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POPULAR MECHANICS

MAGAZINE

WRITTEN BY MEN WHO CAN UNDERSTAND IT

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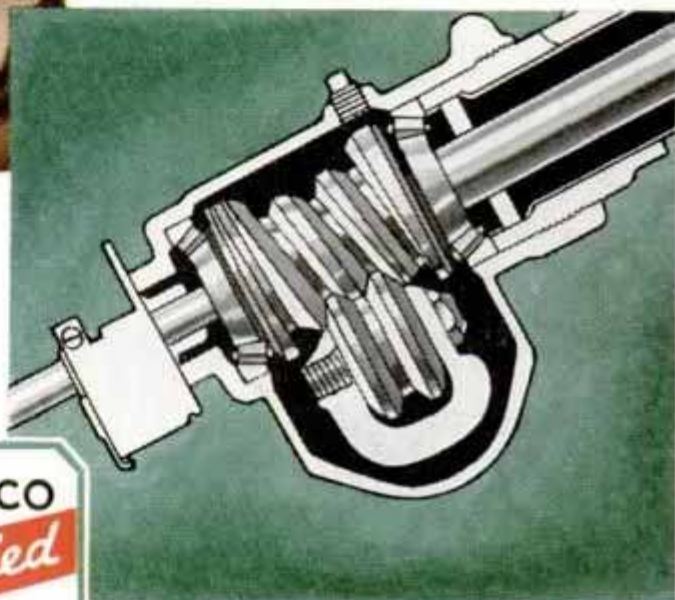
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SEE PAGE 212



MARFAK HOLDS!



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1 "Under the Code regulations, cars today practically have to sell themselves," says Mr. Newman.

"We check Brakes and Bodies to get the real Low-Down."

"YOU GET the best line on a used car by checking how its body has held up and the way the brakes work!" says Mr. Newman.

"That's why used Plymouths are the easiest to sell," adds Mr. Adolph. "Safety-Steel Bodies and Hydraulic Brakes show less wear."

In addition, Plymouth gives you patented Floating Power engine mountings and Individual Wheel Springing to make your ride smooth and comfortable as well as safe.

Plymouth is the only low-priced car with all four of these vital features. Any Dodge, De Soto or Chrysler dealer demonstrates Plymouth.



2 "On the used car lot, we find Plymouth is the one that gets the most attention. Floating Power engine mountings keep it a smooth-running car!"



3 Used car dealers Newman and Adolph with the De Luxe Plymouth Sedan. New, reduced prices begin at \$485 f. o. b.

factory, Detroit. Time payments to fit your budget. Ask for Official Chrysler Motors Commercial Credit Plan.

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August, 1934

Vol. 62, No. 2

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Scenic Wonders of the World

IF you had an opportunity to visit the most interesting places in the world, regardless of their location, where would you go? What would you desire most to behold? Would you visit the Grand Canyon? Would you include the Taj Mahal in old India and the Shrines of Nikko in Japan? In the September issue, Burton Holmes, celebrated lecturer and world traveler, who has spent a lifetime searching the world for its scenic treasures, selects the nine most interesting places he has found. Sixteen pages of pictures in color show you why each of the places Mr. Holmes has picked qualifies as an outstanding scenic marvel.

Next Month

IT is said that farming is the most wasteful business in all the world. The farmer raises a bushel of corn and throws away stalks and cobs which would provide gas for light and heat for his home. An article in next month's issue tells how chemists are utilizing such agricultural wastes as corn stalks, cobs, wheat, oats and rye hulls and straw, nut shells and feathers. Such research eventually may make of the farmer a producer of raw materials rather than a mere grower of food.

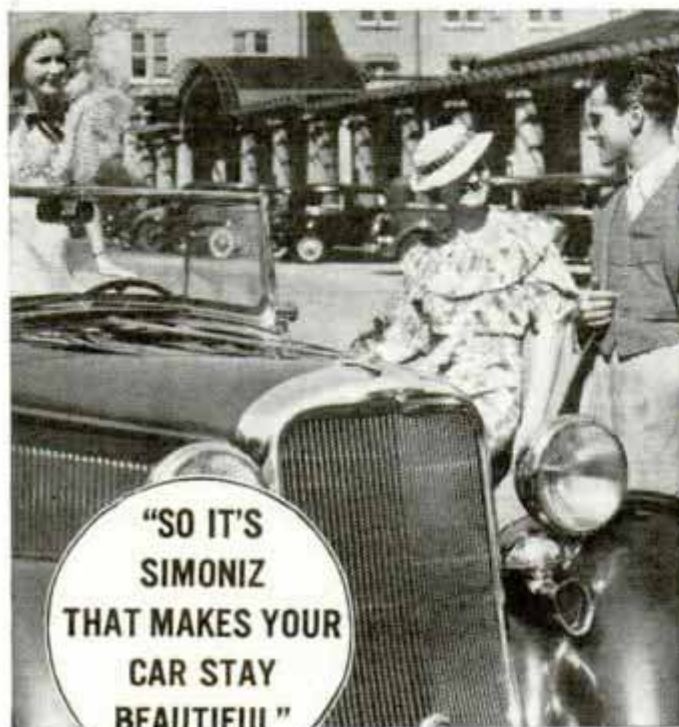
Dare-Devil Drivers

STRANGE things happen on the race track when dare-devil drivers settle down to the serious business of winning a speed event. An article in the September issue tells some of the tricks of these demons of the roaring road. After reading it, you should be able to pick out the really "smart" drivers in the next race you see.

Why Fly Like That?

WHEN you see military planes in formation, do you ever stop to consider why they fly that way? The day of the lone ace is past, and "pack" flying is recognized as the most effective method of aerial combat. A story in the next issue explains the various formations used by the Army and points out why each is effective for its particular purpose.

Motorists Wise SIMONIZ



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Absolute Independence IN 60 DAYS



A new home-industry which husbands and wives (or either) can develop in their spare time... NO PERSONAL SELLING IS NECESSARY... \$2.30 investment brings back \$16.00... husband and wife can clear profits up to \$60.80 a day, working out of the kitchen.

WOULD you be interested in a bonafide opportunity that would free you from all financial worry as long as you live? Within 60 days you can have that wonderful peace of mind of knowing that you will always have an income sufficient for your needs. This plan would not only keep you from ever being dependent on your children... but it would give you something to pass on to them. The past years have wrecked the hopes and dreams of tens of thousands. Many have proved they cannot "take it" and will never get on their feet. But there are others, who though bruised and battered, look through the haze and say "I'M GOING TO STAGE A COME-BACK SO GLORIOUS THAT PEOPLE WILL SAY, 'HE LICKED THE DEPRESSION; HE DIDN'T LET IT LICK HIM. HE'S MAKING FIVE TIMES MORE MONEY NOW THAN HE USED TO EARN.'" Learn of the Vita-Seald plan by which you can stage that glorious come-back of which you have dreamed! You and your wife can operate it out of your kitchen. If you have a job, you can appoint distributors during your spare time, while your wife handles the production of the potato chips, doughnuts, nutrimats, fried pies, fruit fritters, etc., in her extra hours. All these items can be turned out easily with the semi-automatic Vita-Seald Combination Cooker, which only occupies a 36 x 36 inch space.

\$7.60 an Hour Earnings

This machine (which is *only* part of the plan) will enable you to take \$2.30 of raw materials and turn them into \$16.00 worth of food at retail, \$9.90 at wholesale, *in a single hour!* If you distributed through lunch stands, restaurants, drug stores, grocery stores, cigar stands at the wholesale price, you would earn \$7.60 an hour. Working only four hours a day, your earnings would be \$30.40... think of it... \$30.40 a day. Of course, when your business reached larger proportions, you would undoubtedly rent a small store where the sales to passersby would bring you additional revenue.

No Personal Selling Necessary

By the Vita-Seald Plan you do no selling. If you

are interested in the opportunities the Vita-Seald Plan presents, send for full details of this new merchandizing plan which disposes of the Vita-Seald products you make in your kitchen *without your doing any personal selling.*

Put yourself under our guidance for 60 days and you can be absolutely independent. We will furnish you everything you need—the semi-automatic, combination machine, cooking materials, bags, display cards, literature. We tell you exactly what to do, how to proceed. No selling experience is necessary. Nor is any cooking skill. A week's returns can pay for the entire outfit.

The Vita-Seald Combination Cooker is incredibly speedy and easy to operate. Its many labor-saving features amaze! For instance, in making potato chips, *the Vita-Seald machine spares you the necessity of paring the potatoes.* Where other machines only make potato chips (on which fortunes have been made), or only doughnuts (which have made hundreds independently wealthy), the Vita-Seald makes both. With the Vita-Seald you can also prepare the new, imported nutrimats (endorsed by the U. S. Government) which create a sensation wherever introduced and usually outsell salted peanuts. Fried pies and those delicious fruit fritters are other fast-selling items which you can turn out on the Vita-Seald.

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Only a limited number of Vita-Seald franchises will be assigned. Over 10,000 inquiries have already been received as the result of our first announcement. If you are interested in securing a franchise, write for information immediately. Filling out the coupon places you under no obligation.

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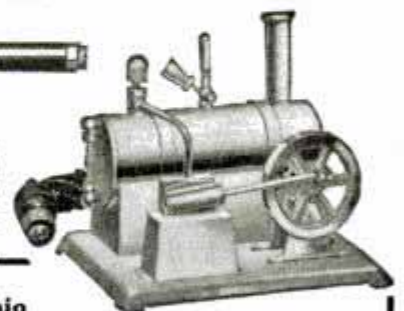
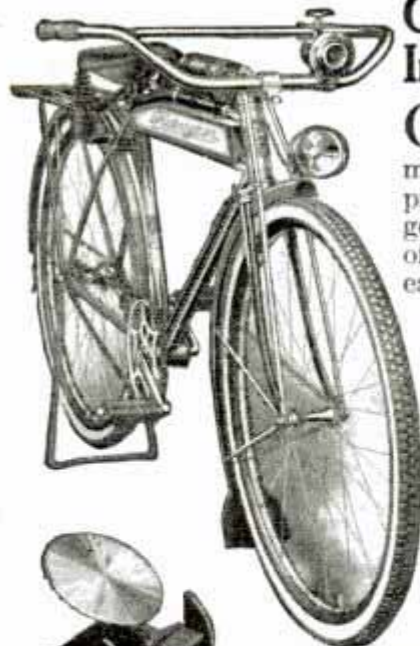
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Are you, too, up against life's big question— "How Can I Make More Money?"

Every bill to be paid, every need to be met, every dream still unfulfilled—demands the answer to this question. For on its answer hang all the other answers of life: how you live, what you wear, where you go, what you do, the position you hold, the one you hope to hold in future!...

MORE than anywhere else, this question haunts you daily on the job. You want a bigger salary; more pleasant and interesting work to do; more advantages for your loved ones—recreation, travel, social activities. And so, as you keep plodding on, in between the little thoughts comes this big one, again and again: "How can I make more money?"

Well, how can you? . . . By working harder than ever, so as to attract more attention to your industry? Thousands of people are working harder than ever, these days; employers have no worries on that score. By trying to "get a stand-in" with somebody of influence? Plenty of people have tried that, too—only to fall down because they couldn't deliver. By getting "outside work" to do? Sooner or later, your regular job suffers—and then what?

Out of the corner of your eye you can see a long line of folks just waiting for the job you have now. Any time you're "out," a dozen others are ready to step in. So it's dangerous to resign and look elsewhere, isn't it? Besides, jobs in your same line elsewhere are bound to pay about what you're earning now.

What's Wrong, Anyhow?

Let's be quite serious for a moment about this "money" question. Who, as you glance around the business world, are the money-makers in it? Are they the filing clerks, typists, stenographers, bookkeepers, timekeepers and routine clerical people? Or are they the expert salesmen, the accountants and C. P. A.'s, the attorneys, the traffic managers, the personnel directors, the sales correspondents, the sales managers, and other executives who give orders for other people to execute?

And how did these money-makers, with their enviable jobs and opportunities, "get that way"? Was it simply by working hard—having a "pull"—changing jobs till they found the fat salaries they wanted?

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| <input type="checkbox"/> Inventing and Patenting | <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> R. R. Section Foreman | <input type="checkbox"/> R. R. Bridge and Building Foreman | <input type="checkbox"/> Fruit Growing | <input type="checkbox"/> Poultry Farming |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Bridge and Building Foreman | <input type="checkbox"/> R. R. Locomotives | <input type="checkbox"/> R. R. Bridge and Building Foreman | <input type="checkbox"/> Radio | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Gas Engines | <input type="checkbox"/> Diesel Engines | | | |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Aviation Engines | <input type="checkbox"/> Automobile Mechanic | | | |
| <input type="checkbox"/> Reading Shop Blueprints | | | | | |

BUSINESS TRAINING COURSES

- | | | | |
|--|---|---|--|
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| <input type="checkbox"/> Office Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> First Year College | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Lettering Show Cards | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> French | <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Civil Service | <input type="checkbox"/> Cartooning |
| | <input type="checkbox"/> Advertising | <input type="checkbox"/> Mail Carrier | |

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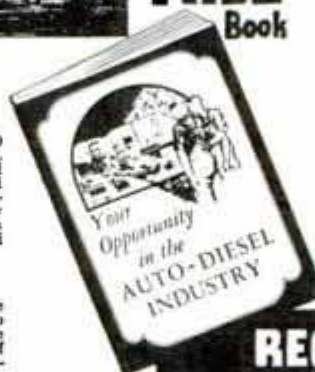
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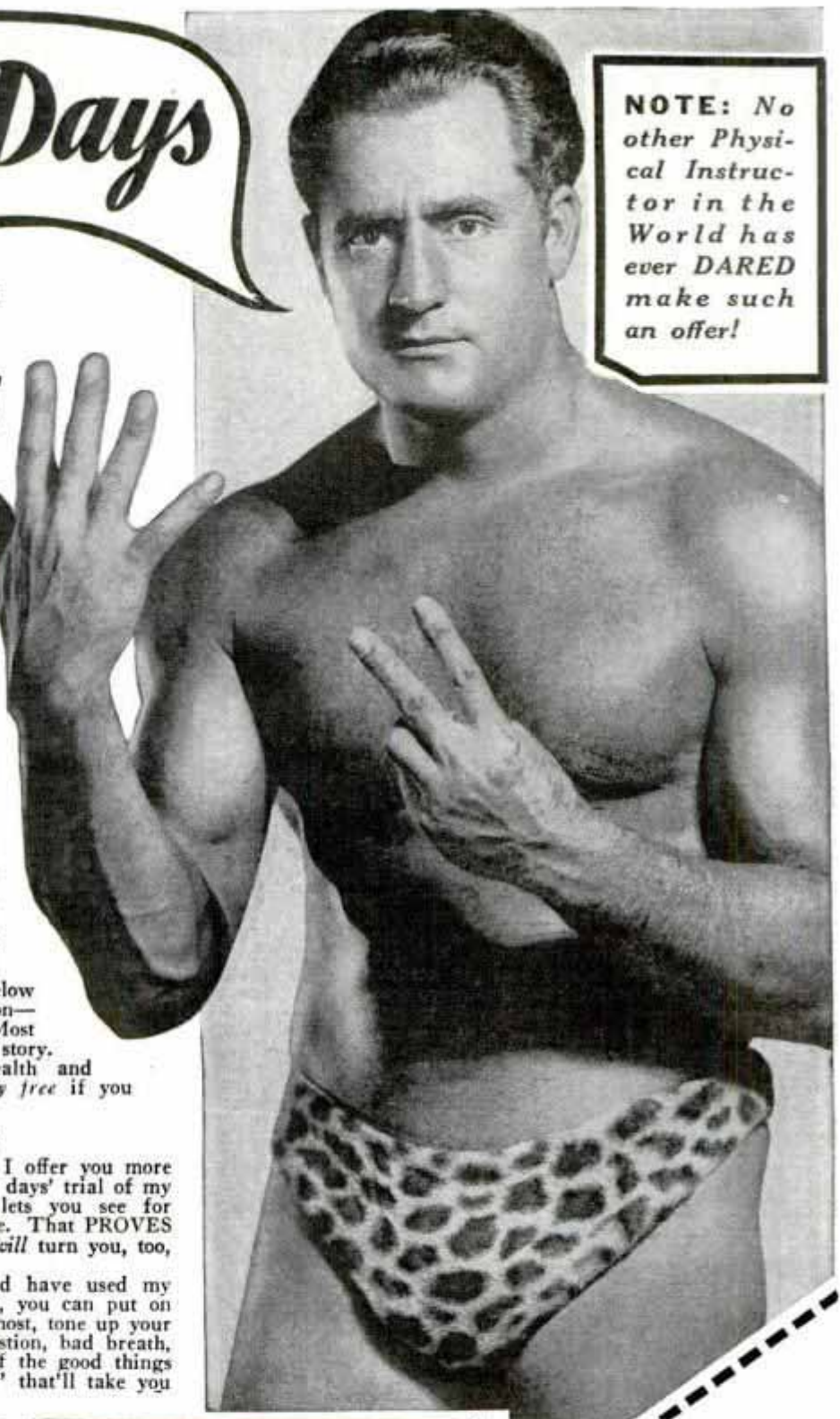
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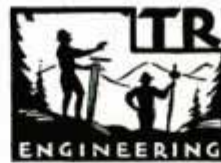
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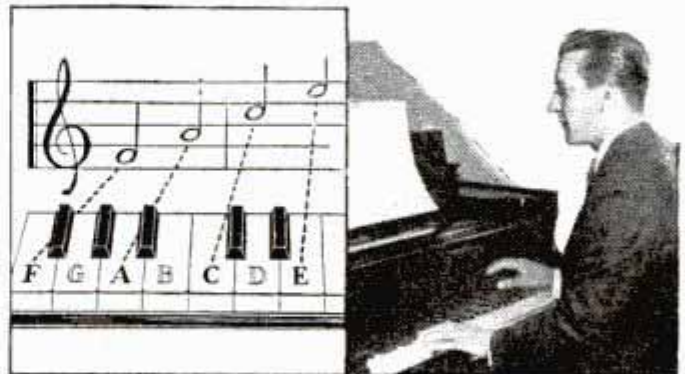
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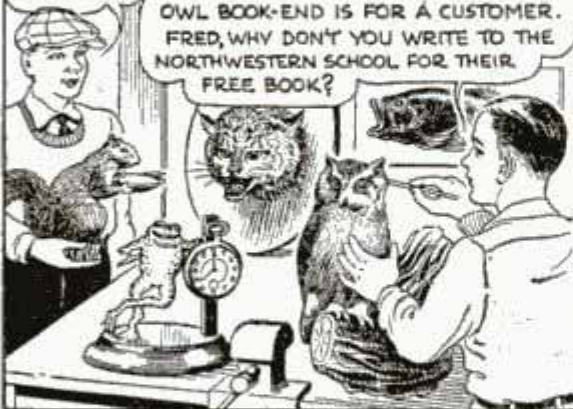
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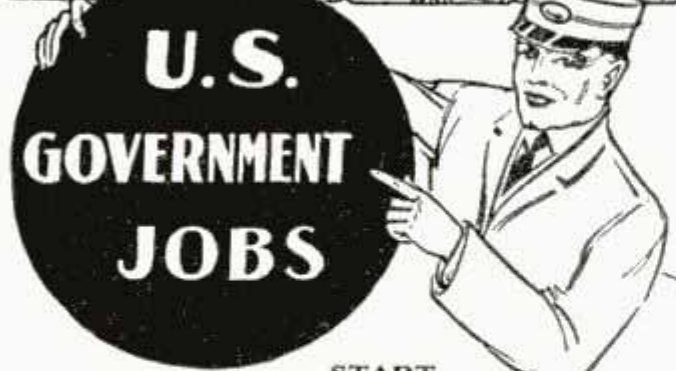
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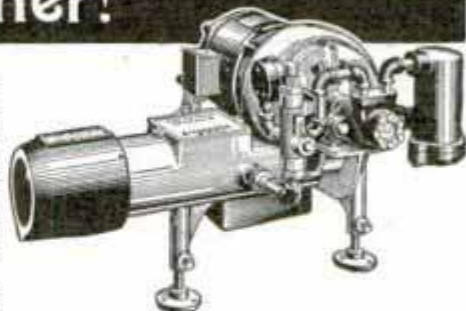
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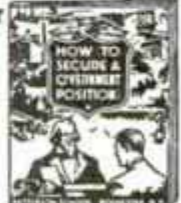
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UNITED States. Large cent, two-cent bronze, three-cent nickel and bargain list, 25c. Thirteen dates large cents, \$1.00. George P. Coffin, Augusta, Maine.

\$5 TO \$500 Each paid for old coins. Many very valuable. Keep all old money. Get posted. Send 10 cents for illustrated coin value book, 4x6. Guaranteed prices. We buy and sell. Coin Exchange, Box 5, Le Roy, N. Y.

FOREIGN Coin before 1800, crisp 5 dollar note and catalog 10c. Geo. Best, Cedar Rapids, Iowa.

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\$1.89 COMPLETE Developing and printing outfit. Genuine Eastman chemicals and printing paper. Printing frame, darkroom light, measuring glass, 24 large Azo papers, developing trays, developer, fixing powder, etc., only \$1.89. Special Deluxe outfit complete, only \$2.89 postpaid. Brownscope Co., Dept. 8M, 234 Fifth Ave., New York.

"PAL-KO"—3 Cameras in one—World's finest photographic instrument; auto-winding, ground-glass focusing before each exposure. Takes 3 size negatives on any standard roll film. No double exposures! "Pal-Ko" counts—thinks for you. Free catalog supplied. Pal Ko, Inc., Chicago, Ill.

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20 REPRINTS 25c. Films developed, two prints each negative, 25c. Skrudland, 4118-8 Overhill, Chicago.

HAND Colored enlargement with each roll 25c. Colorgraph-8, Dunning Station, Chicago.

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FILMS Developed—2 prints of each negative and enlargement coupon 25c. Negatives printed only 2c each. Summers' Photo Service, Unionville, Mo.

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ROLL Developed, 8 prints, oil painted enlargement, 25c. Prompt service. Work guaranteed. Individual attention to each picture. Janesville Film Service, C15, Janesville, Wis.

HAVE You a camera? Send ten cents for recent number of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, 17, Mass.

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MOUNTED 5x7 Enlargement, send negative, 15c coin; 2 for 25c. Low prices, but highest quality. J. Braff, 1475-P Grand Concourse, New York.

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FILMS Developed 5c per roll; prints 3c each. Ask for special bargain list. Roanoke Photo Finishing Company, 161 Bell Ave., Roanoke, Va.

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INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. 104, 10 West 33rd St., New York.

SEND For literature on Wimmerset for developing and printing photographs. See advertisement on page 132A. Winn, 124 West 23 Street, New York.

COMPLETE Photographic outfit. Develop pictures yourself. Cameras, films, developing chemicals, printing materials, directions. Complete \$1.00. Photographical Equipment, 100 Forsyth, New York City.

ROLL Films developed 5c; prints 2½c each. Newtowne, Parkridge, Ill.

ROLLS, Developed, printed, 25c. Mail your films to the biggest and best. Rolls developed and 8 good prints guaranteed plus 8x10 inch enlargement coupon only 25c. Reprints any size 3c each. Geppert Studios, Dept. 130, Des Moines, Iowa.

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16mm FILMS, Suitable for clubs and lodges. A. B. C. Film Service, Navy Pier, Chicago.

\$\$\$PHOTOPLAY Plots accepted any form for free reading and report. Our sales service selling consistent percentage stories to Hollywood studios—the most active market. Experienced writers revise, synopsis, copyright, submit to producers. Free booklet shows how. Universal Scenario Co., 254 Meyer Bldg., Hollywood, Calif.

16MM PROJECTORS, Supplies. Art films. Cine, Box 2133, Paterson, N. J.

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35-MM FILMS, Projectors. Stamp for lists, Box No. 6, Rosedale, Kans.

BARGAIN Lists 3c. Hoffman Film Service, 57 Broad, Albany, N. Y.

WORLD'S Greatest "Passion Play" 16 MM (new) 5 reels. Rent or purchase. Write Hemenway Film Co., 37 Church Street, Boston, Mass.

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YOUR Own brand Colloidal Graphite Lubricants, offered under your name and label. Tremendous demand has been built up for quality Graphited Top Cylinder and Crank Case Base Oils—used with each filling of gas and oil. Jobbers—build up an exclusive business for yourself with no limited territory. Moderate quantities in your own striking packages, get you started with minimum investment. Be independent—make greater profits—write today for our proposition. Grafo Lubricating Company, 52 Chestnut St., Sharon, Pa.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big 1934 business now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1685 Washington Ave., New York.

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MODERN Mail business, five branches. Boundless chances to make money. Amazing methods, profitable income, investment little. All or part time to suit you. Write Prosperity Associates, 2515 Bonafon St., Philadelphia.

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CASH Income daily resilvering mirrors at home. Replating autopaarts, tableware, etc., outfit furnished. Write Sprinkle, Plater, 128. Marion, Ind.

1000 BEST Sellers, blades 65c hundred, moth tabs 59c dozen, needle books 25c dozen, 8 bar box soap 13 1/2c. Free wholesale catalogue. Paty Company 5P Elston, Somerville, Mass.

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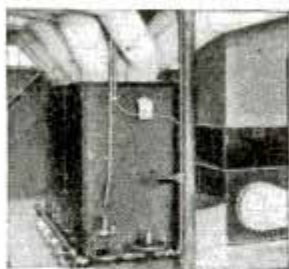
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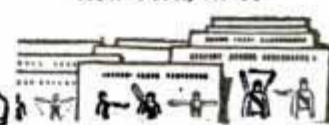
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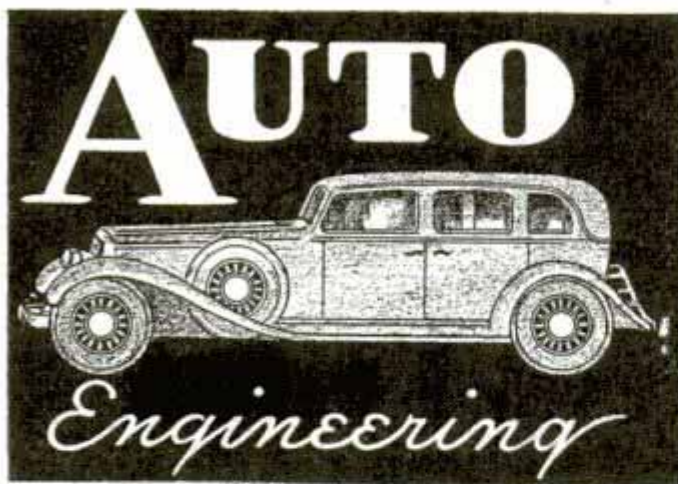
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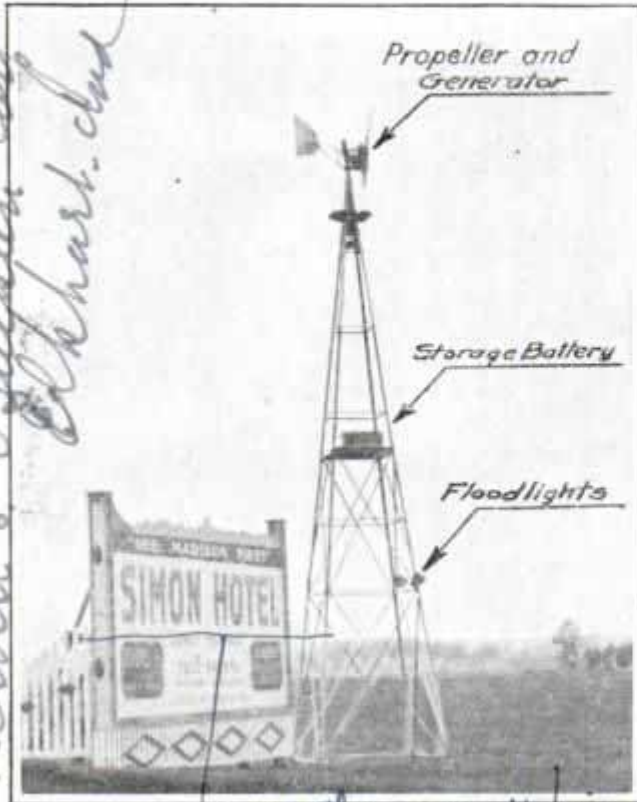
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cally tunes him out for ten seconds. The brain of the robot censor is a detector amplifier similar to the automatic volume-control devices now used in commercial sets. Whenever the current in the tube drops to zero momentarily, a selective relay comes into action and silences the set for a predetermined length of time. Setting the talk eliminator for ten seconds of silence chokes off most radio chatter. A very fast talker can beat it until he stops for breath, but he must do that. Music, which is usually continuous, passes inspection except when there are dramatic pauses. The use of the talk eliminator could be counteracted by supplying a musical background for all the talking, but this in turn might be thwarted, according to Prof. Gleason W. Kendrick, of Tufts college, who demonstrated the device, by using sound filters capable of differentiating between musical sounds and the sound of the human voice.

BAG TAKES PLACE OF MAIL BOX ON RURAL ROUTE

Mail bags are used instead of boxes on one rural route in California. When a rancher has outgoing mail he places it in the canvas bag and attaches it to a support resembling a ship's davit from which the carrier picks it up as he passes. Mail is also delivered in a similar pouch, each family on the route having its own bag, stamped with the family name.



COLOR LAYER IN TIRE FABRIC SHOWS DANGER POINT

It has been suggested in England that a composition of bright red and blue be incorporated in automobile tires between the inner fabric and the rubber tread. When the blue layer showed, this would be an indication to the motorist that it was time to replace the tire, and when the red layer appeared it would be a definite warning that the tire was unsafe.

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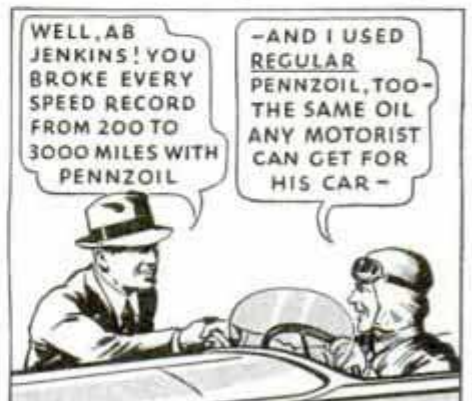
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Sir, what can such men want? What do they mean? They can want nothing, sir, but to enjoy the fruits of other men's labor. They can mean nothing but disturbance and disorder, the diffusion of corrupt principles and the destruction of the moral sentiments and moral habits of society.

—DANIEL WEBSTER,
to United States Senate, March 12, 1838.



Model of a Pennsylvania Railroad Locomotive; the Building of Model Railroad Systems Is Becoming a Popular Hobby—See Page 204

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Vol. 62

AUGUST, 1934

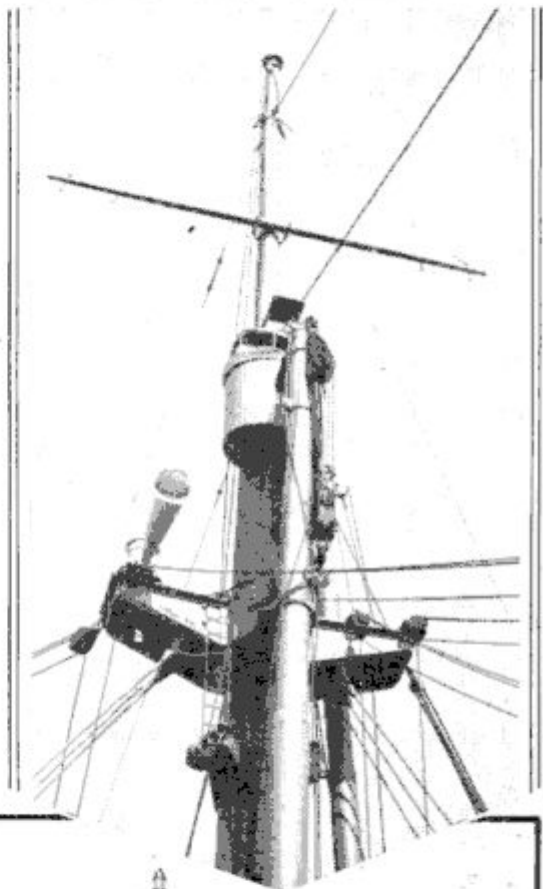
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D 743 IMPERILED SENTINELS *of the* DEEP

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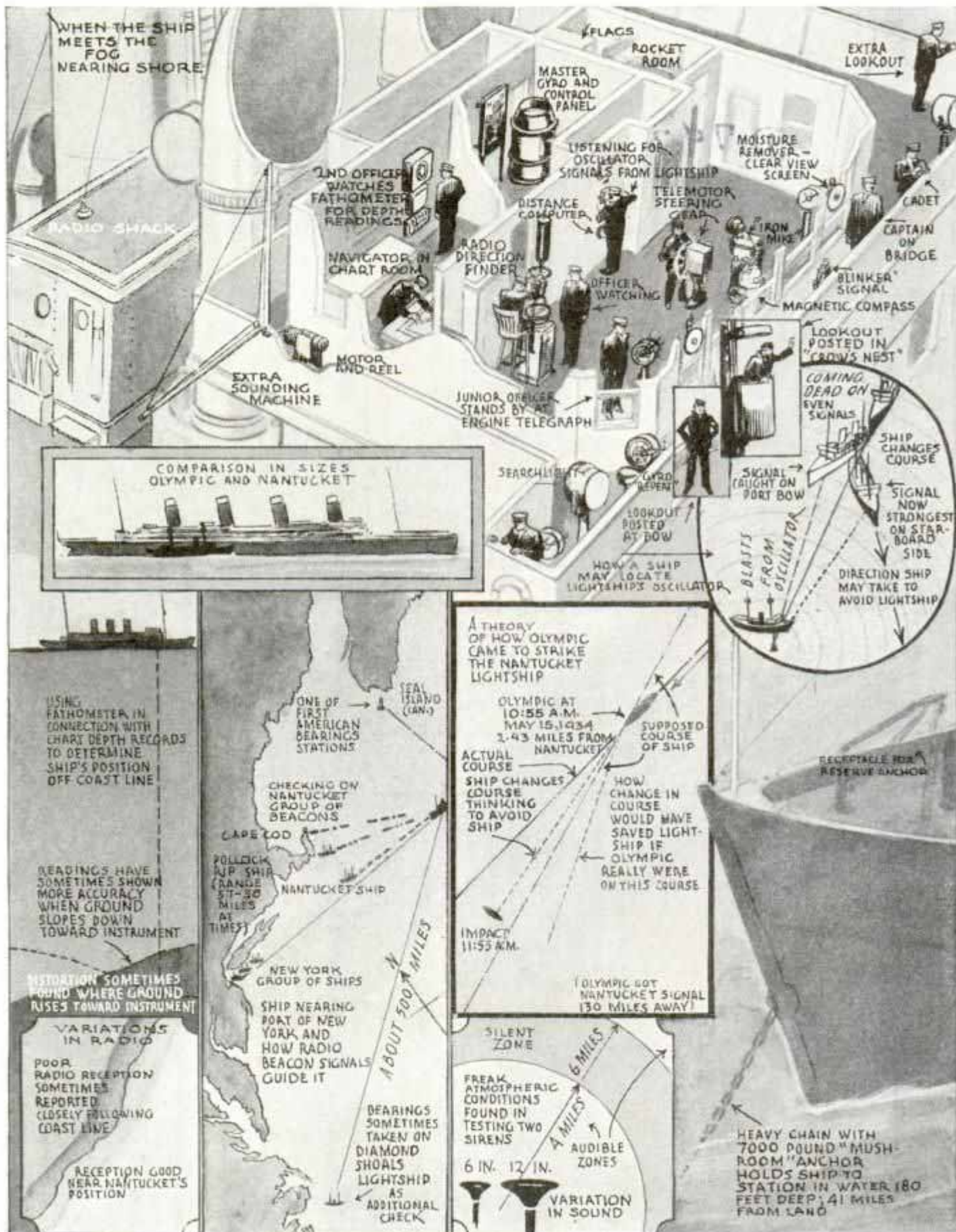
The "Nantucket" was one of the latest designs of the Light House Service. She carried 16,000-candlepower lights at her mastheads and an air oscillator—a huge horn whose sound could be heard fourteen miles away. She also had an oscillator for underwater signaling and a radio



"Nantucket" Lightship Which Was Rammed by "Olympic" Despite Her Many Signaling Devices and a Modern Installation for Signaling the Presence of a Ship in Fog

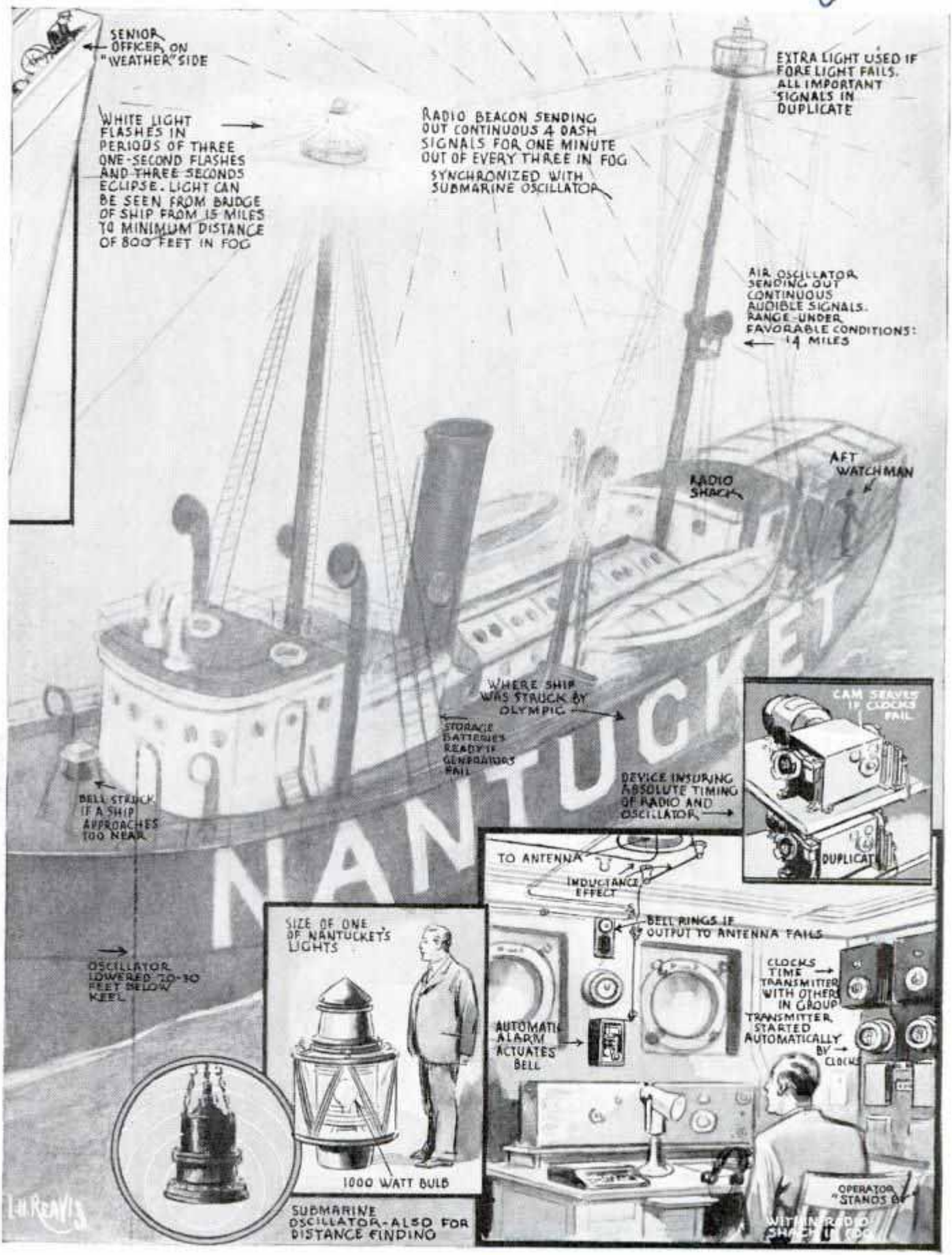
Comd Morgan Farrell, 76

Robots Help Modern Liner Avoid Accidents



Diagrams Showing Safety Devices Aboard a Modern Liner, All Intended to Avoid an Accident Such as Occurred When the "Olympic" Collided with the "Nantucket" Lightship

Beacons, Horns and Radio Protect Lightship



SENIOR OFFICER ON "WEATHER" SIDE

WHITE LIGHT FLASHES IN PERIODS OF THREE ONE-SECOND FLASHES AND THREE SECONDS ECLIPSE. LIGHT CAN BE SEEN FROM BARGE OF SHIP FROM 15 MILES TO MINIMUM DISTANCE OF 800 FEET IN FOG

RADIO BEACON SENDING OUT CONTINUOUS 4 DASH SIGNALS FOR ONE MINUTE OUT OF EVERY THREE IN FOG SYNCHRONIZED WITH SUBMARINE OSCILLATOR

EXTRA LIGHT USED IF FORE LIGHT FAILS. ALL IMPORTANT SIGNALS IN DUPLICATE

AIR OSCILLATOR SENDING OUT CONTINUOUS AUDIBLE SIGNALS. RANGE - UNDER FAVORABLE CONDITIONS: 14 MILES

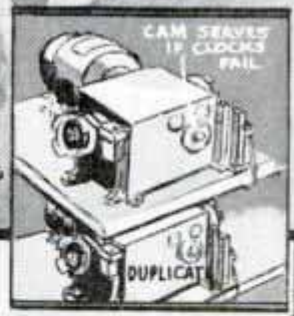
RADIO SHACK

AFT WATCHMAN

WHERE SHIP WAS STRUCK BY OLYMPIC

STORAGE BATTERIES READY IF GENERATORS FAIL

BELL STRUCK IF A SHIP APPROACHES TOO NEAR



DEVICE INSURING ABSOLUTE TIMING OF RADIO AND OSCILLATOR



BELL RINGS IF OUTPUT TO ANTENNA FAILS

SIZE OF ONE OF NANTUCKET'S LIGHTS

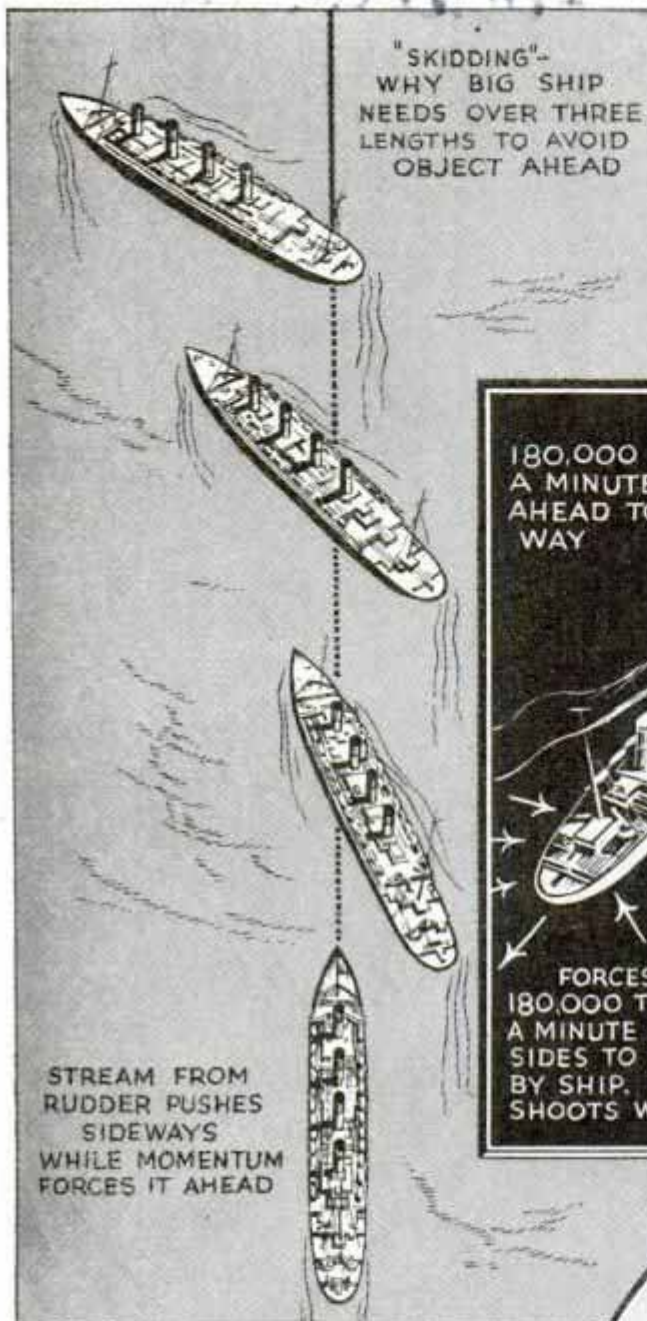


SUBMARINE OSCILLATOR - ALSO FOR DISTANCE FINDING

OSCILLATOR LOWERED 70-80 FEET BELOW KEEL



Despite Both Audible and Visible Warnings and the Use of Radio Signals, Lightships Are Being Run Down by the Very Ocean Giants They Are Intended to Guide to Safety



180,000 TONS OF WATER
A MINUTE PUSHED OUT
AHEAD TO MAKE
WAY

FORCES AT STERN -
180,000 TONS OF WATER
A MINUTE SUCKED IN ON
SIDES TO FILL VOID LEFT
BY SHIP. PROPELLER
SHOOTS WATER BACK

failed or the scientific means devised to make navigation safer in fog, darkness and storm?

To answer this, let us see what goes on aboard a lightship in thick weather. All the signaling equipment aboard a vessel like the "Nantucket" is in duplicate so that it can continue to function in case of failure of any unit. The masthead

light flashes are regulated by an automatic switch, the current for all purposes being supplied by gasoline-driven generator units, in duplicate.

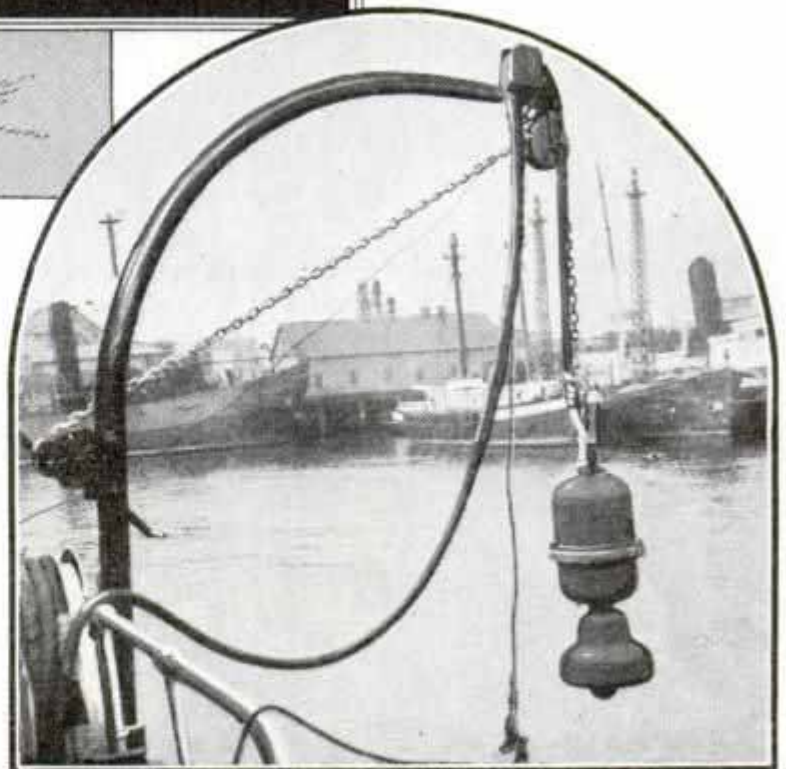
The blasts of the horn, or air oscillator, are sent out in the ship's identification code. These may be Morse letters or numbers or merely an arbitrary arrangement of long and short blasts automatically controlled.

The "Nantucket" also had an underwater oscillator. This is an electrically vibrated diaphragm or sound-producer fitted to the bottom skin of the ship. Its sound resembles

Hidden Forces Are at Work When a Big Liner Plows through the Water; in Changing Her Course, a Long Ship Tends to "Skid" Like an Auto, Thus Requiring More Than Three Lengths to Avoid Anything Directly in Her Path; to Go Astern, a Liner Powered with Turbines Requires a Backing Engine Since the Turbines Operate Only One Way, Ahead; the Backing Engine Is Rarely More Than One-Third as Effective as the Turbines Which Drive a Liner Forward, Hence a Liner, Even at Slow Speed, Runs a Considerable Distance Before Her Engines Can Halt Her

beacon, whose code signal could be picked up at 500 miles. The "Olympic," too, was equipped with radio compass, listening devices and other modern navigating instruments.

Was it human judgment that



Submarine Bell, One of the Many Signaling Devices in Use on Some Vessels to Warn Other Ships

the squeal of a radio signal but is of distinctly lower pitch. It is received by another ship through microphones immersed in water in each of two tanks fitted to the ship's skin, well forward. One is on the port and one on the starboard side. By listening in with ordinary telephone receivers it is possible to locate the source of the sound as on one side of the ship or the other, by its greater intensity in the corresponding receiver. When the intensities are equal the sending vessel is dead ahead.

A lightship's radio signal is sent out in foggy weather for one minute every third minute. It is a broadcast and not a beam. Two other stations broadcast successively with it, on the same wave length, for one minute each.

A motor-driven rotary switch controlled by a clock regulates the sending period within an error of one second. Light and buzzer alarms warn the operator if the antennæ are dead. It is, moreover, a strict rule that when fog signals are going out from a lightship all other sending and receiving aboard her must be suspended. The vessel has then only one function—to send out its regular warnings, and the crew only one duty—to keep sending them.

Now let us see what is going on aboard the big liner. If she is of American registry, the radio compass is on the bridge. It is operated directly under the master's eye. So is the submarine oscillator receiving station.

On certain ships of foreign registry, however, the ship's radio operator in his room, at some distance from the bridge, reads and reports the compass bearings of the lightship's signals only upon order. The report may be telephoned to the bridge, but is often written on a slip of paper and sent to the captain or navigating officer. This was the method on the "Olympic."

Yet with all the signaling and receiving systems, lightships are run down and

(Continued to page 127A)

LIFE JACKET QUICKLY INFLATED WITH CARBON DIOXIDE GAS

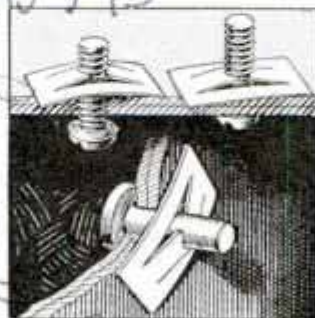
Carbon dioxide gas is used to inflate a life jacket intended for yachtsmen and aviators. By pulling two knobs on the jacket, the vents of two small phials con-



Life Jacket and Phials of Carbon-Dioxide Gas Which Inflates It When Knobs Are Pulled

taining the gas are punctured and the jacket is inflated. The phials are the same as those used in seltzer-water bottles and the jacket, of a tough rubberized fabric, slips over the wearer's head and is secured tightly to the body by one strap in the rear. The pockets are so arranged that the user may lie on his back and float with ease, or lie on his stomach for swimming. After the jacket has been used, the gas is removed by opening two small valves near the neck.

SPEED NUT OF THIN METAL LOCKS ON BOLT



Made of thin sheet metal, a new "speed" nut has corner prongs that prevent turning of the nut, thus locking itself on the bolt. The nut is a combination of nut and lock

washer. It is easy to place and tighten and cannot spoil the thread. The nut flexes with the metal. No wrench is required.

Tinners and Store

Hoag Mart, Nahler Co
Drammingham, Mass

Chicago 440 Dearborn Tel. Harrison 6331
Emergency Corrugated D 709
D 593

rest
2938 Tilton Road, Cleveland, Ohio

Berlin, Steglitz, Germany



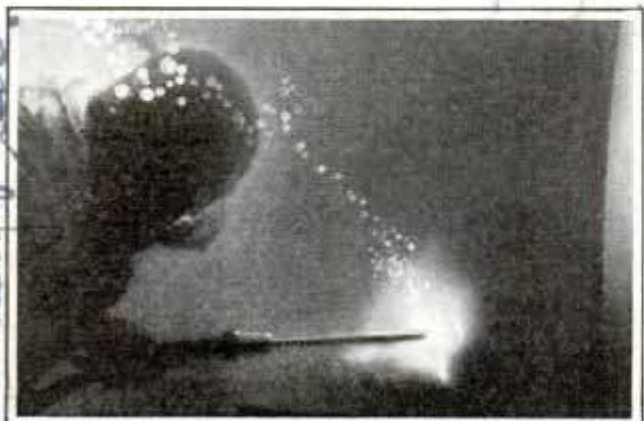
Remarkable Photo of Memorial to German Aviation Pioneer; Large Ball Is Engraved with Names of World's Noted Flyers and Their Feats

AIR FEATS RECORDED ON GLOBE HONORING PIONEER PILOT

Historic flights are recorded on the steel globe of the odd-shaped monument to Otto Lilienthal, pioneer German pilot, who lost his life at Berlin during a flight in 1896. The memorial is located near Lichtenfelde, where this flight was attempted with motorless equipment, or gliders. Among the feats recorded on the globe is the flight of Col. Charles A. Lindbergh across the Atlantic.

TORCH IS USED UNDER WATER TO CUT UP WRECKAGE

When an incoming steamer wrecked a bridge at Fall River, Mass., one end of the span sank in fifty feet of water, the other end remaining on its piers. Salvage ex-



Underwater Photograph Shows Diver Using Electric Torch to Cut Up Submerged Wreckage

perts cut away the twisted iron connecting the two ends, then used a giant floating derrick to swing the detached end out over the water and drop it to the bottom. The submerged wrought-iron structure, weighing about 250 tons, was then bisected by means of an electric underwater torch. Divers descended in shifts to operate the metal-cutting torch. Then the two halves of the span were lifted out of the water and deposited ashore. With some modifications, the electric torch also may be used for underwater

welding. For this purpose, the torch is used to fuse suitable welding rods so that the desired metal may be deposited just where it is needed to fill a fracture or to make leaky rivets tight. To do this work in any other way, it would be necessary to put a ship in dry dock, necessitating the expenditure of much time and money.

LOCK FOR THE DIAL TELEPHONE STOPS UNAUTHORIZED USE

Unauthorized use of dial telephones can now be prevented by employing a simple lock which makes it impossible to turn the dial and obtain numbers. It is particularly useful with instruments where a check



must be kept on calls. It is likewise employed to lock switchboards at night or to keep children from playing with the dial. The lock fits any standard dial and does not scratch or damage the instrument in any way.

German bakers are freezing bread with Dry-Ice to keep it fresh until it is thawed out and used.

Cutting Corfa
Under Water Metals
173 Battery Place N.Y.C.
D617

submerged wrought-iron structure, weighing about 250 tons, was then bisected by means of an electric underwater torch. Divers descended in shifts to operate the metal-cutting torch. Then the two halves of the span were lifted out of the water and deposited ashore. With some modifications, the electric torch also may be used for underwater

Denver, Colo

Clarkson

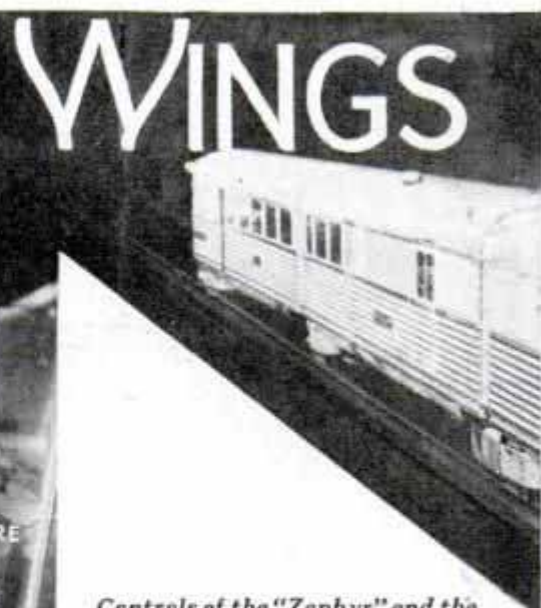
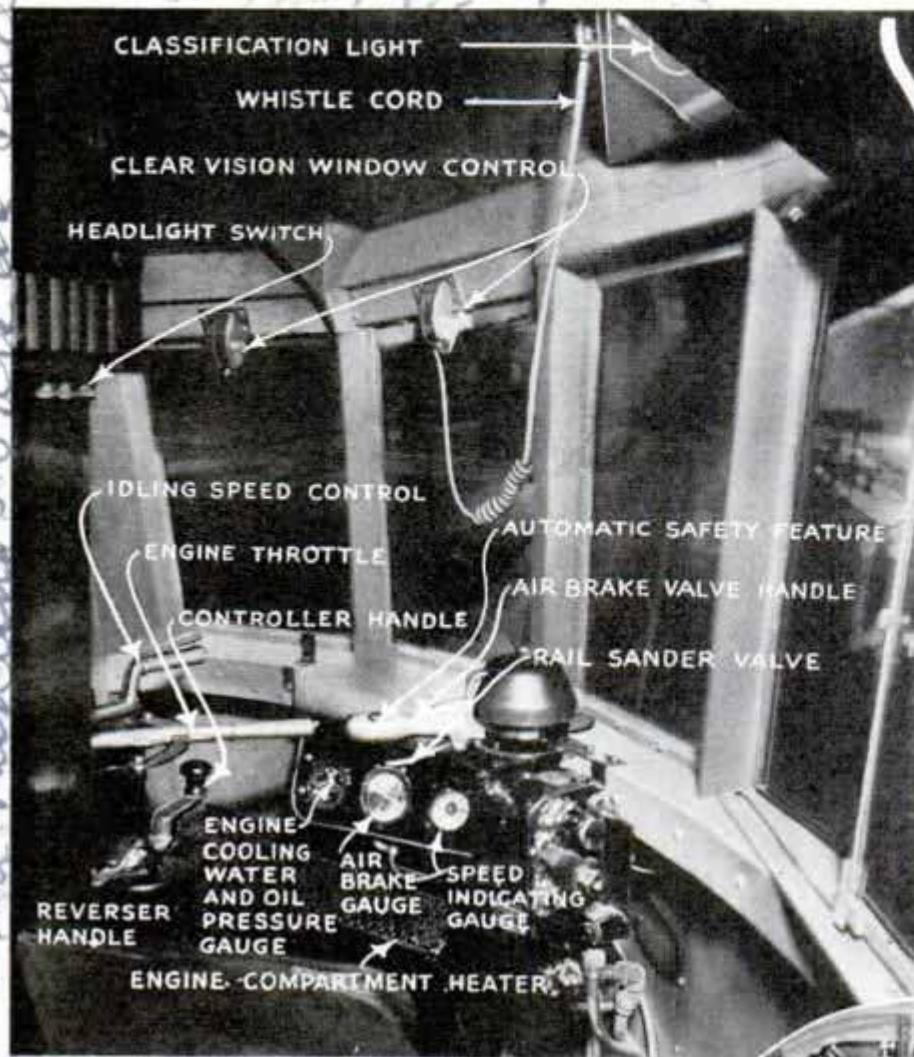
Infy Co. 1676 S

Asborn

and two persons

no data

C 1656 97
 made by Budd Manufacturing Co. 25 Feb 35
 and mounted in Park Ave. Phila



WINGS

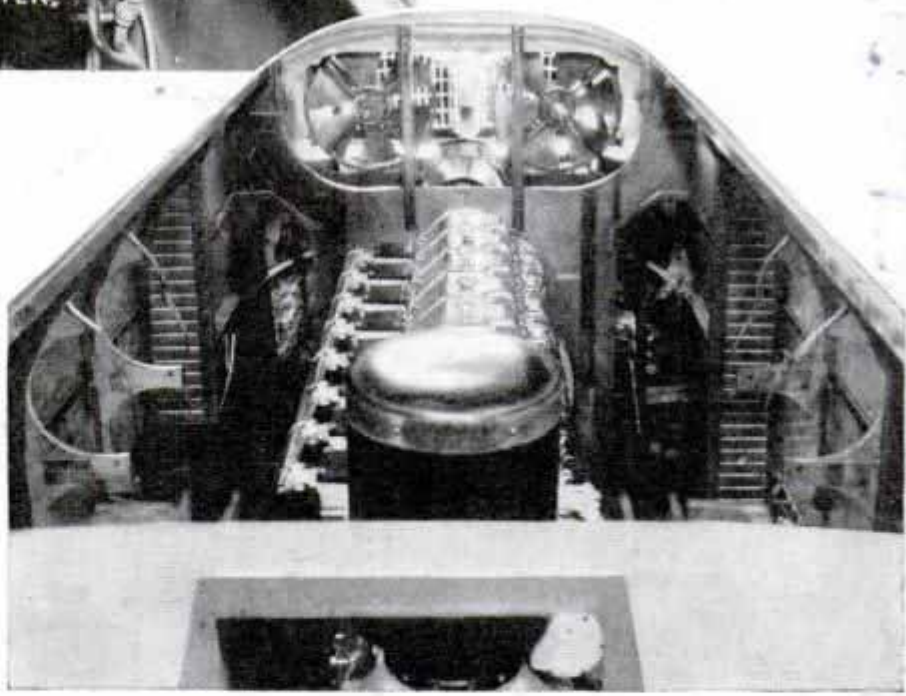
Controls of the "Zephyr" and the Straight-Eight, Two-Cycle, Six-Hundred Horsepower Diesel Which Drives the Train through an Electric Generator, the Current Being Delivered to the Drive-Motors on the Forward Truck; Cooling Air Drawn in through Grill at Top of Control Car Passes through Radiator and Out Near Exhaust Ports in the Roof, Which is Removable and Strongly Reinforced; Lower Right, Rear Observation Compartment

RACING the sun in a history-making flight from Denver to Chicago—1,015 miles in 785 minutes without a single stop—the Burlington "Zephyr" gave the railway's answer to bus, automobile and air competition.

All the safety and dependability of the rails, plus the comfort of a fireside chair and the speed of an airplane, at a passenger cost below that of the least expensive private automobile!

In its run from Denver to Chicago, the "Zephyr" used 418 gallons of fuel oil at a total cost of \$16.72. On the same run a locomotive would burn \$255 worth of coal.

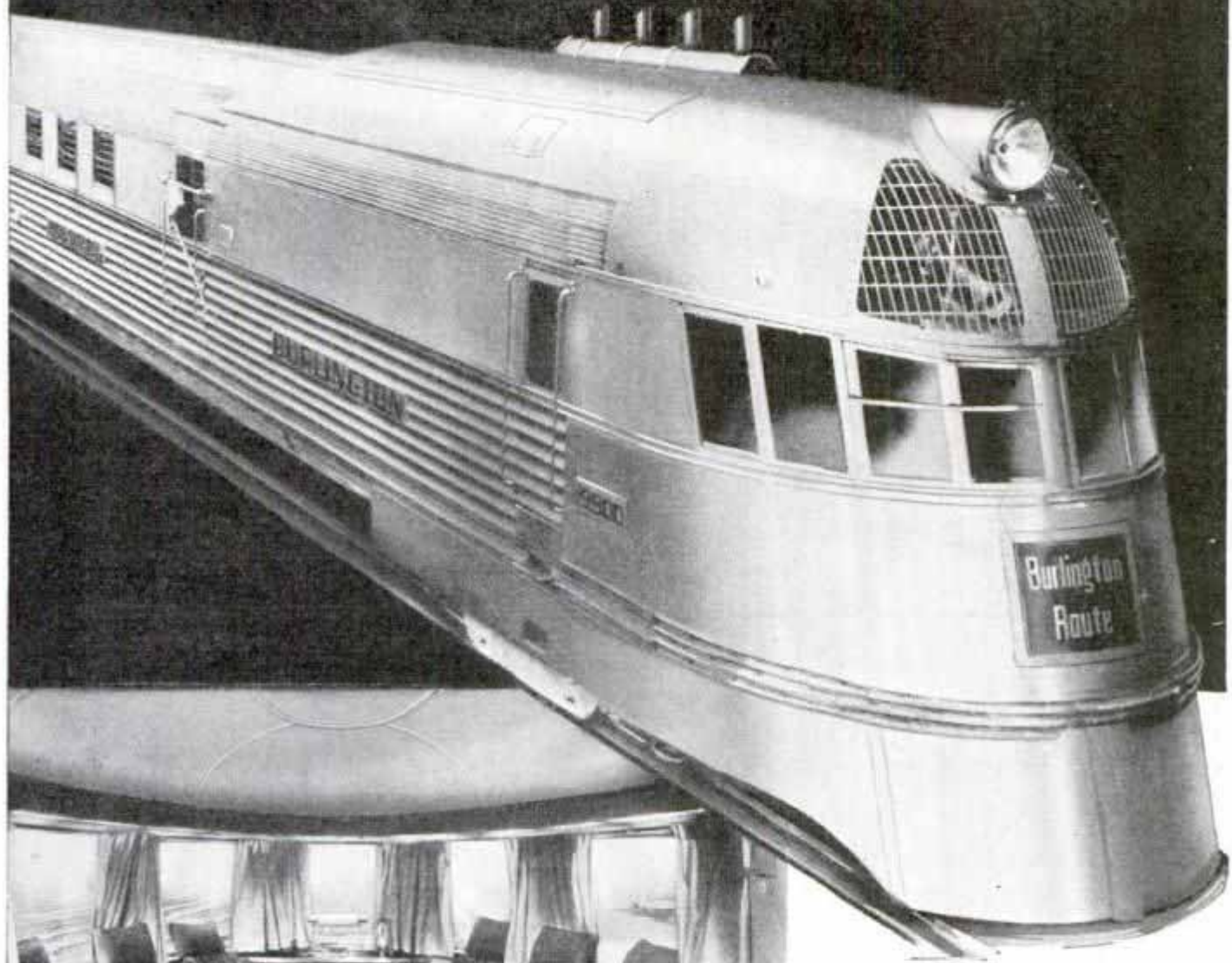
Air conditioned throughout, with concealed lighting, individually adjustable seats and broad, curtained windows, this three-coach articulated train rides as smoothly at 112 miles an hour as the ordi-



nary Pullman does at forty-five miles. Into its building have gone years of scientific progress and research, and at least three of its features point the way for industrial achievement in many other lines. First, the material of which it is built—stainless steel, an alloy of low-carbon steel, eight-

Widened Photos C 1656
229 W. 43rd Street

for the "IRON HORSE"



tric welding developed by Col. E. J. W. Ragsdale and the Edward G. Budd Manufacturing company. By this process a "shot" of electricity is precisely timed, resulting in absolute uniformity of the welds which occur as close together as the stitches in a seam.

Third, the two-cycle Diesel engine with its capacity for quick acceleration, dependable operation and exceedingly low operating costs. Engines of this type have made records of better than 600,000 miles without overhauling.

There is no gainsaying the advantages which trains like the "Zephyr" afford when compared to the conventional steam

een per cent chromium and eight per cent nickel. Because of the greater strength of this metal and the fact that it is not subject to corrosion, tremendous savings in weight are made possible, more than compensating for its higher first cost.

Second, the "Shotwell" method of elec-

25th and Huntington



able horsepower, as compared with steam, in quick starting and at lower speeds. Such propulsion, therefore, has definite advantages in switching and in local services with frequent stops and starts. As speed increases, however, the available horsepower of such units rapidly diminishes. With steam locomotives, by contrast, horsepower available at starting and at the lower speeds is comparatively low, but it increases with speed until about twenty-five miles per hour is reached, and thereafter declines very slowly. Steam locomotives also cost only about one-half as much as other motive-power units.

This higher cost is particularly important if electric traction is adopted, because, in such a case, there is a huge outlay not only for motive power but for powerhouse and wayside equipment as well. The development of the Diesel-electric locomotive, which, though costly compared with steam, does not entail the wayside plant

trains in service today. They are much lighter—a three-car unit weighing only about as much as one Pullman car. They are capable of high speeds at low cost and their lightness has not been secured by sacrificing strength. Also, the center of gravity is low, which improves their riding quality.

But where will all this leave the steam-propelled train and the faithful iron horse? Quite paradoxically, many rail executives believe, it will probably leave them at the threshold of a period of rapid progress such as they have never seen before. In the first place, those who see visions of the new streamlined trains throwing the locomotive on the scrap heap lose sight of the fact that the primary business of the railroads is to transport freight. In 1933, of all locomotives in service on Class 1 railroads, eighty-one per cent were used to pull freight trains and for shunting cars in yards.

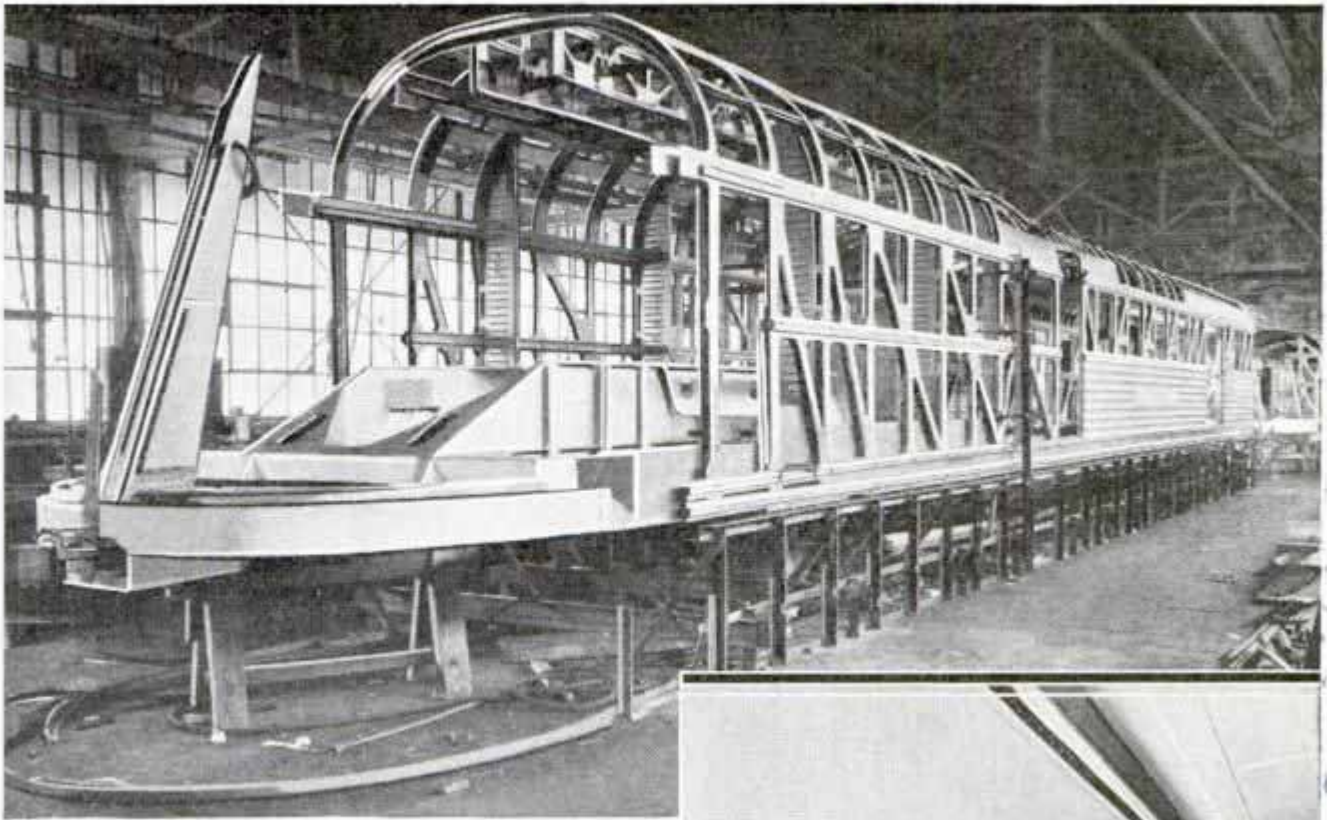
The advantage of electric and internal-combustion traction is their higher avail-



Driver at Controls, Motor and Generator; Similar Power Plants Have Records of More Than Six Hundred Thousand Miles without Overhaul

necessary with electrification, has caused some railroad men to look to it as a possible alternative to electrification in cities.

There exists today also a great hope that the total weight of passenger trains may be materially decreased, making possible the use of lighter power. Such an opportunity does not exist in freight service, however, for, supposing the weight of freight cars is materially decreased—that will not bring a reduction in the total weight of freight trains, because alert railway managers will add paying load to take the place of the reduction in non-paying weight. They will not reduce the total weight of their trains, but rather will take



advantage of the reduced weight of cars—and their weight is going to be reduced by the use of lighter metals and by substituting welding for rivets—by adding to the pay load per car and per train.

In late years, the design of steam freight locomotives has been greatly improved to bring about low maintenance costs and greater fuel efficiency so that the locomotive builders might assert that many engines in service today might well be packed off either to the scrap heap or to museums. Locomotives which were built prior to 1915 are over sixty per cent of all locomotives. Those who have studied motive-power economics most thoroughly are pretty well agreed that locomotives as old as that would be of very doubtful economy in modern railroad operation, even if locomotive design had not been improved in that time, and it has been radically improved.

A few years ago one railroad purchased twenty-two modern freight locomotives to supplant units ranging from only eight to fourteen years old, and found that the new power earned thirty-eight per cent upon the investment—in lower fuel costs, lower maintenance costs and lower wage costs per ton-mile of traffic. A number of roads have kept their heads above water, financially speaking, during the depression



Skeleton of Train Showing Tremendous Strength of Front Exceeding That of a Locomotive, and Adjustable Seats in Day Coach

largely because the decline in traffic has enabled them to move all their freight with their newer, economical engines, letting the older units which cost so much more to run stand idle. There are not a few roads today which are faced with the early alternative of acquiring new locomotives or else, by calling old engines into service,

(Continued to page 135A)

Two-Deck Bus Is Like Zeppelin on Wheels



beam is projected from a source in which there are optical lenses for controlling the intensity and width of the beam. A blind person is guided along the inside of the beam by means of a small portable unit to which is attached a photronic cell. The unit also contains a relay, flash-light battery and a buzzer. Held in the

hand of the blind person, the unit sounds its buzzer as long as the carrier remains in the path of the light beam. Should the blind person stray from the path, the buzzer ceases, warning the carrier to stop and move the unit around until the buzzer starts again. At intersections, where the blind person may wish to turn the corner, sanded strips are placed on the floor. When the feet touch this abrasive surface, the carrier of the buzzer is warned that a corner is ahead. The angle of the strips



Double-Deck Bus with Driver's Cab between Decks; Note Its Resemblance to a Dirigible

Germany is experimenting with a double-deck, streamlined bus which looks like a Zeppelin on wheels as it rolls along the streets. The coach carries twenty-four passengers and the driver's compartment is in a section between the lower and upper decks, giving him a better view of the road than when seated on the lower deck.

BLIND GUIDED BY LIGHT BEAMS AND BUZZER SYSTEM

Beams of light and a pick-up system containing a buzzer have been combined into a means of guiding blind persons through the building that houses the American Foundation for the Blind. The system dispenses with escorts. A light



Buzzer Signal Box, Shown in Hand, Guides Blind Person through an Entire Building

indicates the direction. Two strips warn of a doorway and three of a stairway.

Religious services will be recorded on disks and reproduced on an instrument resembling a phonograph for serving churches unable to have a regular pastor.

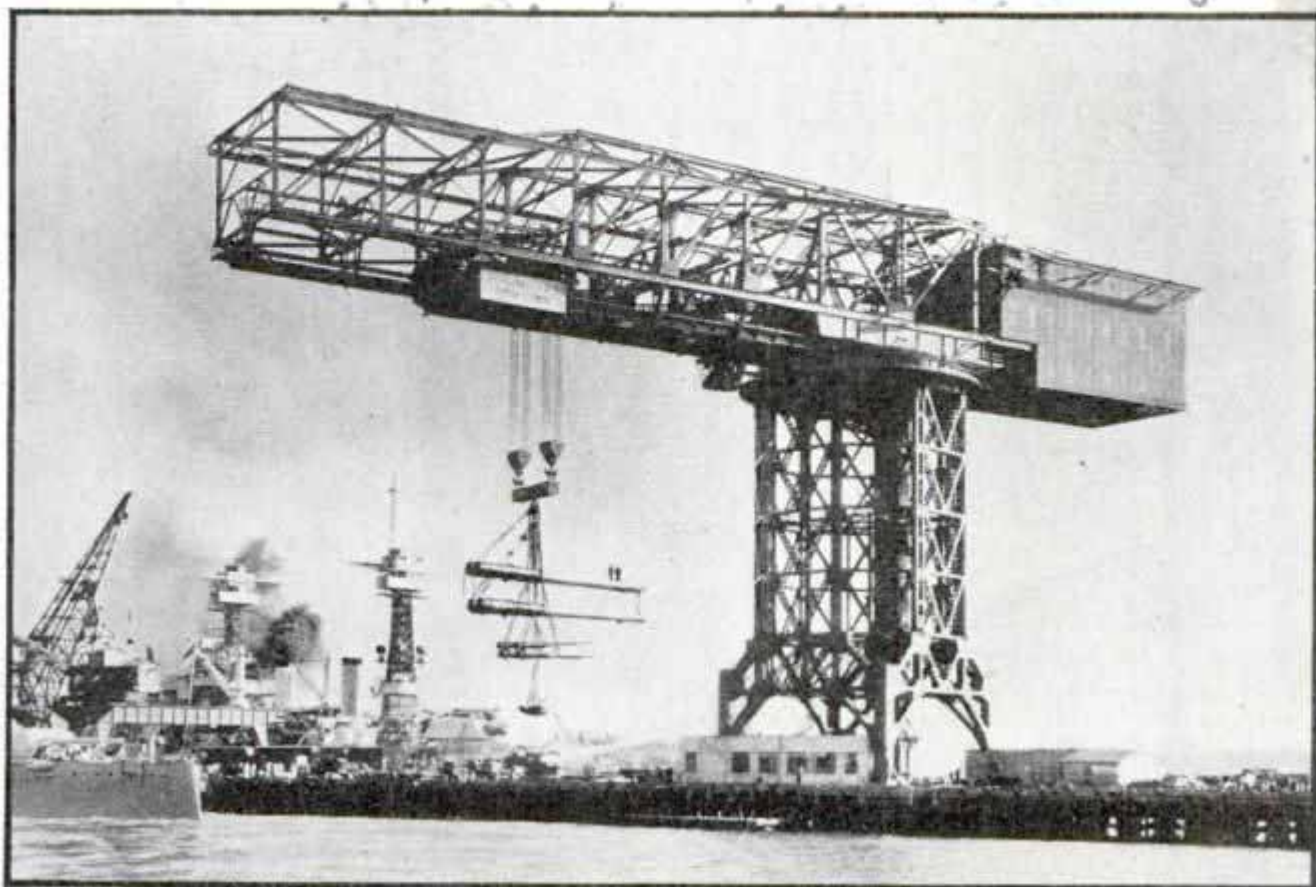
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*Carrosserie Lubrik
1961/2017
Germany
Ludwig, Carrosserie Lubrik
Rhein-Steinbr.*

D494

*125 & 46th St.
New York City*

Huge Crane Lifts Big Guns Like Match Sticks



This Huge Crane at the Puget Sound Navy Yard Can Lift Half a Dozen Fifty-Ton Guns Like so Many Match Sticks; It Has a Capacity of 350 Tons and a 180-Foot Hoist

Six or seven fifty-ton guns are lifted and moved about like so many match sticks by a huge crane at the Puget Sound navy yard. This crane rotates in a complete circle, has a lifting capacity of 350 tons and a hoist runway 180 feet long. At the rear is a structure as big as an apartment building which houses the electric equipment used in manipulating the crane and which also serves as a counterbalance, giving the crane the appearance of a gigantic hammer.

springs to make them non-synchronous. The back of the seat has an up-and-down motion in unison with the bottom, increasing riding comfort, due to proper support of the upper portion of the passenger's body. By means of a yielding fulcrum, the tension of the back of the seat is automatically adjusted to give equal comfort to every passenger, regardless of size.

