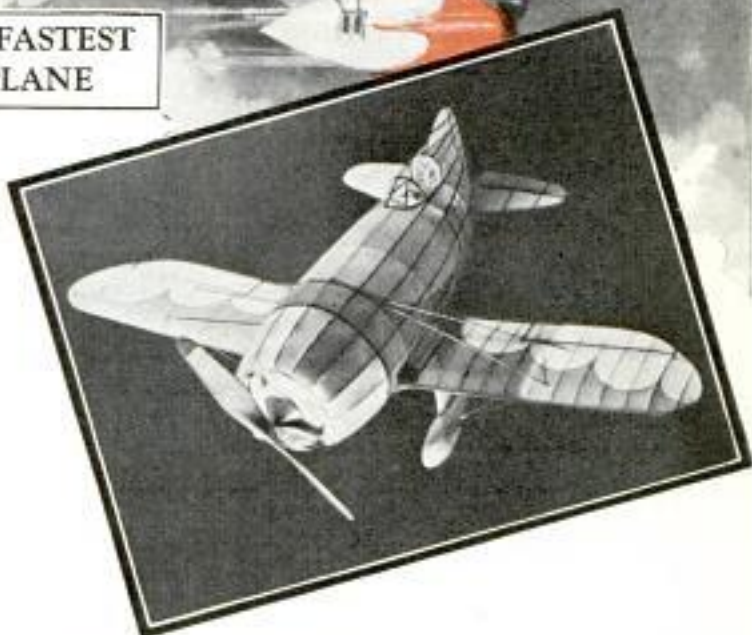
Gee Bee
SUPER
SPORTSTER

By Joseph S. Ott



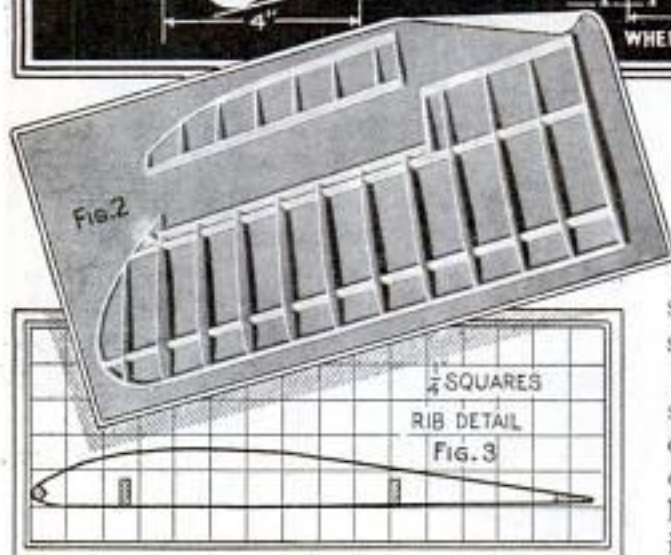
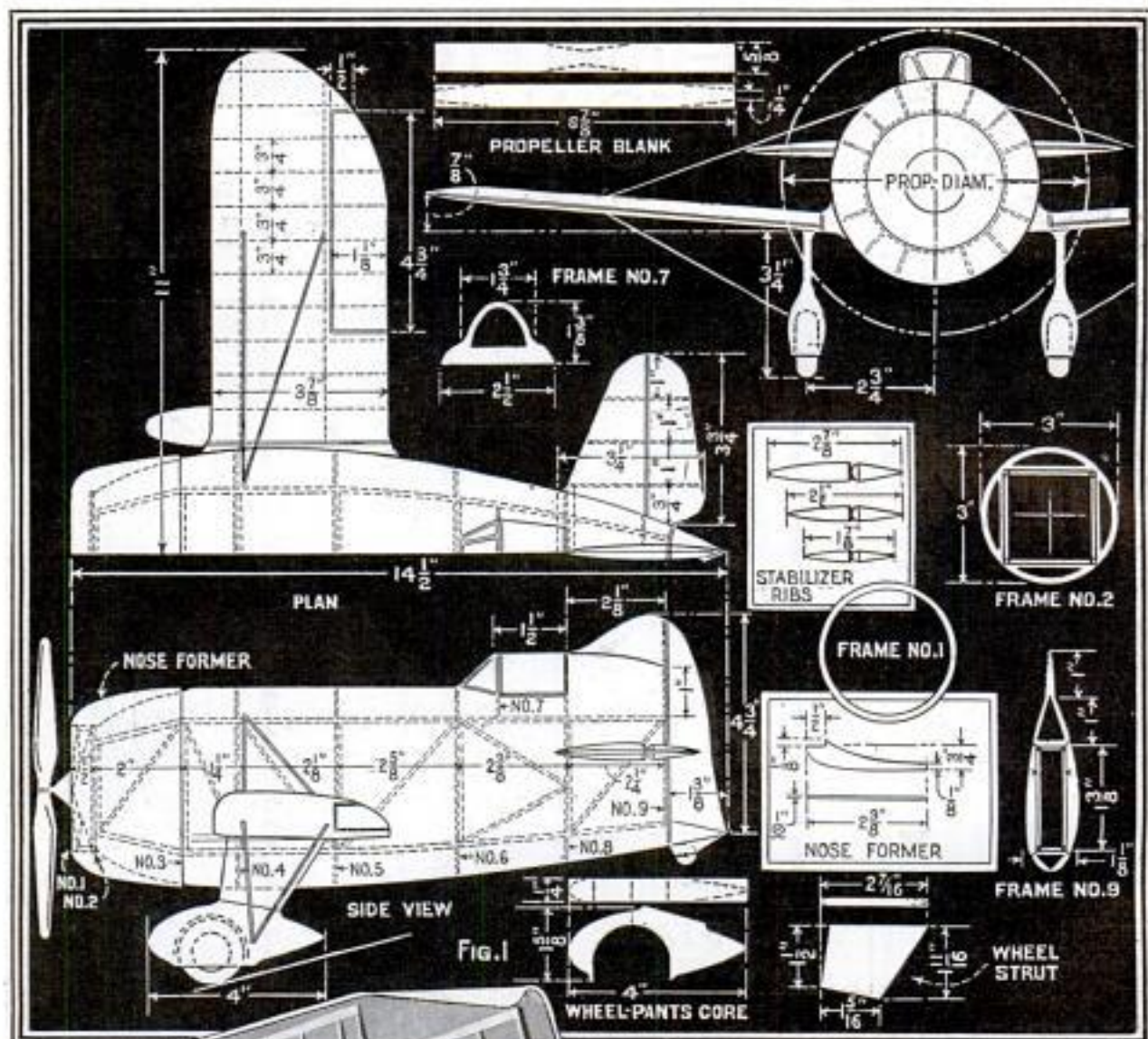
WORLD'S FASTEST
LAND PLANE

HAVING a record speed of 296 miles per hour and a maximum speed of 309, this exceptional plane was the one used by Maj. James H. Doolittle to win the 1932 Thompson Trophy race. In building the flying scale model of this record-speed plane, a few outstanding changes from conventional design are immediately noticeable, for, to attain high speed, considerable power is necessary and the front area of the large motor of this racer requires a cowl with a diameter of 61 in. The model reproduced will appear a little radical to most builders, but nevertheless is a true scale copy of the big plane. Every part of the model has been kept to a true proportion, including the position of the wing and the height of the landing gear, which usually must be changed to accommodate a larger propeller.



Plans of the Original Plane, Furnished by Grandville Bros., Made Possible Its True Reproduction in a Flying Scale Model

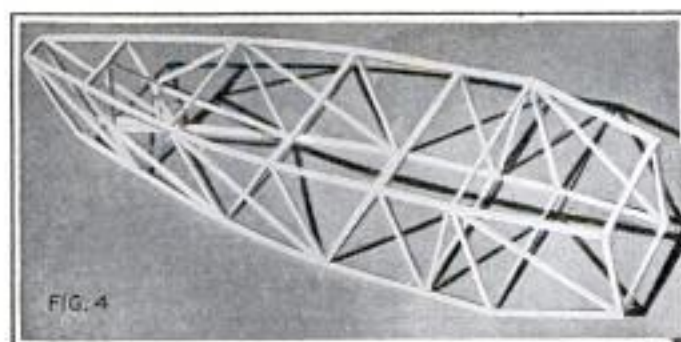
The reduced scale for the propeller measures exactly $6\frac{5}{8}$ in. Fig. 1 shows the side, top and front view of the fuselage, besides a number of details. The material used is balsa wood with a few additions of bamboo where a continuation of a round-



ed part is desired. For the body, pieces $\frac{3}{32}$ in. square are used. This size includes the longerons, the uprights and crosspieces that complete the square main-body unit. The cowl, or small circular sections that are added around the entire body, are $\frac{1}{32}$ -in. sheet balsa. To help maintain the

circular form at the front of the model and the oval shape at the rear, numerous longitudinal fairing strips are added around the outside of the main framework. These are illustrated in position on the outside diameter of a cross section of the fuselage.

The cowl, or nose part, is built of small semicircular sections cemented to two circular forms at the extreme front and end of the cowl. They should be placed closely enough to each other so that the covering tissue will not leave too much of a flat portion from one to the other. The side view illustrates how two small paper cones are added at the center front of the nose to receive the propeller and the dummy motor. The paper cone is reinforced on the outside and inside with a brass washer, to prevent wear of the propeller. The various steps in assembling the fuselage are



indicated in Figs. 4 to 8, inclusive. Details of frames Nos. 1, 2, 7 and 9 are given in Fig. 1, while frames Nos. 3, 4, 5, 6 and 8 are shown in Fig. 7. The wings are built with $\frac{1}{32}$ -in. ribs, spaced 1 in. apart. Fig. 2 shows the method of construction. The spars are $\frac{1}{8}$ by $\frac{3}{16}$ -in. balsa, while the wing tips are of thin bamboo, $\frac{1}{32}$ by $\frac{1}{16}$ in. in size, bent to the correct shape. Each wing section is attached to the solid piece of balsa that is cut and shaped to fit the curve of the body. A template for the ribs will be found in Fig. 3.

The landing gear is built in two separate pieces of balsa with a boot or "pants" to cover each wheel, the thickness of the wheel pants depending on the size of wheel obtainable. It is best to make a solid center section, which is cut out to receive the wheel and is covered on each side with a thin layer of balsa. The entire boot should be thinned down and sanded to shape. The landing gear must be rigidly braced to the body and to the wing, and the wing, in turn, must be braced on the top side so that it will be rigid. A heavy black thread is suitable for this purpose and it may be "doped," when in position, to draw it up tight. The stabilizer ribs are $\frac{1}{32}$ in. thick with a spar measuring $\frac{1}{16}$ by $\frac{1}{2}$ in. The elevators may be made movable by attaching them at two points with a piece of soft wire cemented into the stabilizer and into the elevator on each side. The ailerons on the wings may be made movable in the same way. The outside edge of the stabilizer and elevators is made of thin bamboo, $\frac{1}{32}$ by $\frac{1}{16}$ in., bent over a candle flame, and the rudder edge is the same size. If the rudder is made movable, it will be necessary to make a concave rudder post and a round upright at the front, pivoted at the top and the lower end. The propeller shaft is put through the small cone from the

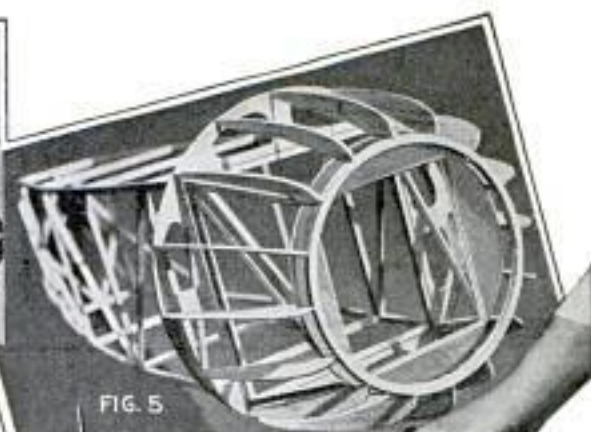


FIG. 5

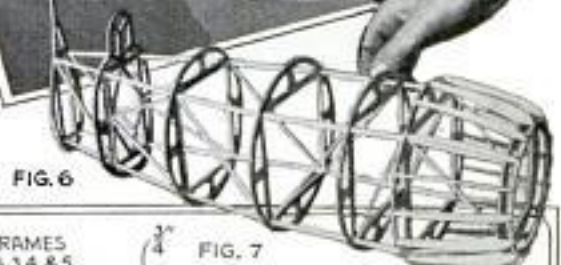


FIG. 6

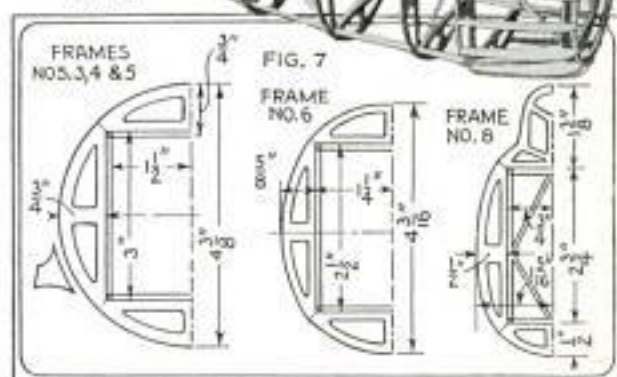


FIG. 7

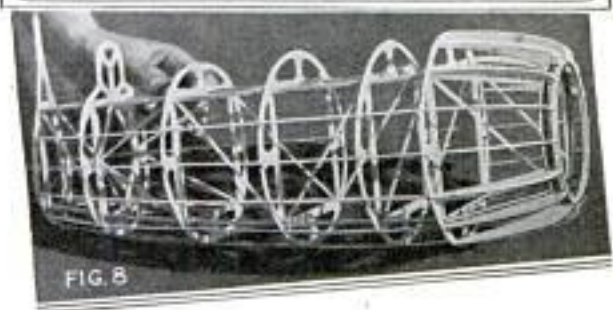
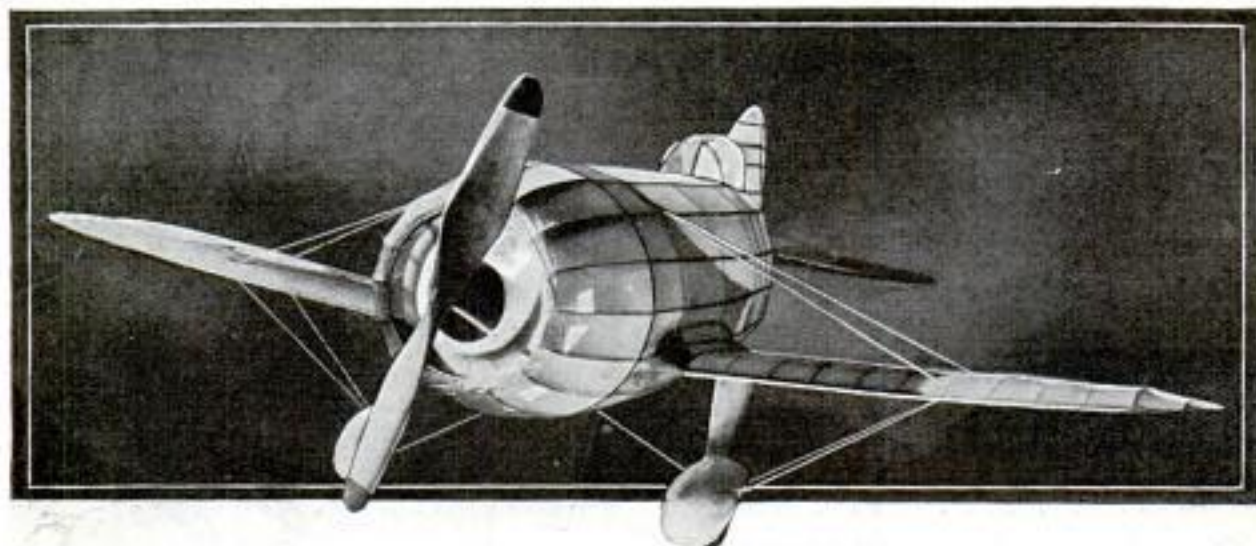


FIG. 8

lower side of the cowl, which may be recovered later and pushed through the propeller center hole, bent to a hook shape and pulled back into the side of the propeller so that it will not turn without revolving the propeller. Eight to ten strands of $\frac{1}{32}$ by $\frac{1}{8}$ -in. flat rubber are required to drive the propeller. This is pulled in place by first dropping a piece of thread with a weight through the fuselage and pulling the rubber after it. At the rear, the rubber is attached to a piece of balsa, and one section of the body is left uncovered to reach this piece, which rests against the uprights on each side of the fuselage.

Two colors of tissue, red and white, with black striping passing over the joints,



are used for covering the model. The photograph of the finished plane illustrates the colors in two shades and should be copied accordingly. The darker shade is red. It may be necessary to add a small weight to the nose to give a correct balance for flying the model, depending upon the weight of the material used. Complete kits with full-size drawings are on the market, and include all necessary materials to construct the model as outlined in this article.

Vinegar and Soda Extinguish Fire

An effective fire extinguisher can be made from an ordinary beverage bottle and cap. Drill a small hole in the center of the cap and fill the bottle to the shoulder with a solution of vinegar, 1 part, and water, 2 parts. Then roll some soda in a piece of soft tissue paper and suspend it in the neck of the bottle by a thread pulled up through the hole in the cap and sealed with a drop of paraffin. To use the extinguisher, shake the bottle. When the paper becomes wet it opens and releases the soda into the vinegar solution. This generates a gas which forces the wax seal off of the cap and allows fluid to escape



through the small hole in the form of a fine spray. If the extinguisher is placed on a shelf near the ceiling with a deflector above, it will work automatically when the heat becomes intense enough to melt the paraffin.

Bandage Held with Safety Pin and Tape

Where bandages are fastened with adhesive tape and must be changed frequently, the necessity of pulling the tape from the flesh each time can be eliminated by using the arrangement shown. Short pieces of tape are fastened to the safety pins.



Keeping Razor Blades in Oil Preserves the Edge

The cutting edge of a safety-razor blade can be protected against microscopic rust by keeping it in oil when not in use. To do this, loosen and rinse the blade and then place the razor, blade end down, in a glass jar containing thin rust-preventing oil. A wire support should be provided to keep the razor above the bottom. With this method it is not necessary to dry the razor after using it as any water remaining on the blade will sink to the bottom of the jar. When the razor is to be used again, remove it from the jar and rinse off the oil with hot water.—Chas. A. Younger, Somerville, N. J.

Methods of Removing Common Odors from the Home

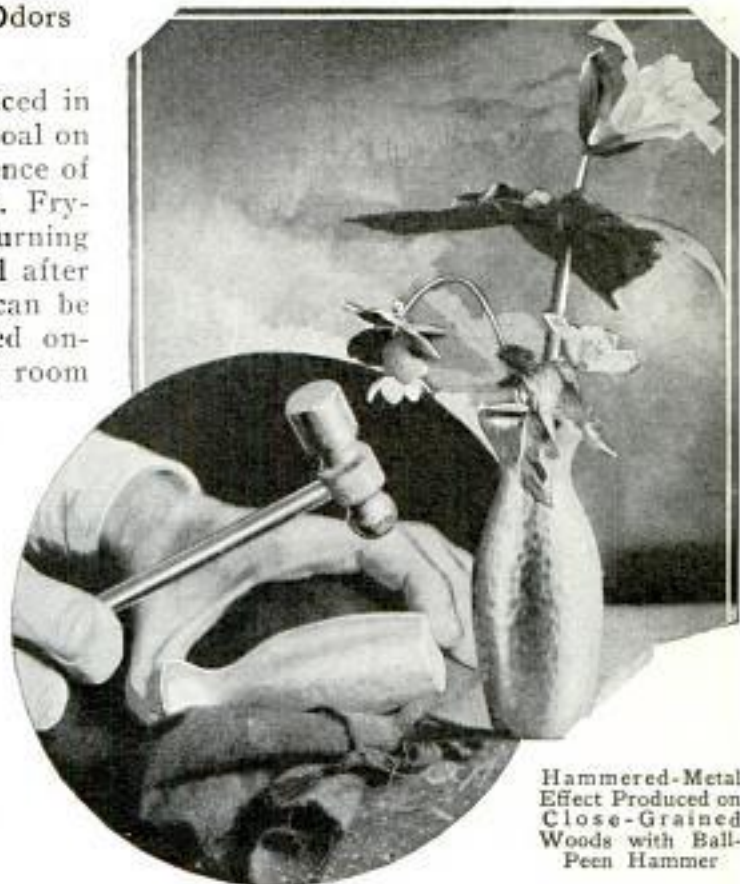
When unpleasant odors are noticed in your ice box, place a lump of charcoal on a saucer in the box, or, in the absence of charcoal, substitute a slice of onion. Frying odors can be removed by burning orange or apple peelings while and after cooking. Odors from fresh paint can be killed by placing two medium-sized onions, cut into small pieces, in the room that has been painted. A camphor ball, wrapped in cheesecloth and placed in the corner of the box or drawer where silverware is stored, will keep it from tarnishing. Clothes closets can be kept fresh by painting the walls white.

Homemade Clothes Drier Uses Centrifugal Force

Here is a machine that dries clothes by centrifugal force which has been used several years. The machine consists of a wire basket arranged so that it can be whirled rapidly inside of a tub mounted on a frame as shown. A length of pipe is rigidly attached to the bottom of the basket and is suspended from the driving mechanism, which consists of a hand grinder.



Whirling Clothes a Few Minutes in This Machine Makes Them Dry Enough to Be Ironed



Hammered-Metal Effect Produced on Close-Grained Woods with Ball-Peen Hammer

Hammered-Metal Finish on Wood

Hammered silver and gold effects are easily imitated on wooden bases, bowls, etc. Use a close-grained wood, such as birch or maple, and finish it as smooth as possible. Then apply a coat of aluminum, gold or bronze, the exact color depending on the effect you desire. When this is thoroughly dry, indent the surface with a ball-peen hammer. If such a hammer is not available, the same result can be obtained with a round-head rivet, held in a pair of pliers. Different size rivets can be used for various textures.

Wood Bushing Stops Wear of Loose Belt on Shaft

Wear on a belt, that hangs loosely on a countershaft when not in use, can be eliminated by binding together the halves of a wood bushing, of a larger diameter than the shaft, and allowing the belt to run on it. In this way, the belt turns with the bushing, instead of sliding on the shaft.

☐ Drawers will slide more easily if furniture wax is applied to the slides.

Things Electrical

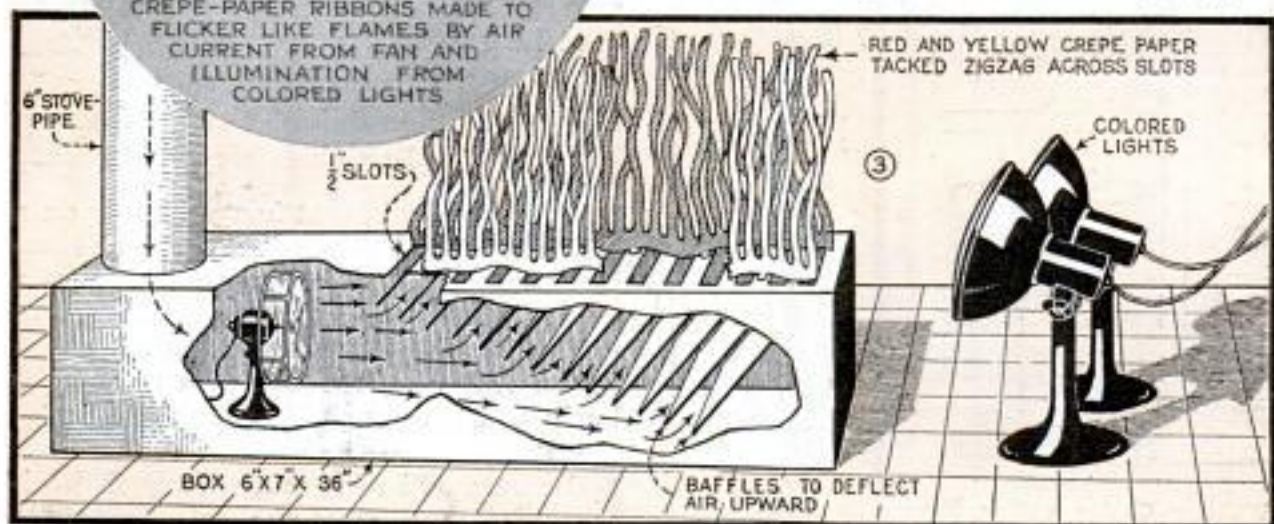


①
CELLOGLASS SCREEN THAT
CRACKLES LIKE BURNING
WOOD ADDS REALISTIC TOUCH
TO THIS ARTIFICIAL FIRE

HERE are a number of useful and interesting electrical displays for the home as exhibited in the Chicago Lighting Institute. The construction of the devices needed to produce these effects is well within the range of any home craftsman, although it is advisable to call upon the services of an electrician to do the wiring. Figs. 1, 2 and 3 show a realistic electric fireplace, consisting of a box with a slotted top and baffles inside to distribute an air current supplied by an electric fan to agitate rows of crepe-paper



②
CREPE-PAPER RIBBONS MADE TO
FLICKER LIKE FLAMES BY AIR
CURRENT FROM FAN AND
ILLUMINATION FROM
COLORED LIGHTS



for YOUR HOMIE

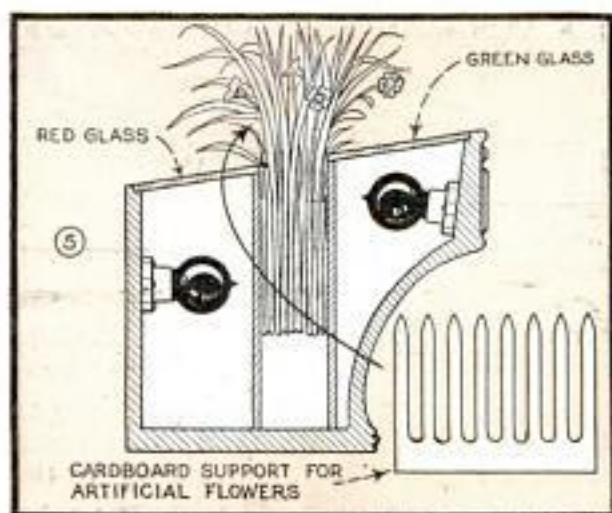
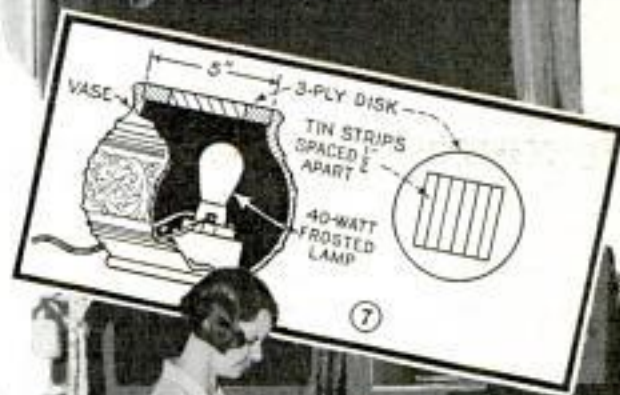


④
INDIRECT LIGHTING BATHES FOLIAGE IN WINDOW BOX GREEN AGAINST RED BACKGROUND

ribbons upon which colored lights are thrown, the latter being hidden from view. A number of charred logs and some ashes are built up around the box to make the fire appear more realistic. Figs. 4 and 5 show an attractive window box to hold real or imitation foliage, the latter being illuminated with green light, while the window and wall behind are red. Paintings can be displayed in an interesting way without showing the source of light by hiding the latter in a vase with artificial flowers, as in Figs. 6 and 7. Tin strips in the cover of the vase confine the light rays to the picture only. Indirect lighting in the kitchen cupboard, as in Fig. 8, is another feature of practical value, ordinary show-case lamps being used.



⑥
LAMP HIDDEN IN VASE THROWS SOFT LIGHT ON PAINTING



⑧
MAKING KITCHEN TASKS MORE PLEASANT BY EQUIPPING THE CUPBOARD WITH INDIRECT LIGHTING



Comfortable Knee Pads Made by Cutting Out Heel Portion of Old Overshoes

Knee Pads Made from Overshoes

For painting floors, or other jobs that require a kneeling position, a pair of comfortable knee pads can be made by cutting out the heels of a pair of overshoes as shown in the detail. One buckle is left on the shoe for fastening the pad around the leg.—Fred W. Schneider, Towaco, N. J.

Movie Camera Used as Printer for Film Positives

Movie positive films can be printed by running the negative and the fresh positive film stock through the camera together. The emulsion side of the negative is placed against the emulsion side of the positive film, and the camera operated without the lens, but pointed toward a 100-watt lamp. The correct distance between the lamp and the camera is determined by making test exposures, varying according to the density of the negative and the sensitivity of the film used. Inexpensive positive film, which is used for titles, can be used to make negatives for experimental work which does not require high-grade film. It is considerably slower than ordinary roll film and can be handled in a red light. A short piece of the film is cut off and run through the camera in the regular manner, and developed in 4-ft. lengths in the same way as ordinary roll film. The resulting negative is then print-

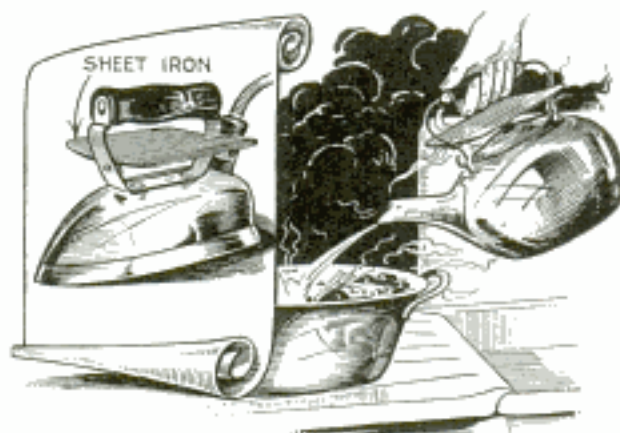
ed as described, and developed, producing the positive used for projection. In printing, the two films should be wound loosely on a camera reel, with the ends free, and then loaded in the camera with the negative toward the lens, leaving an extra frame of film between the take-up sprocket and film gate on the negative only. The free ends should be threaded onto a take-up reel in the ordinary manner.

Screen Prevents Clogged Vents in Oil Stove

The screen grid from an old radio tube will be found handy for straining kerosene in an oil stove. The screen, which is just the proper mesh for this purpose, is formed to a cone-shape, and inserted into the mouth of the feed pipe under the oil basin. The point of the cone should be pinched together firmly so there will be no opening for the sediment to pass. The cone is easily removed for cleaning, which should be done at regular intervals.

Shield Deflects Heat from Kettle and Electric-Iron Handles

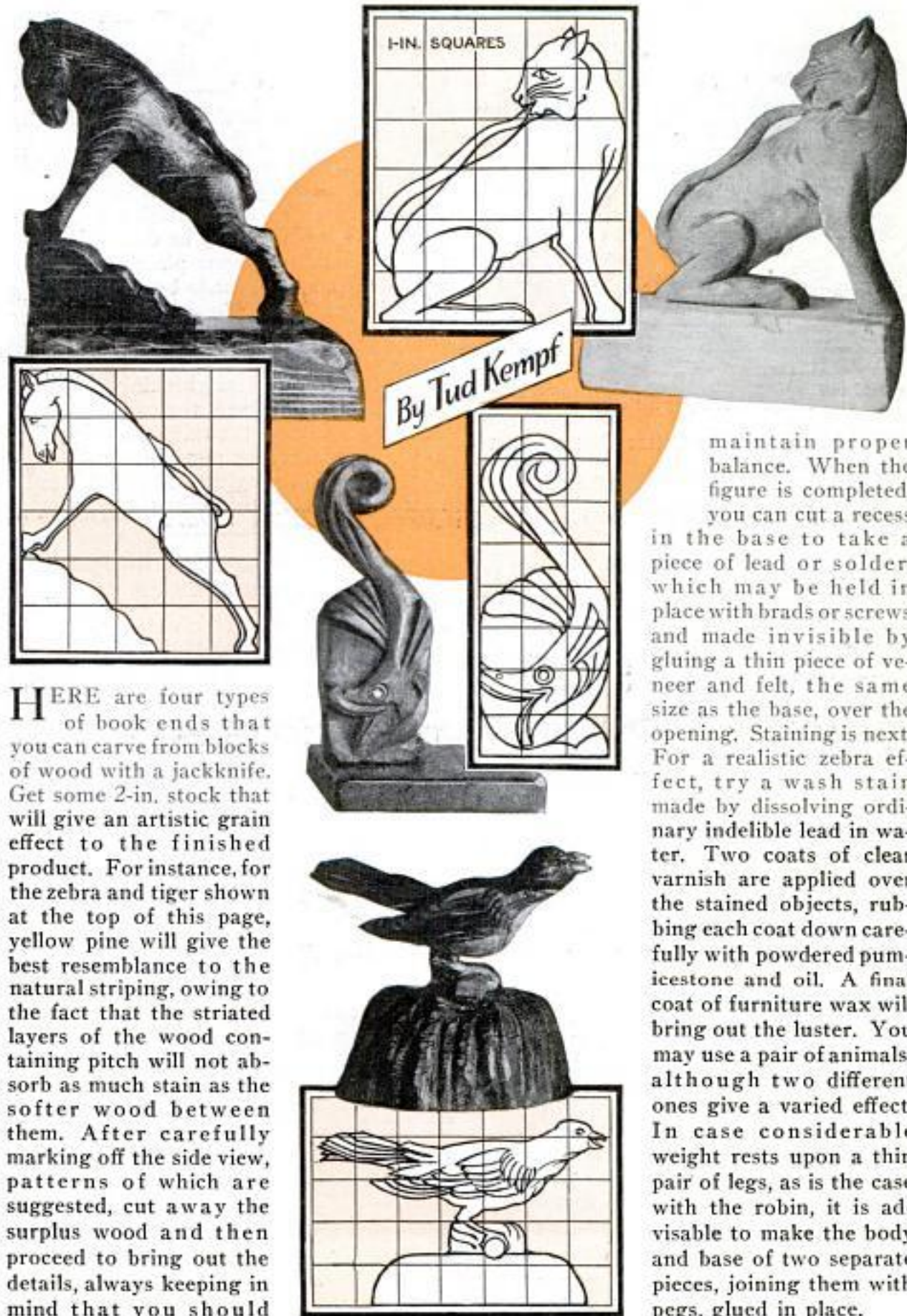
To prevent the hands from being burned by steam from a teakettle, a piece of sheet iron can be attached to the handle in the position shown. Notches are cut in two sides of the metal and the pieces turned down and bent around the kettle handle to hold the deflector in position. The same



Metal Deflectors Fastened to Utensil Handles Protect the Hands against Heat and Steam

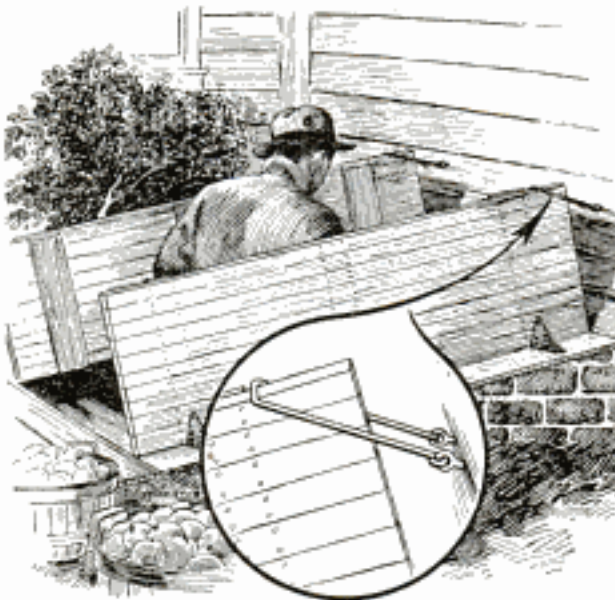
idea may be applied to an electric iron to deflect the heat. In this case, the metal pieces are turned down and riveted to the handle.

Novel Book Ends Carved from Wood Blocks



HERE are four types of book ends that you can carve from blocks of wood with a jackknife. Get some 2-in. stock that will give an artistic grain effect to the finished product. For instance, for the zebra and tiger shown at the top of this page, yellow pine will give the best resemblance to the natural striping, owing to the fact that the striated layers of the wood containing pitch will not absorb as much stain as the softer wood between them. After carefully marking off the side view, patterns of which are suggested, cut away the surplus wood and then proceed to bring out the details, always keeping in mind that you should

maintain proper balance. When the figure is completed, you can cut a recess in the base to take a piece of lead or solder, which may be held in place with brads or screws and made invisible by gluing a thin piece of veneer and felt, the same size as the base, over the opening. Staining is next. For a realistic zebra effect, try a wash stain made by dissolving ordinary indelible lead in water. Two coats of clear varnish are applied over the stained objects, rubbing each coat down carefully with powdered pumicestone and oil. A final coat of furniture wax will bring out the luster. You may use a pair of animals, although two different ones give a varied effect. In case considerable weight rests upon a thin pair of legs, as is the case with the robin, it is advisable to make the body and base of two separate pieces, joining them with pegs, glued in place.