LOW-TENSION SPRINGS IN SEAT GIVE EASIER RIDE

Easier riding qualities are claimed for a new automobile, bus or train seat equipped with long low-tension springs instead of conventional coil springs. The seat is constructed so that the greater portion of its weight represents the weight on the springs, resulting in a reduction of the amount of vibration reaching the passenger. The arrangement is made more efficient by varying the length, mass and tension of the



Lengthwise Springs Replace Coil Springs in Seat Frame, Shown Here without Covering

Herbert F. Roman, Inc.
 208 Full St.
 Chicago

Herbert F. Roman, Inc.

D589

Mr. F. W. Roman

208 Full St.

Chicago

D596

Stretchable Paper May Cut Printing Costs



Right, Showing How Stretchable Paper Is Alined for Printing Purposes



A simple method for making the right-hand edges of typewritten copy aline like printed matter has been invented by Joseph Speilvogel, of Newark, N. J. It consists of a finely crinkled and slitted paper mounted on a firm paper backing by means of a plastic paste. The sheets are inserted in the typewriter, and the lines are typed as evenly as mechanically possible. When the prepared paper is taken from the machine, the crinkled paper is lifted at the right-hand edge by means of tweezers and stretched to make all lines even. Paste on the back of the stretchable paper does not solidify, and when the line is stretched, the finger may be passed over it again to cement it to the firm backing. The invention holds possibilities for revolutionizing present methods of printing newspapers, books, law briefs, periodicals, pamphlets and catalogues. The printing process makes use of photo-lithography, which makes it possible to take printed matter from a typewritten page and reproduce it in quantity with the sharpness of typography of the conventional printing process. With the stretchable paper it is possible to produce lines of equal column width on an ordinary typewriter without mechanical attachments and to produce various sizes and forms of type

with a standard typewriter keyboard. That is, extended type may be produced by first typing a line, and then stretching it. Italic type may be produced by stretching the crinkled paper at a biased angle, and condensed type may be effected by typing on the special paper at right angles to the normal fashion and stretching it until the degree of condensation desired is reached.

D694

RED GLASS DISK IN REAR OF CAR REFLECTS THE LIGHT

As an added safety device for night driving, a small red glass disk has been attached to a metal holder in such a manner that the appliance can be bolted to the rear license plate or plate holder. In case the tail light is not functioning, the lights from a car approaching from behind are picked up and reflected by the glass disk which serves as a tail light until the regular light can be repaired.



glass disk which serves as a tail light until the regular light can be repaired.

D637
 Federal
 Paper 6.6.31
 Speilvogel, Joseph
 D694
 Speilvogel, Joseph

W. F. Woodruff Co. Ahern, Chhe

The WEST POINT *of the* AIR

FOKKER twin-motor observation plane originally designed as a light bomber but now used for aerial photography and observation work. Below, squadron insignia.



49TH BOMB. SQDN.



7TH OBS. SQDN.



35TH PUR. SQDN.



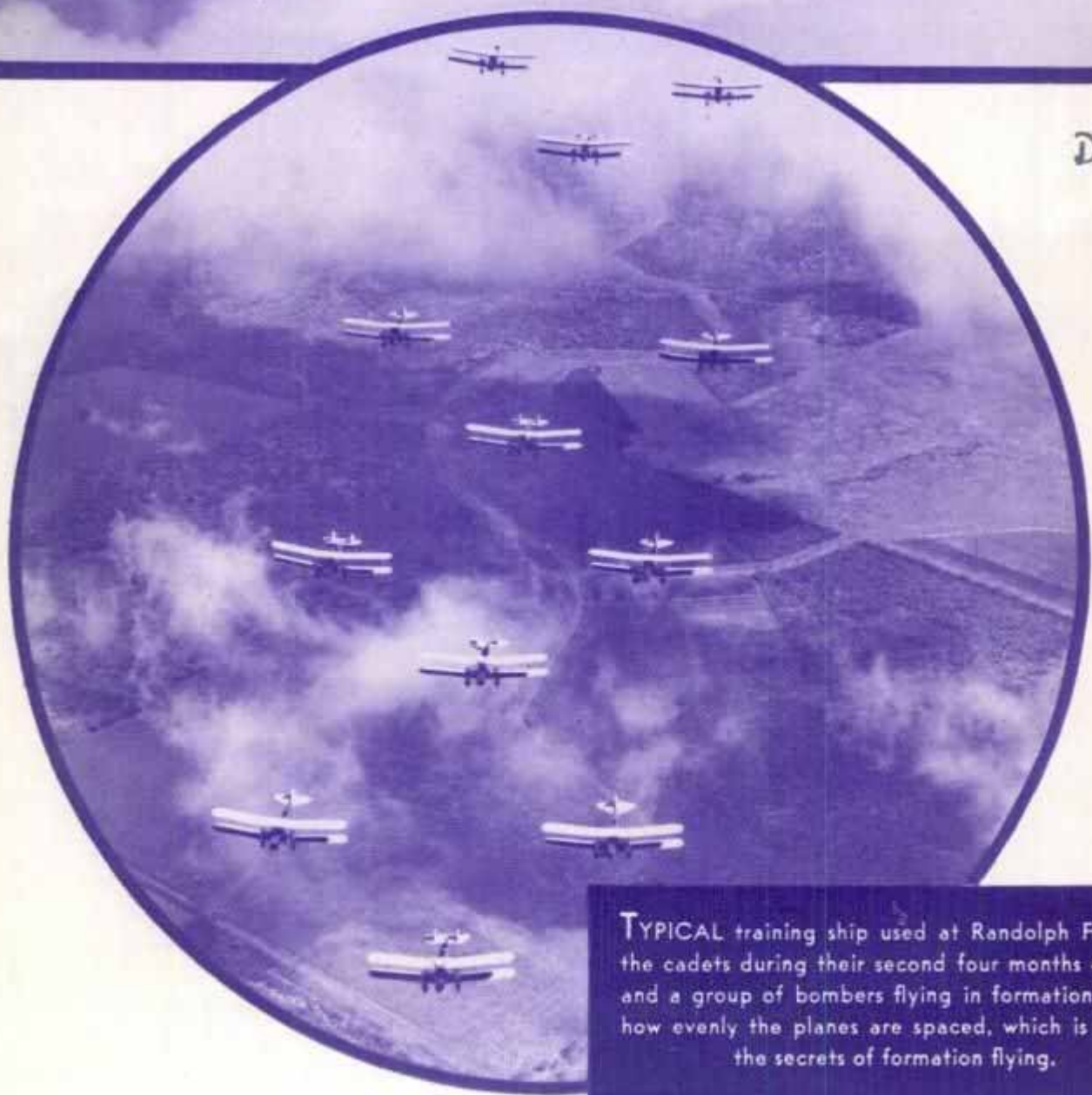
23RD BOMB. SQDN.

D60 4



FLYING cadets at Randolph Field are taught to do many things besides fly an airplane. The group above is at work on a 600-horsepower motor such as is used on attack and bombing planes. Below, cadets drawn up on the parade grounds at Randolph Field as a

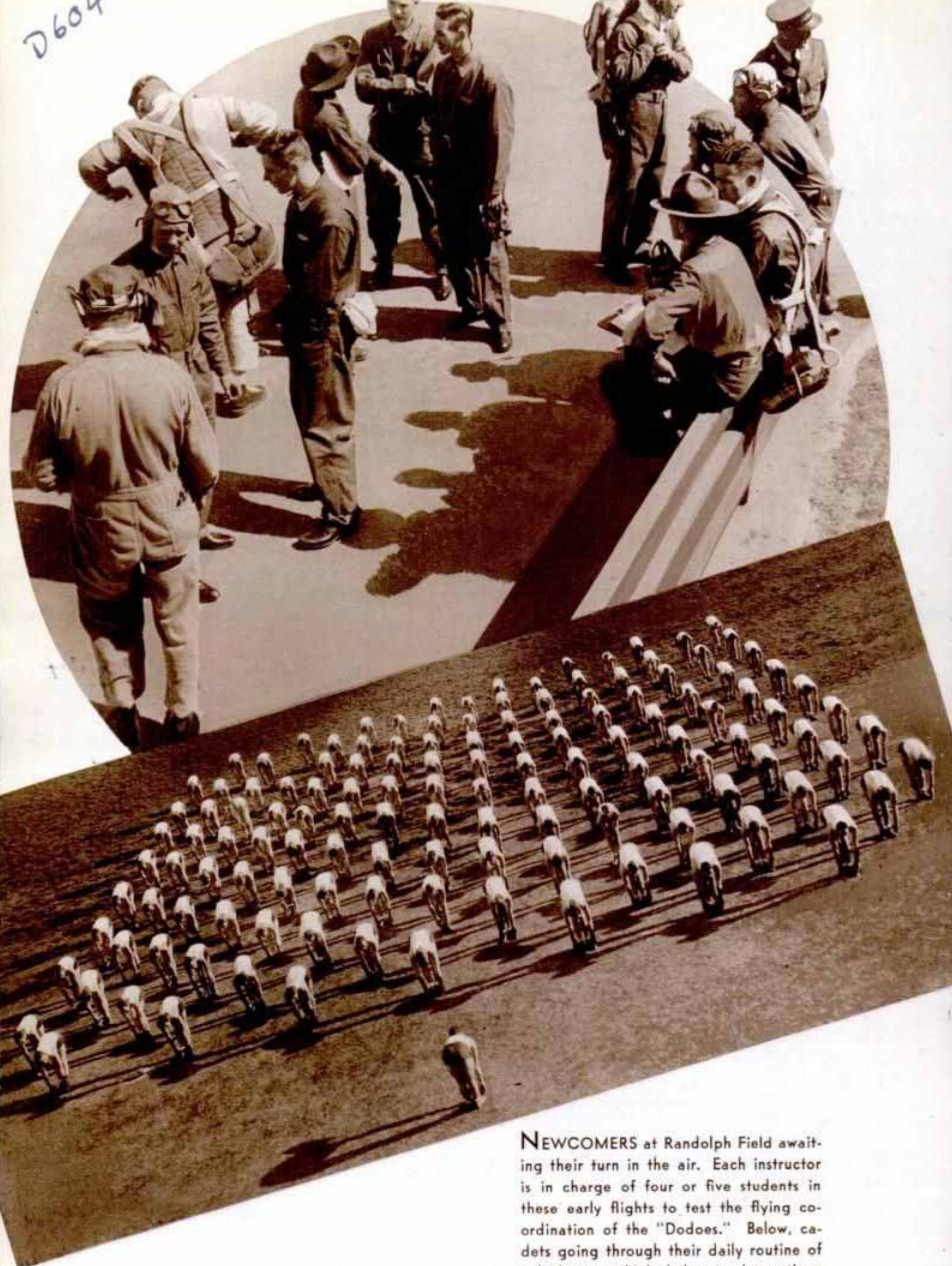
2007



D604

TYPICAL training ship used at Randolph Field by the cadets during their second four months of work and a group of bombers flying in formation. Note how evenly the planes are spaced, which is one of the secrets of formation flying.

D604



NEWCOMERS at Randolph Field awaiting their turn in the air. Each instructor is in charge of four or five students in these early flights to test the flying coordination of the "Dodoes." Below, cadets going through their daily routine of calisthenics which helps to keep them physically fit for flying.



44TH OBS. SQDN.



1ST OBS. SQDN.



88TH OBS. SQDN.

ONE of the Army's Martin bombers, the last word in that type of fighting craft.

D104

PART II

IF you want to learn to fly, Uncle Sam has an educational plan which reads like a daydream. He offers to teach you to pilot an airplane, feed you, clothe you, provide comfortable living quarters for a year, give you your wings, make you a second lieutenant when you graduate—and pay you \$75 a month while you learn.

To take advantage of all this, you need do only two things. First, get into the Army air corps training school at Randolph Field, Texas. Second, stay in for

a year. These are the "jokers." Neither is easy, but getting in is not as difficult as staying in.

If you are between twenty and twenty-seven years of age, unmarried, a male citizen of the United States, of good character, sound physical, normal mentality and have completed at least two years of college or university work or the equivalent, you are eligible to apply to the adjutant general of the Army for admission to this unique and exclusive school.

That doesn't mean you'll get in. If your application is approved, you must pass a physical examination more rigor-

Write Adjutant General of the Army

for booklet and application blanks.



260x



5TH OBS. SQDN.

NINE-plane bombing formation "stepped down" with a pursuit plane above as a protection against the enemy's fast ships.

ous than that for enlistment in the regular Army, other tests to determine your moral character and general fitness, and possibly an educational test covering such subjects as history, grammar, geography, arithmetic, algebra, geometry, trigonometry and physics.

If you pass all these tests, you may be among a new class of flying cadets entering the school March 1, July 1 and October 15 each year. But even if you get in, that's no insurance you will stay long. Despite the care with which flying students are selected, the eliminations are very heavy. More than fifty per cent of each class of 150 cadets is "washed out"

in the first few months, many of them before they have more than attempted to solo. That isn't the fault of the students or the Army either. Cadets may pass mental and physical examinations with flying colors and do good work in ground school but be unable to fly an airplane safely. No one can tell whether you will make a good pilot, regardless of your qualifications, until you get in the air, for the air is a strange environment for man to master.

The year of instruction is divided into three parts, four months of primary training with light planes, four months of basic training with heavier ships and



D 604

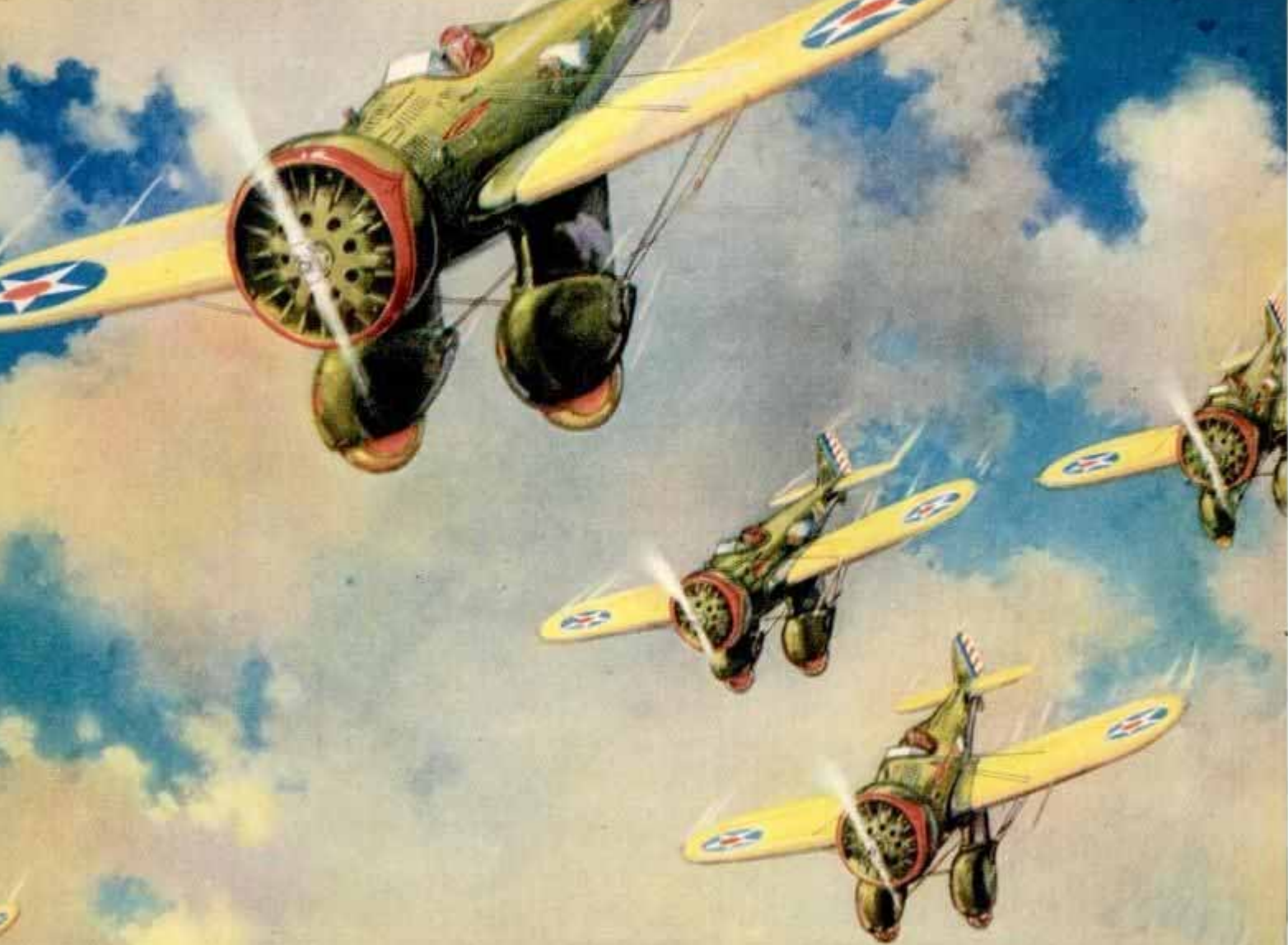
ADVANCED students at Kelly Field becoming familiar with the mechanics of various types of bombs. Below, regular army drill is a part of the training for all cadets, particularly during the earlier months of their training.



D604
four months of advanced flying, the latter at Kelly Field, San Antonio, Texas. When you arrive with a new class of "Dodoes"—named after that extinct bird that could run but had no wings—you will be assigned to a comfortable barracks, issued a natty uniform and other equipment and started to work.

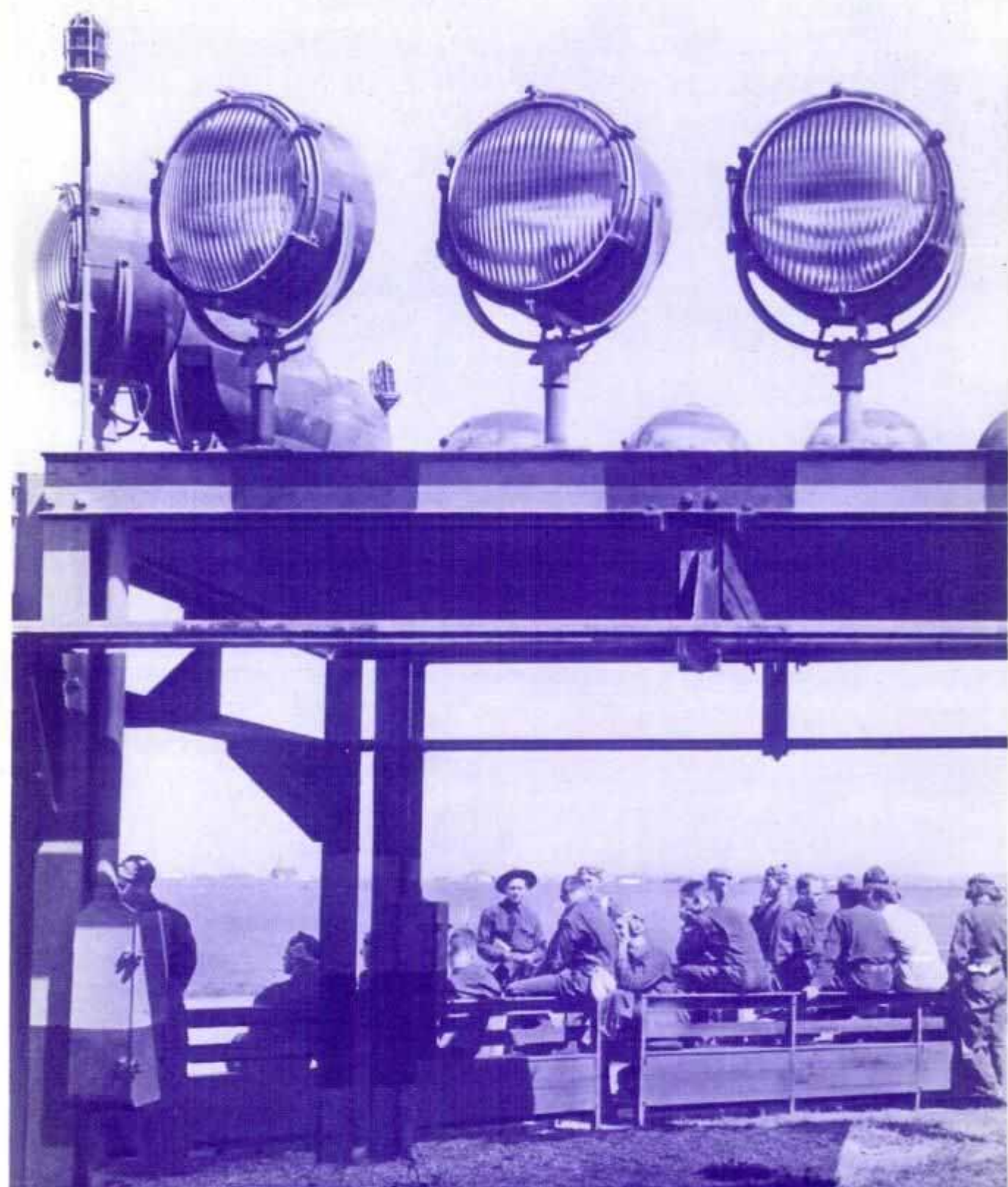
One of the first things you will learn is

that you are in the Army. That means strict discipline, obeying orders without question, recognizing the will of your superior officer. One cadet remarked facetiously that he used only three expressions in the entire year. They were, "Yes, sir," "No, sir," and "No excuse, sir." The Army is developing a new brood of American eagles—pilots trained



D 604
WHAT a thrill for the flying cadets! Boeing pursuit planes in a power dive. Right, attack plane which drops bombs and has two machine guns that fire through propellers, two on landing gear and two more on the rear cockpit.

D60



THIS is only one of the many groupings of powerful flood lights which provide illumination for cadets at Randolph Field while they are being taught the secrets of night flying.

to go in formation, follow the leader, fight in squadrons. So the second thing you will learn is that it is teamwork that counts, and you are part of a team.

Your flying instructor wastes little time in preliminaries. You are there to learn to fly and unless you are "washed out" you will get 150 hours or more of flying the first few months. You are told the location, function and use of the controls, then you are taken up to find out for yourself. During the first ten hours of dual work, you get straight

GROUND school instruction in the mechanics of airplane motors, and newcomers leaving the auditorium after a lecture period.

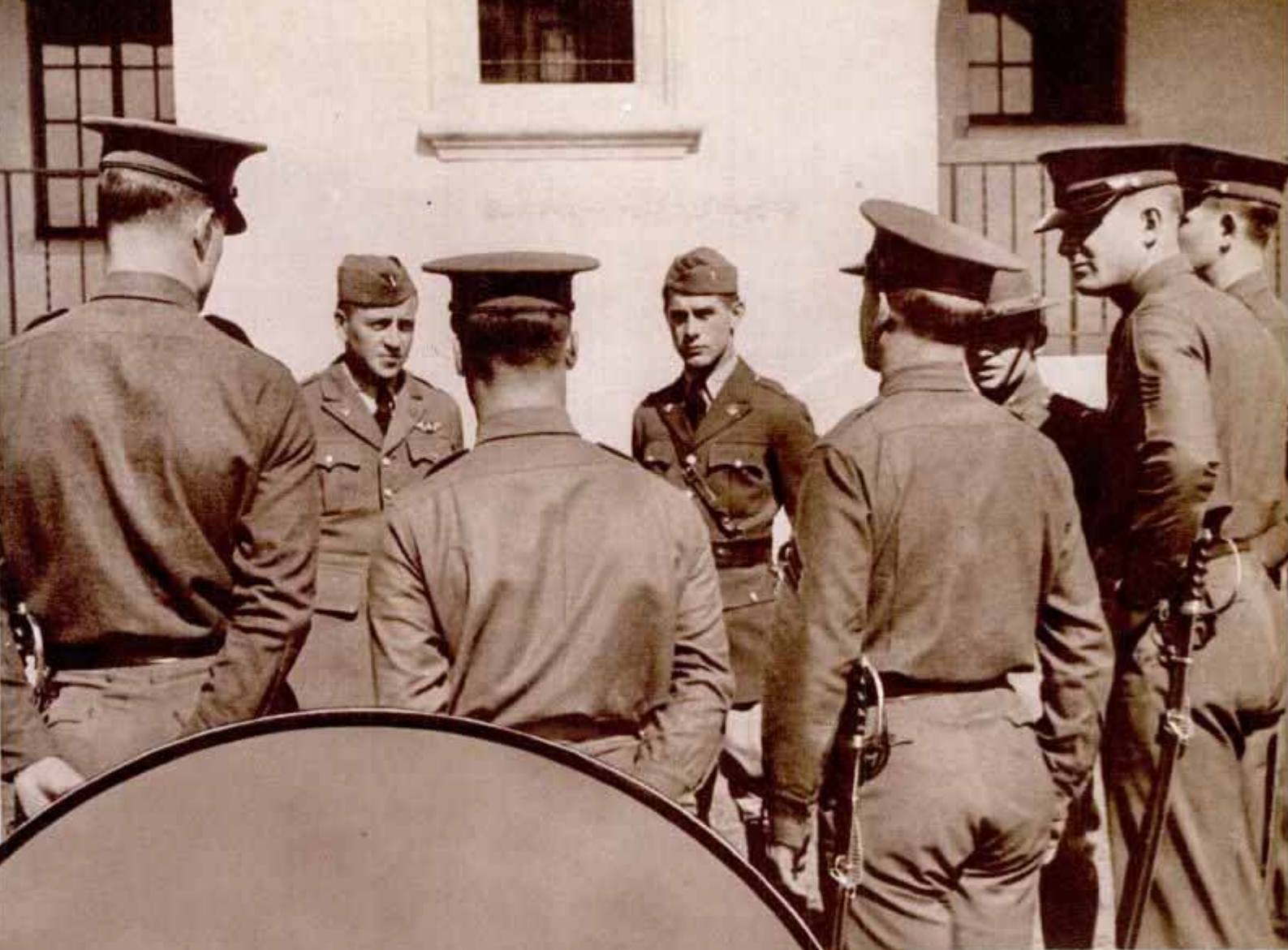




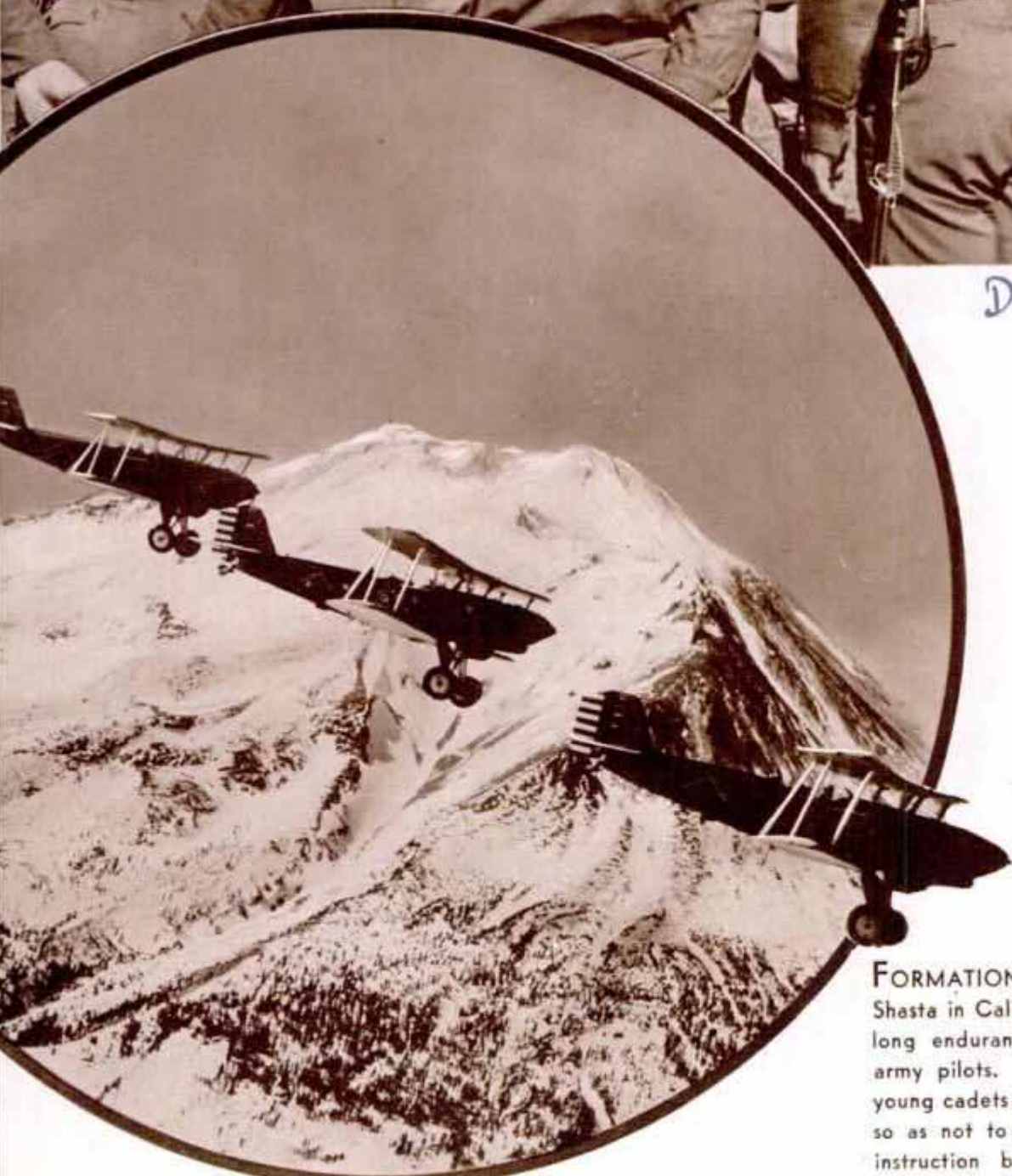
D604



AIR view of part of Randolph Field, showing the long row of hangars along one side and the training ships lined up in front of them. Right, ability to think and act quickly is important for the flyer. Here a cadet is taking a test in the aviation school intended to show how quickly he re-



D604



FORMATION flying over Mount Shasta in California on one of the long endurance flights made by army pilots. Above, a group of young cadets gathered in a huddle so as not to miss a word of the instruction being given by the



2604

HANGING the deadly bombs on the bomb racks of an attack plane. Correct hanging on the racks is almost as important as timing the dropping when it comes to making hits. Below, packing a parachute. Only experts are employed in the parachute room because the lives of the flyers sometimes depend on the proper operation of these silken umbrellas. All the flyers wear parachutes and the operation of the 'chute is one of the first things the new cadet is taught.



and level flying, shallow and medium turns, climbs, glides, taxiing, spins, elementary eights, take-offs, stalls with power on and off and possibly a forced landing or two.

About the tenth hour you should be ready to solo, and for the next seventeen hours you will be expected to do dual and solo flying and learn to execute climbing turns, spirals, steep turns and chandelles. Next comes accuracy and acrobatics with thirty-four hours of dual and solo work devoted to the mastering of rolls, half rolls, Immelman turns, slips, hurdles, loops, cross wind landings and take-offs, vertical reverses and

(Continued on page 120A)

D604



BOMBERS following a pass through the mountains and a skeleton plane in the radio school room equipped with sending and receiving sets



PLANES flying over the Administration building at Randolph Field. Note the concrete runways and the flying insignia of the army set in the circle designed with flowers.



73RD PUR. SQDN.



8TH ATT. SQDN.



2ND OBS. SQDN.

Earthquake Is Made to Order for the Movies

When the script of a recent motion picture called for an earthquake, the director could not afford to wait for nature to produce one, so a quake was made to order by the technical staff with the aid of some ingeniously designed mechanical equipment. For interior shots, sets were placed on rollers and tied to the floor with heavy springs. The ends of floor joists were extended and equipped with handles on which several men pushed and pulled alternately to produce the earthquake, the steel springs taking up the motion. Walls were constructed with prepared but concealed cracks and a cable was

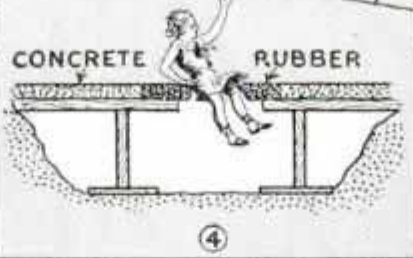
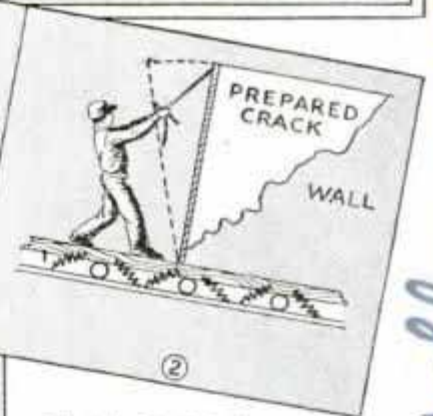
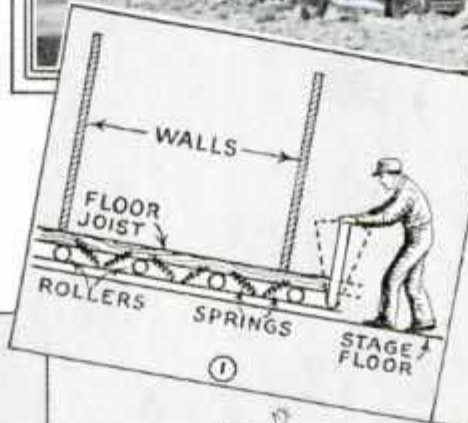
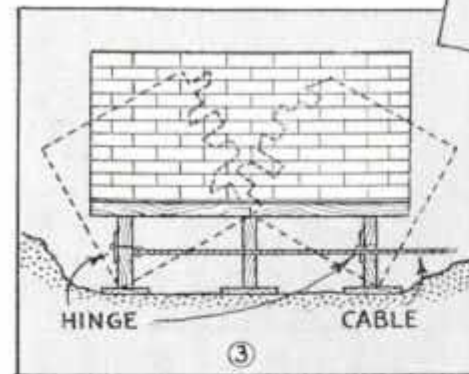


Photo by Paul R. Harner of International Photographer

Wall of Building Falling in a Man-Made Earthquake Produced to Order for the Movies, and Diagrams Showing How Effects Were Obtained

suspended from a wall section to a truss in the stage roof. In this manner the partly suspended wall, when pulled, appeared to sway and split. Floors likewise were made in sections with prepared cracks and furniture was pulled over with concealed wires. For exterior shots, walls were made to fall outward by weakening them on the line of breakage and pushing from inside or pulling them down with a truck. A solid masonry wall was supported by hinged posts, called "weak knees," the wall splitting and dropping when the sections were pulled apart. Cracks in streets were made to open and close by using rubber sections which parted as an actor

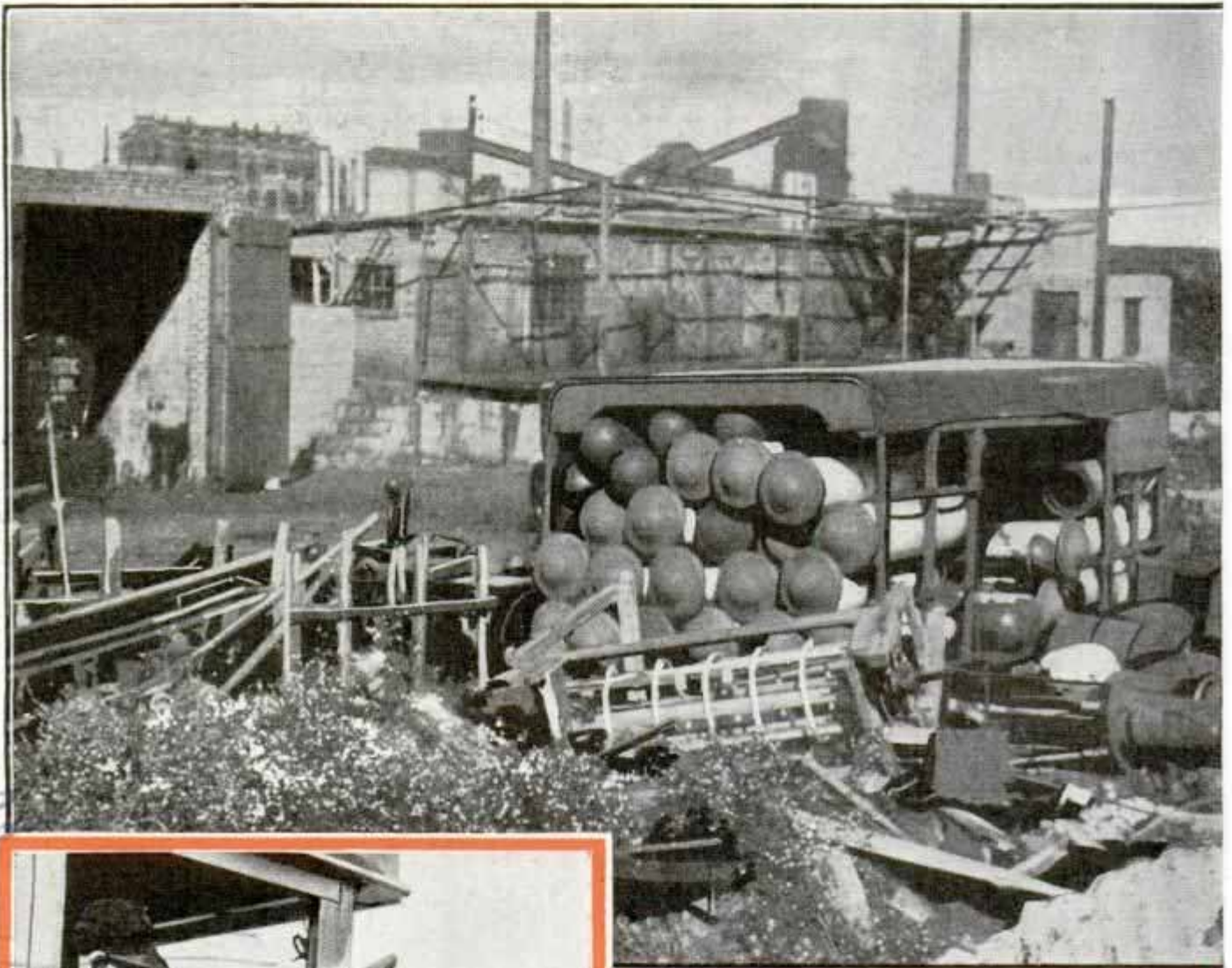
stepped on them and then closed, apparently holding him fast. Entire buildings were made to crash by wrapping cables around the middle and literally pulling them in two with a truck. Shooting such scenes required many cameramen, some on the edges of walls to be broken, some in pits beneath sidewalks shooting straight up at buckling masonry, and others on trucks. Sound engineers carried microphones to record the noise and others had them mounted on long booms to reach into the clatter made by a falling structure. The director used a system of push buttons and pantomime to signal to each actor and technician his cue for action.

at studios of 20th Century pictures.

Hollywood, Calif.
Hollywood, Calif.

700
8038: 182nd Y
Necessford City

HIGHWAY ROBBERY:

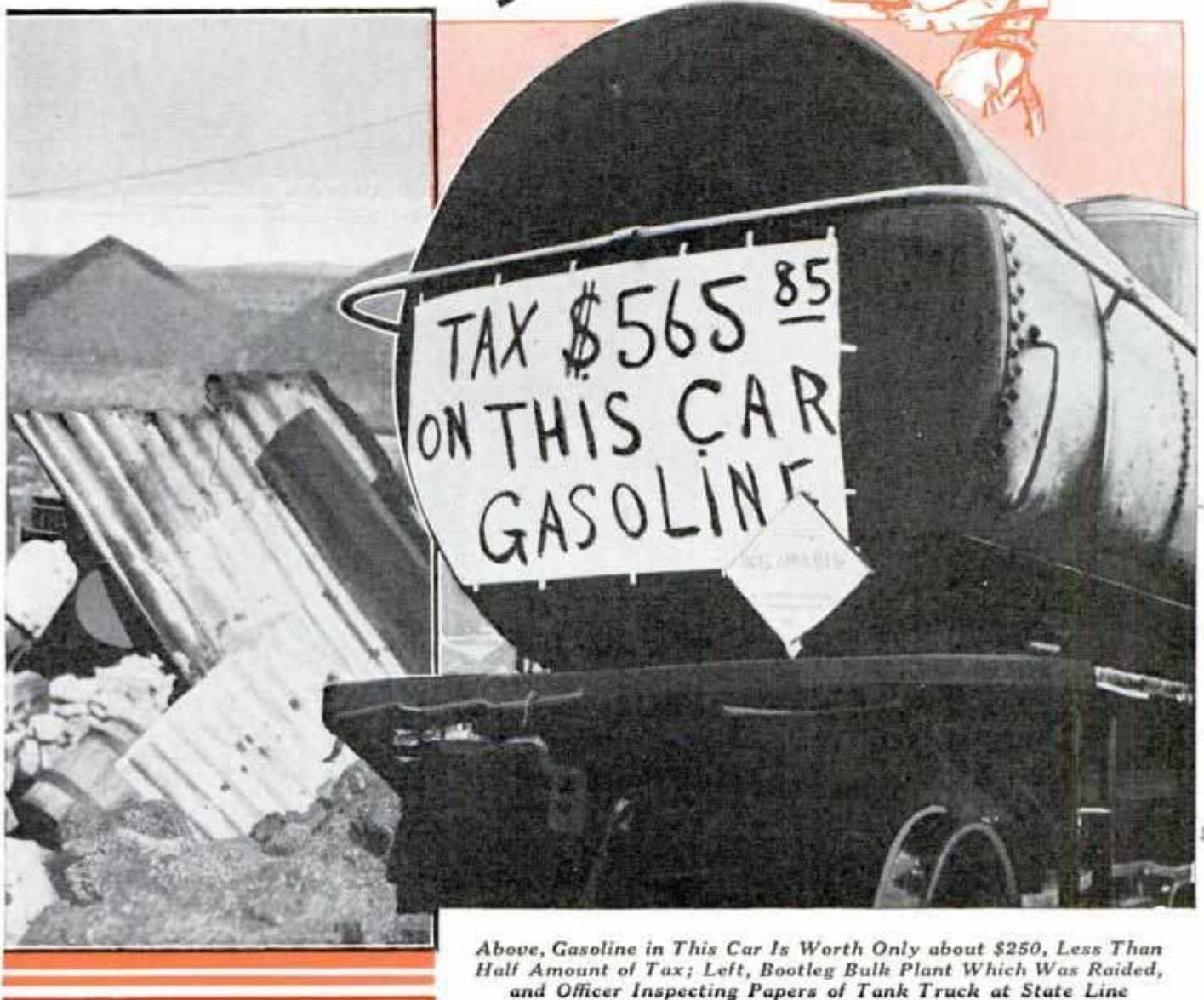


THIS summer's touring motorist is in for a lot of extra trouble. He will be driving along smoothly enough until he comes to a filling station, perhaps at a state border, announcing a "bargain" in gasoline. A sign may tell him to fill up because in the next state the gas tax is higher, so he'll fill up his tank.

He is hardly across the border when his engine starts acting up. Somehow, the car will crawl to a garage, the motorist cursing the oil, the car, everything but the gas. The mechanic will take a good look and diagnose the trouble.

"Looks like bootleg gas," he will tell

New Style



Above, Gasoline in This Car Is Worth Only about \$250, Less Than Half Amount of Tax; Left, Bootleg Bulk Plant Which Was Raided, and Officer Inspecting Papers of Tank Truck at State Line

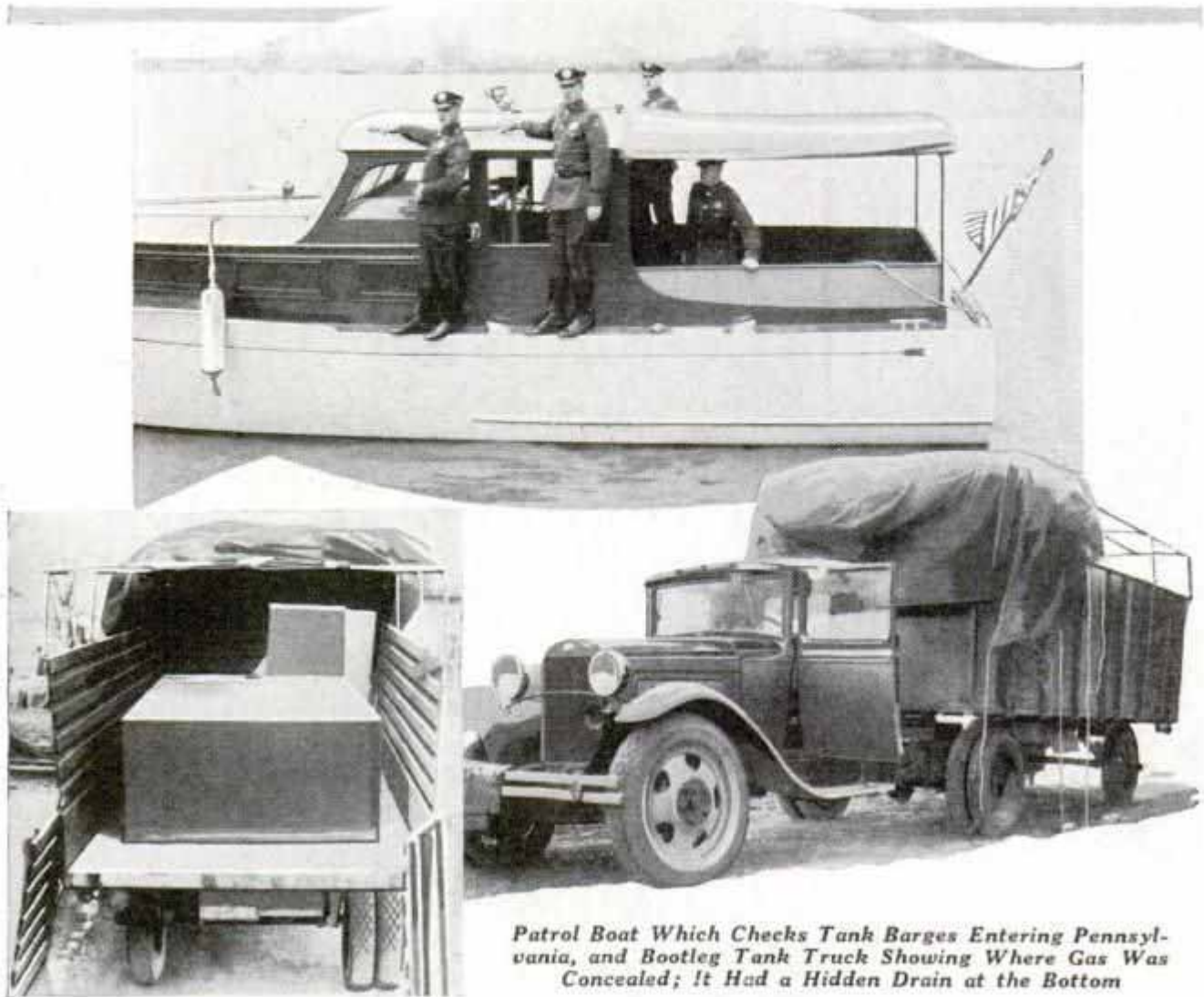
the driver. Then he'll syphon gas from the tank, clean out the carburetor, blow out the feed line and indulge in other tasks destined to dent the motorist's bank roll.

State and federal taxes on gasoline sold range from two to eight cents a gallon in the various states. One of the chief objects of the bootlegger is to collect this tax for himself. While the few cents a gallon doesn't sound like much profit, remember that sixteen billion gallons of gas were used by cars last year. Experts estimate that bootleggers nowadays gyp the public out of more than \$100,000,000 each year—about a fifth of what the states collect themselves. In large cities, including New York and Chicago, retail dealers have been

influenced by higher profits to cheat the public by selling pirated gas.

How is this colossal highway robbery worked?

There are dozens of systems and schemes, but the dangerous form of the racket hits the car owner when he buys blended gas. The bootlegger dilutes or "cuts" good gasoline with twenty-five to fifty per cent kerosene, naphtha, furnace oil, distillate or other non-taxed liquids, and sells the mixture as high-test motor fuel. Or a dealer may mix 1,000 gallons of good gas with 5,000 gallons of bootleg and pay the tax on only 1,000 gallons. The inferior gasolines are dyed to make them look like high-priced premium fuels.



Patrol Boat Which Checks Tank Barges Entering Pennsylvania, and Bootleg Tank Truck Showing Where Gas Was Concealed; It Had a Hidden Drain at the Bottom

Where does the pirated gas come from? Much of it from the oil wells, where some are running without supervision and the product escapes taxation at the origin. Other bootleggers evade taxation by taking off surplus oil on which they pay no tax. This is called "hot oil," and escapes all the taxes in the industry if it is made into gasoline and sold through bootleg channels. At some oil wells portable gasoline "refineries" mounted on trucks park in hidden places and manufacture low-grade gas for the bootleg trade.

Least direct damage to the motorist is incurred through smuggling of regular gasoline across state lines. Bootleggers buy tank-truck loads of gas in Connecticut or Missouri, where the tax is only two cents a gallon. During the night, "to avoid heavy traffic," the tank cars of gas, painted black, are driven along back roads over the border into states where the tax is higher. The smuggler then sells his gas without reporting to the state authorities.

Generally the bootlegger doesn't even pay the tax when he buys the gas. According to the law, gasoline purchased for "export" or out-of-state shipment, is not taxable in the state of origin. So if the bootlegger is stopped at the state line by a tax collector, he merely declares that the gas is for export. When smuggling goes on regularly between two states like Pennsylvania and Ohio, the same trucks that bring Ohio fuel to Pittsburgh will take Pittsburgh produced fuel into Ohio.

On railroads, a tank car may be shipped for export from one state, New Jersey, to another, Pennsylvania. The car may stand at the Pennsylvania railway siding for a while and then return to New Jersey to escape the tax. One of the booze bootlegger's old tricks is brought up to date, with the frequent shipment into a state of tank cars of good gasoline marked "molasses" or "kerosene"; thus the provisions are avoided which require railroads to report all gasoline shipments by tank car. An-

other scheme is to bill gasoline by a dummy corporation which can't be located. Or tank cars may be sent to out-of-the-way flag stops where they are unloaded at night.

How attractive the bootlegging of gas appears to the racketeer is indicated by one of the leaders of the game.

"There's more profit in bootleg gas than there ever was in liquor," he said. "There's less danger because it's hard to convict—the bootlegger must be caught in the actual dumping act. Then, there's very little gunplay and less murder. We can make a bigger turnover than with liquor."

Bootlegging also extends into the lubricant field, with the result that some companies have devised "bootleg-proof" cans. It also has penetrated the accessories lines—spark plugs, polish, brake lining and grease of poor quality being widely sold.



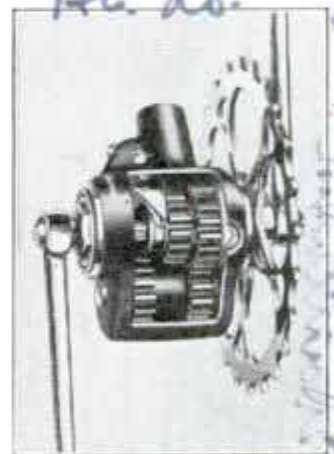
Combination Oil Can Opener and Spout Attaches to Side of Can to Prevent Fraud

SIDE-SPOUT OIL CAN OPENER PREVENTS BOOTLEGGING

Bootlegging of motor-car oil may be prevented by using a combination opener and funnel that destroys the side of the can. Refilling of the can with cheap oils is made impossible. After the device is attached to the can, the oil is poured into the auto crankcase through the funnel.

BICYCLE WITH TWO SPEEDS HAS A GEAR SHIFT

When the bicycle rider comes to a hill or roads covered with sand, mud or snow, he shifts into low just like the auto driver if he is riding one of the new bicycles with two speeds and a gear shift. This gear shift consists of a "high" speed with three revolutions of the rear wheel at every turn of the pedal, and a "low" with one revolution for every turn of the pedal. By moving a lever under the handlebar, the gears are shifted noiselessly.



TIMING METER FOR CAMERA GIVES CORRECT EXPOSURE

Correct exposure for taking pictures under various light conditions is determined quickly by a simple timing meter in the form of a celluloid disk with a movable notched edge. An arrow on the movable part of the disk is set to the film speed, then the notches opposite the conditions under which the picture is being taken



Celluloid Disk Shows the Correct Exposure for Making a Photograph under Various Light Conditions

are successively pulled down to the stop position. The proper time of exposure is read opposite the lens diaphragm and the camera shutter is set accordingly.

Only a reliable solution should be used to clean the radiators of cars with aluminum cylinder heads.

Walter Ralph Harris, Bromfield St. Boston, Mass.

Chicago, 1805 S. Duane St. Calumet, Ill. 7069

Ball Crank Co. Cincinnati, Ohio

Balcrank Sid. E. Springfield, Ohio

The Colson Co. Clyria, Ohio

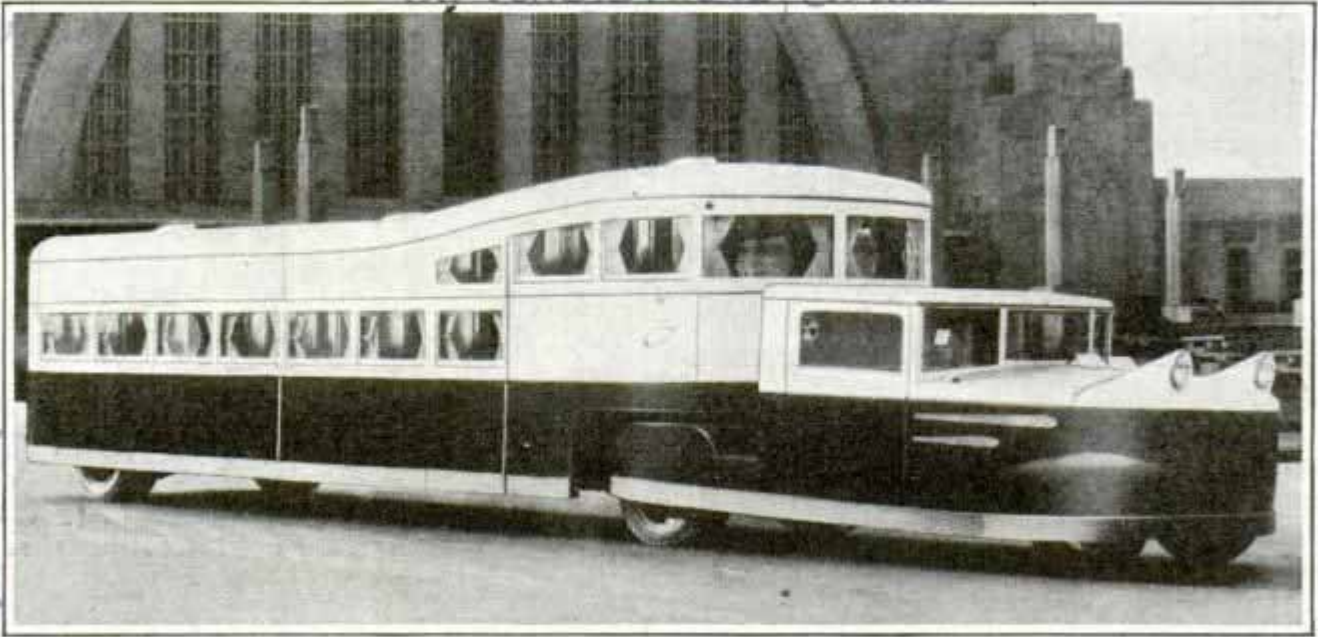
Warner Clean Warner-Patterson, Michigan

Burleigh Brooks

Elmwood Place,

Articulated Motor Coach Reduces Vibration

Cincinnati, Ohio



Streamlined and Articulated Motor Coach in Which Vibration Is Reduced to a Minimum by the Unusual Form of Construction; Note the Enclosed Observation Deck

Engine vibration is eliminated from the passenger compartment of an articulated motor coach consisting of two units which have been so thoroughly streamlined as to have the appearance of a single vehicle. The convex front of the passenger coach fits snugly into the concave back of the cab, thus closing the vertical back usually

seen in such construction. The raised forward level of the coach gives an extra half-deck and offers an observation section. The truck, being separated from the coach, acts as a safety bulkhead in collision and permits the vehicle to turn in a small circle. It is said this form of construction eliminates side sway.

Lawn Roller Driven by Gasoline Engine Easy to Operate

Tennis courts and lawns can be pressed down quickly and easily with a small hand

roller driven by a gasoline engine. Once the engine is started, the operator merely guides the roller which travels about two miles per hour. The implement has a rolling width of thirty-five inches and operates on the two-cycle principle, driving a countershaft by means of a single roller chain, the shaft in turn driving the roll through a duplex chain. The crank-started engine has two controls, one for the clutch, the other for the throttle, and consumes about four and one-half pints of gasoline per day. The pressure on the turf is thirty-four pounds per lineal inch of width rolled, less than many hand rollers. Ball and roller bearings are used for the running shafts and the frame is a rigid electrically welded steel structure bolted to the steel plate sides. A tool box is part of the apparatus and the cylindrical fuel tank holds half a gallon of gasoline and oil mixed.



Hand Roller Operated by a Gasoline Engine at Speed of About Two Miles per Hour

*Engineers
The St. Louis
Barford Ltd.
England
D 634*

*Barford Ltd.
Barnham*

See page 198

U. S. John W. Isallo,
49 Central Ave
Revere, Mass.

**"TIGER TOMB" AND STOREHOUSE
REVEAL INDIAN SECRETS**

Guarded by the fierce figure of a tiger with bared fangs, the fiftieth tomb of the ancient Indians of Mexico has been discovered by scientists exploring Monte Alban. This tomb holds the reburied bones of what appear to be four individuals and was found more than a mile from the cemetery zone of the old Indian city. Only a few bits of jade and pottery were with the bodies but in an adjoining annex were found elaborate black pottery, the ornate figures of gods, big urns, incense burners and food dishes.

**TRICYCLE CHANGES TO BICYCLE
BY ADJUSTING WHEELS**

Adjustable rear wheels make it possible to convert a new velocipede to uses of either a tricycle or a bicycle. There are three rear wheels, one of which is adjusted clear of the ground when the velocipede is used as a tricycle. Lowering that single center wheel lifts the other two wheels, turning it into a bicycle.

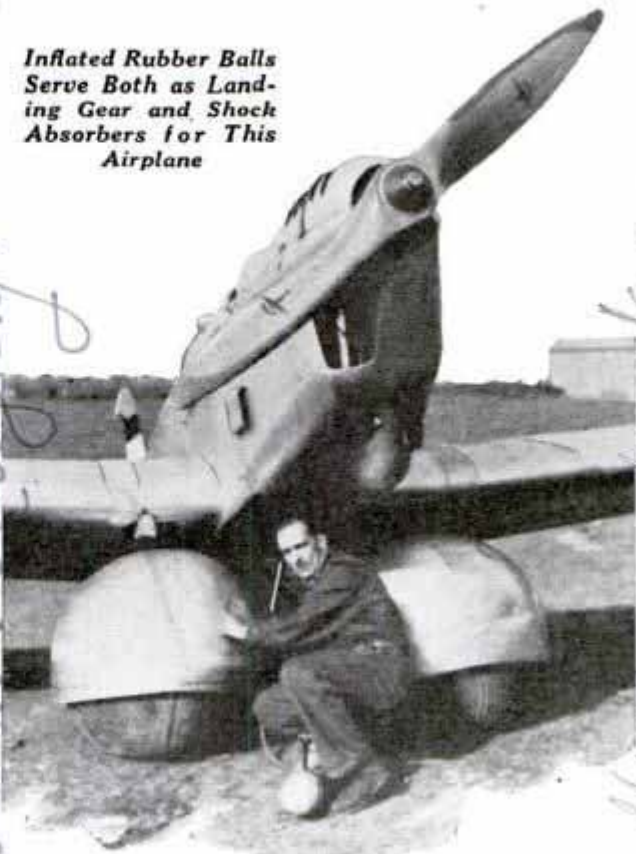


Cycle with Three Rear Wheels May Be Used as Tricycle or Bicycle by Making Adjustment

**RUBBER BALL LANDING GEAR
USED FOR AIRPLANES**

Rubber balls fixed to the fuselage of an airplane without spring suspension are being used to replace the conventional types of wheel landing gear. The balls are inflated and it is claimed a ship can de-

Inflated Rubber Balls
Serve Both as Land-
ing Gear and Shock
Absorbers for This
Airplane



scend on land or water with them. It is also asserted that the balls eliminate the danger of nosing over when landing on uneven ground. Streamlined aluminum bonnets cover the upper parts of the balls to lessen wind resistance during flight. The balls, which act as huge shock absorbers, are divided into sections like an orange and the sections are jointly inflated to maintain equal pressure. It is now planned to build a plane with the new type of gear partly recessed in the wings.

**DISPENSER FOR GUM LABELS
IS AID TO CLEANLINESS**

Gummed labels are kept free from dirt by a dispenser that issues them one at a time. The device is made of molded plastic. It opens easily for replacement of label rolls.



Hydraulic pressure is used in producing a paper nail that can be driven into hard-wood without breaking or bending.

Wheels - Continental Rubber Co. Valhalla, N.Y. 95-100
D 5/8

Continental Rubber Co.

Paper Foundation

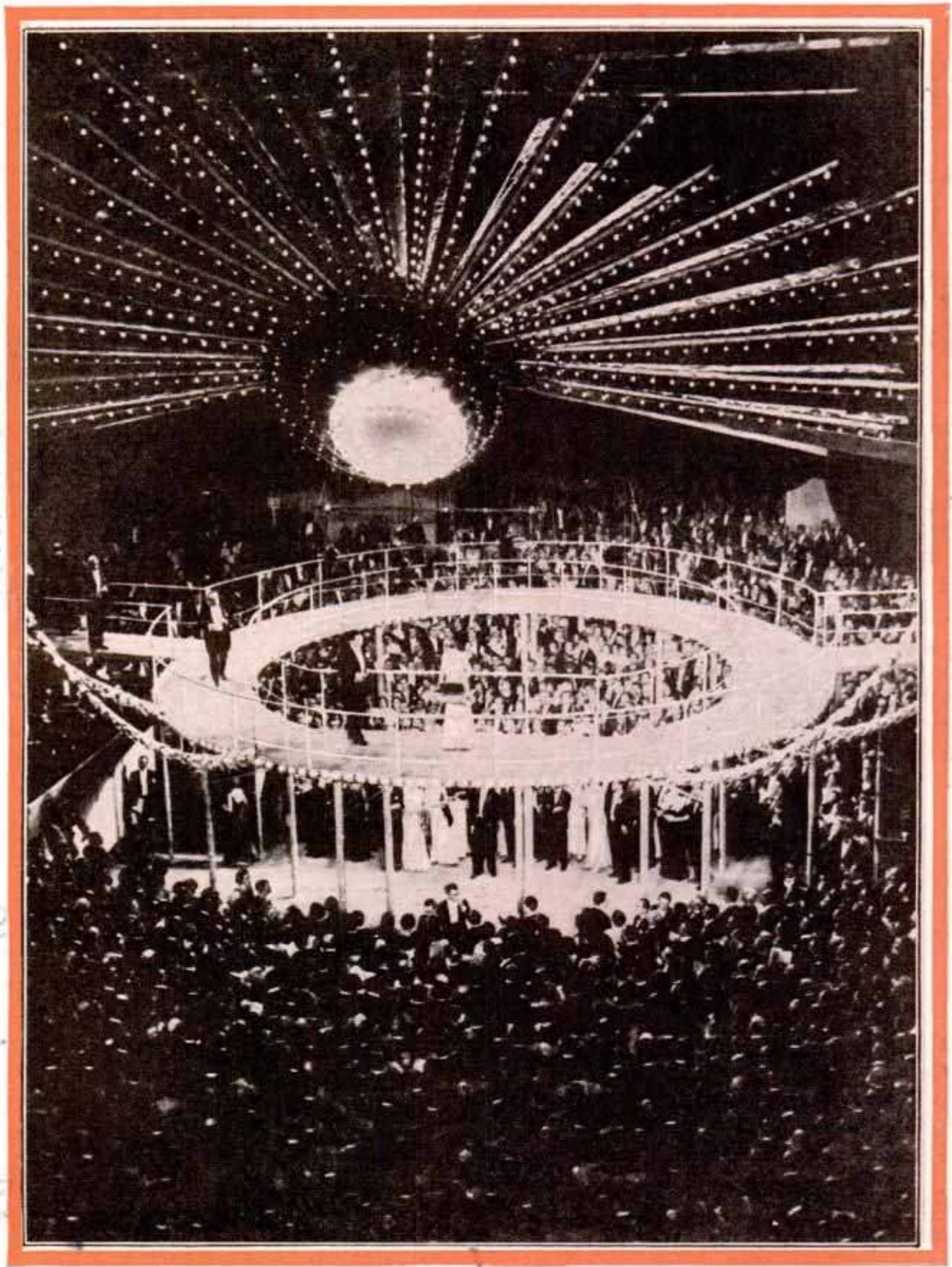
and also on road and water

inflated from mass at
St. Louis
D 5/8

D605

Mr. John L. Conroy
3107-19th St. N.W.
Washington, D.C.

The LOTTERY and



*Drawing of Tickets in a Paris Lottery in Which Cars, Diamonds
and Furs Were Distributed to Winners*

“NUMBERS” Racket



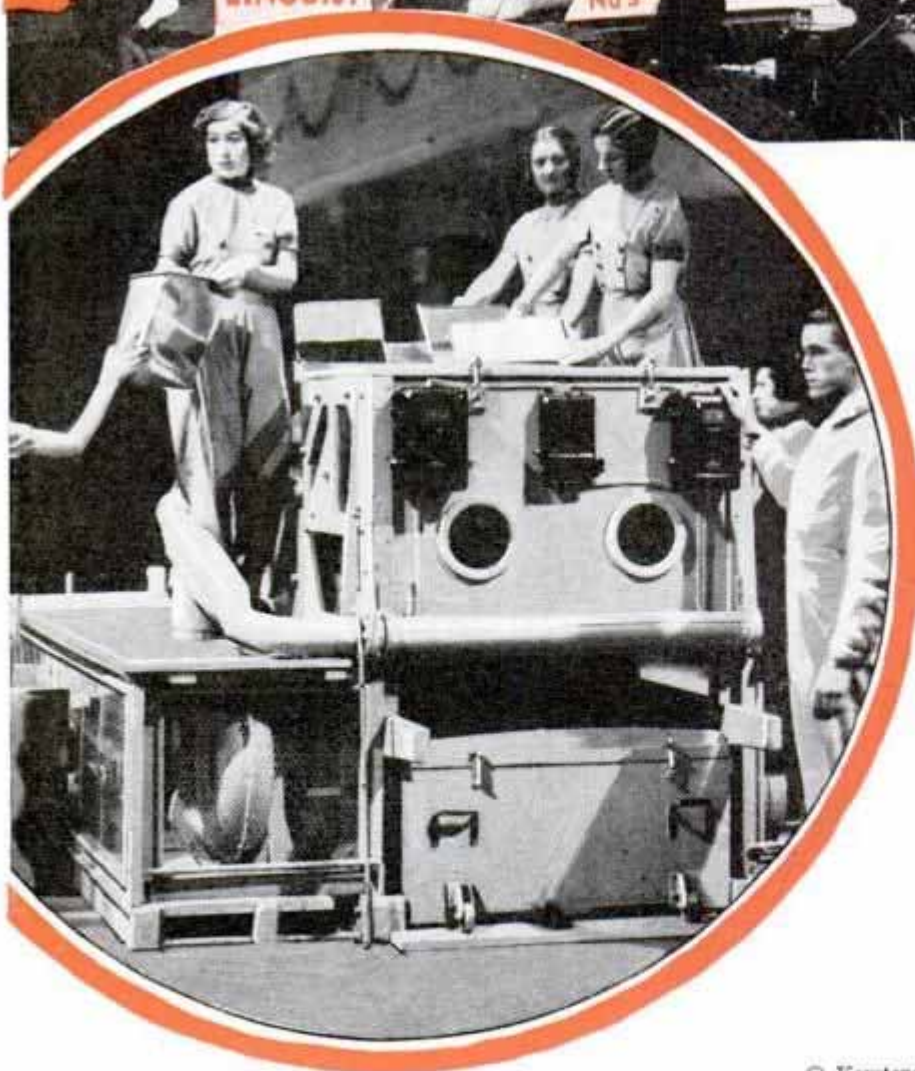
LOTTERIES, “numbers” games and various other gambling rackets mulct millions from the American public annually. The sum is conservatively estimated at \$4,000,000,000 to \$6,000,000,000. This is divided two ways. Over \$1,000,000,000, it is estimated, is taken out of the country by legitimately operated foreign lotteries. The balance is taken by local gaming rackets.

A lottery scheme recently unearthed by federal officials in New England netted its operators over \$8,000,000 monthly. At the close of the last



© Keystone

Nurses in Irish Sweepstakes Drawing Lucky Counterfoils and Mixing Counterfoils in a National Lottery



Irish sweepstakes, officials announced that \$16,500,000 had been contributed to its success by New York. It is not an uncommon thing for federal authorities to confiscate lottery tickets in the millions. These sell for \$1.00 and for fifty cents a piece, sometimes higher. Last year the post office department denied the use of the mails to over 1,500 sweepstakes lotteries. The federal law forbids the use of the mails to further lottery schemes. This does not affect, however, local lotteries—lotteries unconcerned with mail distribution. Recently James J. Wilson, assistant district attorney for New York City, announced that at

© Keystone

Announcing National Lottery Winners and Mixing the Counterfoils

least 100 such lotteries existed in New York.

Lotteries run from great national sweepstakes, fostered by governments and involving millions, down to local "pools" and "policy" games centered in villages and the corner drug and cigar stores of cities. These small pools—baseball, football and racing—are fed by the nickels and dimes of working men and low-salaried clerks. Even school children have been known to gamble their lunch money on these games. Recent investigation in an eastern city disclosed ninety per cent of its citizenship playing these games. Except for the great legitimate government operated and controlled lotteries the majority of those existing are frauds. All kinds of robbery schemes are worked. False tickets are sold. Recently government authorities confiscated 42,000,000 counterfeit Canadian lottery tickets. These were for sale in the United States at \$1.00 apiece.

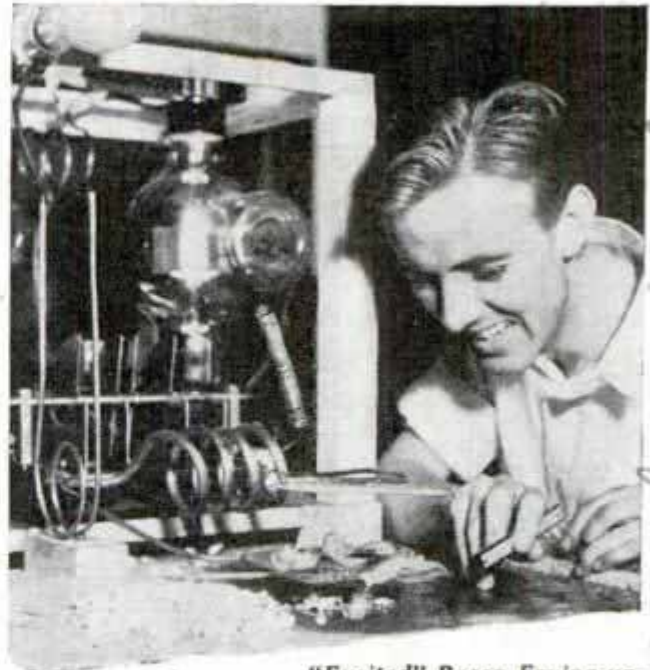
Dummy organizations help this crookedness. Dummy organizations with dummy officers. The dummy organization is to fool the law; the dummy officers to fool the lottery-minded public. The game is pure swindle. You buy a share in a newly organized company for a dollar. With the share you get the privilege of voting for the officer-set-up of the company. In due time the officers are elected. The president, of course, draws a fine salary; so do other officers of the company. You might even get elected a "salesman." Then the company fails or sells out. The president and other officials were mere dummies.

(Continued to page 124A)

"WINDOW" IN TOP OF TIN CAN EXPOSES CONTENTS



and sealing, the same as ordinary cans, without injuring the glass.



"Excited" Bacon Frying under High-Frequency Current

BACON MADE TO FRY ITSELF BY HIGH FREQUENCY

Bacon that becomes so excited that it fries itself is used in demonstrating a high-frequency oscillator. Placed between two cold plates, the bacon is subjected to the oscillator's heat. Electrons composing the bacon become so excited that they dash back and forth sixty million times a second, thus cooking their own cells by this rapid expenditure of energy.

POCKET-SIZE STAPLING TOOL USED IN OFFICE OR HOME

Strong, compact and portable, a new pocket-size stapling tool simplifies sealing of paper bags and stapling work done away from the desk or bench.

A ring grip places the hand of the operator so that the multiplied driving power of the fastener is always obtained. A small blade permits a flat top seal, as well as a non-sift seal or a carrying seal with a finger pocket. The tool works with ease in fastening paper, cloth, fiber and even some metals. The action is visible, increasing accuracy. Loading is easy.



California Institute of Technology Pasadena

Chicago - 111 W. Washington
Grandin 8711

Van Buren 104-6951
Chicago 59

Continental Can Co
100 E 42nd St

W. G. Stitch Sales & Service

D 8 2

Vice-President.
American Model Engineers
2130 Lawrence Ave. Chicago

The THRILLS of

Refer all inquiries to Smith & Smith
Forward letters asking about A.M.E.
only



By C. H. SMITH

SHOW me the man who doesn't thrill to the sight of the "Twentieth Century Limited" flashing past, or whose heart won't skip a beat when a giant freight engine puffs by with a mile-long string of cars in its wake, and I'll show you the only man in the world who wouldn't like to have his own model railroad, if he could.

An old and beloved hobby in England, the popularity of model railroading in this country is growing constantly. Practically every city in the United States, of any size, has its Model Railroad society. Five years ago the man who would have a model railroad

Details of Model Tank Car and View of Tracks, Engines and Scenery of a Model Railroad Builders' Club at Maywood, Ill.

3017 Carroll Ave
Chicago

D 82

MODEL Railroading

had to construct every single piece of it himself. Today there are any number of well established firms dealing in model-railroad supplies and equipment.

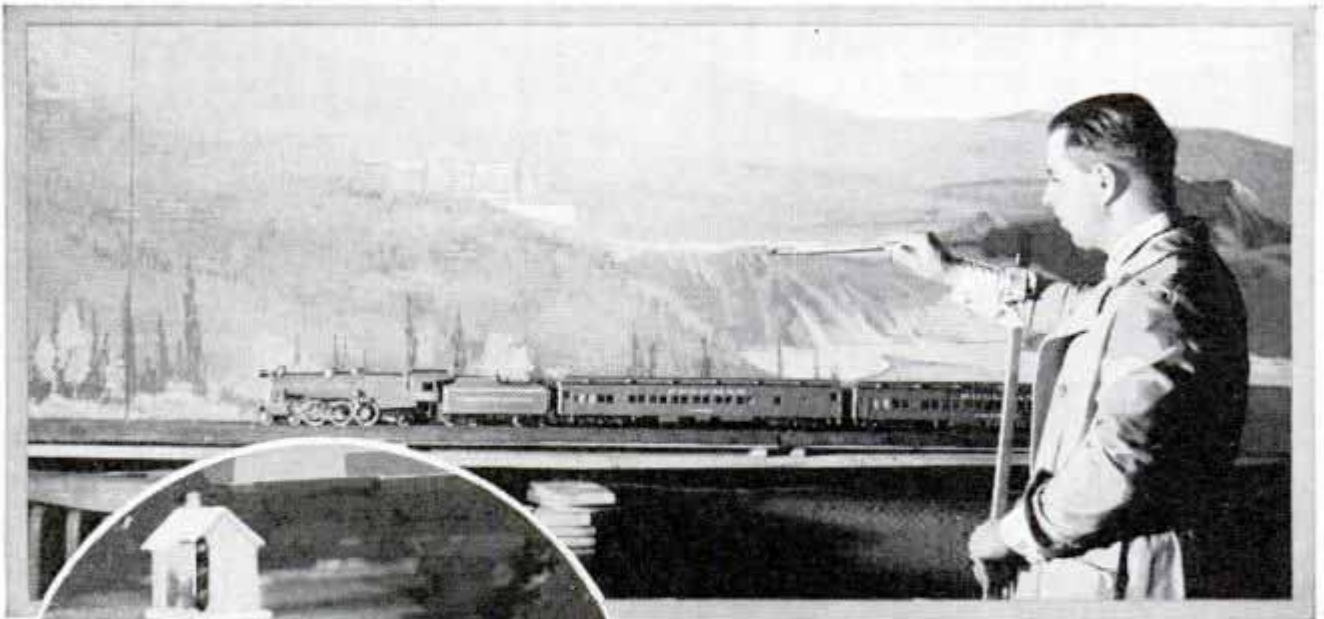
A model railroad is a real miniature operating railroad system, each unit a scale copy of some full-sized piece of railroad equipment. Some of these "systems" are almost unbelievably elaborate and detailed, having thousands of feet of track, a dozen or more locomotives, hundreds of pieces of rolling stock, and any number of switches, signals, roundhouses, and other scenic effects. "Realism" in every detail is the very fundamental of model railroading, and,



Model Locomotive "Cooling Up" and the Turntable Arrangement of a Model Railroad System at Pasadena, Calif.

whether a man has an elaborate and costly system, or a small and inexpensive one, what he does have must be true to life, both in appearance and in operation.

Most model railroads in this country are built to the scale of one-quarter inch to the foot, known as "O" gauge. In this gauge the distance between the rails is one and one-fourth inches. The average O gauge locomotive is from eighteen to twenty inches long, a Pullman is exactly twenty inches long and an or-



five-foot radius to operate properly. In a space fifteen feet by twenty feet a splendid miniature railroad system can be built, while a space forty feet square is ample for even the most elaborate layout.

Many enthusiasts build their railroads to the scale of one-eighth inch to the foot, which permits an elaborate installation in just exactly one-quarter of the space required for an O gauge layout. This one-eighth inch scale is known as "OO" gauge, and the distance between the rails is five-eighths of an inch. It is possible to build a rather detailed OO gauge railroad on a table top, and those who adopt this scale usually do so because of the space limitations in their homes. It is, however, difficult to incorporate much detail into an OO gauge locomotive or car, and the work is so fine that Americans haven't taken kindly to



Two Views of the Same Model Railroad System Showing How Painted and Modeled Scenery Are Combined, and Details of Freight Caboose

ordinary freight car is ten inches long. It requires a room at least ten feet by ten feet in which to install even the simplest kind of an O gauge model railroad, because these little locomotives and cars can't negotiate curves of less than three-foot radius, and should have curves of four or

this smaller scale. As those who build O gauge or OO gauge model railroads are interested principally in operating systems those locomotives are electrically powered. Those who are interested in steam-operated locomotives build them in larger scales, such as one-half inch or three-

quarter inch, or even as large as two and one-half inch. If these locomotives are to be operated at all, the railroad must be an outdoor installation and is therefore both costly and difficult to construct.

Model railroading is neither a costly hobby nor a difficult one. Rails must be purchased, since they are of rolled steel, exactly like the full-size rails, but every other unit of a model-railroad system can be built at home. Most men, however, purchase castings and other parts of cars and locomotives that are most difficult of construction, to save the time and trouble involved in making their own.