Secured to House Wall, These Wire Holders Keep Cellar Doors in Upright Position

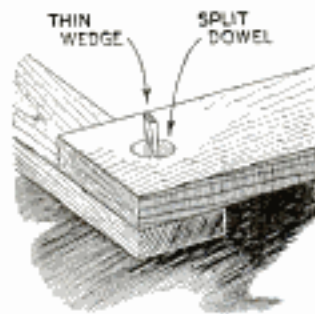
Wire Holders Keep Cellar Doors Open

Neat holders that will keep outside cellar doors open are easily made as follows: Eyes are formed on the ends of two lengths of heavy galvanized wire, which are then bent into loops and fastened to the wall by means of screweyes. When the doors are raised, the holders are lifted and dropped over the corners, holding the doors securely.

A Good Polish for Steel

A polish for renewing the luster of steel can be made by dissolving oxalic acid, 2 oz., in 1 qt. of boiling water. After the acid has dissolved, add finely powdered pumicestone, 2 oz., and strong ammonia, 3 oz. The polish should be well shaken before using. Apply by briskly rubbing the metal with a piece of soft felt moistened with the polish.

Thin Wedge Tightens Dowels



Dowels can be kept tight in their holes by first splitting one end and then driving a thin hardwood wedge between the two parts as shown. When wedged in this way, it is not

necessary to use glue to hold the dowels in place.

Straightening Bent Valves in a Vise

Bent motor valves can often be straightened in a vise. To do this, the valve is first wrapped with paper to prevent the vise jaws from marring the stem, after which it is clamped in the vise and straightened with a hammer. If the bend is near the head of the valve, it will be necessary to drive the head toward the vise by striking it on the high side, while, if the bend is some distance from the head, a soft copper or brass punch may be driven against the stem at the proper place. Tests for accuracy should be made by clamping the end of the stem in a breast drill and spinning the valve. The high spots may be marked with chalk, which will provide a guide for further straightening. If there is a center in the head, the carbon should be cleaned out and the valve placed against the end of a center punch clamped in a vise. This will provide additional steadiness for checking the trueness.

Paper Fasteners Help to Open Spectacle Case

Two paper fasteners, of the type shown, clamped over the edge of the lid will facilitate the opening of a spectacle case when wearing gloves. If the case is of metal, small holes or indentations should be made in the lid for the points of the fasteners. They should be set far enough back on the lid so they will not project beyond the bottom edge of the case and wear a hole in the pocket you carry it in.

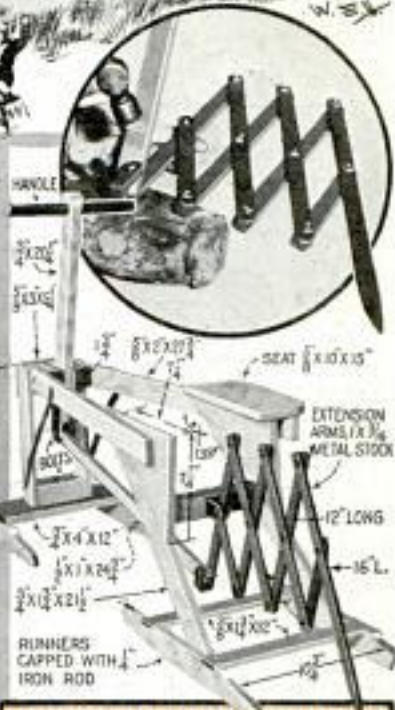


Ammeter Case Makes Good Peep Window

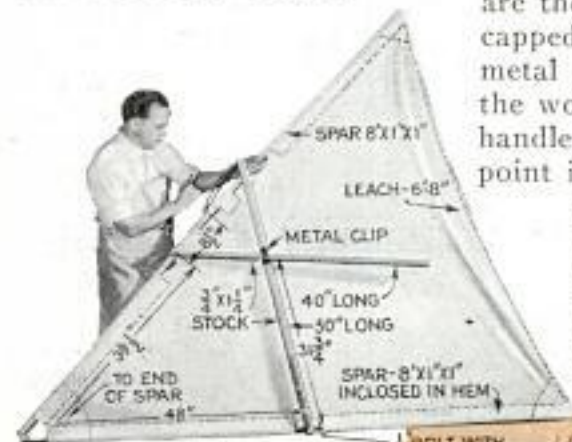
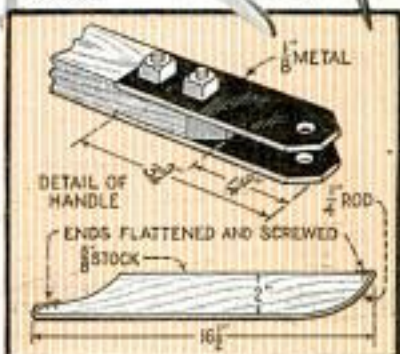
The cover of an old auto ammeter makes a good peephole for a storm door. All that is necessary to install it is to drill or cut a hole in the door and screw the case over it. The glass in these devices is held firmly in place with a retaining ring.

WINTER SPORTCRAFT

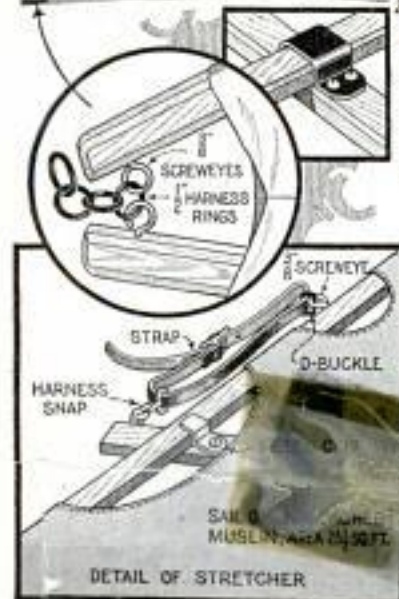
ON smooth ice, speeds up to 20 miles per hour have been attained with the scooter shown on the right. The propelling metal extension arm is made from 1 by $\frac{3}{16}$ -in. stock, securely bolted and riveted. Notice how the first leg is turned over to couple with the wooden lever. The hand lever is bolted between two $\frac{1}{8}$ -in. metal plates, mortised into the side of the handle. The four runners



are the same, each being capped with $\frac{1}{4}$ -in. round metal stock screwed to the wood. A pull on the handle jabs the metal point into the ice, pushing the sled forward. Steering is done with your feet on the front runners. One or two large washers should be fitted at the pivot bolt to permit easy turning.



Skate sailing is not new, but it affords thrills to hundreds of newcomers each year. The simple lateen rig shown below is easily made. The sail itself is made from heavy unbleached muslin. Have the straight edge of the cloth along the leach and sew the spar hems several times to minimize stretching of the cloth. A strap is used to pull the vertical arm forward to spread the main spars apart. All wooden members are held together with carriage bolts and wingnuts, but the sail can be folded for transportation without removing these.





Sawbuck Fitted with Old Crosscut Saw Blades Holds Logs While Cutting Them

Old Saw Blades Make Sure-Grip Jaws on Sawbuck

Two pieces of an old crosscut saw blade, bolted to one side of the jaws of your sawbuck, will hold the work and keep it from turning. Wooden pieces are bolted to the sawbuck as shown to clamp the saw blades in position.

Small Tweezers Made from Cotter Keys



For removing a sliver that is imbedded in your hand, a pair of small tweezers can be quickly improvised by bending a cotter key as

shown in the photo. If a file is handy, the ends of the key can be squared to make the tweezers more efficient.

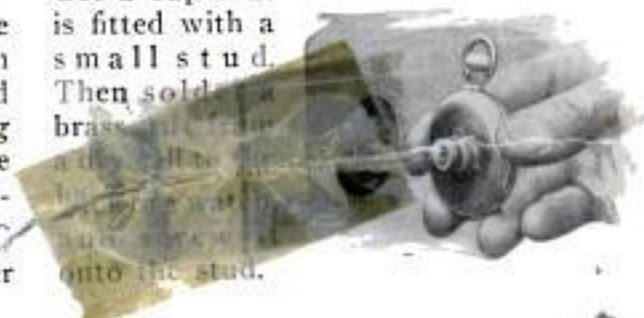
Gilding Carved Work with Bronze and Gold Leaf

Hand carvings may be given a bronze or gold-leaf finish by first sizing them with hot glue, thick enough to penetrate and leave a glossy finish, and then coating them with plaster. Soft wood will require a heavier size than hardwood. After applying the size, it should be allowed to harden for four or five days. The plaster

is the dental kind, 1 lb., mixed with Spanish whiting, 2 oz. Small quantities of the mixture should be thinned with water before use to the consistency of thick varnish and applied with a soft brush. Patience will be required to do this, and therefore it is best to practice on scrap pieces. When a batch of plaster has been used, or has thoroughly set, the container should be cleaned before another batch is mixed, as particles of dried plaster will cause a rough job. After the first coat has hardened, apply another coat, repeating this process until the plaster is at least $\frac{1}{16}$ in. thick. Fine lines may be touched up with a sharp knife dipped in water. Then allow the coating to dry in a warm room for eight or ten days. Small cracks should be filled by applying the plaster as before. When dry, touch up the entire surface with No. 0000 split polishing paper. Japan gold size is next brushed over the surface. A second coat may be required to stop absorption. When the last coat becomes tacky, sprinkle on fine bronze powder from a cheesecloth bag. After the surface has dried, invert the work and shake off the excess powder. For a glossy finish, apply a thin coat of the size, and, when tacky, lay the gold leaf and gently pat it on the surface with a cotton pad. When the finish has hardened, the handle of a toothbrush may be used to burnish it. The finished job should be protected from discoloration by applying a coat of bronzing liquid. If a dull finish is desired, mix a small quantity of starch in cold water and add boiling water to make a clear, but slightly viscid solution, which is painted on.

Rubber Suction Cup Holds Watch on Windshield

A rubber suction cup makes a good holder for attaching a watch in a convenient place on the windshield of a truck. Get a cup that is fitted with a small stud. Then solder a brass ring or a small brass knob onto the stud.



Sovereign of the Seas

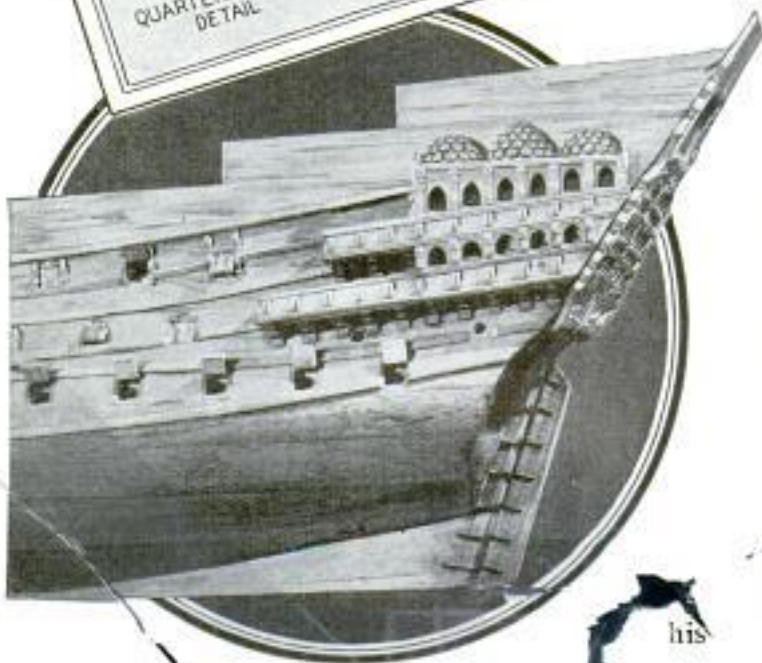
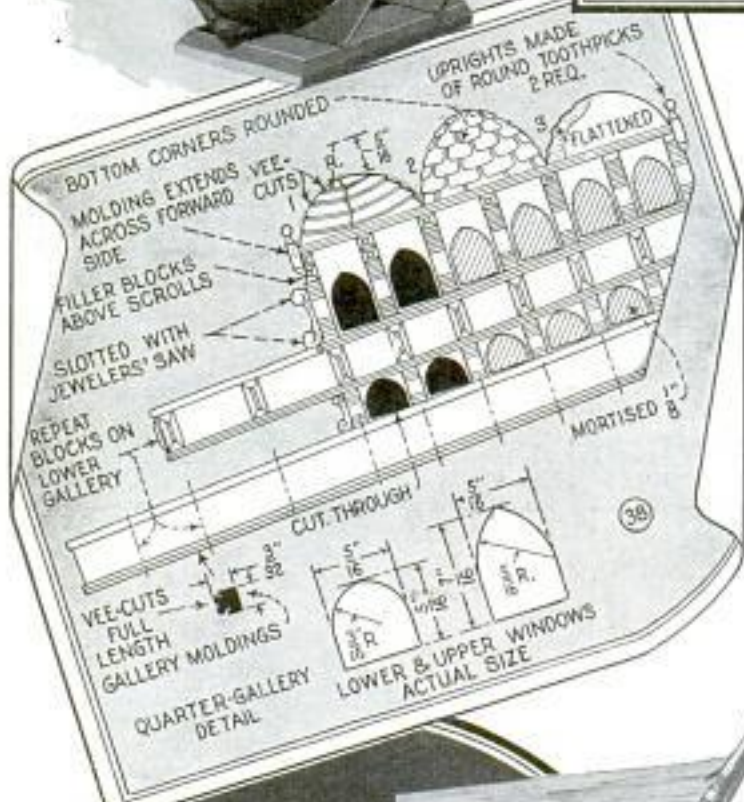
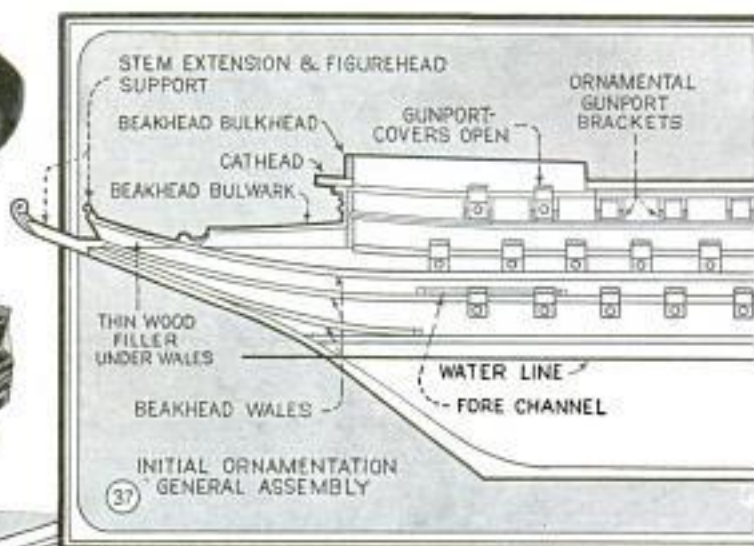


PART III—Wales, Gunport Covers and Initial Ornamentation

CROSS sections of the wales, which are made of maple, are shown in Fig. 41 and their position in Fig. 37. The thickness of the beakhead wales is the same throughout their length, but the depth tapers to about $\frac{1}{8}$ in. at the forward end. Before rounding main wale No. 2, it is slotted down the middle, either with a small circular metal-cutting saw or by hand, using the sharpened tang end of a small file. Temporarily, main wales Nos. 1 to 5, inclusive, are allowed to extend about 1 in. beyond the vertical line of the beakhead bulkhead. Use waterproof casein glue and lill pins, with heads clipped and riveted over with a light ball-peen hammer, to attach the wales to the hull.

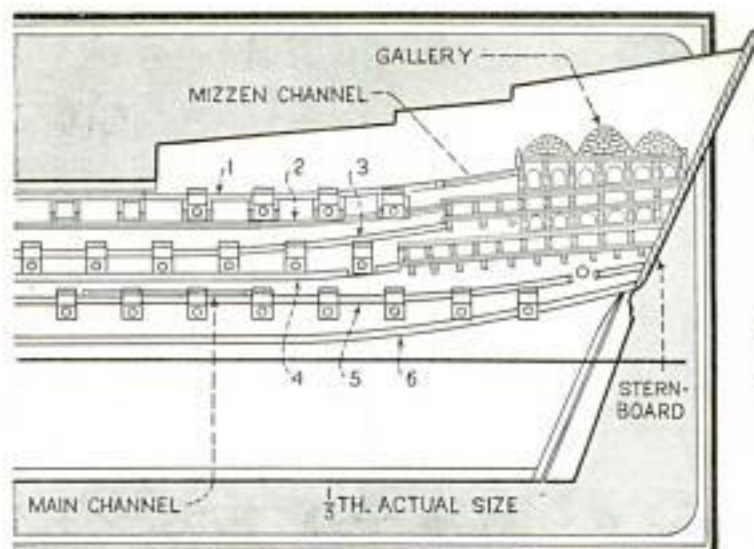
Before attaching the beakhead wales, the stem extension and figurehead support, Fig. 40, are installed. When you have completed this small assembly, cut off the sharp beakhead point about $\frac{1}{8}$ in. back and mortise the beakhead deck, $\frac{1}{16}$ in. deep, on the center line to receive the new fitting. You can now apply the three beakhead wales. In a vertical line with the beakhead bulkhead, above, join the upper ones by half-lap joints with precisely



CLAMPING GUNPORT BRACKETS
ON MAIN-DECK BULWARKS

wales Nos. 4 and 5. Just before pinning and gluing the top beakhead wale to the inboard upright of the new fitting, insert a thin triangular wood filler between the two. This can be made from a match box. Exact dimensions cannot be given for the curves of the beakhead wales, but reference to Fig. 37 will enable you to locate these wales properly.

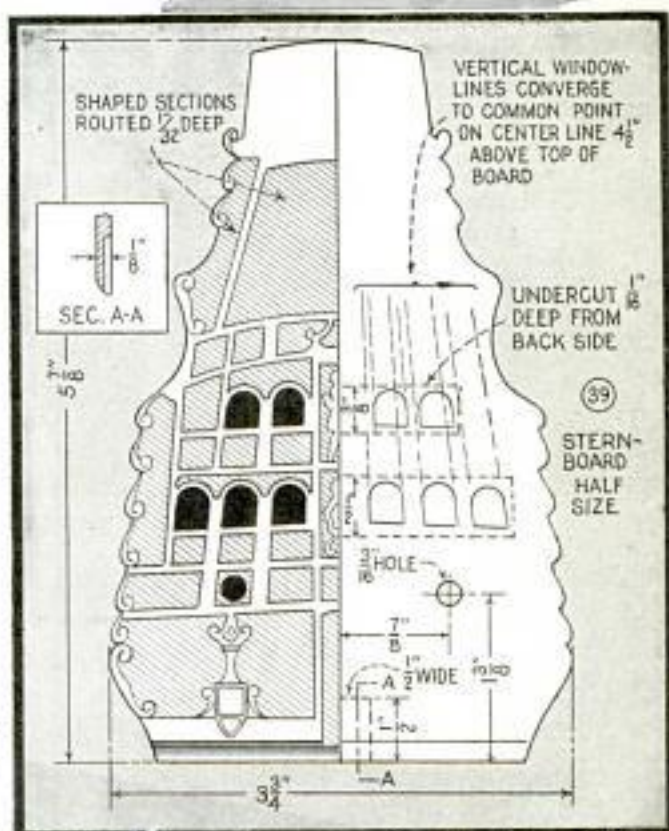
The beakhead bulkhead is made of maple. (See Fig. 40.) Its base is the exact width of the beakhead deck. The sides are flush with the sides of the forecabin, while the top edge comes flush with the forecabin deck. Next, locate centers for two $\frac{1}{16}$ -in. holes to receive the heavy bracing cables that will extend downward from the holes to the beakhead deck. Four $\frac{1}{8}$ -in. holes for gunports are also drilled. The door measures $\frac{3}{4}$ by $\frac{3}{8}$ in. and is located on the center line of the bulkhead, $\frac{1}{2}$ in. above the deck. Fit it with a maple sill, $\frac{1}{2}$ in. thick, and frame the top and sides with other pieces of the same thickness. Attach the door trim with casein glue. A pair of catheads are made from $\frac{5}{16}$ -in. square maple, the edge and back of the bulkhead being mortised to receive them. Before attaching, drill and file a vertical sheave slot through each cathead, $\frac{1}{2}$ in. wide and $\frac{1}{8}$ in. long, about $\frac{1}{16}$ in. in from the outboard end.



MORTISING
STERNBOARD
WITH CARVING
CHISEL

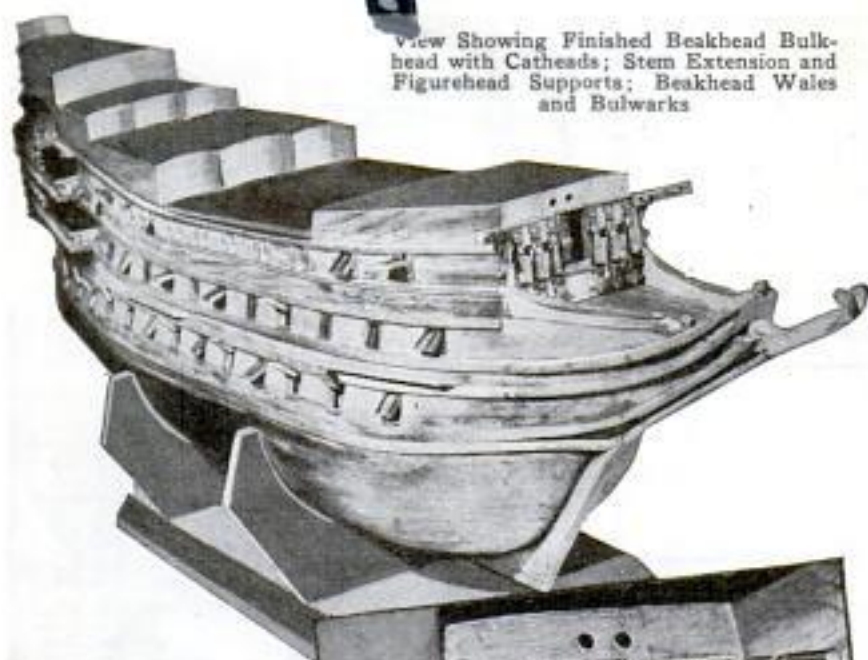


After the glue on the catheads has dried, drill small holes through them and into the bulkhead to take dowels made from round toothpicks, gluing these in place. Cut off the inboard ends of the catheads flush with the back side of the bulkhead. Figures D are conventional representations of human figures. However, the effect would be better if these were actually shaped to human likenesses. To prevent splitting, make the cathead brackets C of three-ply maple. You can glue this up yourself in the small-size pieces required. Brackets F are made first as a section of molding, and then each is cut $\frac{1}{8}$ in. wide. Trim the top of the two outer brackets on both sides to accommodate the curved molding above. Now, glue the completed bulkhead assembly to the forward side of the forecastle. Glue and pin main wales Nos. 1 and 2 to the sides of the bulkhead and bevel their forward ends flush with the exposed forward side of the bulkhead. The beakhead bulwarks, detailed in Fig. 40, are of two pieces, the top rail being pinned and glued on the top edge of the lower piece, and rounded after the glue has dried. Bevel the bottom edge of each bulwark so that it is flush with the flare of the beakhead below. The bulwark abuts the bulkhead, the top rail being beveled to join the edge of the latter. Make another strip of molding for the upper gunport brackets. When formed, cut each bracket off the strip, $\frac{1}{8}$ in. thick, and glue one bracket at each side of each upper gunport only. The forward brackets fit ni-

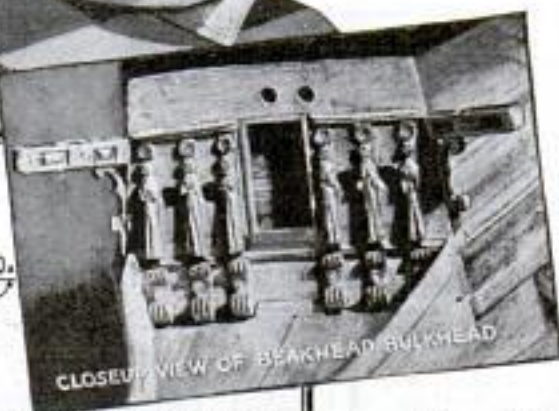
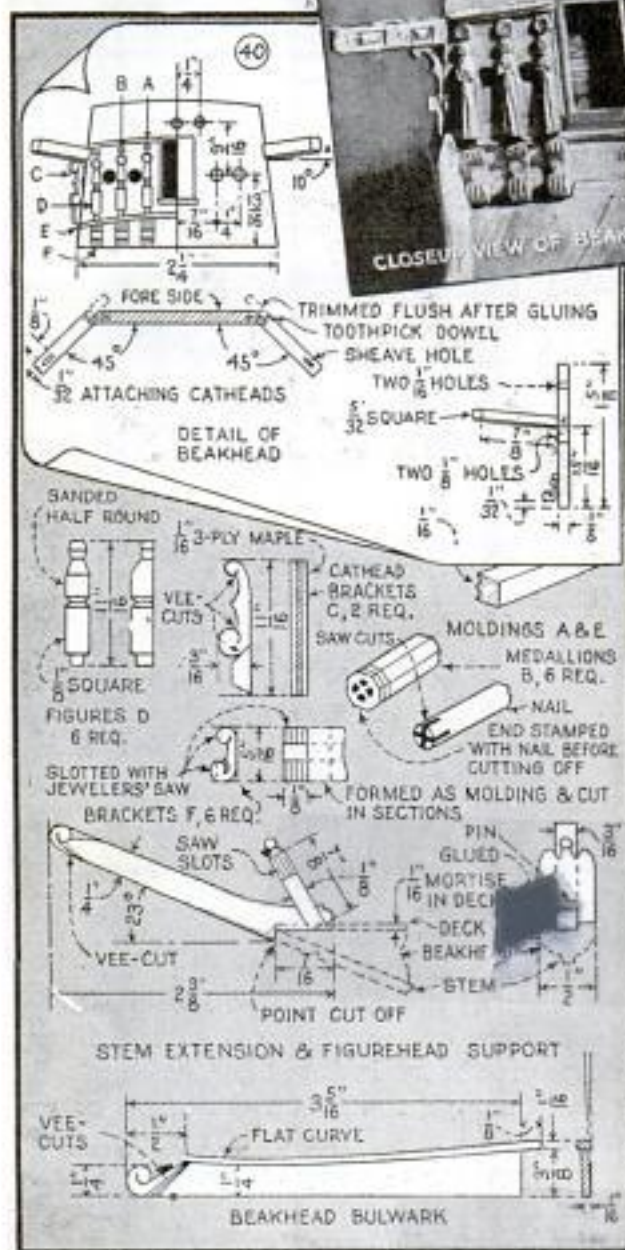


bet main wales Nos. 1 and 2, but these holes must be cut out to take the brackets of the last two gunports aft.

Carving on the three quarter-gallery domes is shown in Fig. 38. Cut four windows through the forward section of the gallery and route the others $\frac{1}{8}$ in. deep. The lengthwise gallery moldings are made from strips of maple, as shown in the detail of Fig. 38. Brackets, $\frac{1}{8}$ in. wide, are



View Showing Finished Beakhead Bulkhead with Cathedis; Stem Extension and Figurehead Supports; Beakhead Wales and Bulwarks



CLOSE-UP VIEW OF BEAKHEAD BULKHEAD

glued in the spaces between the windows, one at each corner, and one on the forward side of each gallery. The lower brackets are shorter than those above. Just below the rails, small rectangular blocks are attached in line with the brackets above and below, and extending at regular intervals forward along each open gallery section. These are $\frac{1}{8}$ by $\frac{5}{16}$ by $\frac{1}{16}$ in. in size and beveled on all four edges. One of each is also glued to the forward end of each open gallery. From toothpicks, make decorative uprights and attach one at each end of the topmost molding, which should be notched to receive them.

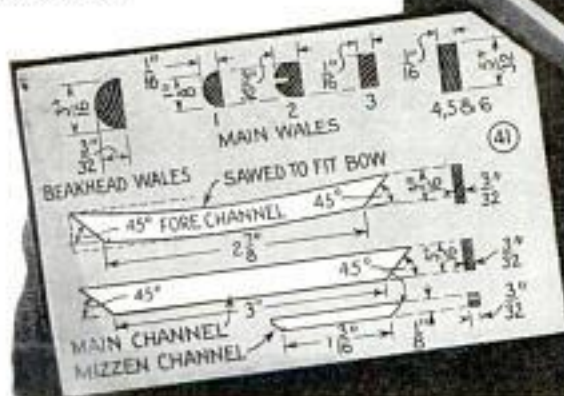
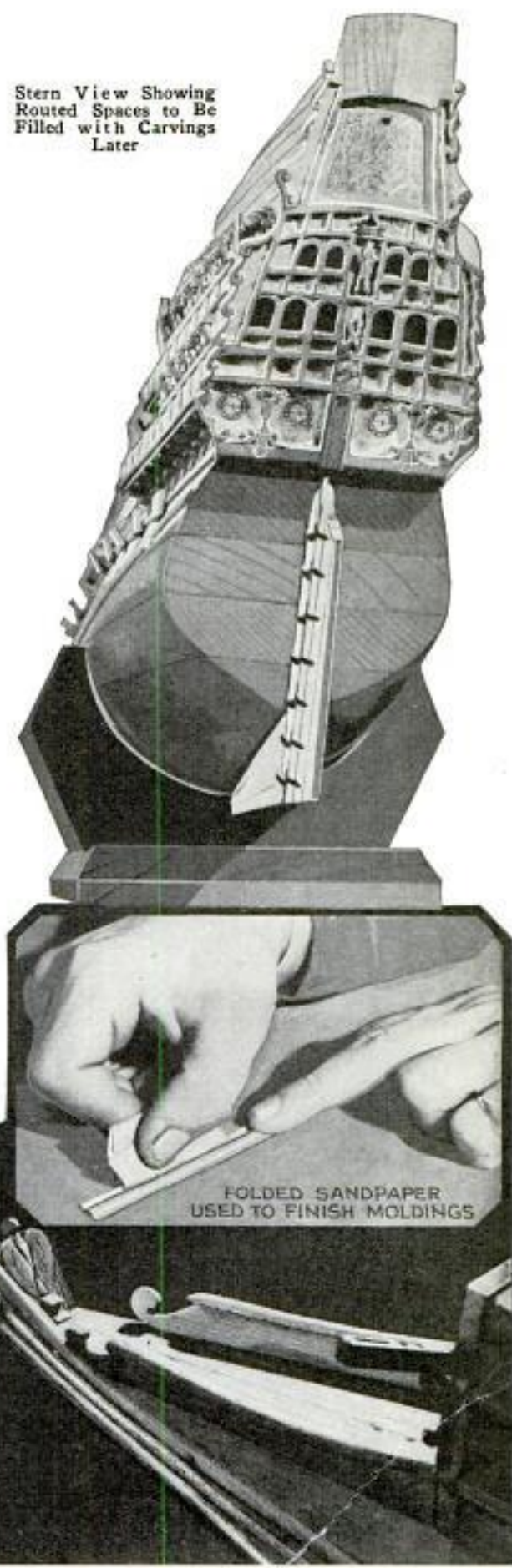
The sternboard is cut from maple stock, $3\frac{3}{4}$ by $5\frac{7}{8}$ by $\frac{1}{8}$ in. in size. Fol-

low Fig. 39 for details. The sternboard curves can be cut either by hand or on a power jigsaw. Make a full-size tracing on drawing paper, and transfer the surface decorations to the sternboard, following the same method you first used to lay out the hull lifts. Ten windows are cut through the board, as shown, while the shaded sections are routed out $\frac{1}{32}$ in. below the surface. Round the bottom edge of the board to a curve that will match nicely with the curve of the stern, which it joins. At the bottom, on the reverse side of the board and centered, cut out a $\frac{1}{2}$ -in. square $\frac{1}{8}$ in. deep, to provide clearance for the rudderpost. Do not attach the sternboard permanently; tack it in position with two or three light nails, pending further decoration that will be described later.

The fore channel is made of $3\frac{1}{2}$ by $\frac{1}{2}$ by $\frac{3}{16}$ -in. maple. It conforms to the curve of the bow and should be sawed to insure a constant width of $\frac{5}{16}$ in. its entire length. Before cutting the wood, make a cardboard template of the curve and fit it to the exact curve of the bow, transferring the curve later to the wood. Between bev-

els, this channel will be $2\frac{7}{8}$ in. long. Attach with the channel resting on top of main wale No. 5, the forward, outboard corner of the piece about $\frac{1}{8}$ in. forward of the first gunport in the middle row. The main channel is 3 in. long between bevels and the same in width and thickness as the first channel. It also rests on top of main wale No. 5, its corresponding forward corner exactly in line with the forward side of the seventh gunport aft in the middle row. The mizzen channel is $1\frac{3}{16}$ in. long between bevels, $\frac{1}{8}$ in. wide and $\frac{3}{32}$ in. thick. Flatten main wale No. 1 sufficiently from the quarter-gallery dome forward, to give this channel a good seat. Then glue and pin the mizzen channel in place, directly over the vertical side of the wale. The fore and mizzen channels are likewise glued and pinned to the hull with headless lill pins, driven through their beveled ends. You may make either working or dummy gunports, as in Fig. 33. Fig. 35 shows a jig to hold the gunport covers while you drill small holes through brass and wood for pins, using a vise. Use the clothespin jig as in Fig. 36 to hold the cover and hinge assembly securely, while applying a drop of solder to each end of the hinge pivot. To attach the working gunport covers, insert a thin blade between the wale and hull centrally above the gunport. Then slip the wide section of the hinge under the wale and remove the blade. Try the cover in the gunport to make sure that it fits flush on all four sides. Now, with the cover closed, use the pin vise to drill through the wale and brass to the hull, after which a pin is driven through both, the pinhead clipped off and the end riveted over with light taps of a ball-peen hammer.

Stern View Showing Routed Spaces to Be Filled with Carvings Later



Cornstalk Fence an Effective Snowdrift Barrier



Cornstalks Woven into Wire Fence Form Good Barrier to Stop Snow Drifting

Cornstalks woven in between the wires of a fence as shown, form a barrier to prevent snow from drifting. This method will be useful in preventing snow from drifting in roads and around buildings.

Lean Fuel Mixture Causes Burned Valves

Operating an auto engine with a mixture which is slightly too lean for best results, sometimes causes the exhaust valves to burn, especially if the engine is being operated under heavy loads. This destroys either the valve or its seat, and sometimes both. A lean mixture contains air pockets, which supply too much oxygen causing the valve to burn. The remedy for this

condition is to enrich the mixture slightly, which, contrary to popular belief, will not increase the fuel consumption of the engine. Another cause of burned valves is insufficient clearance between the tappets, which keeps the valves from seating tightly and allows the burning gases to escape around them.

Starch Solution Cleans Woodwork

Woodwork in your kitchen that has become stained from smoke and grease, can be cleaned by painting it with a solution of starch in water. After the solution has dried, it is rubbed off with a soft brush or clean cloth, which removes the stains. Treating the woodwork in this way does not harm the paint, and any finished surface treated with starch will remain in good condition for several years.

Protecting Camera-Shutter Tubing

To keep the small tube used to operate the shutter on a camera from breaking where it connects to the shutter mechanism, cut the neck from a dropper bulb and slip it over the tube as indicated. Thereby the tube will be prevented from making a sharp bend at this point.

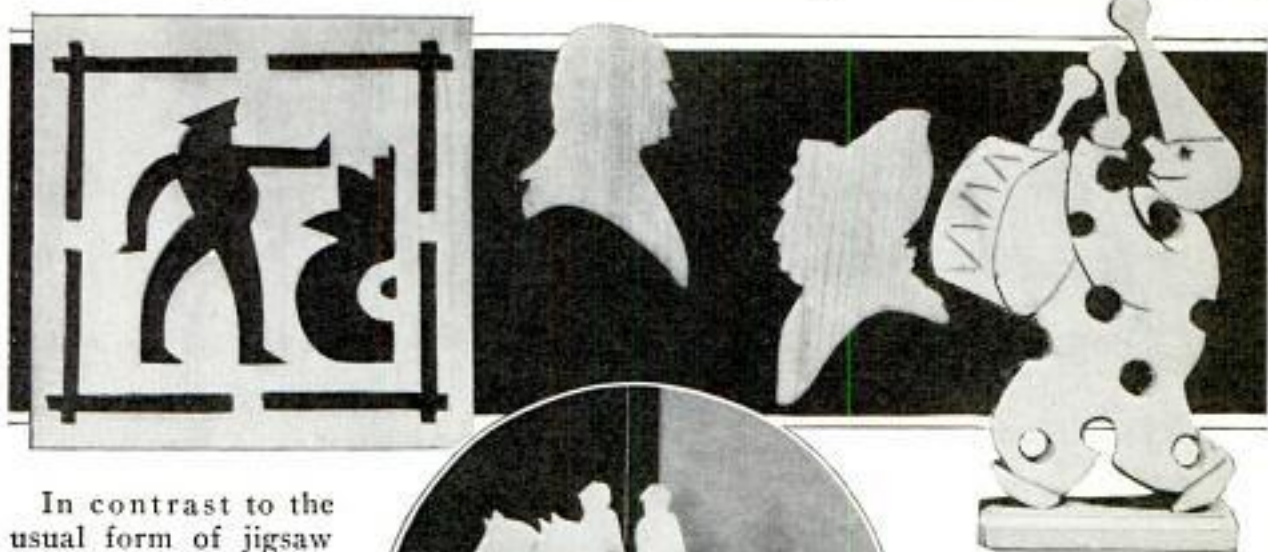


Blueprints on "SOVEREIGN OF THE SEAS"

Four blueprints on this unusual ship model are now ready at 25 cents each. Also, there are prints on 350 interesting projects, including airplanes, toys, smoking sets, tables and other practical items. Free list sent on request.