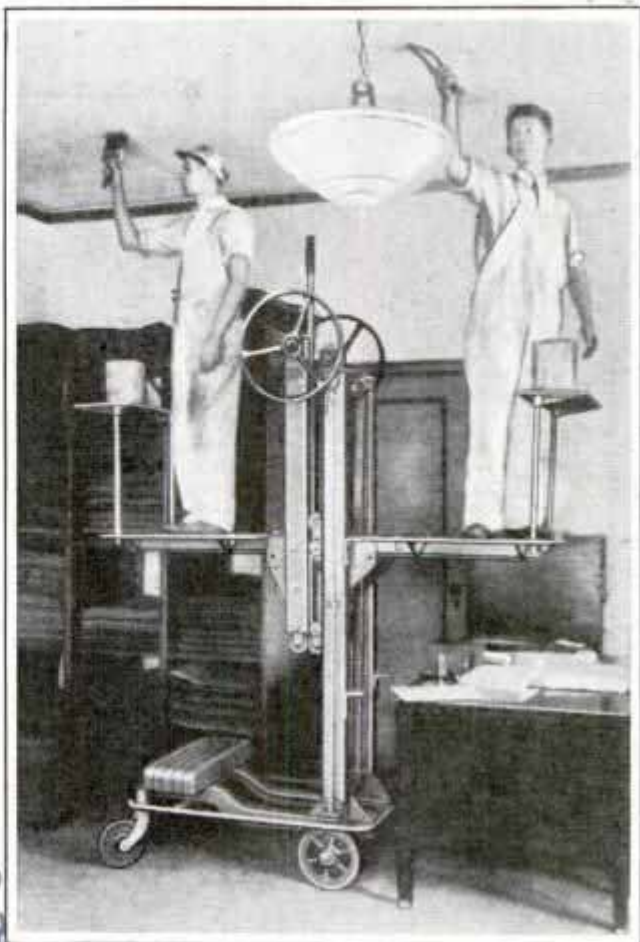
The electrical system in a model railroad is tremendously interesting. All switches, especially on the main line, are electrically operated, and interlocking, in exactly the same manner as on a full-sized railroad. The main line is protected by automatic block systems and automatic train control, which makes it possible to operate several trains on the same track. Each switch requires a switch motor, either a double solenoid or a miniature electric motor, and each automatic block requires a series of relays to change the signals, and to stop and start the trains automatically. All control switches are gathered together on one central control panel from which the entire system is operated. Cars of all types are of simple construction and exceedingly realistic in appearance, and the more rolling stock the system has, naturally, the more pleasure there is in its operation.

The final step in construction is the addition of the scenery and effects. Buildings can be made quickly and easily from cardboard and wood, mountains of plaster of paris or ground asbestos. Landscapes can be painted on. Every inch of the system should be landscaped and made to look as lifelike as possible, although elaborate scenery isn't necessary. The final scenic effect, however, is the thing that really "makes" the whole job.

(Note: Other articles for model railway builders will be found in following issues of the magazine.)

PAINT PLATFORM ON WHEELS SPEEDS INTERIOR WORK

Mounted on wheels, a new painting machine eliminates the use of ladders and scaffolds on interior jobs and speeds up work considerably. Two platforms, one



Painters Shown at Work on Handy Rolling Platform Developed for Interior Work

on each side, with accompanying work benches, may be raised or lowered six to eight inches at one stroke of a lever. The machine is propelled about the room by operating two handwheels. A rubber bumper prevents the marring of woodwork and furniture. Either platform can be swung to a vertical position.

"KNEE-ACTION" WHEEL CLAMP USED IN JACKING UP CAR

Cars with independently sprung front wheels must be jacked up several inches before the wheels leave the ground. To eliminate this "slack" when using a jack, clamps are being produced for mechanics working on the "knee-action" wheels. With two wheel clamps in position, the regular front end service jack provides all the lift necessary.

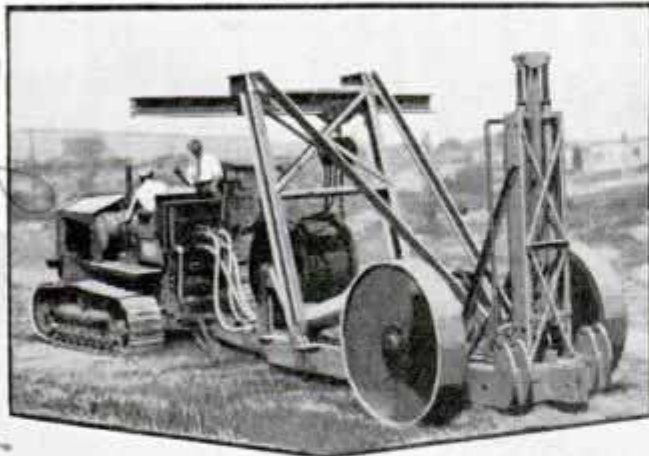


1805 of Chidmore Co.
Wear with Co
Springfield, Ohio
2 for \$4.25
2 for \$4.25
D647
D655
N.S. Blake & Co.

Designed by J. W. Lyons, Lyons Bros. Engineering Co. Los Angeles Calif.

Giant Plow Lays Rod to Protect Power Line

Used by Municipal Bureau of Power and Light, Los Angeles



Two Views of Huge Plow Which Digs Trench and Lays Counterpoise to Guard Power Line from Lightning; It Weighs Twelve Tons

form the counterpoise which, together with overhead ground wires, protects the power line from lightning, the top wires short-circuiting the lightning down the tower frame to the buried ground rods, which dissipate the high voltage through the earth. This buried grounding system will be 1,000 miles long, being laid the entire length of the transmission line and back again. The huge plow designed for the job unreels the counterpoise wire from a drum carrying 20,000 feet of cable, lays it and covers it. Built to withstand a 40,000-pound pull through rough country, the machine weighs twelve tons. It is constructed of special steel, the parts being welded. The machine

Buried rods to protect a high-tension power transmission line are being laid by a giant machine capable of traveling over the mountains and desert country between Boulder Dam and Los Angeles. The rods

travels on two steel, disk-type wheels, each of which weighs 1,100 pounds. The digging point, or tooth, which opens up a furrow to receive the cable, is controllable to a maximum depth of thirty-six inches.

D 612

Bullet-Shaped Racing Auto Is Tested for Record Run

Constructed for an attempt to break the world's record for autos of the 1,100 c.c. class, a bullet-shaped racing car has been tested at high speed in England. The car is driven by Capt. George Eyston. The rounded nose of the speedster is designed to penetrate the air easily, resulting in higher speed without an increase in the size of the power plant. Preliminary tests were made at the Brooklands track.



(acme photo)

magnette

Front of Racer Constructed along Aerodynamic Lines; Note Unusual Nose of Car; Built Low, It Rounds Curves at High Speed

at Weybridge Surrey

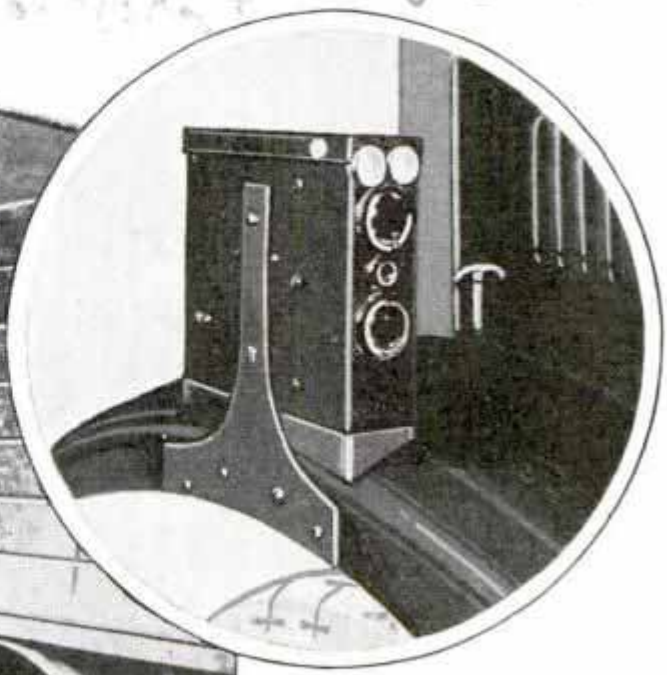
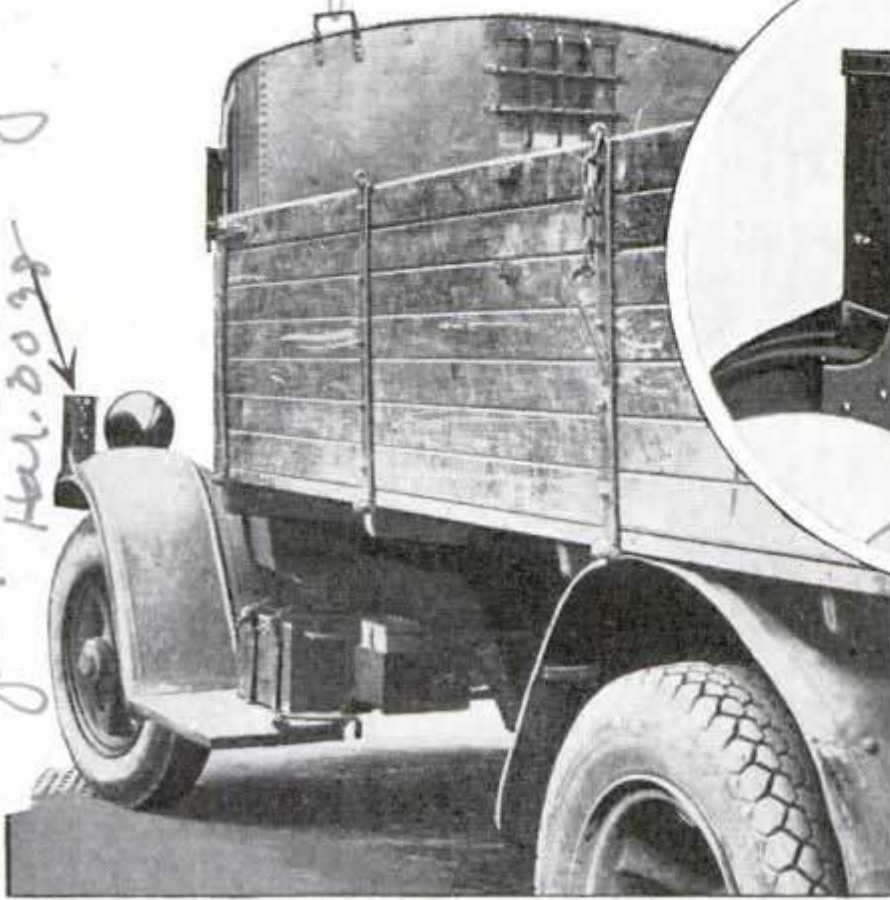
V 54.6. Carl Jess. Jena, Germany

485-5 66 Ave. New York

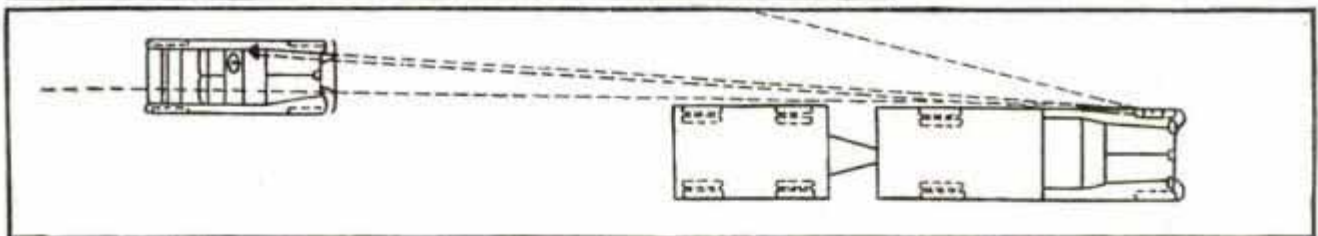
Inter-Car Signaling Lights Make Driving Safer

Opstelko

Chicago - 122 S. Melburgam
Mar. 20 1928



Left, Truck with Arrow Designating Signaling System Mounted on Fender; Right, Closeup of Device; Bottom, Sketch Shows How Car Behind Signals to Truck for Space to Pass, the Signal Being Flashed to Dash of Truck; Driver Then Flashes "Go Ahead" Signal to Car



Increased safety for the motorist is claimed for a new system of light signals which enables a driver to warn the driver ahead of his intention to pass. It also makes it possible for the driver ahead to signal that he understands and that the road is clear. The system calls for installation on both cars of equipment including a small twelve-volt lamp to project a beam of light, a filter allowing only red rays to pass, a special type of triple-faceted mirror and two photo-electric cells. When a driver wishes to pass the car ahead, he switches on a yellow light, which is transmitted by the mirror to the mirror on the car ahead, thence to the photo-electric cells. This causes a yellow light to be switched on in front of the driver's eyes, warning him of the car behind. So he

turns off the yellow light and switches on a green signal, which is reflected back by the special mirror to the car behind, finally appearing as a green light in front of the second driver, so that he knows it is safe to pass. The system also may be applied to street traffic regulation and to unguarded railroad crossings.

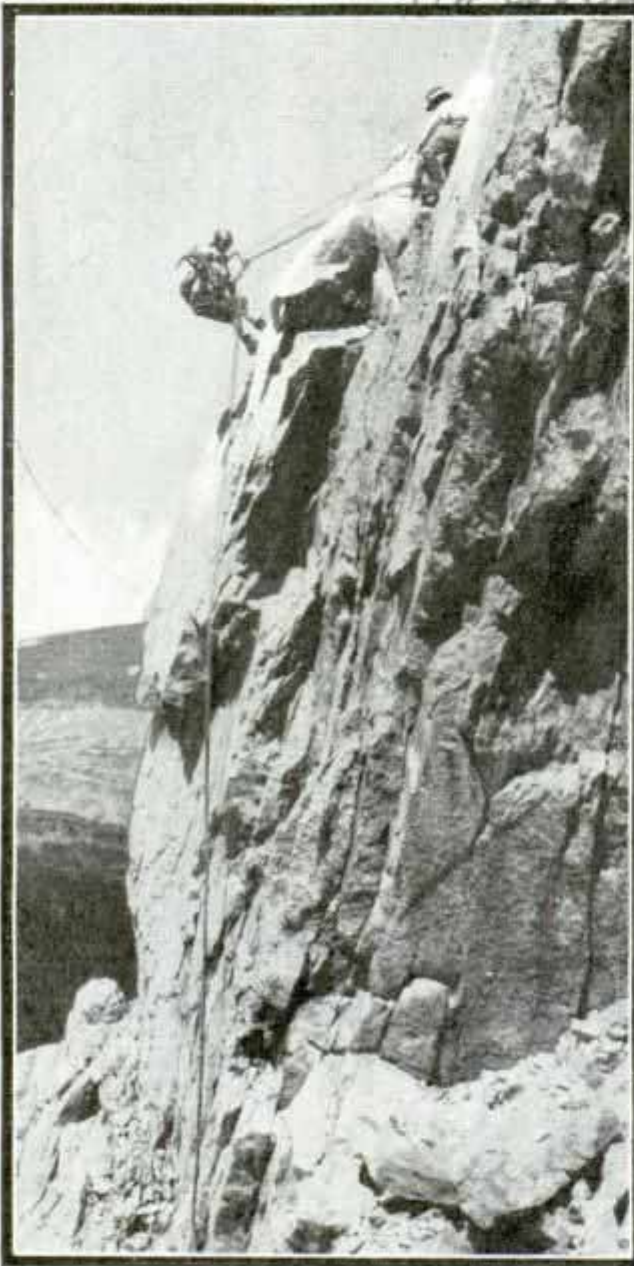
D672

BIRDS MENACE PLANES

Eagles and vultures are becoming a real menace to airplanes in India. The sixth collision between a bird and an aircraft to be reported within a brief period occurred a few weeks ago near Calcutta when a plane flying at 3,000 feet struck a vulture. The bird hit the wing of the plane which was forced to land for repairs.

Clip from "Star" ...

Canada's Peaks Challenge Expert Climbers



Mountain climbers in search of new thrills are tackling western Canada's hundreds of unscaled peaks. The United States, Canada, Europe and Japan are well represented, with the Swiss, who are among the best climbers in the world, doing most of the guiding. The training of mountain climbers consists mainly of walks and climbing of small mountains. This limbers them up sufficiently to tackle with rope, ice pick and heavy hobnailed boots the unconquered peaks. Many peaks in western Canada remain unnamed, their surrounding territory hardly explored. Only for a few hundred miles north of the international border are the mountains thoroughly mapped. Farther north lies virgin territory for the mountain climbers. These ranges stretch north through Alberta into British Columbia, and so to the Yukon and Alaska. With modern equipment, such as portable stoves, light tents, thermos flasks, compasses and strong field glasses, mountain climbers are able to stay on the job for several days if necessary. According to the guides a clear head and a strong body are the main requisites to climb these unscaled peaks towering 8,000 to 12,000 feet above sea level.



Top, Roping Off Mount President, in Yoho Park, British Columbia, Requires a Cool Head and Strong Muscles; Bottom, Woman Climber and Guide as They Conquer a Peak in Banff National Park

**MERCURY LAMP LIKE SUNLIGHT
USES RARE METAL**

Adding a minute part of a rare metal, rubidium, to mercury usually used in mercury lamps has resulted in the development of a lamp whose light approximates sunlight. The metal causes the lamp to give red rays, in addition to the mercury spectrum. The lamp is said to have a life ten times as long as an ordinary incandescent lamp. Rubidium costs \$5 per dram, but only one five-hundredths part of the metal is used in each lamp to change the light hue from green to light red. Previously physicists had improved the mercury lamp by adding potassium to the mercury, but the potassium is said to disintegrate the glass bulb or tube of the lamp.

**RUST TRAP FOR AUTO RADIATOR
PREVENTS CLOGGING**

Inserted in the upper rubber hose, a simple trap prevents rust scales from reaching the radiator of the automobile, eliminating clogging. The device catches the rust scales as they come from the cast-iron jacket of the engine. Openings in the trap's screen are large for water to flow easily



but small enough to trap the scale. Since the screen is smooth, vibration of the engine causes the rust particles to drop to the bottom of the trap. These particles may be removed by taking out the screen.

**COUNTER ICE-CREAM FREEZER
ALSO CHILLS DRINKS**

Frozen drinks can be made in fifteen seconds or a dish of ice cream can be manufactured in half a minute with an electric freezer made for use on the counter of a soft-drink stand. The machine chills, frosts, produces iced drinks, or makes ice cream or other frozen confections. The material is passed down a hollow central shaft, is atomized and then sprayed against the wall of the refrigerated cylinder which is maintained at a temperature of twenty

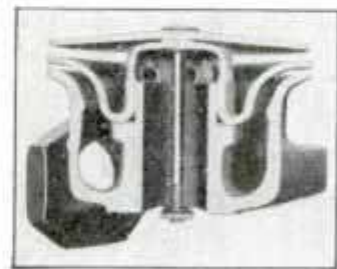


Freezer for Store Counter Which Makes Frozen Drinks or Ice Cream in Less Than a Minute

degrees below zero. A cutter head automatically disengages the material from the walls, molds it and delivers it to a glass, cone or sandwich. So much surface of the atomized material is exposed that freezing is almost instantaneous, so the confection is smooth. The freezer is operated by a one-sixteenth horsepower motor with methylchloride as the refrigerant. It is claimed the cost of operation is less than for maintaining a cold-storage cabinet.

**CONTINUOUS-SLOT GAS BURNER
HAS HIGH EFFICIENCY**

Constructed with a continuous slot that makes it possible to bring the flame closer to the cooking vessel, a new round gas burner is said to have a high efficiency. A controlled secondary air duct causes the air to come up through the middle of the burner, resulting in even distribution directly around the base of the flame. By removing the top assembly, a shim may be taken out, decreasing the port when the top is replaced and converting the burner to operate on bottled gases.



Shaw's American Physical Society, F. A. Baling, Cincinnati, Ohio, D109, D595, Champion Blast Stove, 1900, W. 112 St. St.

Commercial Refrigerator by Co. Los Angeles, 1920, 8:50, St. St.

D 201

Cont. G. C. Schrammacher,
22 E. 69th New York

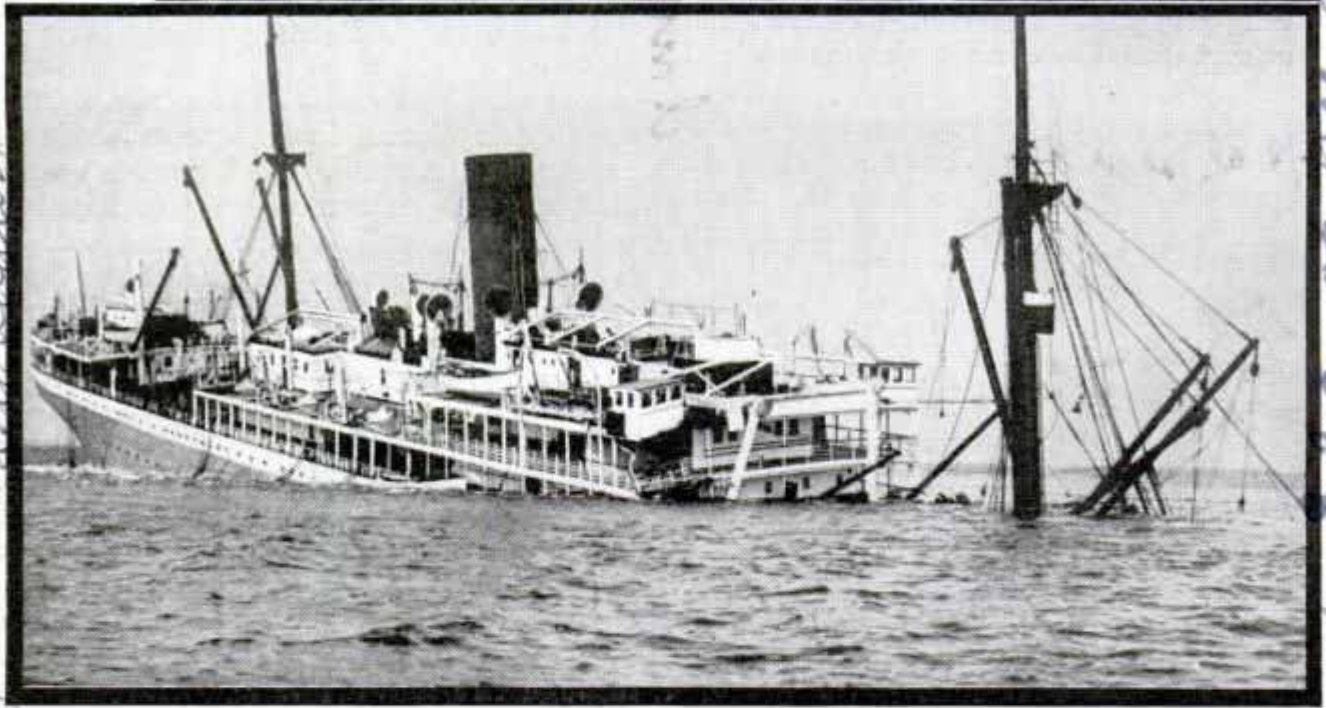
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The TREASURE

5727 Fountain Ave
Los Angeles, Calif
see May 1942 50
new address



Lower Photo © Acme News Pictures
Diver Equipped for a Descent,
and a Sinking British Steamer
in the River Elbe; Right, Deep-
Sea Diving Bell, Type of Six-
teenth Century Spanish Gale-
leon Which Carried Treasure,
and Diagram Showing How a
Single Diver Recovers Sunken
Treasure in Shallow Water;
at Great Depths the Diving
Bell or Similar Apparatus
Usually Is Employed



at 120.00 per barrel
Charls
47 High St.
Rosemont Alexandria

WOULD you like to go sea hunting for treasure this summer? An old Spanish galleon lying deep in some quiet harbor, ducats of gold, fat doubloons, pieces-of-eight and precious jewels trickling through its rotting sides into the yellow sands below? Or an English pirate's brig piled high with golden loot and silver plate taken on half a hundred plundering ex-

peditions centuries ago? If you have the cash to finance such a trip, you might induce Lieut. Harry E. Riesenberg, of Washington, D. C., to start you off on a jaunt that would give you the thrill of a lifetime. Lieutenant Riesenberg has charted the caches of more sunken treasures than any man in the world. Prosaically enough, he sits at a desk handling ship documents

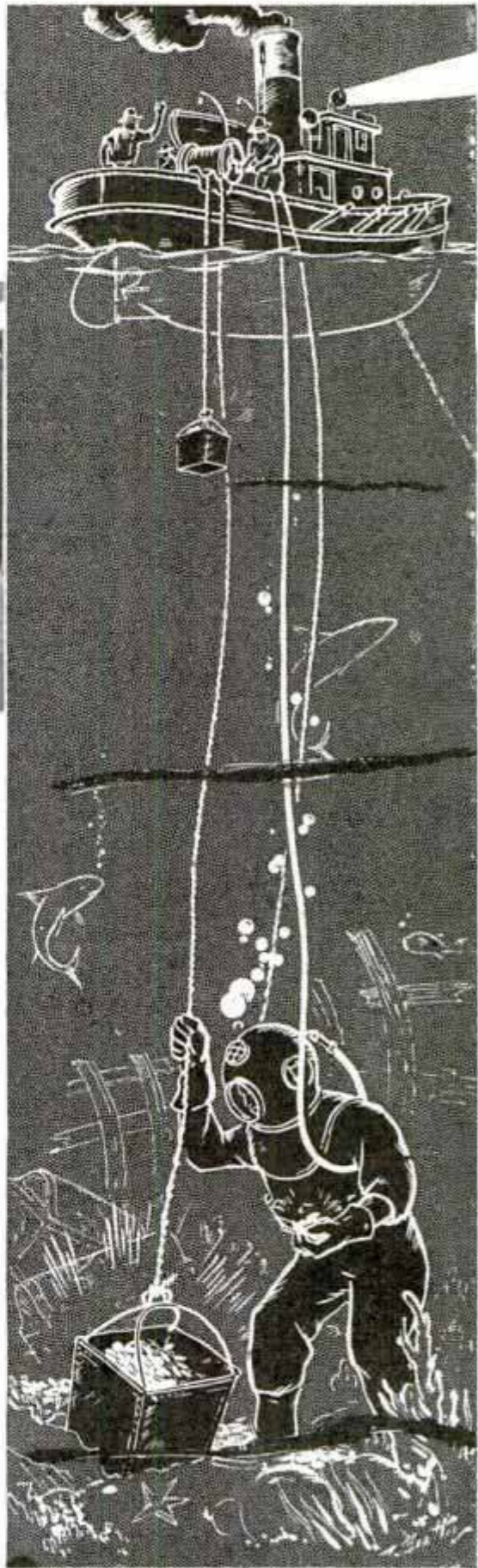
D 207

HUNTERS - -



for the bureau of navigation and steamboat inspection division of the United States department of commerce. But in the files of his office is a record of more gold and jeweled treasure than was ever dreamed of by Cræsus or the maharajahs of India.

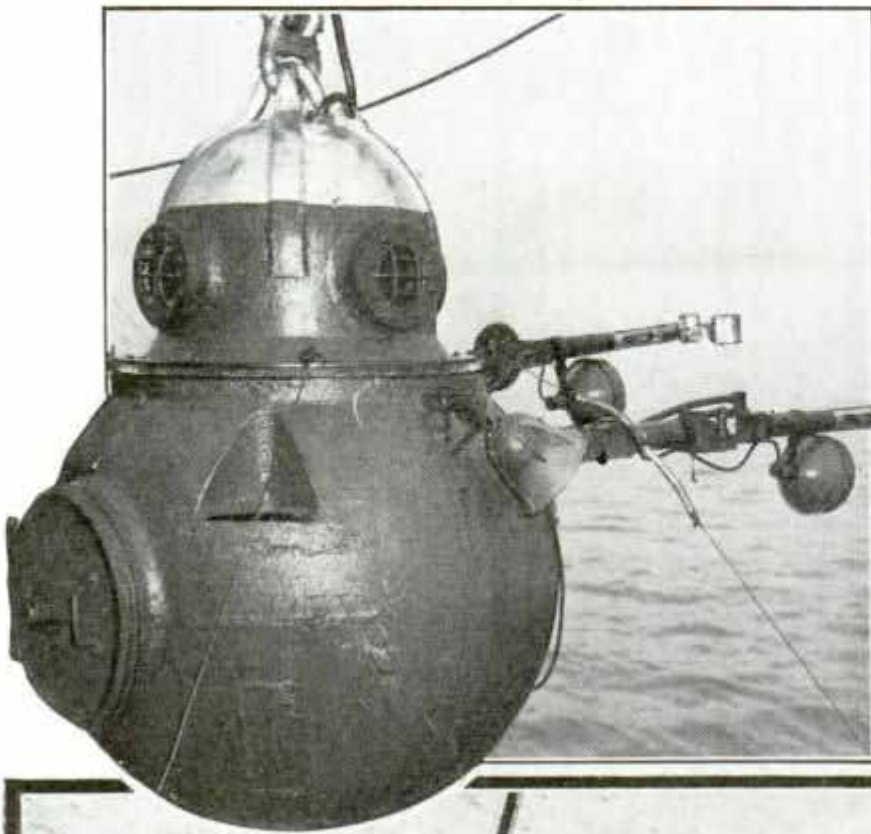
The limpid, tropical waters of Hispanola, or New Spain, hold the world's greatest undersea treasures. Take for instance Sarvona. Off the east end still lies the treasure ship of Bobadilla, untouched, laden with gold since 1500. In that year Bobadilla, the governor, recalled home by Ferdinand and Isabella, sailed in the largest galleon of the Spanish fleet. The Golden Hind met a tropical hurricane a few hours after leav-



15 Whitehall St. New York City. also shallow water outfit

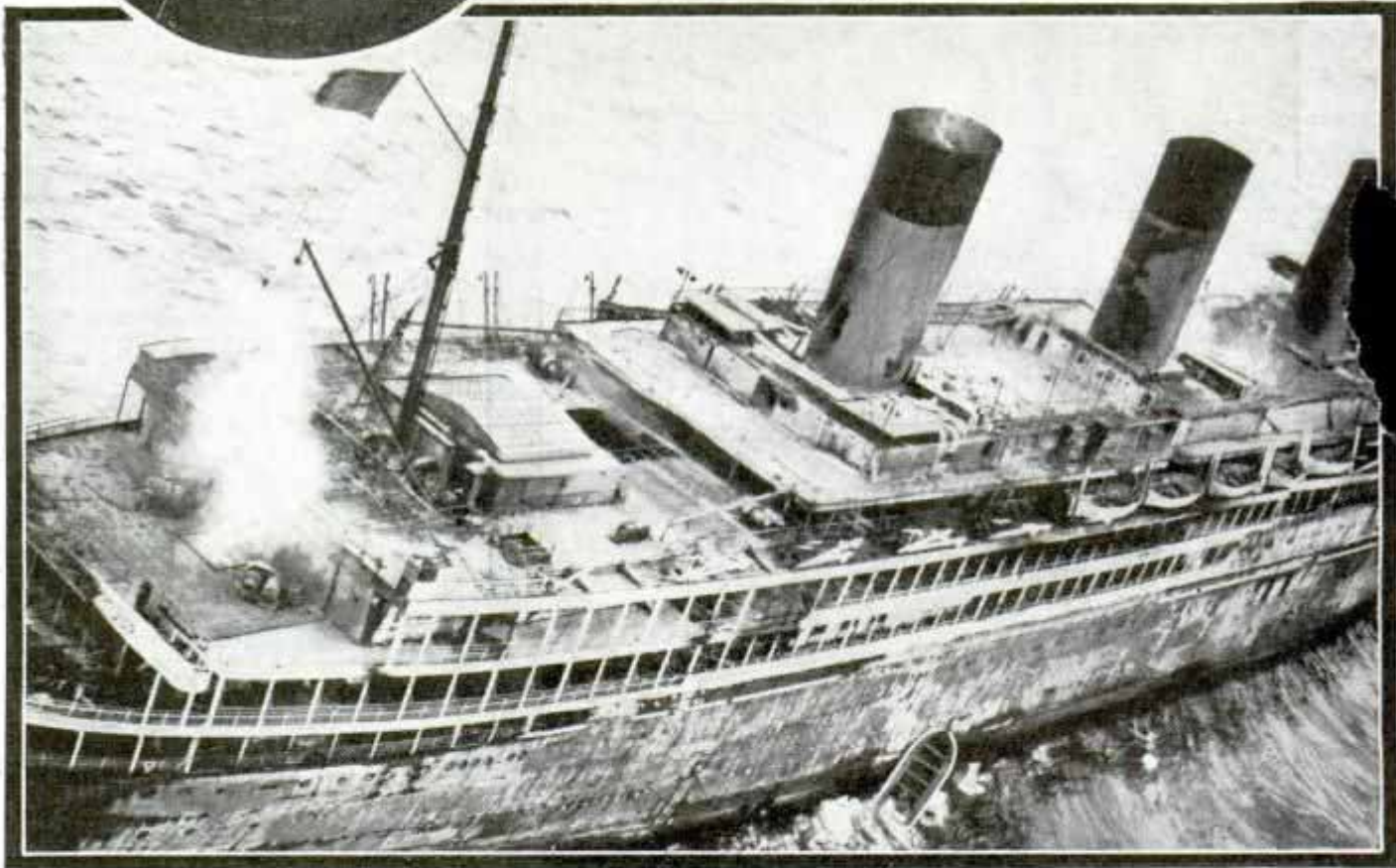
sell and several bells. pontoons general outfit.

D209



Not far away a whole treasure-flota of Spain sank in 1643. An entire fleet, bound from the rich Potosi mines of Peru., smashed on the Silver shoals near Puerto Plata, Haiti, during a hurricane. Evidence of where this treasure trove lies has been proved by treasure already brought up. For the treasure hunter with modern equipment great wealth beckons here.

Eleven million, six hundred thousand florins lie at the bottom of Ma-



Lower Photo © Planet News

Diving Bell Showing the "Fingers" on the Extended "Arms" and an Air View of a Burning French Liner as She Was Being Towed into Port

ing port. She foundered on the deep with all on board. Somewhere along the south-east coast of Santo Domingo she lies, buried in shark-infested waters, and weighted down with her precious load of Spanish gold.

tanzas bay, Cuba. A Spanish galleon in 1628 was pursued and captured in the bay by a Dutch fleet. Authentic historical records show that the Spaniards abandoned the treasure overnight, heaving it through the dark mist that enshrouded them.

Vertical handwritten notes in the left margin, including "Diving Bell" and "French Liner".

Handwritten notes at the bottom of the page, including "Diving Bell" and "French Liner".

In Schattegat lagoon, near Curacao in the Caribbean, lie many buried ships laden with New World treasure. Coins still bearing the impress of the monarchs of Europe of the sixteenth century, of Holland, Spain, England and France nestle side by side in this warm, tropical lost world. Far over on the African side lies treasure hidden from the world for centuries. In April, 1702, the East India company's ship, "Meresteyn," was wrecked on the shores of the little fishing village of Soldanha, Jutten Island, Table Bay. To this day



Model of Salvage Apparatus for Raising Sunken Boats, and Diver Coming to Surface after Day's Work

treasure from Portuguese trading stations in the East and from India sought shelter in the bay during a terrific storm. Her treasure still lies at the bottom of the bay waiting the hand of its salvager.

Not one-tenth of the sunken treasure ships that lie beneath the waters already mentioned have been recalled. Their hulks stretch like a golden chain down the Atlantic and up the west coast of Africa to Spain, France and the British Isles. Recent attention of the world to gold as a result of its increase in value due to monetary action on the part of the United States

fishermen pick up coins washed up by the sea from this wreck. The "Meresteyn" lies in less than eight fathoms of water.

Not far away lies the gallant Portuguese galleon "St. James." She was stricken in False bay, off the Cape of Good Hope. The galleon, freighted with gold and silver

and other governments has brought vividly into the sunlight of the present these hidden caches, vast fortunes awaiting the hand bold enough to stretch down through the dark-fathomed waters to bring them to light again.

(Continued to page 122A)

D653
1370 Ontario St
Cincinnati man
Cleveland Ohio



Squirrels Have Great Freedom in Cage Constructed around Trunk of Tree in This Manner

SQUIRREL CAGE INCLOSES TREE TO GIVE PET MORE SPACE

Greater freedom for its occupant is provided by a squirrel cage constructed around the trunk of a large tree. The wire inclosure extends from near the ground to a bark top in which a nest is housed. The arrangement permits the squirrel to play up and down the tree without escaping.

FELT BONDED TO SHEET METAL FOR USE IN AUTO OR PLANE



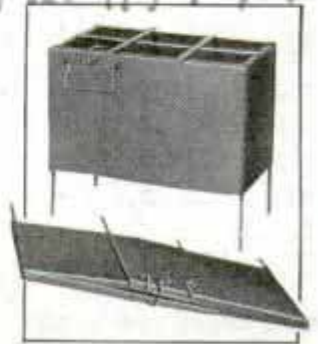
Permanent bond between metal and felt is accomplished by a process in which no adhesive or other binder is employed. A metal coating is fused between the layer of felt and the metal so that the fibers of the felt are embedded in

the coating, forming a contact that will not separate under heat, cold, moisture, fumes or mechanical friction, strain or distortion. The application of felt may be to one

or both sides of the metal. Uses of the bonded material appear to be almost unlimited, with immediate application possible in air-conditioning equipment, automobile bodies, airplane fuselage, office appliances and precision instruments. The felt deadens sound, absorbs vibration and acts as an insulator. Thickness of the felt may be varied to suit requirements.

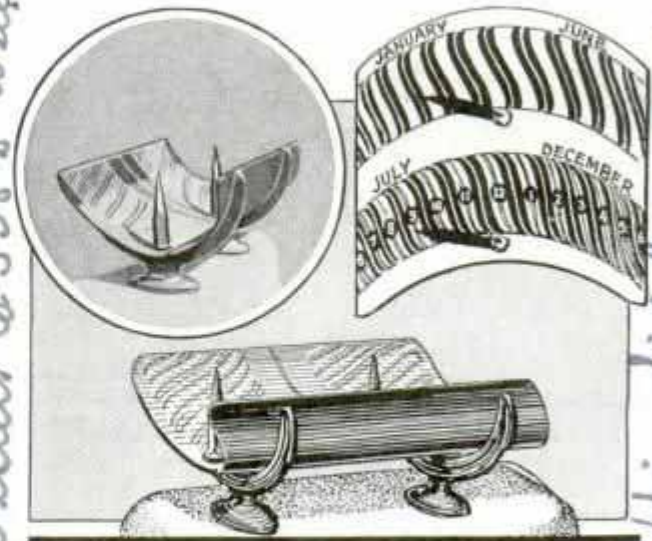
PICNIC STOVE MAY BE FOLDED FOR EASY CARRYING

Weighing only a few pounds, a new picnic stove may be folded and carried as easily as a picnic basket. It can be set up in less than one-half a minute. The stove burns either wood or charcoal, a few cents worth of charcoal being sufficient for the average picnic.



SUN DIAL LIKE HALF-CYLINDER TELLS TIME ACCURATELY

Telling time accurately by means of a pointed shadow cast by an upright indicator, a novel sun dial in the Blakesley Botanical Gardens, Santa Barbara, Calif., is in the shape of a half-cylinder. The dial



Latest Type Sun Dial Has Separate Divisions for Two Six-Month Periods in the Year

has two sections, one for telling time from January to June and the other for the July-December period.

Emb. Clay Schenck, Station 13
Box 4, Cincinnati, Ohio

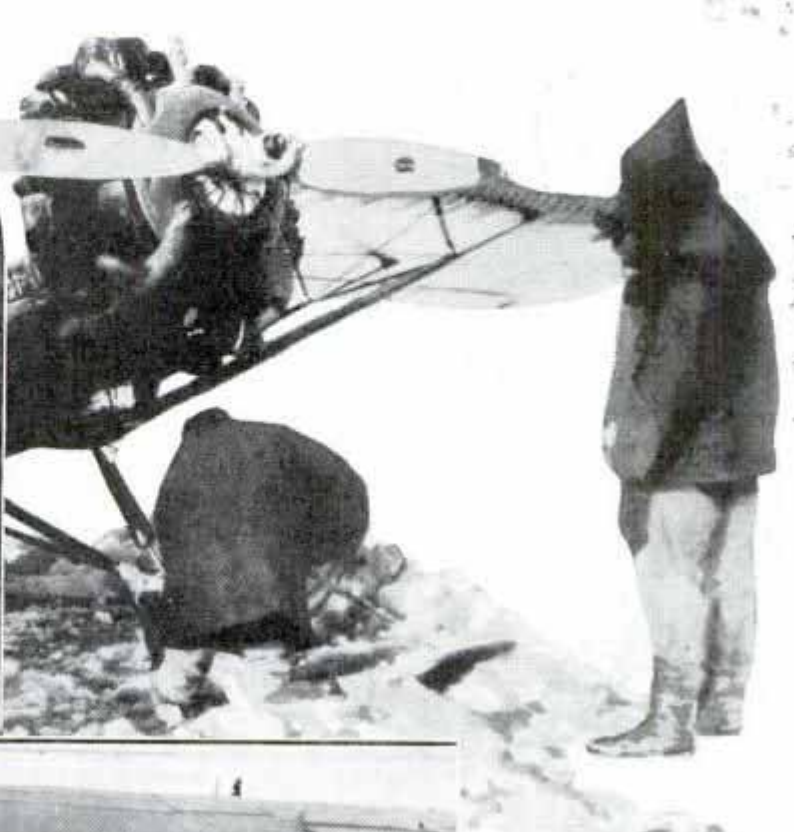
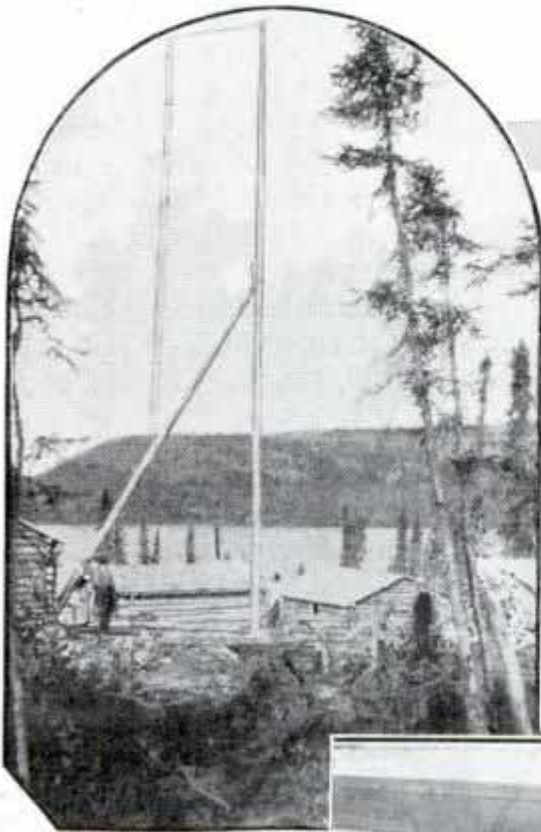
D639
The Filters Co
114 S. 14th St.
Cincinnati, Ohio

Wells, 128
Telus Co 538

Pat. 1,778,330
Hi Sibley, 1954
Bragden Blvd Pasadena, Calif.

H. H. Robertson
no further information

Mail Plane Replaces Dog Team in Far North



Antenna of Radio Station in Far North, a Plane Mired in Top Ice, and Loading One of the Ships with Mail for a Trip to a Remote Region

North of Canada's transcontinental railway line airplanes are rapidly replacing dog teams in carrying the mails. Most people in the far north now know only one postman and he comes by air. Mining camps, fur-trading stores, missions and the many small points where there are settlements now rely on the weekly, bi-weekly or monthly air-mail service where they formerly depended on the dog teams which delivered mail once or twice a year. This year finds the Arctic ocean placed on the air-mail map with the opening of a service to Coppermine on Coronation gulf, an arm of the ocean. Stamp collectors can look forward to more first-flight covers when points along the Hudson Bay and the Hudson Straits are added to the air-mail service. The northern air mail is carried winter and summer but there is a lull in spring and autumn when the ice melts and forms. Even this has been brought to a

minimum with relays of planes at various points on the routes, some equipped with skis where ice has not gone out, and others carrying pontoons where open water is available. While no hourly schedules are maintained, definite

dates for air-mail service are arranged by the post-office department. These may vary a day or so, according to the weather, but whether the sun shines twenty hours a day as in summer, or only two hours as in winter, the air mail goes through. Weather reports are available to pilots from a growing chain of government radio-weather bureaus, supplemented by radio stations maintained by air-transport companies and mines. The planes do not carry radios, however, and there are no lighted airways or radio beacons. Last year nearly 150 tons of mail were carried by planes. No extra charge is made for this air-mail service since it is the only kind available.

"Shot in Arm" Makes Golf Ball More Lively

A. S. Spalding & Bros. 105 Nassau

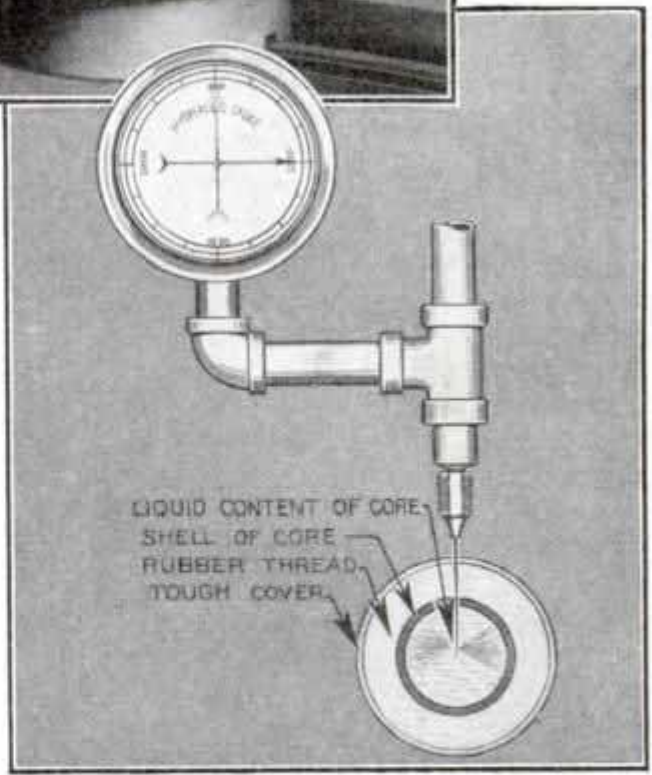
*Chicago, Ill. 211-8
285 Madison Ave
Cmf. Bureau of Industrial
Service, Inc.*

D 465



ment are manufactured with a diameter of 1.67 inches and a weight of 1.56 ounces. The "shot" raises the diameter to 1.68 inches and the weight to 1.62, both of which are standard. A ball given the injection is said to have seven to ten yards more distance on drives than the ordinary ball, or about the same as that of a soft cover ball, which is ruined eas-

Top, Machine Gives Golf Ball "Shot"; Center, Ball with Needle in Cover; Bottom, How Fluid Is Shot into Core of Golf Ball to Increase the Pressure



Increased distance on drives is being built into golf balls by means of a "shot in the arm," actually an injection at the core. One of the main essentials of a long-distance golf ball is high pressure at the core, which provides the necessary high elasticity under impact of the club head. This pressure exerted on the liquid sac which constitutes the core, is built up by the winding over the core of a continuous thread of rubber under tension. When a tough cover is applied, by means of pressure, part of the internal pressure is lost. By introducing an extra amount of fluid at the core, the pressure may be built up. How to inject the fluid into a tough cover ball was a problem that required long study before its solution was found. A hollow steel needle, similar to a hypodermic needle, is thrust through the cover, through the rubber thread windings and into the liquid core. Six-one hundredths of an ounce of liquid is added to that already in the ball resulting in an increase in pressure from 800 pounds to about 1,400 pounds, giving the ball maximum distance qualities. Golf balls intended for this treat-

ily by the golfer who tops with his woods or fails to get under with his irons, the club head cutting the cover.

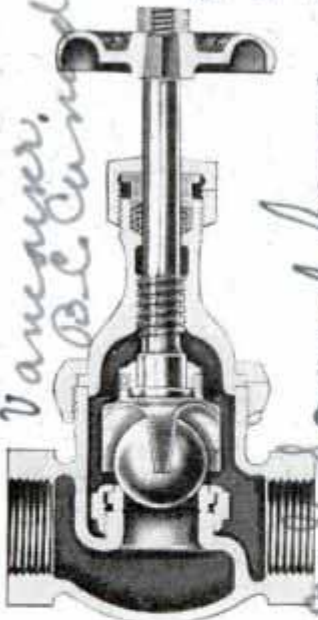
**ELECTRIC FURNACE RIVALS SUN
IN PRODUCING HEAT**

Hot spots of hundreds of thousands of degrees, far exceeding anything known on the surface of the sun, are produced by a new kind of electric furnace. This furnace is a small glass vacuum tube and the hot spots within it provide a new source of protons, or heavy particles of electricity, for bombarding the nuclei of atoms. Three electrodes form the heating element of the tube and hydrogen gas at low pressure is the fuel. Between two of the electrodes a flaming arc forms in the gas. The third electrode is placed around this arc and its boosting action produces the hot spots. The excessive temperatures are confined to these points, the gas around them remaining comparatively cool. The points of intense heat are too small to be read with ordinary instruments, their existence being revealed by the streams of protons shooting out from them. The furnace was developed at the Massachusetts Institute of Technology.

*working with President
Dr. Paul G. Emillion.*

Cambridge, Mass

**VALVE DISTORTION IS STOPPED
BY CHANGING DESIGN**



Distortion is eliminated in a valve designed so the seat may expand or contract independently. In this valve, the seat is separate from the bridge of the chest, while in other types, it is an integral part of the bridge and cannot expand or contract without affecting the entire valve, resulting in distortion.

**GEARS QUICKER THAN THE MIND
IN SOLVING PROBLEMS**

Intricate mathematical problems which might require hours of calculation by the human brain can be solved almost instantly by a mechanical "brain" being constructed at the Moore school of electrical



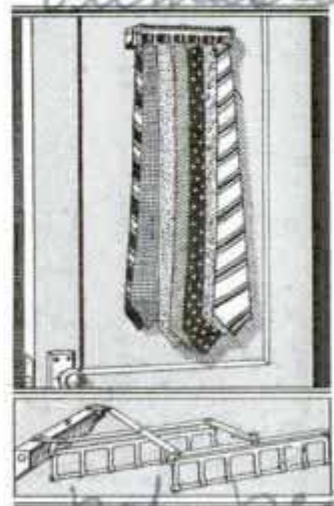
Assembling an Intricate Mechanical "Brain" Which Solves Involved Mathematical Problems

engineering of the University of Pennsylvania. While this super-calculator will save much time in solving mathematical problems, the assembling of the hundreds of parts composing the brain is a problem in itself to tax the ingenuity of the human mind, as indicated by the photograph.

FOLDING RACK FOR NECKTIES

D42% ATTACHES TO DOOR

Many neckties can be kept in perfect order on a folding metal rack which can be attached to a door or other convenient place. When the rack is folded, the ties are held compactly without wrinkling, but when the bracket is extended, all are brought to view, thus making it easy to locate any particular cravat.



Belmaster

Johns Island

Artcraft Patents

*The Bowler Valve Co Ltd
3rd Ave and Cranville St
Vancouver
B.C. Canada*

D536

D594

D45

D 69
Mr. John Z. ...
3107-19th St. N.W.
Washington, D.C.

The Secrets of the



Black Chamber Experts, Wearing Masks to Conceal Identity; Center, Translation of a Secret Message

TAKE all the major ingredients of a highly imaginative detective story and mix them up: a masked ship, a million dollars worth of smuggled liquor, a couple of federal agents and as villainous a looking crew as ever sailed the rum-running lanes.

Add to this the finest type of short-wave radio equipment involving an interchange of secret messages in both codes and ciphers. Now you have in mind an actual case that was solved recently by Uncle Sam's intelligence service. And you can understand why the government has found it necessary to develop a peace-time "Black Chamber," far more efficient than the one that was used to intercept the most ambitious war-time spy.

Only a handful of men and one woman are included in this select body of experts. "Cryptanalysts" is the official title of the group and they are connected with the navy, coast guard and army signal corps. Never will you learn for a certainty their exact names. At all times utmost secrecy is demanded for they are dealing with a rapidly increasing ring of international smuggling desperadoes of an entirely new type. "Cryptograph criminals" is the name given them in confidential government files for they are amazingly well schooled in devising complex secret messages.

Today, in secret federal files the case of the masked ship is listed simply like this: "Brentwood." Unquestionably, had it not been for the Black Chamber's interpretation of numerous cryptic messages sent by radio in intricate codes by the "big shots" in the organization to the crew members, the crooks might never have been brought to justice. One evening, a

Answers should be addressed to Capt. S.C. Hooper, head Naval Communications

"BLACK CHAMBER"

Navy Dept Washington D.C.

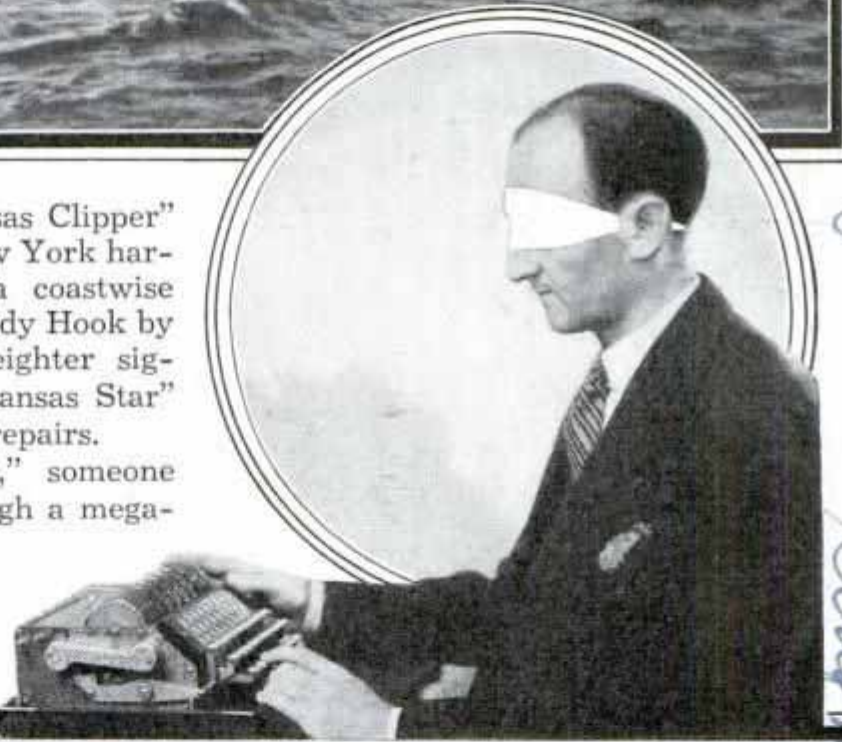
Letter will probably be referred to Commander H.C. Kinnaman



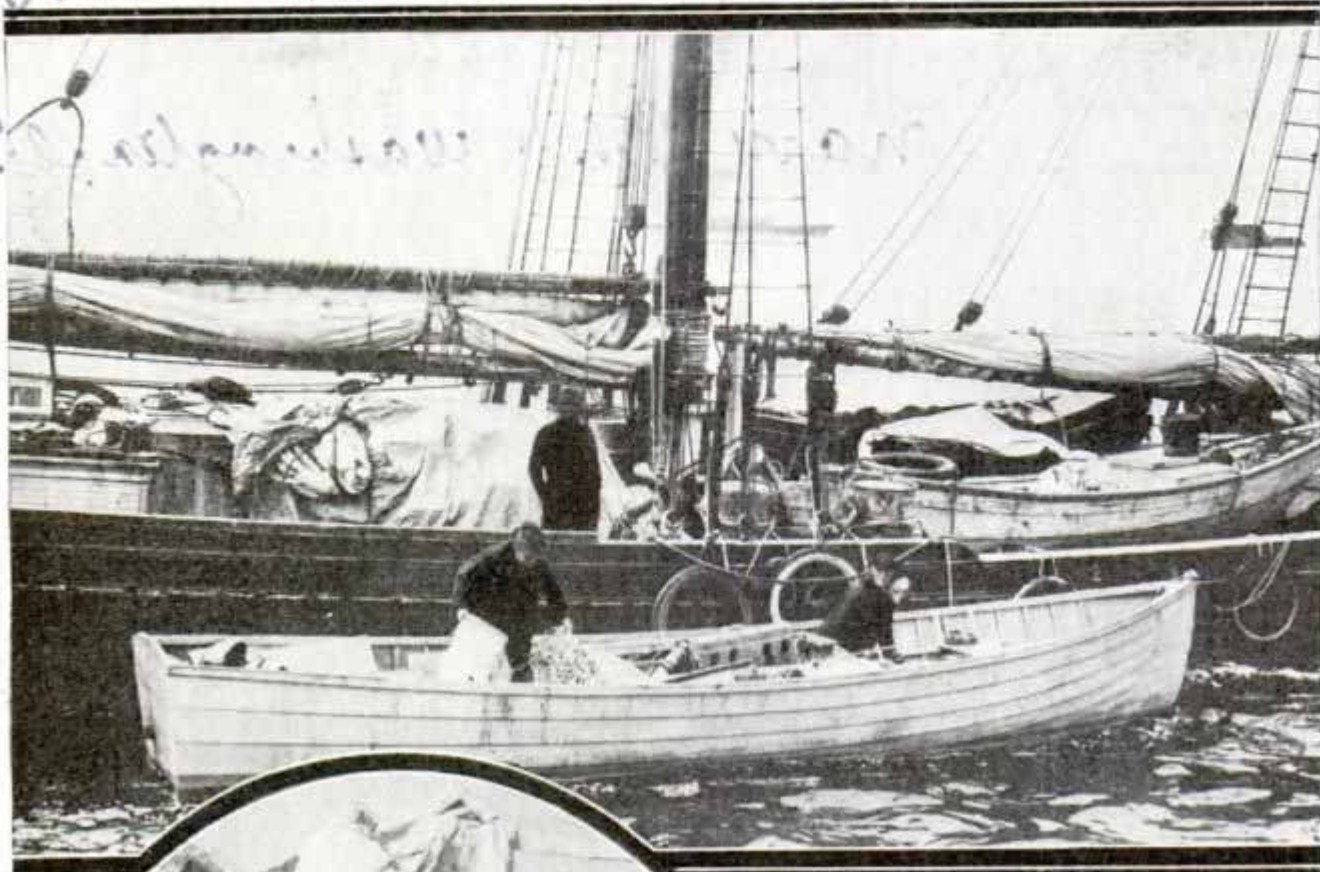
few hours before the "Arkansas Clipper" was scheduled to arrive at New York harbor from Galveston, Tex., a coastwise freighter was seen passing Sandy Hook by coast-guard cutters. The freighter signalled that she was the "Arkansas Star" headed for the Erie basin for repairs.

"We're bound for Albany," someone called to the inspectors through a megaphone from the deck. "We can't stop in this tide."

The vessel proceeded up the Hudson, but not before the



Top, Latest Type of Patrol Boat Used in Chasing Smugglers; Center, Operating Machine Which Enciphers and Deciphers Messages; Below, Patrol Boats "Picketing" Suspected Vessel



Above, Transferring Cargo at Sea; Below, Truck Equipped with Radio Devices for Intercepting Secret Messages

inspectors had observed the name, "Arkansas Clipper" on her sides. Federal boats followed her, maintaining a safe distance in order not to be observed. Some forty miles up the Hudson, the mystery ship dropped anchor. Federal boats closed in, but they were not quick enough to prevent the escape of the captain, with six crew members, in a small boat.

The federal agents seized the remaining seventeen crew members plus 25,000 cases

of whisky and rum. Each case held thirteen bottles. At an average price of \$3.00 per bottle the captain would have realized \$900,000. It was little short of amazing the way the "Brentwood" had been camouflaged to impersonate the "Arkansas Clipper," a freighter of very similar proportions that makes a regular run between New York and Galveston. Even the life preservers of the "Brentwood" were marked "Arkansas Clipper," and it is conceivable that if someone on the deck of the freighter hadn't made the mistake of announcing the ship was the "Arkansas Star," whereas the sides bore the name, "Arkansas Clipper," the outlaw vessel might

never have been apprehended. At the trial numerous code messages, translated by Mrs. "X" of the Black Chamber, proved the turning point in the government's case. It was revealed that the "Brentwood" had been a mystery ship for several years, contained an excellent short-wave radio set, and was registered from the Barbadoes.

Just how do government experts achieve their remarkable results? Of course they are honor bound not to reveal precise

methods. However, they are willing to explain certain elementary, but interesting things, about translating secret messages.

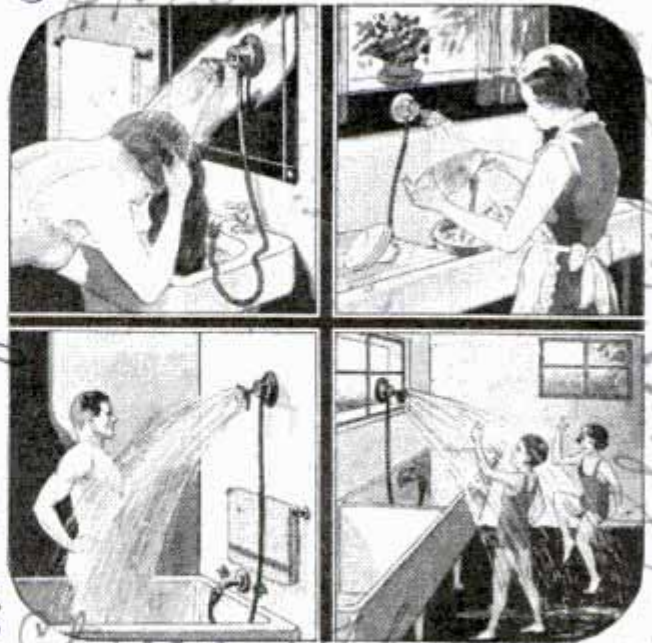
One of the simplest cipher systems, which even a child could understand and use, was employed extensively some years ago by a group of anarchists on the west coast. For many months these conspirators were trailed by secret agents, but never was anything discovered on their persons save a German-American dictionary. Finally a sleuth found a piece of paper in the possession of one anarchist. It read simply "7-2-5," in other words it referred to, "Page 7," "Line 2," "Word 5" of the dictionary.

Indeed, cryptanalysts say a ten-year-old child could devise a cipher system that no one could solve. But the beginner's system might be tricky and yet be valueless for practical use. Smugglers must have one that can be used again and again. Otherwise, for their purpose, it is worthless. The comparatively new science of cryptography, or secret writing, requires painstaking concentration, remarkable perseverance and a vivid imagination plus a close study of language construction.

What's the difference between a code and a cipher? A code system requires a special code pamphlet or book to solve it, whereas a cipher system does not. For a simple substitute alphabet cipher it is only necessary that all correspondents have a copy of the particular alphabet that is chosen to take the place of the ordinary one. Every practical cipher system must combine a basic method of treatment which is constant in character with a keying principle which is variable in character and employs secret key words, phrases or numbers, the individual compositions of which determine the basic method. This method must be such that, even if known to the "enemy," no messages can be read by him unless he knows the specific keys applicable to those particular messages.

Cipher solving starts with the examination of the general system of language communication which, with almost every language, has an alphabet composed of letters that appear in conventional order. Cryptanalysts made frequency tables which show how many times one may expect to find any letter of the alphabet in a

(Continued to page 126A)



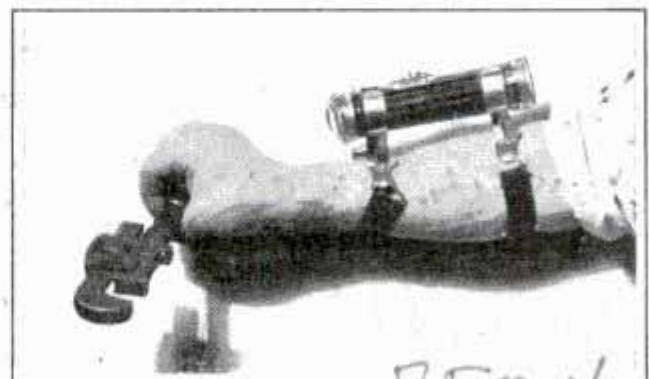
Four Uses to Which Handy Bath Spray May Be Put; Suction Cup Holds It Anywhere

SUCTION CUP ON BATH SPRAY ATTACHES ANYWHERE

Equipped with a suction cup that may be attached anywhere, a new bath spray is adjustable, turning on a ball and socket joint. A special connection fits any faucet.

"THIRD HAND" ATTACHED TO ARM HOLDS A FLASHLIGHT

Both hands are left free when working with the aid of a flashlight if you have a "third hand"—a metal holder for the light, which can be attached to the arm or wrist with elastic tape. In similar fashion the light can be supported on the shoulder or waist. By attaching the light in the proper position, the rays are directed on the work



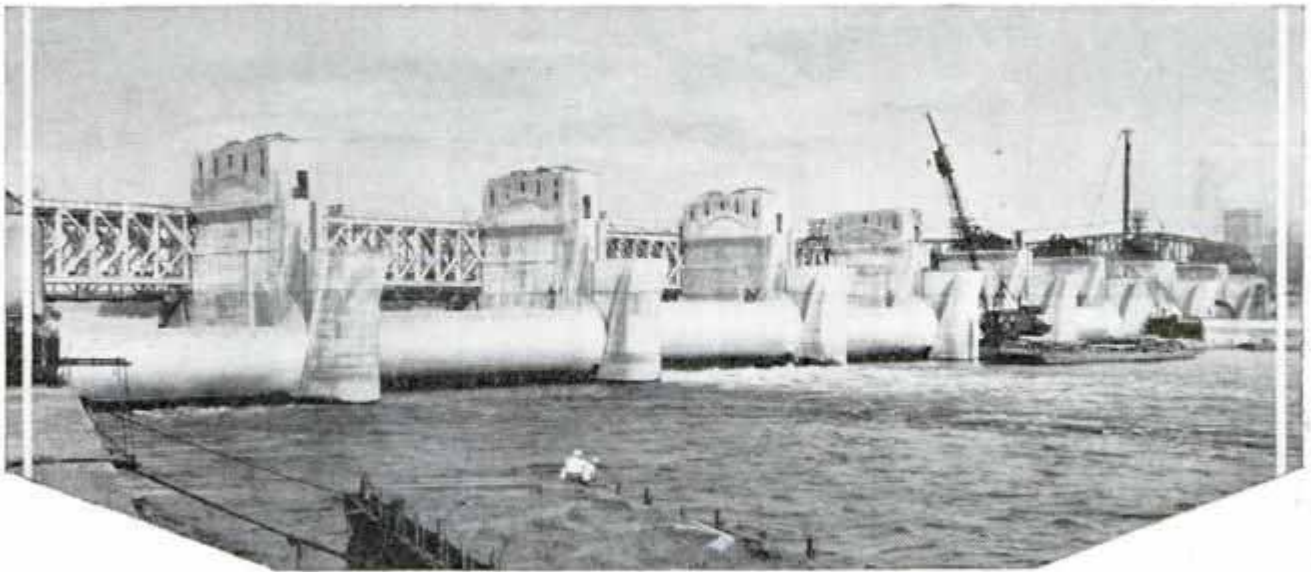
Flashlight Holder Attached to Wrist so Rays Shine on Work but Both Hands Are Left Free

but both hands are left free for the task itself. For night shooting the flashlight can be attached to the gun barrel.

Ch. B. & A. B. Mc Masters

Handwritten notes and signatures in the right margin, including "17288", "D614", and "75 cents".

Giant Rollers Control Water at New Dam



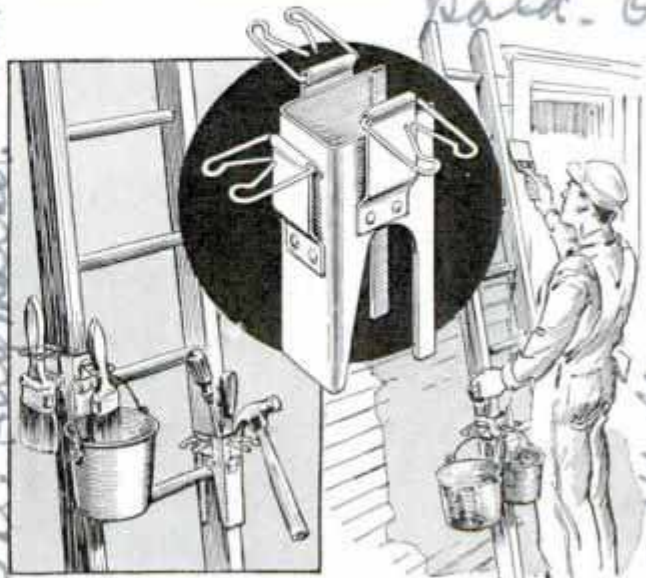
Giant Dam on Mississippi River Eliminates Rapids Near Rock Island, Ill.; Note the Huge Rollers at Water's Surface; Big Cogwheel Permits Opening and Closing of Each of the Roller Gates

Rock Island rapids on the Mississippi river have been permanently effaced from the map by completion of a "roller gate dam." When the gates are rolled down the rapids are submerged at the bottom of a lake 6,000 acres in area. A navigable channel with a minimum depth of nine feet throughout the 617 miles between St. Louis and St. Paul will be created when twenty-five companion dams to the Rock Island structure are completed. Largest structure of its kind, the dam contains eleven rollers, each having the general shape of a log and capable of being low-

ered to position like a log rolled down a skidway. Each steel cylinder, heavily braced inside, is nineteen and one-half feet in inside diameter and 109½ feet long over all. The chief advantage of the roller gate is the relatively great damming height attainable. At one end of each roller is a ponderous cogwheel meshing in a huge rack embedded in a groove in the pier. A chain fastened at the cog end of the drum gives a rolling hitch that opens or closes the gate at a rate of six inches per minute. Electric heating units are provided to melt ice that may form in winter.

Holder for Paint Can and Brushes Attaches to Ladder

Cans of paint, brushes and tools are kept securely in place by a holder which can be attached instantly to any ladder. It consists of a frame which fits over the stile of the ladder and slips over a rung where it is held firmly in position. Paint pots are supported by wide brackets over which the handles are slipped and the brushes are held in spring clips. Two different colors and two brushes can be supported on this holder. The same brackets and clips also will hold hammers, screwdrivers and other tools.



Holder for Cans of Paint, Brushes and Tools Which Can Be Attached Quickly to Any Ladder

Automobile polish containing pure paint pigment in several colors is sold in tubes under the claim that it restores and protects the finish.

D 627

Mr. Charles F. Scherick Carter
468 Riverside Drive

newspaper

dam opposite Rock Island

D 684

paid 50¢

William B. Driscoll

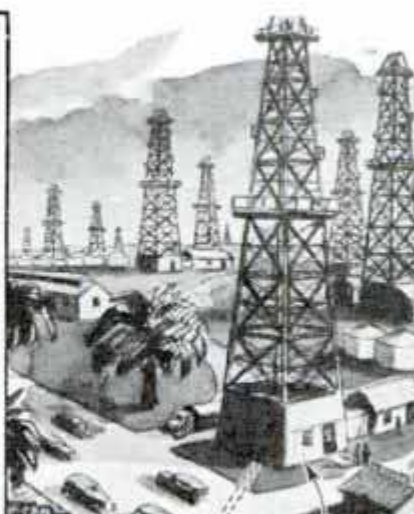
American Auto Paint
Shops 421 & Ashland

Speedometer Man,
1422 Jackson Blvd.

Tapping Cemetery's Oil by "Whip-Stocking"



CEMETERY, 13 ACRES



BOULEVARD 50 FT. WIDE

DRILL DERRICK AND DRILL BED

Cemetery in Oil Field and Diagram Showing How Oil Can Be Drained from Under It

500 FT. BELOW SURFACE

5,000 FT. BELOW SURFACE

"WHIP-STOCKING" OIL

DRILL SLANT LINE

OIL POOLS

Thirty years ago a thirteen-acre site for a cemetery was selected on Signal hill, above Long Beach, Calif., and today it contains 11,000 graves. When oil was discovered there huge derricks sprang up on all sides of the plot and the cemetery association claims that the fluid finally blighted shrubbery and destroyed grass. At last the association appealed to the courts to set aside the perpetual dedicatory restrictions as they applied to depths greater than 500 feet below the surface and grant permission to drill for oil or to lease oil rights to corporations below this depth. Oil can be removed from beneath the cemetery tract without disturbing the graves by tilting the drill beds at a slight angle and tapping pools at a depth of 5,000 feet without erecting drilling derricks directly over the pools. In fact, the cemetery association claims the drill beds of some wells have been tilted sufficiently already to enable this "whip-stocking" of oil.

junked autos. The small car is powered by a motorcycle engine. It has front-wheel drive, with wheels made of Model T Ford brake drums welded to

drop-center airplane rims and fitted with twenty-by-four airplane tires.



Small Auto Built Mostly of Junked Parts Reaches Speeds above 100 Miles per Hour

HOMEMADE MIDGET RACER ATTAINS HIGH SPEED

Speeds of more than 100 miles per hour have been attained by a midget racing automobile constructed mostly of parts from

Built by Selon Arley, Buena Vista, Calif.

Con. Manley Mills, Box 573, Socorro, N.M.

See Sept. 1931

D 59... Claimed by Long Beach Cemetery Assn.

D 673

HOT RIVETS GIVEN FAST RIDE THROUGH PNEUMATIC TUBE



Dropping Hot Rivets in Pneumatic Metal Tube to Be Carried Up to Bridge Workers

Pneumatic metal tubes have replaced the target-shooting riveters in the construction of California's Golden Gate bridge. Instead of tossing the white-hot rivets with tongs to workmen who catch them in buckets, the hot metal spikes are delivered into a metal tube where they are carried upward by compressed air to the riveting crews. The rivets travel about fifteen feet per second and the corrugations of the metal hose rub off all the hard scale or oxide. They emerge from the tube through a spring shutter arrangement into a cylindrical receiver from which they are withdrawn by the riveters.

SHAVING CREAM IS ROLLED ON DIRECT FROM THE TUBE

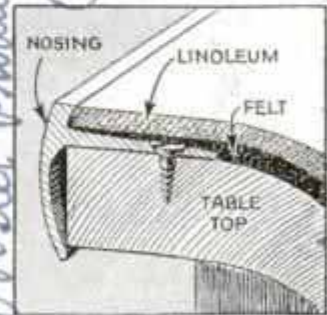


Brushless shaving cream can now be rolled on the face by replacing the cap on the tube with a screw cover containing a barrel-shaped roller. The collapsible tube is squeezed as the roller is run over the face, thus spreading the cream evenly and eliminating waste and hand rubbing. The same

device can be used for massaging the face after shaving. It fits any kind of brushless shaving-cream tube and can also be used in applying depilatory cream.

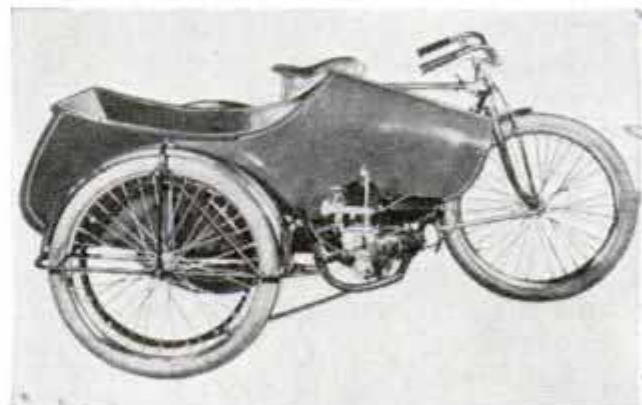
STAIR EDGING USED ON TABLE MAKES ATTRACTIVE TOP

Metal stair nosing, or edging, may be used on kitchen tables and cabinets to make an attractive and lasting top. Produced in brass and white metal, polished or unpolished, the nosing comes in different sizes. The polished white metal, used with a black marbled linoleum, makes a neat table or cabinet top.



MOTOR ATTACHED TO SIDECAR PROPELS ANY BICYCLE

Any bicycle can be converted into a two-passenger motorcycle by attaching a motorized sidecar containing a one and one-half horsepower engine which turns the sidecar wheel through a silent chain transmission with V-belt drive. The fuel tank is in the cowl of the sidecar, controls are on the handlebars of the bicycle and the vehicle can make thirty-five miles per hour, averaging about 100 miles to a gallon of gasoline. The sidecar is attached to

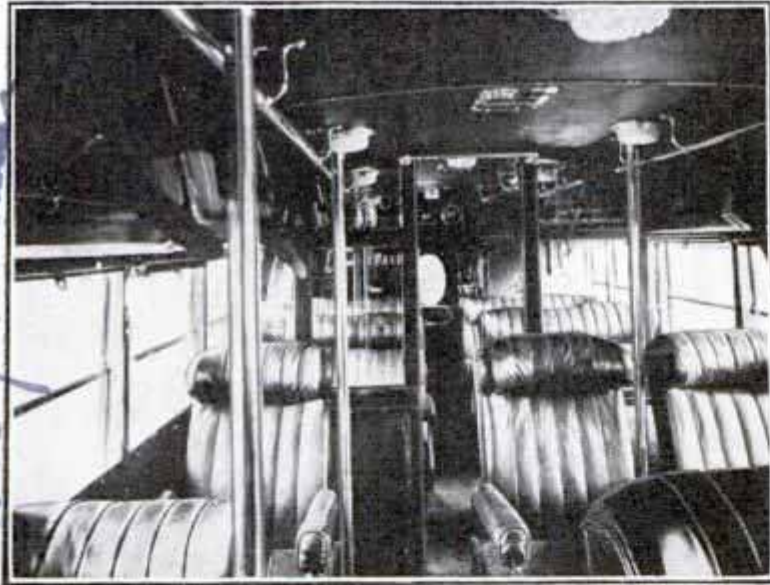


Bicycle Sidecar with Motor Attached to Convert Vehicle into a Two-Passenger Motorcycle

the bicycle through a three-point suspension at the rear-wheel hub, the seat post and the front post. The sidecar can also be obtained with a delivery body.

Handwritten notes:
- Top left: "D 69 of St. San Francisco" (part of "D 69 of St. San Francisco")
- Top right: "1970 Wabancas Chicago" (part of "1970 Wabancas Chicago")
- Middle left: "D 60 3" (part of "D 60 3")
- Middle right: "D 563" (part of "D 563")
- Bottom left: "D 408" (part of "D 408")
- Bottom right: "D 17.4th" (part of "D 17.4th")
- Far right: "Wm. J. ... 160.5" (part of "Wm. J. ... 160.5")

Bus for Desert Trip Carries Own Supplies



Motor Coach Designed for Desert Travel and a View of the Comfortable Interior and the Reclining Chairs; the Coach Carries Fuel and Supplies for a 600-Mile Trip

Intended for travel across the trackless desert between Bagdad and Jerusalem and Damascus, a motor coach with not a screw used in its construction has been built by a Glasgow manufacturer. It will make trips of from 570 to 660 miles, most of the route over territory with no roads worthy of the name. Its 115-horsepower engine gives a speed of fifty miles per hour across the sands, which are almost as bad to traverse in the dry season as during the rainy period when the desert becomes a quagmire. The coach must carry all its gasoline and other supplies for the entire trip. Three water tanks are on the roof,

insulated with ice boxes from the terrific heat. From these tanks the water is piped to taps next to most of the seats. Baggage is carried in a hopper on the roof and a powerful searchlight is also situated on the roof. There are hot-water pipes to keep the coach warm in cold weather which is also experienced in the desert. So rough is the route that steel bands have been passed over the sides, roof and body of the coach to bind the structure together.

ⓈA steamboat invented by a Spanish seaman in 1543 had a speed of three miles an hour.

Spain and Mesopotamia

Albion Motors, Ltd. Scots town Glasgow, W. 4. Scotland

Shoyer & Co. (Iraq)

Science News Letter. Jan. 13, 1934.

D 547 Mr. H. J. Wilkins, Esq. Colchester 29, Bear Road, Bexley Heath nr. London, Eng.

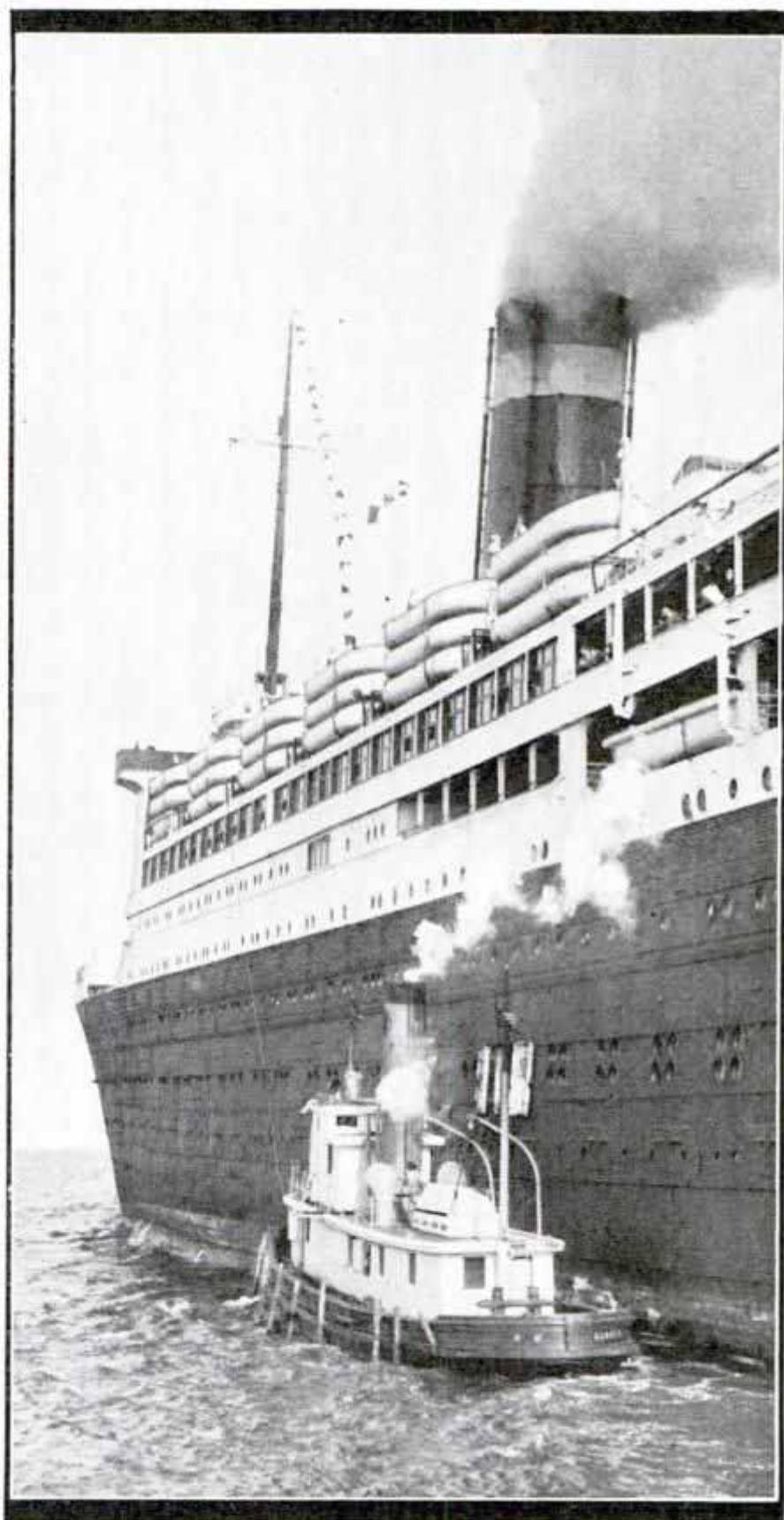
D-703

the BIG ONES

entrance is only forty feet deep, and most of the large liners draw from thirty to thirty-five feet of water. If a diver should hang from the keel of the "Leviathan" or "Bremen," for instance, he would find that his feet would drag the bottom nearly all the way from Sandy Hook to the pier. Even the lowly tramp steamer has to stay circumspectly within the lanes shown on the chart, for most of the wide harbor is only five to fifteen feet deep.

When the wind is blowing a gale, the tide is running strong, and fog blankets the coast. Picking one's way blindly through that submerged labyrinth, with only a few feet of water beneath the keel at best, and with ferry boats, tugs, barges, and other craft cutting across what little water is actually navigable, any captain is delighted to employ a man who knows every inch of that harbor as thoroughly as you know your own home. I'll venture that every reader barks his shins in the dark on the furniture in his home more often than all the pilots together ever permit a ship to touch bottom.

To know a large harbor that well, one has to start young and spend a long time doing little else but getting acquainted with it. And they do catch them



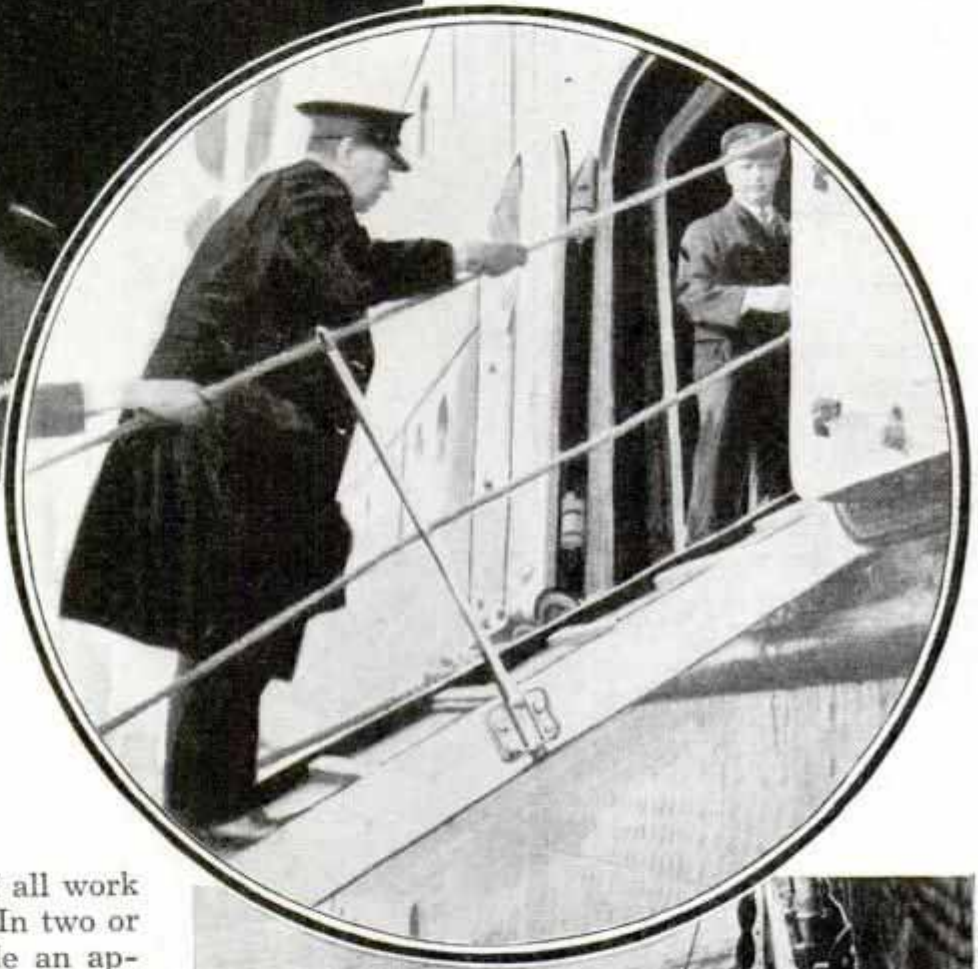
U. S. Cutter Alongside the "Leviathan" Ready to Transfer Customs and Immigration Officials to the Liner Coming into Harbor



out reference to the chart, no matter how the tide may be running, or take a boat to any indicated berth in a fog by merely swinging a lead to get the depth, he is given a license to pilot ships of not over eighteen-foot draft. From then on he is re-examined every few years and licensed for larger and larger

young. Papa and grandpa and great-great-granddaddy were all pilots, so naturally the boy has a boat as soon as he's old enough to row. Then when the boy is sixteen or seventeen he is given a job at \$25 a month as man of all work aboard the pilot ship. In two or three years he is made an apprentice pilot at \$40 a month, and spends the next eight years rowing the pilots to incoming ships, or picking them off departing boats. In his spare time he studies the charts, accompanies experienced pilots on the job, and finally becomes watch officer or captain of one of the three pilot ships.

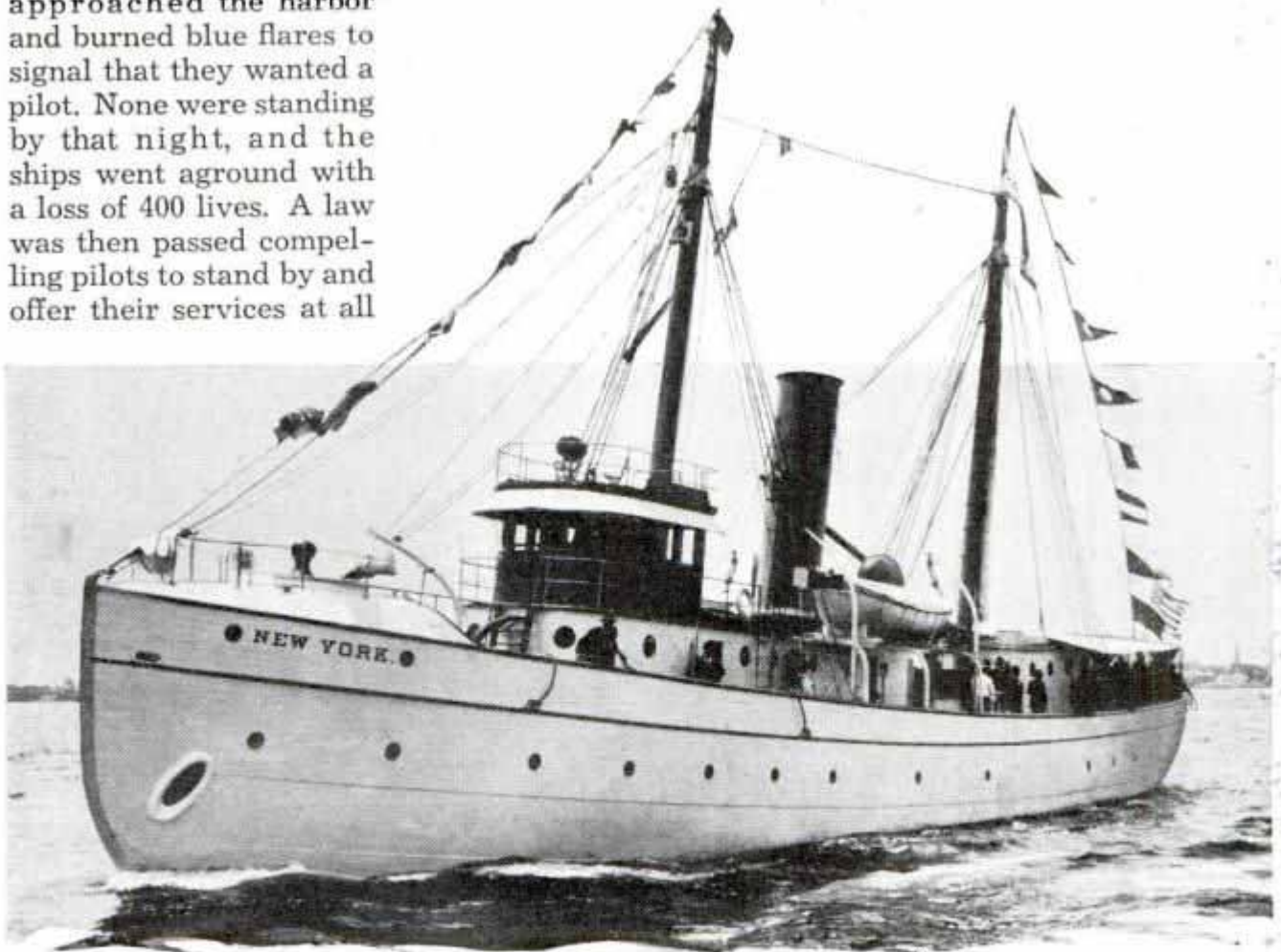
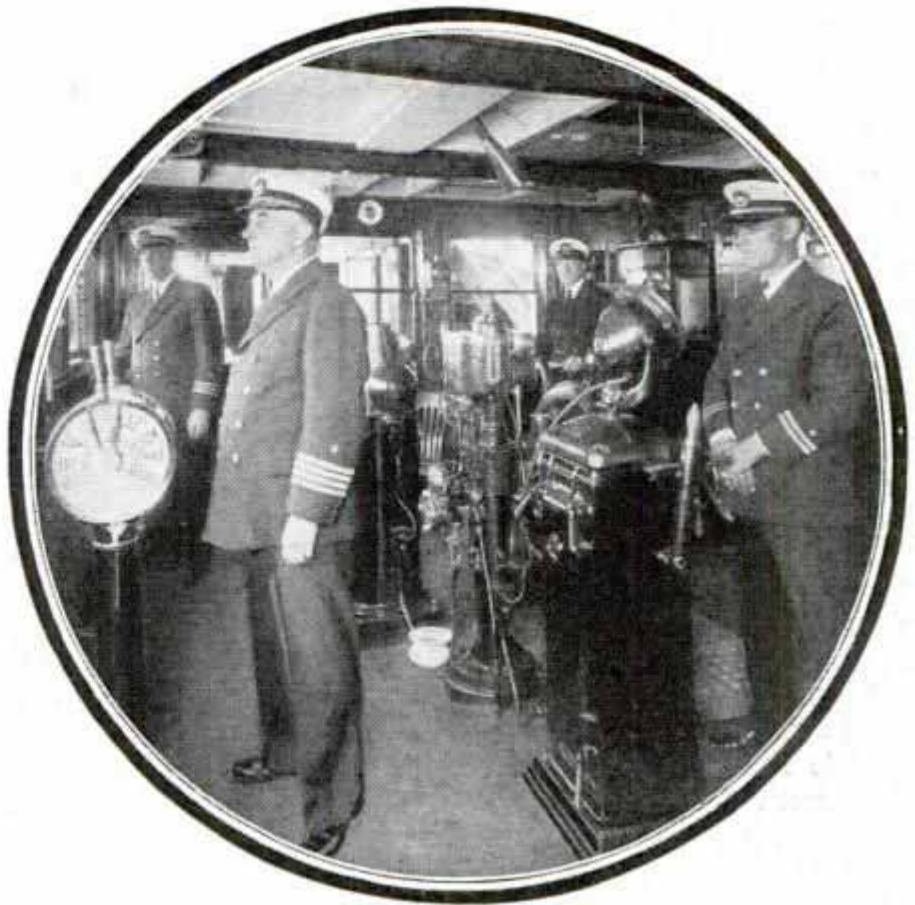
After eight years of apprenticeship he is given an examination by the harbor authorities, and if he can point out offhand the location of every buoy and landmark, tell the actual depth of any spot in the harbor with-



Flare to Direct Pilot Boat, Customs Official Boarding Liner and Pilot Boarding a Steamer

ships, until after twenty years he is given a ticket that permits him to pilot any craft that enters port.

The Sandy Hook Pilots' Association today has a monopoly on the business, and nobody realizes better than the pilots that they must know their jobs thoroughly if they expect the government to protect that monopoly. They didn't always have things sewed up. For over 200 years anybody who wanted to outfit a boat and hail incoming ships was privileged to do so. Since the captain didn't have to take on a pilot, the pilots felt free to abandon their stations when the weather got bad outside. One stormy night two ships approached the harbor and burned blue flares to signal that they wanted a pilot. None were standing by that night, and the ships went aground with a loss of 400 lives. A law was then passed compelling pilots to stand by and offer their services at all



Wheelhouse of a Liner Where Directions of the Pilot Are Carried Out; Note the Sperry Gyro-Pilot at Right; Below, the Pilot Boat "New York" Which Meets Incoming Liners

times. The pilots complained that they couldn't afford to maintain their expensive service unless ships were compelled to use it, so now every ship except those in regular coastwise service or owned by the government must take on a pilot.

There is no shouting of orders when the pilot reaches the bridge. In a conversational tone of voice he will casually suggest a course.

"Steer 296," the watch officer will repeat.

"Course 296," echoes the quartermaster, glancing at the gyro-compass repeater and spinning a wheel, absurdly tiny for so gigantic a ship.

The liner comes majestically around to the new course and is held there by the gyro-pilot. "Steady on 296, sir," casually remarks the quartermaster.

"Aye, aye," the watch officer says, barely audible.

It is rapidly growing dark, and lights flash from the buoys—red on the right and white on the left, turned on automatically as night comes on. The mournful irregular clanging of a bell comes from the right,

while an equally doleful whistle is emitted from the buoy on the left.

"One-third speed ahead," the pilot advises. The watch officer repeats the remark, and a junior officer steps to the engine telegraph and turns the handle to "slow." Why all this caution? The channel is 1,000 yards wide and clearly marked. Thirty miles an hour seems conservative. The channel here, however, is only forty feet deep and the ship extends thirty-five feet below the surface when at rest. With the giant propellers pushing the supporting water away behind, it draws eight additional feet at full speed, so it must slow down to keep off the bottom.

Passing the lights marking the Narrows, the ship crosses to the left and drops anchor off the Quarantine Boarding Station on Staten Island. Health-service inspectors, customs and immigration officials board the ship and the mail is transferred. Meanwhile fog has drifted over the harbor. With the engines at slow the ship feels its way along at ten miles an hour.

(Continued to page 130A)

D616
Self-Opening Station Doors Worked by "Electric Eye"

Controlled by photo-electric cells, or "electric eyes," doors in the Pennsylvania

railroad station in New York swing open as the pedestrian approaches. The main

waiting room and the concourse are separated by twelve doors. Much inconvenience was caused to travelers, encumbered with baggage, by congestion resulting from this arrangement. After careful study, eight of the doors were equipped with the automatic openers. These eight doors now handle traffic which formerly passed with difficulty through the twelve doors. The photo cells and the lights by which they are operated, are mounted in posts which support the rails separating the approach to the doors into aisles. As a pedestrian passes that point, the interruption of the light beam across the passageway causes the photo cell to operate a relay, admitting air to the pneumatic door opener above the door. The door swings open and remains so for a short time. The closing is cushioned to prevent slamming.

Installed by J. Bairley
 Works, New Brunswick, Conn.



Traveler Passes through as "Electric-Eye" Arrangement Opens Doors at Station

see NW. 1937. 722.

Multiple Piano Provides for Group Teaching

Chas. R. Wilson Ross, Mansfield Pa.

Wearer Piano Co., Inc. York, Pa



Standard Electric Piano with Remote-Control Keyboards for Group Instruction; Students Do Not Know Which Instrument Is Actuating the Master Piano at Any Instant

Group instruction of several music pupils is possible with the aid of a multiple piano which consists essentially of a standard electric piano with several remote-control keyboards. By the aid of such a keyboard, each individual student can play the piano, the keyboards making electrical contacts causing the instrument to function. By operating a control switch connected to the various keyboards, the instructor can shut off or turn on any or all of the remote-control instruments. Thus the teacher may have an entire class playing the same composition, but have all the keyboards shut off except one. After three or four measures have been played thus, another instrument can be switched on. Pupils are not aware of which keyboard is actually playing the electric piano at any instant. The piano can also be played independently of the keyboards.

D635

DYNAMITE SHEARS OLD PILINGS

When it was found that pulling up old jetty pilings with block and tackle was too slow, Beach Haven, N. J., authorities called in explosives experts. By resorting

to dynamite, the pilings were sheared off several feet below the sand at the rate of 230 per day. The largest number removed by block and tackle was twenty-five in a single day. The jetties had been constructed on pilings driven into the sand twenty-five feet and close together, in double rows, to form oblong structures about six feet wide and of varying lengths.

GOLD PAN IN THREE SECTIONS HAS DETACHABLE CUP



Both time and labor are saved for the prospector who uses a gold pan made in three sections, one of which is a detachable cup in the bottom. All the fine gold is collect-

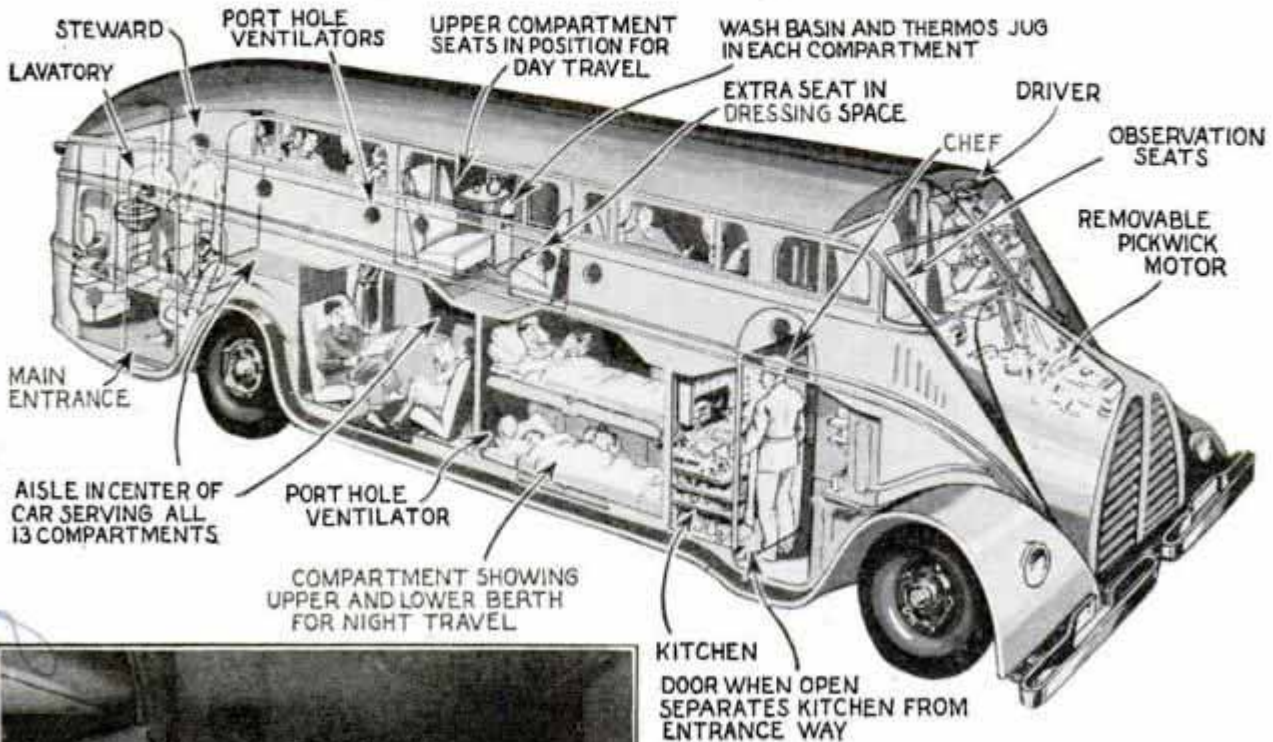
ed in this cup and thus only one cleaning is necessary at the end of a full day's work. It is claimed this pan separates the fine gold from the sand and gravel many times faster than the old-style single pan.

Waller, Charles
Otto Nicolai, Box 28
Finn...
F

From E. J. du Pont, Del

D. 916
 842 E. 79 St.
 Cleveland, Ohio

LAND CRUISING



Drawing Courtesy J. Jay Hirz

Driver's Compartment of Modern Bus and Drawing of Coach with Sleeping and Dining Facilities



By EMILE C. SCHNURMACHER

Greyhound
ROLLING smoothly on rubber tires westward toward Denver, bus No. 754, a modern land cruiser on a coast-to-coast running schedule of 107 hours from New York to Los Angeles with thirty-three passengers and their baggage on board, has nearly completed its daily run of over 400 miles.

Straight ahead the rugged Rockies loom

against the horizon while off to the right may be seen traces of the pioneer trail over which settlers of less than a century ago laboriously drove their covered wagons, averaging less than one-fortieth of the daily distance of the modern covered wagon speeding along on the macadam highway.

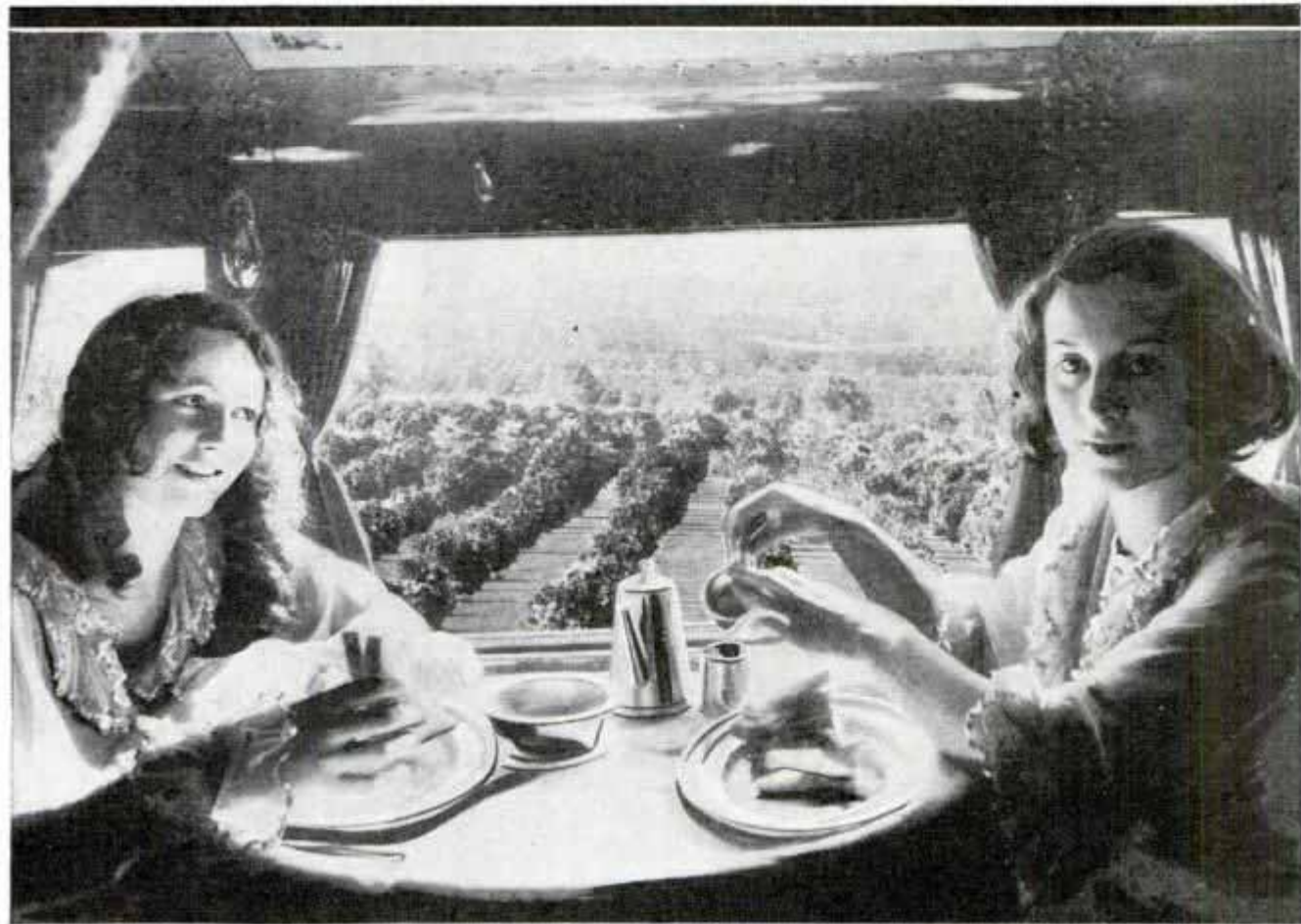
Inside of bus No. 754, the travelers are seated in form-fitting chairs with deep, soft cushions and clean linen headrests. They have but to touch a pedal to cause the back of those chairs to tilt to any of three desired angles for reading, relaxation or sleep. Beneath the coach itself, the latest scientific developments in air springs and spring suspension further contribute to their comfort.

Forward is the pilot of the land cruiser, a trimly uniformed, experienced driver between twenty-four and thirty years of age, who has been carefully trained in a safety school. He is driving a stretch of approximately 200 miles, having relieved another pilot a few hours previously. He is familiar with every inch of the road and has driven a land cruiser over his division

Mr. Cruise C. Schuermer 7/76

22 E 69th,

— DE LUXE... *New York*



many times with the regional manager before being entrusted with passengers.

Pulling into the Denver terminal, which is almost a small replica of a railroad station, bus No. 754 discharges its passengers and immediately goes to the pits for servicing. In addition to the usual greasing and fueling, the brake system will be gone over completely. This science of preventive maintenance is constantly employed on all runs of the modern land cruiser.

As bus No. 754 leaves for the pits, the dispatcher at the Denver terminal has wired a report of its arrival and its mechanical condition to the chief dispatcher in Cleveland, Ohio. He records this report on a huge bulletin board which shows the position of every land cruiser on the more than 50,000 miles of bus system extending to forty-five of the forty-eight states, into Canada and Mexico.

A prodigal child of science, the modern de luxe highway cruiser has been developed from the original "jitney bus," in only twenty-one years, to a point where it may



Dining on a Modern Land Cruiser and Steward Caring for Comfort of Bus Passengers

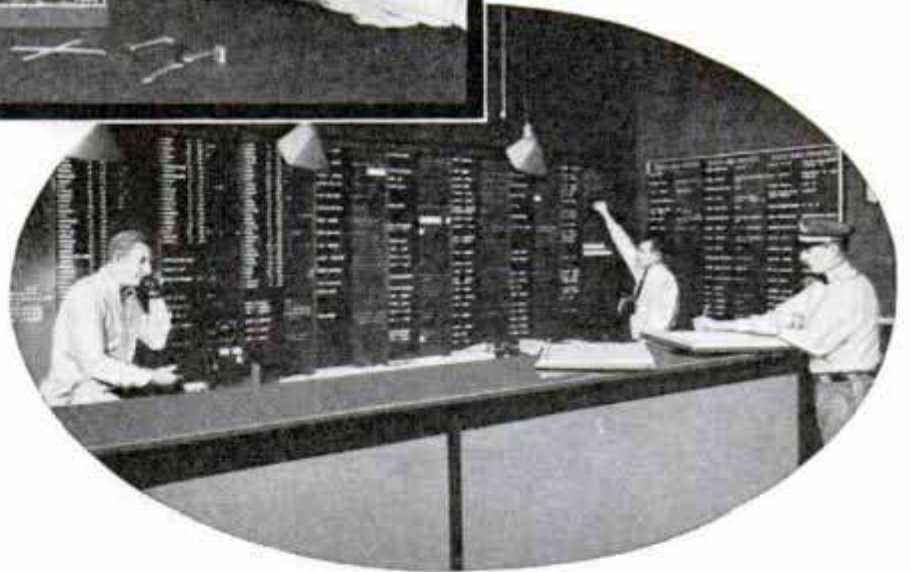


As the highways have been developed so too has the land cruiser. Dining and sleeping accommodations have been successfully tried out aboard the land cruisers of today, especially on the west coast. Special bodies have been developed for sight-seeing as well as for long-distance cruising. Streamlining for increasing speed has long been experimented with in the research division of the large bus transportation systems and will shortly make its appearance.

The first bus in the United States was a far cry from the modern

take you and your baggage safely and inexpensively anywhere along historic and scenic highways—at approximately one-third of the cost of operating your own car and with a degree of safety which shows but one accident for every 300,000 bus miles.

The development of the de luxe car cruiser has more than kept abreast of the development of highways throughout the United States. With the aid of science it has done so with increasing safety and lowering cost, and with its capacity for long-distance, comfortable transportation being constantly improved. Today it is possible to board a modern bus in New York City and travel to Monterey, Mex., a distance of 2,504 miles, in ninety hours running time, to Moose Jaw, Sask., a distance of 2,290 miles, in eighty-four hours running time, to Vancouver, B. C., a distance of 3,685 miles, in 145 hours running time or to any one of thousands of cities throughout the United States.

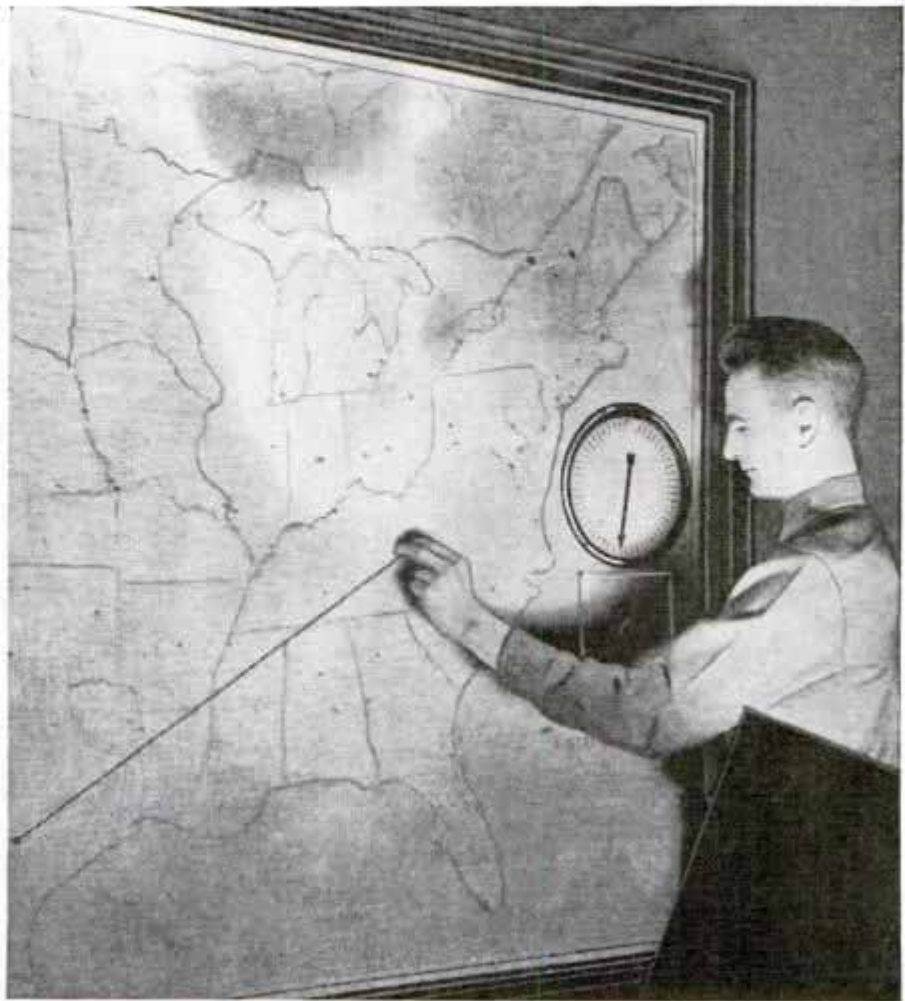


Checking Mechanical Condition of Land Cruiser at a Terminal and the Chief Dispatcher's Office of a Large Motor Coach Company

thirty-three passenger de luxe highway cruiser of today that is easily capable of traveling the distance from New York to Chicago without mishap and right on scheduled time. Eric Wickman is generally conceded to be the father of the bus industry in the United States. In 1913, Mr. Wickman was employed as a diamond-drill miner in the iron mines near Hibbing, Minn. Reaching the mine pits, a distance of six or seven miles from Hibbing, was a problem. He conceived the idea of making a taxicab out of his auto, carrying other miners at a small charge and defraying the

cost of operation of his car. He secured regular passengers and soon found that he did not have seats sufficient to accommodate the large number of iron workers who wanted to ride with him. He then purchased a used truck, fitted it with wooden benches, lengthwise of the body, built a top and partitioned the driver's seat off from the rest of the bus with a glass partition. With this as the first bus, Mr. Wickman maintained several schedules daily between Hibbing and the iron pits. At the end of the month he was surprised to find that he had made more money from the operation of the bus than from his work in the mines. He therefore quit the mines.

This was the real start of what today constitutes the world's largest motor coach system, the Greyhound Lines, operating over more than 50,000 route miles with many schedules daily, reaching every important city in the United States with operations extending into Canada and Mexico.



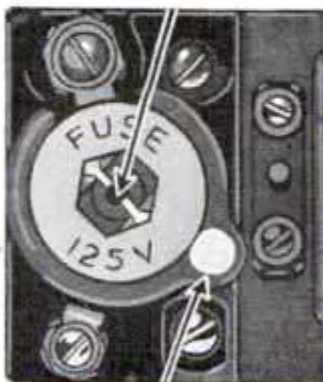
Pilot Determines Distance by Stretching Cord to Destination on Map, Causing Dial, at Right, to Record Mileage for Trip

MILEAGE DIAL HELPS PILOT PLOT FLIGHT ON MAP

Air distances may be determined easily on a map in use at Randolph field, Tex., where the United States Army Air Corps maintains a school for student flyers. The map is equipped with a mileage dial, which is operated by a cord connected to a gear arrangement. When a pilot desires to plot a flight from Randolph field to another army field, he pulls the cord from its reel, stretching it across the map to the point where he has been ordered to go. As the cord is unwound, it causes the dial to show the distance from Randolph field to his destination. Pins mark the location of landing fields on the map.

Popular Mechanics Magazine does not publish the name of the maker of any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

LAMP GLOWS IF FUSE BLOWS TO MAKE REPAIRS EASY



When a fuse blows in a panel-board equipped with indicating cutouts, a neon lamp glows to facilitate replacement. The red light indicates the blown or loose fuse, eliminating the trial-and-error method of determining which fuse requires attention. Any standard fuse may be used with the equipment. The cutouts are not affected by short circuits.

Any standard fuse may be used with the equipment. The cutouts are not affected by short circuits.

Handwritten note: Fuse box, fuse blown

Handwritten note: D 657

Handwritten note: Lib. Orach Ref. Corp.

Handwritten note: 129



Acme
Small Craft Used for Ocean Voyage; It Is a Fourteen-Foot Paddle Board with Eight-Foot Outriggers and Fifty Square Feet of Canvas

**TINY BOAT WITH OUTRIGGERS
USED FOR OCEAN VOYAGE**

Going to sea in a canoe would seem only a little more hazardous than trying an ocean voyage in a Hawaiian paddle board, but a Californian has left Los Angeles in such a craft, bound for New York by way of coastal ports. The boat is a fourteen-foot paddle board with eight-foot outriggers and has fifty square feet of canvas rigged. The craft, despite its diminutive size, has space for food, water and navigation equipment in addition to the owner.

**ONE-INCH "PICKPROOF" LOCK
GIVES MORE PROTECTION**



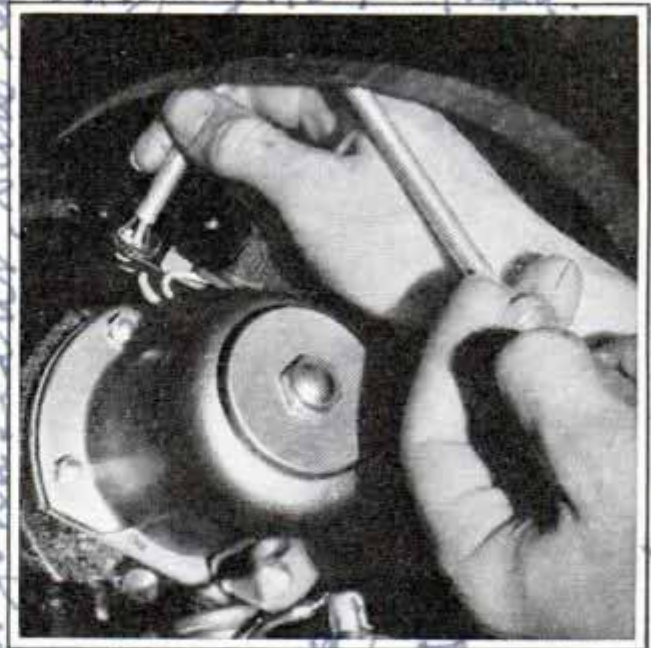
ace
Drill and shear-proof, a small seven-pin tumbler lock resists picking within the time limit set by the Underwriters' Laboratories, giving unusual protection against thieves. Five-eighths of an inch in diameter, the lock is only

of an inch long, making it particularly adaptable to the automotive and coin-

machine industries. Seven tumblers located in a circle around a plug, make it very difficult to pick. Tumblers snap into place at every eighth turn of the lock, requiring four picking operations if one-half turn is accomplished. The lock has a hardened steel shell and hardened steel center. There is no center key slot, the hollow shank key fitting into a circular slot.

D 688
**FLEXIBLE TOOL HAS
"FINGER" TO GRIP
NUT OR BOLT**

Constructed of flexible steel, a new tool with claws reaches into inaccessible places or around corners to start or remove nuts, bolts, cotter keys or rivets. The claws take a powerful grip on a nut or rivet, but only add three-sixteenths of an inch to the cross-sectional diameter, so that only a little more space is needed to let the tool pass than is needed for the nut itself. Con-



price \$7.00
Showing How Flexible Tool with Steel "Fingers" Is Operated in Close Places

controlled uniform pressure on the claws makes it possible to install small radio dial lamps without cracking the glass.

Paul Newhous, Los Angeles, Calif.
Chicago Lock Co. 2024 N. Racine St. Chicago

John... San Francisco

also grip
San Francisco

California Sales Co. Inc. 1444 Market St.

D520

Curtiss-Wright Corp
29 W. 57 St
New York City

Fast Navy Fighting Plane Retracts Wheels



Wide World

Latest Fighting Craft of the United States Navy as It Appears in Flight, with Landing Gear Retracted So That Wheels Fold against the Side; Plane Is Single-Seater and Attains High Speed

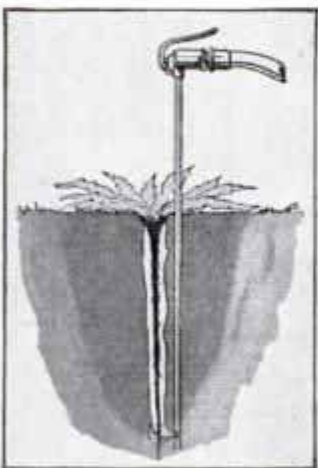
Equipped with retractable landing gear, the U. S. Navy's latest fighting plane is a single seater. It is powered by a 700-horsepower Wright cyclone engine, which drives it at remarkably high speed. Upon leaving the ground, the pilot operates the landing gear control which causes the wheels to fold against the side.

ever, enables removal of the whole plant, roots and all. It can be operated from a standing position.

D625

WATER WEEDER FREES ROOTS AND MAKES PULLING EASY

Dandelions can be eliminated from a lawn by using a water weeder which is attached to the garden hose. It consists of a hose connection, a valve operated by a trigger and a hollow rod with a hole near the end. Inserting the rod beside the plant and turning on the water loosens the dirt and makes removal of the roots easy. It has been found that dandelion



roots extend more than a foot into the ground and cutting off the tops does not kill the plants. The water weeder, how-

D545

SPRING-PRONG ELECTRIC PLUG INSURES GOOD CONTACT

Fitting securely in any electric outlet, yet easily removed, an electric plug is equipped with V-shaped spring prongs instead of the usual straight blades. The plug is of rubber and is particularly suited for use in worn outlets or for plugging into ceiling fixtures, since the springs hold it in place. Due to the springs, no tampering with the blades is necessary in order to make a contact and the plug is just as handy where electrical equipment is moved about as where permanent contact is necessary in order to insure against interruption of current.



(Factories of the world produced seven times as much rayon as silk in 1933.

Colvin Weeder Co

Science News Letter
1934

Alfred Mercantile Co
2 Osborne Terrace, Newark, N.J.

Washington
166 W. Washington
Del. Rand. 3252

D 560

160 4 D St.
San Bernardino
Calif

From COWBOY to

Thompson & Sherman
Cent. 1055
Los Angeles
Calif



JUST think of building your own airplane in a few weeks' time, test hopping it once right before a race, then taking off and setting a world speed record! It hardly sounds possible, but it was done by Lee S. Miles, former cowboy and lumberjack, who is breaking records in the midget airplane that he built himself.

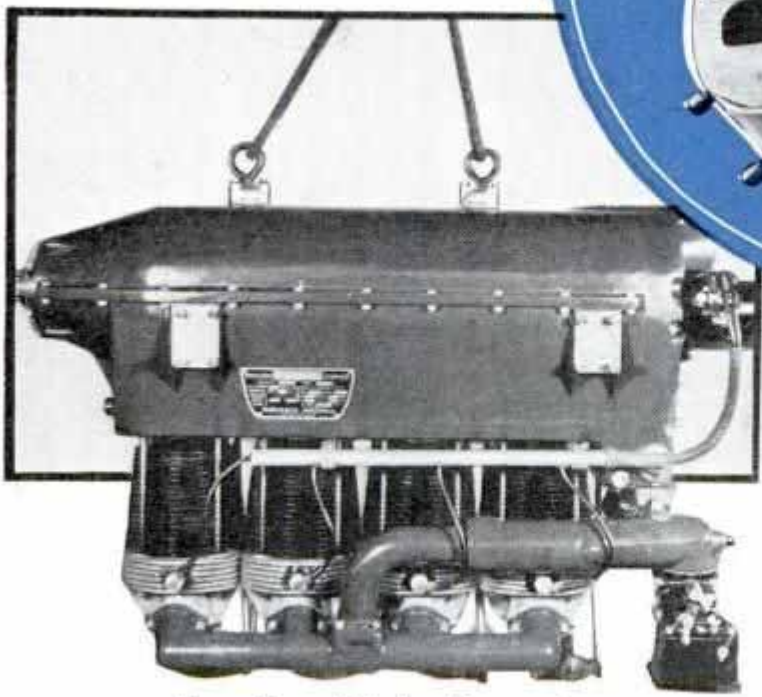
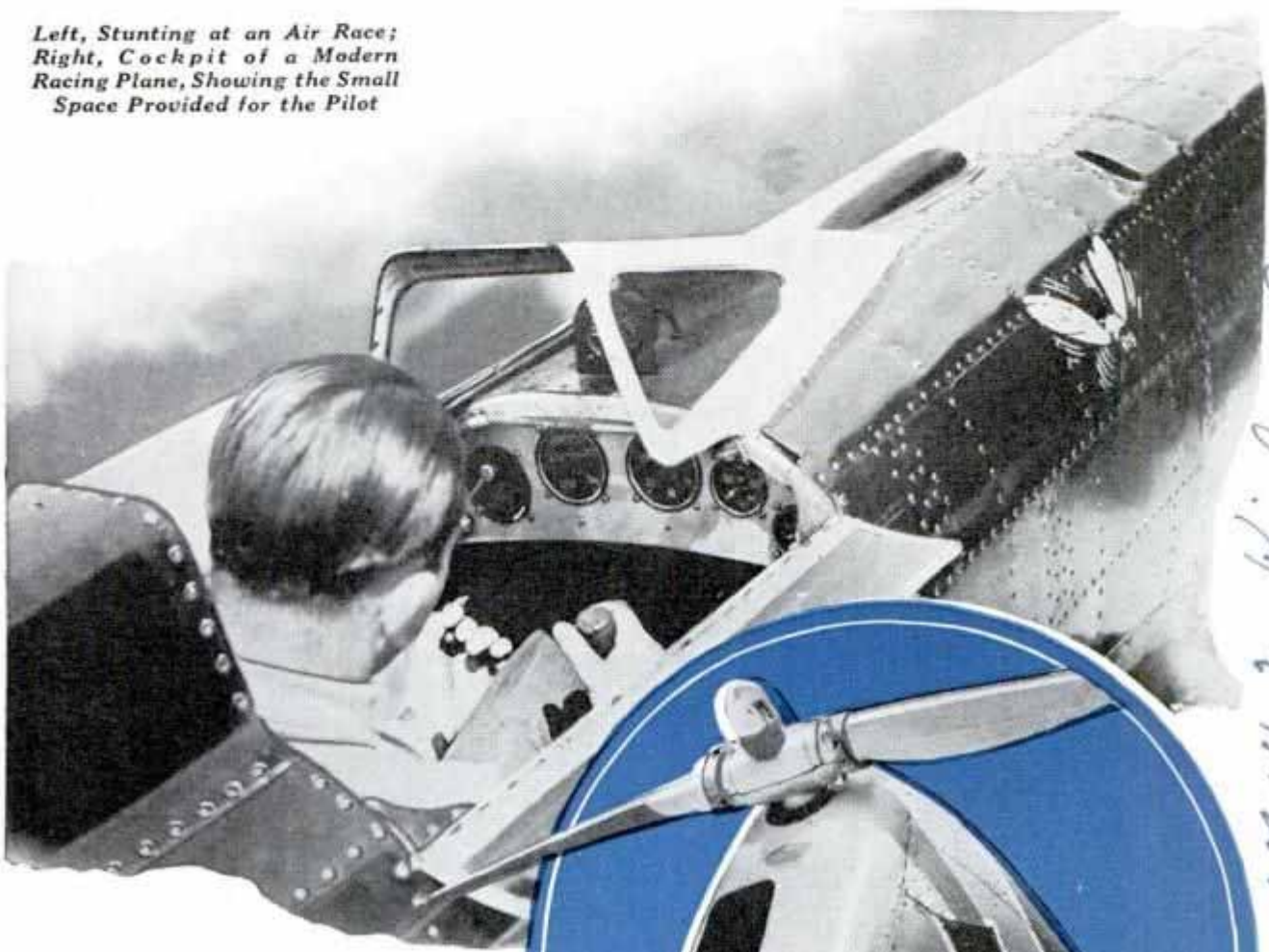
Thirty-five days before the start of the national air races in Los Angeles last summer, Miles decided that he wanted to compete. He didn't have a plane, so he went to his friend Leon Atwood and told him that he wanted help to build the "Miles-Atwood Special," a tiny speedster of only sixteen feet wingspread. Plans were hastily drawn, materials purchased, and mechanics hired. Many of the working days lasted long after dark but the airplane was still unfinished on the morning the meet opened.

Finally, half an hour before the first race, the last cotter pin was fastened in place. Then the plane, with the green paint hardly dry on the fabric, was wheeled out on the field and Miles squeezed into a cockpit so small there was no room for him to wear a parachute. His friends fastened the transparent cover over his head, kicked away

D520

SPEED CHAMPION

*Left, Stunting at an Air Race;
Right, Cockpit of a Modern
Racing Plane, Showing the Small
Space Provided for the Pilot*



*Lean Nose of Racing Plane and an
In-Line Engine Inverted to Give
Propeller More Clearance*

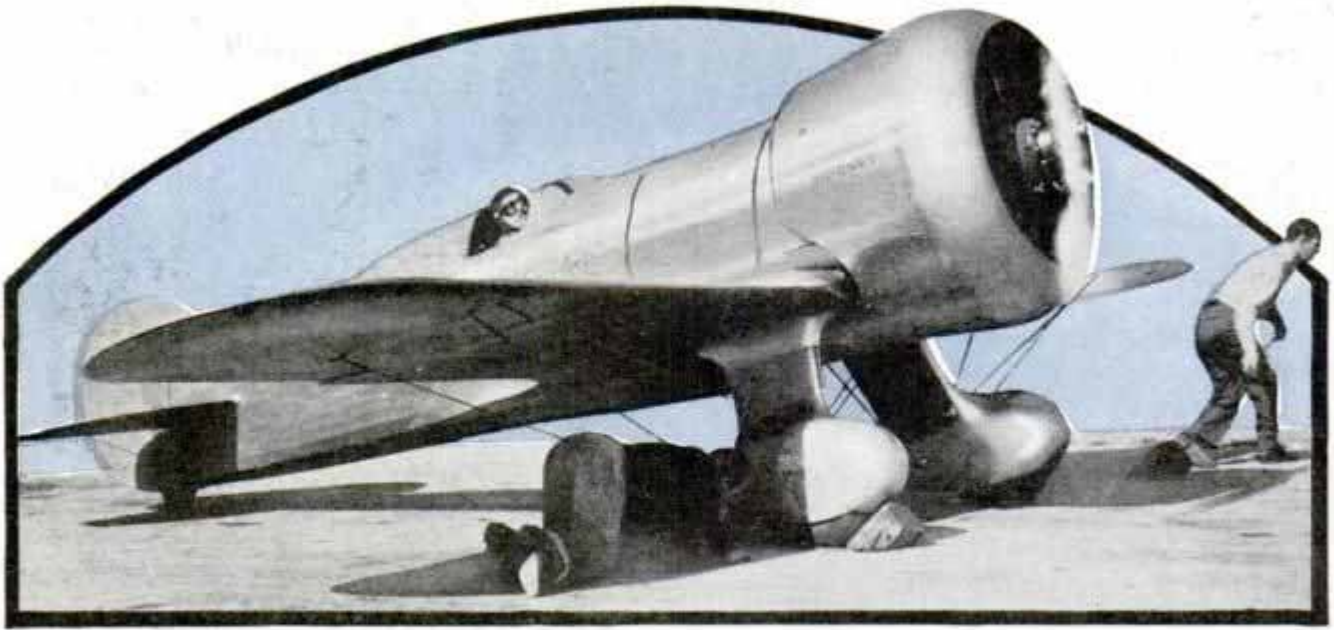
the wheel blocks, and crossed their fingers while the plane roared down the runway. It rose into the air, a success. Miles landed and made a minor adjustment to the propeller, then took off again just in time for the start of the three-kilometer speed dash. A few minutes later the crowd was acclaiming the unknown plane and pilot that had beaten the favorites by the record-breaking speed of 211

*6714 McKinley Ave
Los Angeles, Calif*

Mfg. Co.

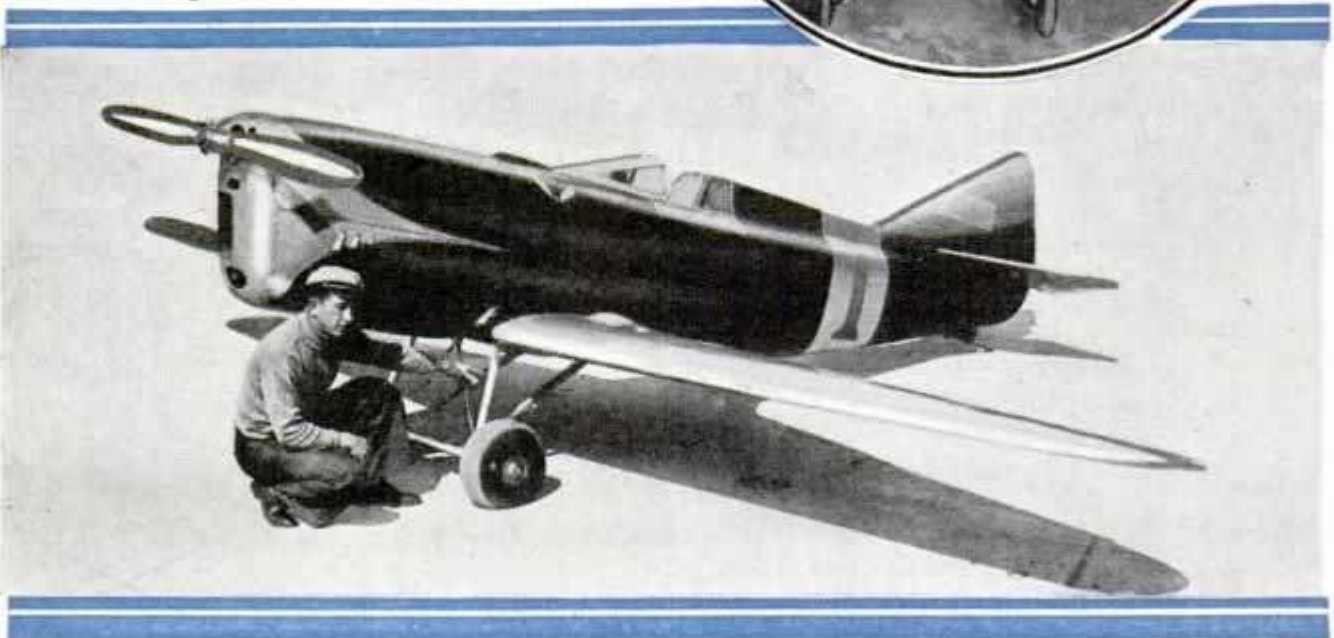
Menasco

"Menasco Pirate" name



Above, Racing Plane Ready to Take Off; Below, Comparison of Propeller of Transport Plane with Modern Racer, and Racer Fitted with Retractable Landing Gear

miles an hour. Since then Miles has won nearly every race he has entered and has set new official and unofficial world records for all distances, from three kilometers to 100 miles for airplanes in the 375-cubic-inch displacement class. His plane is the only one powered with a four-cylinder engine that has ever qualified for the Phillips free-for-all trophy race. His most recent feat has been to wrest from France the world record for the 100-kilometer course, taking it away from an airplane that has more than twice the horsepower of his own. Now he is making changes that, he hopes, will give him a speed of more than 250 miles an hour, within fifty miles an hour of airplanes that have



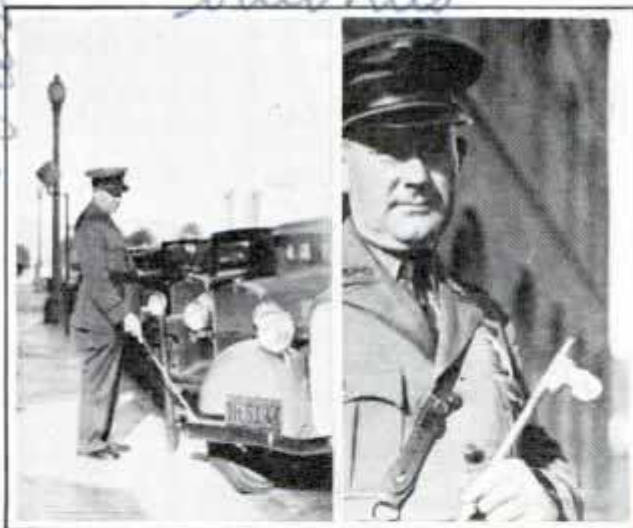
nearly five times the power of his own.

Behind this list of achievements is a story of years of miscellaneous flying that have given him a superb air sense. Once, after saving up the money he earned working in a lumber camp, he operated an automobile service station in San Bernardino, Calif., and kept a "Jenny" in an adjoining field that was so small he could take off only through a narrow gap he had cut in a row of trees. Another time, after a job as cowhand on a Mexican ranch, he got work cracking up airplanes for motion pictures. He needed this variety of experience on the day that he first flew his small airplane. A midget racer is the

(Continued to page 128A)

ROLLING MARKER ON GOLF CLUB USED FOR CHALKING CARS

Traffic officers in one California town save themselves much time in marking parked cars for the purpose of checking parking limits by using a golf club for the task. The cut-off club has a rolling marker attached to the end and the tires of cars can thus be marked without stooping.



This Traffic Officer Uses a Golf Club with Rolling Marker Attached to Chalk Parked Cars

STEEL GUARD COVERS JEWELS WHEN WINDOW IS BROKEN

Bandits who make a specialty of robbing jewelry shops by smashing windows and scooping up the display are being foiled in London by the use of steel shutters which automatically slip into place over the gems the instant a window is broken. At the same time the shutter



An Electric Eye Causes the Steel Guard to Slip in Place When Jewelry Store Window Is Broken

glides over the jewels a siren sounds while the trays of jewels vanish, being pulled from the window by another automatic mechanism. The device employs an electric eye or photo-electric cell which projects a sheet of light instead of a beam. When the window is broken, this sheet of light is interrupted and this causes a relay to operate an electric motor which moves the steel shutter and sounds the alarm.

LONG-LIFE MUSHROOM LAMP CUTS LIGHTING COSTS

Brighter light at lower cost for electricity is produced by a new mushroom lamp that gives 500 extra burning hours of illumination. By a special process, the opal enamel is combined with the glass, eliminating outside frosting and resulting in a concentrated light without glare. The lamp is guaranteed for 1,500 burning hours.



The Lanore Co
33 Union Square

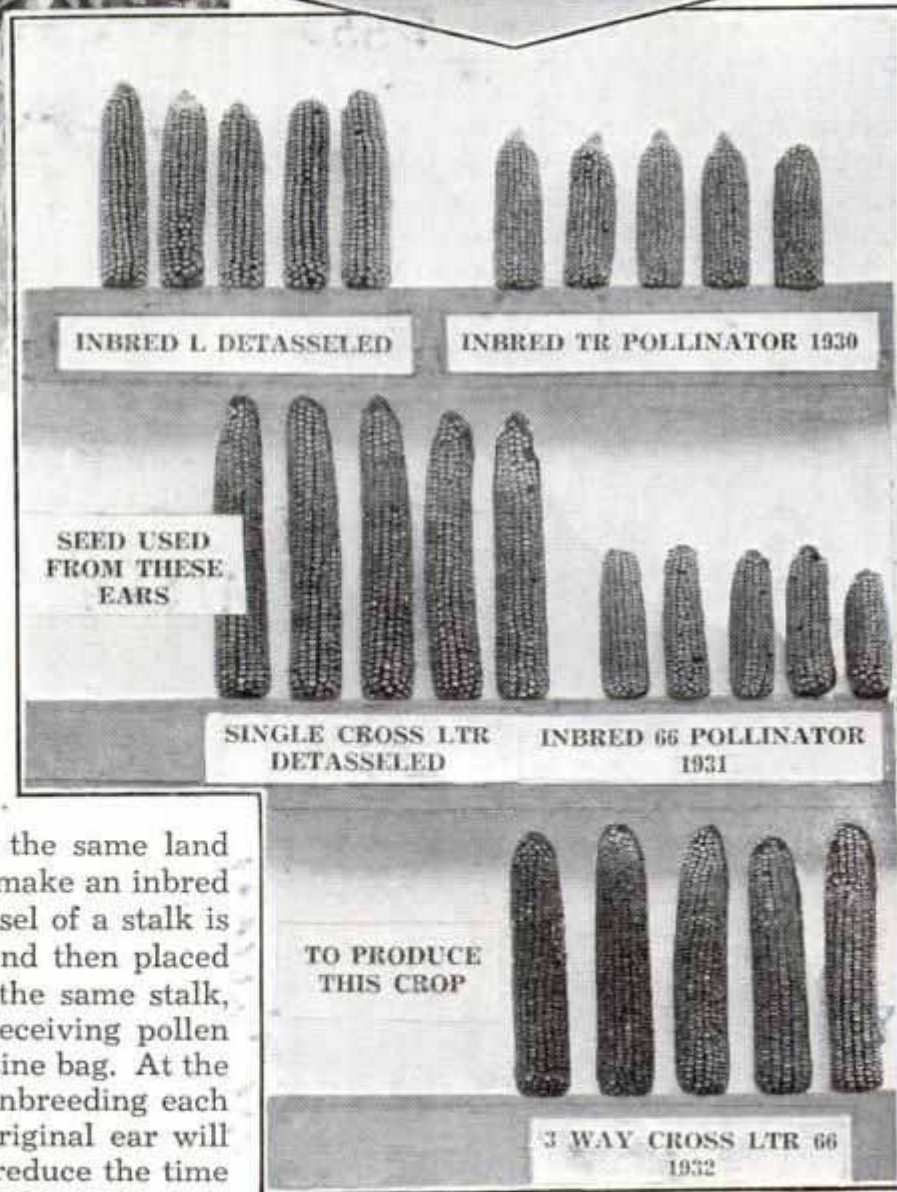
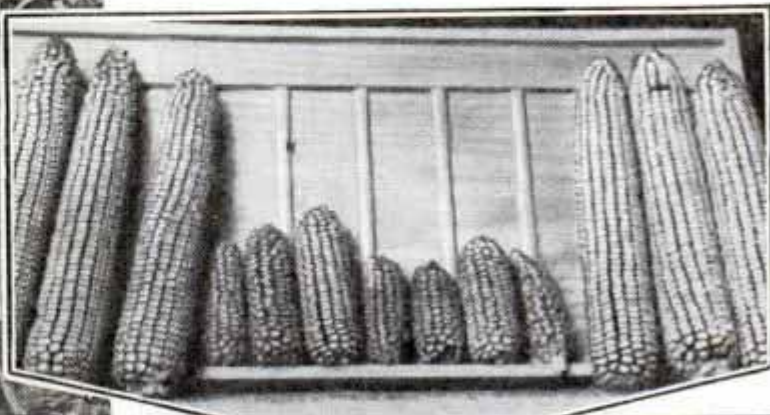
Emb. Hi. Sibley 1954 Brugden Bloa
 Pasadena Calif
 Salinas
 D558
 D564
 D68

General Electric Co. Magnet
 Home, Kinsway
 Imp. in W.C. 2 England
 me 11 agent

Giant Ears of Corn Produced from Nubbins



houses to grow inbreds in winter. After several ears have been inbred, two of the most promising are crossed. The seed from the cross, if it is a good one, produces more than any other variety on soils that are



Top, Left, Gathering Giant Corn; Top, Right, Giant Corn Compared to Nubbins; Below, Varieties Crossed to Produce Big Ears (Bottom)

Nubbin ears of corn can be crossed to make a strain that will produce ears eight to ten and one-half inches long. Tests have shown that inbred hybrids produce twenty per cent more bushels on the same land than present varieties. To make an inbred hybrid, pollen from the tassel of a stalk is shaken into a paper bag and then placed on the silk of the ear on the same stalk, which is protected from receiving pollen from other stalks by a glassine bag. At the end of about six years of inbreeding each ear descending from the original ear will look very much alike. To reduce the time until an inbred is fixed and can become useful, Frederick Richey, of the U. S. Department of Agriculture, has used green-

adapted to it. The unusual vigor of the hybrids dies out in two or three years

Em. Raymond L. Sawyer, La Fontaine, Ohio

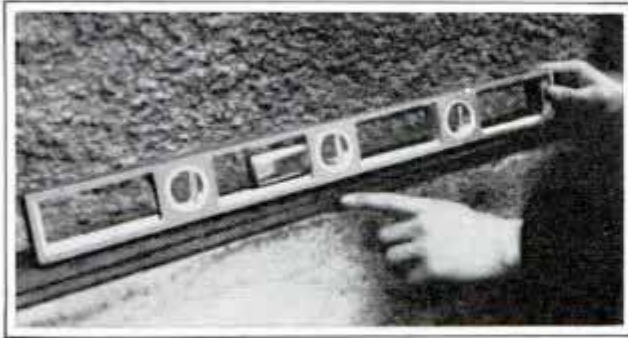
after the cross is made, so new hybrid seed is necessary. When two inbreds are crossed, alternating rows of each are planted and the tassels pulled out of one of the inbreds each day or two. This insures the silks of one inbred receiving nothing more than the pollen from the other strain. Dr. G. M. Smith, who has charge of sweet corn work at the Indiana Experiment Station, has developed an inbred hybrid sweet corn known as golden cross bantam which is resistant to bacterial wilt and has doubled and tripled the yield of other early sweet corns. This corn was so valuable that the inbreds producing it sold for \$5 a pound in 1933 while the hybrids cost \$1. Because of the uniformity of inbred and hybrid corn, a strain can be developed that is adapted to any condition under which corn is grown. In a pure inbred, the cob of every ear, each grain and each stalk is almost identical. If the strain possesses a stiff stalk, each stalk of the variety will remain standing while ordinary corn is flat on the ground. This quality, of course, saves corn that would be damaged by laying on the ground and is appreciated by the farmer who husks corn by hand. Other conditions for which these strains are being bred include husking with a mechanical picker and immunity to the European corn borer.

D 580

FLASHLIGHT FITS INSIDE LEVEL TO ILLUMINATE BUBBLE

Mounted inside a level, a single-cell flashlight illuminates the bubble, faci-

Minneapolis, Minn.



Hand Points to Small Flashlight Fitted inside Level to Facilitate Readings

tating work in dark corners. A small hole in the casting permits the light to pass through. Two metal spring strips, soldered to the rear of the case, fit into grooves in the level, holding the flashlight in position.

*and James C. Kirby
3141*



Political Symbol of German Party Is Shown Atop Exhibition Building at Industrial Show

GIANT EMBLEM ON BUILDING MARKS GERMAN EXHIBIT

Topped by the emblem of the political party in power in Germany, one of the buildings at a German national exhibition houses the display of the German Workers Front. The giant emblem, located at the front of the building, is that of the party headed by Chancellor Hitler.

SNAP-TERMINAL AUTO WIRING GIVES LONGER SERVICE

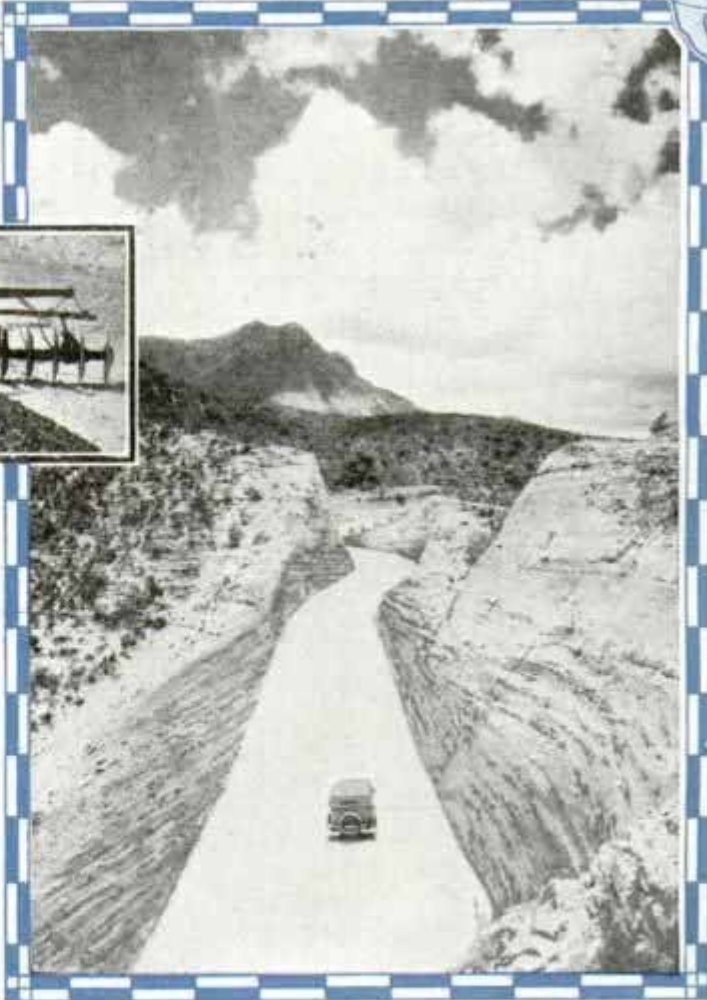
Permanent and positive electrical connections for the automobile wiring system can be made quickly by unskilled workers using a snap-terminal system developed recently. The system consists of snap terminals and spring chamber receptacles. Switches, junction blocks and other devices equipped with spring chambers are available for adaptation to all types of circuits. Tools also are available for swedging the snap terminals to the ends of wires. The system is said to be vibration-proof.



H. A. Douglas mfg co

Emb. Slav Isasseman, 55 W. 86 St. New York

598 From Alaska to middle of South America
The World's Largest

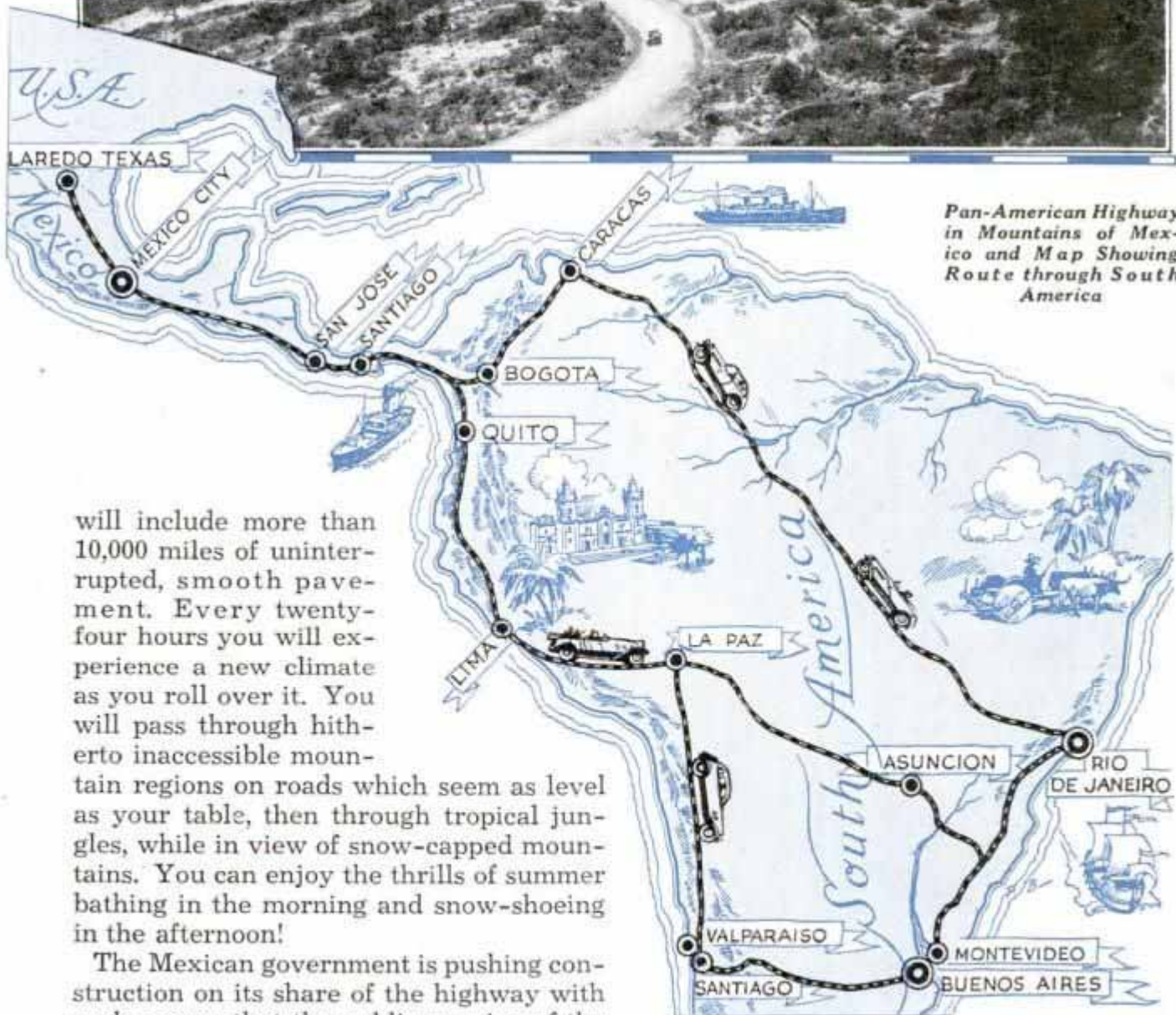


ROLLING down to Rio in a few years will be no novelty for the man who owns a car. The new Pan-American highway, which will carry travelers between two continents and twenty nations deserves to be called the greatest Main street in the world. From the ice-caps of Alaska it proceeds through the heart of the wilderness in western Canada, through the mountains, deserts and bad lands of the United States, the high plateau of northern Mexico, steaming jungles in Central America, across the Panama canal, and thence through South America.

When completed this superhighway

Ancient Church along Mexican Highway, a Mountain Stretch of Road and Some of Modern Machinery Being Used

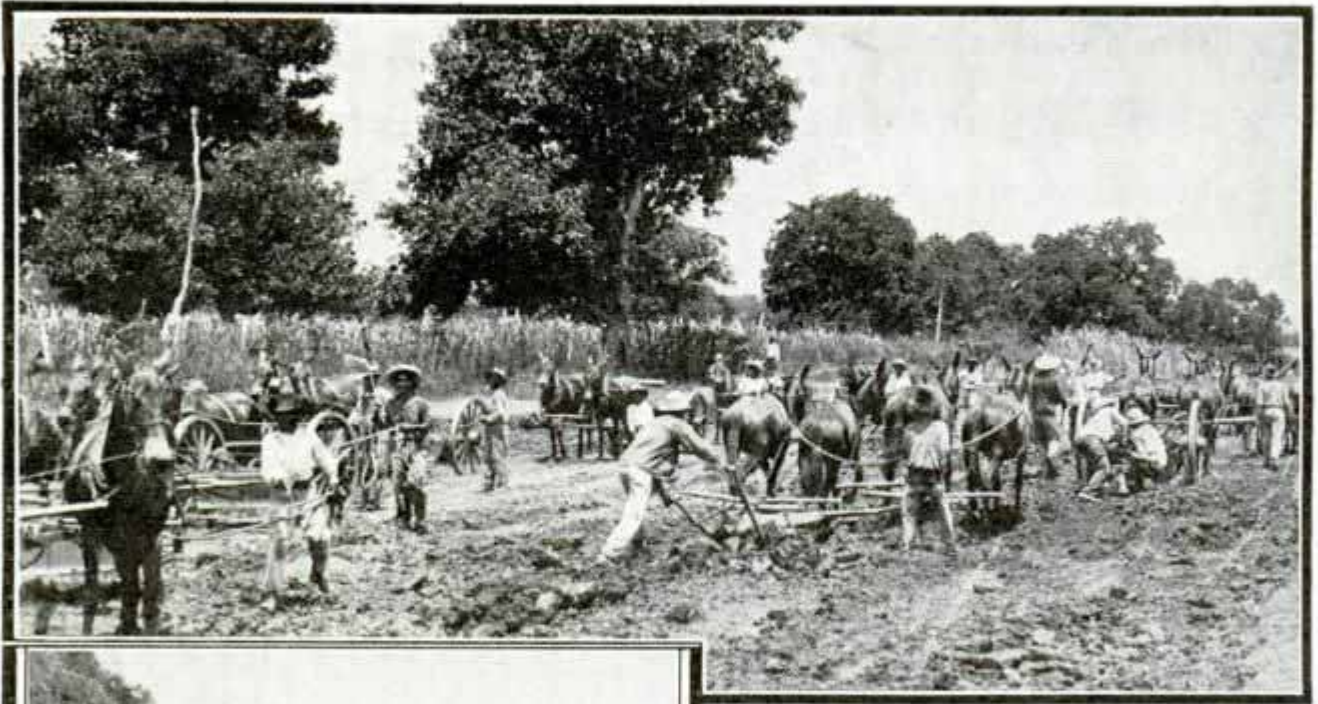
MAIN STREET



Pan-American Highway in Mountains of Mexico and Map Showing Route through South America

will include more than 10,000 miles of uninterrupted, smooth pavement. Every twenty-four hours you will experience a new climate as you roll over it. You will pass through hitherto inaccessible mountain regions on roads which seem as level as your table, then through tropical jungles, while in view of snow-capped mountains. You can enjoy the thrills of summer bathing in the morning and snow-shoeing in the afternoon!

The Mexican government is pushing construction on its share of the highway with such energy that the public opening of the



Laborers at Work on the Highway in Mexico and a Section of the Road Carved Out of Solid Rock

important link between Laredo, Tex., and Mexico City is now assured for 1935. Even now, people are driving from the Rio Grande to the capital of Mexico in twenty-four hours. Only 1,000 miles of additional highway remain to be completed before North and South America can be linked by the superhighway. This stretch lies mainly in the Central American countries, Guate-

mala, Honduras, Nicaragua, Costa Rica and Panama. The expense of constructing the highway through those countries can hardly be borne by such small governments at present. But according to present plans, the United States may undertake to finance the work with a public bond issue.

The government's road program in Alaska is going forward and enterprising provinces of Canada are actively pushing a program for a highway between Alaska and the United States border. Fine automobile roads have already been built in most countries in South America. With the Mexican and Central American links completed, you will be able to drive from your door to the great capitals of Argentina, Brazil, Chile, Colombia, and Peru with as much ease as you now travel between the capitals of our states.

About 10,000 men, mostly Indians, are employed on the Laredo-Mexico City link. Vast areas which were scarcely known have recently been opened to the automobile, and villages which have remained almost unchanged since the time of the great conqueror, Cortez, are now accessible to the traveler. The Mexican government is anxious to assist auto travelers even before the official opening of the highway. Agents, traffic officers, and

(Continued to page 124A)

ELECTRIC TELESCOPE TO SOLVE MYSTERIES OF UNIVERSE

Opening the way to dimensions hitherto beyond the dreams of astronomers, an electronic telescope has been built in model form by Dr. Francois Henroteau, Ottawa, Can., who predicts the new principle will make possible an instrument equivalent to a 2,000-inch lens or mirror. This telescope substitutes electrical for optical amplification and can have twenty times the power of the biggest instrument in use today. The largest optical telescope in existence is at Mount Wilson observatory.

Chicago Daily Trib 12/30/34

Observatory

see June 1934 page

BULLET-PROOF GLASS IN PLANE PROTECTS OBSERVER

Observers in the latest United States bombing planes will be protected from enemy gunfire by bullet-proof glass that covers an egg-shaped cowl over the observer's cockpit in the nose of the ship. The cockpit floor also is made of bullet-proof glass. Thus, the observer may go about his work, making calculations and releasing bombs, in safety. The new bombing plane is capable of 220 miles per hour.