Address Blueprint Dept.

Pleasing Variations in Simple Silhouettes



In contrast to the usual form of jigsaw silhouettes in which the background is cut away, there are often instances when you can obtain a more pleasing effect by cutting out the figure and leaving the background intact, as shown in the upper left-hand detail. Another novelty to ornament your table or bric-a-brac shelf is the cut-out clown shown at the right, mounted on a small base by means of two wood screws driven up through the latter. Almost any scrap wood can be used for making such figures, although hardwood, such as maple, is preferable, as this is not likely to leave a ragged edge when cutting. If you care to mount photographs of yourself and your

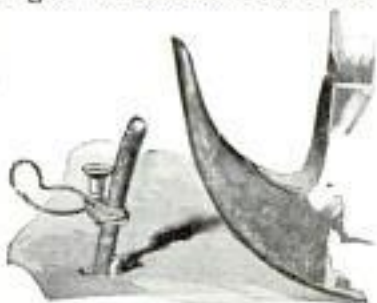


friends on thin wood, also on a suitable base, you will have the effect shown in the lower detail. Groups of silhouettes mounted one behind the other, to obtain the effect of depth, as shown in the circular insert, can be

made from either wood or metal. In most cases, simple silhouettes should not be painted, as it gives them a pictorial effect which detracts from their simple rugged outline. Besides the examples shown here, the variations of jigsaw silhouettes have practically no limit and many ideas can be obtained by clipping the pictures in magazines and newspapers and making such changes as may seem suitable.

Screw Aids in Pulling Nails

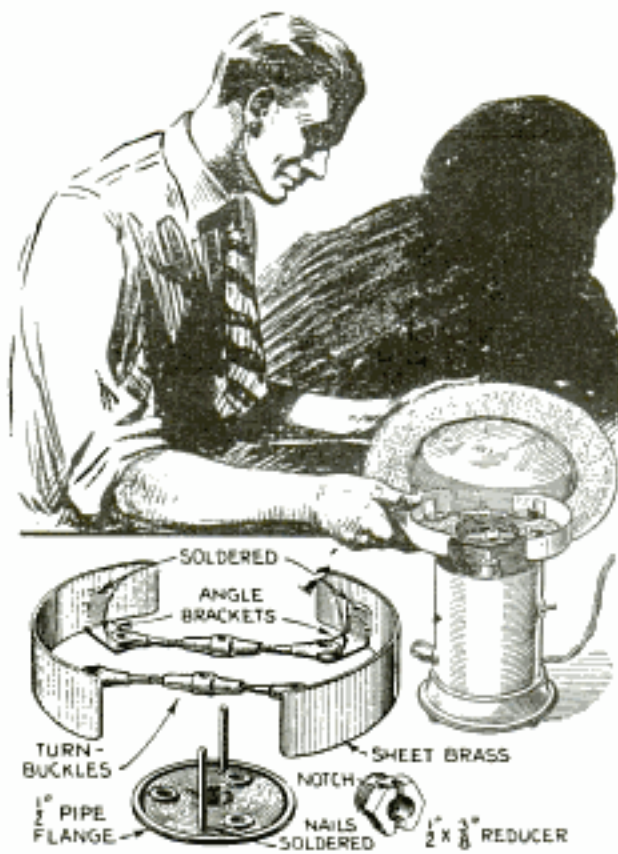
Nails with the heads broken off can be removed by wiring a woodscrew to them as shown. This provides a head for the claws of the hammer to grip, and as pressure is exerted, the threads on the screw bite into



the side of the nail so that it can be pulled out without difficulty.

Mailing Containers for Film Packs from Cigaret Boxes

Amateur photographers who send out their film packs to be developed, will find tin or cardboard cigaret boxes good mailing containers for this purpose. The boxes are practically light-tight when closed, and will accommodate packs up to 4 by 5 in. in dimensions.



After Cleaning a Hat, It Is Revolved on a Fruit Juicer Until Dry

Attachment on Fruit Juicer Cleans Hat by Centrifugal Force

Owners of electric fruit juicers will find this attachment convenient for cleaning hats. It consists of a pipe flange, two 5-in. turnbuckles, and two strips of sheet brass. The flange is fitted with a reducer, notched to fit over the pin in the juicer shaft. Two headless nails, to fit in holes drilled in the center of each turnbuckle, are then soldered in holes drilled on opposite sides of the flange. The turnbuckles are soldered to angle brackets, which are in turn soldered to the brass strips. It is necessary that the attachment be assembled in balance, in order that there may be no excessive vibration.

Storage-Battery Jars Used for Film Developing Tanks

Rubber jars from old storage batteries make good developing tanks for films. The jars must first be thoroughly cleaned by washing out the sediment and scraping the lead sulphate from the sides of the cell. After this has been done, the acid, which has penetrated the pores of the

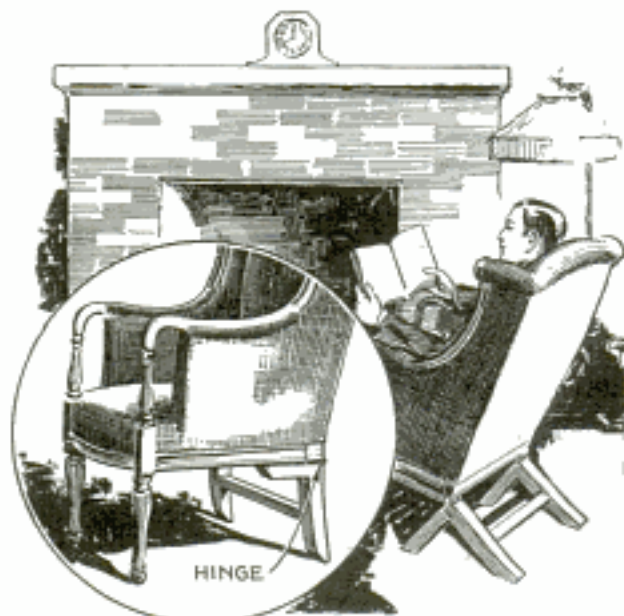
rubber, may be neutralized by filling the jars with a strong solution of baking soda and water. The solution should remain in the jars for some time, after which they are thoroughly rinsed to remove all traces of the chemical.

Drying Shoes with Warm Sand Prevents Shrinking and Cracking

One of the best methods of drying wet shoes and boots is to pack them with warm, dry sand. This fills out the leather and prevents it from shrinking as the moisture is absorbed. If sand is not available, paper will serve the purpose, wadding it into each shoe. When paper is not at hand, dry leaves are the next best material to use. Shoes should not be placed close to a fire as the heat will dry them out too quickly and cause the leather to crack. —Bob Becker, Chicago.

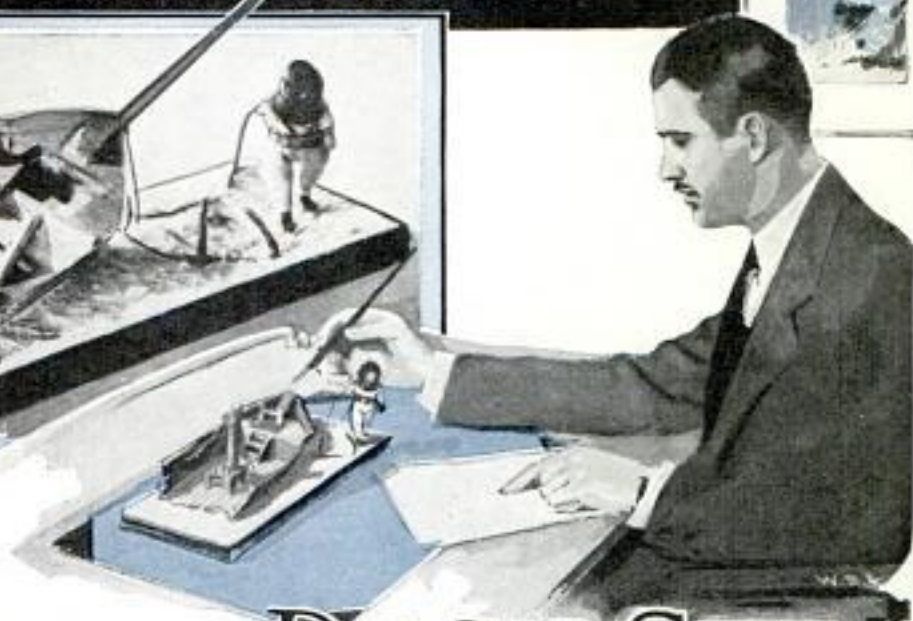
Hinged Legs on Armchair Increase Its Comfort

By hinging the rear legs of your favorite armchair, it can be tilted to a comfortable lounging position. The legs are sawed off flush with the bottom and two short pieces mitered to them, after which the assembly is hinged in position. The legs can be locked in the upright position by means of a hook or latch. Two screen-door springs pull the legs up when the chair is tilted forward.



Hinged Legs on Your Armchair Enable Adjustment in Two Positions

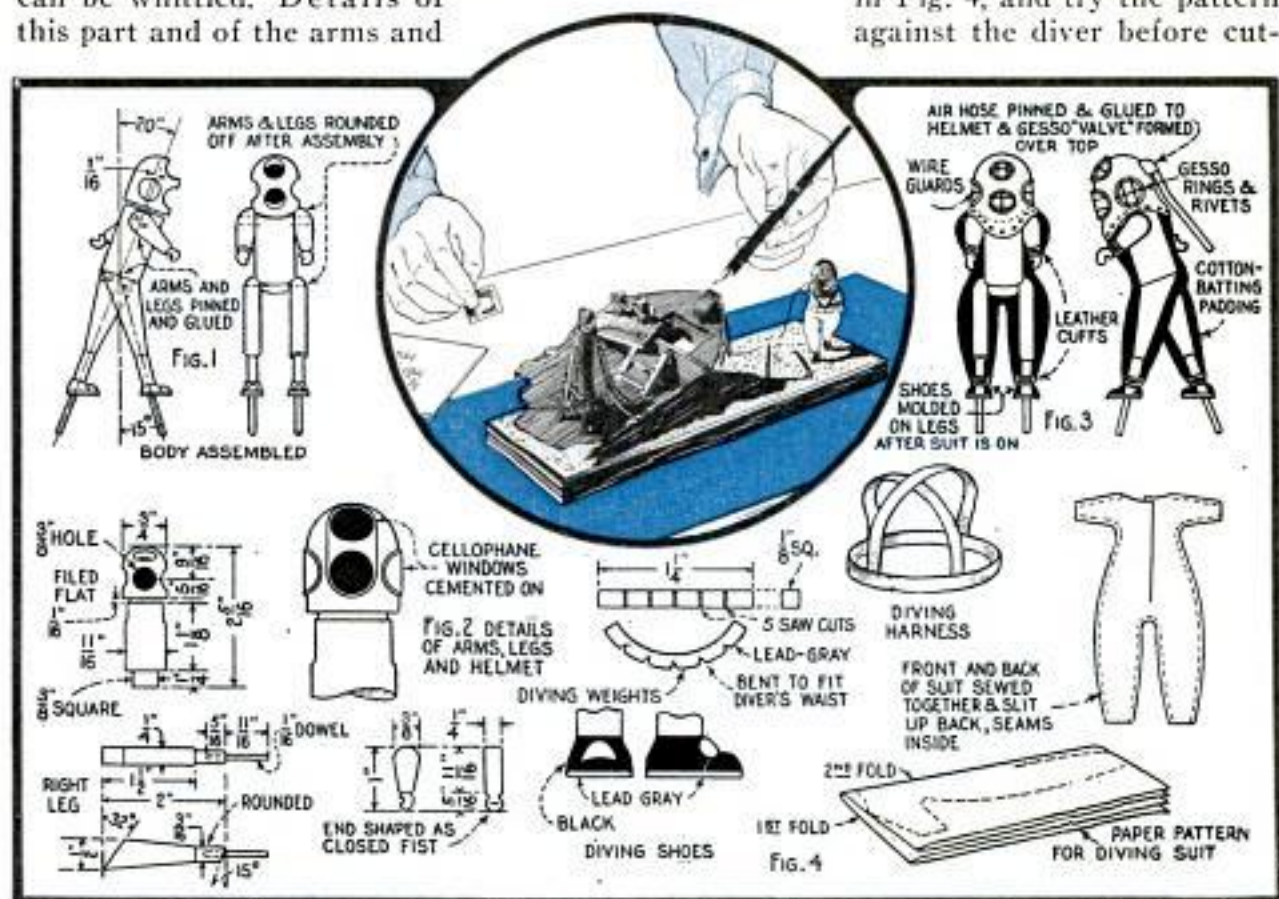
"Davy Jones' Locker"

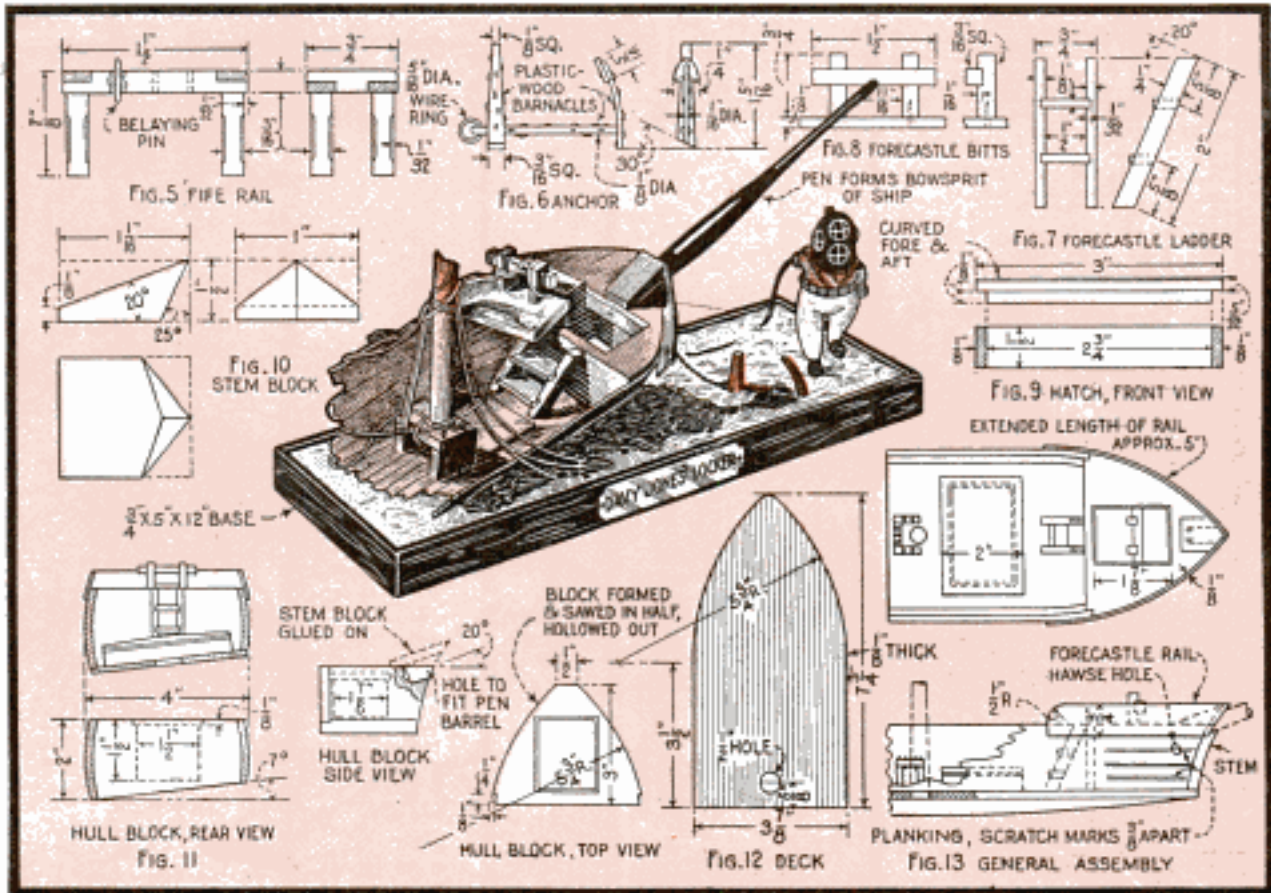


a distinctive DESK SET

WITHOUT carving skill, and with only a few common tools, you can make this artistic and novel set for your desk. The helmet and trunk of the diver can be whittled. Details of this part and of the arms and

legs are shown in Fig. 2, while the body assembly is detailed in Fig. 1. Light white-rubber sheeting is used for the diver's suit. First, cut the suit pattern from paper, as in Fig. 4, and try the pattern against the diver before cut-





ting the rubberized material. Make sure that it allows for the cotton padding that shapes the diver's form. Sew closely around the edges, turn the suit inside out and put it on the diver. Now, with glue and fine white thread, bind the suit to the diver at the wrists and ankles. Band the wrists and ankles, over the thread, with thin leather cuffs, about $\frac{3}{16}$ in. wide. This done, wad cotton batting inside the suit with a small stick, bit by bit, until the diver assumes human form. Draw the slit at the back together over the padding and glue and sew the opening shut.

Cellophane is suitable for the windows of the helmet. The raised rings around the face plates are of gesso. When the rings are dry, cut the heads from pins, bend the ends down at right angles and make the wire guards for the plates, as in Fig. 3, using a fine drill or a red-hot needle point to pierce the rings and the wood of the helmet; then tip the bent ends of the guards with glue and insert in the holes. Make the diving shoes of plastic wood. Cut the diving harness from very thin leather, using $\frac{1}{8}$ -in. strips. The harness should be glued to the suit at convenient intervals. The diving weights are

made from $\frac{1}{8}$ -in. square wood strips. Center and glue one over the waistline belt at the rear and the other at the front.

The hull block, Fig. 11, is made of white pine. Curve the sides and cut the rabbets at the rear to receive the sides, Fig. 13. On top of the block, lay out the rectangle of the fore-castle well, saw the block in two and sink one-half the well into each half of the block. Around the top of the well, cut a shoulder, $\frac{1}{8}$ in. deep by $\frac{1}{16}$ in. wide, to seat the well cover. Then glue the block together.

The deck of the ship, Fig. 12, is cut from a thin board, $\frac{1}{8}$ by $3\frac{3}{8}$ by $7\frac{3}{4}$ in. Locate and drill the $\frac{1}{2}$ -in. hole for the mast, and score planking lines. The stem block is shaped as in Fig. 10. The ship's hatch, Fig. 9, is a rectangular wooden frame. Only half an anchor is required, as in Fig. 6. Make the well cover of $\frac{1}{8}$ -in. stock. On this, center the fore-castle bitts, made as in Fig. 8. The fife rail, Fig. 5, is made from $\frac{3}{16}$ -in. square sticks. Drill the horizontal rails to receive seven belaying pins, cut $\frac{1}{2}$ in. long from round toothpicks. Insert and glue the pins in the holes to project equal lengths above and below the rail. The fore-castle ladder is shown in Fig. 7.

In assembling, nail and glue the deck to the underside of the hull block, allowing the point of the deck to project slightly ahead of the bow. Attach the side boards similarly in the rabbets of the block and on top of the deck. Bevel the insides of the fore-castle rails at the forward point and nail and glue to the hull block. Glue the stem block on top of the hull block, snugly inside the point made by the fore-castle rails. Then, cut the stem roughly to shape, glue to the hull block and deck and finish off to a blunt cutwater, as in Fig. 13. The penhole is drilled through the fore-castle rails into the hull block to within $\frac{1}{8}$ in. of the fore-castle well. Its size depends upon the pen used. Break away the sides, aft of the fore-castle rails, as shown. Glue and nail the fore-castle ladder, the hatch and life rail in place and scratch planking lines on the outside of the ship with a sharpened nail.

Nail and glue the ship on the base, about 1 in. from the rear side and angling a trifle toward the right rear corner. With the hole already drilled through the deck as a guide, sink the mast hole $\frac{3}{8}$ in. into the base and glue the large end of the mast in this hole. Locate the diver on the base near the right-hand front corner and fasten with dowels. Over all the open areas of the base, drive tacks, letting the heads project above the surface to anchor the plaster "sand." This consists of glue, plaster of paris and fine white sand mixed to form a stiff paste that should appear like wet sand. Spread the paste evenly over the base around the ship's hull, up under the diver's shoes and partly over the anchor. Drift some over the deck at the open end, and be sure to cover all the tack heads. Use an old spoon to ruffle the sand in natural ridges at various points. Lastly, sprinkle more loose sand all over the paste and tamp down lightly. Work fast with the paste, as it dries rapidly.

Support Made from Oil Can Holds Paint Bucket on Roof

Cut in two in the center at the angle indicated, a square 5-gal. can makes a good holder for a paint bucket and tools while working on a roof. A hole is cut in the top of the holder to take the bucket, which stands on a board nailed to the inside of

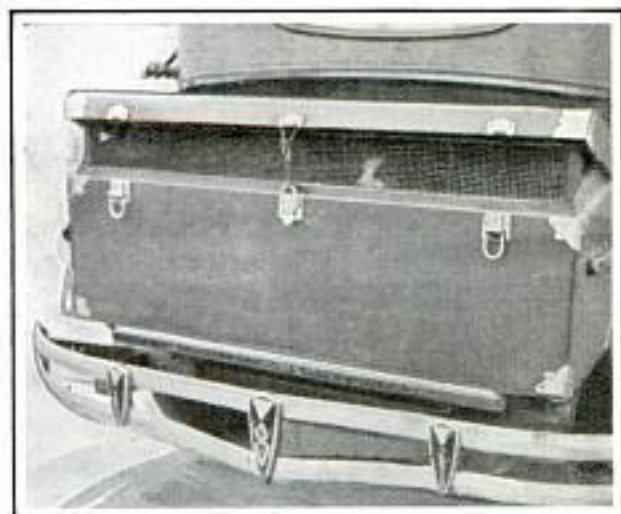


A Square Can, Cut in Two, Makes Holder for Bucket When Painting Roof

the can. To keep the holder from slipping, small notches or teeth are cut around the bottom edges of the can to dig into the roof.

Dog Carried Safely in Car Trunk

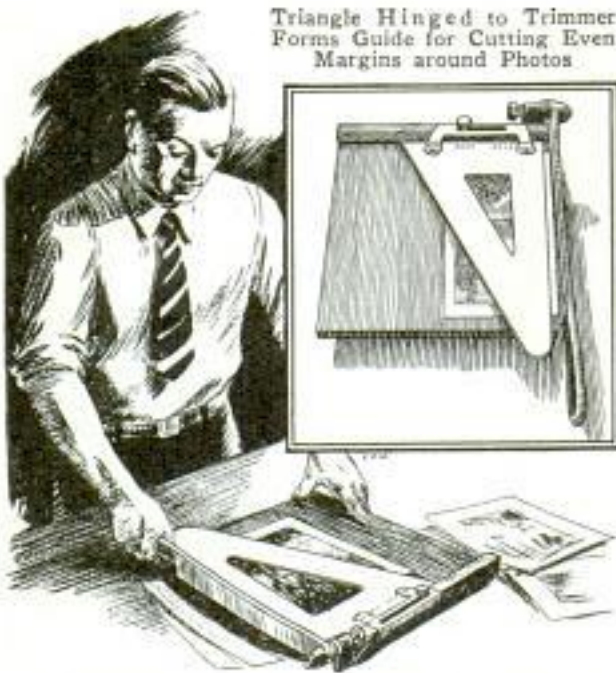
By fitting a screened frame under the lid of your car trunk to hold it open as shown, you can carry your dog safely. A wire or spring may be fastened to the lock and the catch on the lid to keep it from coming open and to hold the screen in place. This arrangement will be found handy in states where laws prohibit the carrying of dogs on running boards unless they are safely crated.—James R. Parker, Hartford, Conn.



Screen Provides Ventilation and Permits Dog to Be Carried in Car Trunk

Guide on Trimmer Helps in Cutting Even Margins on Photos

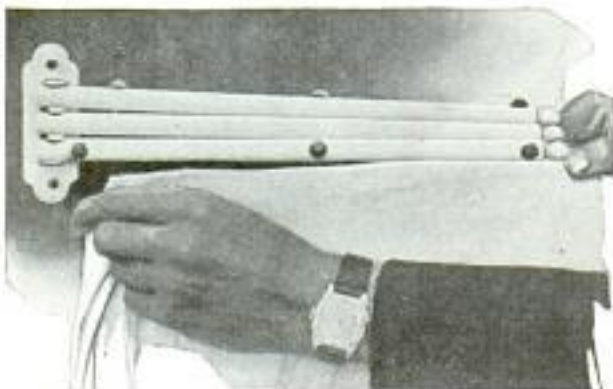
Triangle Hinged to Trimmer
Forms Guide for Cutting Even
Margins around Photos



By using this guide, even margins are easily cut around a photo with a regular trimmer. The guide is a celluloid triangle hinged to a piece of tin. The latter is slotted for a No. 6-32 screw which is threaded into a hole drilled in the rule on the back of the trimmer. Fitting a thumbnut from a dry cell on the screw completes the job. In use, the guide is first set for the desired margin and the photo is then placed under the guide with the edge of the picture flush with the edge of the triangle.—Wm. P. Scheffler, Reading, Pa.

Rubber-Head Tacks Improve Towel Rack

Driven into the polished bars of a towel rack, rubber-head tacks help to keep towels from slipping off. This arrangement is



Friction Provided by Rubber-Head Tacks Keeps Towels from Falling off Rack

particularly useful on racks having several bars, in order to avoid pulling off several towels when only one is needed.

Repeated Heating Increases Size of Cast-Iron Pistons

The size of a cast-iron piston that fits the cylinder too loosely, may be increased several thousandths of an inch by repeatedly bringing it to a red heat and letting it cool slowly. The alternate heating and cooling causes the piston to expand and contract, the expansion being greater than the contraction each time. Frequent tests for accuracy should be made to avoid getting the piston too large. Also, it is necessary that the piston be heated evenly in order to avoid excessive warping. High spots are removed with a fine file.

Insulated Container Keeps Milk from Freezing

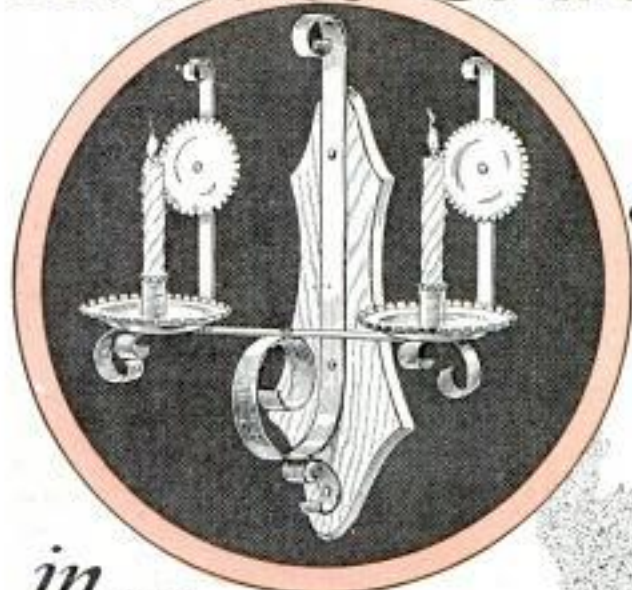
This container will be useful where early delivery often results in milk being frozen before it is taken inside. The container is a section of stovepipe lined with several layers of newspapers, or, better still, asbestos, which will retain the heat in the milk for several hours. It is a good idea to keep crumpled wads of paper under and over the bottle.



Steering-Knuckle Pins Tested for Wear

Front-wheel brakes have a tendency to wear steering-knuckle pins on cars in a manner which is rather difficult to detect by the usual methods. This wear can be seen, however, by jacking up the wheel to be tested and having an assistant apply the foot brake tightly, while the degree of wear can be determined by watching the steering knuckle while rocking the wheel backward and forward.

Artistic CANDLESTICKS

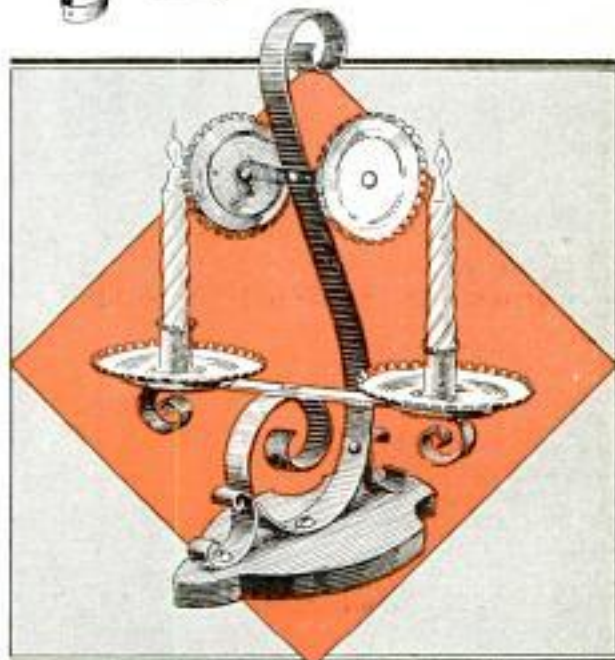


in
**Hammered
Metal - - -**

By A.C. Ullrich

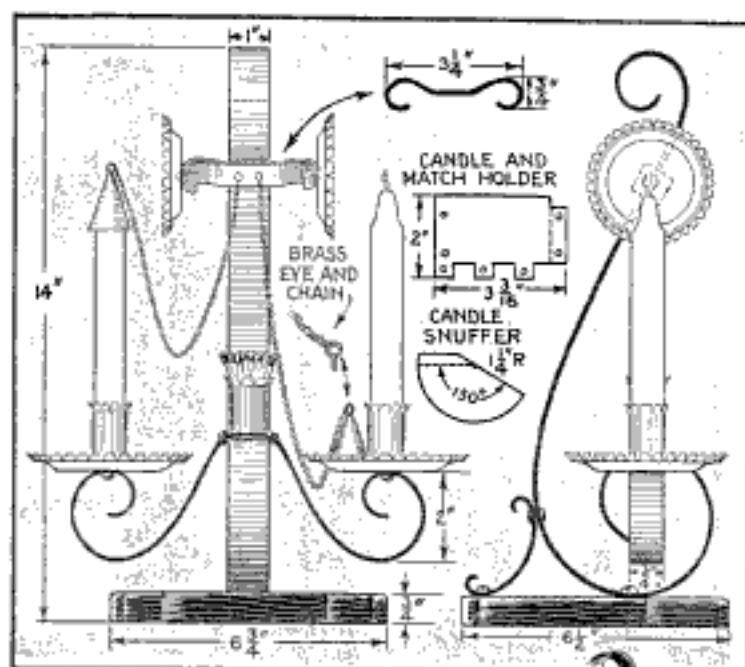
THERE are a number of multiple candlesticks that can be formed from sheet metal and can be adapted to the use of either candles or small electric lamps, the former being copied from similar articles used by early American colonists, while the latter are modernized adaptations. These candlesticks can be hung on the wall in sets of two, three or four, or they may be mounted on bases for use on the table. In both cases, the base to which the metal work is fastened is a piece of 1-in. stock, preferably hardwood, which may be stained and antiqued to suit your taste.

In the various designs given here, a rather heavy gauge of sheet iron, brass or copper is used for all the parts except the drip dishes, reflectors and snuffers, which are made from lighter sheet copper. The parts are soldered together, and wood screws are used to fasten the metal to the wooden base. To make the candle sockets and the holder you will have to resort to sheet copper. These pieces are first cut from a sheet of copper to the size and form shown in the detail, and are then bent into a cylindrical shape, after



which the overlapping edges are sweated together. In doing this, avoid getting surplus solder over the work. If too much solder is applied, wipe off the surplus with a rag before it hardens. Further traces of solder can readily be removed by means of a wire scratch brush and buffing wheel. The candle snuffers are attached to short pieces of brass or copper chain, which are in turn fastened to the candle holder as indicated.

After hammering the metal, all burrs



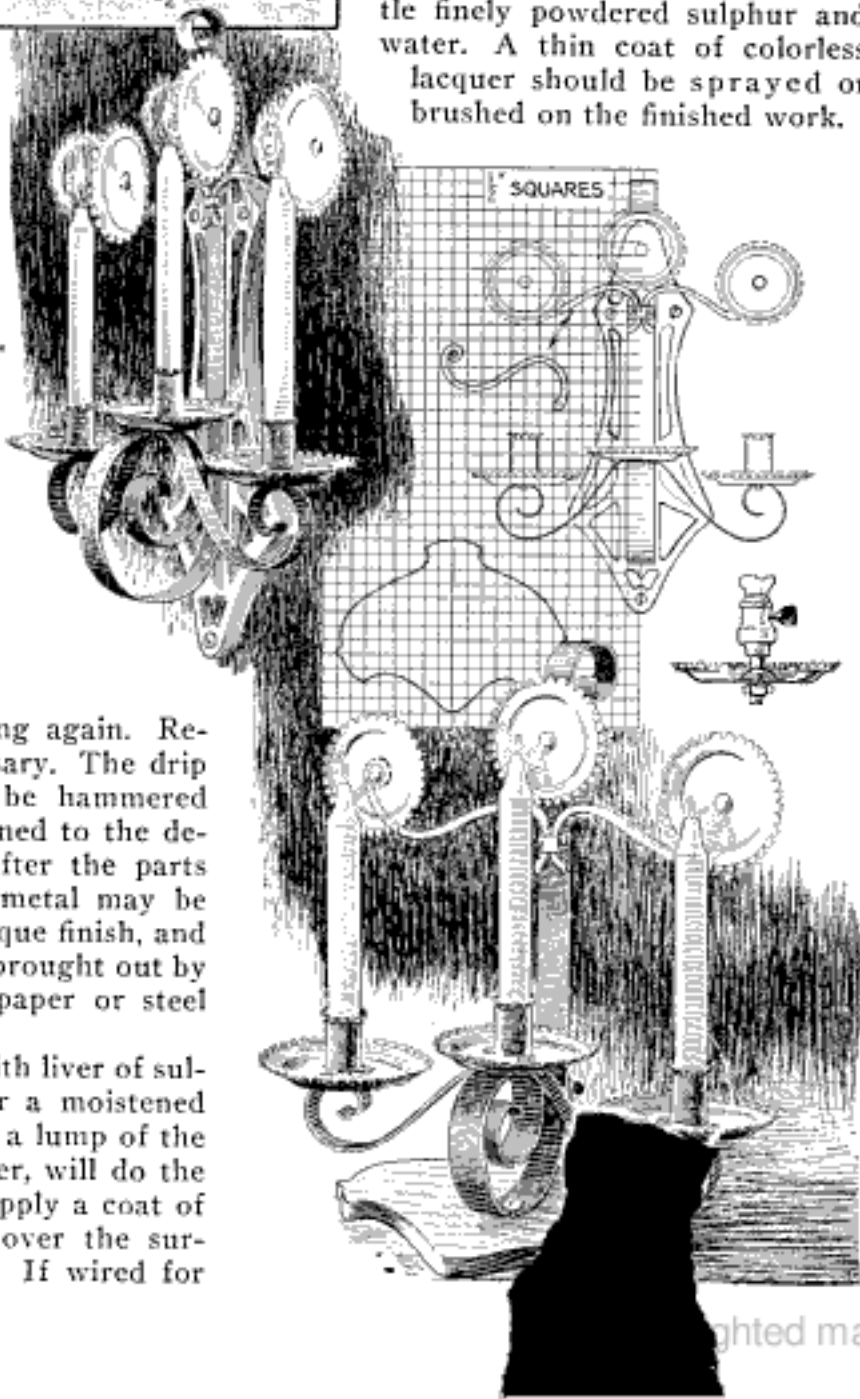
and sharp edges should be removed with a fine file. In working with copper, one must remember that hammering makes it hard and brittle, so that too much hammering may cause it to break. As soon as you notice this condition of hardness, heat the copper over a gas or a blowtorch flame until the entire piece assumes a reddish hue, then quench it in water. This process of annealing brings the copper back to its original soft state, so that you can proceed with the hammering again. Repeat this as often as necessary. The drip dishes and reflectors can be hammered over a hardwood block turned to the desired shape on a lathe. After the parts have been assembled, the metal may be blackened to give it an antique finish, and the high spots can then be brought out by rubbing with No. 00 sandpaper or steel wool.