Chicago Daily Tribune (2)

Martin's plane

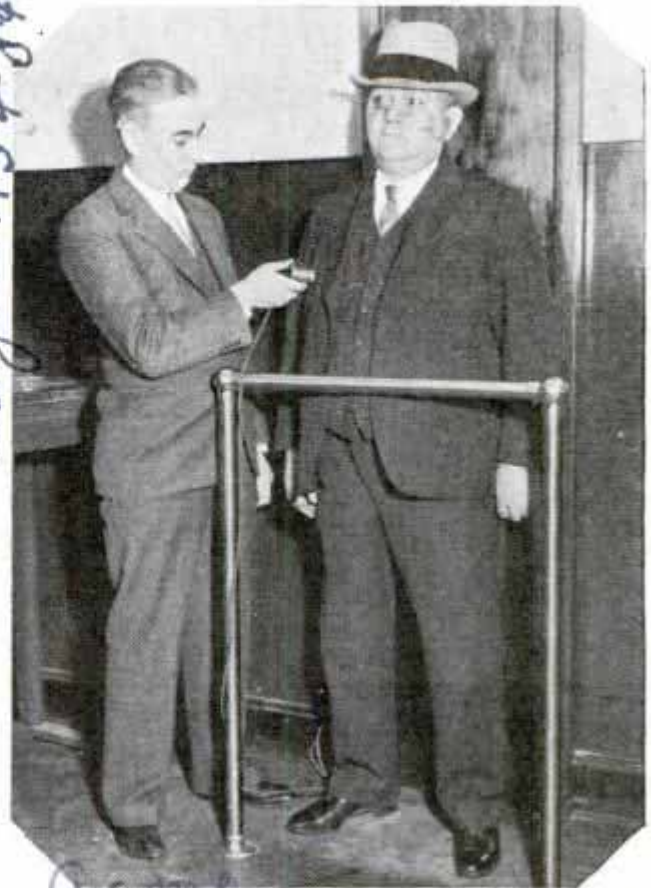


Christening New Bombing Plane; Note Glass Inclosure That Protects the Observer

WEAPON IN POCKET DETECTED BY ELECTRICITY

Weapons of steel or iron in the clothing of prisoners may be detected instantly by electrical "frisking" equipment recently developed. As prisoners march single file between a railing and a sensitized wall

D609



Searching for Weapons; Panel behind "Suspect" and Iron Railing Form Electrical Field

Woolsey - all in case

plate, an alarm sounds if pieces of steel or iron are concealed in their pockets. A small hand coil enables police to detect the exact part of the clothing in which the metal is hidden. The equipment detects guns, knives, fragments of saw blades, finger-nail files and similar articles which might be used in attempts to escape.

SCALES ADDS WEIGHT FIGURES AND KEEPS RECORDS

Weighing, adding the figures and writing a record of each transaction are accomplished quickly with one machine, recently introduced in Germany. The scales is automatic. As each article is weighed, the machine writes the figure, then adds up the column of figures to produce the total weight. An attendant may insert on the record the number of articles as each is weighed.

D620

Wolsey



Wolsey - all in case

Detective Bureau

Steitz - Werke

Electric Welding Joins Steel without a Seam



pieces of the weld are the same, atomically, buried pipe of this manufacture does not create magnetic fields ordinarily found in pipe underground. These magnetic fields produce electrolysis, permitting corrosion to set in. Elimination of this one factor lengthens the life of the pipe considerably. The process also has been applied to commercial stainless steel, high carbon and alloy welds, as well as thin sheets such as used in automobile bodies.



WELD IS INVISIBLE

PARENT STOCK

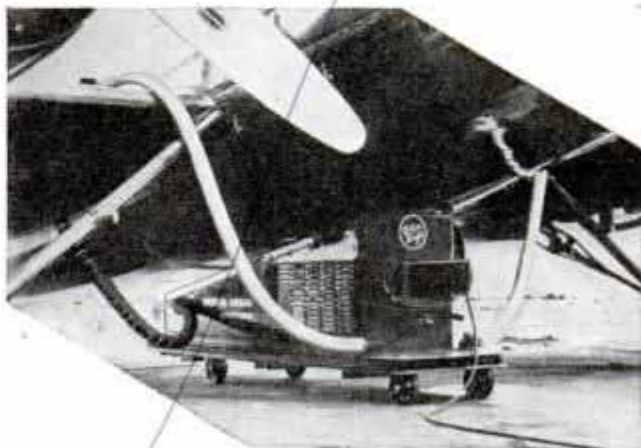


MAGNIFICATION 125 X

Top, Holding Steel Weld in Which Point of Welding Is Invisible; Below, Comparison of Welding Methods, with New Process at Bottom

Electric welding, combined with a new design of sheet-forming equipment, is used in the production of electrically welded seamless steel pipe. So perfectly are the pipes joined that not even microphotographs reveal a seam. As described by the discoverer of the process, Howard J. Burnish, it is like kneading two pieces of dough together. Just as they become one piece of the same substance, so do the two pieces of steel welded by the new process. The welded section is returned to the identical atomic structure of the original steel sheet from which the pipe is made. The Burnish process is said to result in cheaper production, greater strength and longer life, the latter due to freedom from electrolytic corrosive tendencies. Since both

ground absorb much heat so they are uncomfortably warm. To overcome this difficulty and keep the cabin comfortably



Portable Air Conditioner at Work Cooling the Cabin of a Sleeper Plane Before the Take-Off

PLANE PRE-COOLED BY PORTABLE AIR CONDITIONER

Railroad companies long have followed the practice of pre-cooling Pullman cars before they start on trips, and now a portable air conditioner has been developed by the Curtiss-Wright corporation for pre-heating or pre-cooling sleeper planes. The cabins of metal planes standing in the bright sun on the

moved - left no address

Refer my to Al. Lettler 32/3. 4th Ave. Pittsburgh Pa.

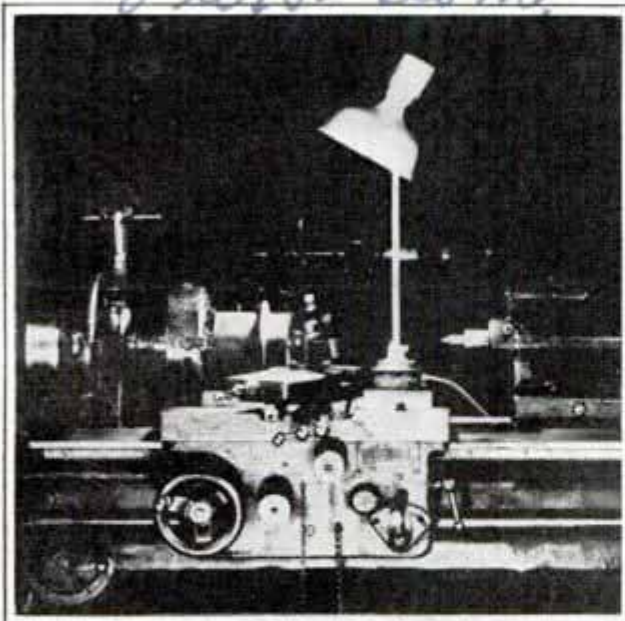
27 W 57th St. New York City

warm or cool until the ship gets in the air and the ventilating system begins to function, the ground ventilating unit has been made. It is a combination electric refrigerator, electric heater and building ventilator, thermostatically controlled to keep the cabin comfortable at all times while the ship is on the ground. It can change the air in the cabin every two minutes and stands under the ship and distributes the air through the regular ventilating and heating channels. This unit makes it practical for passengers to retire while the ship is on the ground and be assured of adequate ventilation and temperature until the take-off.

**LIGHT DIRECTED ON MACHINERY
BY ADJUSTABLE UNIT** *D501*

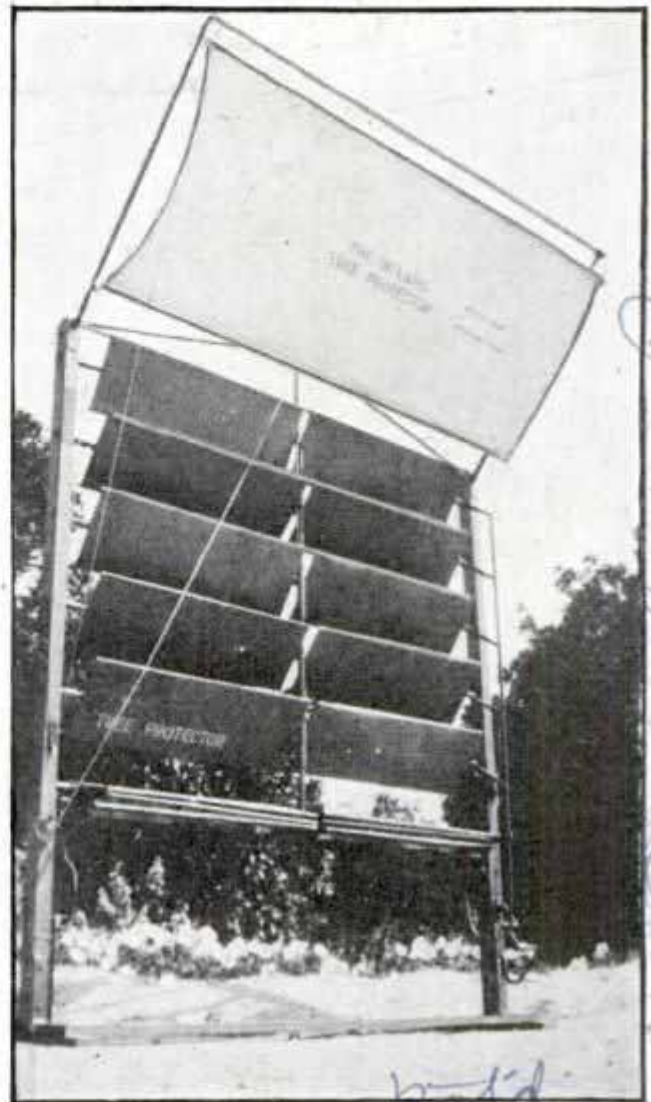
Better light for the machinery operator is provided by a compact, adjustable unit. It is equipped with an aluminum reflector, the reflecting surface of which has a special finish worked into the metal. Fire and weather proof, the unit is portable, having its own wiring system, socket and independent switch. Rigid, hollow tubing forms a stand for the lamp. Adjustment of the unit to any and all angles is controlled, and firmly held, by means of stops and

Felers. Home



Handy Lamp, Shown Outlined in White, Directs Illumination on Work at Machine

set-screws. Flexible tubing is used to connect the unit with supply wires in the usual outlet box. The lamp also protects the eyes of the operator from glare.



Wind Deflectors in Frame Control Air Currents in Orchard to Promote Growth

**WIND LOUVERS GUARD ORANGES
BY DEFLECTING AIR**

By directing hot or cold air currents away from the trees, wind louvers are protecting oranges in California orchards. The equipment consists of louvers twenty feet long, set in frames twenty-four feet high. For wind control, the louvers extending along about half of the windward side of the grove are set by means of a gear at forty-five degrees from the horizontal. Air currents striking the blades are lifted over the trees. For frost protection, the louvers are set at an opposite angle. In tests, the louvers have been found capable of checking the wind velocity in the grove from twenty-six to thirty per cent and of raising the temperature above freezing point when the thermometer registered twenty-eight degrees Fahrenheit in neighboring orchards.

John Ireland, John A. Heem, C. W. Kelly

Walker Reflector

Sea Phone Aids Rescue of Submarine Crews

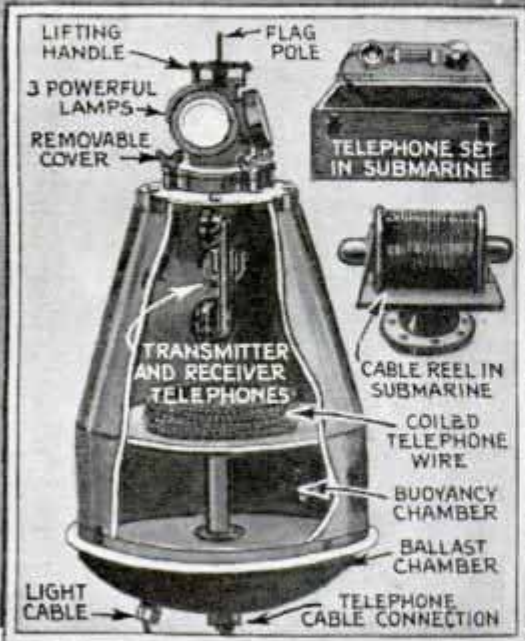
NEW TYPE OF TELEPHONE BUOY ON SURFACE - THE POWERFUL LAMPS INDICATING ITS POSITION AFTER DARK



BUOY ON SURFACE - COVER REMOVED AND BOAT'S CREW IN TELEPHONIC COMMUNICATION WITH CREW OF SUNKEN SUBMARINE



TELEPHONE AND LIGHT CABLES

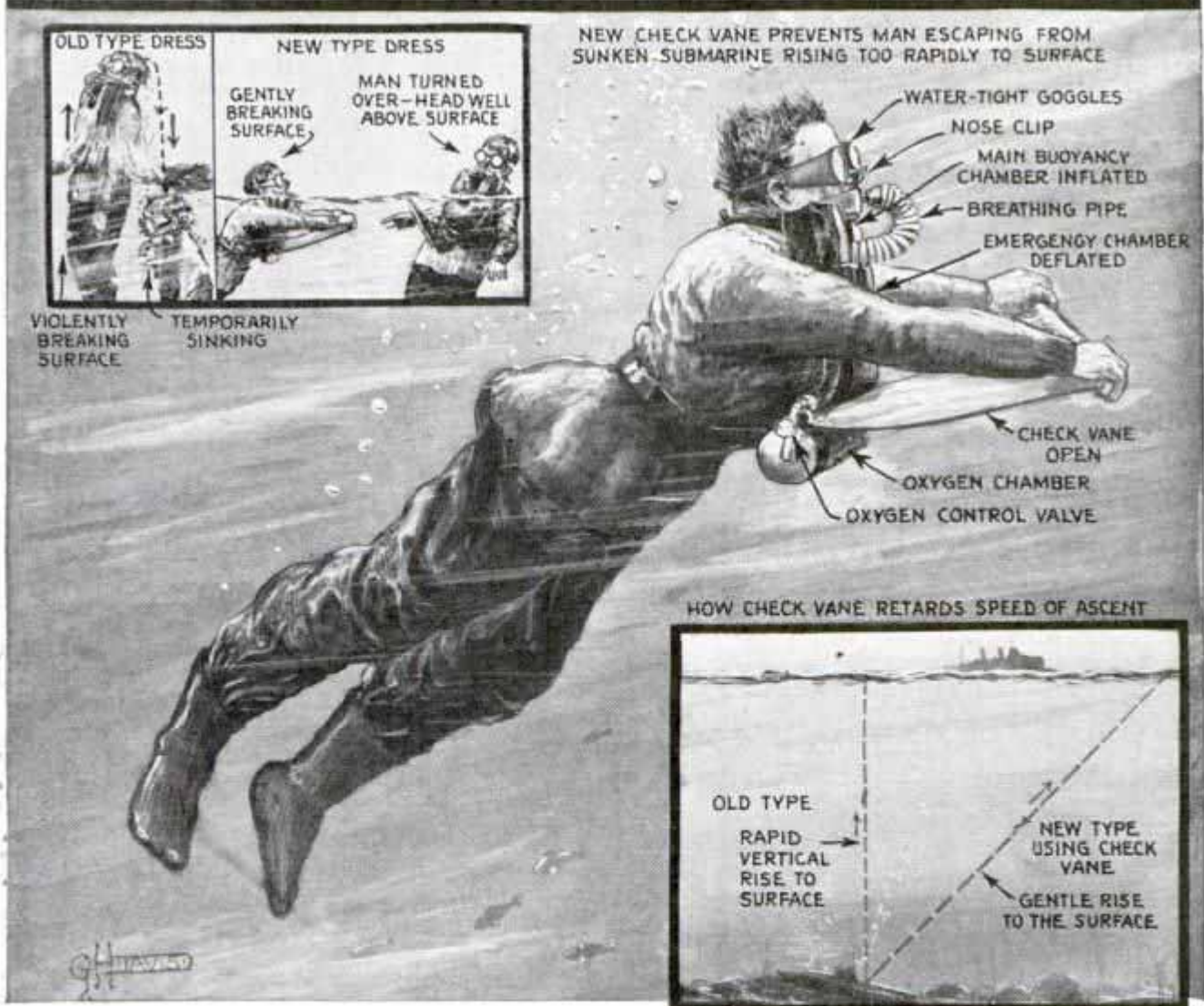
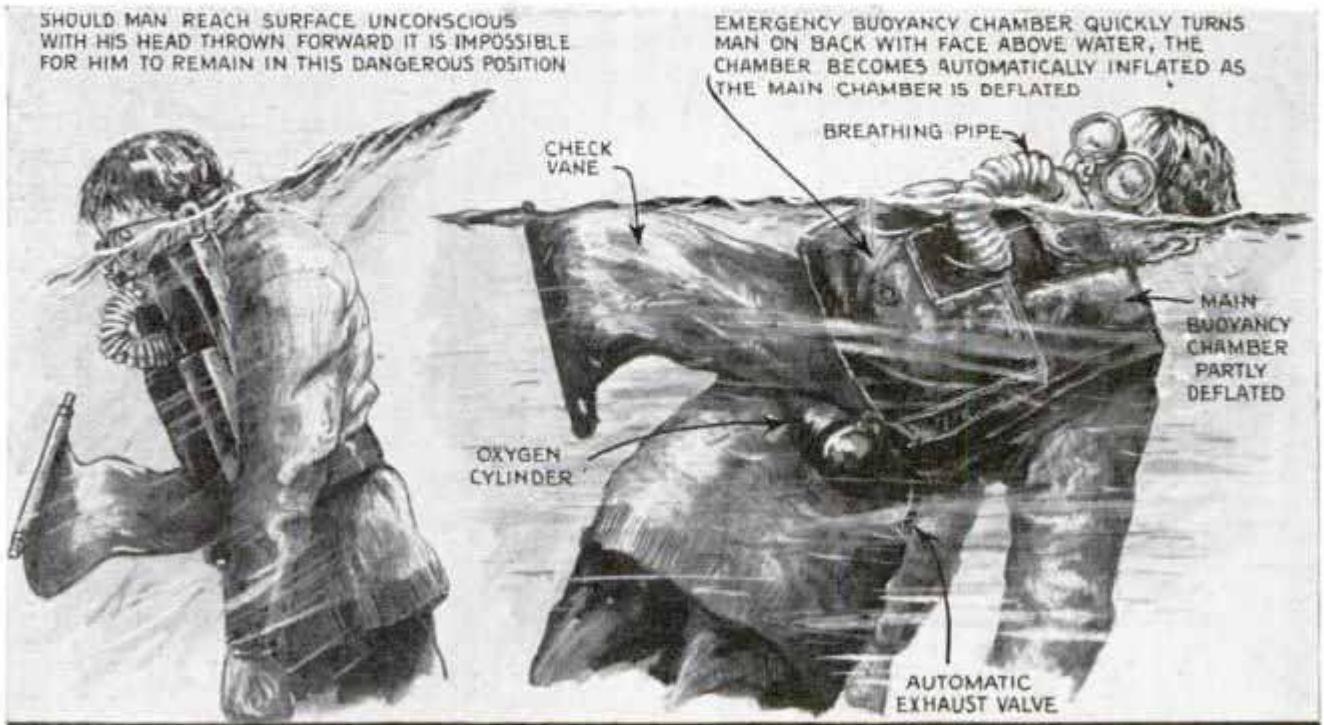


Great Britain Has Adopted New Escape Gear for the Crews of Sunken Submarines, a Part of Which Is This Lighted Telephone Buoy to Establish Communication with the Underseas Craft

Cmt. ds. H. Sears, Cog. "Limner" Bellside Road, a well known England

2624 Messrs. Osbe, Norman & Co Ltd, 187 Westminster Bridge Road, S.E.1, London, England

Water "Parachute" Lifts Survivors to Surface

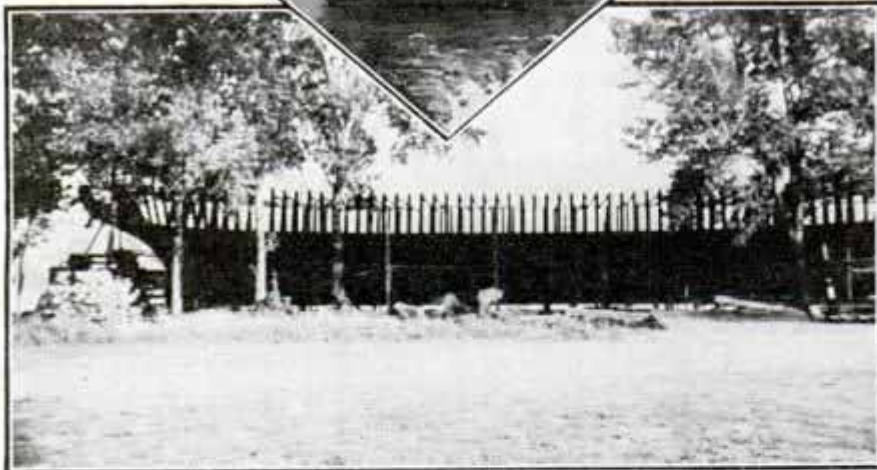
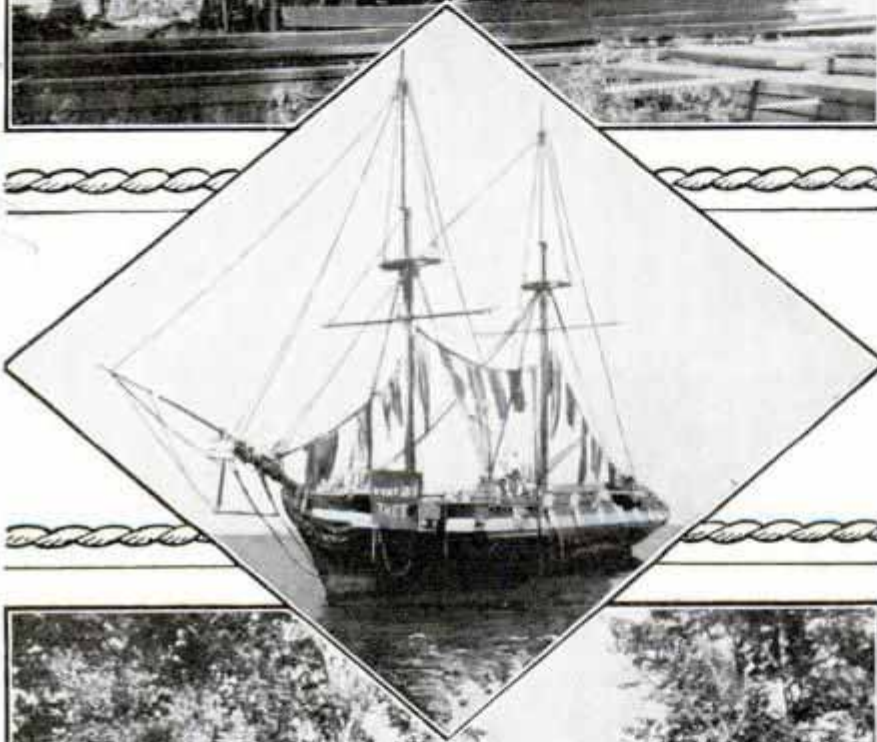
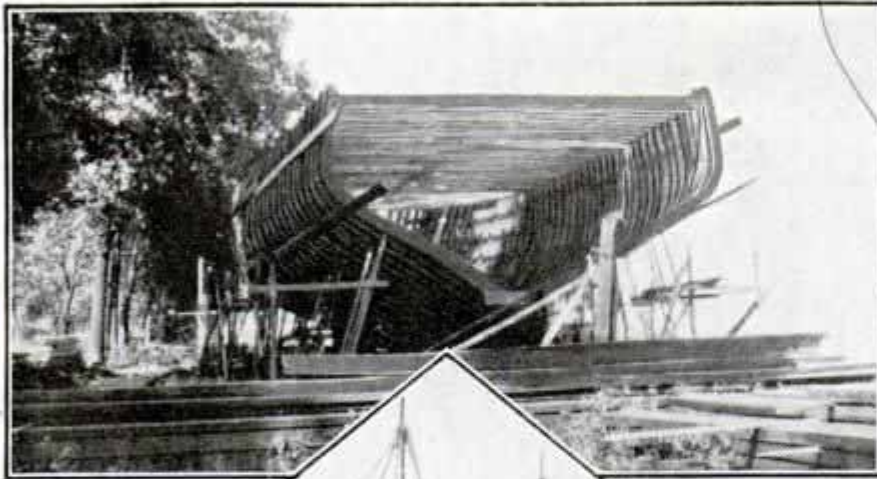


Escape Equipment Includes Check Vane or Water "Parachute" to Govern Rate of Ascent and Emergency Buoyancy Chamber to Keep Survivor on Back with His Head above Water

414
256

James Purcell
President
Erie, Pa

Perry's Flagship in Lake Battle Is Restored



was sunk as obsolete under orders of the navy. In 1911, it was raised, rebuilt and taken for a tour of the Great Lakes, but sank in Misery bay again. Now, under supervision of the Niagara Memorial Commission of Pennsylvania, the "Niagara" has been raised a second time. Outside planking, three inches thick and cut to shape, has replaced heavy ancient black timbers of the original ship wherever necessary. Although 110 feet long and with a beam of twenty-nine feet, the "Niagara" was built originally with only nine-foot draft to permit her to sail the shallow bays indenting Lake Erie. The ship has been re-calked and awaits only new rigging and mastheads.

© 2056

STRINGLESS PIANO IS AMPLIFIED ELECTRICALLY

Production has been started on a piano with no strings. Instead of having lengths of wire to produce the tones, short slivers of steel only a few inches long are vibrated by electricity. The instrument, called a clavier, uses a piano keyboard to actuate tone production,

the resulting notes being ninety per cent fundamental and only ten per cent overtones. Tones are produced by plucking a steel bar which has been grooved to the proper tune. The almost inaudible sound thus created is picked up by magnetic induction and passed through an audio-frequency amplifier having a capacity of thirty watts, as contrasted with the two or three of the average radio amplifier. Thus the player has available a tone ranging

Top, Restoration of Flagship in Progress; Center, as It Appeared upon Its First Restoration; Bottom, After Being Taken from Lake

For the second time in more than 120 years, Com. Oliver Hazard Perry's historic flagship "Niagara" is being rebuilt, not far from the Pennsylvania forests out of which the ship was originally hewed. In a naval battle on Lake Erie during the war of 1812, Perry's flagship, "Lawrence," was shot away. The Commodore transferred his flag in an open boat to the U. S. S. "Niagara" and turned the tide against the British. The "Niagara" later

Cont. John Winters Fishing, 240 Wallace Ave Buffalo, N.Y.

Chas. Prof. Lloyd Loar
Wintone Co.

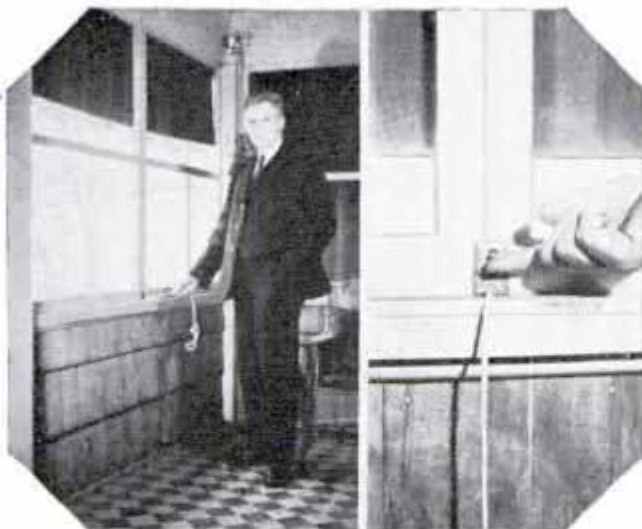
12/28/33

from a mere whisper to one balancing an orchestra, with little distortion or dilution. The impact noise, sometimes audible in the ordinary piano, is filtered out, producing what are said to be pure tones, capable of blending with other tones. By using earphones, the piano student can practice on this instrument without disturbing anyone else. The piano of the future, the makers claim, will use the tuned slivers of steel and will be little more than the keyboard since the piano movement occupies only a few inches of space.

D608

STORM CURTAINS FOR PORCHES ALSO USED AS SUNSHADE

Screened porches may be protected from wind and rain by canvas curtains attached to heavy spring-controlled shade rollers. Fastened outside the screens, the rollers are operated by a cord attached to the curtain and run through the shade holder, which acts as a curtain rod pawl. The shade holder is fastened to the bottom of the screen frame. Pulling the cord from the inside of the porch draws down the curtain and closes out wind and rain. The curtains also may serve as a sunshade because they can be stopped at any level.



Curtains on Rollers Protect Porch from Wind and Rain; Cord Control Is Shown at Right

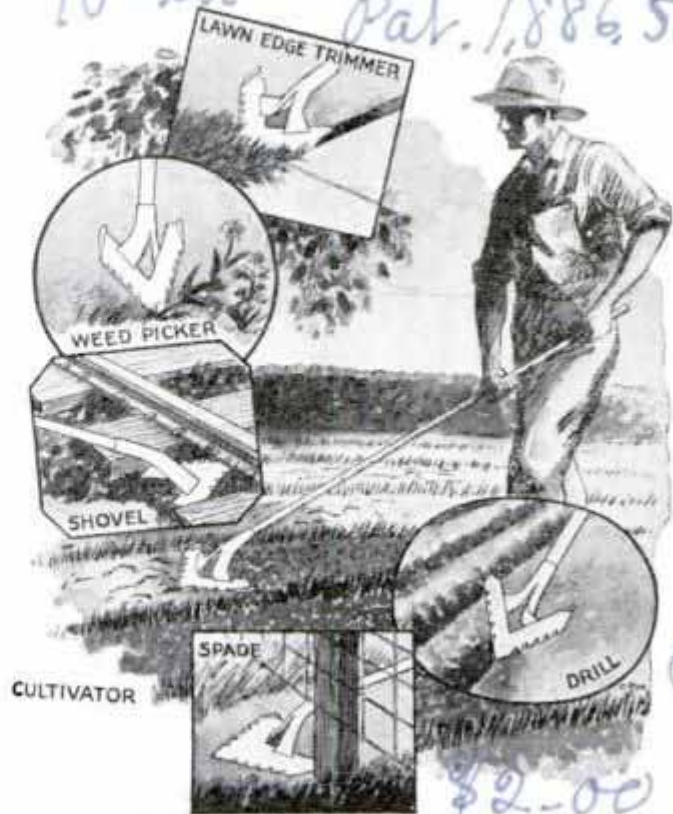
D592

HAND CULTIVATOR LIKE SPEAR DOES WORK OF OTHER TOOLS

Time and labor are saved in working the garden or lawn by using a wedge-shaped hand cultivator which, it is claimed, combines ten tools in one. It can be used as a spade, hoe, drill, cultivator, pulverizer,

10-in-One.

Pat. 1,886,560

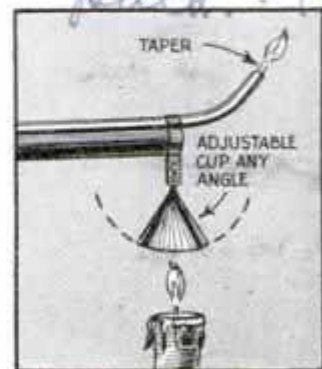


Hand Cultivator for Garden or Lawn Which Does the Work of Several Ordinary Tools

rake, weed picker, grubbing hoe, hedge ax, or lawn edge trimmer. The spear-shaped steel tool has serrated cutting edges beveled so that friction tends to keep them sharp. For most work, the tool is operated with a pushing motion instead of pulling or chopping. It is especially designed for shaving vegetation smooth on the surface of the soil, for cultivating around and under shrubs and for trimming along concrete edges and under fences. It can be obtained in two sizes, with a twenty-three or twenty-seven inch cutting surface.

CANDLE SNUFFER IS ADJUSTED TO ANY ANGLE

Candles in places hard to reach can now be extinguished with the same long-handled taper lighter used to fire the wicks. The long handle contains the taper and there is also an adjustable funnel-shaped cup which extinguishes the flame when placed over it.



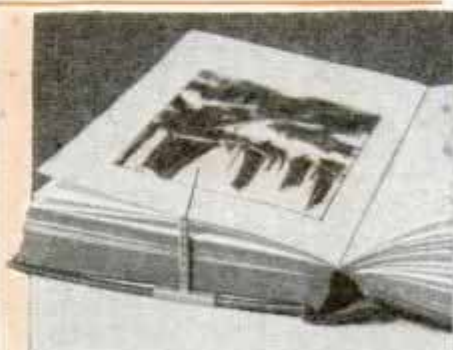
patd 1926

Anton Schroeder
217 S. Carroll Ave

Wander Light Co 281 W. 10th St
St Paul, Minn, Tex

maurice & dovein, safety of form. I have been advised by...

Latest HOME



Left, Moisture-Proof "Cellophane" Cap Permits Clear Vision and Keeps the Hair Dry in Shower without Disturbing the Coiffure; It Fits Loosely over the Head; Right, Automatic Bookmark That Clips on Back of Book and Holds the Place When Reader Is Interrupted; It Is Made of Metal in a Variety of Colors

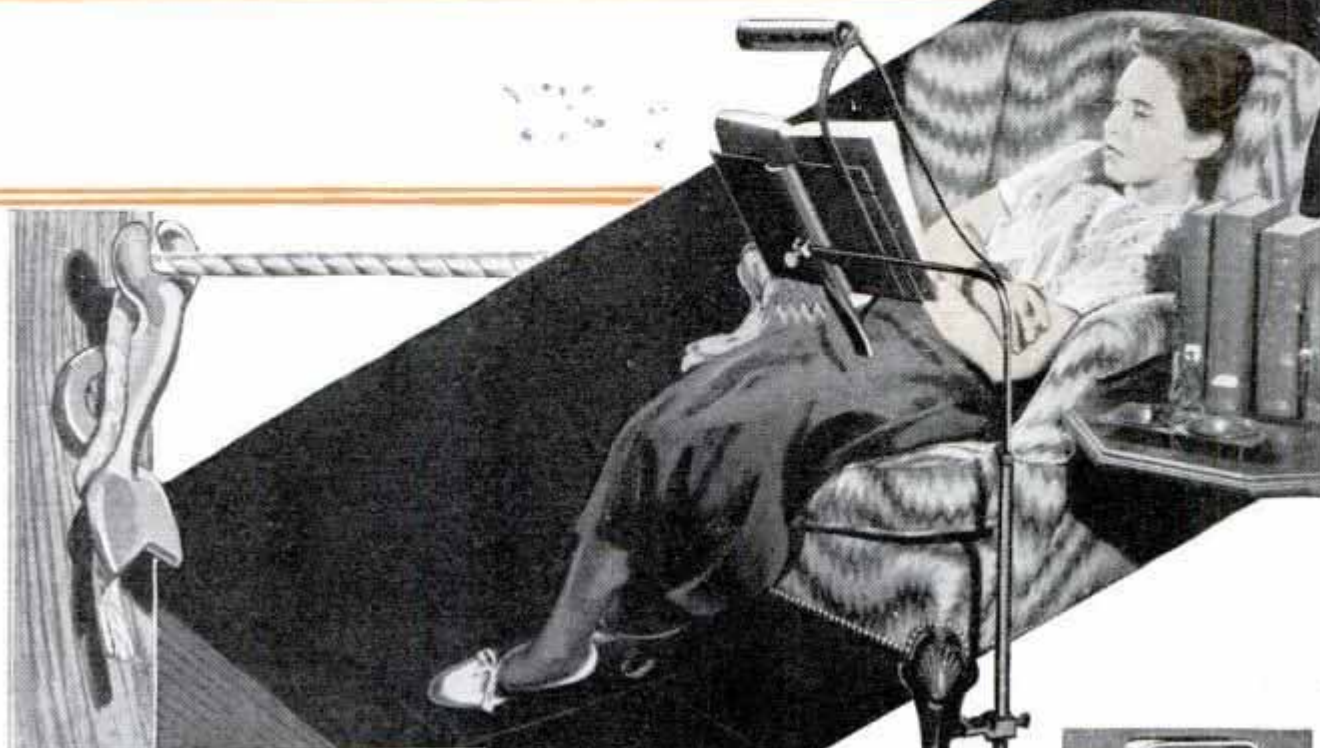


Above, Handle of Any Length May Be Attached to Scrub Brush or Floor Brush by Means of This Patented Clamp That Fits Any Flat-Top Brush; One Set Screw Will Clamp It to the Handle and Brush



Above, Wheels of This Sharpener Are Made of Hardest Steel Known, Making It Possible to Put Keen Edge on Hardest Stainless Steel Knife; Left, Special Flakes May Be Placed Directly in Suds for Bluing; No Separate Rinse Is Necessary in Giving the Weekly Wash Just the Right Amount of Bluing

ACCESSORIES



Left, Clothesline Clamp Grips the Line Automatically, Making Loosening or Tightening Easy; Right, Adjustable Reading Rack with Tubular Lamp; Bookholder—with Rubber Tips Holds the Pages Down; Pressure at Base Permits Turning of Page

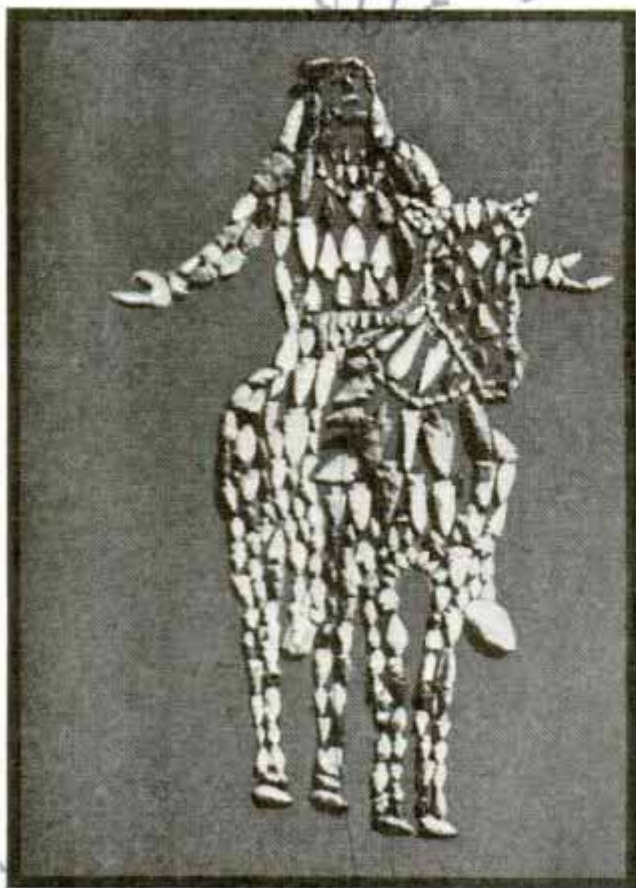


Above, Handy Copper Shelf Rack Provides Hooks for Skillets, Stew Pans, Double Boilers and Other Utensils Hard to Store; It Is Twenty-Two Inches Wide, with a Five-Inch Shelf on Top for Pot Covers, Etc.; Number of Hooks Can Be Varied



Above, Combined Juice Extractor and Strainer Does the Work in Half the Time and Saves About Ten Per Cent of Juice Lost by Similar Devices; Illustrations Show Simplicity of Operation; Left, Hot-Water Tank Is Heated with Radiator Alcohol; the Fuel Tank, When Filled, Heats Full Tank of Water to Almost Boiling Point; When Half Tank of Water Is Required, the Fuel Container Is Filled Only Half Full; When Fuel Is Exhausted, the Burner Stops without Attention or Danger

D 484



Reproduction of a Famous Remington, This Work of Art Is Composed Entirely of Arrowheads

ARROWHEADS IN ART GROUPS RESEMBLE PAINTINGS

Mounted upon bristol board by means of small wires, Indian arrowheads have been arranged by one collector to resemble famous paintings. Two of the most popular groups are reproductions of the Remingtons, "The Last Trail" and "Plea to the Great Spirit." One group resembles a life-sized bear, another follows the lines of a large buffalo and a third depicts an Indian chief and his squaw.

LOCK-SEAM METAL ROOFING IS EASY TO LAY



Offering new protection against blowing out, leaks, buckling and rattling, a new metal roofing is constructed with seams that lock. The roofing is easier to lay than many other types because the sheets are re-squared before forming to insure per-

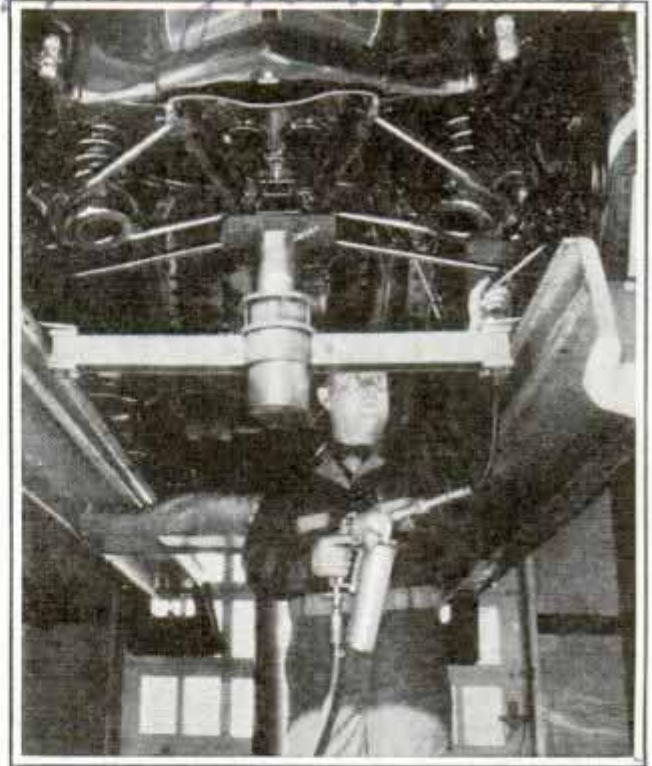
fect fit and alinement and because the lock-seam feature makes lapping simple. Nails driven through a special flange are covered by side lapping sheets, resulting in longer service than is obtained ordinarily from roofing with exposed nails. The lock-seam roofing can be laid directly over wood shingles.

D64

AUTO LIFTER FOR USE OVER PIT TAKES WEIGHT OFF WHEELS

Operated by any type of air compressor, an automobile jack for use over pits and for drive-on lifts takes the weight off the wheels when the car is raised. This enables grease to flow freely on all sides of steering spindles and king pins, removes the tension from tie rods and drag links for easy lubrication, frees spring shackles and spring leaves for more complete penetration of lubricant, makes removal of front wheels for repacking easy and also makes an easy task of changing tires, wheels and tire chains. The lifter spans the runway in any position and raises

\$40.00 for Case. Pat. 1117



Auto Lift for Pit Which Takes Weight Off Wheels and Enables More Thorough Lubrication

front or rear of the chassis with complete safety, including models with "knee-action" wheels. Support brackets are adjustable to variance of track guide flanges, making installation easy.

Simmons Mfg Co
2405 Park St
Que

Edwards Mfg Co Case Butler and
P. S. Culbert. Cincinnati, O
79

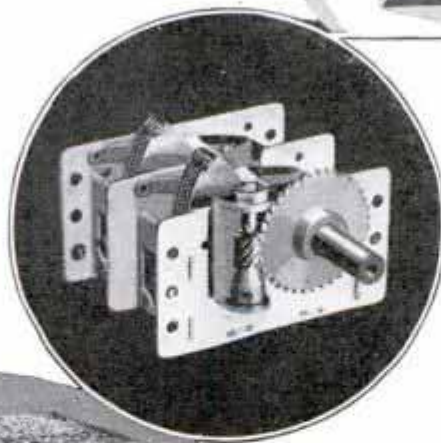


D 4557

COMPACT RECEIVER for S-W Listeners

SHORT-WAVE listeners can now enjoy foreign and domestic programs without the use of converters, adapters or plug-in coils. Combined in one compact unit, this short-wave receiver includes a built-in dynamic speaker and employs tubes of the latest type in a regenerative circuit composed of a pre-selector r.f. stage and a regenerative detector using the new type 6D6 super-control screen-grid tubes. A 6C6 tube is selected for the first audio stage and a 42 pentode for the power output to the electro-dynamic speaker. The usual type 80, full-wave rectifier, completes the line-up.

The set is housed in a metal cabinet $7\frac{1}{2}$ in. high, $7\frac{1}{2}$ in. deep and 17 in. long. The top cover has been removed in the upper photo to show the tube arrangement and compact assembly. The ganged tuning condenser, shown in the insert photo, is a geared variety to insure smooth operation.



The tuning dial is divided into 4 bands, numbered from 1 to 4, which are selected by a 4-position switch similarly numbered. The upper portion of the transparent traveling pointer on the dial covers the bands calibrated in megacycles (1 megacycle equals 1,000 kilocycles).

For those more familiar with station logs written in meters, the lower portion of the pointer indicates the same readings in meters, and pencil-point holes are arranged on a guide line so that the dial can be accurately logged.

Provision has been made for the use of a doublet antenna in noisy locations, ordinarily a single wire is employed.

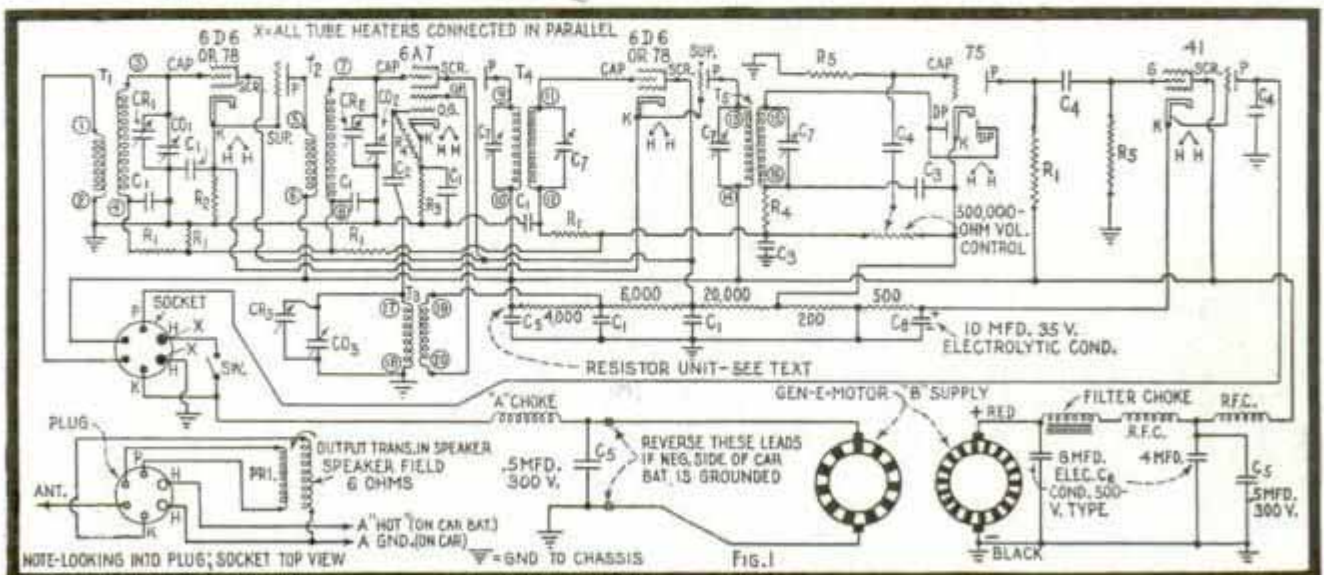
The Ballcrafters Co. 417 N. Tel. Sup 2025 Dale, Chicago

FIVE-TUBE Auto

By FRANK M. LUND PART I

THE particular radio experimenter will find everything he is looking for in this homemade 5-tube all-electric superheterodyne auto receiver. Although the layout is of advanced design, construction has been simplified so that any careful beginner can assemble it with very few tools. Thoroughly tested by Popular Mechanics radio laboratory in actual road operation, the results were highly satisfactory in every respect.

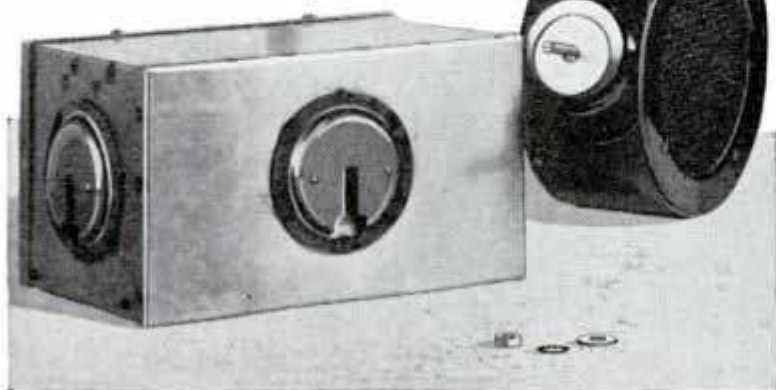
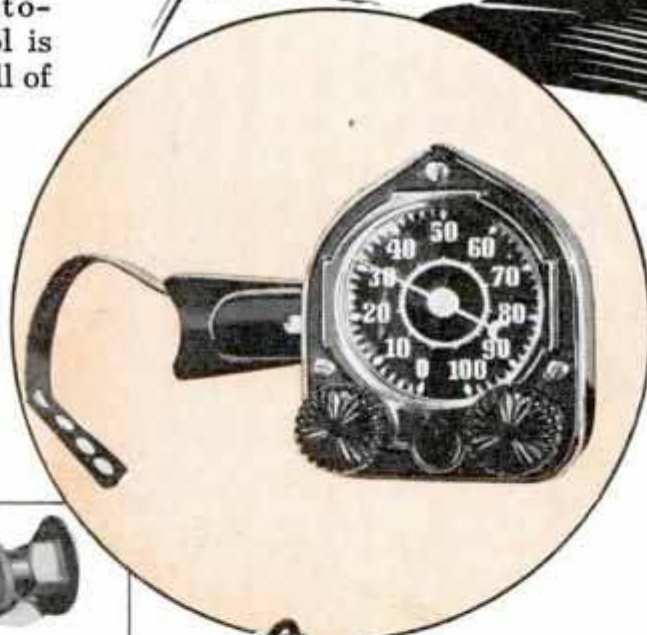
The superheterodyne circuit used has the advantage of excellent sensitivity and selectivity for a minimum number of tubes and parts. No B-batteries are required as the power unit consists of a small built-in gen-e-motor. This practically trouble-free B-eliminator costs but slightly more than a good set of B-batteries; it operates directly from the 6-volt car battery and only draws about the amount of current necessary for the operation of one auto headlight bulb. Four connections are



ALL-ELECTRIC Receiver

required for this unit, which is mounted directly on the base at the left, as shown in the photo.

Other features in addition to the trouble-free power unit are: automatic volume control, coast-to-coast range on a limited antenna, excellent tone quality, and selectivity sufficient to separate strong local stations and bring in really distant programs on adjacent channels without local interference. The automatic volume control is made to function on all of the r.f. and intermediate tubes instead of one or two tubes, as now in general practice. A 6-in. dynamic speaker is housed in a separate metal case that is easily mounted in any convenient po-

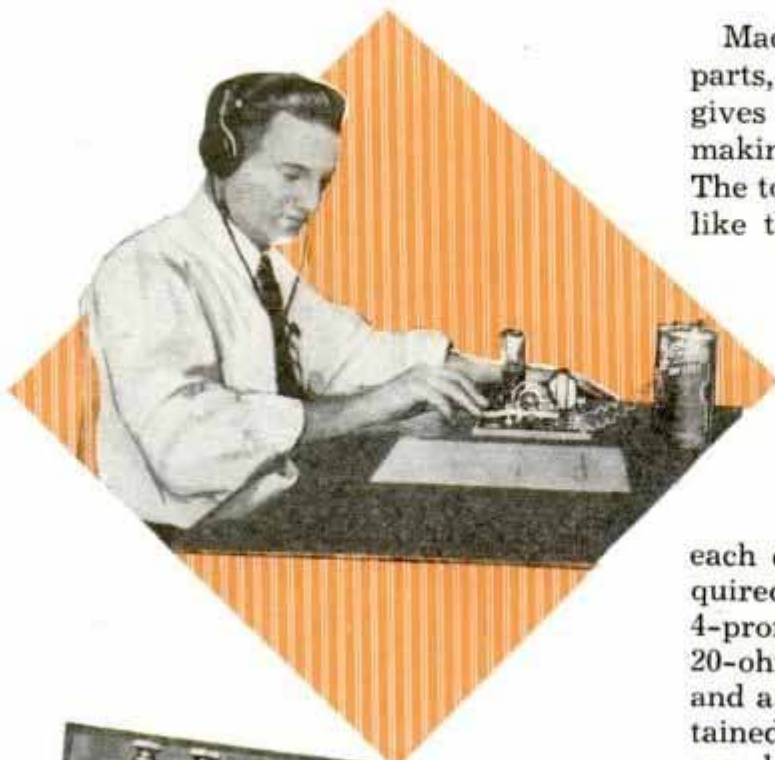


sition, by means of a single bolt.

The schematic circuit diagram is given in Fig. 1; a simplified wiring diagram, together with further construction and installation details, will appear in the September issue. The tubes are all of the new special-purpose type and the line-up from right to left, as shown in the photo, is as follows: 1 type 6D6, or 78, for the tuned r.f. stage; a 6A7 which combines the first detector and oscillator; 1 type 78 for the intermediate amplifier and a 75 which combines the second detector and high-gain first audio stage. The fifth tube, at the front, is a type 41 which is the pentode power-audio amplifier. The first four tubes are all inclosed in tube

(Continued to page 116A)

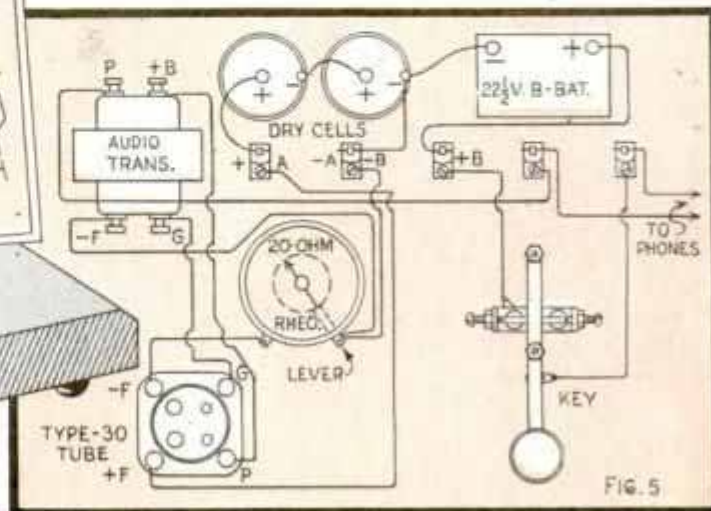
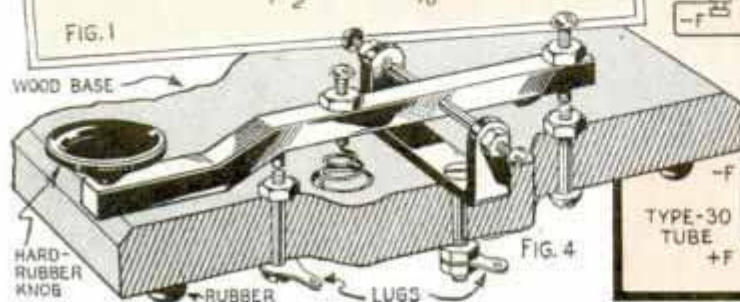
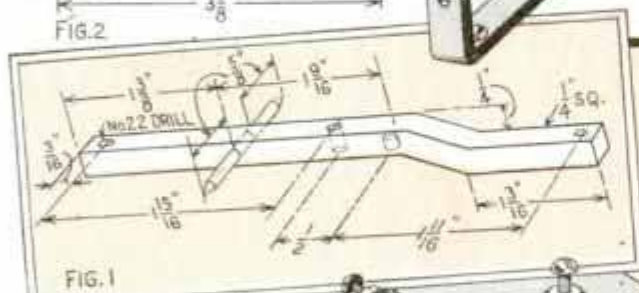
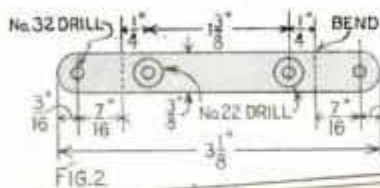
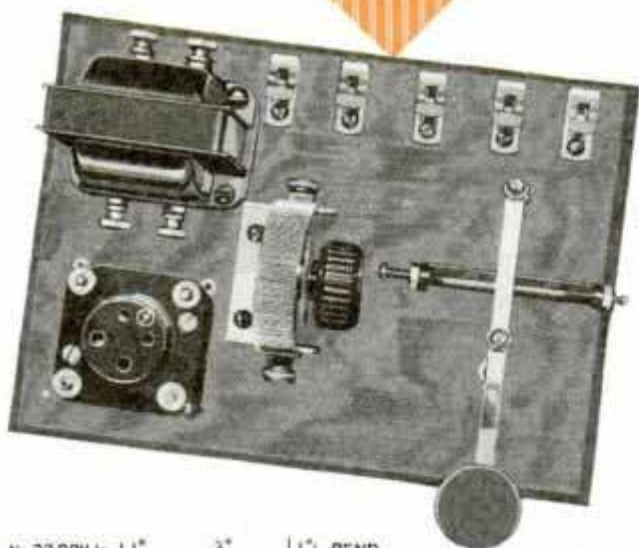
Homemade Code-Practice Set for Beginners



Made from odds and ends of old radio parts, this inexpensive audio oscillator gives a fine signal in the phones without making any disturbing noises in the room. The tone may be adjusted to sound exactly like the radio dots and dashes heard on the air, a further advantage over the noisy and inefficient doorbell buzzers usually employed by beginners for code practice.

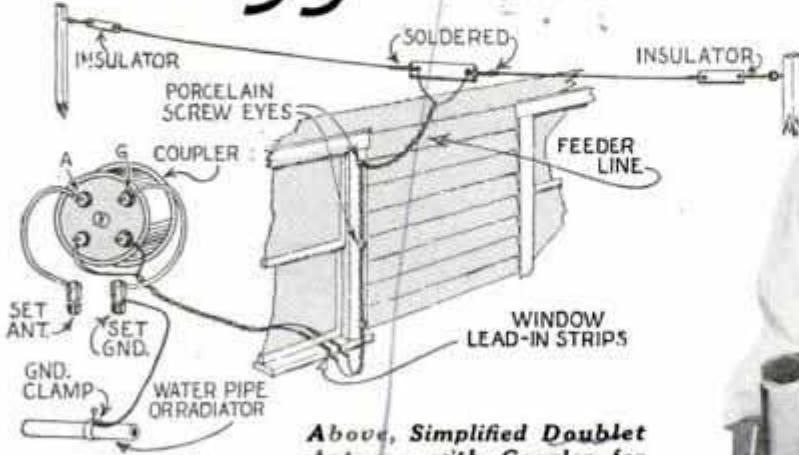
All parts are mounted on a hardwood base $\frac{1}{2}$ by 8 by 10 in., the edges are beveled and rubber-headed tacks are placed under each corner. The following parts are required: 1 audio transformer, any ratio; 1 4-prong tube socket; 5 fahnestock clips; a 20-ohm rheostat, with mounting bracket, and a key. The terminal clips may be obtained from old B-batteries and the key can be either homemade, as shown, or purchased for about \$1.00. Detailed construction diagrams are given for those who wish to make the key. The lever, in Fig. 1, is made from a piece of $\frac{1}{4}$ -in. square brass rod $4\frac{1}{2}$ in. long and bent as shown. The holes are drilled and tapped for 6-32 machine screws excepting those for the bearing rod and contact-mounting hole, which are made with a No. 30 drill. The bearing consists of a piece of $\frac{1}{8}$ -in. brass rod, $1\frac{1}{2}$ in. long, with the ends pointed as shown. This rod should fit tightly in the hole through the lever, with $\frac{5}{8}$ in. extending on each side. The lever contact consists of a piece of $\frac{1}{8}$ -in. brass rod, $\frac{3}{8}$ in. long, which is forced into the hole drilled part

(Continued to page 118A)

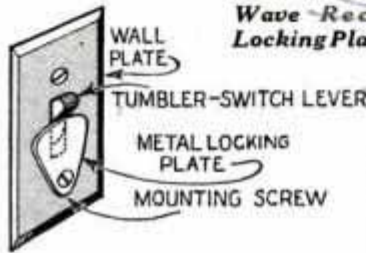


D455/145 Hudson St New York

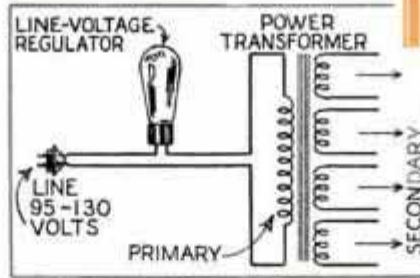
PRACTICAL RADIO Suggestions



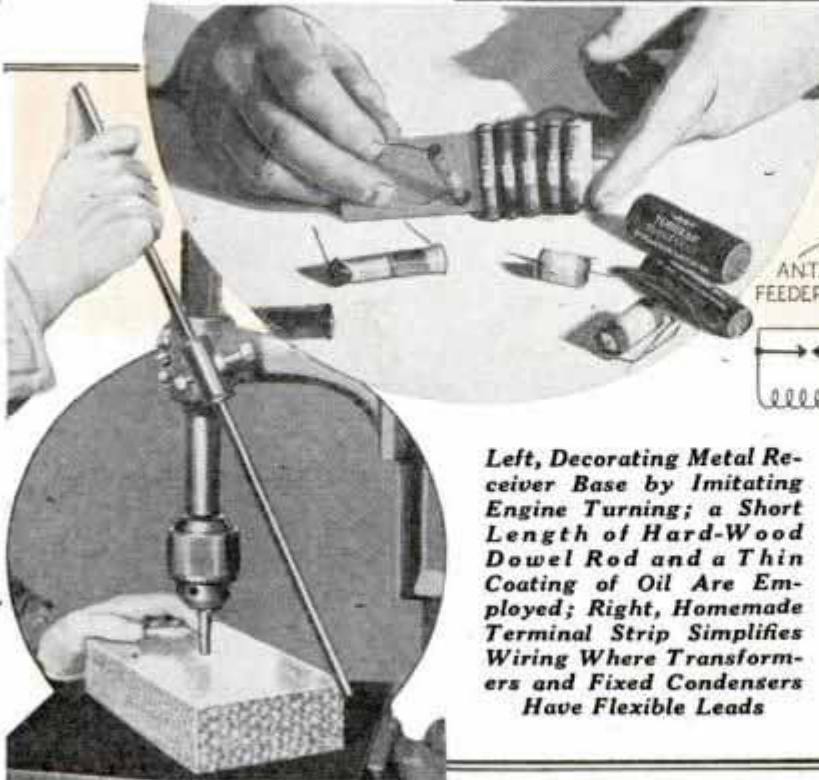
Above, Simplified Doublet Antenna with Coupler for Both Broadcast and Short-Wave Receivers; Below, Locking Plate for Wall Switch



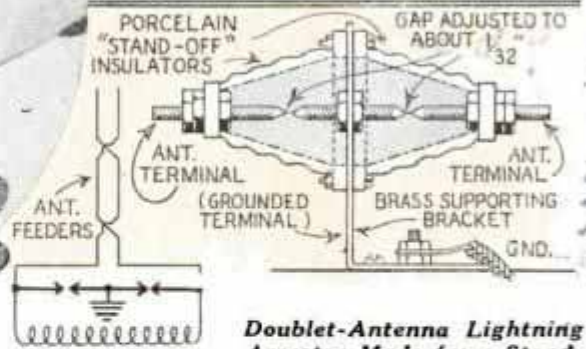
Below, Small Fixed Resistors and Tubular Condensers, Provided with Wire Leads for Wiring Midget Sets and Auto Receivers Where Space Is at a Premium



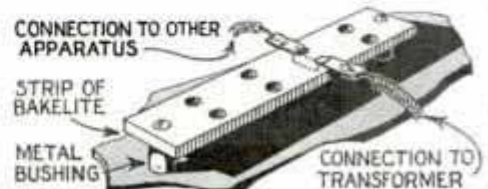
Voltage-Regulator Tube, in Series with the A.C. Supply Line to Any Power Pack, Automatically Stabilizes Fluctuating Power-Line Voltages; an Ordinary 4-Prong Socket Required Is Mounted Either on the Power Unit, as Shown Above, or at Any Convenient Near-By Point



Left, Decorating Metal Receiver Base by Imitating Engine Turning; a Short Length of Hard-Wood Dowel Rod and a Thin Coating of Oil Are Employed; Right, Homemade Terminal Strip Simplifies Wiring Where Transformers and Fixed Condensers Have Flexible Leads

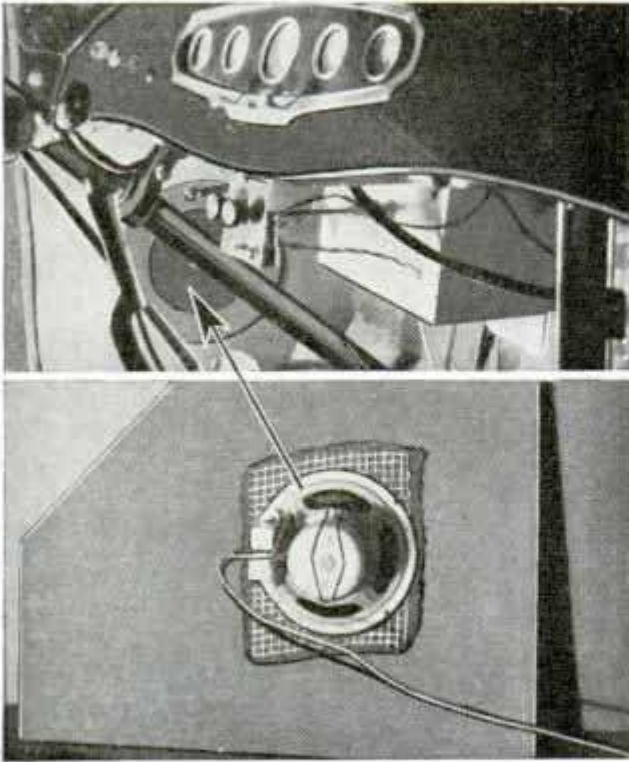


Doublet-Antenna Lightning Arrester Made from Stand-Off Insulators; Pointed Brass Screws Form the Gaps; Supporting Bracket Is Also Mounted on Insulator



D 44549 Ampereite Corp

*Laboratory,
Youngstown, Ohio*



Above, Speaker Installed in Side Panel; Below, Panel Removed to Show Method of Mounting

Auto Speaker in Side Panel Saves Space

When a heater and other gadgets occupy most of the available space under the dash, the speaker for the auto receiver may be installed in the cardboard side panel at the left of the driver. There is plenty of room for a small speaker behind this panel which also makes a good baffle. A hole is cut and backed with a piece of heavy wire screen to which the speaker is fastened.—P. S. Graffam, Waverly, Mass.

D4552

Radio and Phonograph Combined in Table Model

Although no larger than the average table-type receiver, this dual-purpose instrument includes a superheterodyne circuit and phonograph turntable. The receiver tuning range is extended to 3,500 kilocycles which includes all police calls and some amateur transmissions, in addition to regular broadcast programs. A dynamic speaker is used in the output for both the radio and pho-

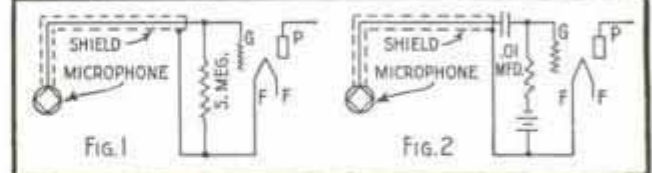
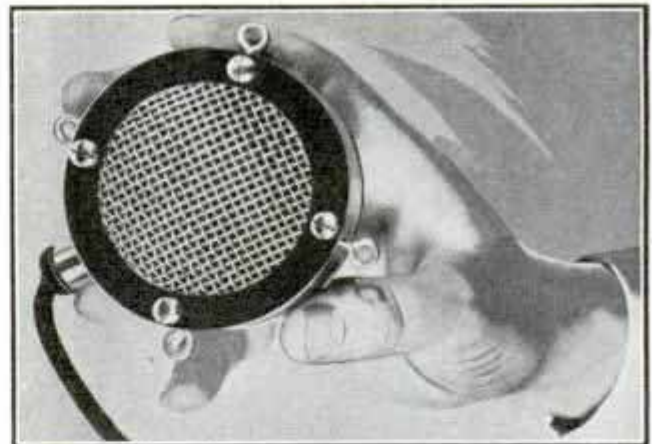


nograph; a two-point tone control and illuminated tuning dial complete the assembly. The phonograph plays 10 and 12-in. records and the manual-starting turntable is driven by a synchronous motor. Slip hinges in the removable cover provide for easy access to the turntable.

D4537

Crystal Microphone Eliminates Background Noise

The electrical properties of a Rochelle salt crystal are employed to advantage in this general purpose microphone. Installation and operation costs are reduced as no additional button current, field current or polarizing voltage is required. Owing to its high impedance, it may be connected direct to the grid and ground of the speech amplifier input tube, as shown in Fig. 1. When connecting in the cathode circuit, an isolating condenser is required as indicated in Fig. 2. No delicate adjustments are necessary with this crystal microphone; it responds equally well in any position and may be moved about while in



Above, Crystal Microphone with 6-Ft. Shielded Cable; Below, Diagrams Showing Simple Connections

use. The usual background noises are absent and the crystal is carefully protected against damage from humidity or moisture.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

*General Electric Co
Budgetpart, Com*



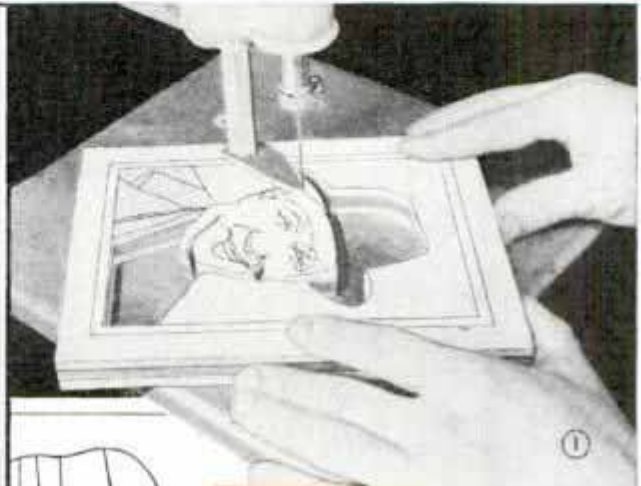
AMATEUR MECHANICS

INLAY

Your Own Portrait

in Wood

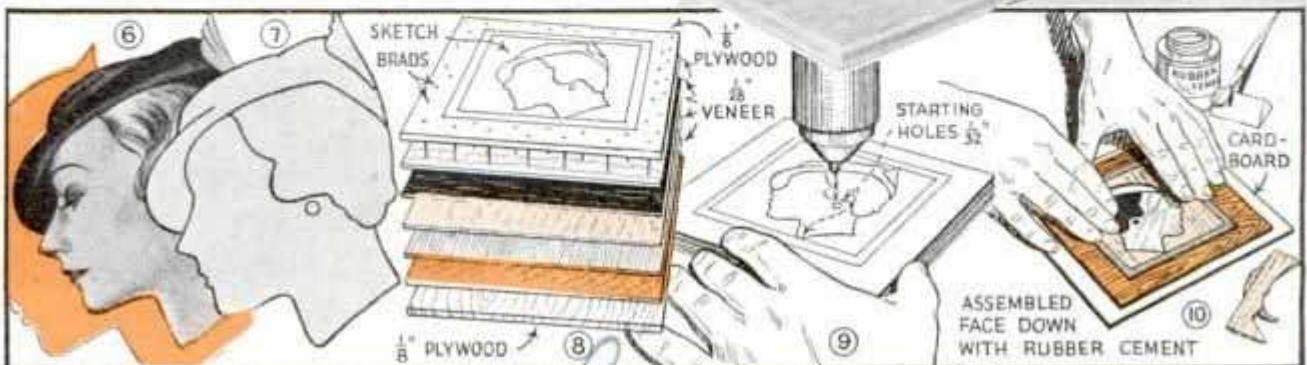
by Sam Brown



ONE of the most fascinating of all wood-working arts is inlaying, especially when the inlay is a finely textured and recognizable portrait of yourself or some other individual. The four steps of the process are shown in Figs. 1 to 4 inclusive. Fig. 2 shows the original photo; Fig. 3, the ink sketch traced from the photo; Fig. 1, cutting the veneer on a scroll saw, and Fig. 4, the finished inlay.



In learning the simple technique involved, it is advisable to start with a semi-silhouette effect. For example, take a magazine clipping as shown in Fig. 6, and from this make a tracing showing only the main bodies of the picture, as in Fig. 7. The sketch is then fastened with rubber ce-

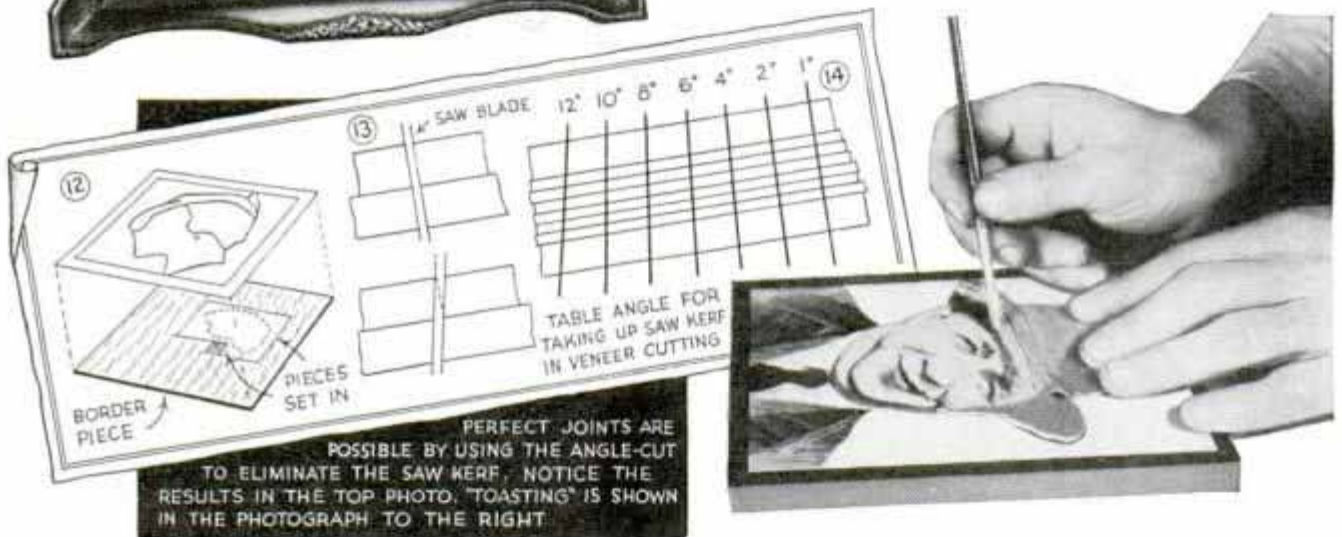


Wood Crafts Supply Co. Crafterman Wood Service
 166 W. 4th St. Chicago, Ill. 2727 Mary Ave. Chicago

A. L. Wild, 570 E. 11th



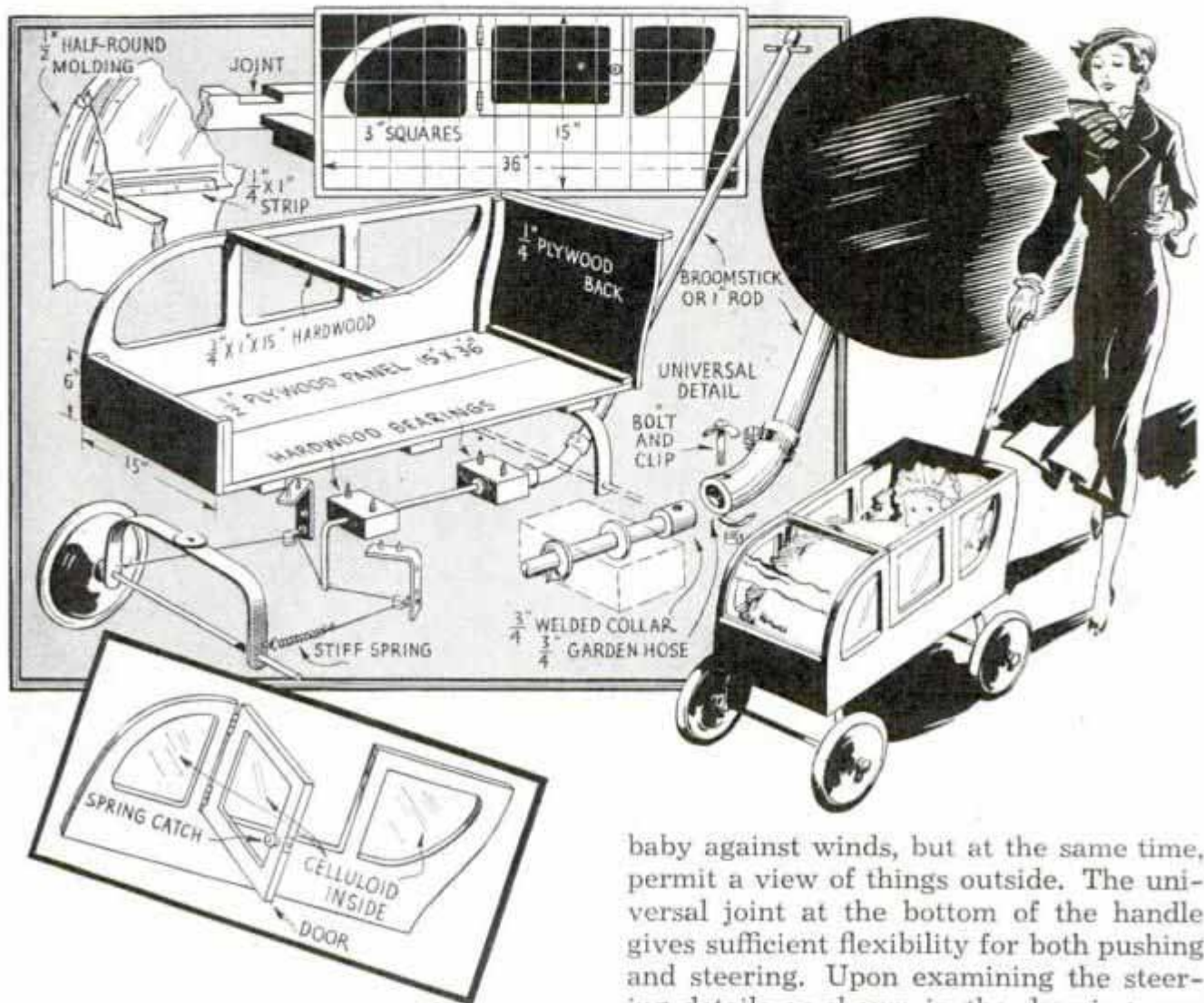
in Fig. 10. The permanent mounting for the portrait is a piece of $\frac{3}{8}$ -in. plywood. This should be cut a little larger than the picture. It is coated with a good grade of glue, and the assembled inlay then set in place, as shown in Fig. 5. Drive two or three brads through the inlay to guard against slipping, and then clamp the whole thing in a press or pile it heavily with weights. After drying, the waste stock is trimmed off around the edges. The seams are filled with plastic of suitable color. Sanding and shellacking complete the job. Several variations from this simple process will be noticed. First of all, a separate layer of veneer is not necessary for every color, but different pieces can be patched in, as shown in Fig. 12. Here, one layer makes the border, the earring and the hair.



ment to a piece of $\frac{1}{8}$ -in. plywood of the same size. The complete pad for the picture is shown in Fig. 8, consisting of plywood at top and bottom, with five layers of $\frac{1}{28}$ -in. veneer between, using different kinds of wood for the sake of contrast. This picture needs two starting holes, as shown in Fig. 9. These should be no larger than $\frac{1}{32}$ in. The picture can now be cut out on the scroll saw, using the very finest puzzle blades. All isolated pieces should be cut out first (the earring is the only one in this example), then the design is cut anywhere from the border, detaching only one piece at a time. After sawing, the veneers, which will actually make the finished inlay, are brushed on the face side with rubber cement. A piece of cardboard is coated with cement, and the inlay is assembled face down on the cardboard, as

Cutting is easier with less wood, which also means a saving. Angle cutting is important. If you cut the design with the saw table level, the blade, however fine, will take out a certain amount of wood at the seam. If the table is tilted to about 12° when cutting two layers, the angle will take up the saw kerf, and the pieces will fit together perfectly, as shown in Fig. 13. Fig. 14 shows the approximate angles for cutting through various thicknesses of veneers. Although the diagram shows the blade tilted; actually, of course, it is the table which is moved. The piece which is to fit inside another piece must be on the underside when the blade goes through at this angle. In actual cutting, you will find that the saw table must be moved constantly as you cross division lines calling different layers of veneer into play.