The blackening is done with liver of sulphur dissolved in water, or a moistened wad of cotton, rubbed over a lump of the liver and then on the copper, will do the trick. If desired, you can apply a coat of transparent metal lacquer over the surface to preserve the finish. If wired for

electric lamps, candelabra sockets should be used.

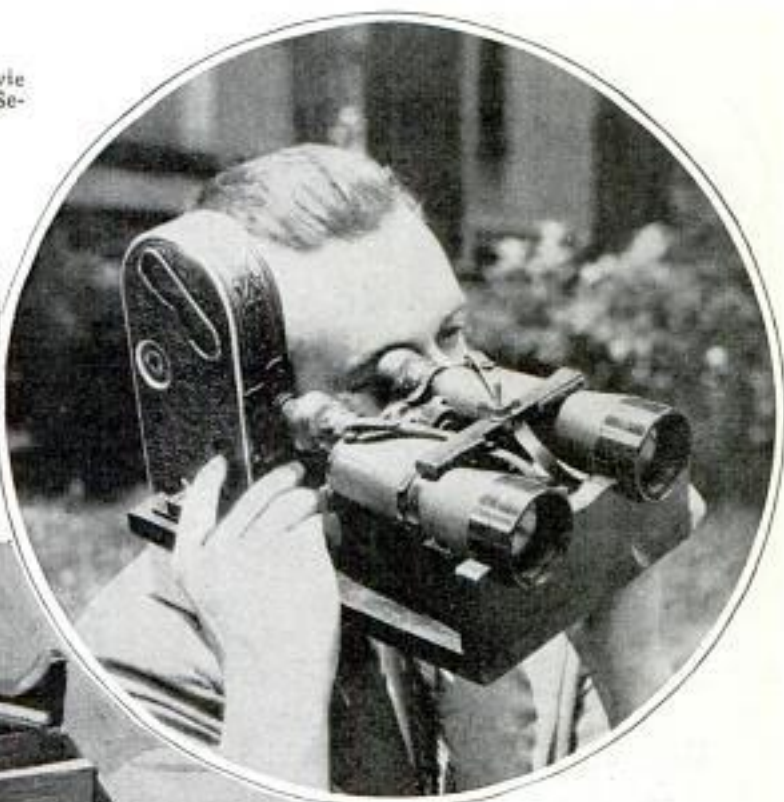
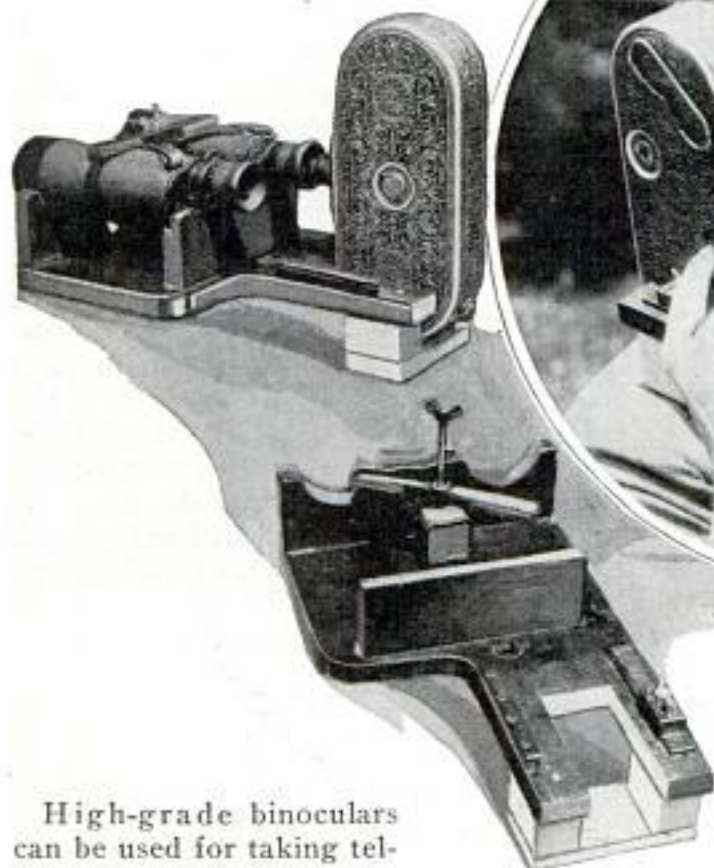
Green Finish for Brass

Brass articles may be given a green finish by immersing them in an almost boiling hot solution made by dissolving hypo, 8 oz., and iron nitrate, 2 oz., in 1 gal. of water. Before immersing the work, it should be thoroughly cleaned and finished with fine emery paper. When the desired shade of green develops, wash the work in running water to remove the chemicals. High lights may be brought out by brushing with a tampico brush or wheel and a little finely powdered sulphur and water. A thin coat of colorless lacquer should be sprayed or brushed on the finished work.



Telephoto Shots Made with Movie Camera

A Pair of Binoculars and a Home Movie Camera Are Both Held Together Securely on a Wooden Frame



High-grade binoculars can be used for taking telephoto shots with a movie camera, by mounting them on a wooden frame so that the sun shade of the movie lens fits securely around the eyepiece lens of the glasses. The focusing adjustment of the binoculars may be tested with the camera shutter open, on a piece of film leader. Paper stops with holes of various

size should be tried on a series of test exposures of a few frames of film each, in order to determine which stop should be used to permit adjustment of the regular lens diaphragm for the light, as if the binoculars were not used. If one eyepiece is adjustable for individual eyes, it is turned to about minus three, and that side used for the finder. This will provide approximately correct focus for the camera mounted behind the other eyepiece when the binoculars are adjusted until the object looks sharp in the finder.—J. D. Brubaker, Evanston, Ill.

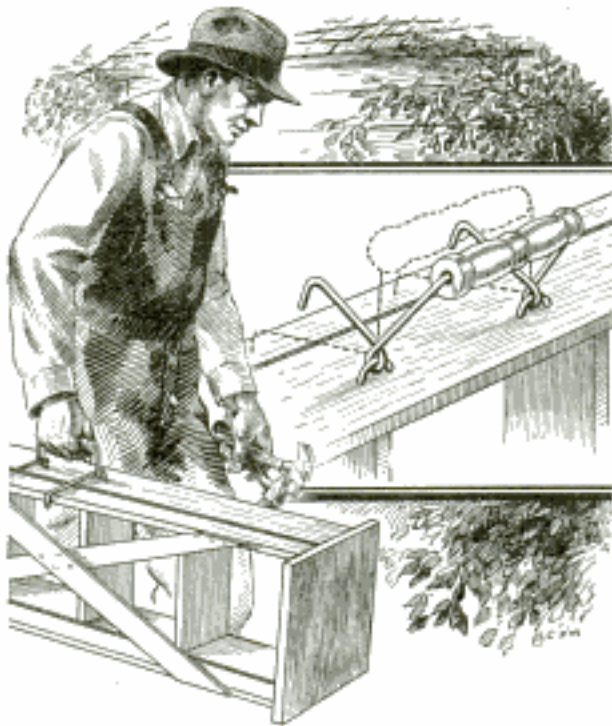
Removing Bursted or Swollen Shotgun Shell with Jackknife

Bursted or swollen shells can be removed from a shotgun with an ordinary jackknife. Do not open the blade of the knife, but grasp it with the right thumb pressed firmly against the handle facing your body, the finger tips holding the opposite side. Open the breech and hold the gun firmly with the left hand gripping the fore end. Point the barrel down ahead of the feet. Press the back of the knife blade

firmly down on the brass base of the shell ahead of the metal rim, and draw with a quick pull on the handle.

Envelope Sealer Makes Good Oiler for Small Tools

An envelope sealer, of the type with a hollow handle and a felt pad at one end, makes a good oiler for small tools. This is much handier to use than a regular oil-can, as the pad can be forced into slight irregularities in the tools.



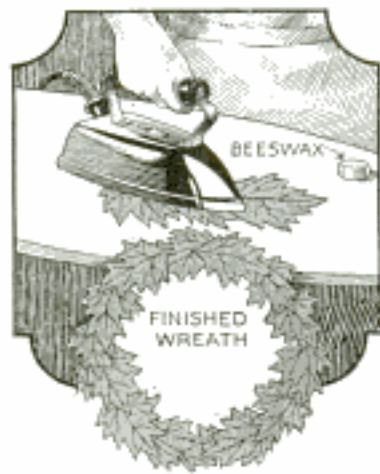
Stepladder Easily Carried with This Handle, Which Holds Both Legs Together

Carrying Handle on Stepladder

For carrying a stepladder, this handle is very practical. It consists of the wooden part of a bucket bail and a length of wire assembled and attached to the ladder as shown. When the handle is raised, the hooks engage the narrow leg of the ladder so that the two sections are held together.

Preserving Leaves with Beeswax

To preserve colored leaves gathered in the autumn for the purpose of making wreaths, use a hot iron with beeswax rubbed over the bottom when you press them. The wreaths can then be made by overlapping the leaves which will adhere better due to the wax.



☐ A flat piece of sponge rubber placed in the bottom of a soap dish will absorb water and keep the soap from dissolving.

Colored Finishes for Copper and Brass

Copper and brass articles may be given a color varying in shade from brown to black, by immersing them, after cleaning, in a solution made by dissolving liver of sulphur, 2 oz., and lye, 3 oz., in 1 gal. of hot water. When using this solution, it should be heated almost to the boiling point. Work placed in this bath will first take a brownish color, after which it turns red and continues getting darker until it is black. When the desired color has been produced, the work should be quickly removed and thoroughly rinsed in warm water. If high lights, or a variation in the color effect is desired, the work may be lightly scratch-brushed or polished with powdered emery, rouge or crocus powder until the desired effect is produced. If pumice powder is used for polishing, it should be mixed with oil or water, preferably the former, as it helps prevent any further change in color by the action of the atmosphere. The finished work should be coated with transparent metal lacquer to preserve the finish. Iron and steel may be colored by this process if they are first copperplated.

Wood Block Aids in Removing Ax

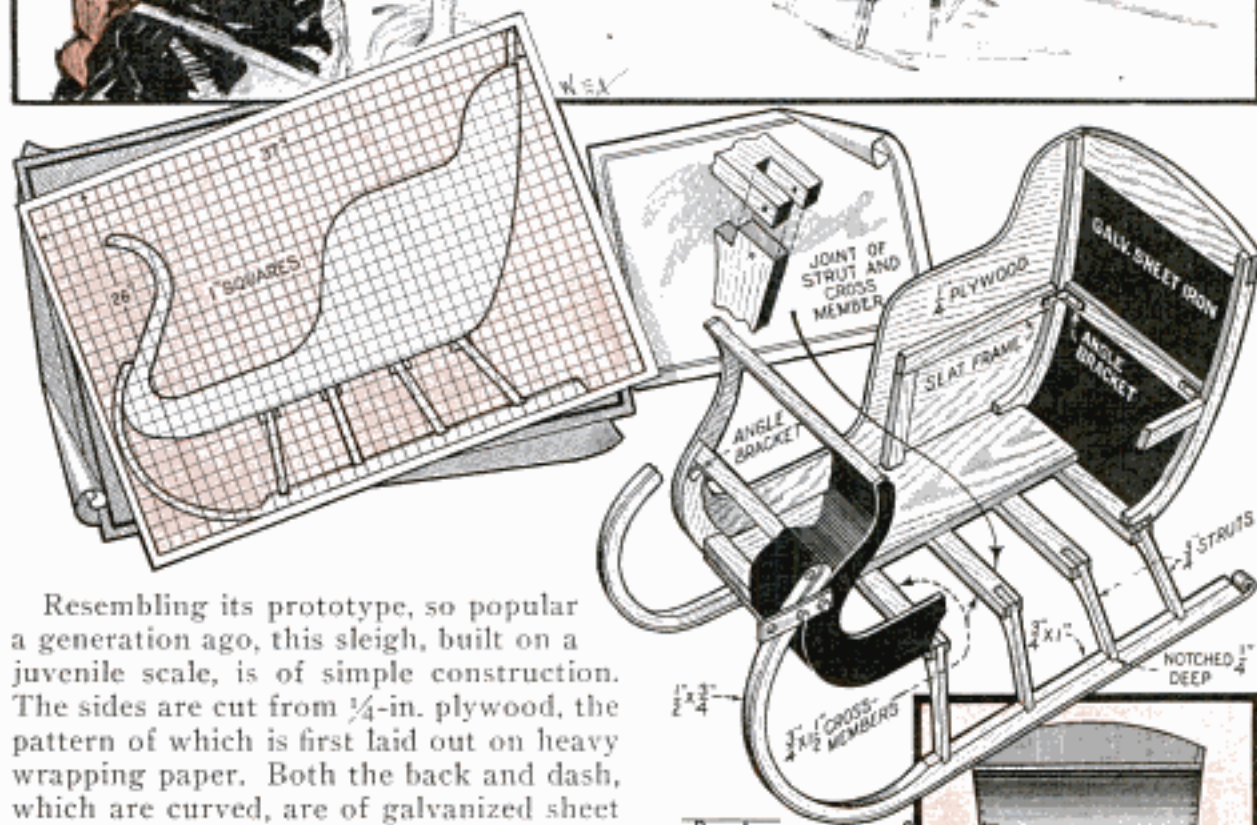
The next time your ax gets stuck in a knotty piece of wood, try this simple method of removing it: Place a small block of wood under the blade as shown and bear down on the handle. The block acts as a fulcrum under the blade, which is quickly released.



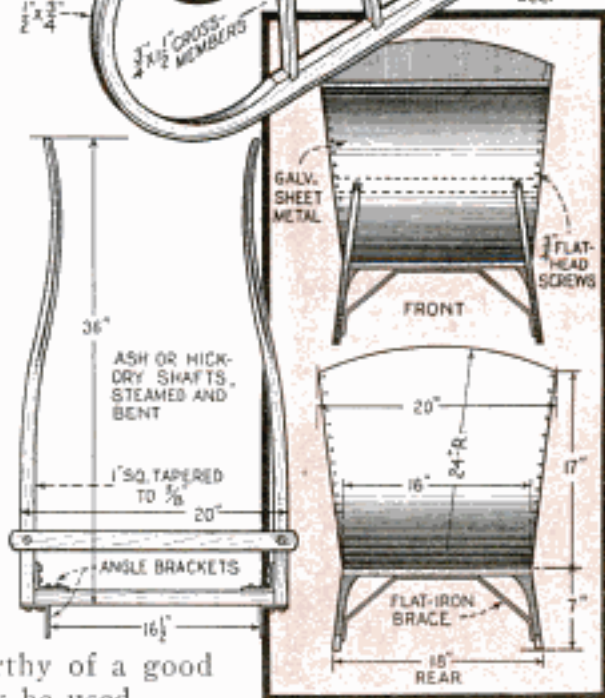
Pork Rind Makes Good Packing for Valves and Pumps

The rind of uncooked bacon makes a good packing for pumps and also efficient washers for sealing oil and gas-line unions and flange joints. Most of the fat should be removed before using. Rings of the rind, with alternate layers of asbestos, will give good service in steam lines carrying a pressure of not over 10 pounds.

Dog-Team Sleigh Resembles Old-Time Cutter



Resembling its prototype, so popular a generation ago, this sleigh, built on a juvenile scale, is of simple construction. The sides are cut from $\frac{1}{4}$ -in. plywood, the pattern of which is first laid out on heavy wrapping paper. Both the back and dash, which are curved, are of galvanized sheet iron. Straight-grained lengths of ash or hickory are used for the runners. The curved ends are made by steaming the wood thoroughly and then bending it around a wooden form to which it is clamped until dry. Four notches, $\frac{1}{4}$ in. deep, are cut to take the frame struts, which are mortised to the crosspieces, the joints being glued and screwed for strength. The curved frame pieces of the body are bandsawed. Strips of $\frac{1}{8}$ by $\frac{5}{8}$ -in. flat iron are screwed to the underside of the runners with flat-head screws, well countersunk. The shafts are made of the same stock as the runners and bent by steaming. When completed, the job is worthy of a good paint job, for which enamel or lacquer may be used.





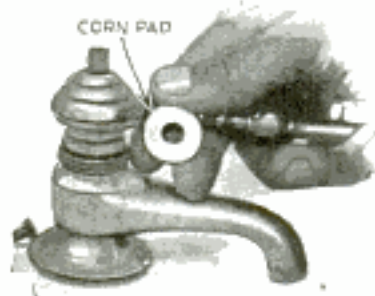
This Foot Bridge across a Small Stream Is Made from Old Steel Rails and Planking

Steel Rails Support Foot Bridge

Old rails from a railroad track can be used to make a sturdy foot bridge. A log or tie is buried on each bank of the stream to be bridged, and the ends of the rails spiked to them. The floor, consisting of 2-in. planks, is laid between the rails so that the ends of the planks rest on the lower flanges. When spiking the rails, care must be taken to get them parallel so that the planks can be slipped in place from one end.—Willie Hudyma, Winnipeg, Can.

Water Faucet Temporarily Packed with Corn Pads

For temporary use, the small pads used for removing corns make good packing for the spindle of a water faucet. They usually will fit inside of the packing nut, while the material is pliable enough to close any leak around the spindle effectively.



Oil blotches and spots on films taken with an amateur moving-picture camera can be removed by passing the films through a tray of cleaning naphtha, removing the surplus with a cotton wad.

Paste and Liquid Polishes for Brass

A liquid brass polish that is non-inflammable is made by thoroughly mixing powdered rottenstone, $1\frac{1}{2}$ oz., powdered pumice-stone, 1 oz., and oxalic-acid crystals, 2 oz., in 1 qt. of hot water. The polish must be shaken before using, and should be applied with a piece of soft felt or chamois skin. A similar polish in paste form is made by mixing finely powdered pumicestone, 10 oz., oil of turpentine, $\frac{1}{4}$ oz., good liquid soap, $1\frac{1}{2}$ oz., and lard oil, 1 oz. When these ingredients have been thoroughly mixed, add oxalic acid, $\frac{1}{4}$ oz., dissolved in hot water,

$\frac{1}{4}$ pt. Stir the combined mixtures to the consistency of paste. Apply with a soft cloth, and rub until the desired luster is produced, after which the surplus polish is removed with a soft rag.

Holes Convert Shovel into Sifter

By drilling rows of holes through an old coal shovel, it will be found handy for sifting sand or ashes over icy sidewalks. The holes will not interfere with the use of the shovel in the coal bin.



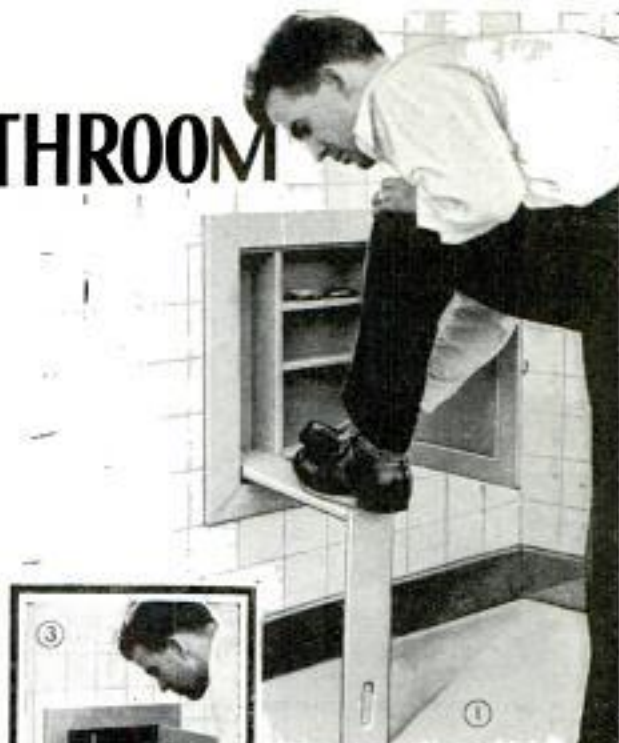
Graphite Keeps Type Clean When Cutting Stencils

To avoid the wax coating from clogging the type, when cutting a stencil on a typewriter, simply dust the cleaning brush with a little powdered graphite and go over the type. If graphite is not available, cut a soft-lead pencil to a sharp point and force this into the openings of the type that clog most frequently. If this is done, you will find it necessary to clean the type only after cutting each stencil.

Built-in FITTINGS for the BATHROOM

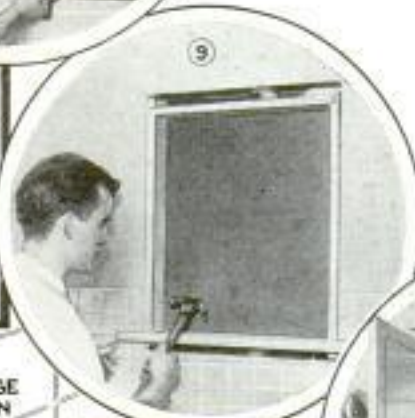
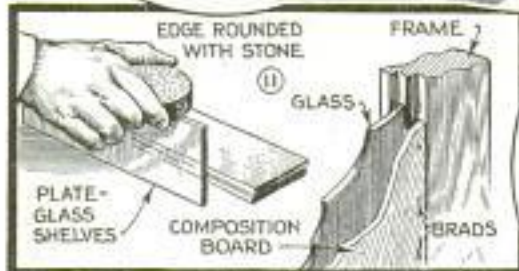
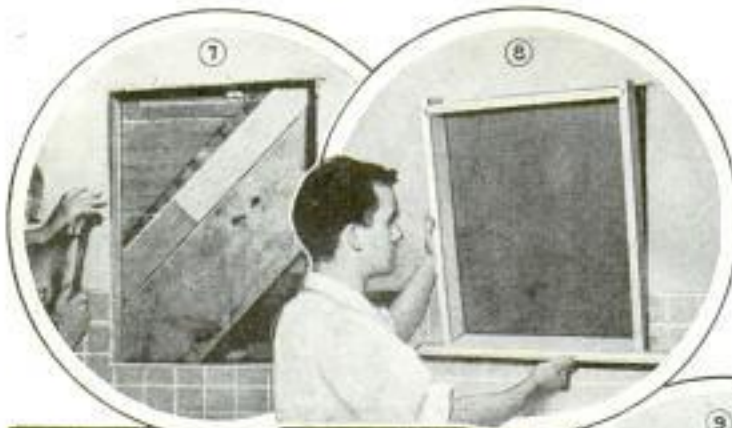
BUILT-IN fittings mean added comfort and convenience in the bathroom. In almost every case, the average bathroom can be greatly improved by the installation of one or more of these units. The work is simple, the material inexpensive and the whole job is well within the capability of the home craftsman.

A handy cabinet for shoe-shining supplies is shown in Figs. 1, 2 and 3. A hole should first be cut through the lath and plaster to take the boxlike frame. This is securely nailed to the studding, additional studs and headers being put in where necessary. The back of the frame and the panel in the door are cut from thin plywood or composition wood fiberboard. Notice that the inside of the frame must be $15\frac{1}{2}$ in. from the floor so that the foot support will come to a level position when the cabinet is opened. The other dimensions should be carefully followed so that the support will nest neatly within the opening without any tendency to fall out when the door is opened. Backband trim should

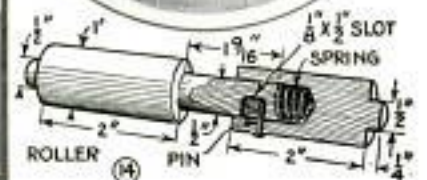
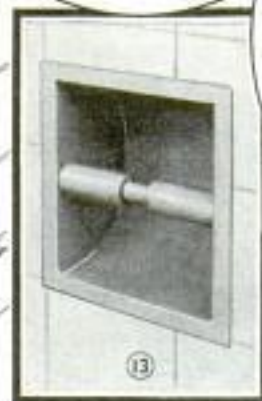


be added to the cabinet, if the rest of the woodwork is finished in this manner.

A laundry chute, as in Fig. 5, is also practical. You can install one easily by using two or more lengths of standard furnace pipe. This is pushed up from the basement after the necessary holes have been cut through wood and plaster, as shown in Fig. 4. In a job of this nature, it is advisable to drill a pilot hole first and check with a weight on a length of string in order to determine if the way



is clear, or push a flexible stick up from the basement. Change the selected location for the chute if any obstacle is encountered between the two floors. Fig. 6 shows how the end of the first pipe section is cut away to fit the cabinet opening. The basement end of the chute should be fitted with a detachable canvas bag. The construction of the cabinet itself is simply a matter of a box frame with a door hinged to the floor, as can be seen in the photograph.



Of course, the familiar medicine cabinet is quite essential. The construction for this is much the same as for the shoe cabinet, with minor changes in the interior and in size. Be sure to nail the loose lath ends to short sections of 2 by 4-in. stock set into the proper position, as in Fig. 7. Headers and base plates can be added, but are not necessary. Fig. 8 shows the frame being slipped into place. This is nailed to the vertical timbers previously set, as in Fig. 9. The completed cabinet, with back-band trim, is shown in Fig. 10. The rests for the glass shelves and the necessary hardware can be purchased for a nominal amount. The facing edge of the shelves should be carefully rubbed with a piece of

sandstone, as shown in Fig. 11, using water as a lubricant. Notice, also in Fig. 11, how the door is double-rabbeted in order to receive the glass and the composition backing. No dimensions are given here, the usual procedure being to pick up a good glass first and make the woodwork to fit.

The flush-type paper holder shown in Fig. 13 is both convenient and neat. No. 28-gauge galvanized stock is fitted over two semicircular pieces of wood to

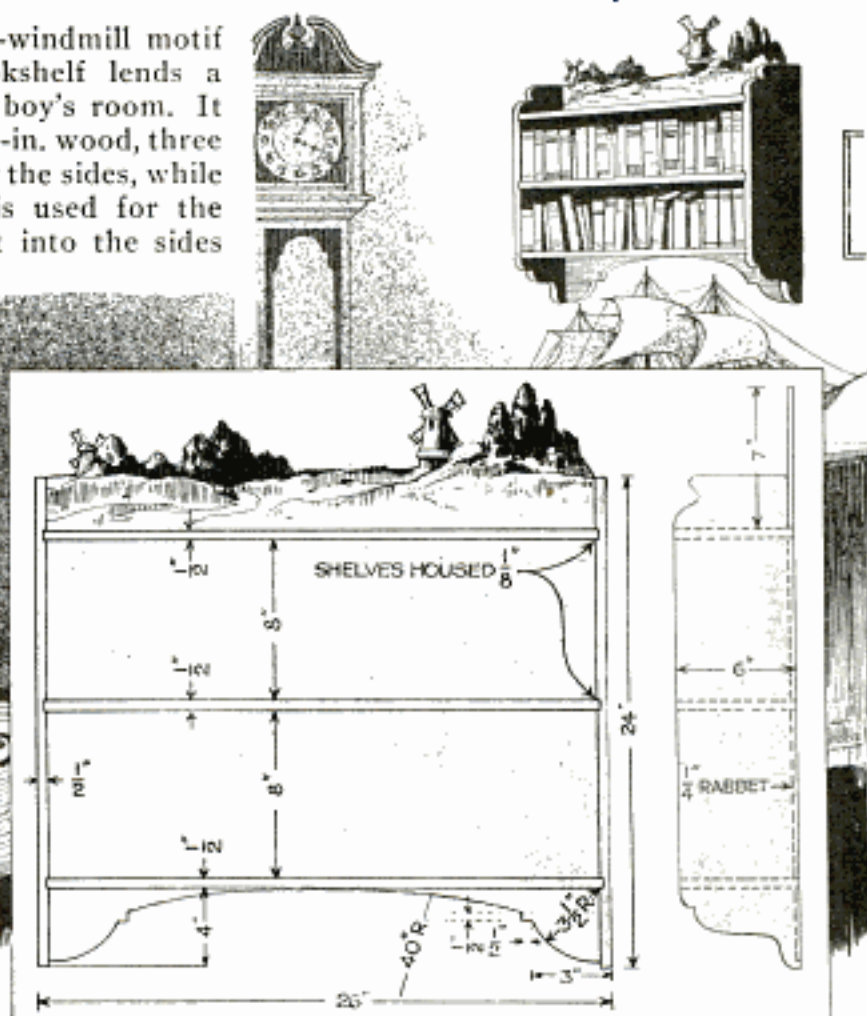
make the unit, as shown in Fig. 12. The roller is important. It must be made so that it will readily expand and contract to permit a fitting of the paper. The detail in Fig. 14 shows this part of the construction.

Lubricating Mechanism of Padlock

A thin coating of powdered graphite will protect the mechanism of a padlock from rust. First dip the lock in kerosene, and then dry it out thoroughly with an air blast. Fill a rubber bulb, of the kind used for filling storage batteries, with the graphite and blow it into the mechanism. Be sure that the inside of the bulb is dry. After blowing out the surplus graphite from the lock mechanism, it will be lubricated for a long time.

"Landscape" Bookshelf for the Boy's Room

By virtue of the Dutch-windmill motif across the top, this bookshelf lends a touch of interest to your boy's room. It consists of five pieces of $\frac{1}{2}$ -in. wood, three for the shelves and two for the sides, while a piece of $\frac{1}{4}$ -in. veneer is used for the back. The shelves are set into the sides



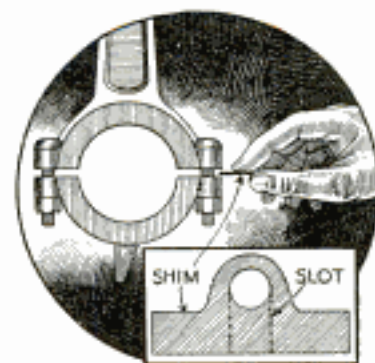
$\frac{1}{8}$ in., and the latter have a $\frac{1}{4}$ -in. rabbet at their rear edge to take the back. The landscape is drawn across the top of the back and cut out with a scrollsaw, as well as the curve at the bottom and the harmonizing curves at the top and bottom of the sides. After the bookshelf has been assembled with glue and screws, the scene can be brought out in sharp relief with color, and then one or two coats of clear varnish are applied.

Judging Distances by Means of Known Measurements of Your Body

When a scale or tape measure is not available, approximate dimensions may be obtained by using various parts of your body as units. To do this, you should know the correct distance of your reach, spread of the arms, length of your forearm, and the span of the extended hand; also the height from the ground to the

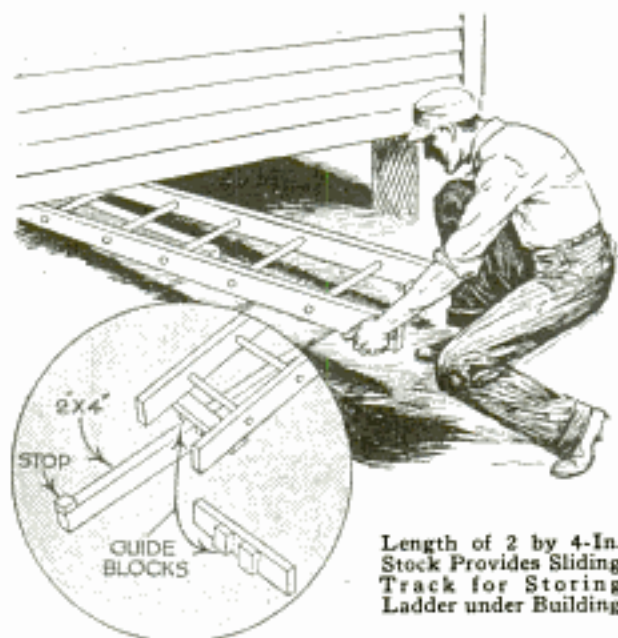
top of your head, to the chin, and to your eye level. The length of one's step from heel to heel may be found by walking naturally a known distance and counting the steps.

Slotted Shims Simplify Adjustment of Bearings



top of your head, to the chin, and to your eye level. The length of one's step from heel to heel may be found by walking naturally a known distance and counting the steps.

By slotting a shim as shown, it can be taken out or replaced without removing the bearing cap. This will save time in tightening connecting-rod bearings in a car, as it is often necessary to remove the cap several times before the right thickness is found.



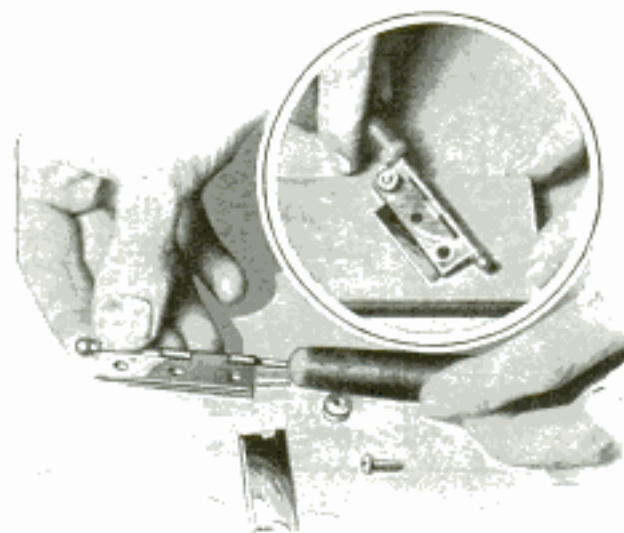
Length of 2 by 4-In. Stock Provides Sliding Track for Storing Ladder under Building

Ladder Slides on Track Laid under Building

Anchored on the ground, a length of 2 by 4-in. stock provides a good sliding track for storing a ladder under a building. Guide blocks, to keep the ladder on the track, are nailed to a cleat, which is in turn nailed across the top end of the ladder. A little grease smeared over the upper surface of the rail will reduce friction.

Holder for Stropping Razor Blades Improved from Hinge

Here is a holder for stropping safety-razor blades that is made from an ordinary cabinet hinge. First place the hinge in a vise and press the two leaves until they lie flat against each other. Then,



Hinge Fitted with Handle and a Bolt Makes Holder for Stropping Safety-Razor Blade

with a wedge between the edges at one end, apply pressure at the other end to distort the leaves slightly. Drive a nail into a wood handle, cut off the head, and insert it into the hinge instead of the regular pin. A small bolt and thumbnut is used at one end to clamp the blade between the leaves.

Cleaning Gauze Strainers with Heat

Fine-mesh wire or gauze strainers are easily cleaned of gummed grease and dirt by burning off the accumulation. Canned heat will be found handy for this purpose. A flame produced in this manner will burn the grease, but is not hot enough to damage the screen. On soldered screens, care should be taken not to melt the solder. Canned heat can be carried in the car, and it is ready for use in any emergency when shop facilities are not available.

Canvas Repair for Hole in Bucket

Large holes in a bucket can be temporarily repaired with a piece of canvas. The surface of the bucket around the hole is first coated with paint, after which the canvas is thoroughly saturated with paint and pressed over the hole. When the paint has dried, the hole will be sealed. While this is not intended as a permanent repair, it will prolong the service of the bucket for a considerable time.



Killing Moths in Closets

Here is a simple method of killing moths in a clothes closet. Moth cakes or crystals are placed in a small pan and set on top of a hot brick, which is held in a pie pan on a shelf. An inverted pan is placed under that holding the brick, to keep the heat from damaging the shelf. For best results, the closet should be sealed tightly and kept closed for at least two hours after the treatment. The fumes generated in this manner are heavier than air, so the equipment should be placed on a shelf near the ceiling.—William C. Reichard, East Orange, N. J.



SHOP NOTES

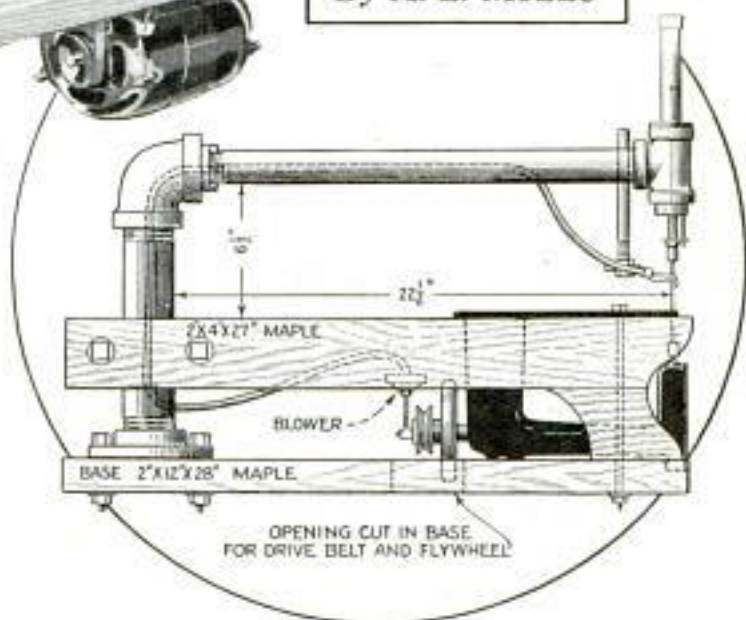
Efficient SCROLLSAW for Heavy Duty

A High-Speed Machine with a 22-In. Swing

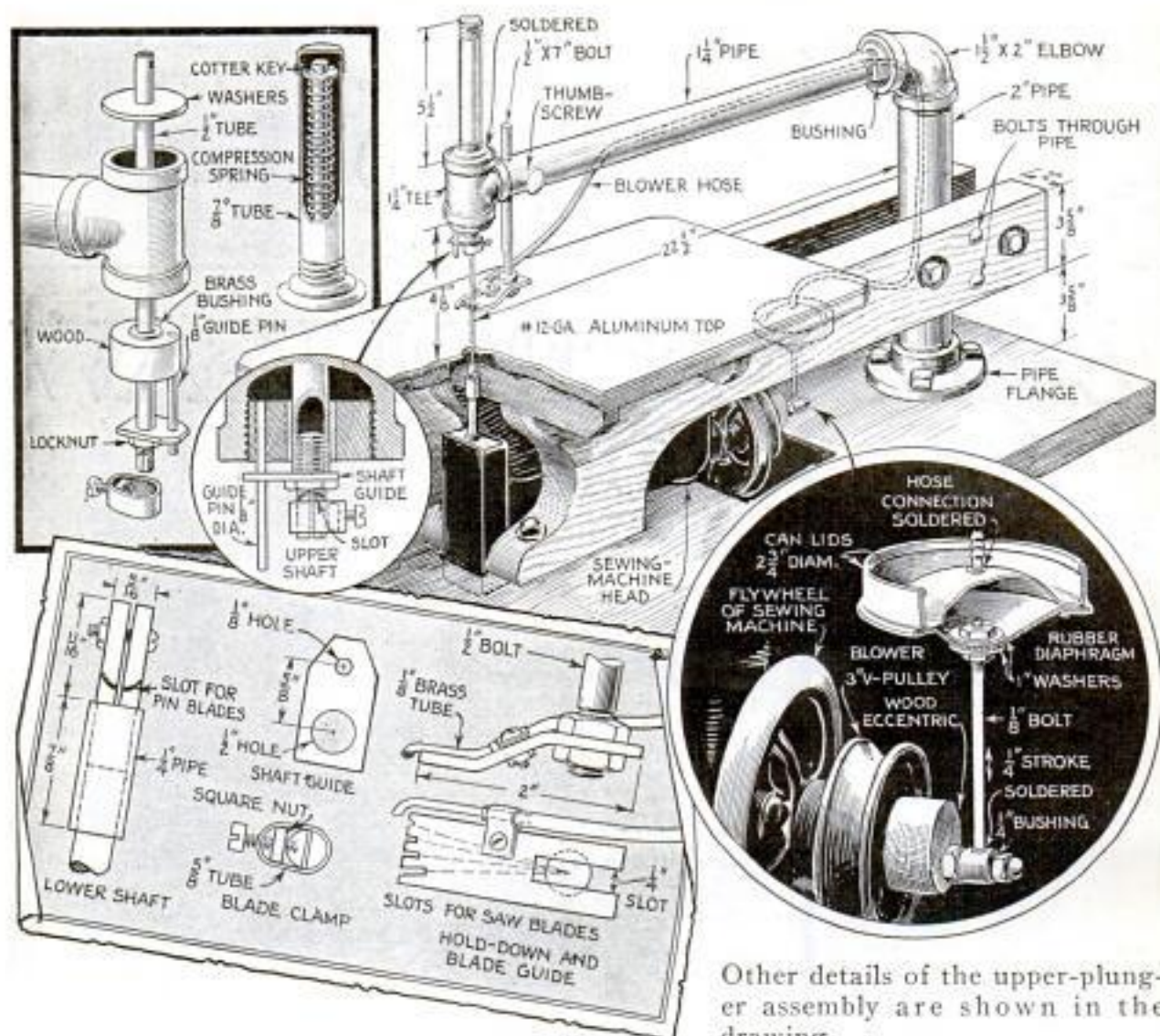


THIS powerful scroll saw cuts 1½-in. stock with ease at 1,400 strokes per minute, and is designed to be used with either the heavy saber-type of blades or the finest jewelers' blades. If you have an old sewing-machine head and a ¼-hp. motor, the total cost should not exceed \$5.

The sewing-machine head is adapted to its new use by first removing the needle shaft and holder and substituting a blade holder. The head is then inverted and securely bolted between two lengths of 2 by 4-in. maple which are supported on two hardwood blocks bolted either to a separate base or directly to the bench top. Due to variations in the size and needle stroke of different types of sewing-machine heads,



slight alterations may be found necessary when assembling, and for this reason some of the dimensions have been omitted as they depend on the particular installation you will use.



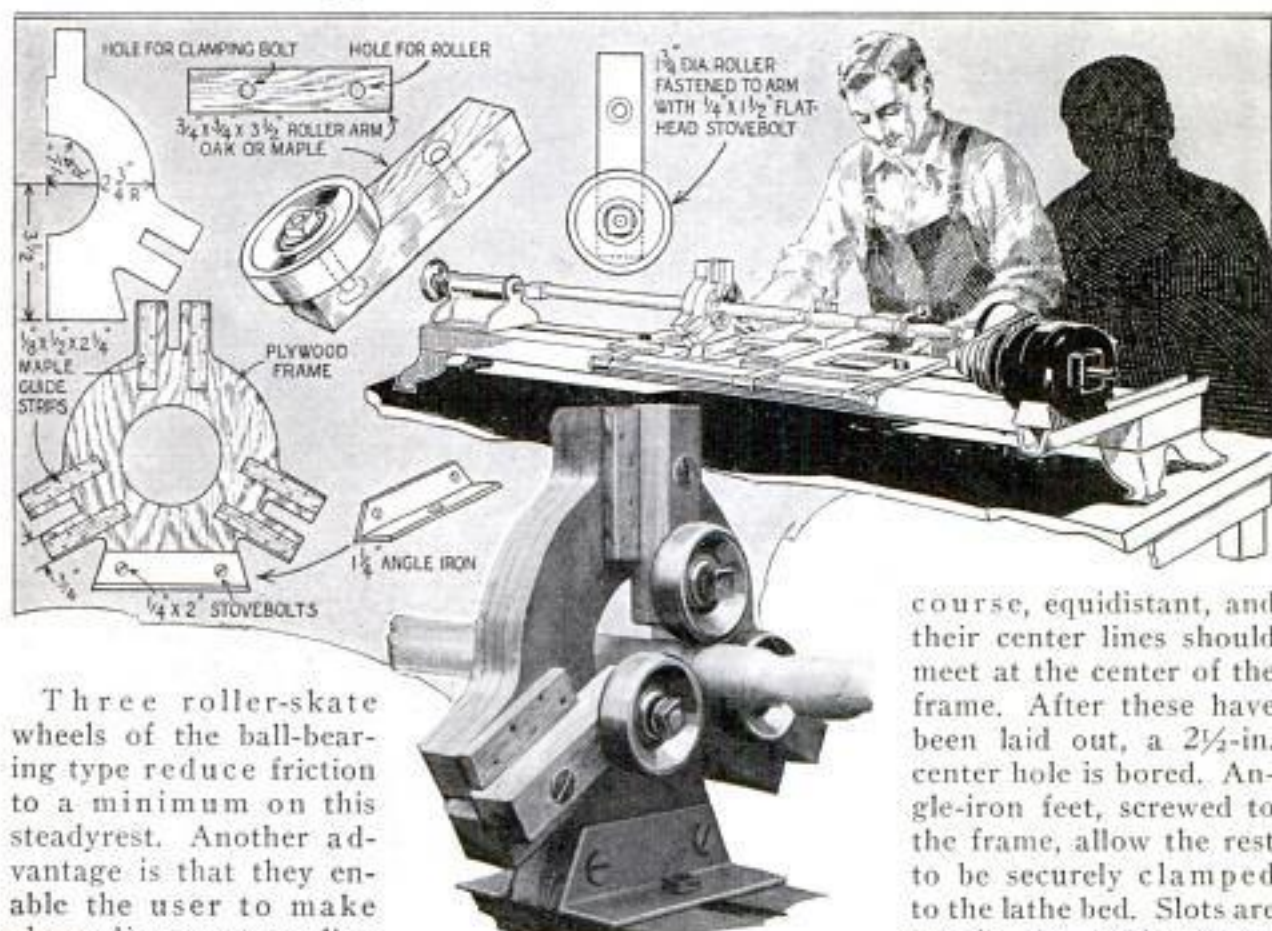
Other details of the upper-plunger assembly are shown in the drawing.

Pipe and fittings are used for the frame. When assembling it, the joints should be turned in as tightly as possible. The flange is securely bolted to the base. A saw table of $\frac{3}{8}$ -in. hardwood is made to fit over and around the base of the sewing-machine head. It is covered with a 10 by 20-in. plate of No. 12-gauge aluminum. A $\frac{1}{2}$ -in. hole is drilled in the plate to form an opening for the blade. The upper slide shaft, or plunger, is made from a 9-in. length of $\frac{1}{2}$ -in. seamless-steel or brass tubing. The lower end is bushed with a piece of brass tubing soldered in place and tapped to take a $1\frac{1}{2}$ -in. length of $\frac{3}{8}$ -in. bolt. The shaft guide is then drilled as shown. It is held against the end of the tubing with a thin nut. A wooden disk, bushed with brass to fit the plunger, carries the lower end of the latter and also the metal guide pin which prevents the plunger from turning. The wooden disk is turned into the lower end of the pipe tee.

The combination blade guide and hold-down is made by first sawing the head from a $\frac{1}{2}$ by 8-in. carriage bolt and filing two $\frac{1}{8}$ -in. grooves in the threaded end at right angles to the length. The end of the hold-down is slotted to fit the grooves and is held with two nuts as shown. Narrow slots are filed in the opposite end of the hold-down to serve as guide slots for the various sizes of blades. The blower nozzle is formed by bending a short length of $\frac{1}{8}$ -in. tubing to an elbow. A blower is easily made from tin-can lids and is driven by means of a wooden eccentric attached to the outer end of the V-pulley hub. The rubber hose is led from the blower through the frame to the nozzle as shown.

Experiments carried on by federal horticulturists prove that grapes treated with carbon dioxide before they are shipped, shatter very little in transit.

Ball-Bearing Steadyrest Does Not Mar Work



Three roller-skate wheels of the ball-bearing type reduce friction to a minimum on this steadyrest. Another advantage is that they enable the user to make close adjustment, to eliminate whip, without marring the work. The wheels are held on hardwood arms that slide between guides on a frame of 1-in. plywood. The guide extensions are, of

course, equidistant, and their center lines should meet at the center of the frame. After these have been laid out, a 2½-in. center hole is bored. Angle-iron feet, screwed to the frame, allow the rest to be securely clamped to the lathe bed. Slots are cut in the guide extensions to accommodate the adjustment bolts that pass through the roller arms, the bolts being provided with washers and wingnuts.—M. C. Smock, Jr., Indianapolis.

Buffing Compound in Stick Form

Buffing compound can be made in stick form by melting together equal parts of hard tallow and paraffin, varying the proportions according to the hardness desired in the stick. The more paraffin used, the harder the compound will be. If beeswax is available, it is better than paraffin, although its cost is greater. When the waxes have been well mixed, stir in powdered abrasive until the mixture becomes quite thick, and then pour it into long slender paper tubes. After the compound has hardened, the paper molds are removed. The abrasive substance to use depends on the kind of work for which the stick is intended. Emery powder cuts rapidly and is available in a variety of grades, while powdered tripoli, crocus, rouge and several other abrasives are suitable for fine work.

Fine powdered lime is often used for polishing. The name and grade of the abrasive should be marked on the stick, or if several abrasives are used, the batches may be colored differently by dyeing the molten wax with aniline.

Screw Holds Saw on Sloping Roof



A pointed woodscrew, substituted for one of the regular screws in the handle of a saw and projecting about 1 in., will keep it from sliding off of a sloping roof. When the saw is laid on its side the screw digs into the roof.



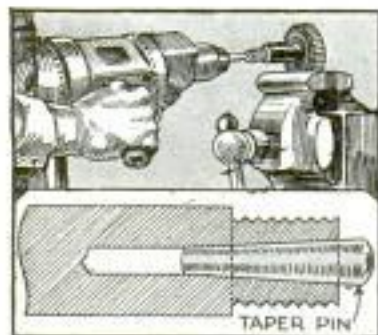
Spaced at Equal Intervals, Three Wooden Blocks Hold Auto Casing Open When Examining Inside for Tacks

Notched Blocks for Holding Casing Open for Inspection

When inspecting the inside of an auto casing for tacks or other sharp objects, three wooden blocks, notched as shown, will be found useful in holding the casing open. In use, the blocks are set against one edge of the casing while the other edge is held in the notches.

Threads Renewed by Expanding Shaft with Tapered Pin

Worn or stripped threads on a propeller shaft, axle, or similar part, are easily renewed by expanding the part and rethreading. To do this, drill and ream a tapered hole, of a diameter equal to about one-half that of the threaded part, in the



end of the shaft. Then drive a taper pin into the hole, which will expand the metal enough to permit recutting the old threads. Care should be taken not to expand the shaft too much. It is a good idea to set a pair of calipers to the full outside diameter of a good thread

and then test the part while expanding it. Bronze can be worked cold, but steel should be heated before driving in the pin.

Packing Clay Is Moistened with Sprayer While Babbitting Bearings

To prevent packing clay, used when babbitting bearings, from drying so that it lets the molten metal run out, it is a good idea to have a small hand sprayer ready-filled with water to keep the clay moist. This will enable a workman to pour several bearings at once, as there will be no risk of the clay drying, and the babbitt will not have to be remelted each time it is used.—Waldo Orton, Griswold, Iowa.

Plumb Bob Useful in Setting Posts

For setting posts in a true vertical position, the illustrated method is accurate. A V-shaped notch is cut out at the end of a board and a hole is drilled about 6 in. below the notch. With the plumb line through the hole, the board is set against the post at any convenient angle. The line will then hang in a true vertical position, close to the post, so that one can readily see whether or not they are parallel. This method is especially helpful when setting long poles.—R. H. Kasper, Philadelphia.



Cane Molasses Is Good Feed for Beef Cattle

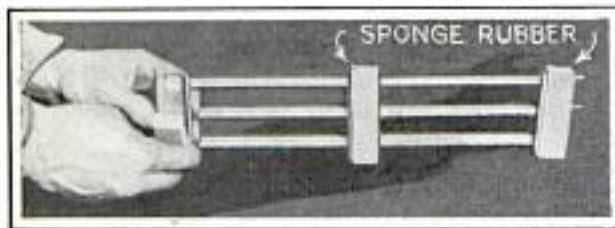
Experiments carried on by the experimental farm of the Canadian government show that beef cattle fed on a diet containing 8 per cent of cane molasses had a daily gain of $\frac{1}{4}$ lb. over cattle fed on a meal mixture alone. The cost of this increase in weight is less per pound than if the cattle were fed without the molasses.—James Montagnes, Toronto, Can.

A Non-Corrosive Etching Solution

A non-acid etching solution for iron and steel that will not burn the hands or cause the rapid rusting so generally encountered with these solutions, can be made by dissolving copper sulphate, 12 oz., zinc sulphate, 4 dr., and common salt, 10 oz., in water, 3 pt. Although this solution works more slowly than acid, it will reproduce fine lines and does not blister the varnish or wax used for masking. It may be applied with a brush or tuft of cotton. Fine lines, lettering and designs are easily cut in a thin film of paraffin wax, spread over the surface of the steel to be etched. This can be done by either melting the paraffin and applying it with a brush, or by dissolving it in gasoline and flowing it over the surface. When the gasoline evaporates, the thin film of paraffin may be lettered with a scribe. In making designs for etching it is important to make the lettering clean-cut, as the solution will not attack the metal where it is coated with even a thin film of wax.

Sponge Rubber Lessens Noise of Toy Trains

Placed under the ties of a toy railroad track as shown, pieces of sponge rubber will absorb the vibration from the train and lessen the noise considerably, which is



Sponge-Rubber Pads under Toy-Railroad Ties Absorb Vibration and Lessen Noise

especially noticeable when the track is laid on a bare floor. The rubber can be cut from old kneeling pads or purchased at small cost.

Improved Self-Dumping Arrangement for Coal Truck

For emergency use on a coal truck that is not equipped with a self-dumping mechanism, one end of a rope can be tied to the rear of the body and the other end to a hook fastened to one of the lower spokes



Rope Attached to Rear Wheel and Body of Truck Provides Self-Dumping Arrangement

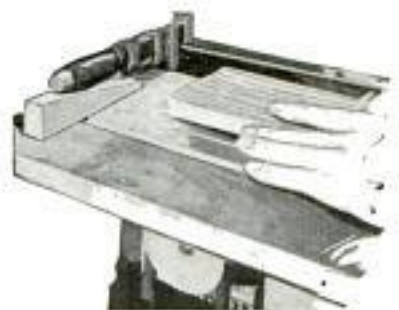
of the rear wheel. When the truck is backed, the body will be tipped as shown. After dumping the load, the truck is driven forward to let the body down again.

Aluminum in Engine Head Increases Compression Ratio

On many of the small single-cylinder gasoline engines the heads were ordinarily cast for the use of breaker points for the ignition system, which are now replaced with a spark plug. The use of the plug lowers the compression ratio with consequent loss of power. By filling in the cavity, originally intended to take the points, with aluminum, the ratio will be reestablished. Babbitt or lead is not suitable for this purpose, as it melts when the engine gets hot. A wooden plug should be driven into the spark-plug hole to keep it open to the combustion chamber while pouring the aluminum.

Monkey Wrench Serves as Stop on Saw Fence

Clamped over the saw fence, a monkey wrench makes a quick-acting stop. A wooden wedge is pushed under the wrench to hold it in place. If considerable work is done that requires the use of a stop at different settings, the fence may be graduated.



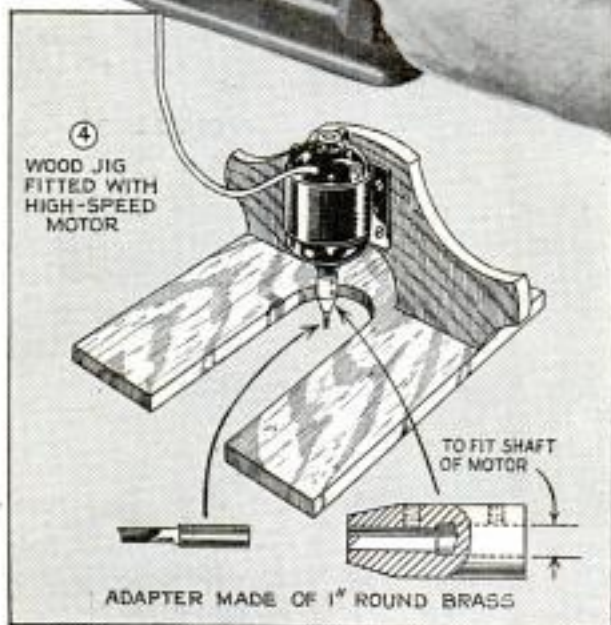
Jigs and



①
YOUR DRILLPRESS
CAN BE USED FOR
ROUTING CURVED WORK



②
GRINDING
THE ROUTER
BIT ON AN
EMERY WHEEL



④
WOOD JIG
FITTED WITH
HIGH-SPEED
MOTOR

TO FIT SHAFT
OF MOTOR

ADAPTER MADE OF 1" ROUND BRASS

IRREGULAR routing on curved work, recessing designs for inlaying, and fluting and beading operations on turned legs are usually beyond the limits of a hand routing plane. Work of this nature can often be done on motor-driven workshop machines such as the drillpress, Fig. 1, and mortiser, Fig. 11, or by means of simple jigs that you can improvise from small pieces of hardwood stock.

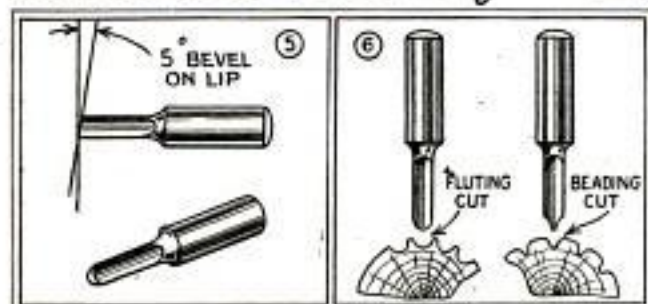
Small bits suitable for this work may be obtained directly from the manufacturers of routing machines or, failing this, the type of router bit used by engravers can be made to serve the purpose. The latter type will have to be altered slightly to adapt it for use on wood, as the cutting lip is ground flat for use on metal. Fig. 5 shows a bit properly ground with the cutting lip slightly concave and the edge beveled. The bevel shown on the cutting edge of the bit is important, as the degree of the bevel determines the clearance and varies somewhat with the wood used. For soft wood, a slightly greater degree of bevel than that shown is required. Grinding the bit is best accomplished on an emery wheel, as shown in Fig. 3, although it can also be done by hand on an ordinary oilstone, holding the bit vertically with the beveled cutting edge flat on the stone.

When you use a drillpress to rout a groove for a curved line inlay, a guide is clamped to the table, as shown in Fig. 2.

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Fixtures for ROUTING

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By W. CLYDE LAMMEY

This assures cutting the groove a uniform distance from the edge in both straight and curved work. If the work is of such a nature that it must remain stationary, it will be necessary to use a specially made jig, like the one shown in Figs. 4, 7 and 8. This consists of a suitable wooden frame on which a small high-speed motor can be mounted. A chuck or adapter to hold the router bit securely on the motor shaft can be made by drilling and counterboring a short length of 1-in. round brass, as in the lower detail of Fig. 4. In fitting the chuck, it is necessary to take care that both the motor shaft and the bit shank are a close fit in the holes, so that, when the set-screws are tightened, the parts are not thrown out of line, which would result if the hole were slightly oversize. Used with a motor in this manner, the bit should not exceed $\frac{1}{8}$ in. in diameter, nor should it cut deeper than $\frac{1}{16}$ in.; otherwise it will be very difficult to guide it in following a line on an irregular or curved pattern. Also, where possible, the bit should be moved over the work either directly toward or away from the operator, as this gives better control. If a small motor is not available, a flexible shaft may be attached to a larger motor placed in a convenient position, and the working end of the shaft is then fastened to the router frame, as in Fig. 7. The shaft is held securely in place by cutting a groove in the vertical piece to which it is attached by means of a U-bolt, or grooved blocks and two bolts, the latter fitted with thumbnuts to permit quick adjustment for depth. The

FLEXIBLE SHAFT
MAY REPLACE MOTOR



opening through which the end of the shaft projects to the surface of the work should be large enough to allow the bit to be seen and to prevent the chips from collecting around it. Other fixtures, similar-

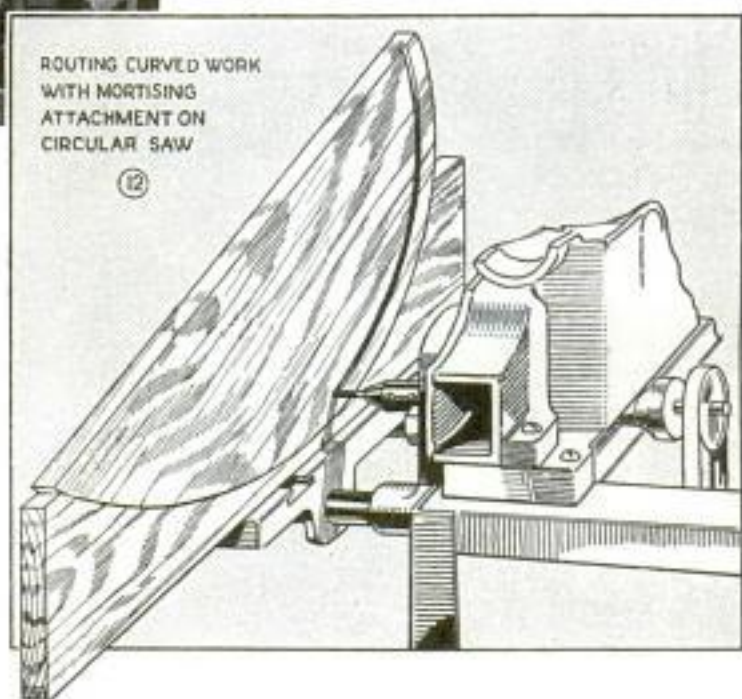


routing out the recess, as indicated in Fig. 9, which will make it much easier to follow the lines accurately. Acute angles in which it is impractical to run the router bit, can be chipped out to the level of the recess with a sharp knife.

Straight fluting and reeding on table legs may be done with the router bit and flexible shaft by making a jig and sliding fixture as in Fig. 15. To do accurate work, the jig must be carefully made and the bevel on the top edge of the sides must equal the taper of the portion of the leg that is to be fluted, in order that the depth of the cut may be uniform from one end to the other. Two centers must be provided for support-

ly utilizing a flexible shaft, are shown in Figs. 8, 14 and 15. The first one is especially handy for use on large surfaces where intricate patterns are cut out, as it affords a clear view of the work. The one shown in Fig. 14 is particularly adapted for making straight-line cuts, and for this reason is provided with a guide, which is made of hardwood and supported on two steel rods, as indicated. Thumbscrews on the guide enable the user to adjust it for spacing the cut any desired distance from the edge of the work. The guide is also removable, so that the router can be used for irregular work.

When using a flexible shaft for routing, particularly with the type of jig shown in Fig. 8, heavy cuts are likely to cause chatter owing to the overhang of the shaft, and therefore one should not use a bit larger than $\frac{1}{8}$ in. Also, in working on irregular patterns, the bit should be adjusted to cut not more than $\frac{1}{2}$ in. deep, for if it runs deeper, it will be difficult to control the direction of cut when following the pattern lines. If the pattern is intricate and of close formation with several sharp angles, it is better to cut the wood at the pattern line with a knife before



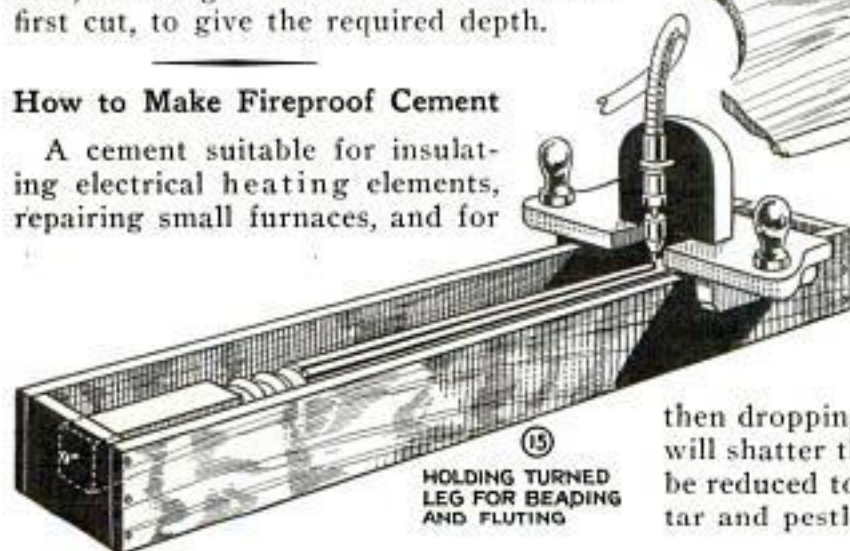
ing the ends of the work, and these may be made from short lagscrews, the threaded end being filed to a sharp tapered point—the taper approximately the same degree as that of a lathe center. The screws must be located very carefully so that, when the work is in place and the centers tightened, the top of the tapered portion of the work will be flush with the top edges of the sides of the jig. The two guides of the router frame should be placed so that the unit slides easily throughout the length of the jig without binding. When mounting the work, it is necessary to see that the lagscrew centers enter the same hole as the lathe centers did when the piece was turned; otherwise

the work will be off center, and the depth of routing cut will vary. Methods of grinding the router bit for both fluting and reeding are shown in Fig. 6. The position of the cuts must be carefully spaced with dividers and far enough apart so that the cuts will not overlap.

Fig. 12 shows another method of routing a groove around the edge of a small curved table leaf for the purpose of a line inlay of contrasting wood. This arrangement makes use of the mortising attachment on the power saw. A router bit of the required size is placed in the chuck, and the regular guides and holders are removed from the machine table. A wooden guide is made as shown and fastened securely to the table by means of clamps. The curve of the guide must, of course, be the same as that of the work; also the thickness of both must be equal. The table is then set so that the bit will cut the required depth and distance from the edge, and the work is fed against the bit very slowly. If the groove must be more than $\frac{1}{8}$ in. deep, it should be made in two cuts, resetting the machine table after the first cut, to give the required depth.

How to Make Fireproof Cement

A cement suitable for insulating electrical heating elements, repairing small furnaces, and for



SHOWING HOW GUIDE IS USED FOR STRAIGHT-LINE ROUTING

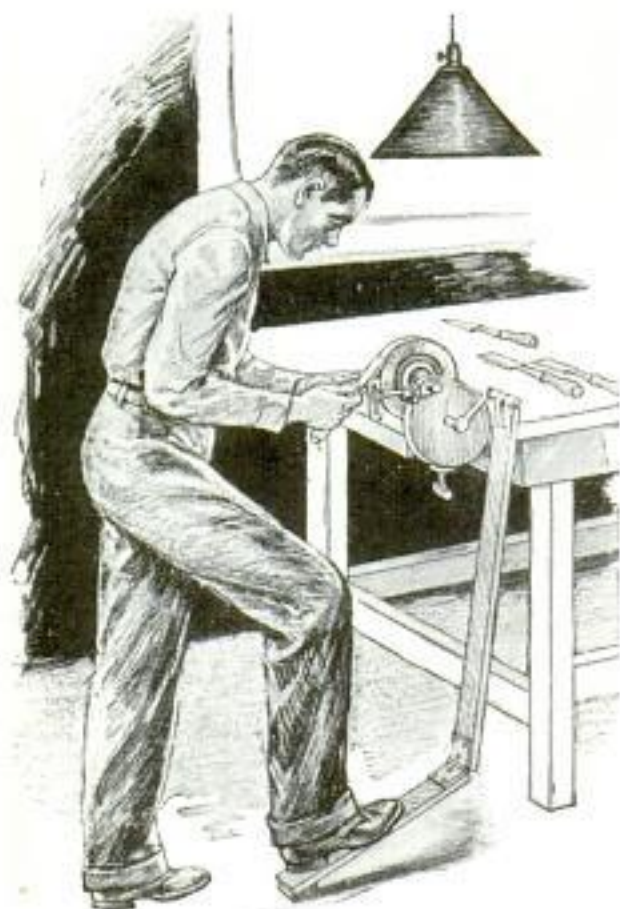
$\frac{1}{2}$ gal. of the water glass, the cement will become extremely hard after heating. Old bottles and scraps of glass may be easily powdered by first heating, and then dropping them into cold water. This will shatter the glass so that it can readily be reduced to a powder with an iron mortar and pestle.

other purposes where resistance to heat is necessary, may be made by mixing asbestos flour with sufficient water glass to make a paste thick enough to mold. Pack the cement tight and allow it to dry. When it is hard and free from moisture, treat the surface with a solution made by dissolving calcium chloride, $\frac{1}{2}$ lb., in 1 qt. of water. This treatment forms a hard, insoluble coating on the surface. If finely powdered glass is added to the water glass, in the proportion of 1 lb. of glass to

Strip of Rubber Protects Plane Bit

A good protector for your plane bit can be made from a piece of old inner tube. The rubber is riveted to two sheet-metal strips, which are bent to hook over the ends of the plane. When this method is used, the rubber strip should be stretched so that the clips will be held firmly in place.





Crank on Emery Wheel Turned with Pedal Leaves Hands Free for Holding Work

Pedal Improves Hand Emery Wheel

By providing a pedal for your hand emery wheel, both hands are free to hold the work. The lower end of the treadle is hinged to the floor, while the other end is hinged to a pitman, which is in turn fastened to the crank on the wheel. Two pieces of leather are used to hold the pitman to the crank.—Albert E. Cooper, Philadelphia.

Friction Guide Keeps Tape Measure from Unwinding

Carpenters and others who occasionally have to lower a tape measure from a height, using the case as a weight, can prevent the tape from unwinding by providing this friction guide. A piece of wire is bent as shown and run through holes drilled in the case. There is no inter-



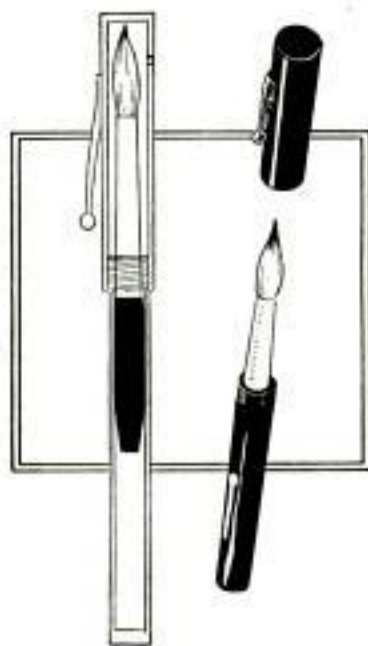
ference with normal operation, and just the right amount of friction, to enable the user to suspend the tape from a nail and descend to make the reading without the tape unwinding.

Easy Methods of Dressing Cork

One of the easiest methods of shaping cork is to use a coarse grinding wheel, but if it is necessary to cut it, a greased knife will work better than a dry one. For drilling holes in cork, a boring tool can be made by grinding one end of a piece of thin-walled tubing to a knife-edge. Small pieces of cork may be turned symmetrical if held in a lathe and rotated at a good speed, using a small grinding wheel attached to the shaft of a small motor instead of a turning tool. A toy motor will serve for this purpose, as only little power is needed to rotate the cork.

Pocket Water-Color Brush Made from Old Fountain Pen

By removing the ink reservoir and point from an old fountain pen, the barrel can be utilized to good advantage for making a pocket water-color brush. The handle of a regular water-color brush is cut in two and inserted into the barrel, but not so far that the bristles will be bent when the cap is screwed on. If the handle is too small to fit snugly into the barrel, it can be wrapped with adhesive tape to make it tight, first applying ambroid to prevent the wrapping from coming off. A small hole should be drilled through the cap to allow air circulation.



☐ Tarnished steel articles can be cleaned by polishing them with dampened ashes.

How to Color and Waterproof Plaster-of-Paris Casts

Plaster-of-Paris articles are easily waterproofed by soaking them for a few minutes in a solution of barium hydrate and water, mixed in the proportions of a handful of hydrate to each quart of water. The solution should be well stirred before using. This treatment hardens the surface of the cast and forms an insoluble fine-grained crust over it. After soaking, allow the cast to dry thoroughly before handling. Aniline dyes or painters' dry pigments may be added to the water to obtain a colored cast. If an imitation of marble is desired, dip a moistened knife blade into the dry powder and draw the edge of it over the surface of the soft plaster. Another effective method of decorating plaster is to sprinkle a fine soluble dye from the blade of a knife held over and to one side of the wet cast. The fine particles of dye dissolve and spread. A piece of paper with a design cut out, may be held just above the wet plaster during the sprinkling if the pattern is to be reproduced in color.

Emergency Coil Springs for Small Chuck Jaws

If you break or accidentally lose a spring out of the chuck on your hand drill, the spring from the valve core of an old inner tube makes a good substitute. The



wire center of the core is cut out and the spring placed in the small holes in the side of the chuck jaws, where it will work as well as the original one.



Chains Wound on Long Shaft, Turned by Buggy Wheel, Operate Gates Above Feed Trough

Battery of Gates above Feed Trough Opened as One Unit

Cattle feeders will find this a quick and easy method of opening gates used above a feed trough to keep stock from interfering while putting the feed into the trough. The gates move in vertical slides provided on the supporting posts, and are operated by a shaft running the entire length of the trough. Short chains fastened to the bottom of the gates wind on the shaft when it is turned to raise the gates. An old buggy wheel, rigidly fastened to the end of the shaft, provides a means for turning it, while a length of chain attached to one of the supporting posts, can be hooked to the wheel as shown, to hold it at any convenient position.

Cement for Holding Tool Handles

To make a cement that can be used to hold the tangs of small tools securely in their handles, mix rosin, 4 oz., beeswax, 1 oz., and fine brick dust, 1 oz. The latter ingredient should be ground to a fine powder, using a mortar and pestle. The mixture is melted, thoroughly stirred and then poured into the hole in the handle, after which the tang is forced into place. To assure good adhesion, roughen the tang with a file before forcing it into place. The melted cement may be poured into molds and kept until needed, when it is melted again.

Tool Box Fits between Ladder Legs

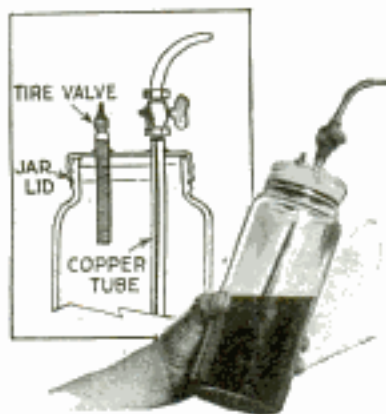


This Detachable Tool Box Is Always at Hand on Top of Your Ladder

Anyone whose work requires frequent use of a ladder will find this tool box handy. It is made just large enough to fit between the rails of the ladder above the top rung. Pieces of flat iron, screwed to each corner and projecting as indicated, hold the box in position. A suitable handle is provided for carrying the box, and a narrow piece of wood is nailed across the front in order to keep loose tools from falling out.