Baby Cart Is Pushed and Steered from Rear

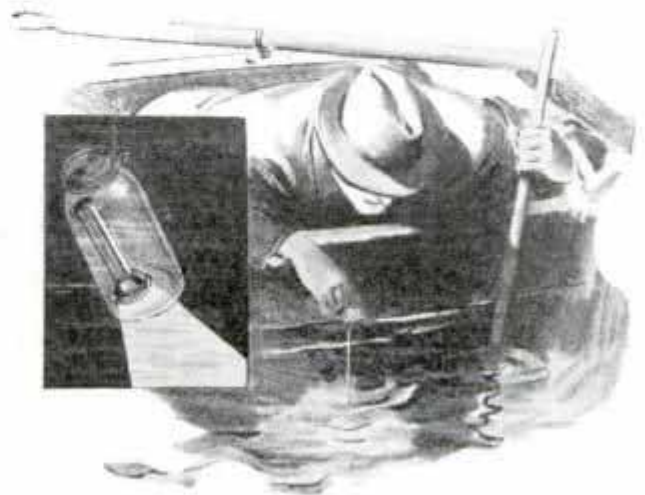


Steered by means of a convenient handle at the rear, which is also used to push it, this baby cart is made from an old coaster wagon. The sides and cowl have celluloid panes which help to protect the

baby against winds, but at the same time, permit a view of things outside. The universal joint at the bottom of the handle gives sufficient flexibility for both pushing and steering. Upon examining the steering details as shown in the drawing, you will see how simple the arrangement is. Pushing the handle to either side turns the front wheels in the same direction. A pleasing color combination is ivory with light blue wheels and trim.

Flashlight inside Fruit Jar to Locate Objects Lost in Lake

Watches and other bright objects that have been lost under water often can be located with the aid of a flashlight placed inside of a glass fruit jar, which is lowered into the water as shown. A stout string is tied to the jar and the cover is screwed on tightly, using a jar rubber to keep out the water. If the flashlight is not heavy enough to sink the jar, small rocks or pieces of iron can be put inside. Light from the flashlight will reflect on any bright article, which may then be recovered with a garden rake that has an extension tied to the handle.



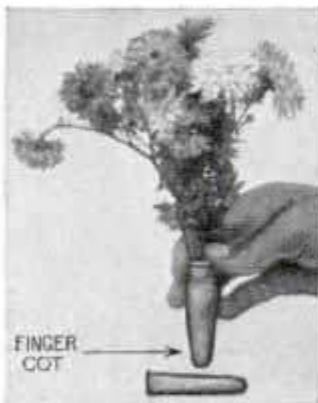


Gate Pivoted on Pipe Standard Is Supported by Chains Fastened to a Crossbeam Above

Swinging Gate Closes Automatically

Revolving on a vertical pipe standard having the bottom end set in concrete and the upper one slipped through a hole drilled in a crossbeam overhead, this novel gate opens easily and closes automatically. The gate frame is made of 4 by 4-in. stock, and the top and bottom rails of the gate are drilled in the center to take the pipe. Chains fastened to the upper rail and the crossbeam, in the manner shown, hold the gate above the ground and cause it to close when released.—Alfred H. Taylor, Jr., Edgewater, Colo.

Rubber Finger Cot Keeps Bouquet of Flowers Fresh



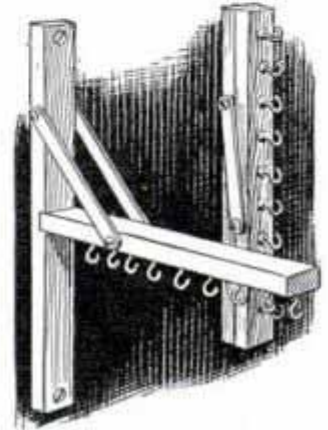
When a small bouquet of flowers is worn on the clothing or carried in the hand, a rubber finger cot fitted over the ends of the stems will help to keep the flowers fresh. Cut off the stems evenly, and then wrap a dampened cloth

around them, and over this put the finger cot. This will prevent evaporation of moisture from the cloth so that the flowers will get the full benefit of it. These cots

can be obtained in almost any color, so that when the bouquet is worn on the clothing the cot will not be noticeable.

Folding Hangers Save Space in Clothes Closet

Screwed to the wall in a clothes closet, this folding hanger will save considerable space. It is made from two pieces of hardwood, which are pivoted together by means of two pieces of flat iron, as shown. The arm has several screw eyes driven into the under side to hold the hangers, and when in use, the lower end of the arm rests in a notch cut in the vertical piece. The hanger is also handy for use in small kitchen pantries for holding pots and pans and other kitchen utensils.



—D. Loudermilk, Caldwell, W. Va.

Sand Cleans Small Brushes

To remove paint and varnish from a brush, and at the same time thoroughly dry the bristles, after washing with kerosene or gasoline, it is a good idea to work fine, dry sand into the bristles as shown. The sand absorbs the paint remaining on



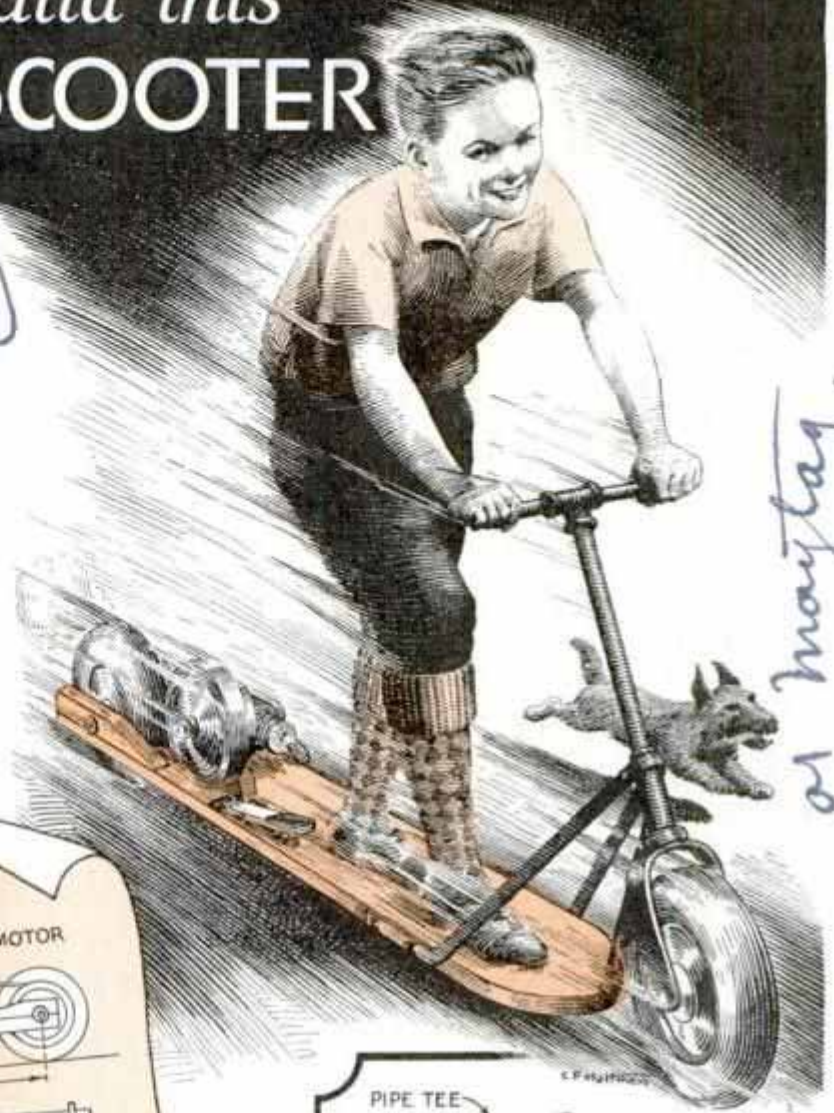
Paint and Varnish Removed from Brushes by Working Sand in between Bristles

the bristles after cleaning. When clean, remove the sand from the brush. If fine sand is not at hand, corn meal can be used instead.

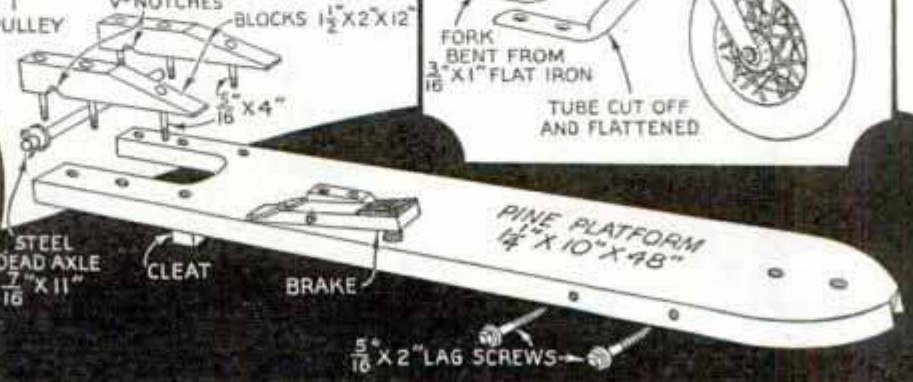
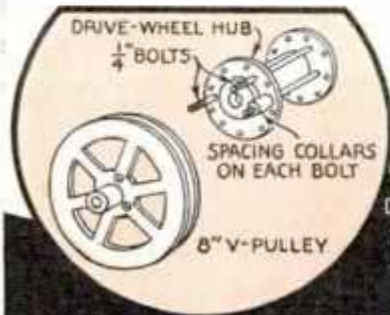
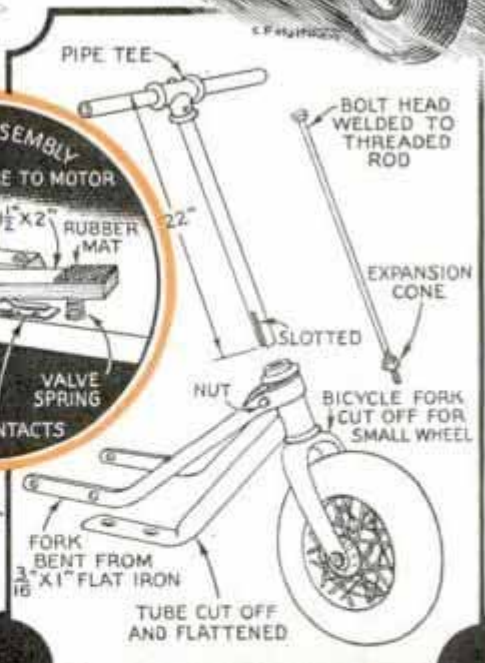
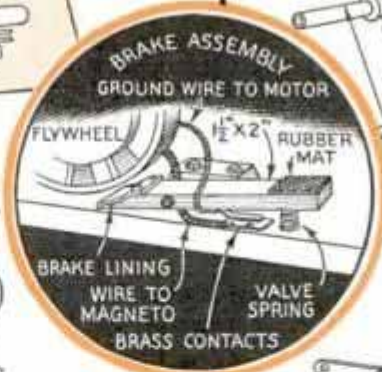
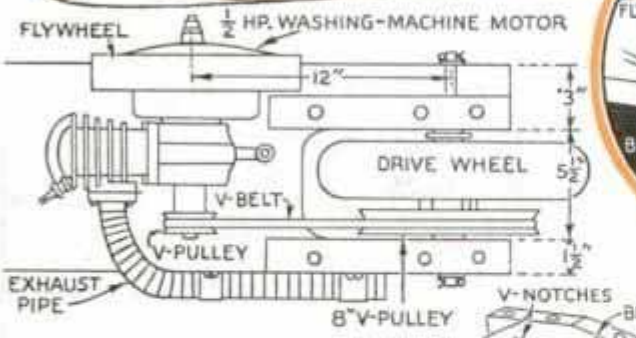
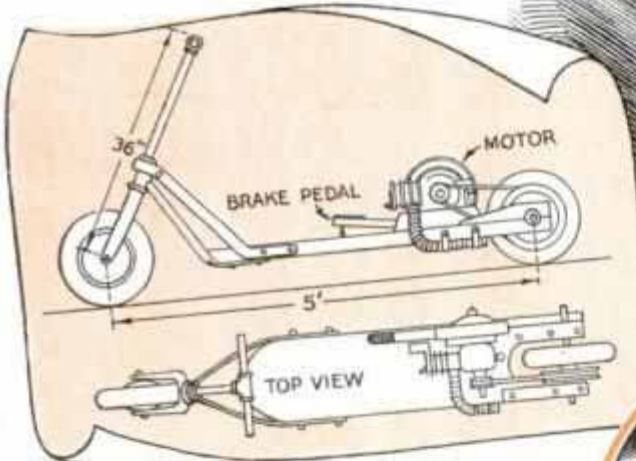
*Uttidismotor - Jacobsen
Mfg. Co., Racine, Wis.*

It's easy to build this MOTOR SCOOTER

Utilizing a Small $\frac{1}{2}$ -Hp. Gasoline Motor, This Speedy Scooter Is a Simple Job to Build and Will Assure You of Plenty of Fun. The Motor Is Coupled Direct, There Being No Transmission or Clutch. It Is Started by Simply Pushing the Scooter and Hopping Aboard. The Steering Apparatus Consists of Standard Bicycle Parts, the Fork Being Cut Down to Suit the Small Wheel Used. The Brake Works against the Motor Flywheel and at the Same Time Cuts Off the Power by Short-Circuiting the Magneto



or may tag.





Milk-Delivery Box Permits Bottles to Be Inserted Easily but Hard to Remove

Box Prevents Theft of Milk Bottles

To avoid having his milk stolen when delivered early in the morning, one man made this box and bolted it to his porch so that the deliveryman could set the bottle inside of it. The box is made of 1-in. stock and has one end hinged and secured with a padlock. A hole in the top permits the bottle to be set inside, and four strips of spring brass, arranged as shown in the detail, prevent it from being removed. Layers of corrugated paper cut out and

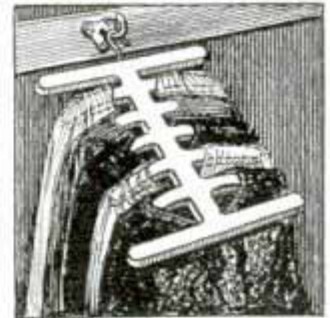
placed in the bottom of the box cushion the bottle when it is dropped inside.—A. H. Waychoff, Glendale, Ariz.

Window Screens That Kill Flies

A method that has been found highly effective to keep a house free from flies during the summer consists of painting the screens with a solution of quassia extract, 3 fluid oz., sugar, 1 oz., and gum arabic, 30 gr. The solution is applied with a brush. It is deadly to flies, which it attracts, but harmless to humans and animals.—Kenneth Murray, Sturgis, Mich.

Multiple Clothes Hanger Saves Space in Closet

Cut from plywood, this clothes hanger will save space in a small closet. An ordinary wood hanger can be used as a pattern in tracing the design onto the plywood. The arms are spaced 1 in. apart. It is not advisable to have more than five or six arms on one hanger as the bottom of the garment may touch the floor.



New 32-Page Blueprint Booklet FREE!



Full of practical ideas for the home craftsman. Explains what tools and equipment you need in your workshop; gives tips on the care and use of tools, besides information on reading blueprints. This booklet will be sent free to anyone furnishing 3 cts. to cover postage and handling.

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- "Roamer," 16-ft. outboard cruiser, 765 to 770, \$1.
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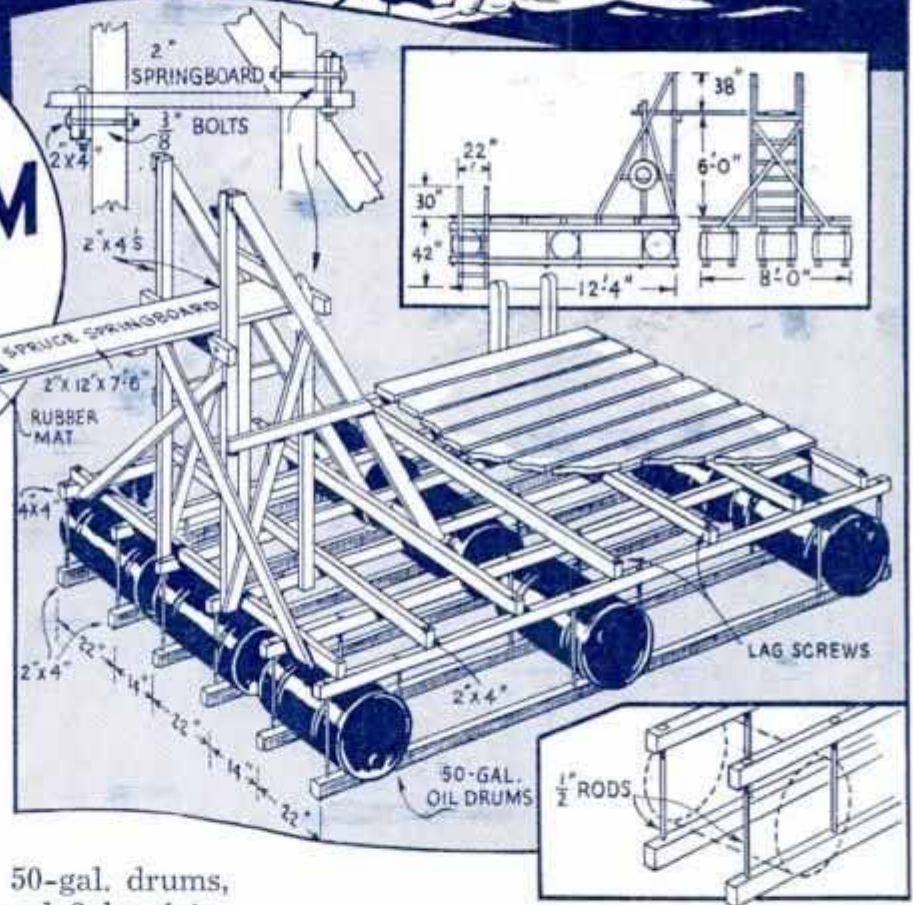
Address Blueprint Department, Popular Mechanics Magazine, 200 East Ontario St., Chicago, Ill.



DIVING PLATFORM

made from OIL DRUMS

Floated on oil drums, this diving platform can be constructed at a nominal cost and will require little attention as the drums will remain water tight indefinitely. The platform is supported by three pontoons, each of which consists of three 50-gal. drums, clamped between 4 by 4 and 2 by 4-in. timbers as indicated. Galvanized tie rods, $\frac{1}{2}$ in. in diameter, clamp the timbers tightly against the drums so that they cannot work loose. If the drums show signs of rust, sandpaper the exposed area and then apply two or three coats of asphaltum paint. Apply white lead to the bungs and drive them in tightly. Join the pontoons with seven cross members, which also serve as floor joists. It is a good idea to install diagonal braces between the joists before laying the floor. Next erect the diving-board super-structure, brace it,



and anchor it to the joists by means of lag screws or carriage bolts. For the spring board, use spruce or other tough wood. Plank over the deck with the boards; set them $\frac{1}{4}$ in. apart to permit draining. See that the corners and edges of the boards are sandpapered. The rungs of the ladders are rounded.

☐ Muriatic acid applied to old putty and allowed to remain for an hour will soften it so that it can be scraped off easily.



"Hod" Lewis Photo

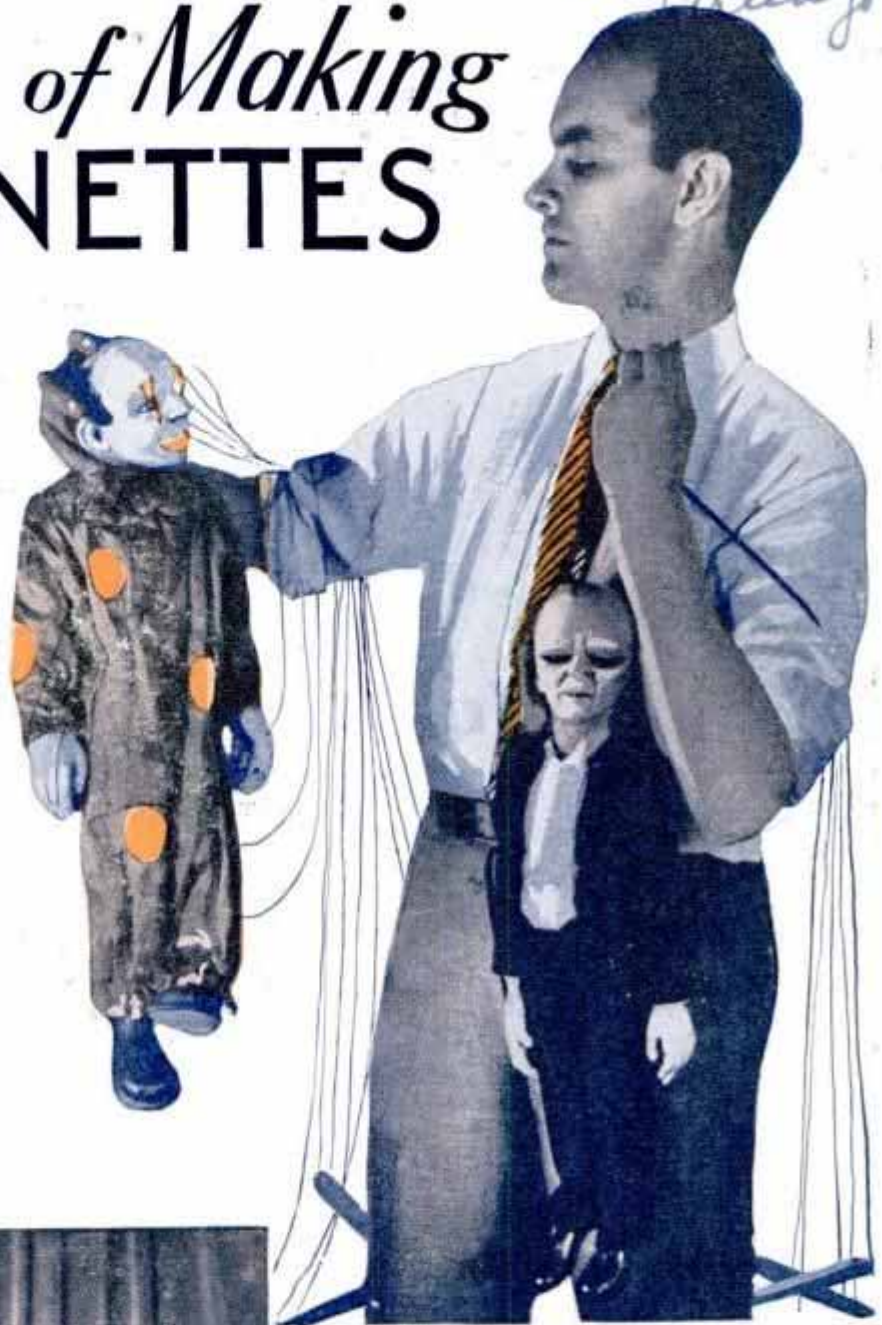


A. & P. Photo

*Refer msg to Paul Sutton,
612 Leary Place
Chicago*

The Secrets of Making MARIONETTES

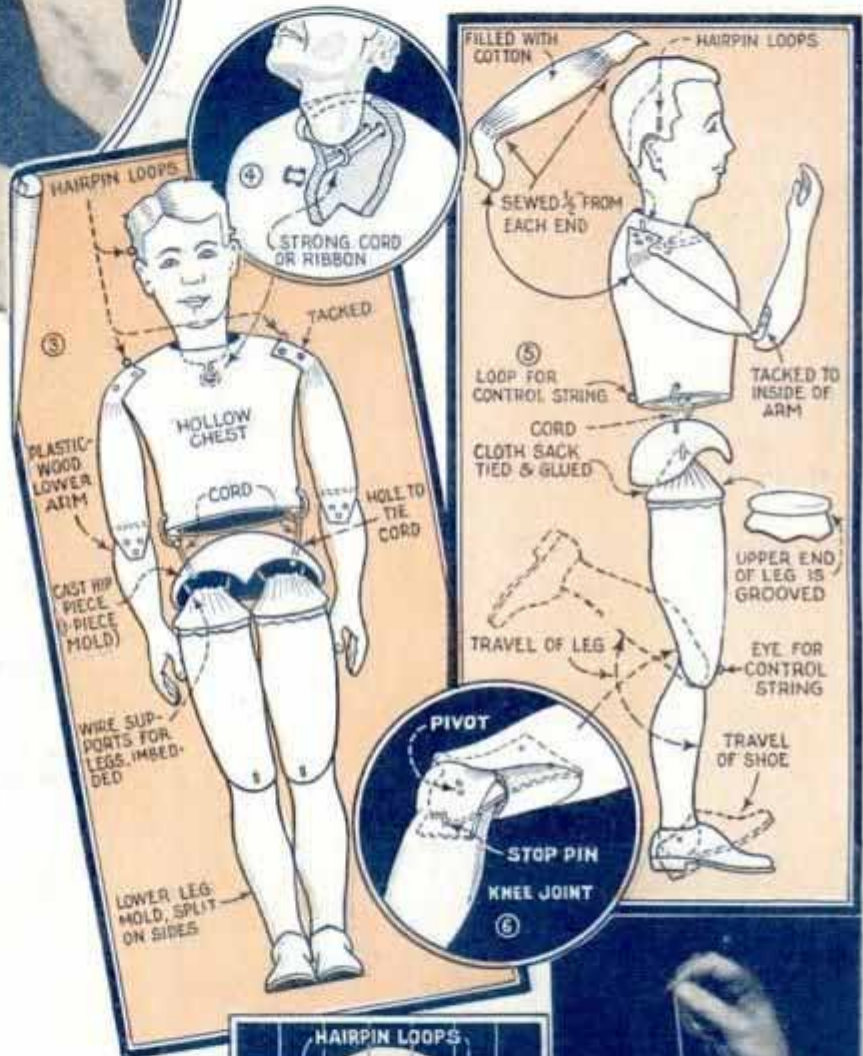
ANYONE can learn to make these amusing string-operated midgets perform, which provides fascinating entertainment either in the home circle or on school programs. All the mystery of making and operating marionettes is completely eliminated in this series of interesting articles, written especially for the readers of Popular Mechanics, by Rufus Rose, noted designer and maker of marionettes, and Paul N. Sutton, both of the Marionette Carnival at the 1933 Century of Progress, Chicago.



MARIONETTES, those string-operated midgets that walk, dance, and do all sorts of amusing tricks, will afford fascinating entertainment in the home as well as on the school stage. And, they are really easy to make, no particular difficulties being connected with their construction and little practice being needed to make them perform in a pleasing realistic manner.

Start out by making a simple marionette to learn its mechanics; then, as your skill in modeling increases you can reproduce in caricature, yourself, your friends or some famous character of today or yesterday. Historic or legendary figures

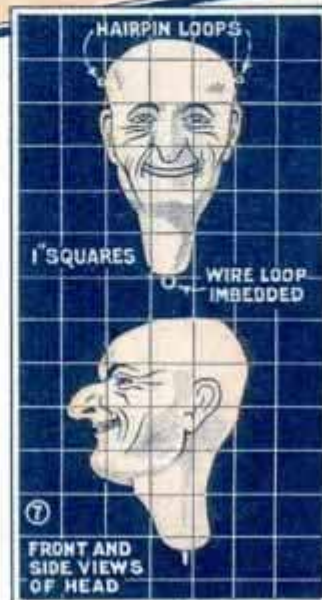
2 ft. high, and every part of the body will be one-third the height, width and thickness of its human counterpart. Next the head is formed with modeling clay, Fig. 1. To do this a modeling stand or "armature" is made as in Fig. 2. Enough clay is packed on the rounded block at the top to roughly conform in size to the head you wish to make. Then by careful work, bring the



will enable you and one or two helpers, to put on miniature stage productions. Also, with the aid of phonograph or radio music, effective marionette revues are possible. If you tune in on a radio speaker or entertainer, a clown marionette will mimic him to the delight of your audience.

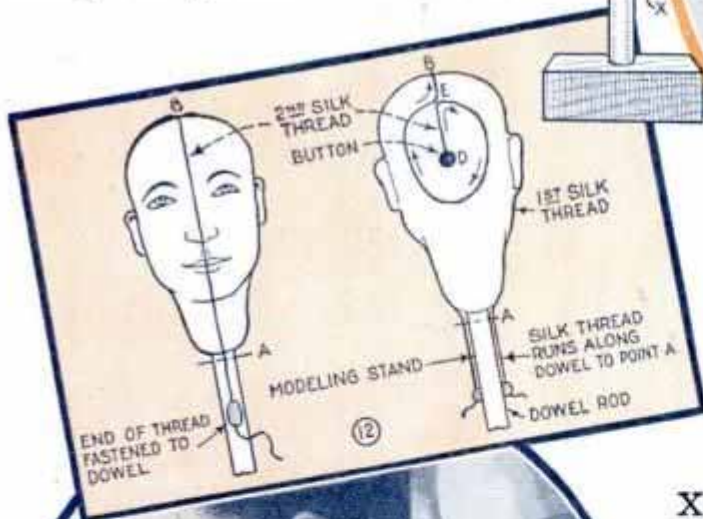
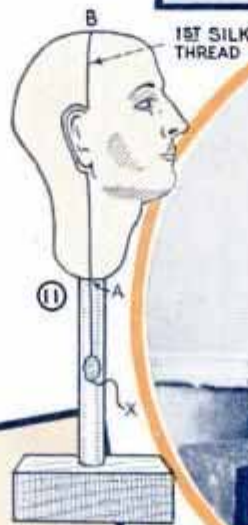
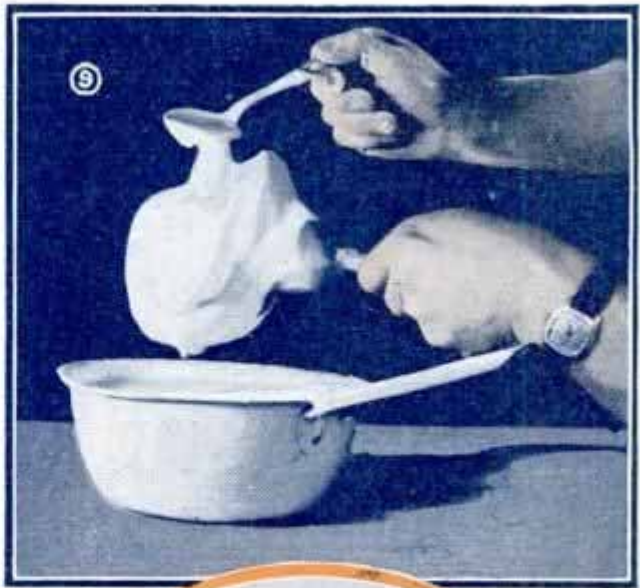
For schools, marionettes offer many possibilities for cooperative work in various classes including woodworking, mechanics, sewing and designing, dramatics and public speaking, sculpturing and art work, in order to meet the constant need of entertainment for school assemblies and programs. Such plays as "Captain Kidd," "Dick Whittington and His Cat," "Hansel and Gretel," "Ali Baba and the Forty Thieves" and "Little Red Riding Hood" are admirably adapted to this purpose.

The first step in making marionettes is to make actual-size drawings of the front and side, showing the body parts in their relative proportions, as in Figs. 3 and 5, one-third the size of the human figure. Thus the marionette of a 6-ft. man will be

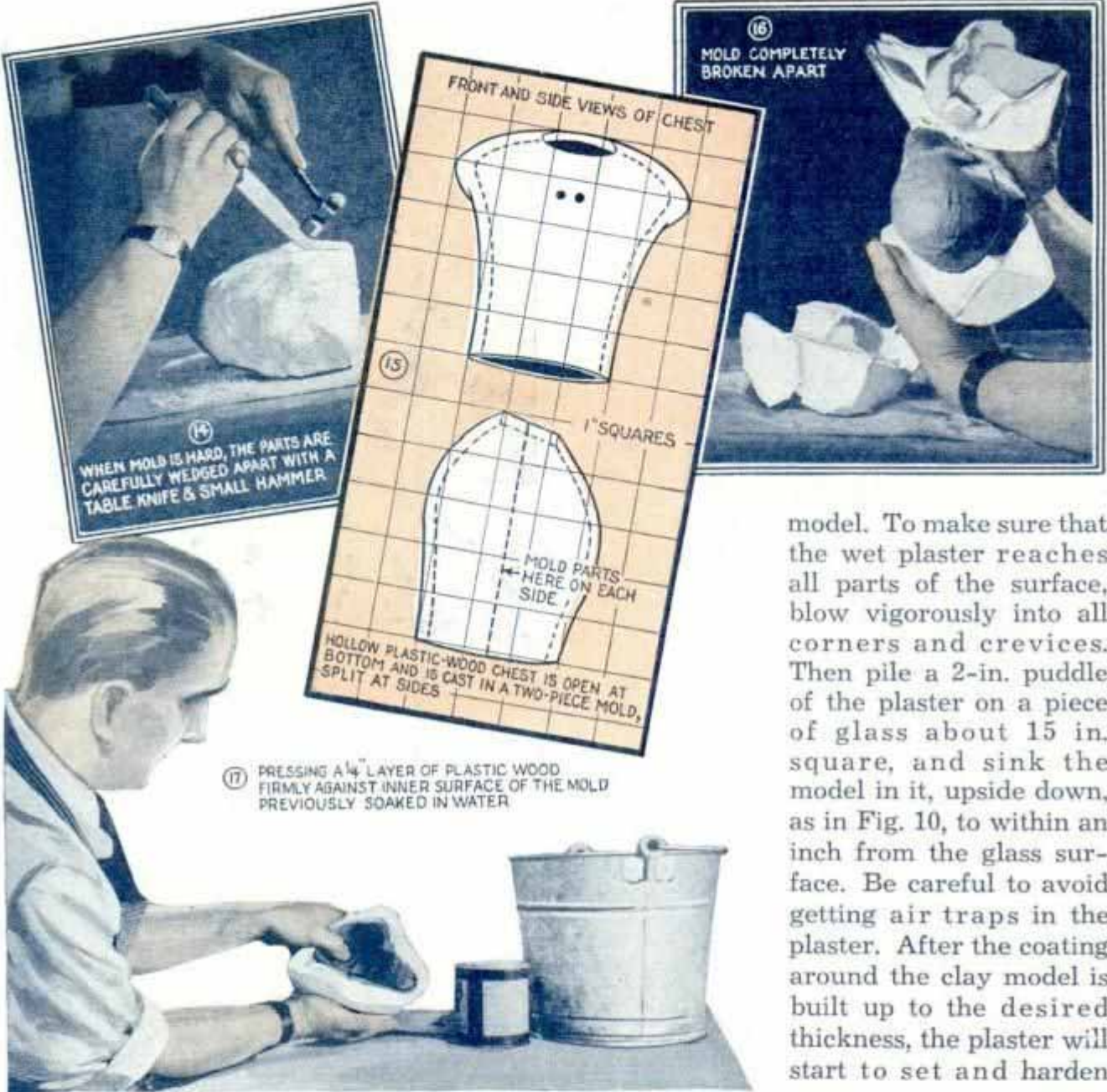


head to shape, using a model, photo, statue or drawing to copy. If you wish to copy the marionette shown in various stages of construction in the accompanying photos and drawings, follow the outline of the head as shown in Fig. 7. Look at the work frequently from all angles to correct inaccuracies. Modeling clay remains plastic and as it does not dry out, there is no need for hurrying. The more time you take, the better the work will be. In making caricatures, exaggerate the outstanding features and minimize all others.

After the head has been modeled in clay, you are ready to make a plaster-of-paris mold of it, which is to be used as a form for casting the finished head in plastic wood putty. In order to make the plaster mold break away from the modeling clay easily, buttonhole silk thread is imbedded in shallow trenches in the clay as in Figs. 8, 11 and 12, leaving the ends of the thread project outside of the plaster so that the thread can be pulled through the plaster before it has

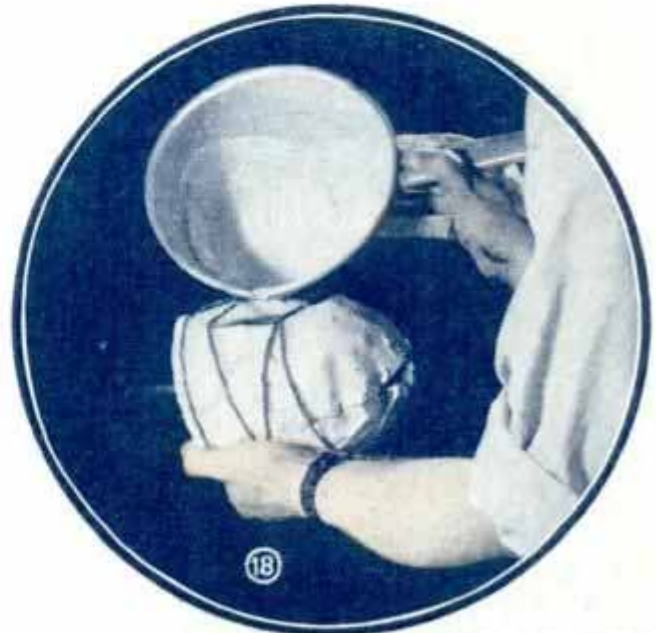


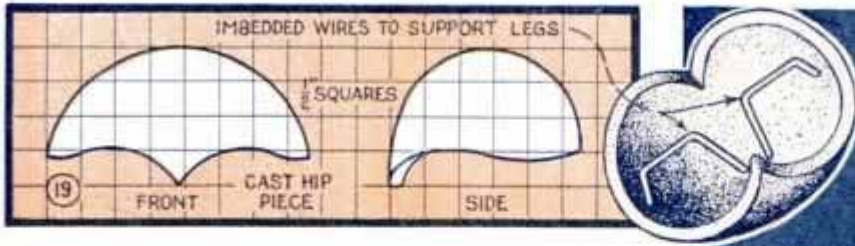
thoroughly hardened. Use a pointed tool to make the trenches. In this way two lengths of thread are arranged at right angles to separate the mold in four pieces. The first thread is stuck to the dowel with clay, at point X, Fig. 11, and goes up the side of the head, starting at A, around the top of the head at B, and then down in the same way on the opposite side. Lay the thread in the trench and smooth the clay over it carefully as you go. One end of the second length of thread is tied to a small button, which is imbedded at point D, Fig. 12. The thread is then laid in a circular path as indicated by the arrows. After completing the circle, the thread is brought straight up to point B, where it crosses over the first thread, down the middle of the face, over the center of the nose, etc., down to point A and down the dowel



model. To make sure that the wet plaster reaches all parts of the surface, blow vigorously into all corners and crevices. Then pile a 2-in. puddle of the plaster on a piece of glass about 15 in. square, and sink the model in it, upside down, as in Fig. 10, to within an inch from the glass surface. Be careful to avoid getting air traps in the plaster. After the coating around the clay model is built up to the desired thickness, the plaster will start to set and harden

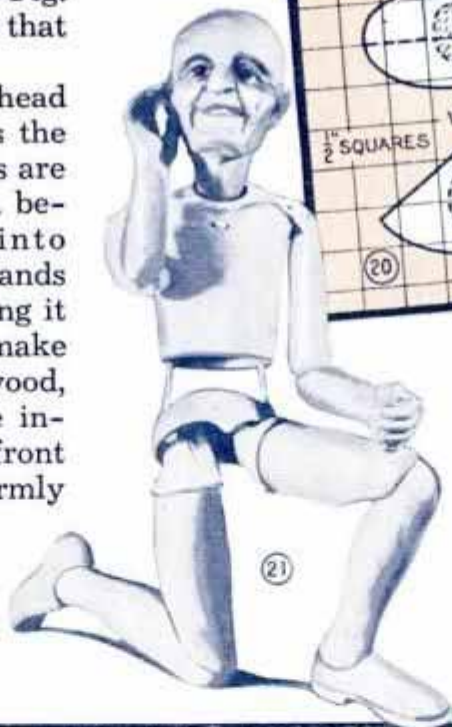
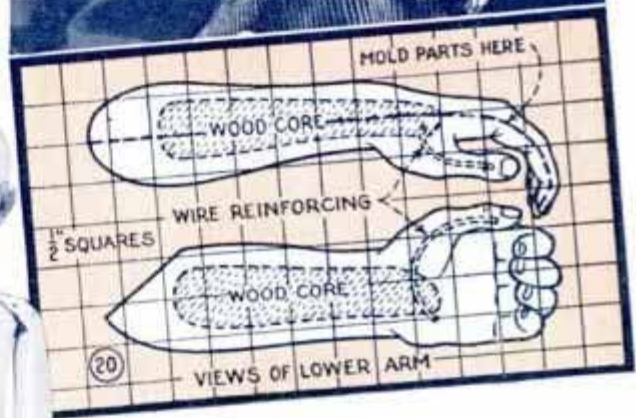
where the thread is again stuck to the dowel. When the threads have been properly arranged, the clay model is entirely covered with plaster of paris to a uniform thickness of not more than one inch. Estimate the amount of plaster needed, allowing some extra. Place two thirds as much water as the total volume of plaster required, in a deep, smooth-surfaced vessel. Then add the plaster to the water as fast as you can sift it through your hands, until it stands up at the surface of the water. Stir the mixture well to an even consistency of heavy cream. Remove the base of the modeling stand and dip the head into the mixture, and cover the entire surface by applying the plaster with a spoon, Fig. 9. Be careful not to gouge the



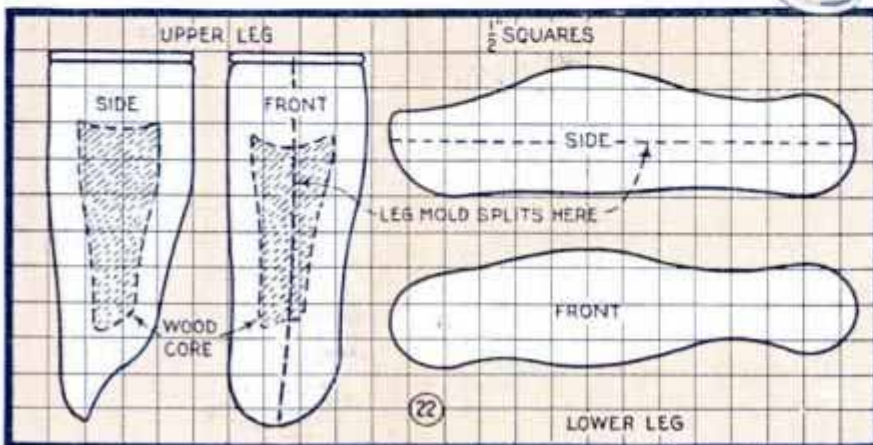


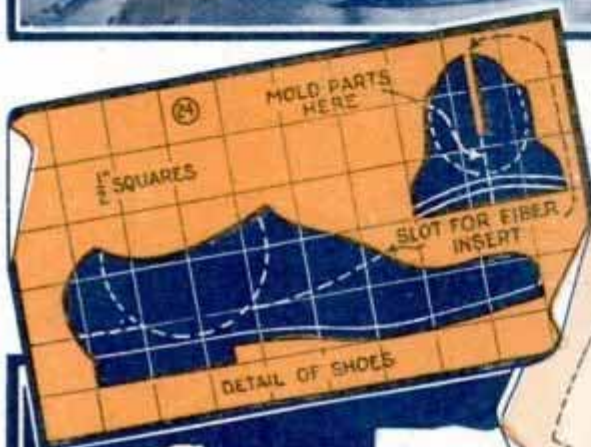
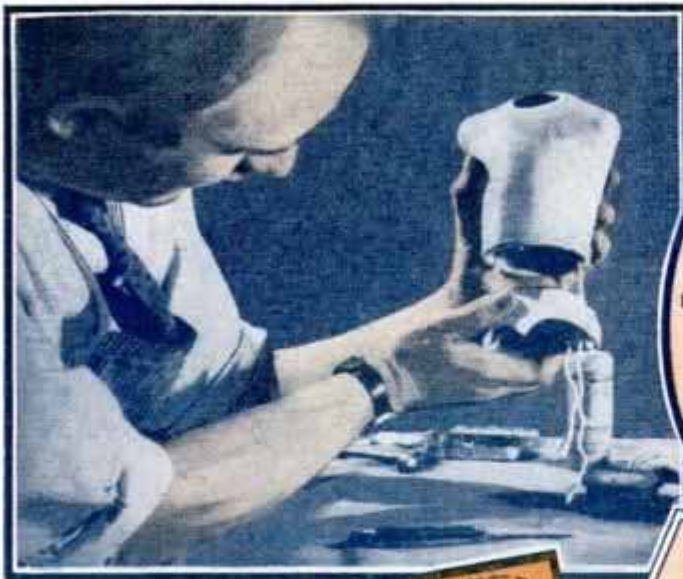
fast. As soon as it takes a fairly firm pressure to make a dent in its surface, take the end of the last thread imbedded and pull it through the plaster as in Fig. 13, just far enough to complete the circle but not up to the button. Then take both ends of the first thread and cut the mold from side to side. Be sure to pull the thread through the plaster before it hardens enough to break the thread. Allow the plaster to harden for 15 min. before separating the mold pieces, which is done with the aid of a table knife and a small hammer, Fig. 14. Separate the circular piece first, then the others, as in Fig. 16, and remove any clay that adheres to the plaster.

Casting the finished head with plastic wood putty is the next step. The mold pieces are soaked in water for 5 min. before pressing the putty into them. Also keep your hands dripping wet when handling it to prevent sticking. Then, make a "pancake" of plastic wood, large enough to cover the inside surface of one of the front mold pieces and press it firmly in place to reach every corner and crevice as in Fig. 17. Do likewise with the other front mold piece, fit the two together



er and press the plastic wood together firmly at the joint. Support these two pieces so they stay together and proceed with the back mold piece in the same way, pressing plastic wood into it and then joining it to the front pieces. The three pieces are then bound together. Now anchor a $\frac{3}{8}$ -in. loop of wire about $\frac{1}{16}$ in. in diameter at the base of the neck, which is later used to hold head and body together as in Fig. 4. The loop opening should face the front of the head. The ends of the loop are bent over and imbedded in the plastic wood, which is extra thick at this point. To prevent shrinking of

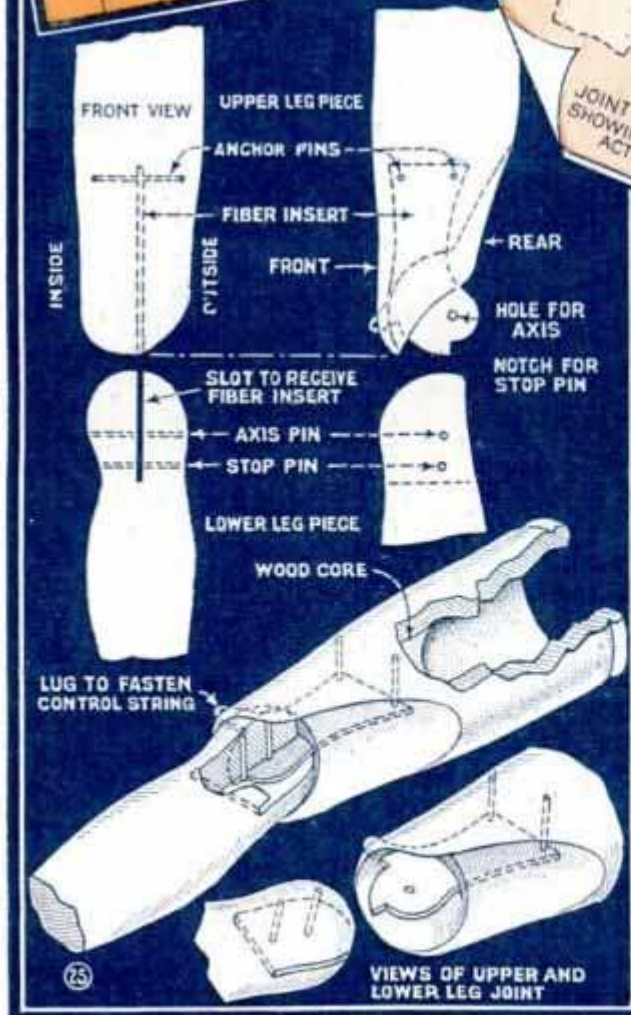




the plastic wood, upon drying, a thin coating of freshly mixed plaster of paris is swashed inside the hollow head through the circular opening as in Fig. 18. When this inside layer of plaster is hard, remove the back mold piece immediately and also start the mold pieces away from the plastic wood. Separation is aided by blowing vigorously between the plastic wood and

the molds. Then lay the head to dry for 48 hrs. on crumpled cloth. Make the cap piece, coat the inside surface with plaster and remove it from the mold piece. After the plastic-wood head is dry, clip away the inside coat of plaster and put hairpin-wire loops on each side of the head, Figs. 3 and 5, drilling small holes and anchoring the loops in small wads of plastic wood, applied inside. The cap piece is glued in place, after which the head is sandpapered where needed, and necessary repairs made. It is now complete, except the finish, which will be described later.

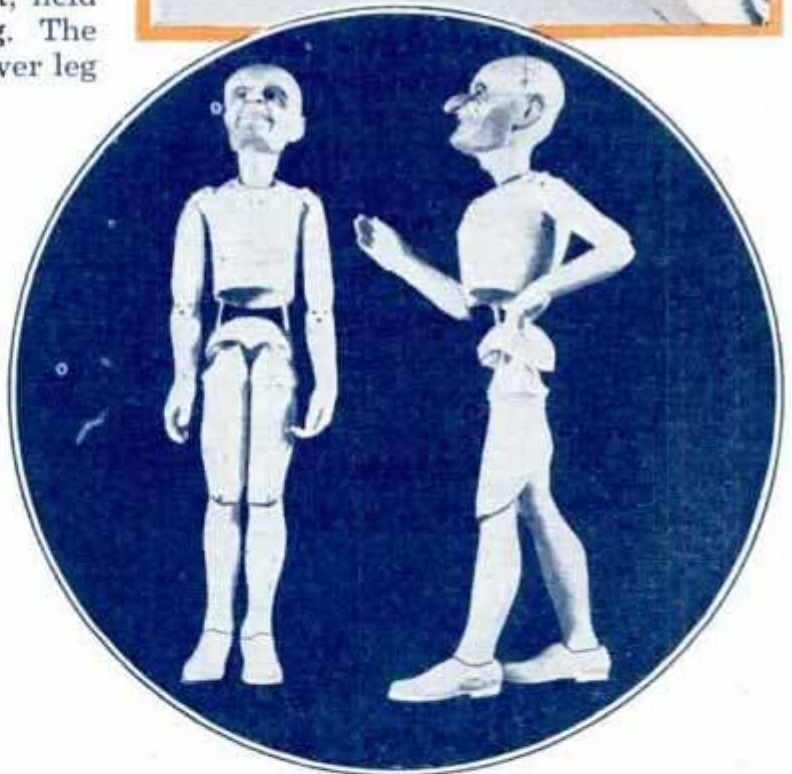
The method of procedure in casting the head has been explained in detail, as the same steps also apply to making the chest, hip piece, lower arms, legs and feet. Front and side views of each of these parts are given in the cross-hatched details, Figs. 15, 19, 20, 22 and 24. Wooden cores in the lower arm and leg pieces help to strength-



en them, save material, and avoid undue shrinkage of plastic wood. A piece of wire is used to reinforce the thumb. The space between the thumb and fingers is filled in to facilitate casting, and is carved out later. The silk thread extends along the outside, over the outside of the little finger, across the ends of the fingers to the thumb and then back up along the inside of the arm. The mold of the chest piece parts at the sides and the bottom is open where the mold is set directly on the glass plate instead of in a puddle of plaster. Hairpin-wire loops are fitted at the shoulders. The hip piece is a shell cast from a one-piece mold, and wire is imbedded as shown in Fig. 19, to hold the upper legs. These are provided with wooden cores at the knee end, while the upper ends are left hollow for lightness and economy of material.

The knee and ankle joints, shown in Figs. 6, 23, 24, 25 and 26, if carefully duplicated, will give your marionette lifelike action. At the knee, both joining members are slotted to receive a fiber insert, held with anchor pins in the upper leg. The axis pin passes through both the lower leg and the fiber insert, while the forward travel of the lower leg is limited by a stop pin which swings against the part of the fiber insert, thus avoiding any strain on the knee cap. A similar method of obtaining ankle action is shown in Fig. 23. To insert the fiber in the foot, cut a saw slot down through the center of the foot, lengthwise, Fig. 24. After all joints have been assembled the exposed saw slots may be filled with plastic wood, taking care not to press it in so far that it will interfere with the free action of the joint.

After the legs and feet have been assembled, the upper leg members are fastened to the wire loops of the hip piece by means of small cloth sacks, tied and glued in grooves along the edge of the upper legs, and sewed to the wire loops. The hip piece is next swung from the chest piece with two pieces of stout cord, small holes being drilled to permit tying the cord. The upper arm members are cloth sacks filled with cotton and sewed shut about $\frac{1}{2}$ in. from each end, after which the ends are tacked



to the lower arm and shoulder. The head is attached with strong cord or ribbon as in Fig. 4, and the marionette will be completely assembled as in Fig. 21.

In the next article, finishing the marionette, dressing it and stringing it to the control stick will be explained so that you will be ready to operate it.

Baseball and Knife Used to Repair Percolator Lid

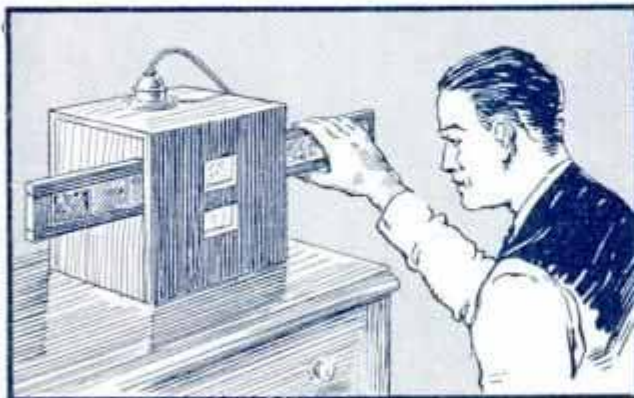


Lip Holding Glass Top in Percolator Lid Repaired with Knife and Baseball

Often the lip that holds a glass percolator cap in the lid spreads and allows it to drop out. The lip can be repaired by holding a baseball against the lid as shown, and pressing the edge of the lip over with the end of a knife handle. Another method is to hold two knives together and run the lip between the handles, holding them at an angle to bend over the edge.

Lantern Eliminates Guesswork When Printing Photos

After ruining several sheets of sensitized paper because of incorrect exposure when printing, I rigged up a testing lantern for comparing the density of a negative to be printed with that of test negatives having



Lantern for Comparing Negatives to Determine Correct Exposure Time When Printing Photos

varying densities. Each one of these had the correct exposure time already recorded. The lantern consists of a box having

an electric lamp inside and two square holes in the front, one to hold the negative to be tested and the other for viewing the test negatives. The latter are mounted on a frame which slides in slots cut in the sides of the box before the front is attached. To use the lantern, move the slide until a test negative is found that has approximately the same density as the one to be printed. Then note the exposure time and make the print.—J. Wilson Doty, Carroll, Ia.

Magnifying Glass for Model Makers

Model makers who wear spectacles will find this method of attaching a magnifying glass to one of the lenses highly effective when working on fine parts of a small model. The magnifying glass is a small camera lens, and is attached with a holder made by bending a narrow strip of



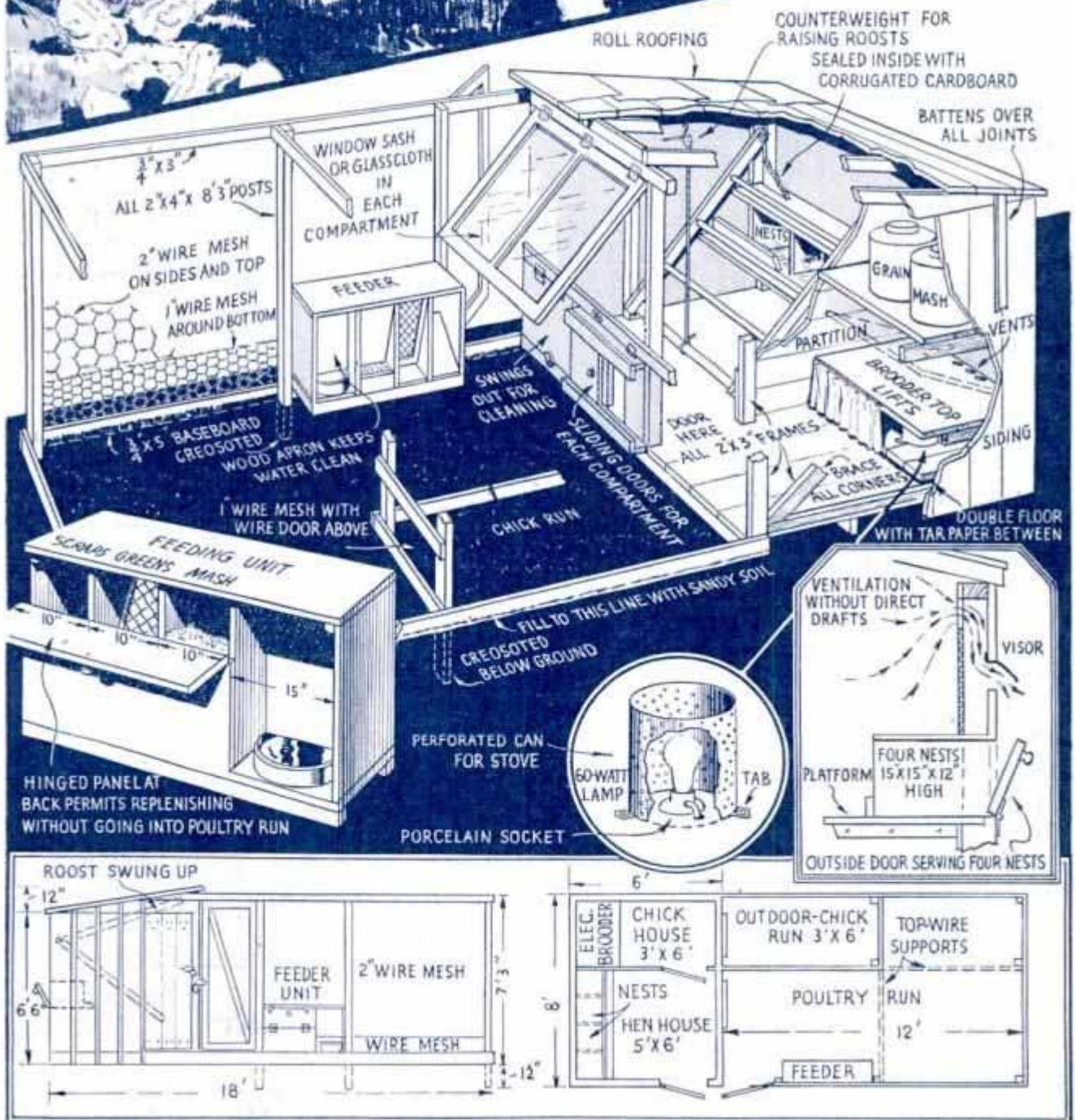
spring brass to the shape shown. Held in this manner, the magnifying glass is in place when needed and does not have to be removed when looking away from the work. It also leaves both hands free.—George F. Vonderheide, Denver, Colo.

Bands Cut from Inner Tube Hold Rubbers on in Mud

Slipped over your shoes as shown, a couple of bands cut from an old inner tube will prevent your rubbers from being pulled off when walking in mud. The bands are slit about one half their length to straddle the ankle or shoe top, and the wide parts are slipped under the heels of the rubbers.—F. W. Bentley, Jr., Missouri Valley, Ia.



BACKYARD CHICKEN RANCH



Clothespins Hold Hats on Backs of Wooden Seats

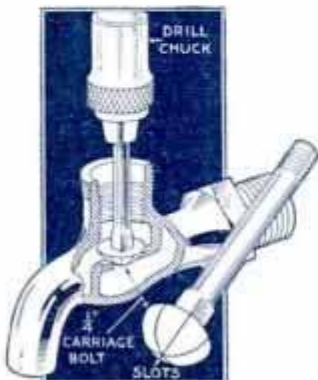


Clothespins Glued to Backs of Chairs and Seats Serve as Hat Holders

Glued to the backs of chairs, wood benches or seats used in lodges, churches or other public places, spring-type clothespins make good hat holders. Each clothespin is taken apart and one leg is screwed to the back of the seat after which the pin is reassembled. This type of clip can also be used on the backs of wooden folding chairs.—Sorrob Ally, New Orleans, La.

Faucet-Valve Seats Ground with Carriage Bolt

Rough valve seats in water faucets quickly wear the washers, and can be ground without removing the faucet from the water pipe by using a carriage bolt and some grinding compound. Get a bolt of the right size to fit the seat, as shown, and, with a hack saw, cut several slots from the top center of the head to the lower edge. Then chuck the threaded end of the bolt in a hand drill, apply the grinding compound to the slotted head and start grinding. The bolt



head should be raised repeatedly a fraction of an inch above the seat while grinding in order to prevent the abrasive particles from making grooves in the seat, which would cause the faucet to leak.—John M. Baldwin, Salt Lake City, Utah.

Straw Lengthens Oil-Can Spout

Following is a little kink that will be found handy in connection with an oil can: When the spout of the can is too short to reach a hole that is hard to get at, slip a soda straw over the end as shown. If a straw is not at hand, a length of small rubber or copper tubing can be used, or even a piece of paper can be rolled on a wire and the resulting tube used for the purpose in emergency cases.



Hand Scoop and Pestle Made from Stocking Darner

Grocers and chemists can make various sizes of small hand scoops by cutting pieces of cardboard to the shape of a scoop and using a stocking darner for a handle. The pieces, which are cut so that they hold certain known quantities, are slipped un-



Spring on Stocking Darner Holds Cardboard Form, Which Makes a Handy Scoop

der the stiff head spring of the darner. By removing the spring, the darner also serves as a pestle.

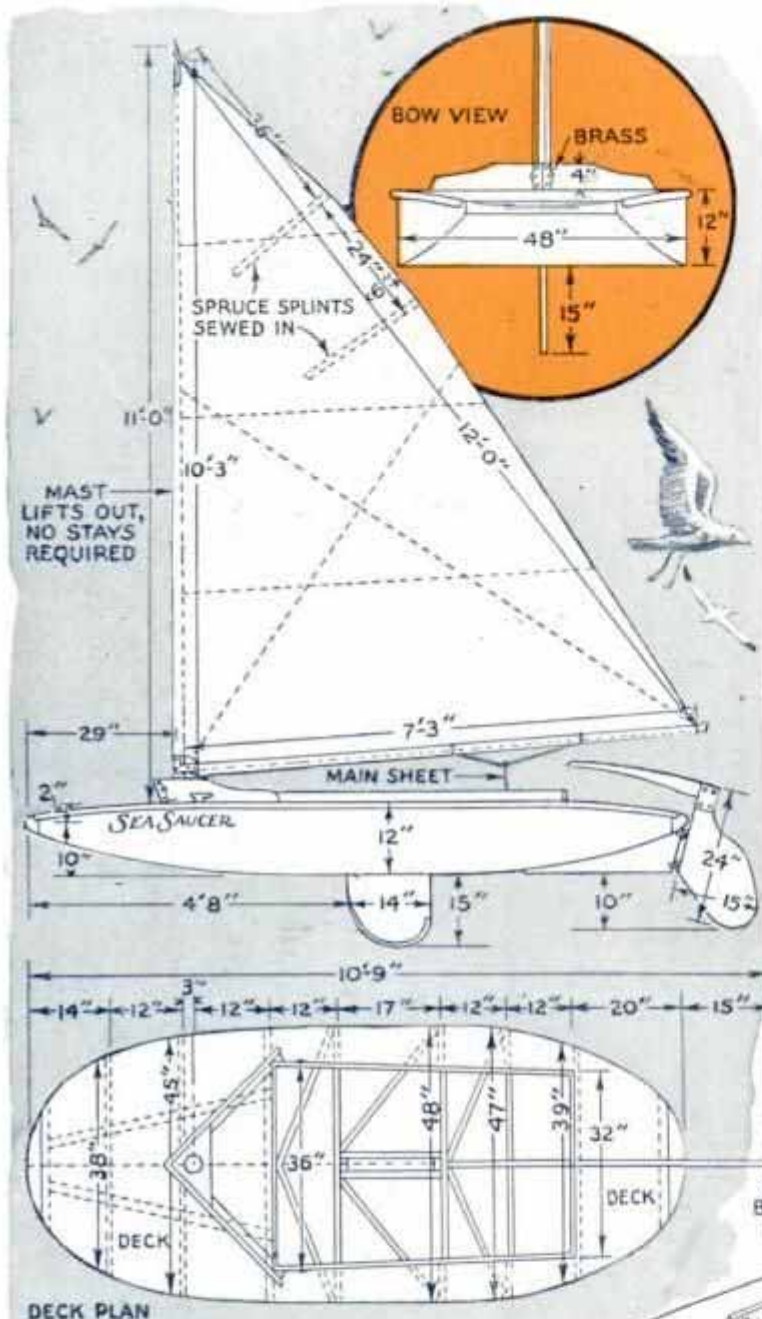
"SEA SAUCER"



HERE is a small sailboat so light in construction that no trailer is required to transport it. Simply remove the mast and sail, take out the centerboard and remove the rudder, and strap the flat hull to the top of your car. The stanch but light framework is covered with thin waterproof plywood. Note that the deck curves slightly fore and aft for run-off of the wash, and high baffles at the mast, as well as coaming, keep the cockpit dry in fair seas. This hull, however, is obviously not built to buffet heavy going.

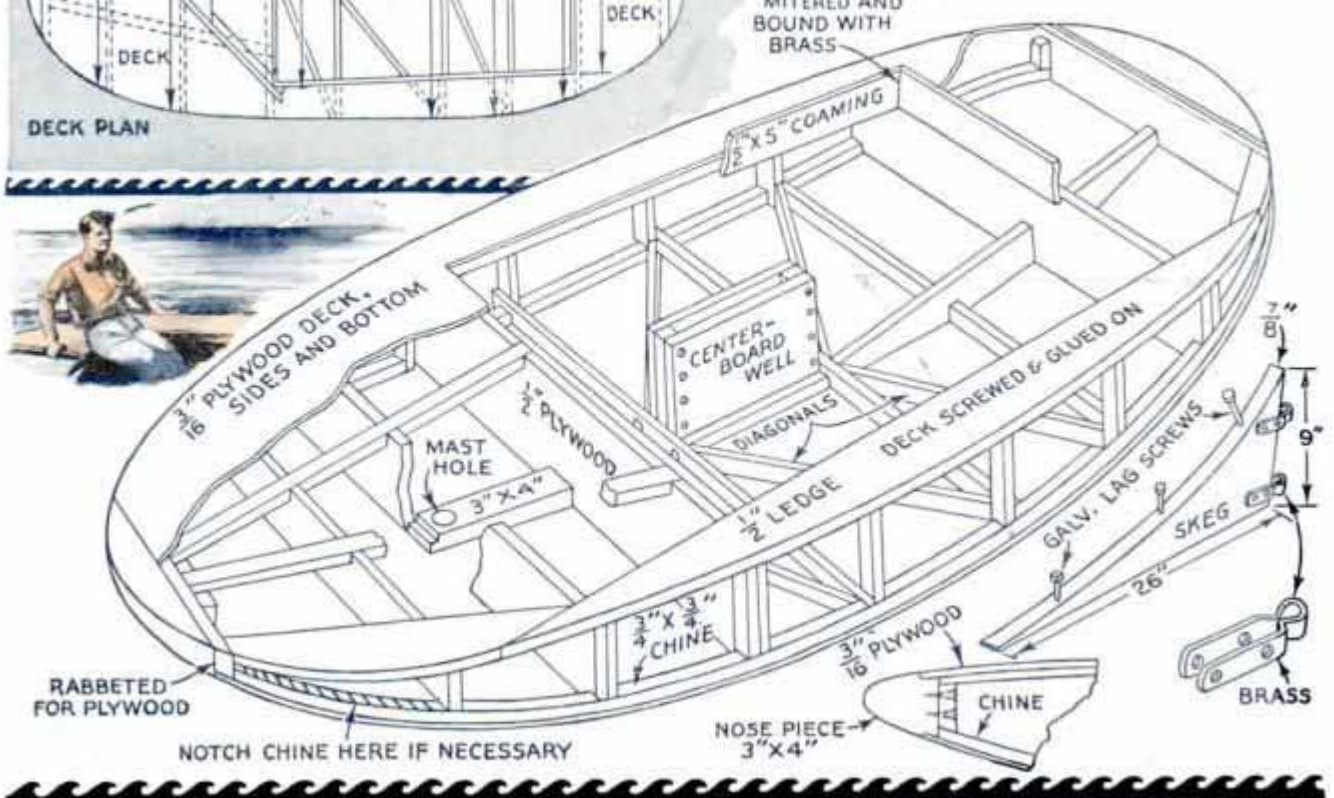
A sectional view of the hull through the centerboard gives an idea of the rib construction, chine and deck installation. The first step is to cut out the bottom piece from a single panel of $\frac{3}{16}$ -in. plywood. The shape is given in the deck plan, which will serve as a pattern when assembling the framework. Make the nose and stern pieces, which are identical. These are planed down from a 3 by 4 by 24-in. piece of soft

wood, such as white pine. They are rabbeted, so that the plywood sides, bottom and deck will lie flush when screwed down. Assemble the frames at their respective distances with temporary boards across the top, and install the spruce chines. The latter should be steamed or soaked where the pronounced bend occurs. If the spruce does not bend readily, notch at 1-in. intervals about a third of the way through, on the inside, cutting diagonally from corner to corner. It is important that the chine and bottom edges of cross frames are flush. After shellacking on both sides, fit the plywood bottom over the frame temporarily, and when trimmed to your satisfaction, lay a strip of $\frac{1}{2}$ -in. binding tape along the chine, apply white lead liberally and fasten the bottom with a few brads



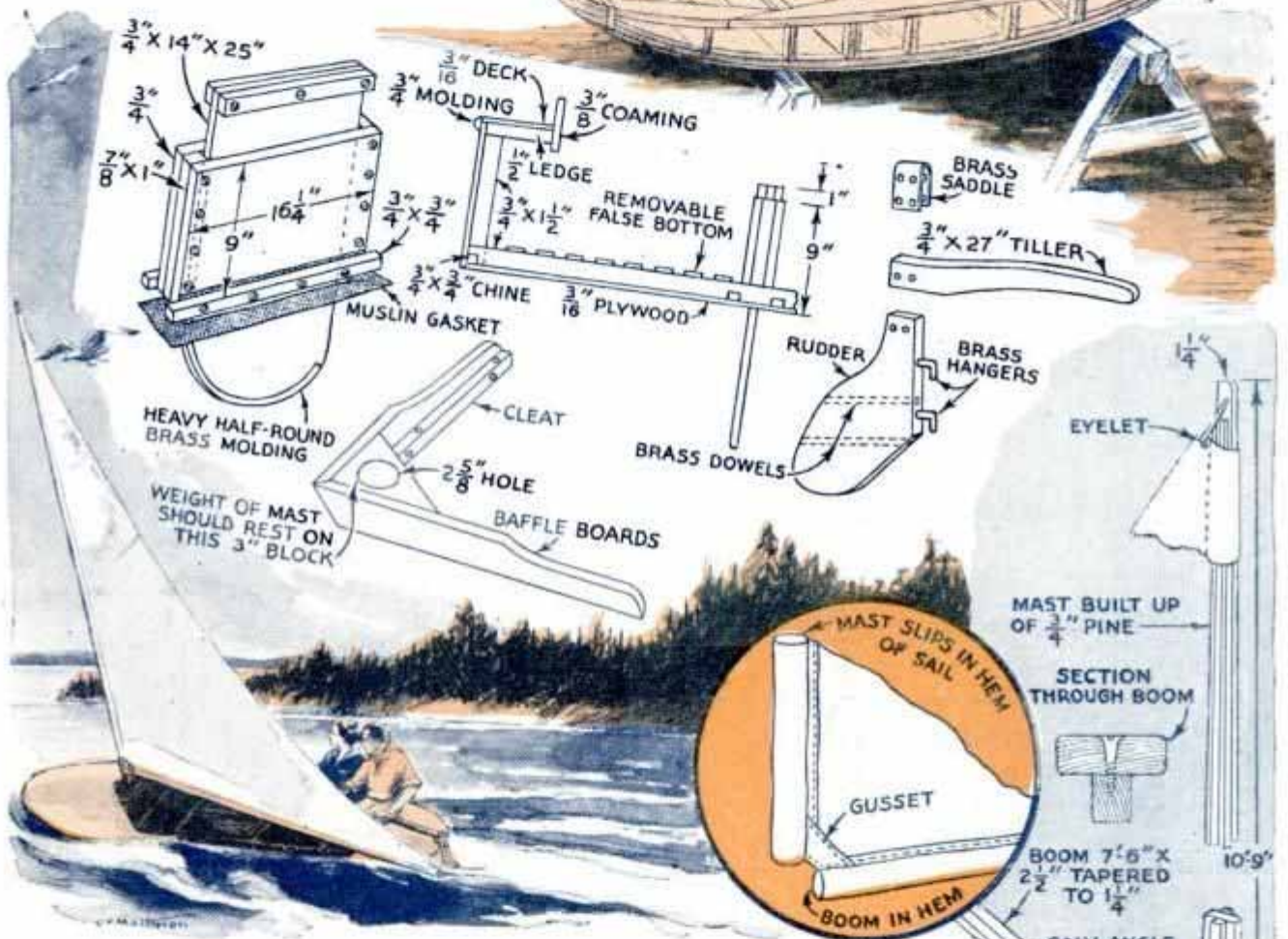
here and there preparatory to screwing down. The edges of the ribs, incidentally, should also be coated with white lead. Next install the plywood sides in exactly the same manner, using binding tape and a generous application of white lead. It is also important that all surfaces and edges of the plywood be well coated with shellac before assembling. Use muslin and white lead where the plywood joins the nose and stern pieces. On the bottom, install a piece of 2 by 4-in. stock bored for the mast step. Decking is also of $\frac{3}{16}$ -in. plywood, laid over a $\frac{1}{2}$ -in. ledge to which marine glue has been applied. Bottom, sides and deck are all fastened with $\frac{3}{4}$ -in. brass, flat-head screws, located about $1\frac{1}{2}$ in. apart. All joints must be white leaded before being fastened permanently.

Details of the centerboard and well are clearly illustrated. A muslin gasket is laid between the bottom of the well and the bottom of the boat. The centerboard should be of pine with a heavy, half-round brass molding along the bottom. Rounding the edges



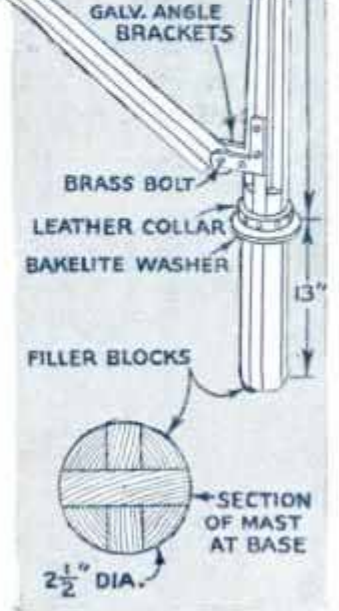
slightly will reduce resistance somewhat. The coaming is given a mahogany or walnut stain. The corners should be brass bound, and mitered.

The mast and sail are of novel design, no stays being required. The mast turns in the mast step as the boom swings from port to starboard and back. It is built up of three pieces of spruce or pine

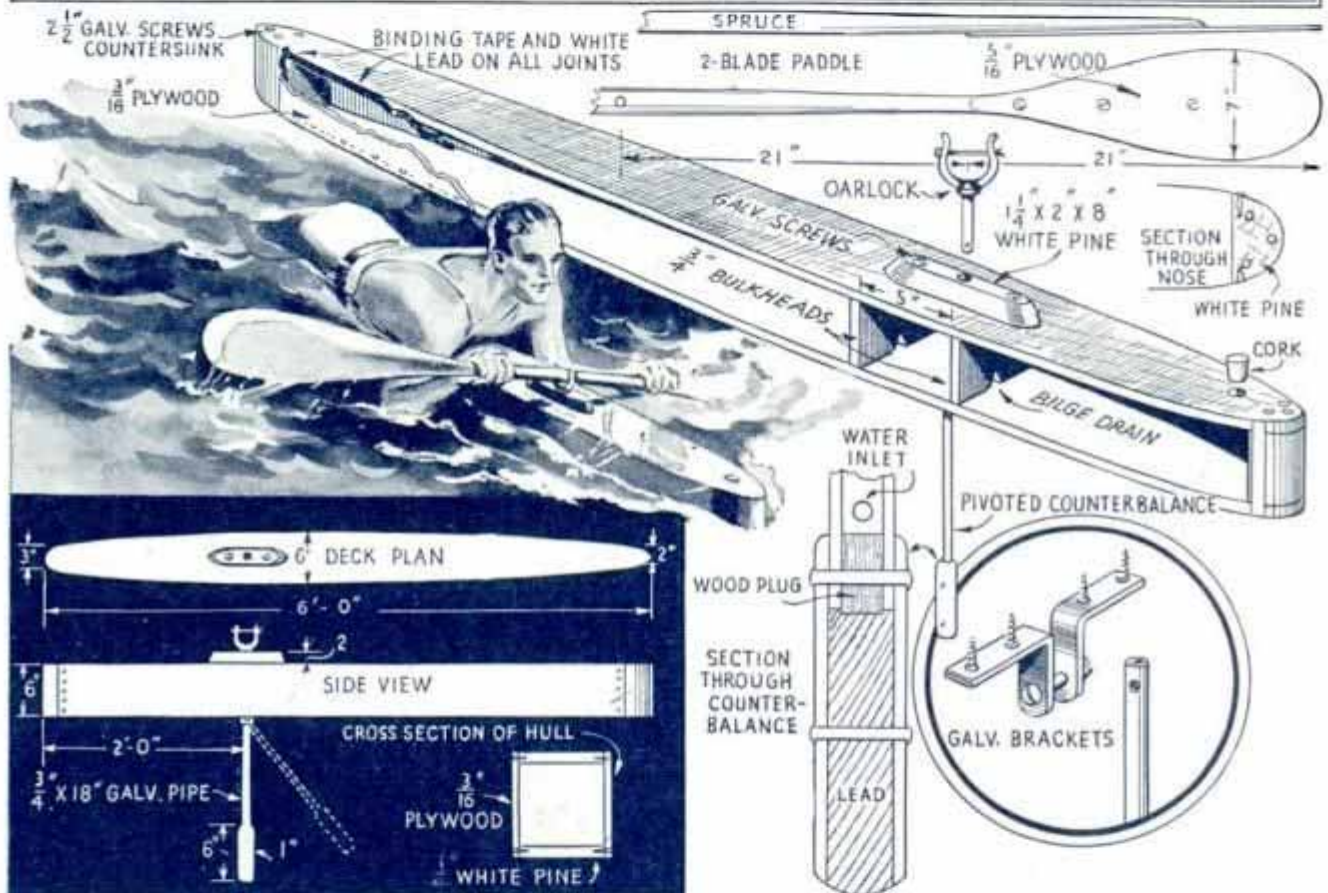


$\frac{3}{4}$ -in. thick, and when assembled, tapers from $2\frac{1}{2}$ in. at the bottom to $1\frac{1}{4}$ in. at the peak. The boom, of similar construction, is built up of two pieces. The bottom end of the mast is filled in with segments of wood so that they present a round surface when set in the mast step. This portion of the mast should be treated with melted wax so that it will turn freely. Wide hems are made in the sail, through which mast and boom are inserted, and spruce splints are sewed in. When taking the boat out of the water for transportation or storage, the boom folds up against the mast and the sail is wrapped around them. Baffle boards are set at an angle to throw the deck wash down, and are cleated to cross frames under the forward deck.