Handy Oil Gun for Lubricating Parts Underneath Car

Consisting of a glass jar fitted with a tight lid, a tire valve and a copper tube, this pressure gun is handy for oiling parts underneath a car, such as brake fittings and springs. The valve and tube are soldered in holes drilled through the lid, and the



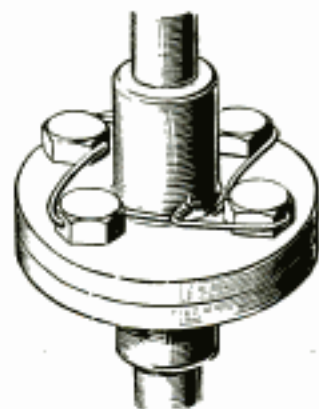
tube rests on the bottom of the jar and has a V-shaped notch cut in the end to permit entrance of the oil. A small shut-off valve with a nozzle at one end, is then soldered to the projecting end of the tube. A few strokes of a tire pump will supply sufficient pressure in the jar to enable one to squirt the oil where needed. If a spray is desired, the nozzle should be flattened.

Permanent Brown Finish on Steel

A rich, brown color may be produced on iron and steel by painting the metal with a solution made by dissolving copper sulphate, 2 oz., and sweet spirits of niter, 2 oz., in 1 qt. of water. To color the steel, apply four coats of the coloring solution, allowing about five hours between each coat. When the last coat has dried, burnish the surface with a smooth, hard-surfaced tool. To preserve and polish the finish, rub it briskly with a piece of leather, dipped in a compound of boiled linseed oil, 2 oz., beeswax, 2 oz., and enough turpentine to make a thick mixture.

Wire Keeps Studs from Loosening

To keep studs from loosening in machinery that is subjected to considerable vibration, run a length of soft-iron wire through the hole in the top of each stud and twist the ends of the wire together. The wire should be in-



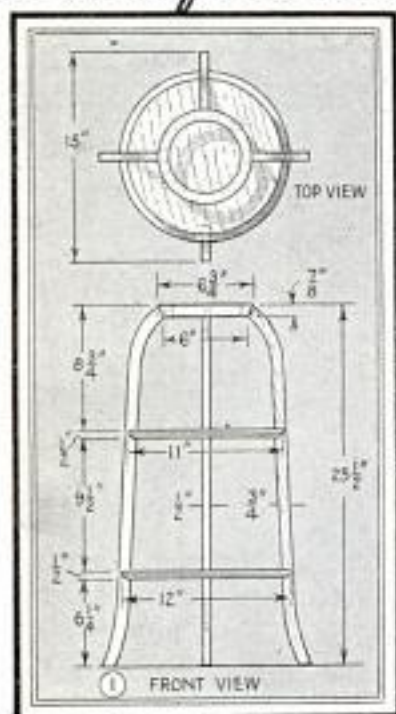
serted as shown, so that, when it is pulled taut, the tendency is to tighten the studs.

Emergency Repair for Three-Phase Motor Running Single-Phase

When a large, three-phase motor in a factory began to run single-phase, owing to the warping of a contact finger in the starting box, a temporary repair was made by placing a wooden block behind the starting lever to hold it in place. While this repair worked satisfactorily, it should only be temporary, as it prevents the overload release from functioning.

English SMOKING STAND

for
your
den



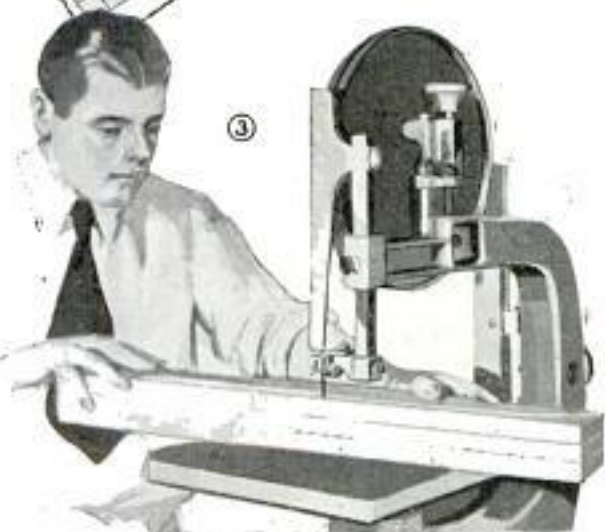
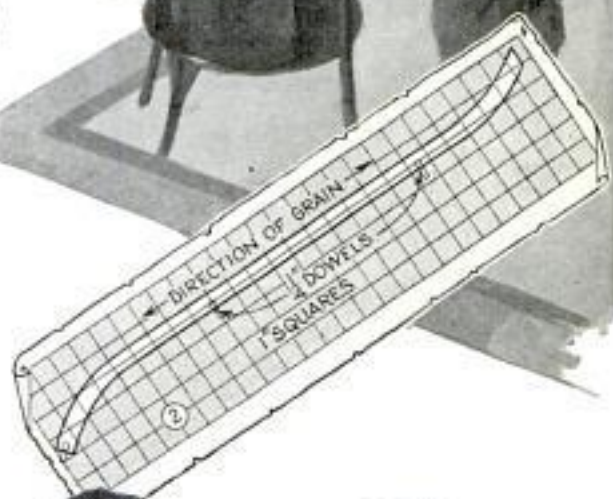
By R. O. BUCK

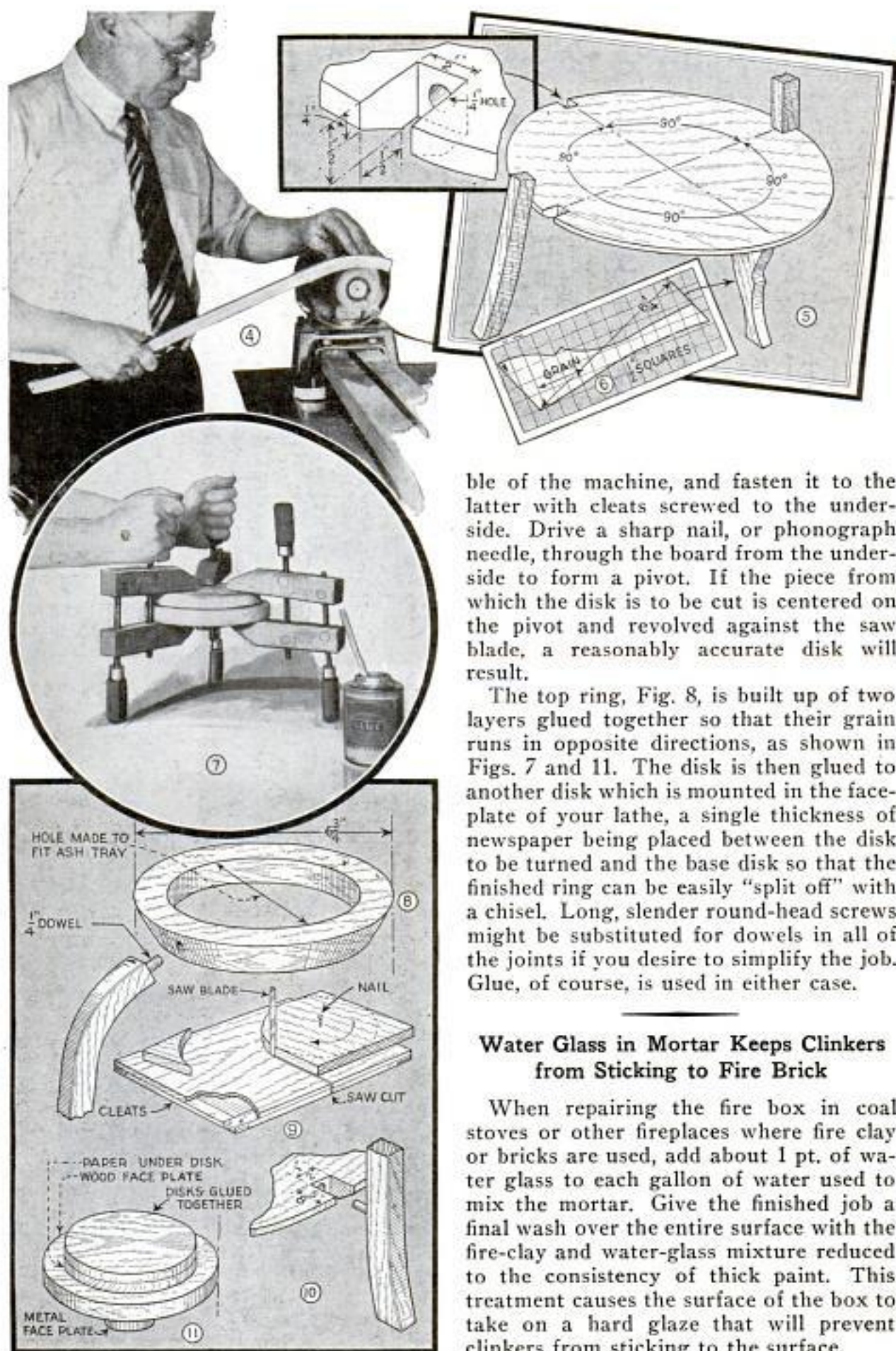
Lane Technical High School Chicago

THIS portable smoking stand of delicate design has sufficient room for a humidor, can of tobacco or perhaps a tin of cigarets in addition to the ash tray. Walnut, mahogany or maple may be used, the latter being preferable because of its close grain, which makes the legs less likely to split off at the curves.

Fig. 1 shows the top and side view while Fig. 2 gives the pattern of the legs. Cut out three pieces of 1/2-in. stock to make the legs and pile them up with the pattern on top. Fasten the pile together with nails driven into the waste part of the stock. The three legs are then sawed out together on a bandsaw, as shown in Fig. 3. You can smooth the legs with a file and sandpaper, or you may use a sanding drum mounted on the lathe, as shown in Fig. 4. A short leg is doweled to the bottom shelf at the front, as in Fig. 5, a pattern for this piece being given in Fig. 6. The shelves have beveled edges, and notches are cut to house the legs. All joints are made with glue and dowels.

The shelves may be turned on a lathe or cut on a band or jigsaw. A jig for the latter method is shown in Fig. 9. Make a wood table, somewhat larger than the ta-





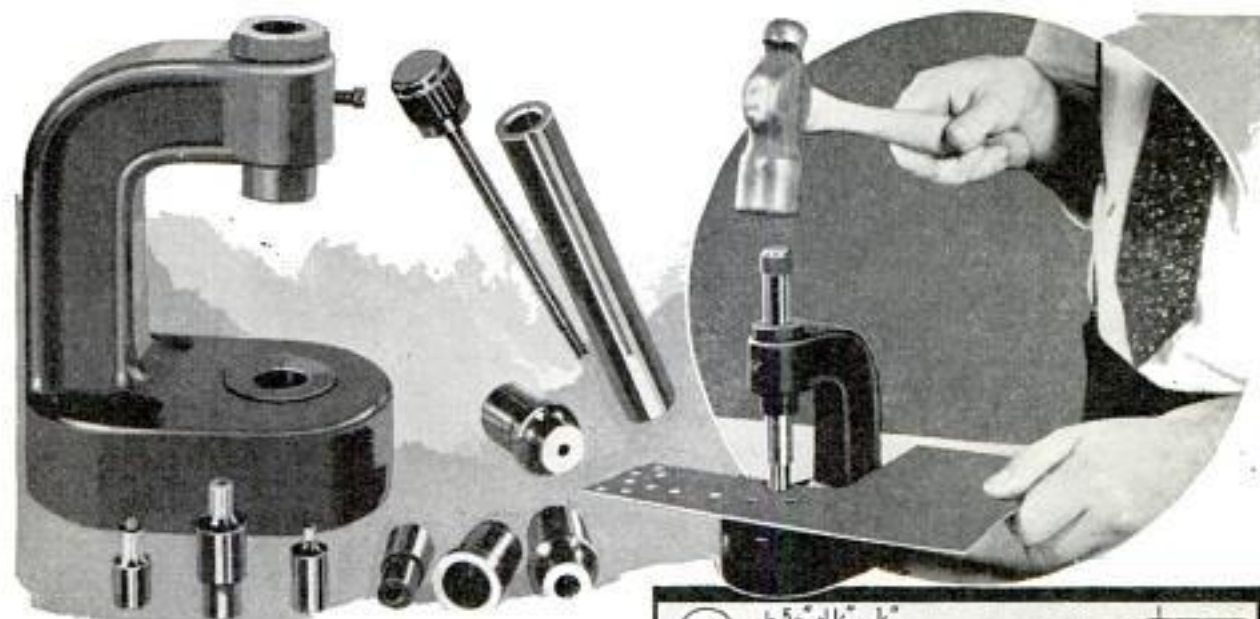
ble of the machine, and fasten it to the latter with cleats screwed to the underside. Drive a sharp nail, or phonograph needle, through the board from the underside to form a pivot. If the piece from which the disk is to be cut is centered on the pivot and revolved against the saw blade, a reasonably accurate disk will result.

The top ring, Fig. 8, is built up of two layers glued together so that their grain runs in opposite directions, as shown in Figs. 7 and 11. The disk is then glued to another disk which is mounted in the face-plate of your lathe, a single thickness of newspaper being placed between the disk to be turned and the base disk so that the finished ring can be easily "split off" with a chisel. Long, slender round-head screws might be substituted for dowels in all of the joints if you desire to simplify the job. Glue, of course, is used in either case.

Water Glass in Mortar Keeps Clinkers from Sticking to Fire Brick

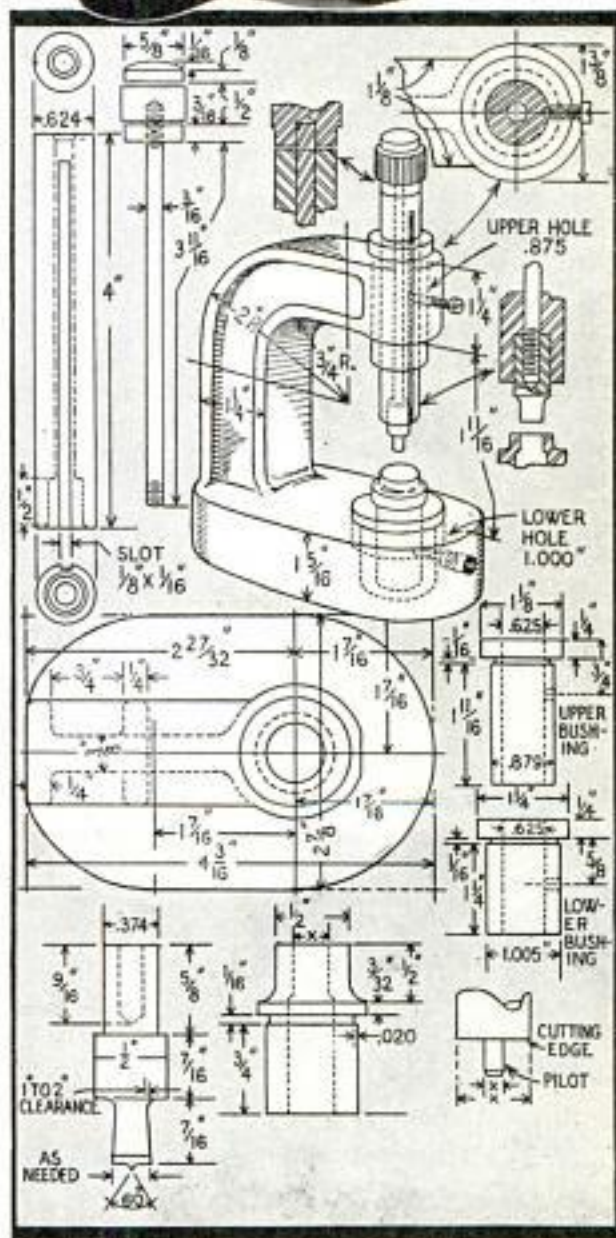
When repairing the fire box in coal stoves or other fireplaces where fire clay or bricks are used, add about 1 pt. of water glass to each gallon of water used to mix the mortar. Give the finished job a final wash over the entire surface with the fire-clay and water-glass mixture reduced to the consistency of thick paint. This treatment causes the surface of the box to take on a hard glaze that will prevent clinkers from sticking to the surface.

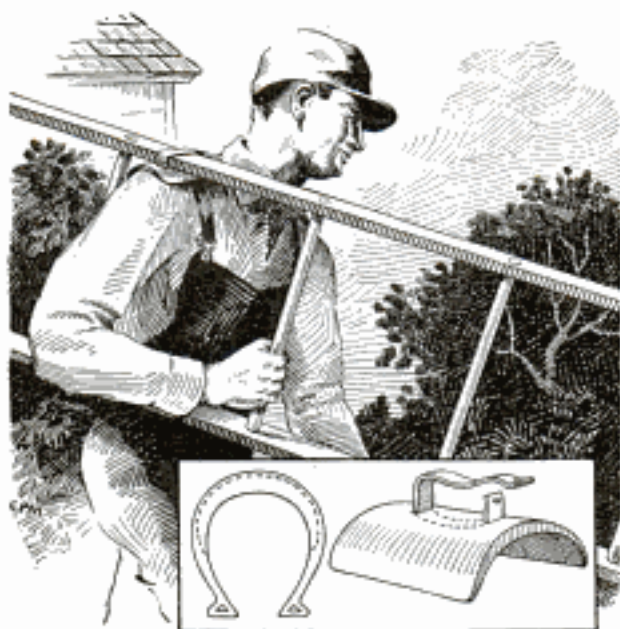
Accurate Holes Assured with This Punch



Interchangeable dies and punches assure clean-cut holes up to $\frac{1}{2}$ in. in diameter with this tool. Accuracy in making the punch is essential, as the alignment of die and punch is governed solely by the upper guide bushing in the frame. The bushing holes in the casting are drilled and reamed exactly to size, while the holes in the bushings are lapped to a mirror finish. Hardened tool steel is used for the plunger, which is lapped in so that it will slide slowly down through the upper bushing by its own weight, while the rod inside of the plunger can be made from ordinary drill rod, its only purpose being to hold the punches in place. A good grade of tool steel, properly hardened, is necessary for the cap on top of the plunger, as it takes the blows of the hammer. The punches are also turned from tool steel and hardened, a small point being turned in the center of the lower end of each to fit in a center-punch mark used to lay out holes in the work. In making washers, first punch out the center holes in the stock, leaving sufficient room around each hole to include the diameter of the washer, and select a pilot punch that will slide easily through the hole in the stock, centering it accurately for the diameter to be punched.

Applications of alcohol are effective for removing almost any kind of grease stains.



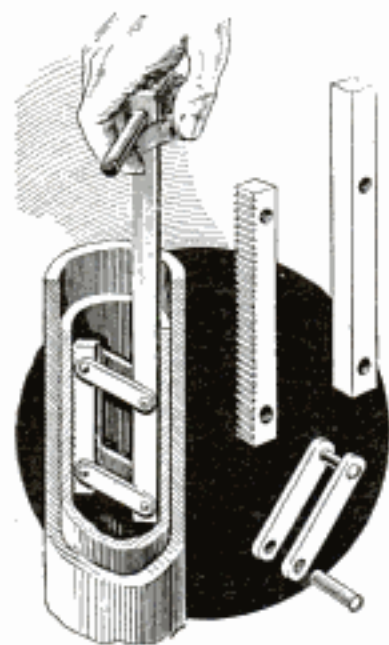


Heavy Ladders Easily Carried without Bruising Your Shoulder by Using This Rubber Pad

Rubber Shoulder Pads for Comfort When Carrying Ladder

An 8-in. section of an old auto casing with the tread and beading removed, will make a comfortable shoulder pad for carrying ladders. The center of balance of the ladder is determined, and the pad is attached at this point with a strip of inner tube.

An Expanding Leader to Handle Heavy Cylinders



links as indicated. The shorter piece has serrations made on the outside to afford

In the assembly of machinery it is often necessary to have a tool that will grip a cylinder in the bore when moving it through a restricted space. Such a tool is easily made, and consists of a long and a short piece of steel, hinged together by means of four

a positive grip on the cylinder, while a rod inserted through a hole in the top of the longer piece provides a handle.

How to Locate the Height of Platforms in Stairways

To locate the correct height of platforms for stairways, multiply the distance in inches from the finished floor at the bottom of the stairs to the top of the finished floor above by the number of steps from the lower floor to the platform. Divide this product by the total number of steps in the flight of stairs and the result will be the distance from the top of the floor to the top of the platform. The thickness of flooring should be deducted from this measurement when setting the joists. In counting the total number of steps in a flight of stairs, platforms are counted as steps.—F. R. Rodgers, New Palestine, Ind.

Holder Keeps Card on Cream Can

To keep test cards on cream cans, rubber holders cut from inner tubes will be found convenient. A section of inner tube is cut as indicated and snapped over the neck of the can. When it reaches the station where the testing is done, a card is made out for each can and is slipped behind the cut-out part of the holder, so no confusion will result.



Effective Bait for Trapping Foxes

Smearred over the traps, a mixture consisting of tincture of musk, 1 oz., and olive oil, 10 oz., will be found useful in attracting foxes. The oil retards evaporation of the musk and serves as a body for the mixture.

☛ To polish the porcelain part of a spark plug, first scrape off the carbon and then use some medium-grade valve-grinding compound, rubbing it on with a cloth.

W. M. Chase & Valve Co.
4743 W. Lake. Chicago

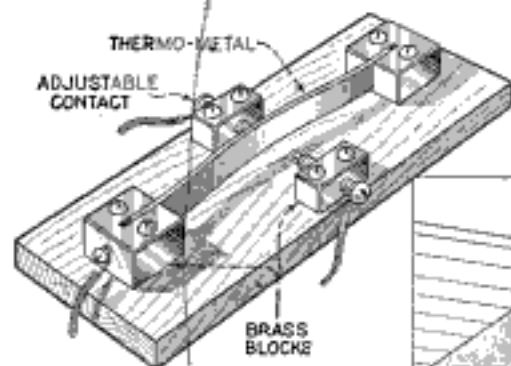
POPULAR MECHANICS

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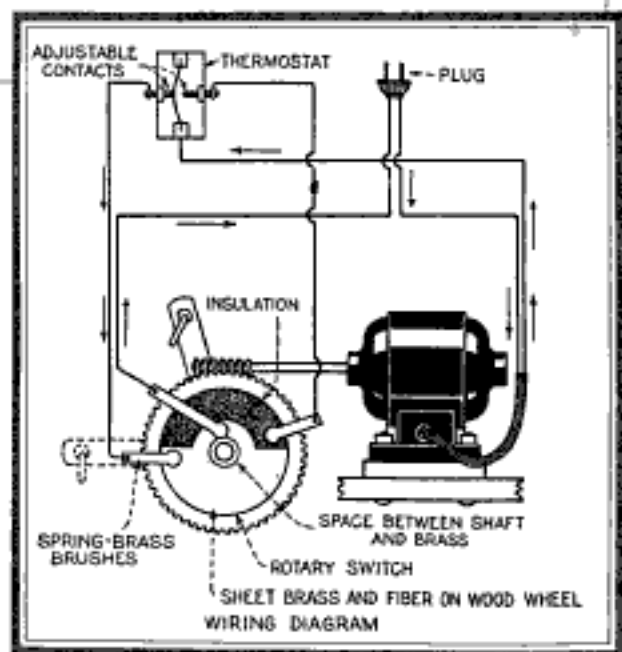
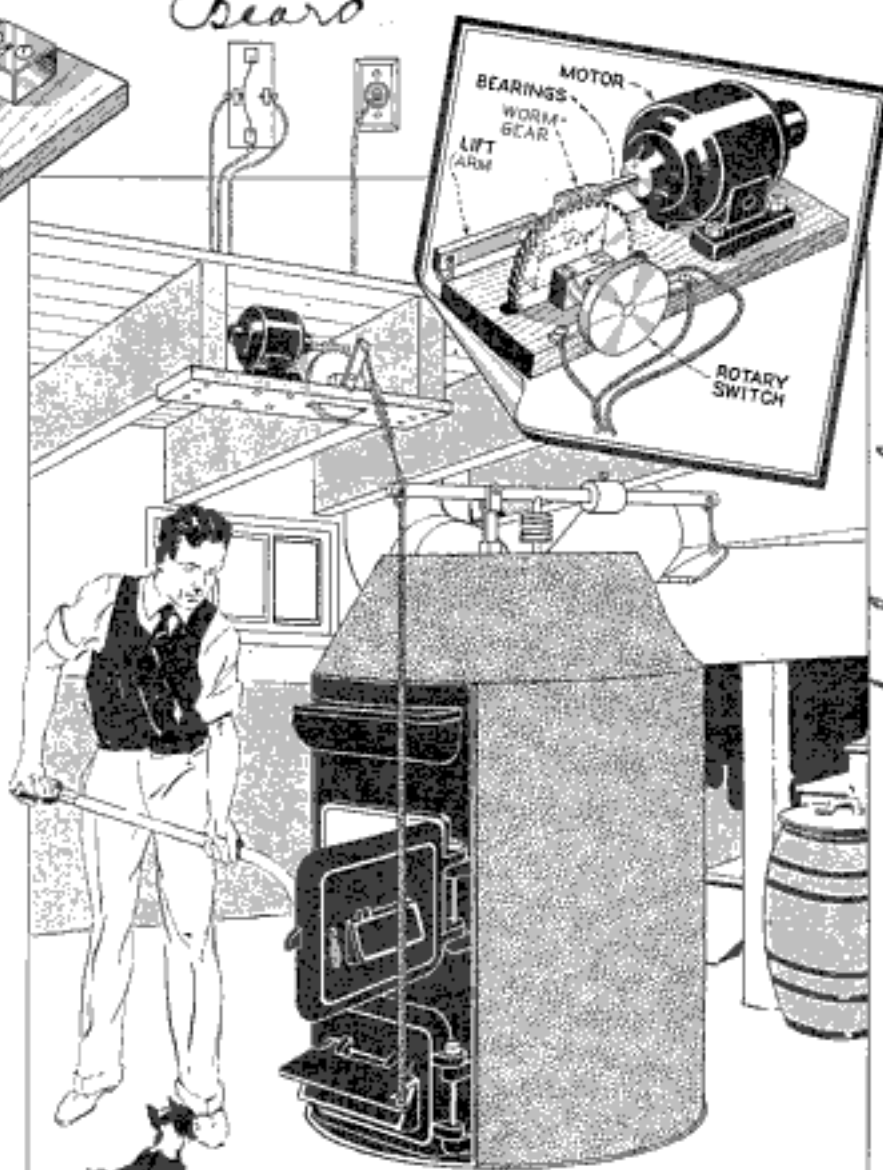
also 1600 Beard's Use Helipot

Electric Draft Control Saves Steps and Fuel

Beard

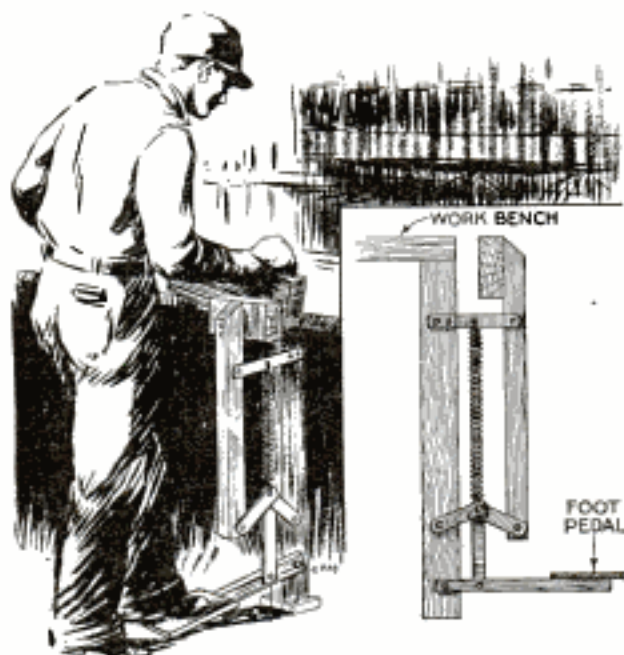


For less than \$5 you can make an electrically operated draft and damper control for the furnace, to automatically keep the temperature constant through adjustment of a thermostat. The principle of operation is as follows: When the thermo-metal strip touches one side contact, the motor turns until the shaft, which holds a crank that raises and covers the draft control, has made one-half revolution. A rotary switch on the same shaft, then opens the circuit and stops the motor. When the strip on the thermostat touches the opposite contact, a circuit is again made, which causes the motor to run until another half revolution of the crankshaft has been made. Adjustments of the contact over a wide range of temperature limits, are obtained by setting the screws at both sides. The strip is soldered into saw slits in two brass blocks, which are screwed to a fiber or hard-rubber base. The rotary switch, made of sheet brass and fiber on a wood wheel, is also setscrewed to the shaft. Or, if you like, this wheel can be made of brass. Spring-brass contacts are fastened on the base to slide over both metal and fiber. A coil spring should be inserted in the line connecting the crank to the furnace draft-control lever.—Walter E. Stewart, Sewaren, N. J.



Beard's Invention
Patented by Beard
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Foot-Operated Vise Automatically Opened by Spring



Pressure on Pedal Tightens Vise, Which Automatically Opens When the Foot Is Removed

Attached to one leg of a workbench, this vise is closed by pressure on a pedal and opened automatically by a spring fastened between the upper and lower pivots. The vise jaw is pivoted between two pieces of flat iron bolted rigidly to the bench leg near the top. The bottom lever assembly consists of four pieces of the flat iron arranged so that the lower part of the jaw is forced away from the bench when pressure is applied to the pedal.

Soap Stops Reamer from Chattering

To keep a reamer from chattering when reaming soft material, such as brass, aluminum or soft iron, fill the grooves or flutes with ordinary soft soap. This simple expedient makes the reamer cut smoothly and leaves a fine finish.

Etching Your Name on Tools

A neat and permanent job of etching your name on tools or metal goods can be done by the use of a rubber stamp and ordinary asphaltum paint. First stamp the lettering on the tool with the paint, being sure to get an even impression. When dry, apply an etching solution over and around the name, using a toothpick with a tuft of cotton on the end for a dauber.

After the etching is done, wash away the surplus fluid, and remove the asphaltum with gasoline. This method will leave the lettering in relief with an etched background. The etching need only be deep enough to produce a good frosted appearance. For etching steel tools, use a fluid composed of nitric acid, 2 oz., and acetic acid, 1 oz. If you desire a deeper etch, use a solution made by mixing concentrated hydrochloric acid, 1 oz., and water, 8 oz., and in this, dissolve $\frac{1}{5}$ oz. of potassium chlorate. For brass work, the solution should be made by dissolving potassium chlorate, $\frac{1}{2}$ oz., in 1 qt. of water. When the chlorate has dissolved, add 1 oz. of concentrated nitric acid. It is not advisable to make up more of the etching solution than will be needed.

An Adjustable Speed Wrench

Welded to an old bit brace, as shown, a small monkey wrench makes an adjustable speed wrench, useful for light work around the shop. After removing the chuck from the brace, cut off the wrench handle and weld together as indicated.



Cork Shows Height of Water in Gauge

Placed inside of the glass, a small ball of cork will help in determining the height of water in a gauge when the glass is dirty or when it is located in a place where the light is dim. The cork should be shellacked and dried before using.



Flat-surfaced oil and slipstones can be resurfaced by rubbing with emery cloth, using first a coarse grade and finishing with a fine grade.

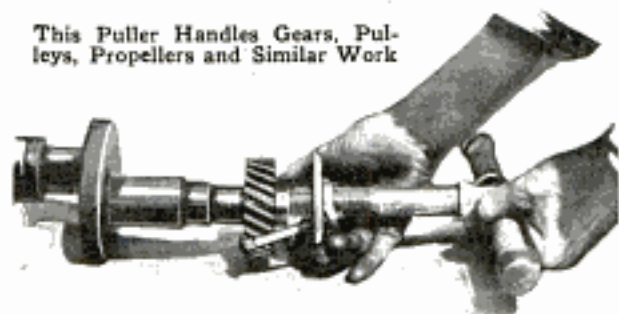
Striping Done with a Copper Tube

Difficulties encountered in striping auto bodies may be overcome by using a drawing pen made from a copper tube. One end of the tube is flattened, and the sides of the flattened part are opened by filing them. This end is then rounded and sharpened to imitate a drawing pen. Changing the width of the stripe is done by spreading the tip of the pen until it draws a stripe of the desired width. The pen is used against the edge of a rule for straight lines and against a cardboard template for curved lines.

A Gear Puller from Pipe Fittings

Made of $\frac{1}{2}$ -in. pipe and fittings, this gear puller will be found heavy enough for average work. A pipe tee, two nipples and two caps are made into a handle, which is screwed onto one end of a 10-in. length of pipe. A 5-in. thread on the other end takes a pipe flange, which has the holes on opposite sides enlarged for $\frac{3}{8}$ -in. carriage bolts. In use, the heads of the bolts fit over the gear, which is pulled by screwing the pipe into the flange. If the part is hard to pull, it may be necessary to wire the bolt heads together to keep them from spreading. A sharp blow on the tee

This Puller Handles Gears, Pulleys, Propellers and Similar Work



in the handle will sometimes help in starting the gear.

Stains for Coloring Celluloid Articles

Celluloid articles may be colored by using special stains consisting of aniline dyes dissolved in acetone. These colors are waterproof and may be applied with either a brush or a writing pen. Eosin, the dye used in most red inks, will produce a good red stain, while the package dyes used for coloring cloth are sufficiently soluble in acetone for the purpose.



Wooden Arms Permit Hot Tar to Be Carried on Wheelbarrow without Splashing on Workmen

Extension Arms on Wheelbarrow Carry Tar Bucket

Wheelbarrows used in repairing asphalt paving were equipped with two wooden arms extending in front of the wheel so that a bucket of hot tar could be hung on them. In this way, there was no danger of the tar splashing on the workmen.—G. E. Hendrickson, Argyle, Wis.

Lead in Barrel Keeps Fountain Pen from Dropping on Point

To prevent your fountain pen from falling on the point when it is accidentally dropped, remove the rubber tube and drop some lead shot in the end of the barrel. Then pour melted paraffin over the shot and replace the tube. This treatment makes the butt end of the pen heavier than the point.—D. M. Gutis, Philadelphia.

Tin Strip Held on Edge of File Protects Finished Work

When filing close to the finished side of work, a tin strip held over the edge of the file will prevent the finish from being accidentally scratched. The tin can be held in place with the fingers. This is a better method of protection than grinding off one side of the file.



Can You Solve *these* Puzzles?



By SAM LOYD

Hazy & Boring ⁵³
OUR tenants have plenty of light and air—there are 145 windows in the front and 105 on that side,” said the philanthropist, pointing to his model tenement. “In the front and two sides, the total number of windows is three times as many as there are in the rear, and the rear has twice as many windows as has the side which we cannot see.” How many windows are there altogether and how many on each side?

THREE prospectors were reminiscing on the road back to civilization. “If I were to remain another year, and continue

at the rate I have saved during my stay,” remarked Jim, “I’d be worth a million.” “At the rate I have stacked it up, it would take 19 years more to make me a millionaire,” observed John. “I’d have to go on saving the same term over again, to get my million,” said Bill, “and I’ve been there as long as you two together.” Jim went on, but Bill and John returned to the hills for six years more, where they saved at the same rate as before. Bill quit with \$600,000, and John with \$675,000. How much did Jim retire on?

Answers to Last Month's Puzzles

In the speedway puzzle, at the rate of 100 miles an hour, the driver would go one mile in $\frac{3}{4}$ min.; at 90, in $\frac{4}{9}$ min.; at 80, in $\frac{4}{5}$ min., and at 60, in 1 min. Therefore, four miles equally divided among the four speeds, would consume $3\frac{3}{10}$ min. Dividing 60 minutes, his elapsed time, by $3\frac{3}{10}$, and multiplying the quotient by 4, gives $79\frac{101}{181}$ miles as the total distance the driver covered.

In Mrs. Terwilliger's puzzle, 2 ones, 1 two and 1 four answer the problem, be-

cause $1+1+2+4=8$, and $1 \times 1 \times 2 \times 4=8$.

The “doctored” scales present a study in ratio and proportion. The statement would be: 2 cubes are to 2 cones (first weighing) as 4 cones are to 9 cubes (second weighing), or if the number of cubes is called X and that of cones Y, we get the equation: $2X : 2Y :: 4Y : 9X$; $18X^2=8Y^2$; $9X^2=4Y^2$; and $3X=2Y$; that is, three cubes are equal to two cones, and the answer is that nine cubes would be required to balance six cones.

 ON CHRISTMAS COUNTERS

New principle Ciné-Kodak



• CINÉ-KODAK EIGHT is small, simple, complete. A real full-fledged movie camera. Price only \$29.50 . . . and it cuts film cost 62½%.



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NEW FILM
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Ciné-Kodak EIGHT takes splendid movies . . . yet costs only \$29.50

Uses a completely new, marvelously fine-grained film. A 25-foot roll at \$2.25 runs as long on the screen as the usual 100-foot roll at \$6. Saving 62½%.

Kodascope EIGHT . . . only \$22.50 . . . projects the film . . . strong, steady, flickerless.

Go to your nearest Ciné-Kodak dealer. He'll gladly show you this "EIGHT" outfit and the remarkable movies it makes at such remarkably low cost. A marvelous Christmas gift—appropriate, exciting, permanent. Eastman Kodak Company, Rochester, N. Y.

• THE NEW PRINCIPLE

Ciné-Kodak Eight makes a special 25-foot film, 16 mm. wide, do the work of 100 feet. It runs the film past the lens twice, leaving two separate rows of images along its full length. Eastman finishes this 25-foot 16 mm. film, slits it, splices it, and returns it to you as a single 50-foot 8 mm. film, ready to project in Kodascope Eight. The cost of finishing is included in the price of the film.

Ciné-Kodak EIGHT

Eastman's

NEW-PRINCIPLE *Movie Camera*

When writing to advertisers please mention *Popular Mechanics*

HOW LONG CAN YOU OUTWIT DEATH?

(Continued from page 22)

prevalent in industry, as it is at home or play. Last year, at least twenty-seven out of every 100,000 men lost their fight to outwit death during working hours. Basically, then, your human machine has one chance out of every 3,703 of being demolished during business hours. Should you be injured, but not killed, there is one chance in ninety-one that you'll die as a result of the accident. There is one chance in twenty-six that you'll be partly disabled for the rest of your life and one chance in 2,000 that you'll be completely disabled for the rest of your life.

In spite of the fact that your business may be more or less hazardous than somebody else's, the human factor of carelessness may greatly vary the basic odds either against you or in your favor. Last year the greatest number of accidental industrial fatalities occurred not in so called hazardous occupations, but on farms with careless use of agricultural machinery. Accidental deaths in the manufacturing field were second, with the building and construction field third, and the mining and quarrying industry a close fourth.

"My past ten years of investigative work have shown that accidental fatalities in industry are, in a large measure, due to carelessness," says Emil J. Deering, curator of the American Museum of Safety. "I am convinced that expert workers also take more risks than do inexperienced workers.

"Many accidental fatalities in industry are caused by the worker becoming too proficient. Sometimes he regards the scientific safeguards devised for his protection as a hindrance. Sometimes he scorns to use them in the presence of less proficient workers. And sometimes he is just caught napping."

There is grave danger, then, of your human machine's very proficiency leading you into hazards. When proficiency in industry passes the careful stage and leads to carelessness, the human machine becomes "hot" and greatly lowers the chances of outwitting death. When a window washer starts passing from window to window on the narrow ledge minus his safety belt, when a pilot leaves the ground in a swift climbing turn, or when a steel

worker starts sliding down girders, they have become hot in their particular industry.

Whether in business, at home or at play, your own human machine has developed a careless trait, due to the very familiarity of the danger in your daily life. This carelessness, which may manifest itself in even so casual a matter as driving your car or crossing the street corner, is a considerable factor in decreasing the odds against your ability to outwit death. A good driver, for example, is not necessarily safer driving his car at twenty-five miles an hour than he is at forty, for the care which he employs at forty miles is relaxed in the apparent security of driving at the lower rate.

"Science can conquer nearly every obstacle but the human equation," the late Sir Henry Seagrave said, when preparing for his Daytona Beach automobile trials. "An expert driver takes more risk driving his car on a good road at twenty miles an hour than he does at forty. At twenty miles an hour he is apt to be bored, careless or contemptuous. At forty, he is wide awake and keenly intent on the road ahead of him."

While science is not able to replace actual thought, it has gone so far as to devise methods of allowing more time for slower-thinking brains to function. The ordinary four-wheel brakes on automobiles, which have come into vogue during the past few years, is a commonplace example of this.

With the perfection of four-wheel brakes, science has given you twice as much time to think while driving a car as you formerly had. At twenty miles an hour, your car travels 29.33 feet per second. Decelerometer tests show that if your car has two-wheel brakes, it should stop in less than 43.3 feet at twenty miles an hour. If you have four-wheel brakes, it should stop within 22.2 feet. If you have four-wheel brakes, therefore, at twenty miles an hour you have twice the time to think that you would have with two-wheel brakes.

The medical branch of science today is also playing a vital part in keeping the human machine physically fit to prolong its fight against eternity. In the matter of stamina, for example, the average young

(Continued to page 116A)

\$200. a month for life

Would you be interested in this guaranteed life-long income?



Don't you often wish you could look forward to retiring some day on a Guaranteed Life Income? Many men and women who felt the same way a few years ago now receive Equitable checks for \$100, \$150, \$200 or more every month.

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Closets, garages, cabins, tents — out-of-the-way corners around the house that need a light but aren't wired — are perfect places for Eveready Wallites. Power is supplied by two ten-cent, long-life Eveready Flashlight Batteries inside each light, out of sight.

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EVEREADY
WIRELESS-
ELECTRIC
LIGHT

The longest-lasting batteries that modern science can make — Evereadys! Only 10¢. For Candles, Wallites, and Flashlights. Put them in the Christmas stockings!

NATIONAL CARBON COMPANY, INC.

General Offices: New York, N. Y.

Unit of  and Carbon Corporation

HOW LONG CAN YOU OUTWIT DEATH?

(Continued from page 114A)

man of twenty-two has an expectancy of living for 43.35 more years, a college athlete of the same age, 45.56 more years, and a college honor man, 47.73 years more. The college honor man, then, has the prospect of outwitting death four years longer than the average human machine, while the college athlete has a potential advantage of but a little over two years.

"Is this because mental and physical fitness tend to go together?" queries Doctor Dublin, "or is it because it is difficult for a man to excel in scholarship unless he is in good physical condition? Probably both these causes contribute in bringing about the observed effect."

While today you are facing definite odds in your fight to outwit death, odds which may be varied more or less in your favor by your carefulness and readiness to utilize the safeguards science offers you, tomorrow an epochal discovery may greatly throw the odds in your favor.

"We know that the life span of man is 100 years," states Doctor Dublin. "We know, through carefully kept statistics, the approximate point to which he may travel along that span today. But just around the corner, science may be preparing new discoveries that will change the entire picture and help the machine to travel much farther along the span of life than it has been able to do heretofore."

WING TO WING

(Continued from page 85)

used during the war, and the only kind used until just a few years ago when some bombing pilots discovered that the pilot on the inside of a turn could hold his place much better if he were flying just below the plane ahead. This led to experimentation, and now all bombing formations have the "wing men" below the leading plane. In the stair-step formation, the wing men always had to do a lot of throttle work on the turns, and with slow-moving bombers this was never satisfactory. The inside man had to throttle his plane down and stall almost to the spinning point when the leading plane was banking around, and the outside man had

(Continued to page 118A)



3½¢ a Day WOULD HAVE PREVENTED This

If her husband had only been a trifle more thoughtful, this destitute mother and her children would not be starving today. Heart-rending? Yes; yet occurring in thousands of homes throughout the country. Families under nourished, without means of obtaining food and the necessities of life, and all of it could be prevented for as little as 3½¢ a day. The Union Mutual Life Company of Iowa, one of America's strongest old line life insurance companies, now brings life insurance within the reach of all. This policy was created to give the fullest possible insurance protection at the lowest possible price. It covers death from any cause and pays full benefits of \$1,000.00; also pays \$5,000.00 for accidental death. Anyone from 10 to 60 years may be eligible.

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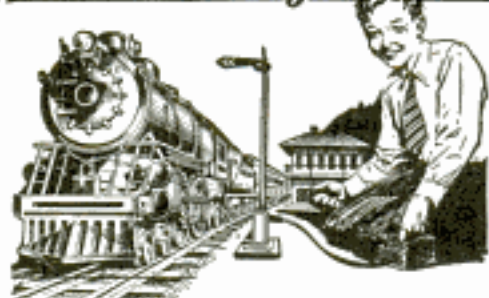
I enclose \$1 deposit. Send Underwood No. 5 (F.O.B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect and get my deposit back. If I keep it I will pay \$3 a month until I have paid \$44.90 (nom. price) in full.

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ELKHART, INDIANA

WING TO WING

(Continued from page 116A)

to put on full throttle to keep up on the outside of the curve. But with the new type of formation, where the wing men are below, the pilots scarcely realize that a turn is being made.

Getting "hot" on formation flying comes with a lot of practice. The throttle practice is just as important as the control work. The slightest pressure on or off the throttles of a bomber can ease the plane into place and keep it there. It is largely a matter of judging speed and distance.

To learn formation work, pilots are sent up to fly fairly close to another plane. They fly closer and more closely as time passes, and finally they are put directly into the harness. Student formation pilots are taught to fly far enough away from the leading plane to let their wings slide past in case they "overshoot." This advice also keeps them out of the dangerous propeller wash, which is quite a hazard behind big twin-motored bombers.

After a formation student has learned to judge his forward speed so that he can keep his wings at an equal distance behind the leading plane, he is allowed to swing in a little bit and test his skill on the side distance. After some practice at this, he is permitted to come in fairly close. But he is shown by an experienced pilot just where his wings will strike the propeller wash of the motors ahead. If a novice should get into this wash, he would probably be drawn into the tail of the lead plane and both machines would get ripped to pieces. But there is a certain "sweet spot," directly behind the wings of a leading plane and slightly below the edges of the wings, where a following plane can ride in undisturbed air.

The practice that a pilot gets in formation flying is a great help in driving an automobile. A man can judge his speed and distance to great nicety after he has had experience in flying in formations. Driving an automobile does not seem to help a person any when learning to fly, but flying helps in automobile driving.

Formation work in pursuit squadrons, however, is about as important as in bombardment. The pursuit pilots must stunt in some of their formations. They loop, roll, spin and dive in formation and some-

(Continued to page 120A)



"I'm always tired and nervous, Dick, and I don't seem to be getting anywhere. No ambition. No pep."

"I'll bet it's constipation, Bill. I had the same trouble till I tried this new treatment. Now I'm fit as a fiddle."

Check Constipation

THIS SAFE, SIMPLE, PLEASANT WAY

**Eat this Modern Type of Pure Yeast
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**Extremely Rich in the Regulating Elements—
Vitamins B and C—Lack of Which is Now
Known as Widespread Cause of Constipation**

CONSTIPATION causes more ill health than any other physical disorder. In its evil wake come bad breath, headaches, pasty skin and ugly eruptions, fatigue and other ailments known to nearly everyone.

Yet this scourge of constipation often can be easily relieved in a simple pleasant way, with a magic-working food that you will actually like. No longer need you resort to drugs, powerful cathartics and similar "cures" which shock the system.

What is the real cause of constipation? Doctors now know that too often it is nothing more or less than foods deficient in Vitamin B. Correct this condition in the natural way, with Yeast—Yeast Foam Tablets. By supplying the system and toning up the intestines with adequate quantities of Vitamin B—in which Yeast Foam Tablets are so exceedingly rich . . . and many common foods so poor—you help promote normal and regular evacuation and thus correct a common everyday type of constipation.

You'll like Yeast Foam Tablets. They are very different from ordinary yeast, as you'll see once you

try them. They have a pleasing nutlike flavor and are scientifically pasteurized. Thus they keep fresh for months—and cannot cause gas or discomfort. Also Yeast Foam Tablets are uniform in quality and high in Vitamin B and G content. Remember, this is the yeast that is used by various laboratories of the United States Government and by many leading American Universities in their vitamin research.

Any druggist will supply you with Yeast Foam Tablets. Only 50 cents for the large 10-day bottle. Get one today. Begin now to rid yourself of constipation in the natural way . . . and to build glowing health and vitality.

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WING TO WING

(Continued from page 118A)

times fly formation on their backs. This upside-down work has little connection with practical flying; it is purely a matter of stunt flying. With the agility of pursuit planes and the sensitivity of their controls, a pilot must be a quick and accurate thinker when doing close-formation work. In fact, the pursuit pilots are sometimes called the "quick thinkers" of aviation. The terrific speed of the pursuit planes also makes a period of time as short as a quarter of a second seem like an hour. As a matter of fact, upon the correct action of a pursuit pilot in a quarter of a second may depend safety or fatal disaster. The quick thinking of the pursuers is no more rapid than that of bombardment or attack, but it appears to be so because of the higher speed of the pursuit plane. A pursuit pilot's mind must be a little more jumpy than others'.

One of the peculiar things about formation flying is that a pilot flies the plane ahead of him—figuratively. The pilot must forget how his own plane flies and manage his throttle and controls in such a way that the plane ahead is kept in a certain position. This is in a way reversing the mental process of regular flying, although it is claimed by some pilot-scientists that an aviator really flies the ground or horizon when he is in the air, because his senses tell him he is standing motionless in mid-air and he only "kicks" himself into thinking he is strictly flying the plane. As evidence that this is true, experiments have shown that a man cannot fly a plane without being able to see the horizon that represents the ground, or instruments which take its place.

In flying close formations pilots cannot think of reading their maps. Only the flight leader knows where the formation is at all times, and if the leader becomes lost, which sometimes happens, the whole formation is lost, unless by some lucky chance, one of the other pilots happens to recognize a familiar landmark.

It is never considered a disgrace to get lost in the air. All pilots know that at some time they are likely to get confused on their locations. But a wing man who pulls out of a formation and begins to lead the leader certainly had better be sure what he is doing.

HARNESSING THE SUN

(Continued from page 92)

been a year of general drouth. After forty years of research, we have results which seem to us to justify in some degree the hope that a sufficient knowledge of solar radiation, and of its behavior in our atmosphere, may enable meteorologists to make valuable long-range forecasts many months ahead. We have not yet, it is true, tried this bold venture, but we have evidence that the sun's output of radiation is variable, that its variation is periodic, that the United States weather bureau's departures from normal are periodic, and that nearly all of the ranges of weather departures from normal are comprised in a series of periodicities which are identical with those found in the sun.

If such periodic effects remained with unchanged magnitude year after year, we could today foretell long in advance the principal departures of weather from normal. Unfortunately, however, the changes vary in amplitude and sometimes are displaced a little in relative recurrence. Up to the present, we have not succeeded in perfecting a solar method of long-range weather forecasting, but we do not despair of doing so. If we succeed in our present efforts to predict the fluctuations in periodic terms, the principal changes of weather can probably be forecast for as much as two years in advance.

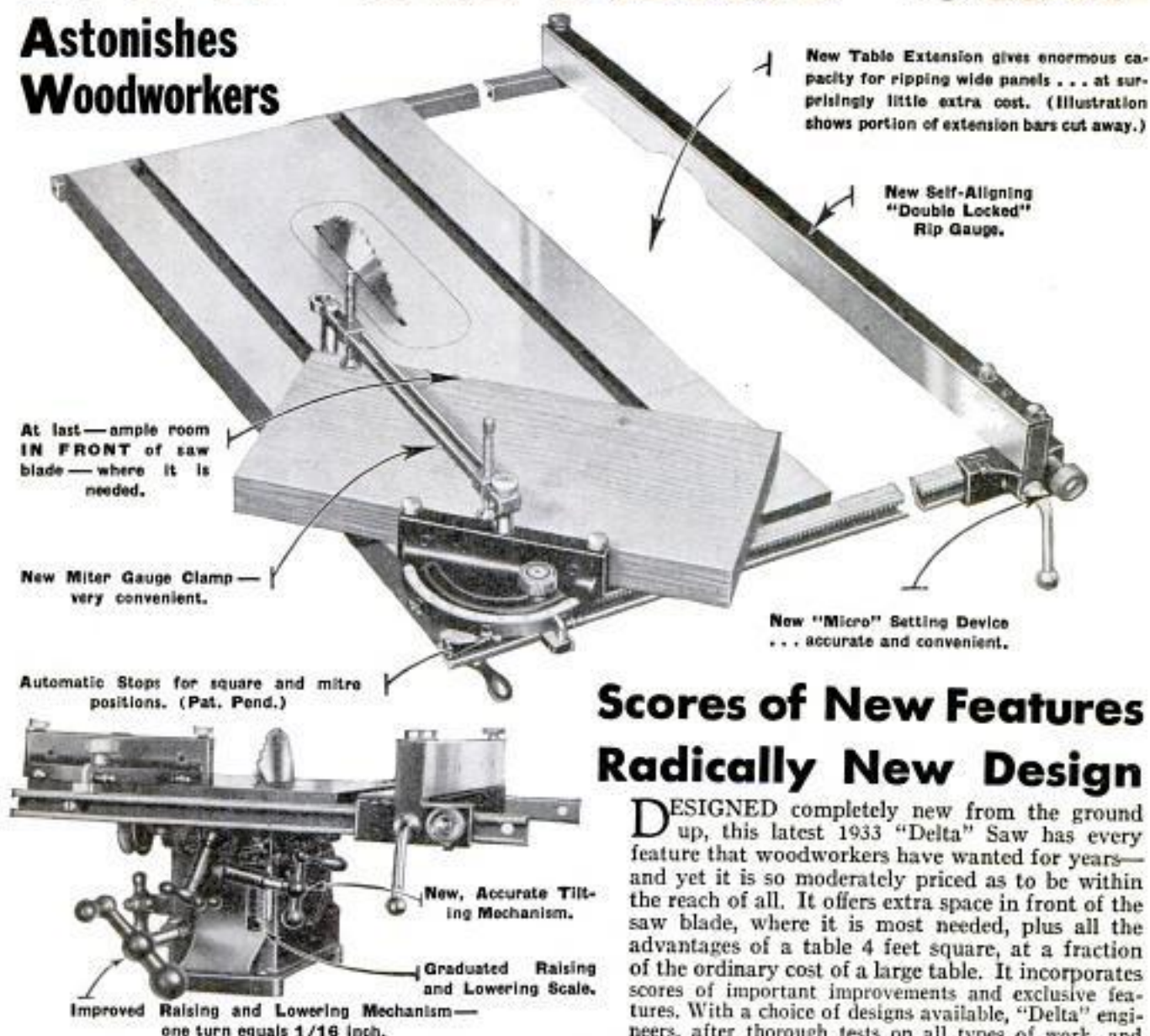
Because of the changing clouds, water vapor and ozone in the atmosphere, we have been forced to establish our observatories on remote mountain tops where we are above the worst of these changes. We have invented our own instruments, some so delicate that they will measure temperature changes of a millionth of one degree, and have maintained a painstaking record of readings from each station over a period of many years.

At a station such as that in Chile or on Table mountain in southern California, the observer measures the total heat of solar rays per unit of area and per unit of time, using a simple instrument with the long name of silver-disk pyrheliometer. With a pyranometer he observes the brightness of the sky in a definite area around the sun and with the bolometer, an electrical thermometer sensitive to a millionth of a degree, he measures the distri-

(Continued to page 122A)

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Astonishes Woodworkers



Scores of New Features Radically New Design

DESIGNED completely new from the ground up, this latest 1933 "Delta" Saw has every feature that woodworkers have wanted for years—and yet it is so moderately priced as to be within the reach of all. It offers extra space in front of the saw blade, where it is most needed, plus all the advantages of a table 4 feet square, at a fraction of the ordinary cost of a large table. It incorporates scores of important improvements and exclusive features. With a choice of designs available, "Delta" engineers, after thorough tests on all types of work, and under all conditions, selected the TILTING TABLE design (no tilting arbor) as being the most efficient and practical. For full details see the new 1933 "Delta" Catalog.

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Because "Delta" Woodworking Tools are efficient and practical under actual working conditions, they are always available for a 10-Day Trial without the slightest risk. Satisfaction is guaranteed. For full details of this liberal offer and also of "Delta" Easy Payment Plans, fill in and mail the convenient coupon below, TODAY!

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The "Delta" line includes Jointers, Circular Saws, Band Saws, Woodturning Lathes, Drill Presses, Scroll Saws, Boring, Routing, Sanding, and Mortising Attachments, and a complete line of accessories.

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Heats just as well as a \$400 or \$500 oil burner without electricity or gas. Simply turn one valve and you have all the heat you want. Cleaner and better for heating and cooking. Approved by National Underwriters' Laboratories and engineers. Over 150,000 in use.

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We also have a complete list of film subjects for any projector. Write NOW for list, FREE Catalogue of Movie supplies.

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Boston, Mass.

HARNESSING THE SUN

(Continued from page 120A)

bution of solar heating for all wavelengths throughout the spectrum. The latter measurements are made within a cave into which the sun's rays are reflected, and all are made simultaneously to determine how the quantities change as the sun rises higher and higher.

In Washington, where the reports from solar stations are received, a "brass brain," known as a periodometer, is used to evaluate solar-radiation changes over long periods of time. With the aid of this brass brain a forecast of the probable changes in solar variation in 1931 and 1932 was made in November, 1930, and thus far the forecast has been well verified.

Among other things, we have discovered that changes in temperature were manifested for as long as sixteen days after a solar change reached its peak, and apparently there is here an opening for forecasting weather changes several days in advance from knowledge of solar variation.

One experiment in long-range forecasting has been made, and in order not to have to wait for years to verify it, a prediction was made backward from March, 1918, to September, 1916, for three widely separated points, the forecasts being based entirely on solar radiation. Comparison of these predictions with actual records of the weather bureau showed that, while the agreement was not perfect by any means, there was in each case a tendency to correspondence in the trends.

We have also been much interested in the production of useful power from sun rays. If the energy of solar radiation could be converted entirely into mechanical work, it would produce about one horsepower per square yard of surface. Hitherto solar machines have yielded no more than two or three-per-cent efficiency, so that from thirty to fifty square yards, or even more, have been needed to produce one horsepower. This makes the installation too costly to compete with coal.

As an experiment in conserving solar energy, we constructed a solar cooker which collects the sun's rays by means of a concave cylindrical mirror twelve feet long and seven feet wide, which swings on an axis parallel to that of the earth,

(Continued to page 124A)

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Get your own personal comfort provided for first, and you can strike out after business with an easy mind. The salesman who makes the Melbourne Hotel his St. Louis home puts his best into every day because he knows that at night there's an easy chair and a luxurious room with a comfortable bed waiting for him.



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Macchi Parasol



Boeing Fighter

with clear building and flying directions. No tools needed. Either set, safely packed, only 50c, postpaid, Canada 65c. Order one or both today!

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\$2.98 POST PAID

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PASSES THRU 3 STAGES

And It is Far Easier Relieved in
the First than in the Second
or Third Stages!

A COLD ordinarily progresses through three stages: The Dry Stage, the first 24 hours; the Watery Secretion Stage, from 1 to 3 days; and the Mucous Secretion Stage. Once a cold gets beyond the first stage it is far more difficult to relieve.

Fourfold Effect for Immediate Relief

The wise thing to do when you feel a cold coming on is to take Grove's Laxative Bromo Quinine.

Grove's Laxative Bromo Quinine stops a cold quickly because it does the four necessary things. It opens the bowels. It kills the cold germs and fever in the system. It relieves the headache and grippy feeling. It tones the entire system and fortifies against further attack. That is the treatment you want—complete, thorough and effective. Anything less is toying with a cold.

Grove's Laxative Bromo Quinine is absolutely safe to take. It contains no narcotics and produces no bad after-effects. Every drug store in America sells Grove's Laxative Bromo Quinine. Handy, pocket-size box, cellophane-wrapped. Get a box today and keep it handy as the "stitch in time."



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Write a Better
Prescription
Myself!"



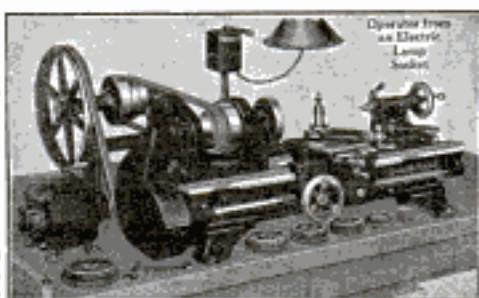
GROVE'S LAXATIVE BROMO QUININE

\$34⁰⁰ Down for this 8" Bench Lathe

**A
Back-Geared
Screw Cutting
Precision
Lathe**

Wt. 240 lbs.

Price includes
1 phase Re-
versing Motor
and Reversing
Switch.



8" x 24" Horizontal Motor Drive Bench Lathe Complete.....\$132.25
\$34.00 down, \$9.00 a month.

The South Bend 8" Lathe shown above has back-geared headstock—six spindle speeds—hollow spindle—tailstock set-over for taper turning—reverse for feeds and threads—power feeds .0208" to .0053". Cuts screw threads 4 to 96 per inch. Built in bed lengths up to 48".

Factory Rebuilt Lathes

Bargain prices on a few Factory Rebuilt South Bend Lathes in sizes from 9-in. swing to 18-in. swing. Countershaft and Motor Drive. All carry our regular guarantee. Bargains while they last. Write for List.

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Get BB Magic at once. A wonderful shooter's digest—tells how to hold, aim and handle rifles; become a crack shot. The principle of compressed air action that made the Benjamin Single Shot world famous has been applied to 25 shot automatic firing. Learn all about both rifles.

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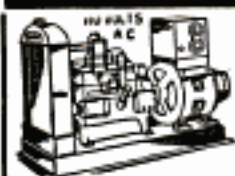
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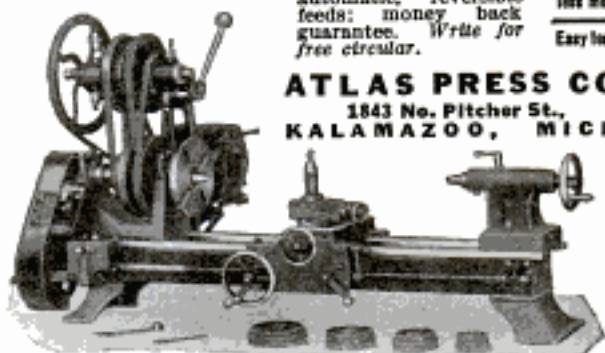
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Complete as shown, less motor
Easy terms

ATLAS PRESS CO.
1843 No. Pitcher St.,
KALAMAZOO, MICH.



HARNESSING THE SUN

(Continued from page 122A)

and which follows the sun automatically, its movement being regulated with a common little alarm clock. The rays are focused on a blackened metal tube containing engine-cylinder oil, the tube being surrounded by a vacuum jacket of pyrex glass to hold the heat, on the same principle as a thermos bottle. From the heater, the tube extends upward into an oil reservoir and a return tube passes under the mirror to the lower end of the heater. Thus the heated oil expands into the reservoir and the cooler liquid takes its place in continuous circulation. Two ovens at the back of the reservoir are bathed by the hot oil, giving temperatures sufficient to bake bread and, as the heat is sufficiently conserved, the ovens remain hot night and day with only seven hours of sunshine.

By studies of the losses of heat in the sun cooker, I have become convinced that an efficiency of twelve or fifteen per cent may be attained in converting sun rays to useful power. An experimental machine for this purpose is already partly constructed.

Nature's own method of conserving sun rays is through the growth of plants and animals. In the coal and oil deposited in former ages, we still retain enormous amounts of energy which came to the earth in sun rays. The chemical reaction whereby the carbonic-acid gas of our atmosphere is absorbed by green plants and converted by the energy of solar rays into sugars and higher chemical products is surely the most fundamental one, for all life depends on it.

In a laboratory for studying the relations of life to sun radiation, we have discovered many startling facts about the simpler problems of plant life. For instance, when we expose to the spectrum of the mercury arc a plate covered with the simplest plants, a single-celled green alga, nothing happens in the green, blue or near ultraviolet, but beginning with the extreme ultraviolet rays, every line in the shorter-wave spectrum prints itself as if on a photographic plate by killing the alga it falls on. Curiously, this killing action is connected with the ozone of the higher atmosphere.

(Continued to page 126A)



A TRULY GREAT HOTEL

When you visit Detroit next time stop at Hotel Fort Shelby. You'll enjoy its thoughtful, efficient, unpretentious service . . . its savory foods and cozy, cheerful, charming rooms. ¶ Hotel Fort Shelby's location in the heart of Detroit's shopping, theatre, financial, insurance and wholesale districts is a happy one . . . no other large hotel in the metropolitan area is so near the principal railway terminals, airports and boat piers. And if you drive to Hotel Fort Shelby competent, courteous attendants will relieve you of your car . . . and return it at your command, free of charge. Nominal garage tariffs. ¶ 900 rooms . . . all with private bath, circulating ice water and servidor. Many as low as \$2.50 per day. Radio for every room. Three popular priced restaurants. Music and dancing every evening in the Main Dining Room . . . no covert charge.

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HOTEL Fort Shelby

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DETROIT

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The Deagan Xylorimba is your Opportunity! Wonderful for home, in demand at dances and entertainments, yet easiest of all instruments to play. No teacher necessary—you actually play simple melodies the very first day even if you cannot read a note of music right now!

Earns \$60 a Week—Ralph Smith, Chicago, says: "Played 20 minutes at wedding. Received \$10." L. E. Hallmann, Reading, Pa., writes: "Made \$300 in 5 weeks, spare time. Had never played instrument before."

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Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xylorimba.

Name _____

Address _____

HARNESSING THE SUN

(Continued from page 124A)

Atmospheric ozone gas is so powerful an absorbent that a layer of it which, if brought to sea-level pressure, would be no thicker than a sheet of cardboard, completely extinguishes all of the ultraviolet rays of the solar spectrum beyond a certain point. This thin ozone blanket not only protects from death the algæ, but all other forms of life. We should die ourselves if it were removed. And yet, if it were more dense than it is, it would cut off the solar rays which prevent rickets.

On so thin a thread as this does all life on earth hang!

But we have not confined our experiments to the lowly algæ. We are growing wheat under conditions so well controlled that its chemical root food, its carbon-dioxide ration, its supply of radiation, and the temperature and humidity of the air about it are all measured to a nicety. We vary the radiation supply and the carbonic-acid supply, and thus determine how the growth of wheat would be modified under other conditions than those supplied by nature at present. We have found that the sunlight is several times stronger than is necessary to promote all the growth that can take place in the ordinary atmosphere.

If the carbonic-acid content of the air were increased, however, from the present three-hundredths of one per cent to as much as one per cent, the sun rays would suffice to promote a monstrous rate of wheat growth. Probably in that geologic epoch when Pennsylvania was covered with a luxuriant forest growth now represented by her coal mines, the atmospheric carbonic-acid gas was much greater than now.

Carbonic-acid gas is heavier than air, and is often found in great strength in the bottom of old wells. Possibly, if a farmer built a tight board pen for his wheat, as he does for his pigs, and grew his grain in a lake of carbonic-acid gas poured from a high-pressure tank, he might produce a variety of grain so amazing that he would be the envy of all his neighbors.

From experiments such as these, and from observations and records maintained for two score years and painstakingly correlated, we are slowly gleaning knowledge

(Continued to page 132A)

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a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. Never fails. A 16-page course on Ventriloquism and the Ventrilo. All for 10c Postpaid.



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STAGE MONEY



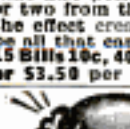
With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices: 15 Bills 10c, 40 Bills 20c, 120 for 50c or \$3.50 per thousand postpaid.**

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3½ Foot Crash-Proof, Flying Model



Your Boy May Be another "Lindy" Give Him a Flying Aeroplane

Designed by real aircraft engineers. 85% unbreakable. Can crash trees, walls, buildings without breaking. Shock absorbing landing gear. 3½ ft. wing spread. 22½ inch fuselage. Weight 12½ oz. Flies 200 to 700 feet at one winding. Patented, oiled rubber motor. In a class by itself. Get yours now.

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BUILT-UP KIT. 110 v. 60 cycle. Size 12½" x 7¼" x 9½" — weight 12 lbs. Easily assembled—Full Instr. 4 R. C. A. 12½" Tubes. Walnut Cab. Fully Veneer. Dial. Myosonic Spkr. COMPLETE WITH ALL PARTS. Send \$4 deposit. Bal. \$6.95 C. O. D. Completely assembled. \$12.95. Agents build and sell these Radios. Send for circular on G Tube Auto Radio. Fully Guaranteed from Manufacturer.

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**THE NEW
ALMOR
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Windshield Wiper**

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ONLY . . . 50¢**

Every car owner will buy at this startling low price. Attached in a few seconds; no

holes to drill; no tools required. **GRAZIER SOLD 38 FIRST HOUR.** Get in on this quick. Territory going fast. Big profits. Rapid sales. Save time—send 50c for TWO agent samples and full details.

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SPARE THE OIL AND SPOIL THE MOTOR

(Continued from page 102)

light four-cylinder car was driven at an average speed of fifty miles per hour. Using one oil of a popular brand and of the specified SAE number, the engine consumed twenty-seven and one-half ounces of oil while the gasoline ran fourteen miles to the gallon. Substituting an oil which was one SAE number heavier, the oil consumption was reduced to eighteen ounces. This saving of nine and one-half ounces of oil meant a saving of about 9 cents if the oil were 30 cents per quart.

Against this must be considered the gasoline used. With the heavier oil, the gasoline mileage dropped from fourteen miles per gallon to twelve and four-tenths miles per gallon. This means that four and three-tenths gallons more gasoline were used in driving the 500 miles with the heavy oil than with the lighter. At 15 cents per gallon, this would mean that the gasoline cost about 65 cents more when the heavy oil was used. The saving of 9 cents was made at a cost of 65 cents. Not counting the reduced speed, reduced power and increased wear caused by the heavier oil, the loss was 54 cents. This is the reason the brag "my car does not use any oil" is meaningless.

The speed of the car is also influenced by the viscosity of the oil. In tests on Lookout mountain, near Los Angeles, a six-cylinder car went over the crest of the hill at thirty miles per hour when it was oiled with an SAE 50. But when the oil was changed to SAE 20, it went over the top at forty miles per hour.

Oil has an important effect on the power of the engine. Salesmen of two similar but competing automobiles were accustomed to demonstrate the pulling power of their cars on the Grand Avenue hill, a steep street in Los Angeles. When the latest models of the two cars came out, one man found that the other was beating him by a small but consistent margin.

"I tried every thing I could think of to get the little bit of extra power I needed to win those contests," the salesman said. "I had our best mechanic tune up the car as perfectly as he could the last thing before our demonstrations, and still we lost by a small margin. We even had the engi-

(Continued to page 131A)



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Complete
READY TO INSTALL

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Equipped with V-pulley for your treadle or motor. 15" long—9" high. 6 1/2" table. All metal construction. Sent postpaid on receipt of \$1.00. (Canada, \$1.35.) C.O.D.'s 25c extra. FREE booklet "Make Your Own Jig Saw Puzzles" with every saw.

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NEW JIG SAW 24" x 5"

Special table for Puzzle Sawing.

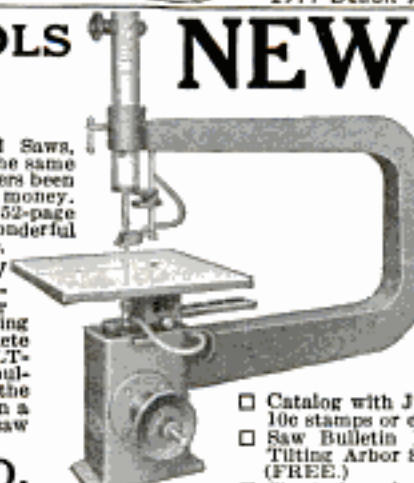
Adjustable tension with quick release. Sliding head for long or short blades.

Table and sliding head may be turned 90° to operate like a Band Saw.

Many other features.

PLEASE SEND ME:

- Catalog with Jig Saw Bulletin. (Send 10c stamps or coin.)
- Saw Bulletin No. 700. Tells why a Tilting Arbor Saw is best for my work. (FREE.)
- Sheet of new low prices for catalog "F."



When writing to advertisers please mention Popular Mechanics

\$200 First Week In OWN Business

We want a reputable, honest man in each county. This man does not need to have any special experience or more than ordinary ability, but he must be honest and courteous.

Such a man we will start in business for himself. You can make far above average profits in the rug-cleaning business—a high-grade business all your own. Many earn \$125 to \$200 per week—some considerably more. L. A. Eagles took in \$200 his first week in Madison, Wis. No shop necessary. The H-B rug-washer finishes rugs like new on the customer's floor. There are hundreds of customers—in your vicinity and nearby towns.

The H-B rug-washer is very simple. Anyone can run it. Electricity does the work. Simply clean a few rugs. These customers tell others and also give you their future work. Soon you will have a prosperous year-around business. Send coupon for booklet explaining everything.

"Monthly Profits \$400"

C. R. Bergseth writes, "My profits run about \$400 every month." M. O. Malmin earned 3 times the cost of his machine the first two months.

Free Book—Mail Coupon NOW!

H-B Co., 6091 H-B Bldg.,
Racine, Wisconsin.

Gentlemen—Send at once (no obligation) your free booklet illustrating rug-washer and telling how I can own my own business; how I can earn large profits at prices below other methods; how I can enjoy a permanent year-around business; how I can become financially independent in a very short time; and how I can pay on easy terms.

Name.....

Address.....

City..... State.....

"Never a Complaint"

C. J. White says: "\$100 business in six days—never a complaint." That is the nicest part of this business—every customer is more than satisfied. Stains and blotches disappear and vivid colorings and freshness in faded floor coverings come back.