One important thing to remember before starting work on this boat is to see that every bit of wood surface, concealed as well as exposed, is given a ground coat of shellac and two or three coats of paint. Spar varnish may be used as a final coat.



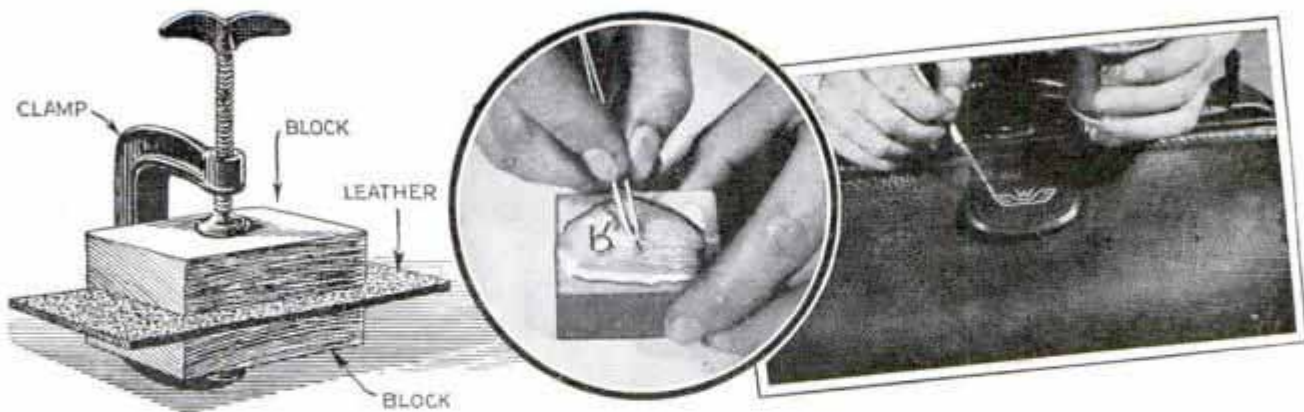
Feathercraft Gives New Sport to Swimmers



Propelled half by swimming and half by paddling, these featherweight pontoons will provide plenty of sport at any beach. They are 6 ft. long, tapered and rounded at both ends. Top and bottom are pieces of $\frac{3}{4}$ -in. white pine of exactly the same size and shape. These are screwed to nose and stern blocks and to two bulkheads located under the oarlock. Sides of $\frac{3}{16}$ -in. plywood are then cut out. It is preferable to use waterproof plywood for this purpose, but if this is not available, ordinary plywood given several coats of paint, especially at the edges, will do. In order to make the pontoon watertight, all joints must be given a liberal application of white lead and a strip of binding tape laid between the contacting surfaces. This should

be done at the nose and stern blocks before the top and bottom are screwed on, and similarly when the plywood sides are attached. Note the bilge drain in the bulkheads, which helps to empty the hull of water, should any get inside. The drain hole at the nose is corked when the pontoon is in use. Besides serving to drain out the water, the cork, if not pushed in too tight, will prevent the hull from bursting when the air inside expands under the hot sun, for which reason an air vent is necessary. A beveled block on the top takes an oarlock for a two-blade paddle. To balance the pontoon properly, an 18-in. counterweight is pivoted to galvanized angle-iron brackets, which are screwed to the bottom directly under the oarlock.

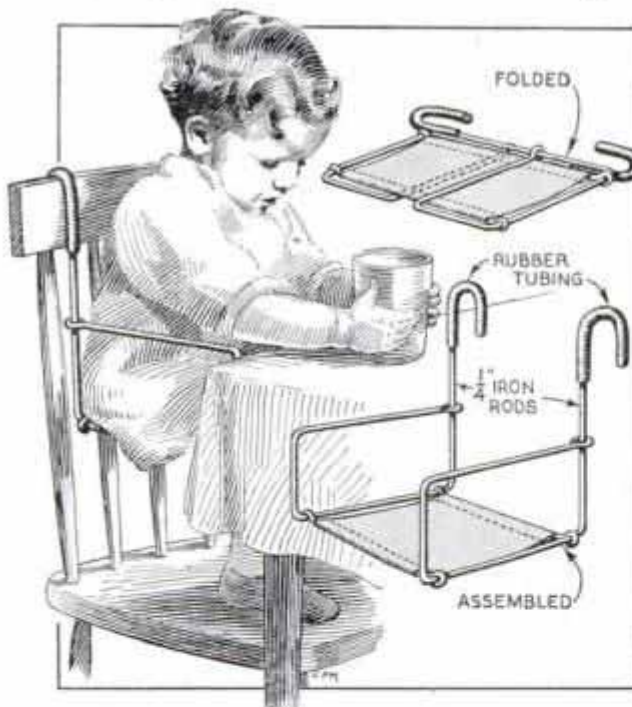
Stamping Your Initials on Leather Articles



Dies for impressing initials and designs on leather are readily made from hardwood blocks and No. 18 wire. After forming the letters from the wire, they are washed in gasoline and then a thick layer of metallic cement is spread on the block, after which the letters are imbedded in it in a reversed position. In drying, the cement shrinks to a thin film, which binds

the letters tightly to the wood. Initials are stamped in the leather by wetting it with water and then clamping the wire die against the article, as shown in the left-hand detail, until the leather dries. The depressed initials then are filled with gold paint or colored enamel. For stamping soft art leather, the die is inked and the impression is made on the dry leather.

Folding Canvas Seat Adapts Dining Chair for Baby's Use

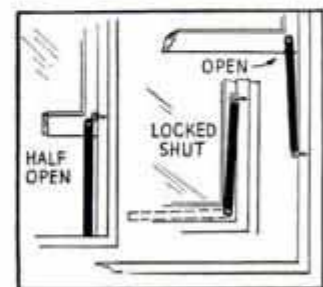


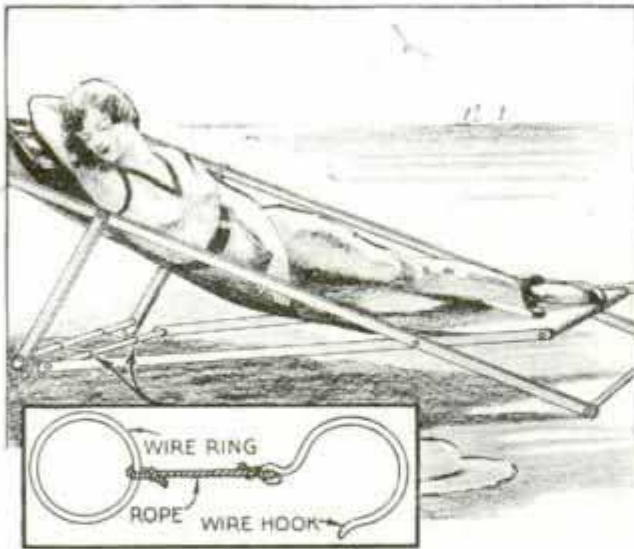
Folding into a small bundle that is carried easily, this canvas seat will quickly convert a dining chair into a high chair for a baby. The seat is especially handy when dining where no high chair is available. It consists of two iron rods bent as shown to form the sides and back, which are cross braced with two shorter rods that support

the canvas. It is a good idea to slip short sections of rubber tubing over the frame to protect the finish of the chair back.

Short Blocks Fitted to Window Sash Hold It Open or Closed

Pivoted to the lower corner of the window sash by means of a screw, a short hardwood block serves the dual purpose of supporting the window either half or entirely open. Also, it can be used to lock the window when it is closed. A screw eye is driven into the inner side of the casing, as shown, so that the free end of the block rests under it when the window is closed, thus preventing it from being opened from the outside. When the window is half open, the lower end of the block rests on the sill, and when entirely open, the end of the block rests on the screw eye.—W. H. Snyder, Great Falls, Mont.





Beach Chair Converted into Hammock on Which You Can Rest Comfortably

Beach Chair Converted into Hammock

Most beach chairs can be easily converted into hammocks. The back rest is turned down and its top ring is tied to the rung on the rear legs of the chair. If preferred, a ring-and-hook arrangement, as shown, may be permanently attached to the leg rung and used instead of a cord.—Sam Trachtman, New York City.

Coil Springs Hold Garden Tools

Stapled to a post or the side of a building, a coil spring from an old auto cushion provides a handy holder for garden tools, such as a hoe or rake. Insert the handle of the tool through the spring as shown, and there will be no danger of it being accidentally knocked down.



Waterproofing a Casting Line

Most casting lines are waterproofed at the factory, but if desired, a fairly good job of waterproofing a silk line can be done by impregnating it with boiled linseed oil. Coil the line loosely and place it in the warm oil, allowing it to remain until thoroughly saturated. Then remove the line and stretch it between two supports, and, with thumb and finger of one hand, squeeze out all the surplus oil. Per-

mit the line to dry in open air, and apply another dressing of oil with a rag. Two applications will do. After the line has dried, rub it with a soft silk cloth that has been sprinkled with talcum powder.

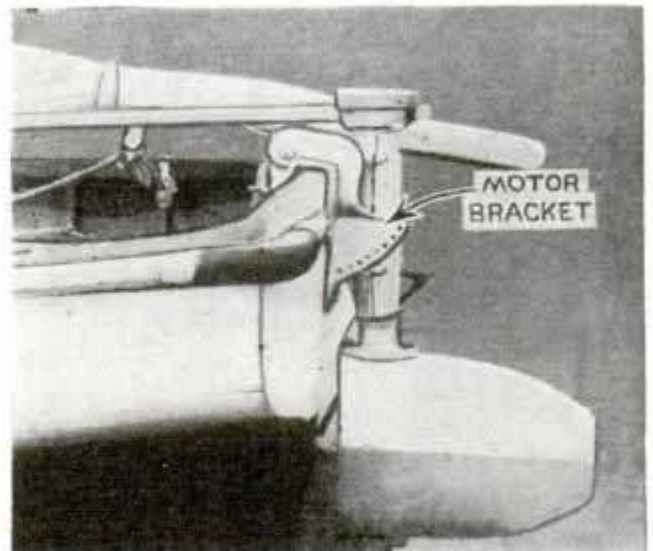
Timer for Telephone Calls

By attaching an egg timer to your telephone, you can readily see when your time for talking has expired, to avoid being charged for overtime. The most convenient place for the timer is usually on the telephone itself, where it may be held by a spring-steel clip.—A. S. Wurz, Jr., Rockyford, Alta., Can.



A Removable Boat Rudder

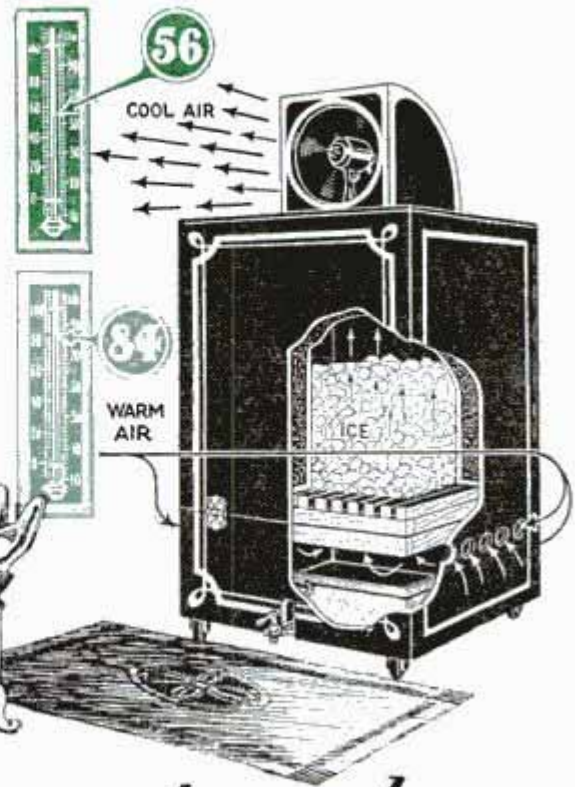
When sails and an outboard motor are used alternately on a small boat, it is convenient to equip it with a rudder that can be easily removed to accommodate the motor. Such an arrangement can be had by using an old outboard-motor bracket to hold the rudder. All that is necessary is to provide your regular rudder with a



Old Outboard-Motor Bracket Used to Provide Removable Rudder for Small Boats

vertical arm that can be pivoted in the bracket housing which formerly held the propeller shaft of the motor.

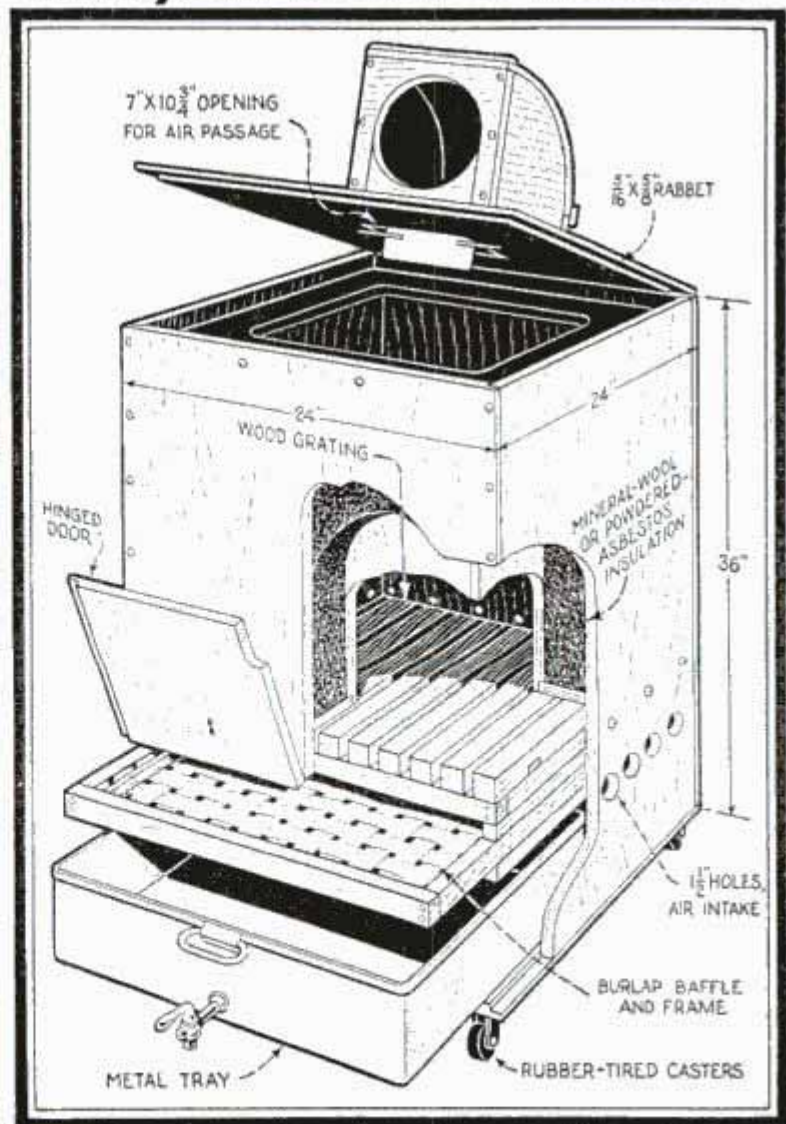
ROOM COOLER

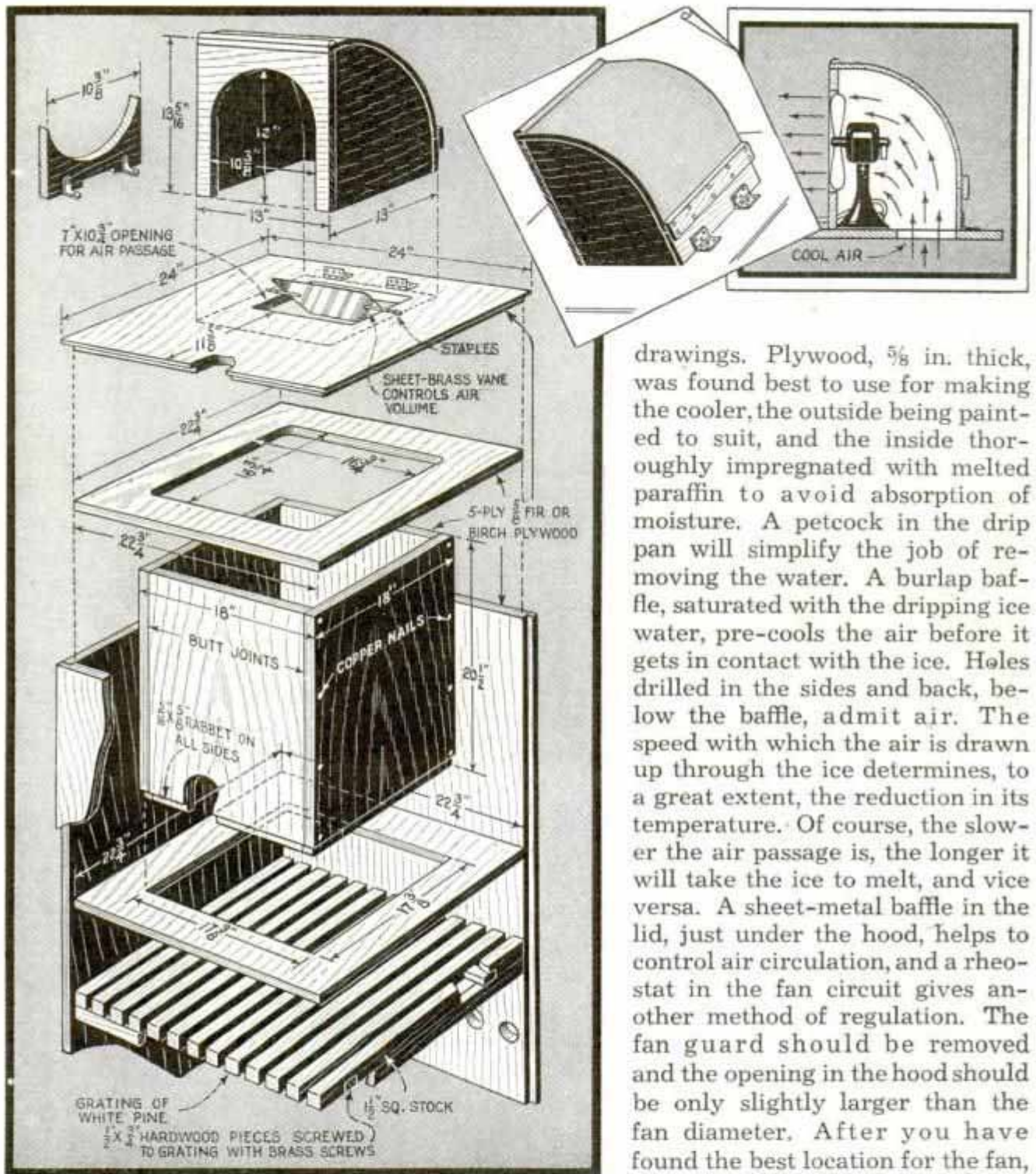


keeps temperature down

TO be perfectly comfortable on sultry summer days ceases to be a problem with this room cooler, the original model of which was built and tested in Popular Mechanics' laboratory. Air at 84° Fahr., was drawn through the cooler and reduced to 56° Fahr. This cooled air, blown out by means of a fan, lowered the room temperature from 84° to 66°. Besides the discomfort of high temperature, sultry days are oppressive because the high degree of humidity of the air prevents body perspiration from evaporating quickly. When this cooler is in operation, the warm, moist air comes in contact with the ice, which causes the moisture to condense on the ice in the form of water. In this way so much moisture is removed from the air that it becomes comfortable. In a 9 by 16-ft. room, three pailfuls of water were taken from the air.

When using the cooler, it is necessary to keep all doors and





drawings. Plywood, $\frac{5}{8}$ in. thick, was found best to use for making the cooler, the outside being painted to suit, and the inside thoroughly impregnated with melted paraffin to avoid absorption of moisture. A petcock in the drip pan will simplify the job of removing the water. A burlap baffle, saturated with the dripping ice water, pre-cools the air before it gets in contact with the ice. Holes drilled in the sides and back, below the baffle, admit air. The speed with which the air is drawn up through the ice determines, to a great extent, the reduction in its temperature. Of course, the slower the air passage is, the longer it will take the ice to melt, and vice versa. A sheet-metal baffle in the lid, just under the hood, helps to control air circulation, and a rheostat in the fan circuit gives another method of regulation. The fan guard should be removed and the opening in the hood should be only slightly larger than the fan diameter. After you have found the best location for the fan, by moving it back and forth slowly,

in order to locate the point where the exhausted air is as cool as possible, mark the position, and then screw the fan base to the top of the cooler. For convenience in adjusting the hood baffle, it is a good idea to hinge the hood to the cooler lid, so that it can be swung back. If desired the cooler may also be hinged. Be sure to have the lid fit snugly all around the edges to prevent entrance of room air at this point. Fitted with rubber-tired casters, the cooler can readily be moved from place to place, wherever needed.

windows closed, as its purpose will be defeated if you permit hot, moist air to get into the room you wish to cool. Also, this cooler is not designed to lower the temperature and humidity of an entire house or office. It is intended for use in a relatively small room where you can retreat when the outside atmosphere becomes almost unbearable. About 200 lbs. of ice are required to keep the room comfortable for a whole day.

The construction of the cooler is relatively simple as can be seen from the

Quick Method of Doing Large Washing Jobs

I have found that one of the most effective cleaning agents for washing autos, painted walls, and woodwork is a bar of borax soap dissolved in a gallon of hot water. By dipping a rubber sponge into the soapy water and going over the work with it, good results will be obtained in less than half the time usually required.—E. J. Wilkinson, Brooklyn, N. Y.

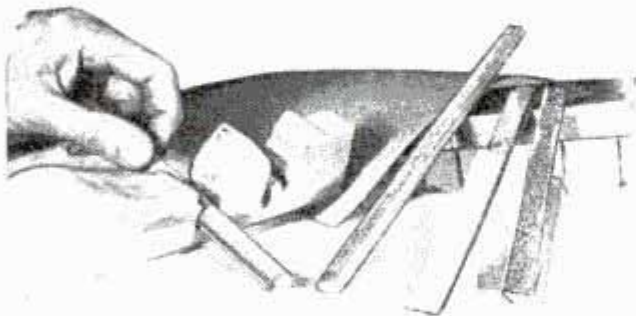
Rubber Band Holds Outgoing Mail in Sight



Outgoing mail can be seen readily by the postman when it is slipped under a band which has been cut from an inner tube and placed around the mailbox. Wind will not dislodge the letters and they will not be overlooked as is possible when placed inside the box.—A. H. Waychoff, Phoenix, Ariz.

Sticks for Sanding Scrollwork

An assortment of abrasive sticks will be found useful around the home workshop for sanding narrow cuttings and scrollwork. The sticks are made by gluing various grades of sandpaper to short dowels of different sizes.



Abrasive Sticks Made from Sandpaper and Dowels to Smooth Edges of Intricate Scrollwork

Three or four small envelopes glued inside of the covers of a cook book provide good containers for recipes that have been clipped from magazines and newspapers.



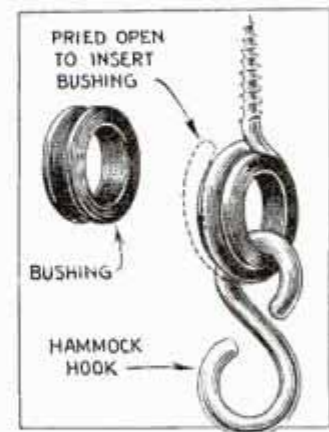
Sheet-Metal Scraper Clamped to Broom for Loosening Gummy Substances on Floor

Scraper on Broom to Loosen Hardened Dirt

Clay and other dirt that hardens on the porch or basement floor is removed easily with the aid of this scraper, which can be attached to the broom. It is made of heavy sheet metal. Such a scraper is also a great help in stores and public halls where chewing gum is often tramped on the floor.—Fred W. Schneider, Towaco, N. J.

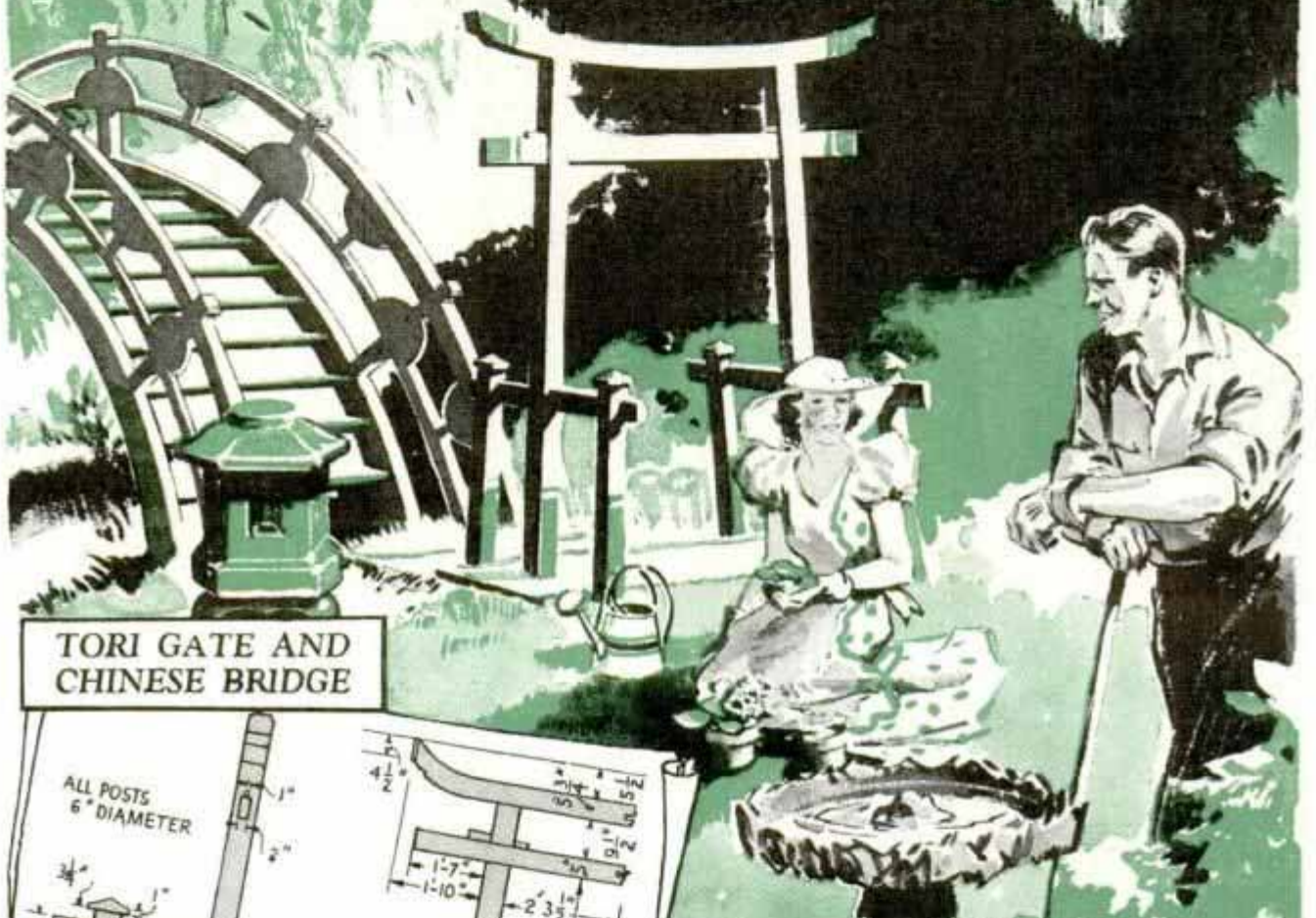
Oilless Bushings Stop Squeaks in Porch Swing

Squeaks in hammocks and porch swings that are caused by the ceiling and hammock hooks can be prevented by using oilless bushings at these points. Large screw eyes are substituted for the usual ceiling hooks and grooves are

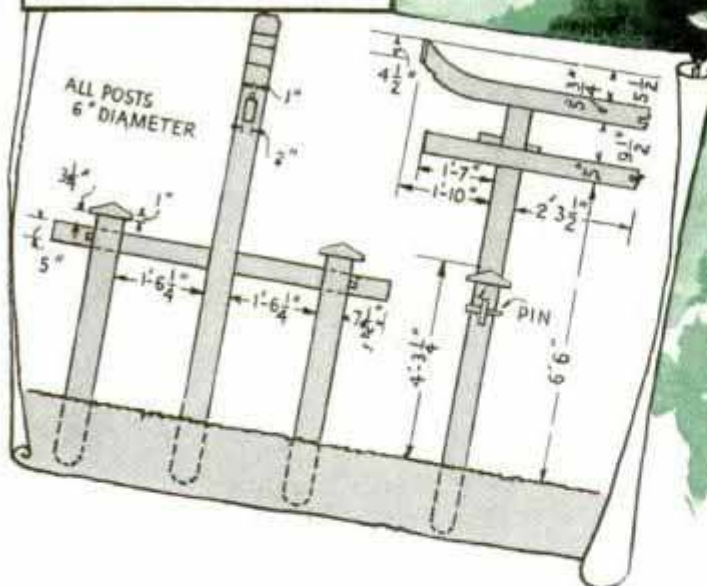


cut around the outside surface of the bushings so that they will fit the screw eyes, the latter being pried open and then closed lightly over the bushings.

Ideas from the GARDEN ARCHITECT

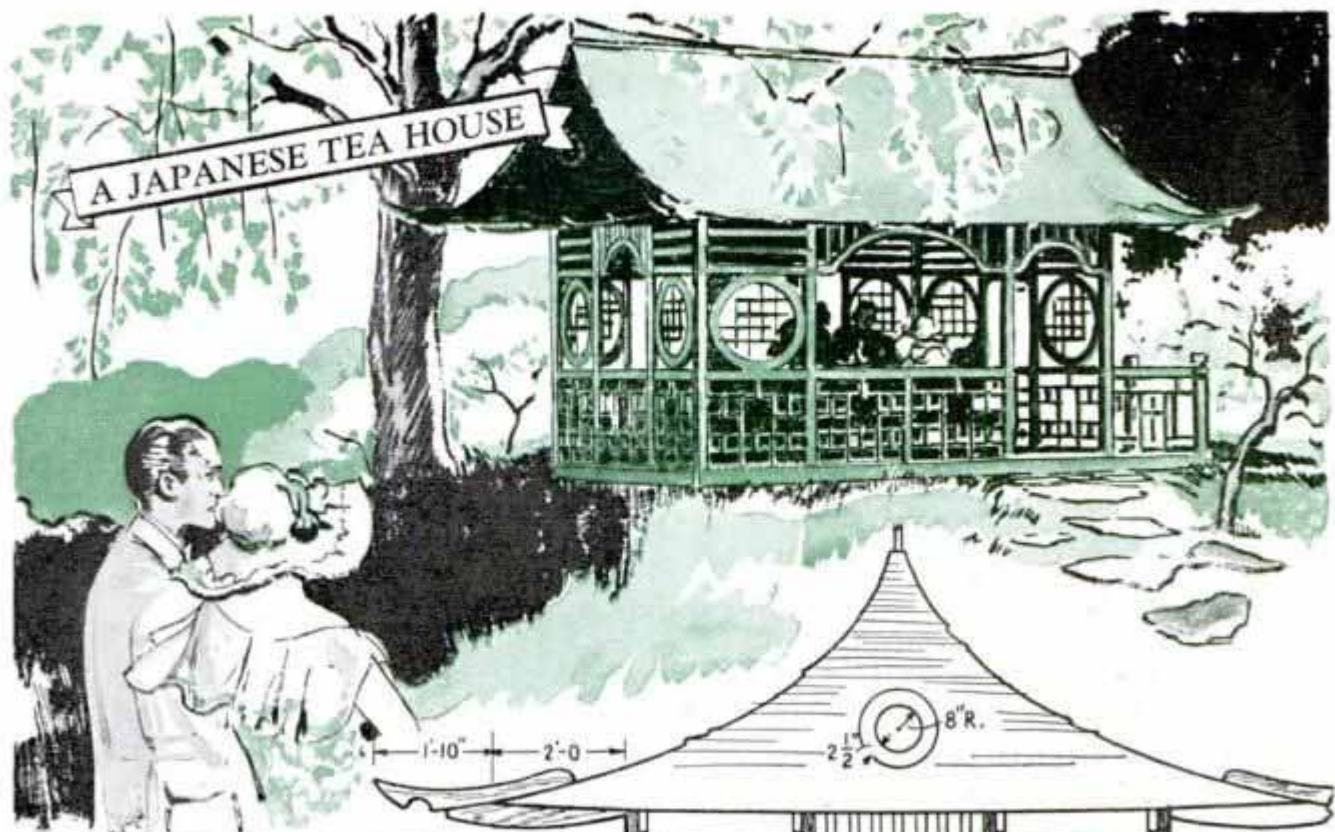


TORII GATE AND
CHINESE BRIDGE

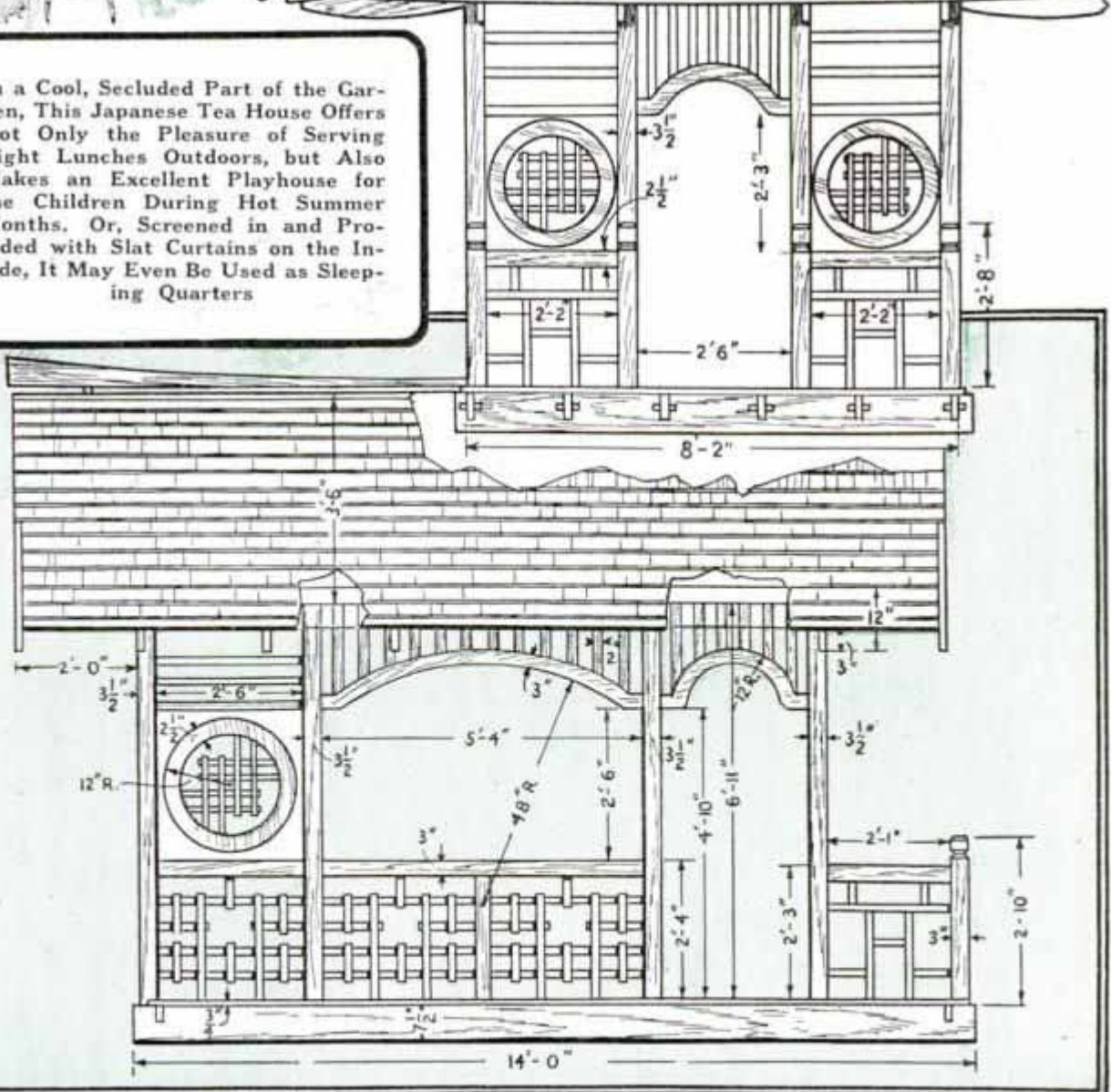


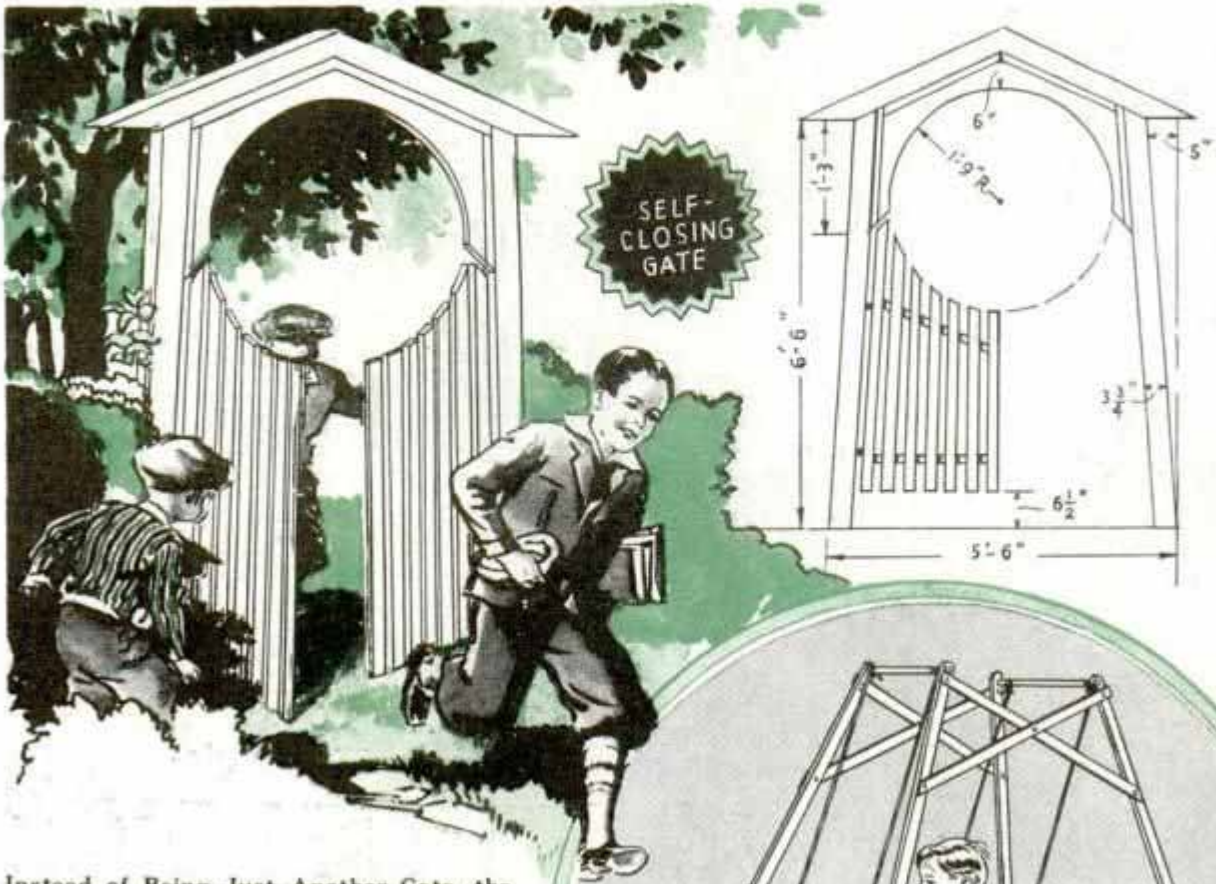
Whether Your Garden Is Small or Large, You Will Find This Striking Torii Gate Unusually Effective. No Nails or Screws Are Used in Its Assembly but the Parts Are Held Together Securely by Means of Wooden Pins and Wedges. The Semi-Circular Bridge of Chinese Design May Be Made Any Desired Size so That It Will Span a Miniature Pool on Your Lawn, or May Be Used on Large Estates for Actual Use to Cross a Small Stream, Besides Serving as an Ornament



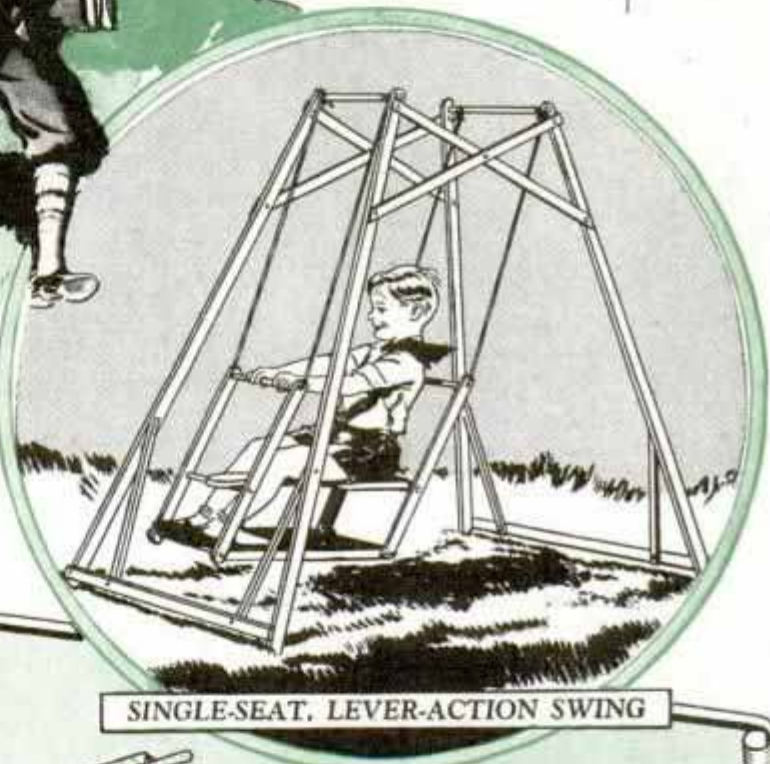


In a Cool, Secluded Part of the Garden, This Japanese Tea House Offers Not Only the Pleasure of Serving Light Lunches Outdoors, but Also Makes an Excellent Playhouse for the Children During Hot Summer Months. Or, Screened in and Provided with Slat Curtains on the Inside, It May Even Be Used as Sleeping Quarters

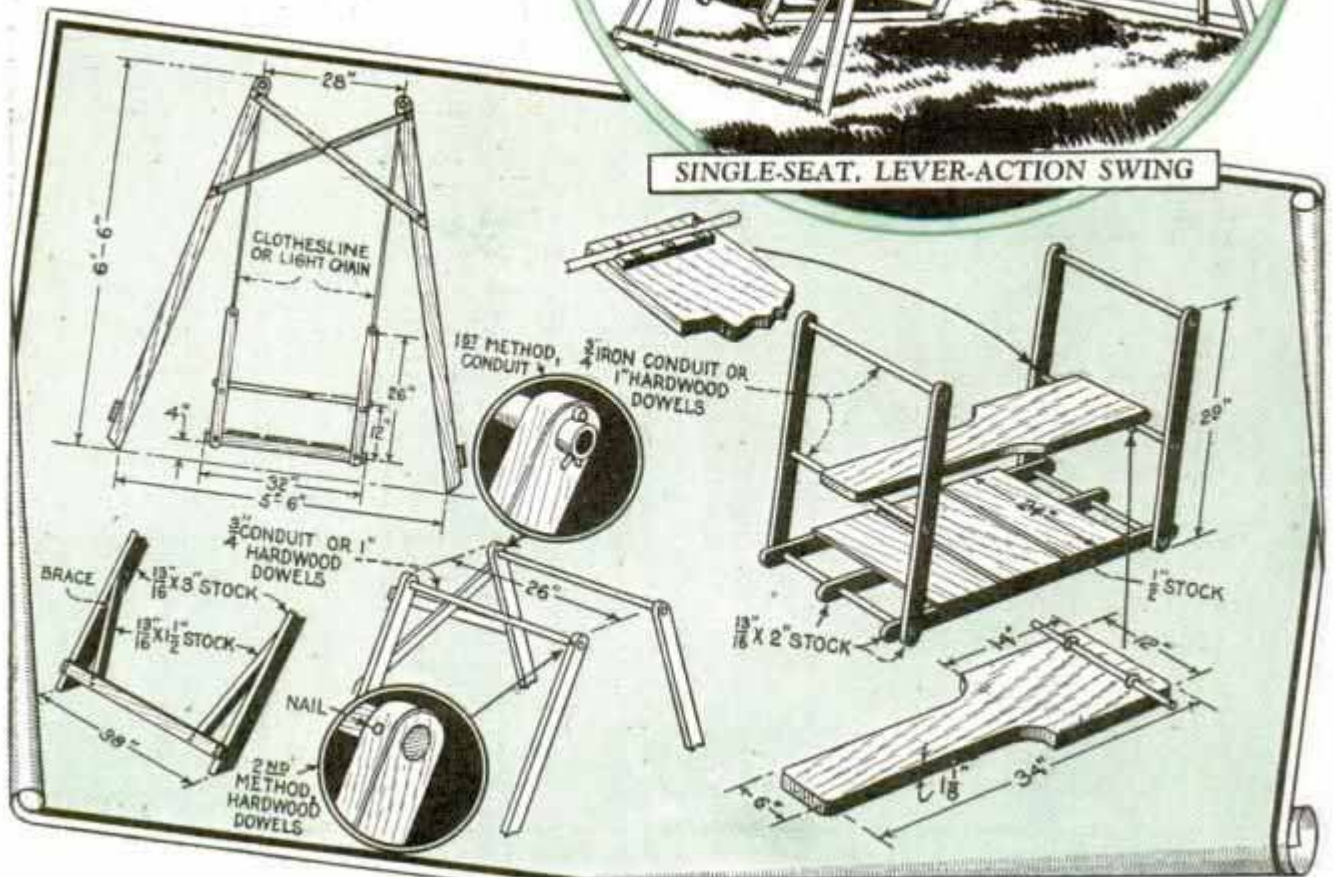


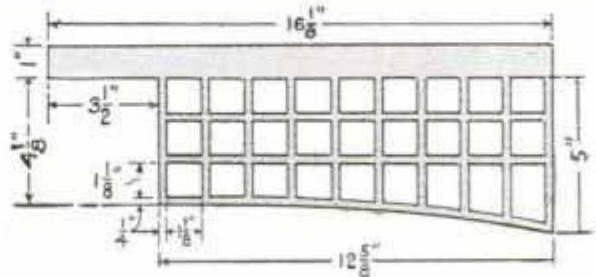
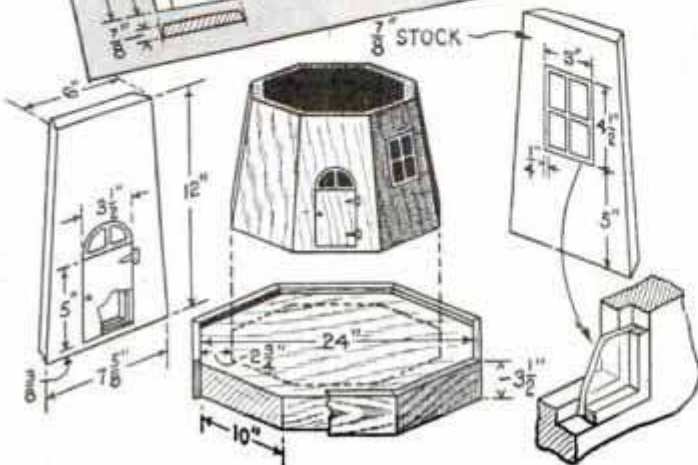
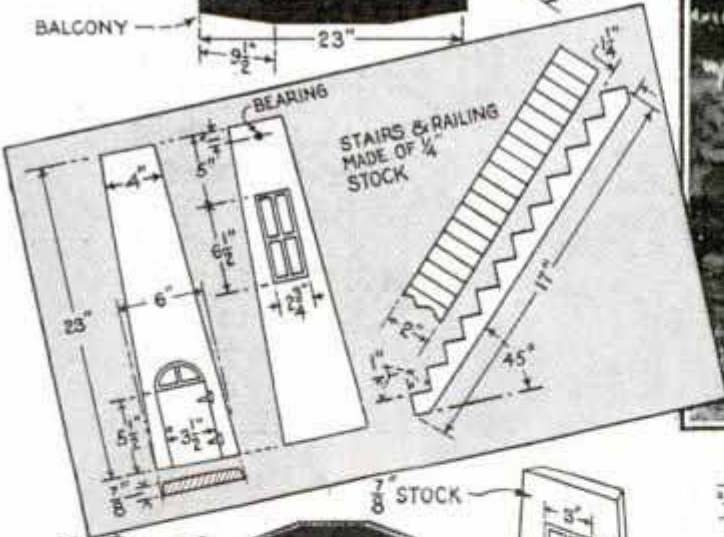
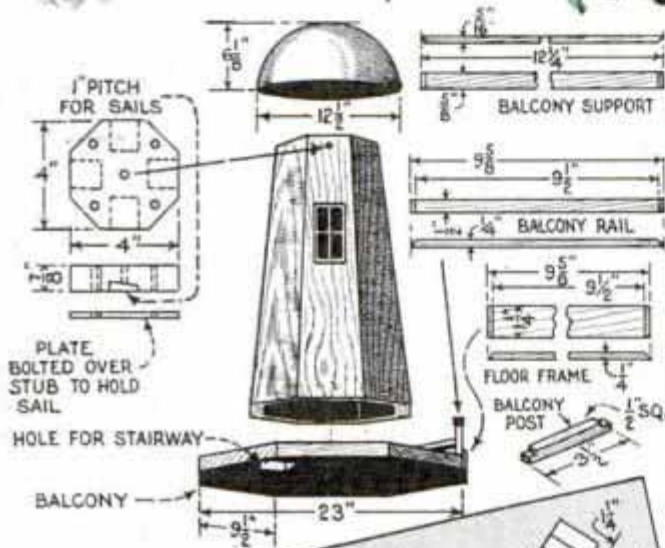


Instead of Being Just Another Gate, the One Shown Above Will Add a Touch That Helps Make Your Garden Attractive. Besides, the Posts Are Set at a Slight Angle so That the Gate Will Be Self-Closing. Right and Below, a Single-Seat, Lever-Action Lawn Swing Which Will Give Junior Plenty of Exercise as Well as Fun



SINGLE-SEAT, LEVER-ACTION SWING





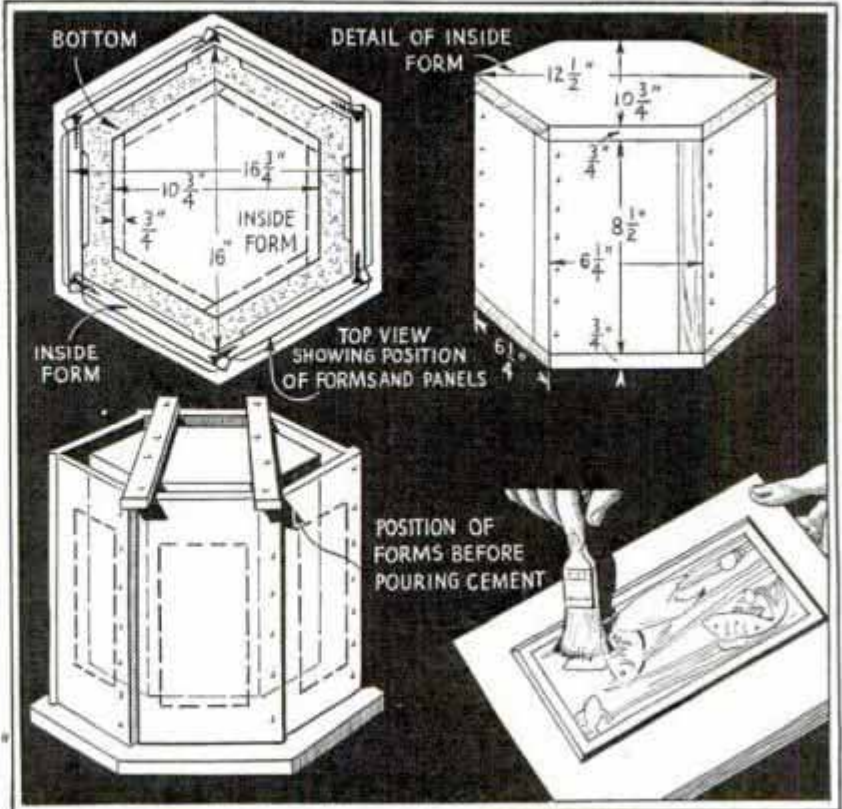
Have You Ever Wanted a Miniature Dutch Windmill? This One Can Be Made of Scrap Lumber and Is About 4 Ft. in Height. The Small Door Swings on Tiny Hinges and a Stairway Connects to the Balcony. For Finish, Use Bright-Colored Paint as This Will Give the Best Effect

A Cast Cement LILY and FISH POOL

Simple Carvings
in Wood or Lino-
leum to Enhance
Sides of Pool



Front and Cross Section of Carving Shows the Parts That Are Recessed and the Relative Depth of the Cuts.



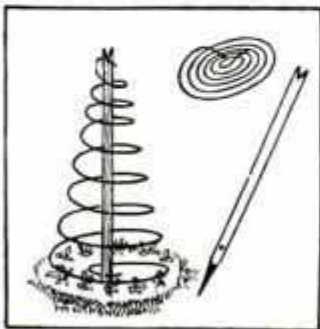
Developing Tanks for Roll Film from Radiator Hose



Section of Radiator Hose Plugged at the Ends Is Used as a Film-Developing Tank

Economical tanks for developing roll film can be made from a section of large auto radiator hose. The diameter of the hose should be about $\frac{1}{2}$ in. greater than the width of the film, and the length should be about 2 in. greater than one half the length of the roll to be developed. Rubber stoppers are best for closing the ends of the hose. If wood or cork is used for the bottom, cover it with a thin layer of melted paraffin. In use, the film is doubled and is pushed down inside of the tank. Then the developer is poured into it and the top stopper inserted. If the stopper fits tightly, the developing may be done in daylight.

Collapsible Trellis Supports Vine Plants in the Lawn

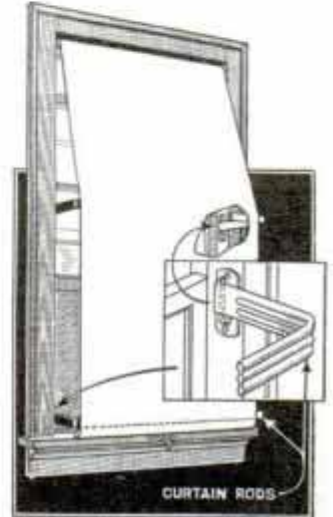


Here is a convenient trellis for morning-glory vines that will beautify the home grounds. A length of medium-gauge wire, coiled as shown, is supported by a stake driven into the ground. Mounted on the lawn, a trellis of this kind will quickly train a morning-glory, or similar vining plant to

resemble a small ornamental tree. Removal of the stake in the fall will allow the dry leaves and vines to be burned from the wire, after which the trellis can be stored for the winter.

Ventilation Assured When Shade Is Drawn Down

Pulled down over a curtain rod fastened to a window casing as indicated in the drawing, a shade can be held away from the window far enough to permit air circulation. The ventilating area provided in this way almost equals that of an uncovered window. The rods may, of course, be removed during the winter months when the window is not kept open.



Seed and Garden-Tool Carrier Made from Oil Can

To carry small garden tools and seeds, and keep them conveniently at hand, a discarded square oil can may be used. Cut the can along three sides and bend the top



Handy Carrier for Small Garden Tools and Seeds Made from Discarded Square Can

section back and down as shown. Then insert a heavy wire under the top and bend it to provide a carrying handle.

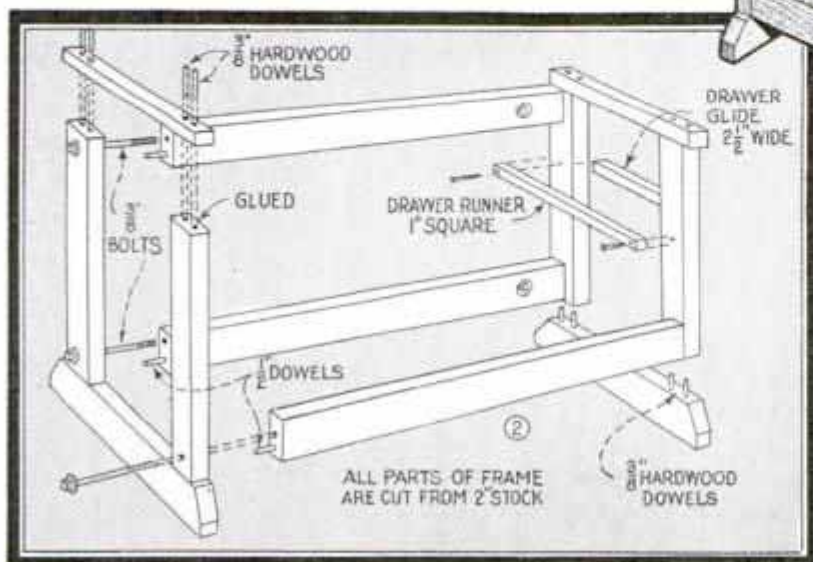
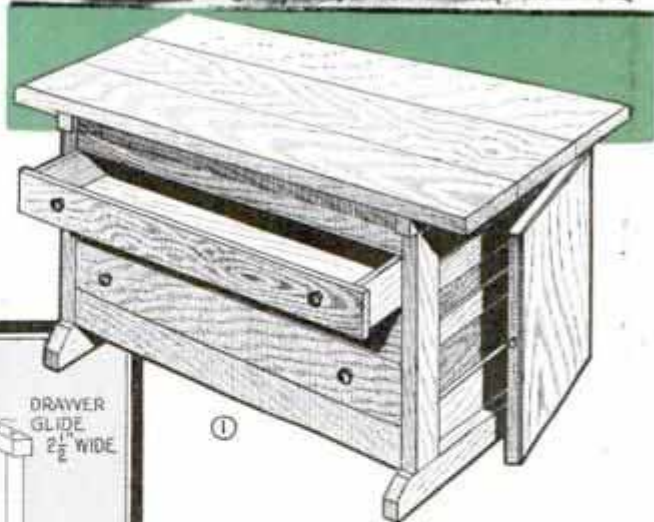


WORK BENCHES

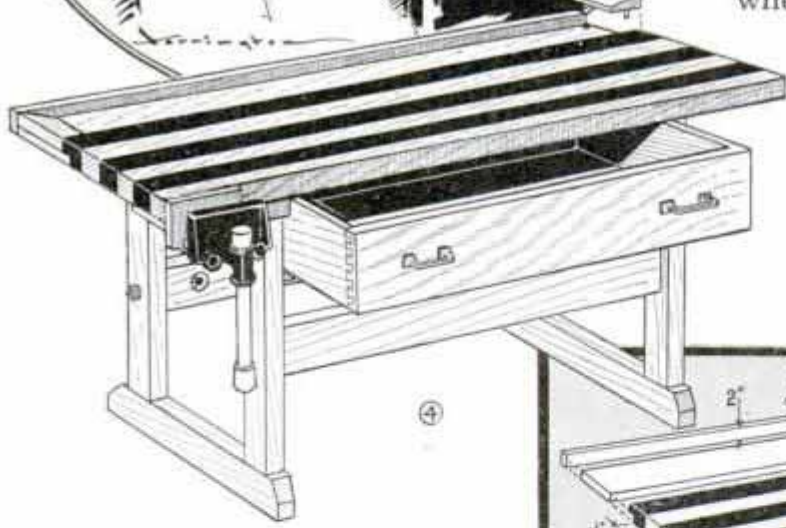
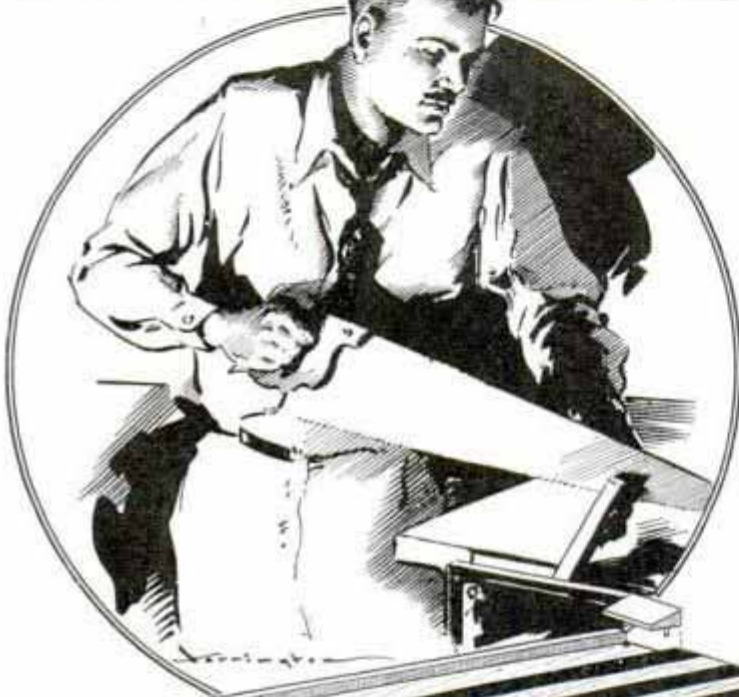
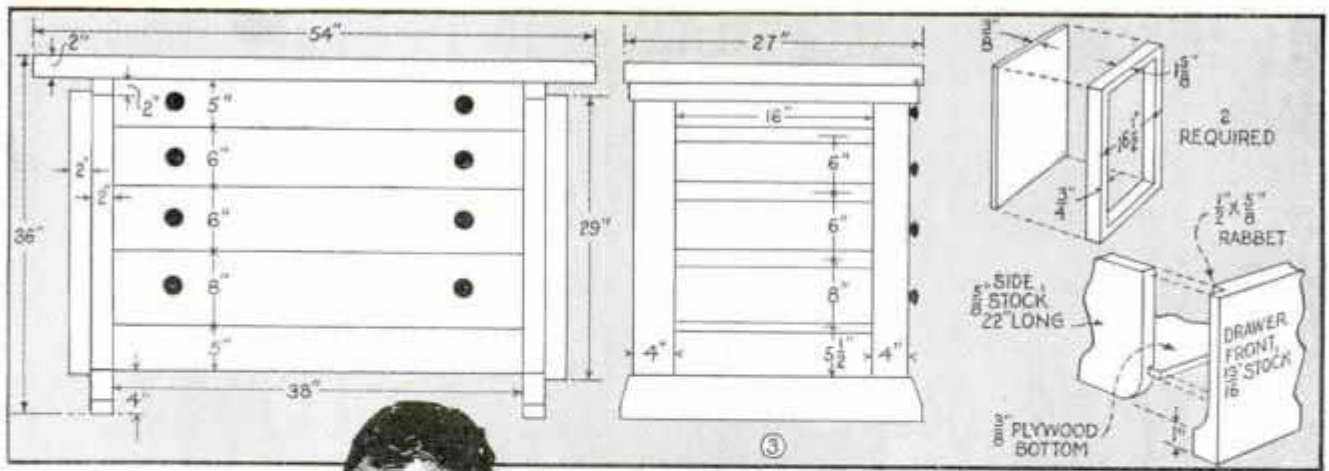
you can build

By W. CLYDE LAMMEY

FOR the average craftsman, who wants a general utility bench that is solid and has plenty of drawer space for tools, a cabinet type of bench, made of maple, as illustrated in Figs. 1 to 3 incl., will fill the bill. The ends are first made up, and are joined to the rails with $\frac{3}{8}$ -in. machine bolts. The rails are fitted with dowel guides, no glue is used and the nuts on the machine bolts are mortised into the rails. Holes for the nuts are centered at least 4 in. from the ends. The drawer runners are screwed to the end uprights. For guides, $2\frac{1}{2}$ -in. strips of $\frac{1}{2}$ -in. stock are nailed to the runners. Front and back rails are absent as the



drawer fronts overlap the space ordinarily taken up by the rail. The corner construction of the drawers is shown in the detail of Fig. 3 and also in Fig. 5. The top is built up from several separate pieces doweled and glued together, and then planed and sanded smooth on both

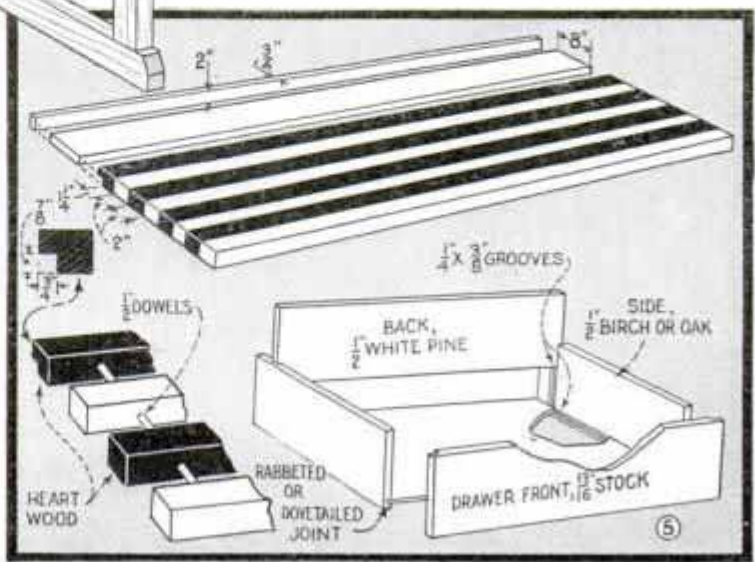


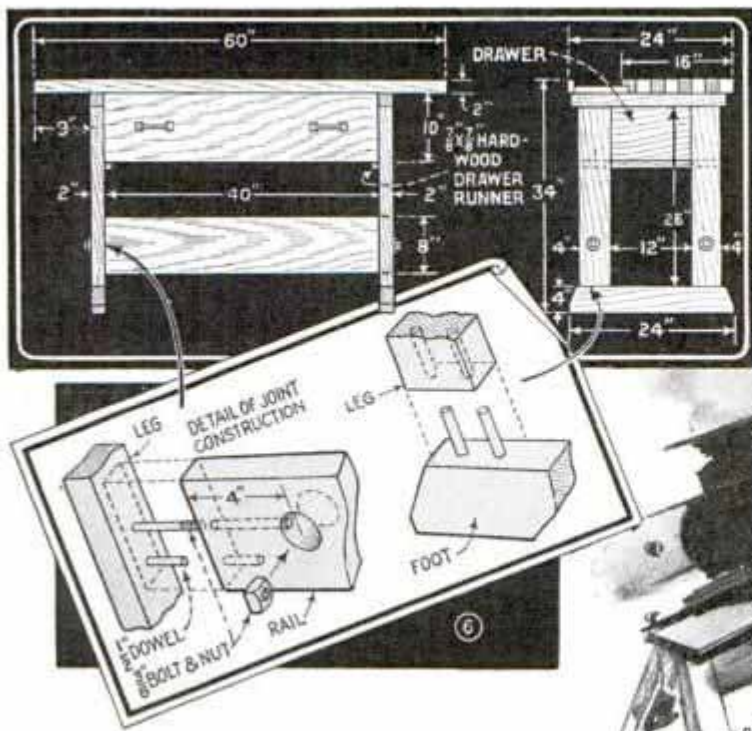
of the top to 60 in., which will allow a 9-in. overhang at each end, and provide ample room for attaching an ordinary vise of the rapid-acting or wood-screw type.

The bench shown in Figs. 4, 5 and 6 is similar in construction to the one described except that it has only one drawer and a tray for tools at the back. The back edge of the top is rabbeted as shown in the detail, and the single board which forms the bottom of the tool tray fits in the rabbet and is fastened with screws.

Fig. 7 shows a folding bench that is particularly useful in a small shop where space is rather limited. The manner of constructing this bench will be seen readily from Figs. 8 and 9. Threaded 3/8-in. rods are used for pivoting the legs. On one end of each rod the threads should be cut back 8 in. to allow sliding the rod through, so that

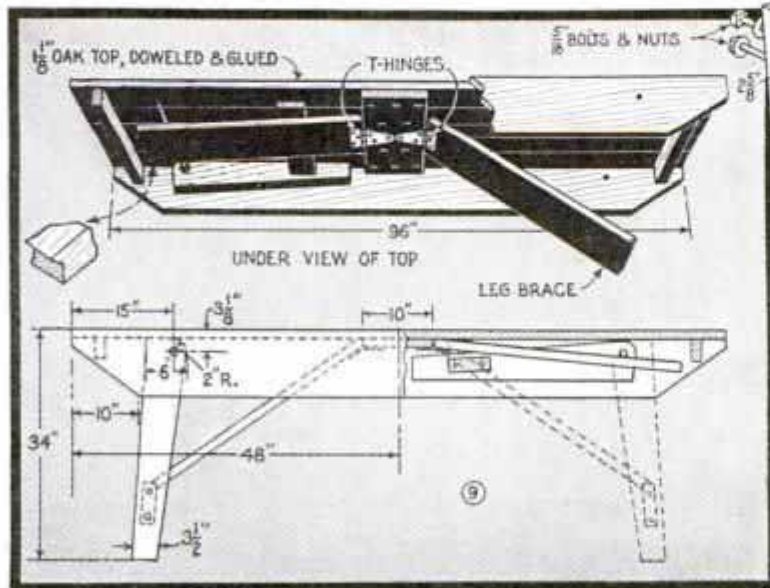
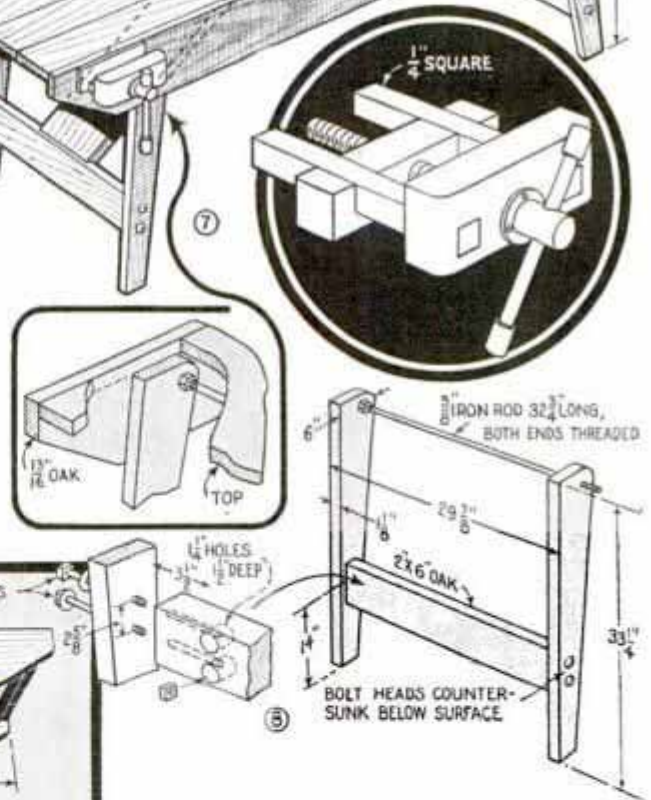
sides. The assembled top is simply set over short dowel pins, holes being drilled in the underside of the top. A tool compartment at each end to hold saws, hammers, squares, etc., consists of a frame of 3/4-in. stock screwed to a piece of 3/8-in. plywood and hinged to the leg. If you wish to use a vise with jaws wider than 6 in., increase the length





the nut may be run on the opposite end. No length is given on the braces as these must be cut to fit after the legs are in position. The length of the brace should be such that the legs must be forced slightly before the notched ends of the brace will drop over the cross rail to assure that the bench will stand rigidly when it is set up.

The construction of a vise of the wood-screw type which can be attached to any bench, is shown in the circular detail, Fig. 7. You can buy the wood screw and nut, and the outer jaw and guides are easily fitted to suit the bench. All parts should be of selected hard white maple. Work



benches should always be shellacked to preserve the wood and to prevent absorption of moisture. This will help to keep them in good condition. And, after making a work bench of which you may be proud, a little care in using it will prevent much unnecessary damage from sharp-edged tools.

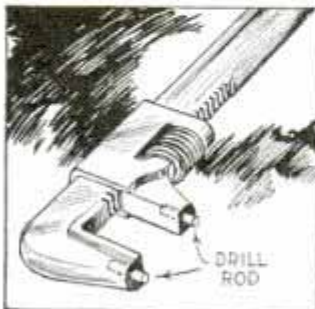


Guides Pivoted to Floor in Front of Narrow Doorway Speed Passage of Hand Trucks

Guides Facilitate Passage of Hand Trucks through Doorway

To speed the passage of small hand trucks through a narrow factory doorway where the men had to go slow and guide their trucks carefully in order to avoid hitting the door casing, one foreman put guides in front of the doors. These consisted of two lengths of heavy flat iron bent to the shape shown and pivoted to the floor next to the inside edge of the casing. The free ends of the guides were held in place with bolts inserted loosely into pipe sleeves, which were imbedded in the floor in front of the door. When not in use, the bolts were removed and the guides were folded against the wall.

An Adjustable Spanner Wrench



A serviceable spanner wrench can be made by slightly altering a monkey wrench. Drill a small hole in the end of each jaw and drive short pieces of drill rod into them.

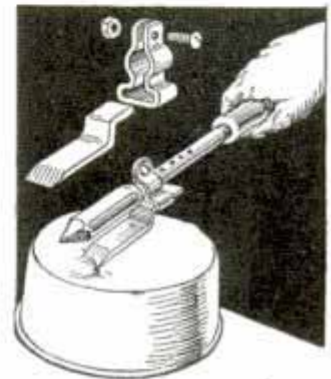
The ends of the rods should project about $\frac{3}{32}$ in. For a strong, permanent job, the rods should be welded to the jaws.—Geo. Conley, Long Beach, Calif.

Eradicating Thistles with Salt

To eradicate Canadian thistles cut them off with a hoe just under the surface of the soil and then sprinkle salt on the roots. The rain will soak the salt into the ground around the root and kill it. Unrefined salt that is packed in barrels is all right for this purpose, and is inexpensive. As these thistles spread from seed as well as by small sprouts that grow up from the roots, it may be necessary to repeat the treatment a couple of times before all the plants are killed.

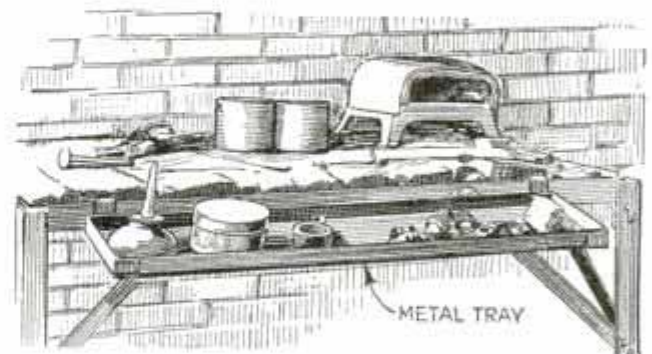
Scraper Improves Soldering Iron

Clamped to the shank of a soldering iron, this scraper is always at hand for removing excess solder from a repair job before the solder hardens. The scraper is made from a piece of flat steel bent to the shape shown and ground to a sharp edge at one end. The detail shows a simple flat-iron clamp that holds the scraper on the shank.—Fred W. Schneider, Towaco, N. J.



Shop Trays Provided with Hooks for Attachment to Benches

In shops where shallow metal trays are used to hold small parts around the workbench, it is a good idea to fit them with



Metal Trays Hooked to the Sides of Workbenches Save Steps in the Shop

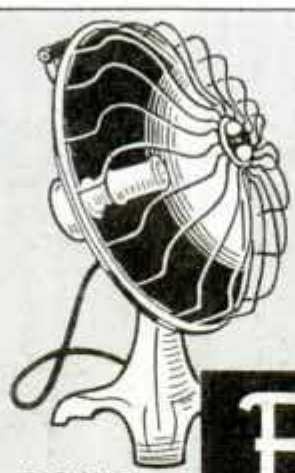
hooks so that they can be attached quickly to one side of the bench. This saves time in walking back and forth to the tray, and also saves space on top of the bench.

*A. H. Waages 110 Chambers
 with L. Wiegand
 Editor
 7506 Home
 Berkeley, Calif.*



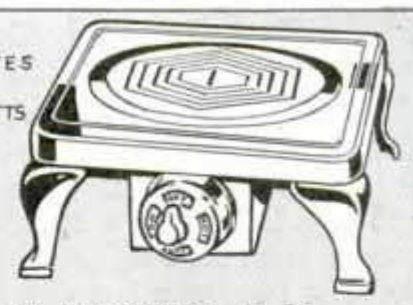
ELECTRIC IRONS

- 3 LB. - 300 TO 330 WATTS
- 5 LB. - 500 - 550 WATTS
- 6 LB. - 350 - 660 WATTS
- 7 1/2 LB. - 660 - 770 WATTS
- 8 1/2 LB. - 700 - 800 WATTS
- 10 LB. - 800 - 900 WATTS



RADIANT HEATERS
600 TO 1000 WATTS

HOT PLATES
500 TO 1000 WATTS



OLD SWITCH CONNECTIONS TO BE FOLLOWED WHEN RENEWING ELEMENT

Repairing



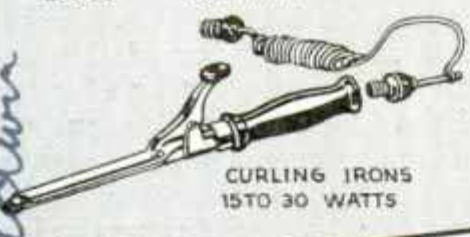
IMMERSION HEATERS
SMALL - 300 WATTS
LARGE - 500 WATTS



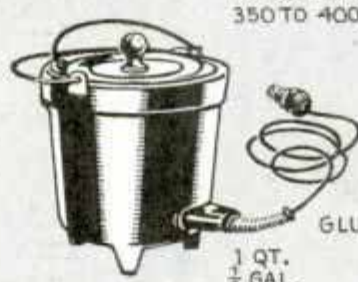
TABLE ELECTRIC STOVES
500 TO 660 WATTS



PERCOLATORS
350 TO 400 WATTS



CURLING IRONS
15 TO 30 WATTS



GLUE POTS
1 QT. 70 WATTS
1 GAL. 90 WATTS
1 GAL. 140 WATTS

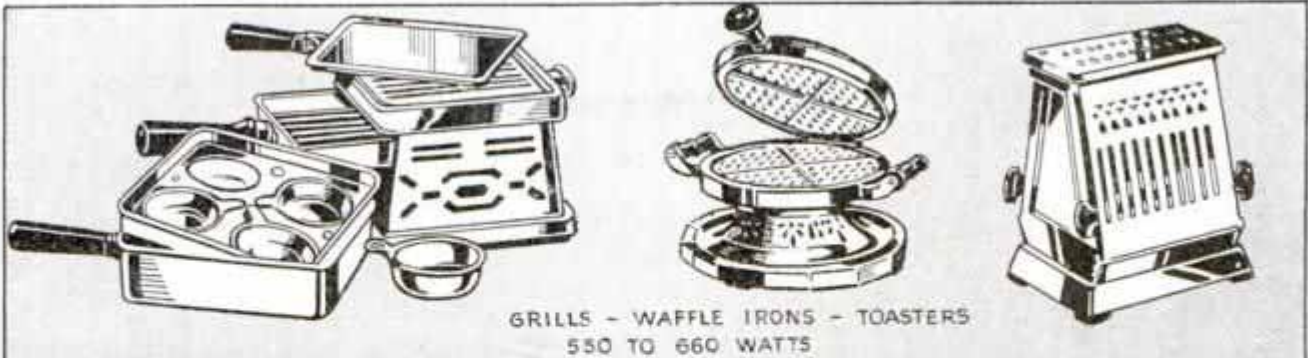
TABLE No. 1
Length of Nichrome Resistance Wire Required for Heating Elements

Watts	110 to 120 Volts		220 to 250 Volts		32 Volts	
	Wire Size B & S	Length Required	Wire Size B & S	Length Required	Wire Size B & S	Length Required
25	34	29 4"	38	47 3"	30	6 4"
50	32	23 7"	34	39 0"	27	6 5"
75	30	24 7"	33	49 8"	25	6 9"
100	29	23 7"	32	47 2"	24	6 4"
125	28	23 10"	31	47 3"	23	6 5"
150	27	24 11"	30	49 2"	22	6 9"
175	27	21 5"	29	42 7"	22	5 10"
200	26	25 6"	28	47 2"	21	6 5"
250	25	25 10"	27	47 8"	20	6 6"
300	24	24 10"	27	49 10"	19	6 9"
350	24	20 5"	26	42 10"	19	5 10"
400	23	22 10"	25	47 0"	18	6 5"
450	22	25 7"	25	49 3"	18	5 8"
500	22	23 0"	25	47 8"		
550	21	26 7"	24	43 5"		
600	21	24 4"	24	49 8"		
650	20	28 5"	24	44 10"		
700	20	26 5"	24	40 10"		
750	20	26 5"	24	39 0"		
800	19	24 7"	23	45 8"		
850	19	29 0"	23	42 10"		
900	19	27 5"	22	51 2"		
950	19	37 10"	22	48 8"		
1000	18	29 2"	22	46 0"		

ELECTRIC heating elements for flat-irons, toasters, soldering irons and other appliances may be repaired by anyone with a few tools, the most important of which are a screwdriver and a pair of

pliers. In this article we are going to take the mystery out of Nichrome wire so that you can figure just how much and what size wire will be needed for any particular job. And, information is also included to enable you to design rheostats and resistors as well as heating units for almost any type of application.