"Profits Pay for Home"

Harry Hill built and paid for a home from rug-washer profits. His first day's business was \$86. You, too, can enjoy a large income. H. Riley says: "One job, about 13 hours work, brought in \$75."

Backed by \$58,000,000 Company

Every H-B rug-washer is guaranteed by a 127-year-old \$58,000,000 company. You take no risk. This method has been successful 12 years. H-B rug-washers are used by United States government and by Statler and other leading hotels. They are GUARANTEED.

Easy Terms

The complete equipment is inexpensive. A reasonable down payment brings every thing to you and the balance is paid monthly. From the start, you have your own business—one that is profitable and of which you can be proud.



Revolutionary
NEW WALL CLEANER
A Gold Mine
For AGENTS!

**\$2300
IN 2 HOURS**

M. O. Klevon,
N. Dakota, re-
ports \$23 in 2
hours. C. Mar-
ling, Ohio, spare-
time worker
made \$84 in 3
days. Write
today for Agents
FREE OUTFIT

HERE'S something brand new and needed in every home! Amazing new wall cleaning invention banishes old style home-cleaning methods forever. Ends drudgery, saves re-decorating. No rags, sponges, mess or fuss. No red, swollen hands. No more dangerous step-ladders. Literally erases dirt like muck—from walls, ceilings, windows, plastered furniture, etc. Women simply wild about it. Low price sells it on sight. Lasts for years. Not sold in stores. Send for catalog of this and 47 other Household Necessities.

FREE OFFER: Special Introductory Offer gives you chance to get yours FREE. Write at once! Kristee Mfg. Co., 1351 Bar St., Akron, O.

Master Home Mike

New 1933 Model, Complete with
Mike Ring and Handle

**95¢
POSTPAID**

Master Mike Co., 4608 Grand River, Detroit, Mich.

Reproduces your own voice through your radio. Fools your friends. A million dollars' worth of fun. Easy to connect. Fits any radio. A real microphone—not a toy. Mailed postpaid, only 95¢. Send today.



FREE RADIO CATALOG

Write for this Big Free Book today. The most complete line of radio sets, service men's supplies, replacement parts, test equipment at the lowest wholesale prices.

ALLIED RADIO CORPORATION
839 W. Jackson Dept. A Chicago

Compressors, Car Washers
Arc Welders, Battery Chargers **Increase Profits Without Expense**

ONLY \$10 MONTHLY

\$17 MONTHLY

\$31 MONTHLY

\$10 MONTHLY

This money-making equipment will bring you \$150 to \$300 profit monthly. Requires no experience to operate—comes on 30 Days Trial. Shouldn't cost a cent—will pay for itself on EASY MONTHLY PAYMENTS. Used by U. S. Govt. Write for details, no obligation, to

Hobart Brothers Co., Box M 13 Troy, Ohio.

30 DAYS TRIAL — EASY TERMS

SPARE THE OIL AND SPOIL THE MOTOR

(Continued from page 128A)

neers in the factory trying to find the bug that made our cars a trifle more sluggish than our competitor's. Finally, just before a demonstration which was to result in an order for fifteen cars, a lubrication engineer suggested that we try a lighter oil. I had my crankcase drained and refilled with the best obtainable oil of SAE 30 instead of the 40 I had been using.

"The next morning we were out early. Traffic officers had cleared the part of the street we were to use, and we both were sitting in our cars on the starting line with the engines idling. Our client was near the top of the hill to watch both cars. My opponent grinned confidently at me as the starting signal was given. We shifted through low and second into high almost exactly together. Then the other car began to pull away from me slightly. By the time we were halfway up the hill, he was nearly a whole car length ahead of me. I was discouraged. But I gave my car every bit of throttle it would stand. Although pulling hard, I knew it was far from stalled. Just as I was about to give up hope, I was mentally kissing that fifteen-car sale goodbye, when I noticed that the other car was no longer gaining. My radiator was even with his rear hub caps.

"We were now on the steepest part of the hill, when I started to gain a little on the other car. The rear of his car soon slipped past me, then I was even with the other driver. We were neck and neck, and his confident smile was replaced by an anxious look of determination. With only a few more feet to go, I noticed that I had to look back to see the driver of the other car. I was ahead. I had won! I topped the hill nearly a half length ahead of the other car. This demonstration clinched the deal and the sale of the fifteen cars was attributed to the change of oil."

Needless to say, this company always afterward demonstrated with as thin an oil as possible. They soon changed to SAE 20 with the new cars, and to their surprise, they found that they not only got more power, but they also found that their top speed was a little higher, and that they got two or three more miles per gallon of gasoline.

(Continued to page 132A)



USE this FLEXIBLE SHAFT

\$8.00
Less Motor

Handiest tool you can own. It's a workshop on wheels!

Drills holes, removes paint and rust, sands and waxes, grinds metal, polishes your car—Goes dozens of other jobs.

Write for free 1933 Catalog

WALKER TURNER CO., Inc., Dept. F
PLAINFIELD, NEW JERSEY

POWER DRIVER TOOLS




Can be easily and quickly assembled. We supply all parts. No special tools necessary. SEND \$1.00 for Illustrated Instruction Booklet giving complete details. Description Circular FREE upon Request.

HARTFORD CLOCK CO.
190 Central Ave. Jersey City, N. J.

Build Your Own \$250 Grandfather's Electric Clock (Observatory Type) for \$55

Small Installment Payments.



Catalog No. 33 Illustrating Electrical, Mechanical and Model Makers' Supplies, Small Steam & Gasoline Engines, Motors, Generators, Lathes, Drill Presses, Bench and Hand Saws, etc.—16-32 & 44 Volt Dynamos, School Projects, Engine Castings, Motor Parts, etc.—Bells, Blue Prints, Brass and Steel Tubing, Gears, Pulleys, Hangers, Experimental Material.

Big Copy. Mailed anywhere for 20 cents, 25 cents Canada, refunded first order.

LOOMIS ELECTRIC CO.
2822 N. California Ave. Chicago, Ill.

Ideal TRAILER HITCH BALL JOINT

CAN'T LET GO!



ONLY \$3 POSTPAID

On or off easily! Millions of miles—no failures! Thousands enthusiastic users. 4 sizes to 10 tons. 11 tongues and parts to build your own trailer. Request catalog.

HAMMER BLOW TOOL CO., 606 Third St., Wausau, Wis.



BUILD FOR PROFIT!

You too can earn money in spare time by making a decorative model, 32 1/2" long, of Drake's "Golden Hind." Hull comes fully shaped and sanded with decks in place. Clear drawings show you how to add fittings. As a gift, cleats, masts, rigging, sails. As a special offer, paints and brushes for decorative model is included in "Golden Hind" set, \$9.75 (plus 4 lbs. parcel post). Send 15c (total) for catalog of quality models.

ROY HANCOCK
323 Douglas Ave., Portsmouth, Va.

NEW KIND OF CLOTHES LINE

NO PINS
NO PROPS
NO S-T-R-E-T-C-H
NO SAG



IN many ways the most amazing household device ever patented—the new PINLESS CLOTHESLINE is creating a tremendous sensation everywhere. Housewives are astounded—can hardly believe their own eyes when they see how firmly the line itself holds all kinds of articles from sheerest silk hose to heaviest blankets—grips them so securely the strongest wind cannot blow them loose, yet a mere finger touch releases them instantly. No more clumsy pins to fumble with—break and lose, and no more props to blow down, dropping wet clothes on the ground. But that's not half! This amazing line cannot stretch or sag—cannot rust or stain clothes—cannot snarl, tangle or break in two. It can be put up or taken down in a jiffy—no knots to tie and untie; is filled or emptied in a third the usual time and holds twice as much as old style clotheslines. Actually cheaper than old fashioned lines since it will last a lifetime with ordinary care. Already, in thousands of homes, it is saving time, money, clothes and labor. Why not decide right now that you too are going to end clothesline troubles forever. At least investigate. Write today to PRICE MFG. CO.; Dept. A-30, 154 E. Erie St., Chicago, Ill.

AGENTS COIN MONEY

Amazing self-seller; housewives everywhere buy eagerly. Possible earnings up to \$10-\$15 in a day. Exclusive territory to hustlers. WRITE TODAY!

AERO INTERNATIONAL ALL WAVE 11-TUBE SUPER-HETERODYNE DE LUXE



Completely Assembled With 2 Matched Full Dynamic Speakers **\$29.75**

At last! World wide reception at a sane price. 15 to 550 meters. Besides the regular broadcast band, it brings in foreign programs, amateurs, police calls, ships at sea and aeroplanes. One dial control. No plug in coils. Latest super-phonetic tubes.

AERO 4-TUBE MIDGET

\$10.95 less tubes
2.95 kit of tubes

The lowest priced quality Midget Receiver on the market today. Very selective, brings in long distance like local stations.

AERO 5-TUBE MIDGET **\$11.90**
 AERO 6-TUBE MIDGET **18.50**

AERO WORLD WIDE

1-Tube SHORT WAVE SET for Headphone Operation
\$5.95

Listed in DIRECT to London, Paris, Berlin, Buenos Aires and other broadcasting stations throughout the world via short waves. Your ordinary receiver cannot tune in these low wave stations. WORLD-WIDE RECEIVER gets 15 to 500 meters. Aero 2-Tube Short Wave Set \$8.75. The same as above set but it has 1 stage of Audio Frequency added to it.

Write for Complete Catalogue.

CHARLES HOODWIN CO.

4240 Lincoln Ave.

Dept. A-20

Chicago

SPARE THE OIL AND SPOIL THE MOTOR

(Continued from page 131A)

The motorist, in order to insure the longest possible life for his engine, should select a high-grade brand of oil and then fit the viscosity to his engine. The maker of the engine specifies the SAE number which he considers best for that engine. But because this is based on the average use of the car throughout the country, each machine will perform best on oil which exactly suits its degree of wear and the type of driving it is being given.

To start this test, first see that the motor is in perfect mechanical condition, then fill the crankcase with a high-grade oil of the SAE number specified by the maker of the engine. Now keep careful check on both the oil consumption and the gasoline mileage. If the oil is used too fast, change to a heavier grade. If the engine has a tendency to heat up, or if almost no oil is used, change to a lighter grade. Use the thinnest oil consistent with economy of gasoline and oil.

HARNESSING THE SUN

(Continued from page 126A)

about man's friend, the sun, and its relation to all living things on earth.

To those of us who are optimistic, the facts we have learned have much significance. Some of us even dream of a day when our neighbor star will be put in harness to do the work of the world—give us our weather reports a year or two in advance, supply the power to run our factories, and insure the farmer bumper crops.

FULL SPEED AHEAD

(Continued from page 77)

gers and freight in a single crossing averages about \$235,600; but in prosperous times this same ship has averaged \$560,000, and in certain exceptional sailings it has earned \$720,000, which is almost \$150,000 per day.

The workday never ends on a running ship. Hundreds of activities incidental to operation are carried on hardly without the knowledge of passengers.

The sailor's eternal watchword is vigilance. And only one report passes the captain's inspection—"All's well."

12" BAND SAW
Ball Bearings—
Tilting Table**FOR THE WORKSHOPS OF AMERICA****Circular Saw**

Big capacity table.
45° tilting fence
and table. Fitted
for dado heads.

Disc Jointer
Faster, safer, smoother.
Adjustable guide

TURNING . . BORING
ROUTING . . BUFFING
Husky lathe, 12" swing.
Buffer, other tools
quickly attached.

**Metal Working**

Built for practical work.
Fittings available for
turning, milling, drill-
ing, honing, thread
chasing, etc.

ONE MOTOR
does all jobs
6-speed
quick belt
shift

New**Ole Evinrude's SHOP-KING**Built by
Ole Evinrude

NOW you can have the rugged, precision-built, high-production machinery you have always wanted, and at a price *actually lower* than that of ordinary workshop equipment. SHOP-KING combines all the most popular machines into one complete, amazingly versatile unit, one big unit that not only embraces a complete wood working outfit (including band saw, circular saw, disc jointer, lathe, etc.) but is adapted to, and built for, such metal working operations as turning, milling, drilling, thread chasing, grinding, etc.

SHOP-KING is the newest creation of Ole Evinrude, famed inventor, engineer, manufacturer. It is built in the great plant that produces Evinrude and Elto motors, thus guaranteeing finest precision construction and making possible a price sensationally low.

SHOP-KING is equally adapted to home workshops and to pattern shops, carpenters' and contractors' shops, small factories. Completeness considered, *there is no cheaper equipment; quality, size, ruggedness compared, there is no finer in the field.* Write today for descriptive literature!

\$139⁵⁰

AS SHOWN, LESS MOTOR

SEND COUPON TODAY!**QUICK SET-UP FOR EVERY JOB!**

Six-speed quick belt shift gives correct speed and power for every operation from single motor. Band saw instantly swings down to bring circular saw into position. Saw tables, fences, guides fully adjustable. Jointer table and guide tilt out of way for open sanding, grinding,

turning, etc. Emery wheel, buffer, lathe equipment instantly attachable. Metal working equipment of professional quality (graduated lathe compound slide rest, milling and thread chasing attachments, chucks etc.) can be quickly mounted or removed.

SHOP-KING DIVISION
Outboard Motors Corporation
4141 N. 27th St., Milwaukee

Send me complete SHOP-KING literature.

Name

Address

MODEL SHIPS
SOVEREIGN OF THE SEAS

We can supply construction sets and all sorts of parts, blue prints, books, etc., for building real life scale models of the Destroyer, Frigate, Flying Cloud, Constitution, Spanish Galleon, Sovereign of the Seas, Blenheim, Mayflower and many others. Our large 64-page photographically illustrated booklet contains valuable information and hints for building ship models in addition to prices and full description of the above articles. A copy will be sent postpaid upon receipt of 15 cts. (coin preferred).

Model Ship Supply Co., Dept. A, Mineola, N. Y.

ERECTOR**"THE WORLD'S CHAMPION TOY"****BUILD REALISTIC MODELS OF THE WORLD'S GREAT INVENTIONS****EASY**

You'll advance faster with an easy playing Conn. Choice of the world's greatest artists. Many exclusive features yet they cost no more. Home trial. Easy payments. See your dealer or write for free book. Mention instrument.

C. G. CONN, Ltd.
131 Conn Bldg., Elkhart, Ind.

CONN
World's Largest
Manufacturers of
BAND INSTRUMENTS

**BUILD-A-MOTOR**

Reg. U. S. Pat. Off.

the NEW K-M TOY

Reg. U. S. Pat. Off.

SENSATION

A REAL ELECTRIC MOTOR
—ABSOLUTELY HARMLESS
—READY TO BE PUT TO-
GETHER—AND TO RUN!

A FASCINATING EDUCATIONAL TOY

What real boy would refuse to trade his last year's sled and his best jack-knife, to boot, for one of these wonderful new BUILD-A-MOTOR sets! Completely "knocked down"—ready to be put together according to the regular draughtsman's blue-print that accompanies it—and thus his first, valuable lesson in electricity is learned!

ACTUALLY RUNS MOTOR TOYS! And what fun—to "plug in" on any 110-115 VOLT (regular house current) wall outlet or light socket (Alternating current only) and "hook up" the toy windmill or buzz-saw, or the Mecanno or Erector crane or merry-go-round!

SEND NO MONEY! Just pay postman \$1.98 plus postage. Take advantage of this Amazing offer. **DO IT NOW!**

AGENTS

Earn up to \$100.00 a week. Big Discount to agents, order one for sample. Credit for sample allowed on first order for a dozen.

SEND COUPON TODAY

SUPERIOR ELECTRIC & MFG. CO.
3300 So. Broadway, St. Louis, Mo.

Gentlemen: Send your BUILD-A-MOTOR. I will pay postman \$1.98 plus postage upon delivery.

Name

Address

City..... State.....

When writing please mention Popular Mechanics

DEPENDABLE POWER WITH THIS LOW-COST TRACTOR



Make Tractor From Old Car!

SHAW TRACTOR EQUIPMENT makes your old model "T" or "A" Ford, Chevrolet or other old car into a powerful, dependable tractor—at amazingly low cost. Tests prove SHAW Tractor does farm power work as well as expensive tractor. New HIGH ARCH Model straddles 1 or 2 rows of corn, etc. Has 30-in. clearance. Cultivates 15 to 20 acres per day. Handles 16-in. or two 12-in. plows nicely. Pulls 7-in. disc harrow. Can be used to disc, seed, haul, run belt machinery, etc. **Price Greatly Reduced** to meet present conditions. Write today for Free literature and 10-DAY TRIAL OFFER! Specify which machine you're interested in!

PRICES GREATLY REDUCED

Does work of many men! Cut production costs! That's the way to make money these days! Save valuable time and labor—by using the SHAW DU-ALL Garden Tractor. An amazing Money-Maker for farms, truck gardens, fruit farms, nurseries, poultry ranches, suburban homes, etc.

SHAW DU-ALL GARDEN TRACTOR plows, harrows, seeds, cultivates, harvests, furrows, discs, mows, pumps water, runs saws, concrete mixers, machine shop and all belt machinery. 4 sizes, 1 to 5 H. P. Walk or ride. Costs only 2c to 4c per hour to run. 3 speeds forward, and reverse.

Prices Greatly Reduced to meet present conditions. Get yours now—and SAVE. Write today for FREE literature. 10-DAY TRIAL OFFER.

WRITE FOR FREE BOOKS

Contain full information about SHAW DU-ALL and SHAW Tractor Equipment. Also Agents' proposition and New Low Prices.



SHAW MFG. CO.
4501 Center St.,
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Kansas






**IDEAL Spad
Vought Corsair
Lockheed Sirius**
15 in. Size

**BUILD 3 MODELS
FOR \$1.65 Postpaid**

Biggest value ever offered; IDEAL 3-in-1 Kit contains everything required to build these 3 Flying Models, including Plans and instructions. Easy to build. Send 5c for NEW catalogue.

Ideal Aeroglass & Supply Co., 28 W. 19th St., N. Y. City

TUNE IN THE WORLD!



Now you can have the thrills of short-wave reception on your present AC radio . . . ships at sea . . . air planes in flight . . . police emergency calls . . . new U. S. stations . . . entertainment and excitement from half the globe or more. "Something doing" day and night with this remarkable

STEWART-WARNER Short-Wave Radio Converter

Easily attached to your present radio set. No rewiring or alterations required. Small attractive Walnut cabinet, only 8½ x 11½ x 10 inches, stands inconspicuously on top of your present radio. Turn of switch gives you standard or short wave reception at will. These are genuine latest model Stewart-Warner Converters, brand-new, in original factory cartons, fully guaranteed. Finest \$20.95 instruments at only \$6.95—but supply is limited—order at once, check or money order.

Regular Price \$20.95

\$6.95

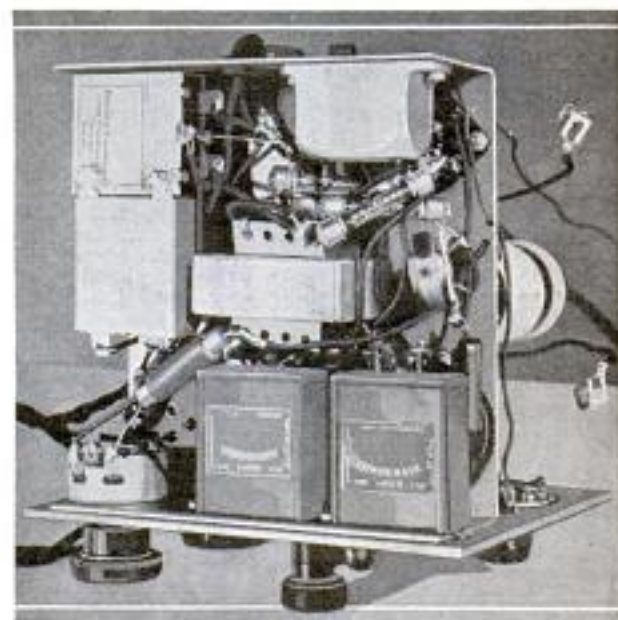
Complete
with
tubes
Ready to hook up

SHORT-WAVE CRAFT, 5215 Detroit Ave., Cleveland, Ohio

TRAVELING MAN'S RECEIVER

(Continued from page 102)

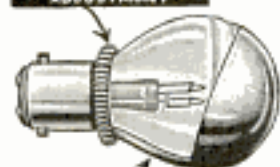
compactly arranged as possible, and it will be noted in the underside photo that the by-pass and 4-mfd. filter condensers together with the choke are all mounted in a very compact group. The three-tap inductance switch, which enables the operator to vary the selectivity of the set to suit local conditions, is mounted on the front panel at one side of the tuning condenser, and the potentiometers at the other. A complete list of materials is available upon application. All connections should be made with well insulated hookup wire and carefully soldered, as a set of this type undergoes rather rough handling.



A suitable cabinet or carrying case may be made of ¼-in. three-ply veneer. The rear of the case should be well ventilated by drilling a number of holes, or better still, the back panel may be made removable to insure good ventilation while the set is in use. The phone leads may be connected directly to the output transformer, or leads may be taken to pin jacks mounted on the front panel. Enlarged blueprint diagrams and further details are available if desired. Tuning is quite simple, and the volume-control potentiometer is wired as the grid-return resistor of the 238 pentode tube, so that the output may be regulated to maximum clarity and volume suitable for headphone reception. A small speaker may be included in the cabinet or used externally as desired.

Makes FLOODLIGHTS of AUTO HEADLIGHTS

SPRING RATCHET ADJUSTMENT



LARGE COOLING FIN

This amazing invention eliminates all the dangers of night driving. Lights both sides of the road, pierces fog, rain and snow and does not blind the eyes of the approaching motorists. Flood lights can be installed in a jiffy by anyone. They fit all standard size bulbs and do not wear out. Exclusive cooling feature prevents burning out of bulbs. They are worth many times their retail price of only 75c per set to any motorist. Liberal Commissions to Agents and Distributors.

AGENTS MAKE UP TO \$100 A WEEK

Make money supplying the demand for this automotive necessity. Every car owner a prospect. Write for FREE information. Sample set on 10 Day Free Trial 50c—3 pair for \$1.00. Postage prepaid. Satisfaction guaranteed or money refunded. SEND TODAY.

FLOOD-LITE REFLECTOR CO., Dept. 961, Racine, Wis.

CRESCENT
20" BAND SAW
\$100
(Belt Drive)

Built to meet the most exacting requirements of fine production work. Priced in line with the times. For pattern makers, cabinet makers, schools, etc., and amateurs who appreciate an extra high grade, accurate band saw. Table tilts to any angle to 45 degrees. Driving tension saw; fully guarded. Self-feeding throughout. Belt drive or with built-in motor. Power from lamp socket. We make a wide line of wood working machines.



THE CRESCENT MACHINE CO.
93 Columbia Street
Lentonia, Ohio

Send for FREE BULLETINS

NEW 3-IN-1—NO. 10 PEN-PENCIL WITH COMPASS. GUARANTEED FOR LIFE

Ideal for carbon copy work. A fast seller. Retail for 75c. Money back if not pleased. Send for

SAMPLE
39c



Free wholesale catalog showing 2000 fast sellers. Send for your copy.

SPORS IMPTG. CO.
1132 Main St.
La Center, Minn.



DO YOU WANT TO STOP TOBACCO?

Banish the craving for tobacco as thousands have. Make yourself free and happy with Tobacco Redeemer. Not a substitute, not habit forming. Write for free booklet telling of injurious effect of tobacco and dependable, easy way to relieve the craving many men have.

FREE BOOK

Newell Pharmacal Co.
Dept. 900 St. Louis, Mo.

NO JOKE TO BE DEAF

Geo. F. Way made himself hear after 25 years of deafness, with his Artificial Ear Drums. They stopped head noises and ringing ears. They are invisible. Write for his true story, "How I Got Deaf and Made Myself Hear." Also booklet on deafness. Sent free. Write

GEO. F. WAY, INC., 789 Hofmann Bldg., Detroit, Michigan

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BE WELL YOUNG STRONG



Booklet Free

Fifteen glorious minutes on Pandiculator better than two hours in gymnasium. Refreshes, rejuvenates. Helps retain youth, energy, vigor, vim. Wonderful results. Doctors recommend it. No electricity, no discomfort; delightfully restful. Write for Free Booklet.

PANDICULATOR CO., 646 Hanna Bldg., Cleveland, Ohio

BUILD A SHIP MODEL

A COACH MODEL OR A SPINNING WHEEL Pleasant Work and a Profitable Pastime

We send you all the parts cut exactly to fit and ready to put together, including genuine California Redwood hull fully shaped and sanded, numbered diagrams and detailed instructions—Flying Cloud \$4.00, Santa Maria and others \$4.50, Spinning Wheel \$1.00.

Send 2c stamp for illustrated catalog.

Miniature Ship Models



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Buy DIRECT

on credit at New

Low Prices

Our 1933 Cut-Price Offers a Remarkable Opportunity to Own A 21 Jewel ~

Santa Fe Special





Send for Catalog Now!

Compare the Santa Fe Special with other Watches costing 30% to 50% more ~

Send No Cash In addition to our NEW LOW PRICE, I will send for your approval one of these Standard Watches, guaranteed for a lifetime of satisfactory service, not only by the Santa Fe Watch Company, but by the Great Illinois Watch Factory. So accurate, Government officials carry them; so perfect and beautiful, jewelers say they are worth 1-3 to 1-2 more than we ask for them. I will send you one to see WITH-OUT ONE PENNY DOWN—allow you to wear it 30 days FREE—then sell it to you on easy payments.

Diamond Rings — Wrist Watches

Write for our New Diamond Ring of Romance and Bulova Wrist Watch Catalog, showing marvelous new designs. Never have we been able to offer such beautiful diamond rings and artistic dependable watches at such low prices. The catalog is sent FREE.

Ask for our Spot Cash Offer. Good for 30 days only.

Santa Fe Watch Co.

TOPEKA 16 Thomas Bldg., KANSAS

To SANTA FE WATCH CO., 16 Thomas Bldg., Topeka, Kans.

Please send me catalog I have checked.

Railroad and dress Pocket Watches..... { }
Ladies' and Men's Wrist Watches..... { }
Ladies' and Men's Diamond Rings..... { }

Name.....
Address.....

When writing please mention Popular Mechanics

Here's Your
Opportunity
To Make
BIG MONEY



Be Independent!

Sharpening lawn mowers by the Foley Electrakeen System gives you 99c PROFIT out of every dollar you take in. It is the chance of a lifetime to make a clean-up this summer and have a well established business of your own. Morse of Minn. made \$1520 in five months. Many others making big money during the season.

Sharpens All Kinds and Sizes

by same method used by mower manufacturers. Does a perfect job in from 15 to 20 minutes; sharpens all blades and cutter bar at same time. You get \$1 to \$2 a job—\$3 to \$5 an hour.

Free Plan shows you how to make big money at home with the Foley Electrakeen Lawn Mower Sharpener, including new attachment for grinding axes, hatchets, knives and all ordinary sharp edged tools. Send post-card today!

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107-3 Foley Building, 11 Main St., N. E. Minneapolis, Minn.

	VEST POCKET ADDING MACHINE
	Adds, Subtracts, Multiplies, Divides. Does work of \$100 machine. Not a toy. Million dollar capacity. Simple and accurate. Guaranteed 5 years.
	FREE TRIAL \$2.50
	—SEND NO MONEY—
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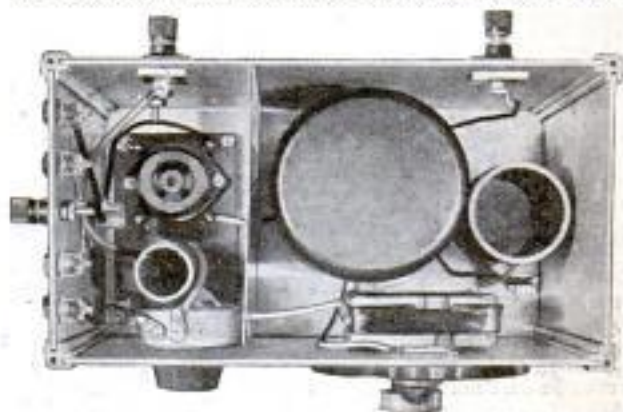
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VACUUM-TUBE WAVE TRAP

(Continued from page 110)

pass on to the receiver. The strength of the bucking signal is regulated by means of the series plate resistor R_2 . The adjustment of this variable resistor is quite critical since it is necessary to obtain an exact balance on the undesired signal. The coupling-coil unit, L_1 and L_2 , is a standard shielded antenna coupling unit taken from an old receiver. The turn data is given in Fig. 2. The coil L_1 is space-wound on a $1\frac{3}{4}$ -in. form, and L_2 is wound on a 2-in. form that fits over L_1 . The coil assembly is covered with a shield can, about 3 in. in



diameter. Number 28 s.c.c. wire may be used for the coils which are wound in the same direction. The receiver pick-up coils L_3 and L_4 are wound on a $1\frac{3}{4}$ -in. form and are spaced about $\frac{1}{4}$ in. apart. The resistor R_1 is 410 ohms and is fastened to an angle bracket which is mounted directly on the metal case, grounding one end of the resistor. The output coils L_5 and L_6 are wound on a 1-in. form and are spaced $\frac{1}{4}$ in. apart. If the connections on either coil are reversed, the polarity will be wrong and the undesired signal will be amplified instead of eliminated; this however, is easily corrected. To operate the trap, first tune in the signal to be eliminated, then turn on the filament switch on the wave trap. Now the tuning condenser C_1 and the output control R_2 are adjusted until the signal disappears. After the signal is eliminated, the desired program may be tuned in on the receiver. The shield can for the vacuum-tube wave trap is made of aluminum and is 6 by 6 by 8 in. A shield is inserted at the left, as shown in the photo above, to separate the type-199 tube and output coils from the rest of the apparatus.—Harry D. Picket and Ivan H. Loucks, Grand Island, Nebr.

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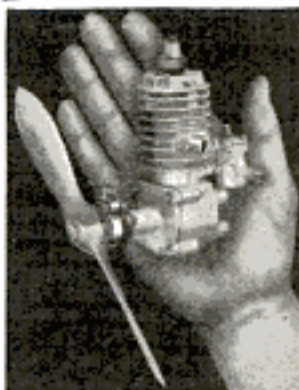
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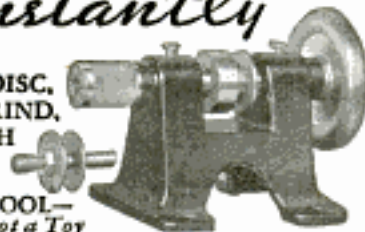


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THE USED CAR RACKET

(Continued from page 29)

cars is to put the rear brakes in good order and neglect the front brakes. If brakes seem to work well and are uniformly warm, they are probably okeh.

When the car is warmed up, head for the open road. Idle down to ten miles an hour and step on it. Knocking in the engine will indicate carbon (unless very cheap fuel has been put in the car). Then get the car up to forty-five miles an hour and take your foot off the accelerator. Let the car push the engine, with throttle closed, for about one-eighth mile. Then come down hard on the accelerator as you glance back. A cloud of blue smoke from the exhaust indicates worn piston rings. Such a condition will make a car an "oil hog." Idle the car down and then open the throttle slowly. A dull thud generally indicates a loose main bearing. A light metallic tap between ten and twenty miles an hour is probably caused by loose wristpins. After getting up to thirty miles an hour, let the car push the engine. A rapping noise in the engine will be caused by loose rod bearings.

Above all, when you buy a used car, patronize a reputable dealer.

THE MAGICIAN OF THE MOVIES

(Continued from page 55)

saved a company on location a half hour of delay and several hundred dollars in money because the cast otherwise would have been idle.

The good prop man maintains that, if given enough time, he can supply anything, or at least can furnish a satisfactory substitute. One of the best of them is hunting, with his rental department, for a herd of walrus. He wants them to furnish the sound for a picture of the north in which such a herd is shown. He has canvassed zoos and circuses and so far has located one. One walrus does not make a herd and does not even sound like a herd, so the prop man, as this is written, is hunting walrus by telephone and telegraph. It is safe to bet that he will assemble a herd of them in California if there are that many in this country—and if not, he will know what makes a noise like a herd of walrus when his director calls for a report.

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FLYING "BLIND"

(Continued from page 45)

amount, rather than rate, has been added. Direction, or azimuth, has been shown by the turn indicator or compass, but is now indicated by a much more sensitive apparatus, the directional gyro, an amount instrument. The artificial horizon supplements the turn-and-bank indicator by telling the pilot the actual position of his ship with relation to the natural horizon.

Unfortunately a successful ground-speed indicator has not yet been invented, so outright navigation by instruments alone is next to impossible. Drift and distance can only be approximated by dead reckoning. Radio has jumped into this breach, however. The solution was found in directive radio beacons, the pilot merely following the radio signals, or "riding the beam" along an airway so equipped.

The pilot flying with modern instruments over a well-equipped airway today has more aerial sign posts than the motorist rolling over a well-marked highway. The radio beam keeps him on his course, and at night, his path is lighted by beacons. His instruments tell him about the

ship itself and its direction of flight. He is in communication with ground stations over a two-way radio telephone, he knows before he starts the weather he will encounter and if an airport is obscured, his radio beam tells him when he is over it. Soon three weather maps covering the entire country are to be compiled at three-hour intervals and sent by teletype to airports equipped to receive them.

Some inventor has a fortune waiting for him, say airways officials, if he can make an instrument that will do for airplanes what the sonic depth gauge does for ships, but it must be able to measure horizontally as well as vertically, warning the pilot that he is approaching the side of a mountain, for instance, and telling him the direction of the mountain from the ship.

Such instruments may one day usher in the robot pilot to fly an air liner, while the human pilot does the navigating.

Since man began to sprout wings, however, a human brain and an alert intelligence have always been found indispensable flying equipment. They may continue so, but new instruments and mechanical aids are constantly making flying safer and easier.

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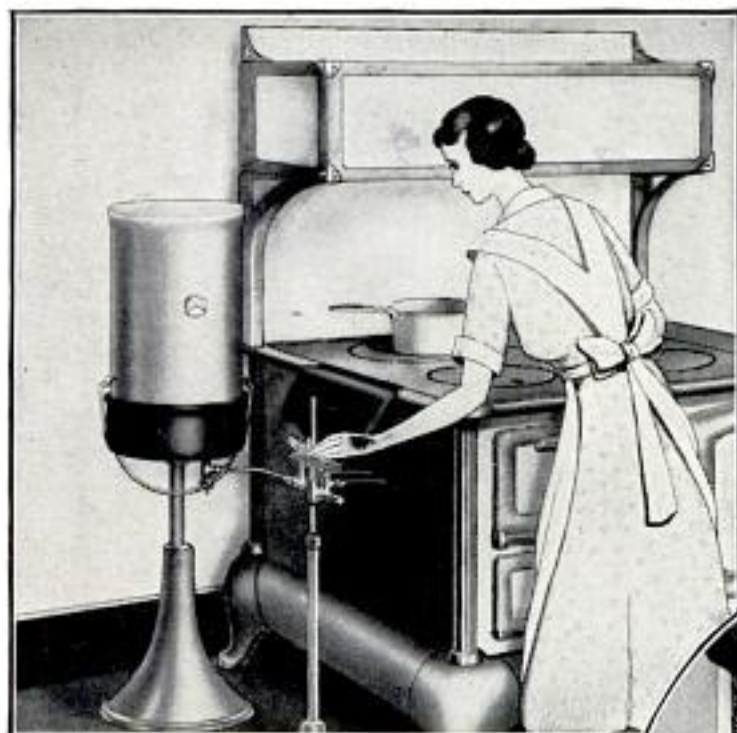
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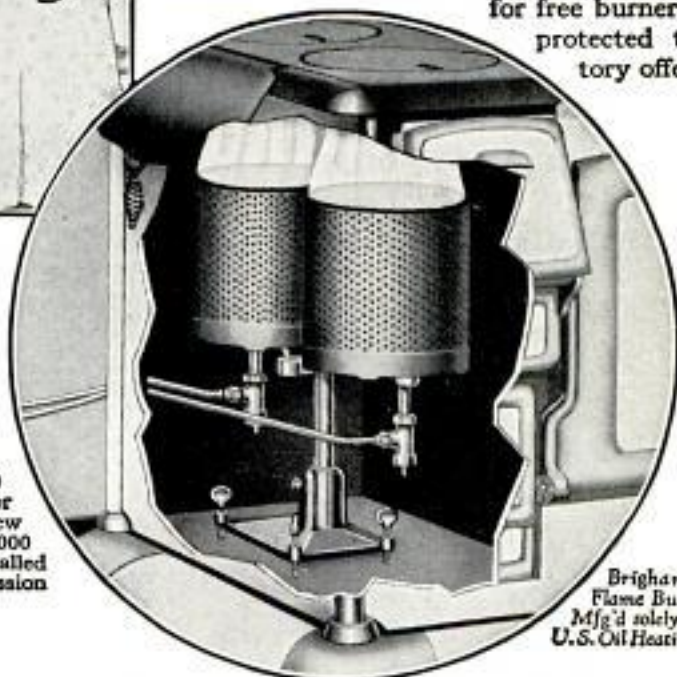
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