Before you can repair a burned-out electric appliance, it is necessary to find the size of element which will be required. Sizes for electric heating elements are rated in terms of the number of watts of electricity they consume. As an illustration, the average household electric flatiron takes 550 watts. This is usually stamped on the nameplate and is therefore not difficult to locate. The watt is the electrical unit of measurement which tells how much electricity is being used. It is figured by multiplying the volts by the amperes. Also, if the wattage and voltage are known,

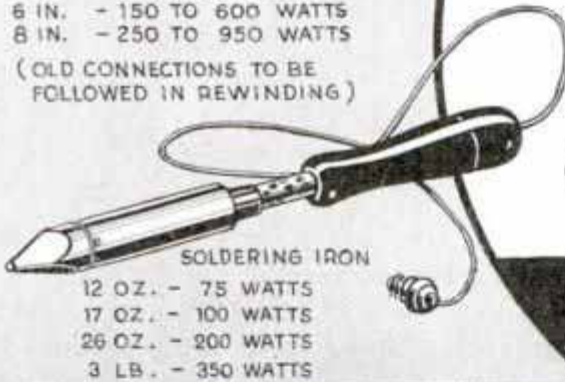


GRILLS - WAFFLE IRONS - TOASTERS
550 TO 660 WATTS

Electric Appliances



DISK STOVES
6 IN. - 150 TO 600 WATTS
8 IN. - 250 TO 950 WATTS
(OLD CONNECTIONS TO BE FOLLOWED IN REWINDING)



SOLDERING IRON
12 OZ. - 75 WATTS
17 OZ. - 100 WATTS
26 OZ. - 200 WATTS
3 LB. - 350 WATTS



By **CLYDE A. CROWLEY**

the amperes (units of electric-current measurement) can be found by merely dividing the wattage by the voltage. By doing this you find that the electric flatiron, which consumes 550 watts and is designed to operate on a 110-volt circuit, passes 5 amperes, when in use. The resistance of the heating element in ohms (units of electrical resistance measurement) is found by dividing the volts by the amperes, or in this case we have 110 volts divided by 5 amperes, which gives us 22 ohms. Table No. 2 shows the lengths and wire size in gauge numbers of $\frac{1}{16}$ -in. Nichrome ribbon, or flat wire as it is sometimes called, which is required for various sizes of heating elements. The lengths of wire shown in the table have been figured

to allow for the fact that the resistance of wire changes as it gets hot; therefore it is both easier and more accurate to use these values than to figure out the ohms from some of the other tables. In the case of the flatiron, we have been using as an example, we find, opposite 550 in the watts column, that No. 36 ribbon should be used. In the last column the proper length of wire is shown to be 11 ft. 11 in. To repair the iron, it is only necessary to remove the old element from the mica form and replace it with the new ribbon. The ends of the new element are carefully twisted around the terminal screws between washers and tightened in place. In making connections with Nichrome wire it should be remembered that solder cannot



To change one pint of water to steam in 30 min. or 1 hour, requires an element of 400 and 800 watts respectively

To start one pint of water boiling in 5, 10 or 20 min., requires an element of 150, 300 and 600 watts respectively



be used because of the heat of the appliance; therefore a tight friction connection is the best practice. When it becomes necessary to make a splice, either twist the wires together tightly or fasten them with a small iron machine screw using a couple of washers to grip the wire. When installing the element, the mica separating the element from the metal must be carefully replaced to prevent short circuits or grounds.

A simple method of making a ground test is shown on the last page of this article. Two testing points are connected to a couple of lamps as shown in the left-hand detail. One of these is touched to the body of the iron and the other to one of the terminal posts. If the work has been carried out properly and there is no ground, the lamps will not light. If they do light, part of the element of the iron must be touching the shell and this condition must be corrected before the iron is used. The center detail shows a convenient test for an open circuit or break in the element which will be the case if the element is burned out. The testing points are touched to the two terminals of the iron and the lamps will light if the wiring is continuous. After assembling a repaired iron, it frequently happens that it still refuses to heat after testing out O.K. The trouble is

TABLE No. 3
Nichrome Wire Sizes for Rheostats

Wire Size B & S	Warm Allowable Amperes in Rheostat	Hot Allowable Amperes in Rheostat	Ohms per Foot of Wire
10	20 amperes	30 amperes	.8624
11	17 "	25 "	.0784
12	14 "	22½ "	.0990
13	12 "	18 "	.1253
14	10 "	16 "	.1586
15	8 "	14 "	.2000
16	7 "	11½ "	.2499
17	6 "	9½ "	.3209
18	5 "	8 "	.4062
19	4 "	7 "	.5015
20	3½ "	6 "	.6347
21	3 "	5 "	.8002
22	2½ "	4 "	1.015
23	2¼ "	3½ "	1.272
24	2 "	3 "	1.625
25	1½ "	2½ "	2.028
26	1¼ "	2¼ "	2.571
27	1¼ "	2¼ "	3.223
28	1 "	1½ "	4.094
29	¾ "	1¼ "	5.090
30	¾ "	1 "	6.300
32	½ "	¾ "	10.15
34	¼ "	½ "	16.37
36	¼ "	¾ "	26.00

TABLE No. 2
Length and Size of Nichrome Resistance Ribbon 1/16" Wide Required for Heating Elements

Watts	Thickness B & S	Length Required 9 ft. 10 in.
400	40	10 " 9 "
425	39	10 " 8 "
440	39	10 " 7 "
450	39	10 " 6 "
475	38	11 " 7 "
500	37	11 " 6 "
525	37	11 " 5 "
550	36	12 " 6 "
575	36	12 " 5 "
600	35	11 " 11 "
625	35	12 " 10 "
650	34	12 " 9 "
660	33	12 " 8 "
675	33	13 " 11 "
700	32	13 " 10 "
750	32	15 " 0 "
	31	14 " 7 "
		15 " 1 "

then usually in the cord. You may confirm this by testing the cord as shown in the right-hand detail. The two testing points are inserted into the plug and the prongs of the socket plug are connected together. If the cord is in good condition the lamps will light. If they do not light one or both of the wires are broken and should be replaced with a new cord. The tests may be made on defective appliances before repairing to locate the source of the trouble. On some electric irons the element is buried in a cement composition. In this case, the cement should be chipped away and the element replaced as already explained. New cement, of the kind used by dentists, is applied over the new ribbon. The cement should be allowed to dry out for two or three days before connecting the iron to the current supply.

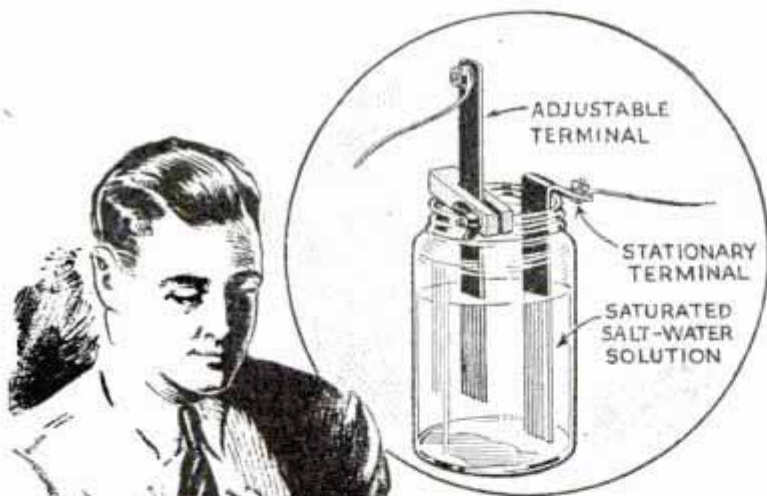
The electrical consumption of the most commonly used electric appliances is shown at the head of this article. If the appliance has a nameplate giving the watts, this value should be used. If this is miss-

ing, the old element should be removed and the length of the wire for replacement can be measured by winding string into the winding grooves. One of the sizes of elements as listed should then be selected. As an illustration, suppose that the unit is a toaster and that there is room on the mica forms for ribbon 11 ft. 6 in. long. From the information given, a toaster may be wound for 450 to 550 watts. Referring to Table No. 2, we see that, opposite these wattages, the nearest length to 11 ft. 6 in. is 11 ft. 8 in. opposite 500 watts, so we will use this size ribbon. The extra 2 in. will be just about right for reaching the terminals. If the appliance happens to be one wound with round wire, Table No. 1 should be used. This table also gives values for 32 and 220-volt appliances.

Rheostats for controlling the speed of motors, dimming lights, for regulating electric fans and many other purposes may be constructed from the details that show both a tubular and a flat type of rheostat.



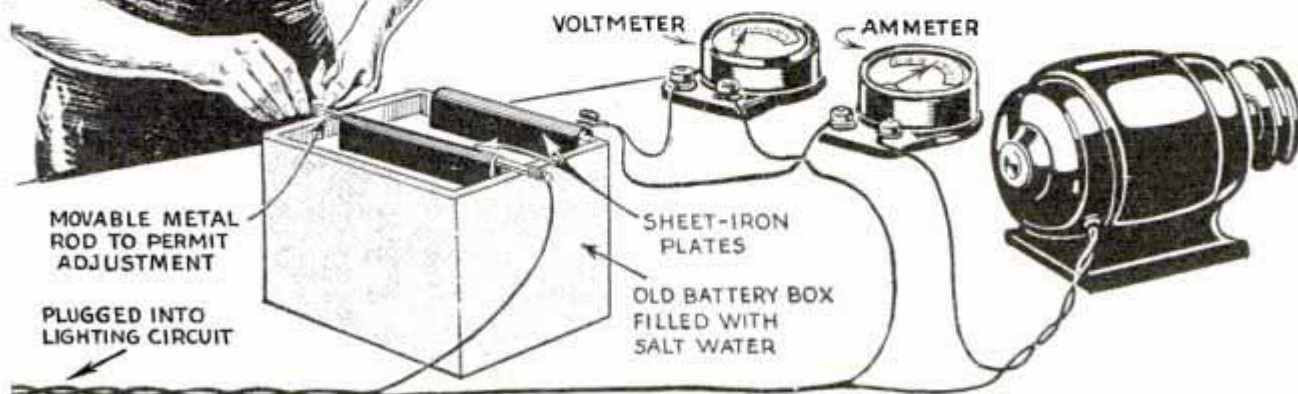
To determine the cost of operating an electric appliance, divide the wattage of the appliance by 1000, and then multiply the resulting number by the rate per kilowatt hour



Two simple types of salt-water rheostats used in determining resistance values of wire-wound rheostats

They must be made so that they will not become too hot. Table No. 3 gives the number of amperes that may be passed through the various sizes of wire. If the current used is not greater than that shown in the second column the rheostat will get rather warm but not hot enough to be a fire hazard. If the current is greater as shown in the third column the wire will get very hot. If heavy currents are to be used with small-size wire, the rheostat should be completely exposed to the air and kept away from inflammable material.

In order to determine the correct size of rheostat for any particular purpose, the appliance on which the rheostat is to be used is

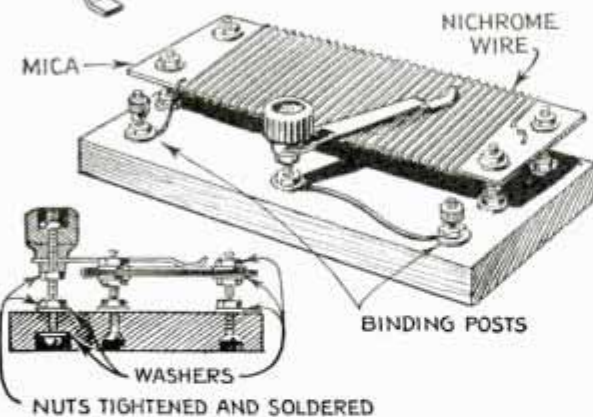
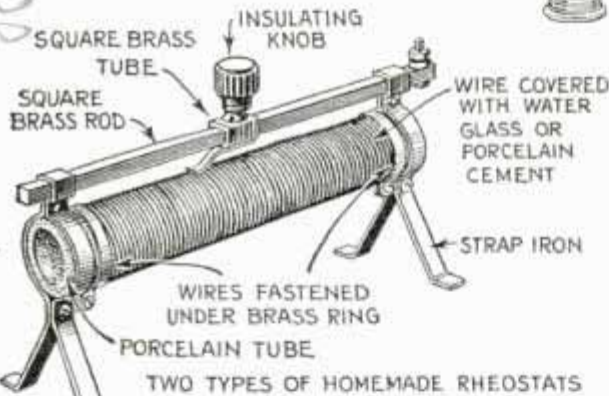
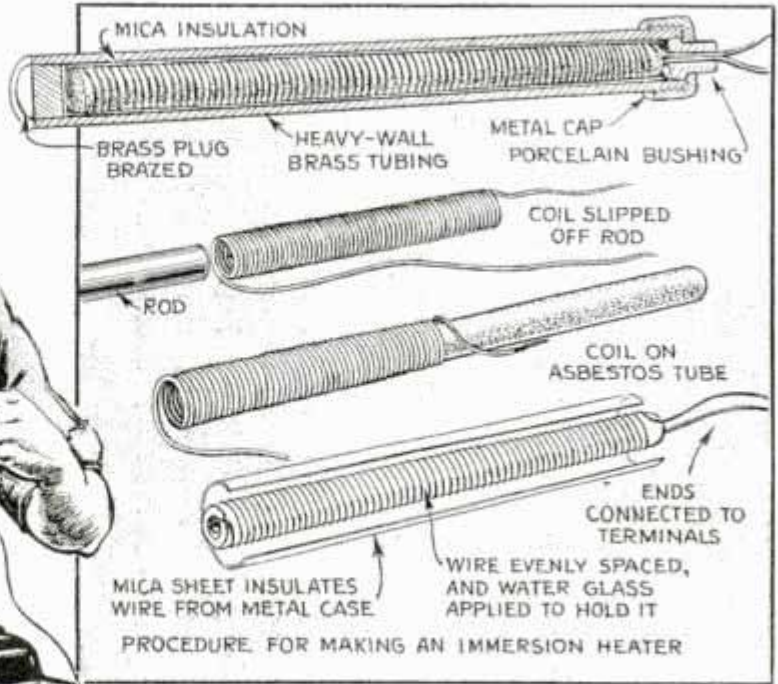
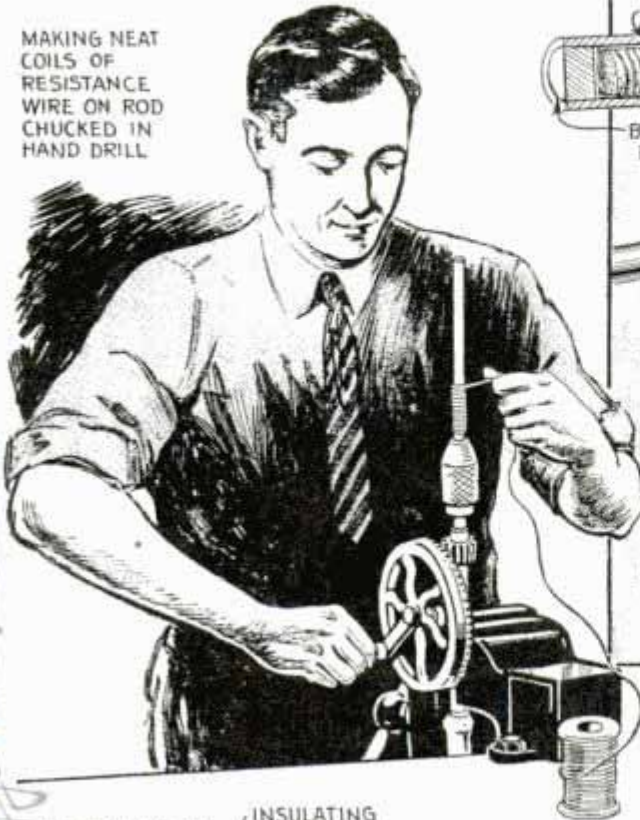


MOVABLE METAL ROD TO PERMIT ADJUSTMENT
PLUGGED INTO LIGHTING CIRCUIT

VOLTMETER AMMETER

SHEET-IRON PLATES
OLD BATTERY BOX FILLED WITH SALT WATER

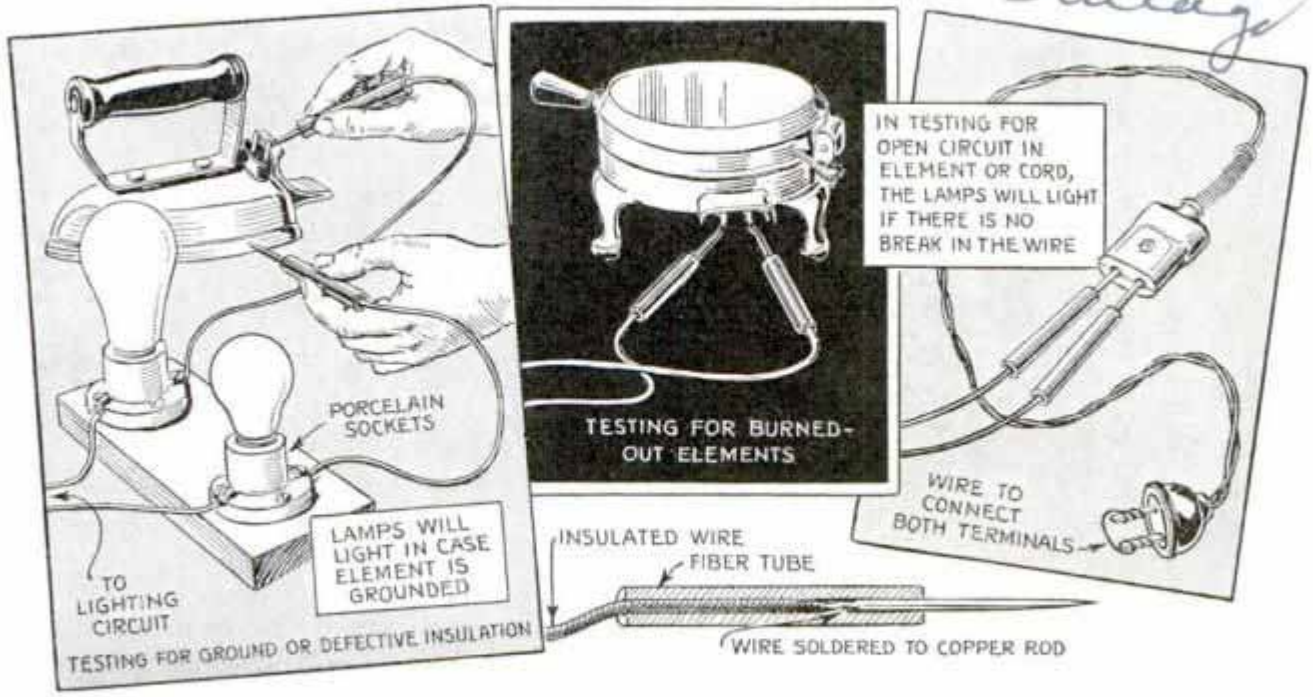
MAKING NEAT COILS OF RESISTANCE WIRE ON ROD CHUCKED IN HAND DRILL



highest current passed. The plates are next separated and adjusted until the appliance operates as desired. With a fan, the plates in the rheostat are adjusted until the fan runs as slow as is desired, while for dimming lights the plates are adjusted until the maximum dimness is obtained. The meters are then read and the resistance needed is figured as follows: For example, suppose that you wish to make a lamp dimmer. Touching the plates together the ammeter will read 3 amperes. When the lights have been dimmed properly, by adjusting the plates of the salt-water rheostat, the voltmeter will read 60 volts and the ammeter will read 2 amperes. Subtracting 60 from 110 (the voltmeter reading and the voltage of the lighting circuit) you get 50 volts. Dividing this 50 by 2 amperes as indicated on the ammeter, you get 25 ohms as the required resistance for the rheostat. Now consult table No. 3 to find the proper wire size and length. If you want to make a rheostat that will not get hot, look down column 2 until you come to 3 amperes, or the first meter reading. You will find this opposite No. 21 wire, so this size is to be used for making the rheostat. Following across the table to the last column you find that No. 21 wire has a resistance of .8002 ohm per foot. As you need 25 ohms divide 25 by .8002, which gives 31.2 or 31 ft. 2 in. If the rheostat is to be adjustable, it would be a good idea to use 32 ft. of wire. The rheostat may be built by either of the methods shown in

connected to a 0-150 voltmeter, an ammeter of suitable range, say one reading from 0 to 15, and a makeshift salt-water rheostat as shown. The meters need not be high priced; the type sold for around a dollar each are quite satisfactory. The plates of the water rheostat are touched together and the ammeter read to find the

Ammeter and voltmeter? Read into. Co., Duffton, Ohio



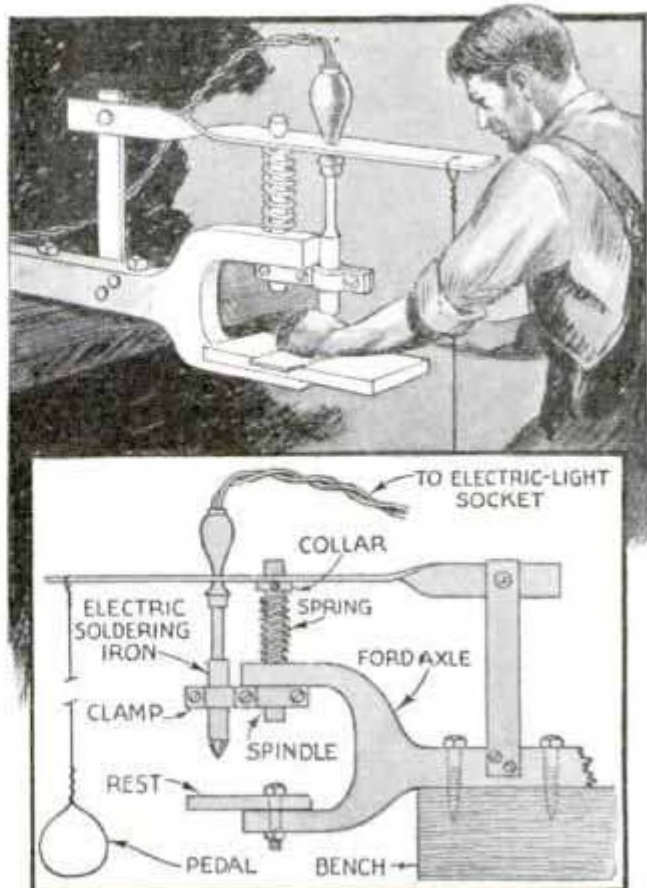
the illustrations. If it is not to be adjustable, and no sliding contact is used, it is not a rheostat but is called a resistor.

Immersion heaters may be constructed from the details shown. In use, they are set in the liquid to be heated. In making immersion heaters, be sure to insulate the element safely from the tube that incloses

it. Also be careful that the individual turns of wire are not short-circuited by touching adjacent turns, or by touching the wire that is brought back across the turns. Use a mica sleeve directly over the coil, then run the return lead over the mica, after which a second piece of mica is wrapped around the assembly.

Soldering Iron Operated by Foot Leaves Both Hands Free

Owners of tin shops and other shops where considerable soldering is done will find this soldering-iron holder handy as it is foot operated, thus leaving both hands free to handle the work. It consists essentially of one half of a front car axle, which is bolted to a bench top so that the end of the axle projects over the edge of the bench. The soldering iron is clamped to the lower end of a spindle which slides through the upper spindle hole in the axle and is controlled by a coil spring. The latter is held in place by the axle at one end and by a collar and set screw at the other end. A rest, bolted in the lower spindle hole, supports the work while it is being soldered. The holder is operated by a wire pedal, which is fastened to a lever carrying the soldering iron as shown.



Some leather dyes, such as mahogany and dark brown colors, make wood stains that can be applied to a varnished surface without damaging the finish, if applied with a camel's-hair brush.

Simple Method of Writing Window Signs in Reverse



Window Signs Lettered in Reverse by Tracing Design in Coating on Outside of Glass

Window-sign layouts for inside lettering are usually difficult for the average amateur as they must be made in reverse. By coating the outside of the window with a solution consisting of whiting mixed with water to the consistency of thin paint, and wiping out the design and letters on this surface, the design is perfectly clear and easy to trace from the inside as shown.

Wind Cleans Threshed Wheat

During an unfavorable season when the wheat fields were infested with weeds, farmers in a middle-western state who



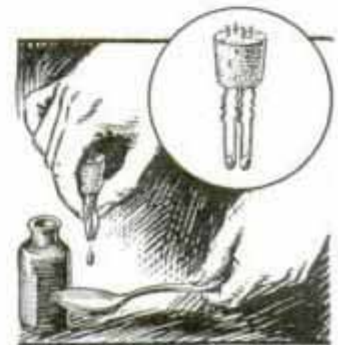
Weed Seed Blown Away from Threshed Wheat by Elevating It Outdoors in the Wind

threshed their grain with a combine harvester, utilized the wind to free the wheat from weed seed. To do this, a portable

elevator was towed into the field away from trees and buildings to get the full benefit of the wind. Each load of wheat from the combine was hauled to the elevator, which raised it into the air and let it fall to the ground. The wheat being heavier than the weed seed, fell in a pile directly underneath the elevator spout, and the weed seed, being lighter, was blown to one side a few feet away. While this method necessitated reloading the wheat, it was worth the extra labor, as the market price for clean wheat was three to six cents more per bushel than that for uncleaned wheat.—L. C. Timmerman, Dodge City, Kans.

Dropper Improvised from Cork and Hairpins

When a medicine dropper is needed and none is at hand, one can be quickly improvised from a cork and two hairpins, which are pushed into the cork as shown. When dipped into the

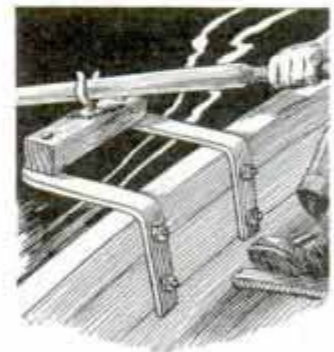


bottle, each pin will retain a little of the liquid, which will combine and form one drop when the free ends of the pins are pushed together with the fingers.

Oarlock Extension Makes Narrow Boats Easy to Row

On narrow rowboats, where the oar handles have a tendency to strike each other while rowing, or where, if they are pushed out to prevent this, the leverage is reduced,

so that rowing becomes a difficult task, extension oarlocks will be found to effectively overcome the trouble. Each extension consists of two pieces of flat



iron bent as shown and fastened to the sides of the boat with a hardwood block bolted to the free ends.

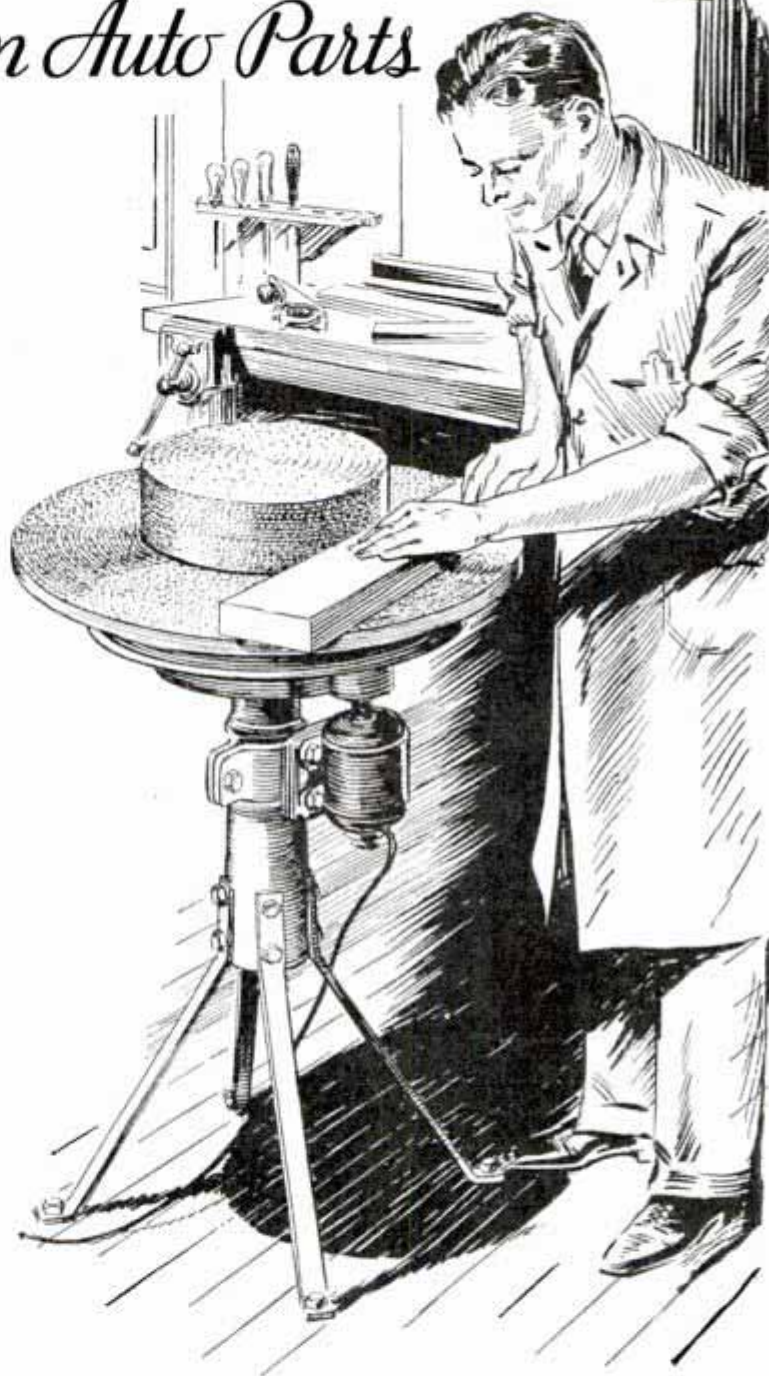
Workshop SANDER

made from Auto Parts

WITH this homemade drum sander you can sand two right-angle surfaces in one operation. Its cost, exclusive of the motor, need not be over a couple of dollars, as the chief requirements are a half section of a full-floating type of automobile axle housing and an old wheel, both of which can be purchased at a junk yard. The full-floating rear end is one in which the wheels are supported on the housing and the axles can be withdrawn without disturbing the wheel bearings.

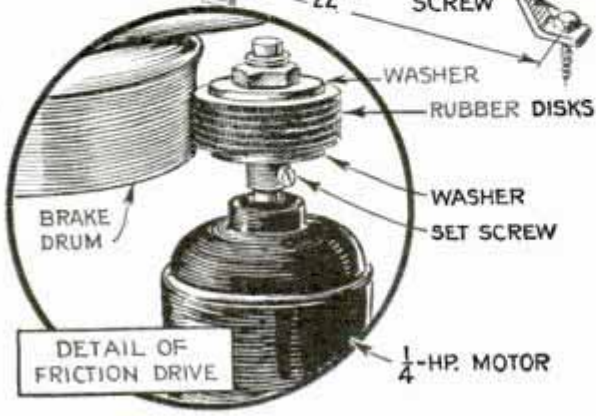
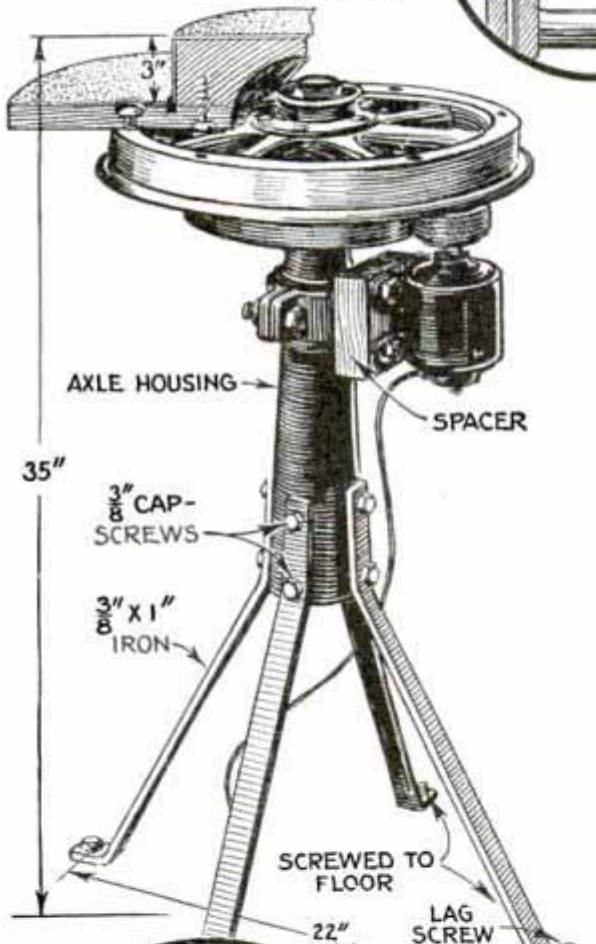
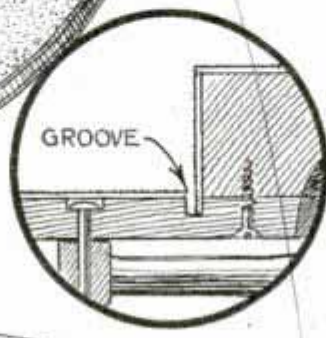
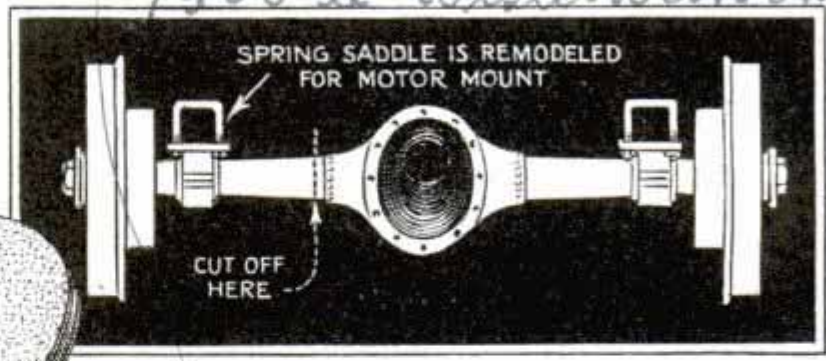
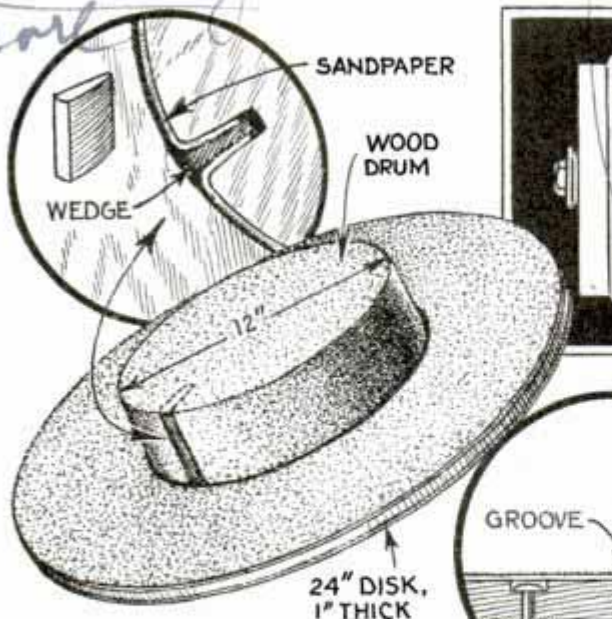
After a suitable assembly has been acquired, one end is sawed off and fitted with four legs of $\frac{3}{8}$ by 1-in. iron to bring the wheel to an elevation of 31 in. In the case of nearly every full-floating axle housing, the spring saddle is mounted similarly to the one shown. With the use of a spacing block, it is a simple job to build up the plate of the saddle to serve as a mount for the motor. The saddle must be made rigid with the tubular axle, which can be done by placing a strip of sheet metal, fiber or even cardboard, under the cap, and then drawing it up tightly. The motor drives the sander by means of a friction wheel. Rubber disks, cut from an old inner tube, replace the cloth disks of a buffing wheel. The diameter of the friction wheel should be about one-third the diameter of the brake drum when using a 1,750 r.p.m. motor. If the surface of the brake drum is very smooth, it is well to go over it with a slender, sharp prick-punch, which will throw up small, circular burrs and afford good friction surface for the driving wheel.

The sanding disk is band-sawed from a glued-up piece of $\frac{7}{8}$ -in. or 1-in. pine, and a center hole is provided to accommodate



the hub cap of the wheel. The drum is cut from a built-up block of pine. It is best to turn the drum on a lathe, but a creditable job can be done on a band saw. Long wood screws hold the drum to the disk, and the disk itself is bolted to the wheel through the existing rim lug-bolt holes. The bolt heads are sunk into the disk and the recesses filled with plastic wood. Both disk and drum must be perfectly balanced. If this is not the case, there will be considerable vibration when the machine is running full speed. The wheel itself may also

28 scans of Minnesota
W. Wall
new York
1500 W. Western Ave Chicago



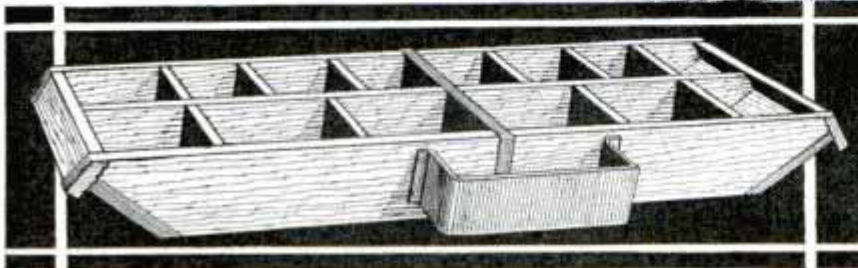
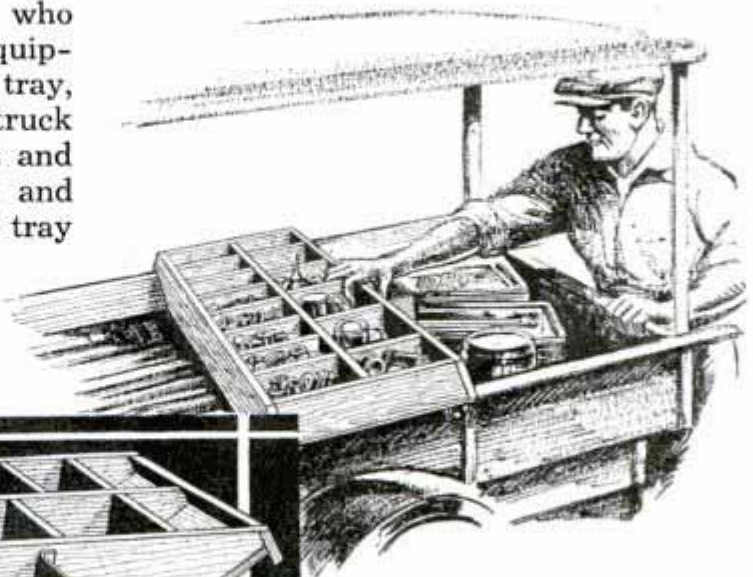
be out of balance. Therefore, after the disk and drum are bolted in place on the wheel, the high spots of the circumference are carefully marked while the disk is rotated by hand close to a stationary object, from which slight variations in diameter can be determined. However, it is not only the trueness of the circumference which counts in getting a wheel balanced. Any variation in the wood will also make the wheel unbalanced. One way to cure this is to arrange the wheel in a vertical position, after which the wheel is rotated by hand. If, after a few trials, it comes to rest in the same position, you know which part of the wheel is heaviest, and it is then an easy matter to chip away a little wood from the underside with a chisel.

After the disk and drum have been properly balanced, the sander is bolted to the floor and sandpaper is glued on in the usual way. Rubber cement is a suitable adhesive and permits the ready removal of the sandpaper for replacement. Apply a thin layer to both surfaces and allow the cement to dry. Then put on the paper. The edge of the paper on the face of the drum fits into a shallow groove in the disk which assures a square edge when sanding two surfaces at once. The ends of the paper on the drum are held securely by means of a wooden wedge driven into a slot in the drum. A 1/4-hp. motor will provide ample power for this machine. Of course, reasonable care should be taken not to "crowd" the work too fast. Because of the torque required in starting the machine, it is well to give the disk a whirl by hand before switching on the power.

☐ To free metal articles of rust, dip them in pure cider vinegar and then let them dry for a few days.

Sliding Tray on Truck Holds Small Items

Plumbers and general repairmen who use a light truck to haul tools and equipment to their jobs will find this tray, which slides along the top of the truck body, handy for keeping small tools and parts separated from heavier tools and boxes in the bottom of the body. The tray is made of hardwood and is divided into several compartments, and the ends are made to fit the box of the truck. Constructing the ends of the



tray in this way holds the tray on the truck so that it will slide easily, yet it can be removed by merely lifting it up, or can be pushed along to get at tools under-

neath. A wooden or sheet-metal handle screwed to the front side provides a hand grip for moving the tray.—Allen P. Child, Kansas City, Mo.

How to Make Your Mimeograph Work More Attractive

Booklets reproducing various lettering alphabets are usually furnished with mimeographing machines, but are seldom used to the fullest advantage because they cannot be conveniently placed beneath the stencil for tracing. If each sheet of letters is cut into strips and then glued together end to end, the resulting long strip can be inserted under the stencil and moved back and forth for accurate tracing of the letters desired. In the absence of special screen plates for shading illustrations to be reproduced, neat stippled effects may be had by laying different grades of sandpaper or emery cloth under the stencil and then rubbing it with a blunt instrument. Line drawings on electros and zinc cuts can also be duplicated. In this case, reverse the stencil, and, after setting the electro under it, put a piece of fine silk cloth over the top and rub with the blunt end of a stylus handle, or fountain pen. Stencils of book covers, menu designs and other decorative pages can be preserved for future use by placing the stencil face down on a thick sheet of paper and re-



moving the ink from the back with a sponge saturated with kerosene. One sponging, followed by a rinsing of gasoline, will leave the stencil clean.

☐ Before filling pillows or cushions, rub the inside of the cloth with beeswax.

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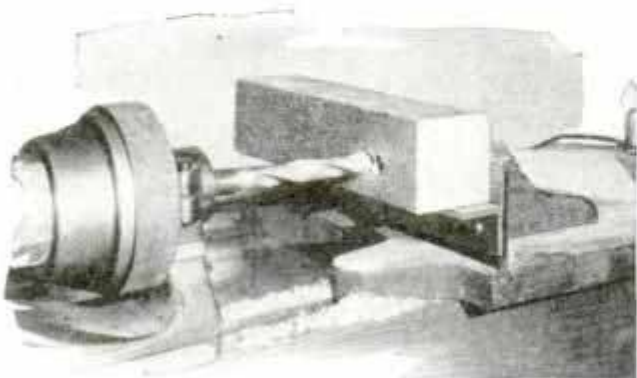


Clamp on Sawbuck Aids in Sawing Logs into Lengths Suitable for a Stove

Clamp Holds Work in Sawbuck

By attaching a sawbuck to a wooden platform on which the operator stands, and having a sliding clamp or weight to hold the work in place, many of the difficulties of one-man sawing can be eliminated. The clamp is a heavy sleeve with a short wooden arm attached, and slides on a pipe standard, which has a handle pivoted to the top. When the arm slides down against the work, the sleeve binds against the pipe and holds it. A chain attached to the handle and to the clamp facilitates releasing the work.

Drilling Mortises on a Lathe

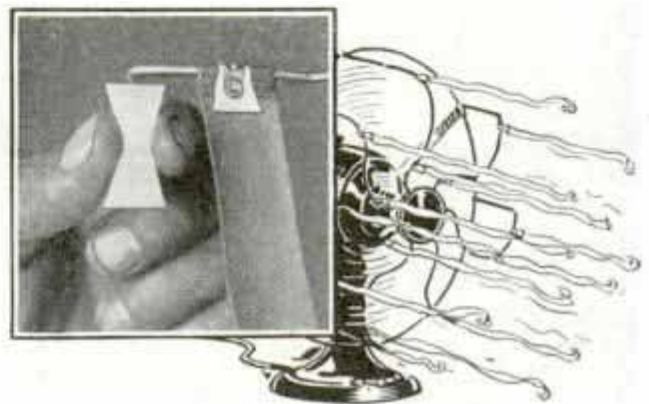


Sliding Table Holds Work Aligned to Be Mortised in a Lathe

When a drill press is not available for drilling mortises, they can be drilled accurately in a lathe by using this sliding table to hold the work. The table is a piece of 2 by 2-in. angle iron fastened to a wood frame, which has another piece of angle iron attached to the bottom so that it slides between the lathe ways.

Streamers Attached to Electric Fan with Paper Clips

Paper streamers can be attached to guards on electric fans with thin pieces of cardboard and small brass paper clips of the type shown. The cardboard is placed



Small Paper Clips on Fan Guard Hold Streamers for Window Displays

around the guard over the end of the paper and the clip is clinched over both the paper and cardboard.

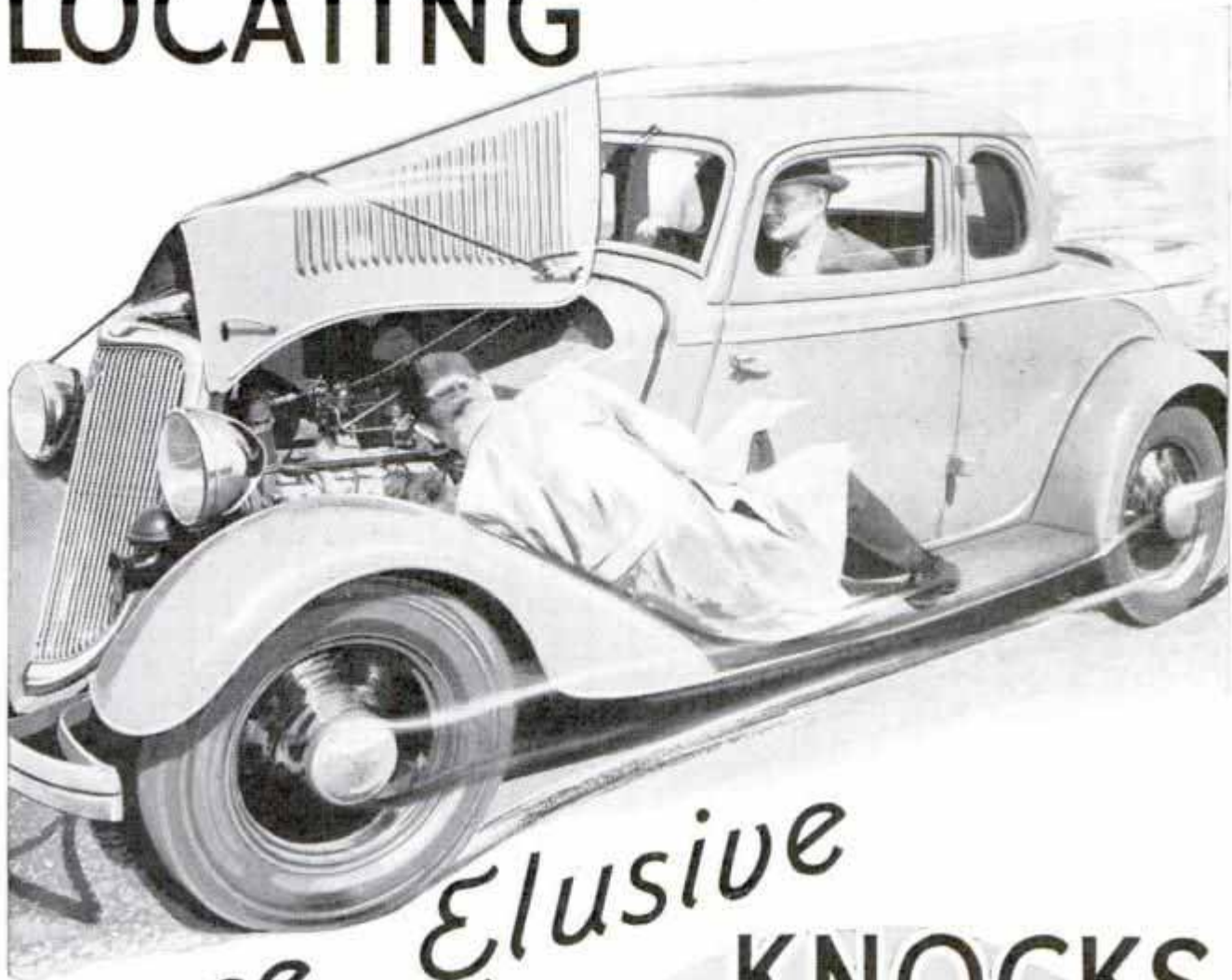
View Finder on Graflex Camera for Taking Vertical Photos

If your Graflex camera is not equipped with a revolving back, which is necessary for taking pictures in a vertical position, it can be fitted with a view finder as indicated in the photograph. With this arrangement, pictures can be focused through the regular focusing



hood and the camera then turned on its side, where the subject is spotted in the finder and the exposure made.

LOCATING

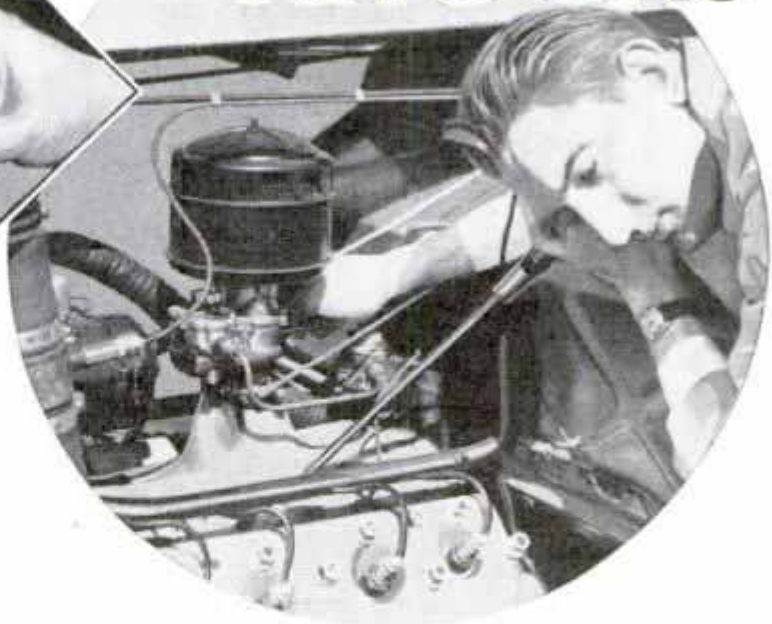


those Elusive **KNOCKS**

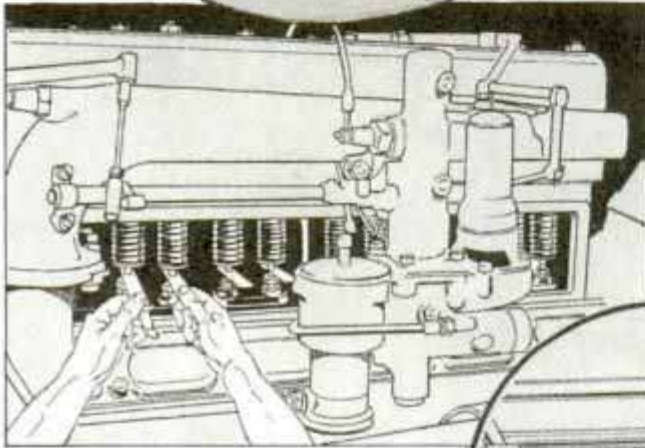
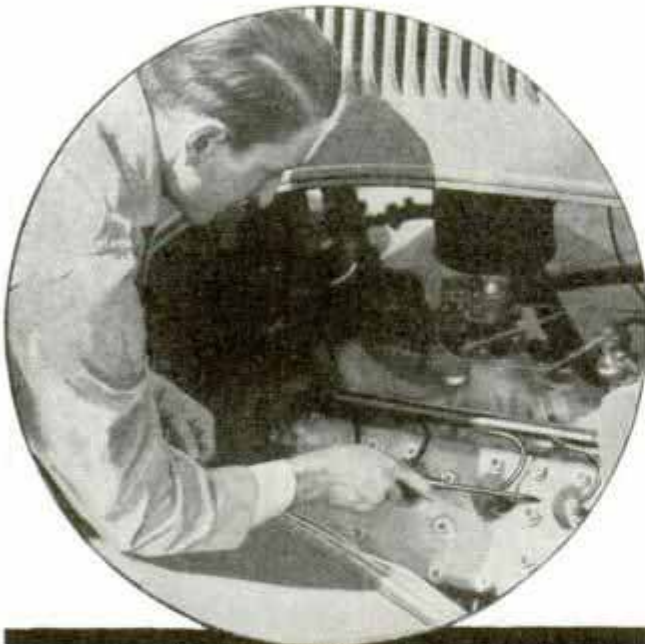
By A. H. VANCE

HAVE you ever driven your car into a garage when the motor was knocking and noticed how a mechanic diagnosed the trouble by listening while the motor was running? You can locate a knock and determine its cause in the same way.

The first thing to do is to determine whether the knock is actually inside of the motor or whether it is caused by worn or broken parts outside. Mechanics usually employ one of two methods for this purpose. One method consists of removing the valve-cover plate, which provides a large opening into the



crankcase and amplifies internal noises. The other method is to insert a length of rubber tubing into the crankcase through the breather pipe and hold one end to your ear. If the noise comes from inside



Above, Using Paper Strips to Locate Noisy Tappets; Center, Tip of Screwdriver Blade Carefully Inserted between Tappet and Valve Stem to Find Loose Camshaft Bearing; Right, Cylinder Wall Scored by Broken Piston Ring

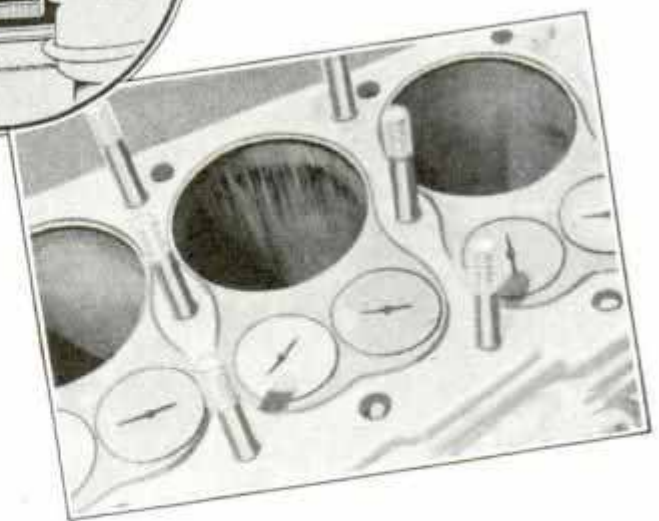


the motor, the next step is to locate its source. This can often be done by noting the tone of the knock, or by taking a long screwdriver, cupping the hand over the handle and holding it against your ear while the point is held against the motor. Move the end of the screwdriver from place to place until you find a spot where the knock is loudest. Short-circuiting one or more spark plugs while making this test often provides a double check, as some cylinder knocks completely disappear when firing ceases in the cylinder in which the trouble is occurring.

Skilled mechanics rely considerably on the tones of the knocks, which range the entire scale. The higher-pitched knocks include broken rings, which produce a

light rattle often accompanied by a distinct scratching sound. Broken rings should be replaced immediately, or the cylinder walls may be scored badly. A little lower down the scale is found the light tap of valve tappets. Still lower is the click of worn camshaft gears, the knocks of worn pistons and wrist pins, worn camshaft and connecting-rod bearings, while the lowest knocks usually come from the crankshaft.

Tappet and valve noises tend to disappear as the motor speed increases. To locate a loose tappet slip pieces of paper or cloth between all the tappets and valve stems. Then remove the strips one by one until the loose tappet is found. The noise of a loose or worn camshaft gear tends to become quieter as the motor speed increases. Valve noises that cannot be eliminated by resetting the tappets often have their sources in a worn camshaft gear. Knocks caused by worn camshaft bearings are difficult to locate, but if the noise can be heard when the motor is idling, "loading" the shaft will usually eliminate the knock momentarily. This is done by inserting the tip of a very thin screwdriver blade between the tappet and valve stem nearest the suspected bearing. Care should be taken not to insert it too far or you may



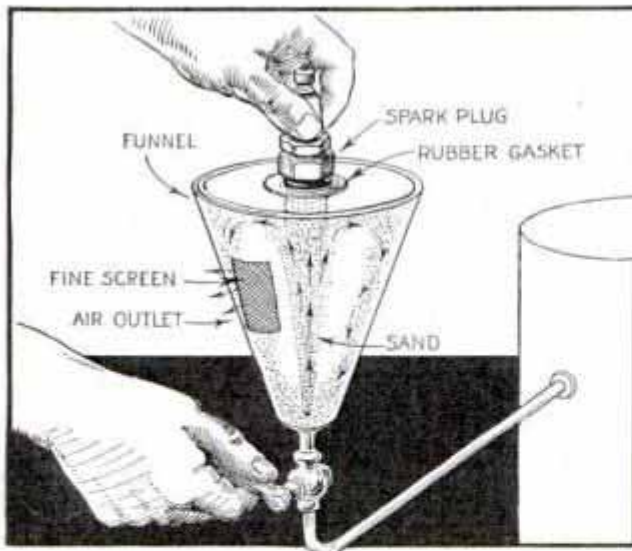
spring the camshaft. Noise caused by end play in the camshaft is most noticeable at slow idling speed and tends to disappear as the speed increases. The tone of a knock caused by a loose piston varies with the type of pistons used and the amount of play present, but it may be compared

closely to a clatter, which becomes louder as the motor speed increases. Noise from loose wrist pins and connecting-rod bearings is more audible when the car is coasting with the clutch engaged or when the motor slows down after being suddenly accelerated from idling speed with the clutch disengaged. End-play knocks in the crankshaft usually occur once during each revolution of the shaft and tend to disappear as the motor speed increases. A loose main bearing produces a distinct knock, which gets louder as the load on the motor increases, especially on heavy pulls.

Sometimes noises and knocks cannot be located when the motor is idling. It may be necessary to ride on a fender with the hood raised and tied as shown so that you can listen while someone drives the car.

Spark Plugs Cleaned with Sand and Compressed Air

This spark-plug cleaner directs a blast of fine sand against the plugs to remove grease and carbon deposits. The neck of a large funnel is cut off, after which an air outlet is cut in the side and covered with fine screen wire. A tin disk with a hole cut in the center to take the base of a



Fine Sand Blown against Spark Plugs with Compressed Air Cleans Them Quickly

plug, is soldered to the top of the funnel. Then a rubber gasket is cemented around the hole in the disk to provide a seal around the plug being cleaned. Attaching the cleaner to a compressed-air line and covering the bottom of the funnel about 2 in. deep with sand, completes the job.



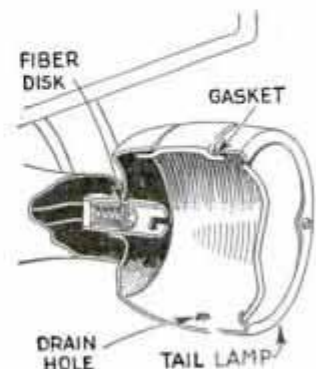
Mirror Held under Instrument Panel Reflects Wires and Connections So They Are Easily Examined

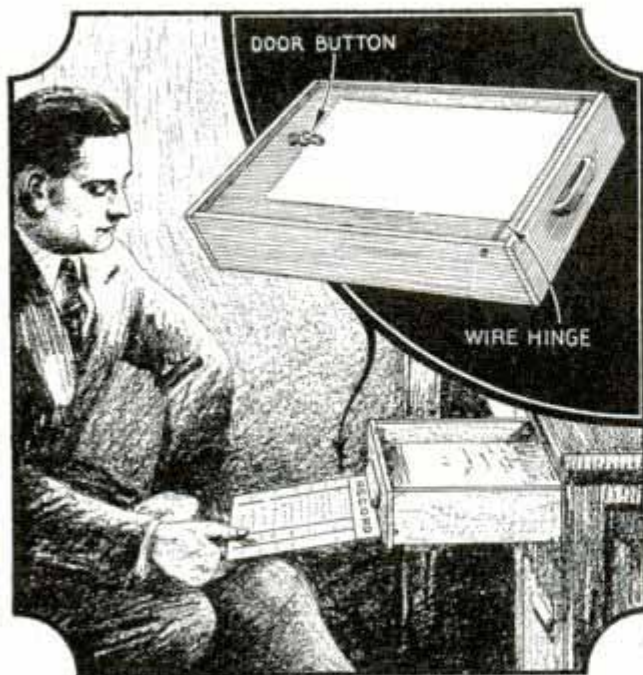
Mirror Aids in Examining Wires behind Instrument Panel

Held under an instrument panel as shown, a mirror will aid in examining the wiring and electrical connections behind the panel. This saves lying on your back and twisting your body around the brake and gear-shift levers to examine the connections.

Draining Trapped Water from Auto Tail Lamp

The tail lamp on my car, like those on practically all late-model cars, has a clear lens in the top for illuminating the license plate. Water entered around the gasket of this lens, and there being no means of escape, it filled the lower half of the lamp and short-circuited the contacts. It also swelled the fiber disk that carries the contacts so that it could not be removed. To remedy the trouble, I installed a new socket and then drilled a small hole in the bottom of the lamp so that the water could drain out.—C. N. Furay, Dayton, O.





This Is a Simple Way of Concealing a Private Record Card under Bottom of Desk Drawer

Record Card Hidden on Bottom of Desk Drawer

In a garage where customers often had free access to the office while the owner was outside, it was found advisable to provide a secret place for a certain record card, and, at the same time, have it handy for quick reference. To do this, the card was hinged to a wire across the drawer bottom as shown, which may be done with adhesive tape. A small turn button was used to hold the other end of the card against the bottom so that it would not interfere when opening and closing the drawer.—G. E. Hendrickson, Argyle, Wis.

☞ By painting the handles of sledge hammers, shovels and other tools, except the gripping surface, a bright yellow, they can be seen easier in dark places.

The Next Issue

EASY AND ECONOMICAL HOME REPAIRS

Practical information useful to every home owner, telling how to make those little repairs that will avoid expensive bills for replacement; quick, simple and effective methods of patching leaky roofs, flashing, gutters; stopping seepage of water into basement; the right way to repair cracks in stucco, etc.

THE SECRETS OF MAKING MARIONETTES

Second installment of story starting on page 274 of this issue. By following the instructions anyone can make and operate marionettes for fun or profit.

TRACING AUTO WIRING TROUBLES

Short circuits, open circuits and grounded wires in your car traced to their sources with improvised equipment so that you can correct the trouble.

WEAVING REED INTO BASKETS

Procedure of reed basketry explained so that you will soon become adept at making these useful and artistic articles, which can be sold at roadside stands.

UNDER-WATER PHOTOGRAPHY

Camera placed in a hollow arm extending under the water and attached to a float to shoot submarine scenes. Submerged photoflash bulbs give light.

HOMEMADE DRILL PRESS

One of the first motor-driven machines a small shop owner needs for accurate drilling. This one, consisting of a sturdy pipe framework, will fill your need.



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THERE'S a *thrill* to motorcycling! You are master of the road — you zip through traffic, around and past the car parades — you are away and gone into the beckoning countryside — free as a bird on wing!

There are good times all the time for the motorcycle rider — club runs, tours, race meets, hillclimbs — with jolly Knights of the Highway for pals.

Get a Harley-Davidson! It's so easy to pay for — costs so little to run. Ask your Dealer about his easy payment plans — and take a demonstration ride!

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One cent per mile with a Single, two cents with a Twin—normal running cost for a Harley-Davidson, and it includes everything! The savings soon pay for the motorcycle.

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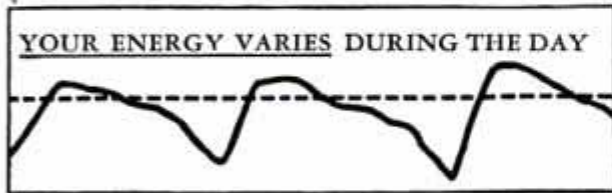


TOO TIRED FOR FUN... and then she smoked a Camel!

KNOW THIS FEELING? The feeling of being too "all in" to respond to the gaiety of the crowd? That's one of the many times to light a Camel and enjoy its rich flavor while your flow of healthful energy is restored. You will *like* Camels—a matchless blend of costlier tobaccos!

"Get a

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Here's a basic discovery that throws new light on our past knowledge about cigarettes. It embodies an "energizing effect"...a quick restoration of the flow of natural body energy...a delightful relief from fatigue and irritability. You do "get a lift with a Camel," and it is a pleasure that you can repeat as often as you like.

CAMELS can literally relieve fatigue and irritability

Are you irritable...cross and fussy when tired? Then light a Camel. As you enjoy its cool, rich flavor, you will quickly feel your flow of natural energy being restored. That "done-in" feeling drops away. Your pep and cheerfulness come flooding back.

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The effect is produced by Camels in a wholly natural and utterly

delightful way. So, whenever you feel run-down, tired and irritable, just light a Camel.

You can smoke just as many of these delightful Camels as you want. You can increase your flow of energy over and over again. And you need *never* worry about your nerves. For remember: *Camel's costlier tobaccos never get on your nerves.*

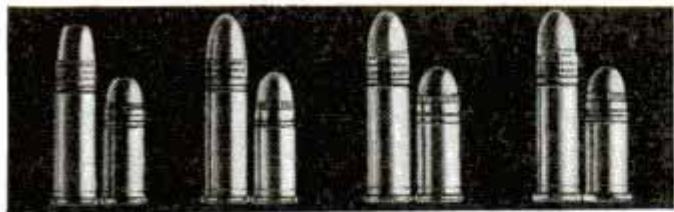
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This low-priced Remington shoots all types of .22's—shorts, longs, and long rifle cartridges, regular and Hi-Speed. American walnut stock, chromium-plated bolt and trigger, adjustable sight. Ask to see Model 33. Write for Folder 22, Remington Arms Co., Inc., Bridgeport, Conn.

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AMMUNITION

Remington

FIVE-TUBE ALL-ELECTRIC AUTO RECEIVER

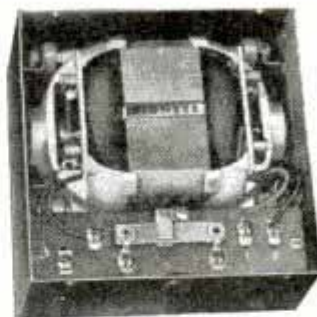
(Continued from page 263)

shields, which are quite necessary for efficient performance. Rubber grommets are placed over the grid leads to these tubes to prevent the grid clips from shorting to the metal tube shields.

It will be noted in this photo that the leads to the volume control are inclosed in a shielded cable; if this is not done, audio regeneration will result. The heavy No. 14 switch leads, on the volume control, are not included in the shielded cable. The ganged variable condenser employs a 6 to 1 gear reduction drive. This greatly simplifies matters when using a remote-control tuning device as no external gear is required. The variable condenser also has a cut-plate oscillator section, eliminating the usual padder condenser thus making it a simple matter to balance the set. Looking at the photo, this is the rear condenser section at the left.

All parts are available and a complete material list can be obtained upon application, without charge. The sheet-metal base is 1½ in. high, 6¼ in. wide and 10¾ in. long; ¼-in. sheet steel is used for both the base and case. The inside dimensions of the case are as follows: 6 in. high, 6½ in. deep and 10½ in. long. One side cover is permanently fastened and the other is

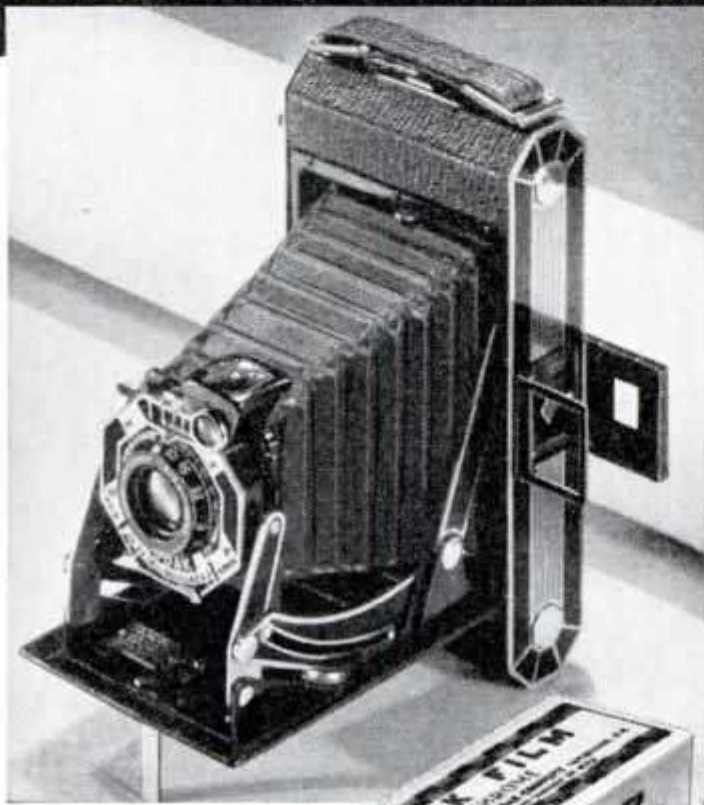
held in position by means of self-tapping screws. This welded metal case and completely drilled base are available at low cost for those who are not equipped to make their own.



A mounting bracket is welded to the rear side and another to one end of the case as shown in the photo. This provides for a choice of mounting best suited for the available space under the dash. The mounting bolt, shown in the insert photo above, is an ordinary carriage bolt ¾ in. in diameter and long enough to extend through a hole drilled in the fire wall of the car. The head of the bolt holds the set firmly in position. The remote-control unit, shown in the center photo, mounts

(Continued to page 118A)

Compare this 1934 Kodak with your present camera



The New Kodak Six-20 with f.6.3 lens

SOMETHING new in cameras . . . and here it is. Kodak Six-20 is the latest . . . sums up years of camera development . . . gives you new convenience . . . new picture-making scope. Compact . . . it fits snugly in your pocket.

Touch a button—this camera springs into full picture-taking position. The fine Kodak Anastigmat f.6.3 lens gives you clear, sharp pictures in almost any weather.

Moving objects are easy to follow with the eye-level finder . . . and you can "stop" them in action with the split-second shutter.

For 2¼ x 3¼ inch pictures, Kodak Six-20, with f.6.3 lens, costs \$17.50. Kodak Six-16, with f.6.3 lens, for 2½ x 4¼ inch pictures, \$20. Other models from \$14 up.

Fit your film to your subject . . .

OUTDOORS . . . use Kodak Verichrome—the film with a factor of safety. Verichrome has two coatings . . . one for shadowy details—another for brilliant high lights. **INDOORS** . . . use Kodak "SS" Pan—the film that's three times as fast as ordinary film under artificial light. With Photoflood bulbs, an f.6.3 or faster lens, and this fast film, you can make instantaneous exposures indoors . . . at night. **FOR ENLARGEMENTS** . . . use Kodak Panatomic—the film with a microscopic grain. Completely color-sensitive . . . amply fast—an ideal film for miniature cameras.



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The fast lens (f.6.3) lets you in on the latest indoor sport . . . snapshots at night. Two or three inexpensive Photoflood bulbs . . . a roll of Kodak "SS" Pan Film . . . and you're ready to make snapshots . . . indoors . . . at NIGHT.



A fine, fast miniature Kodak—low in price

This Kodak Vollenda—with its sharp-cutting f.4.5 Anastigmat lens . . . shutter speeds up to 1/100 second . . . focusing lens mount . . . eye-level finder . . . self timer . . . takes 16 pictures on a roll of "vest pocket" film. A big bargain in miniature cameras—it costs but \$22.50.

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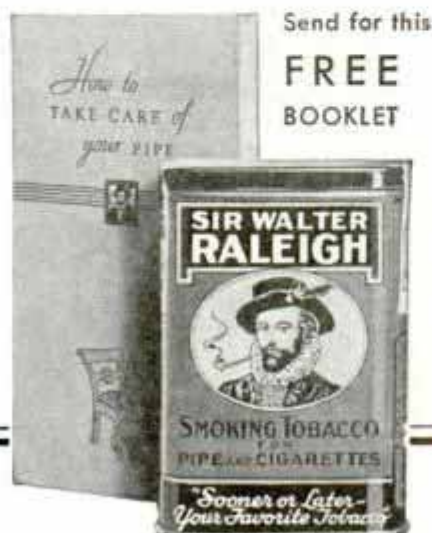
It isn't the heat . . .
IT'S THE FUMIDITY!



IT'S a swell word to describe the gas-attack of that dreadnaught pipe. Webster prints it and says "obsolete"—passed out of use. The young lady caught one whiff and passed out without saying even that much.

Why will ambitious young executives spoil their careers and poison the air with cabbagey tobacco and pipes that should be sent to the dry cleaners? The simple explanation is, they haven't discovered the undiluted joy of Sir Walter Raleigh in a clean, sweet pipe. Sir Walter is mild—as only Kentucky Burleys can be. Sir Walter is softly fragrant. And Sir Walter is making rank, heavy tobaccos obsolete while raising pipe-smoking to a new high esteem. Try it.

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It's 15¢
AND IT'S
MILDER

HOMEMADE CODE-PRACTICE SET FOR BEGINNERS

(Continued from page 264)

way through the lever. A brass machine screw through the baseboard provides the lower key contact.

The bearing support is made from a piece of strip metal drilled and bent as shown in Figs. 2 and 3. The holes through the upright ends are drilled and tapped for 6-32 brass machine screws, the ends of which are countersunk to take the points of the bearing rod. The assembly is clearly shown in Fig. 4 and requires little further comment. The tension spring is adjusted by means of the machine screw through the lever, after which the locking nut is tightened. A type-30 tube is inserted in the socket and the batteries are connected as in Fig. 5. When the code set is not in use one of the leads to the No. 6 dry cells should be disconnected or a switch may be inserted to turn off the filament supply. A wide range of signal tone can be obtained by simply varying the filament rheostat.

When using some types of audio transformers it may be necessary to reverse the connections on either side of the transformer to make the set work properly. Reversing both sets of leads will have no effect whatever.

When learning the code it is best to think of the letters in terms of sound rather than dots and dashes. For example, instead of thinking of the letter A as "dot-dash," memorize the sound as "dit-dah." The letter B would have the sound "dah-dit-dit-dit," C, "dah-dit-dah-dit" and so on throughout the continental code, a copy of which can be obtained from any dealer in radio supplies.

FIVE-TUBE ALL-ELECTRIC AUTO RECEIVER

(Continued from page 116A)

directly on the steering column and is equipped with steel cables in flexible metal tubing. This tubing is anchored to the side of the metal case by coupling bushings on angle brackets, which will be detailed in Part 2 of this article. The steel cables extend through holes in the case where they are fastened to the shafts of the tuning condenser and volume control by means of suitable bushings provided with set screws. An interior view of the small power unit is shown on page 116A.



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Scientific tests and the experience of car owners prove that Ethyl is the coolest of all motor fuels. That's because the Ethyl fluid turns more of the gasoline's energy into power and sends less waste heat into the cooling system.

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WATCH YOUR GAUGE!

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D604 THE WEST POINT OF THE AIR

(Continued from Roto Section)

180 and 360-degree turns for landing. In addition to your instructor, the flight commander will make progress check flights.

After four months of this work, interspersed with ground school, you learn to fly the heavier and more powerful basic training ships, executing the maneuvers with the heavy ships you learned to do with the lighter ones, and varying this routine with formation, night flying and cross-country trips. The final four months at Kelly Field give you an opportunity to fly pursuit, bombardment, attack and observation planes, to engage in acrobatics, dog fights—trying to out-manuever your rival in the air—and to make close formation flights and longer cross-country trips. You will also have an opportunity during this period to specialize in one of the four service types of planes.

At the end of the course you will have had more than 250 hours in the air, plus other hundreds of hours in ground school. This includes avigation, instruction in the radio code, a thorough study of internal combustion engines, airplane maintenance, ground gunnery, some of the fundamentals of meteorology, the use and care of the parachute and instruction in the principles of aerodynamics.

At graduation you are rated a pilot and commissioned a second lieutenant in the air corps reserve. You must agree to serve two years in the reserve on active duty and graduates can also be ordered to active duty with air corps tactical units for one to two years. You can also take examinations to fill vacancies in the grade of second lieutenant, regular Army air corps. Upon completion of their active duty, many graduates find positions in the various classes of civilian flying.

That the Army is on the right track in training these youngsters to fly in "packs" and subordinate self to teamwork is indicated by the results. When it comes to actual handling of an airplane in the air, some of these youngsters make the old-timers sit up and gasp. One veteran Army pilot summed it up one afternoon after watching the cadets doing didoes.

"When this new bunch gets about ten or fifteen years of experience behind them," he observed, "they are likely to be so good they can fly without an airplane."

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 If not, send \$1.00 for 15 matches and counter display case together with salesman's terms, convince yourself how readily they sell and make 50% profit. Single sample 15c. Every store a prospective customer. Every person a prospective user. Exclusive territory and steady business guaranteed industrious salesmen.

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Keep a can of Smooth-On No. 1 in your tool box and be ready for emergencies. Do your own repairing and at the end of the year you will find that your efforts have been handsomely rewarded.

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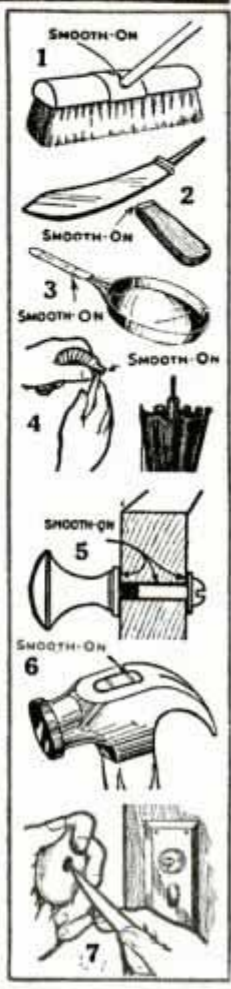
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THE TREASURE HUNTERS

(Continued from page 215)

Because of the constant rising interest in this smothered sea treasure Lieut. Riesenberg has assembled and authenticated the lost treasure ships of all the nations of the world. Old ship registry records at home and abroad have furnished him with this authentic data. As a result salvaging gold treasure and other sunken wealth from the sea has come to be "big business" with millions behind it, well organized and ultra modernly equipped.

Until recently recovery of the contents of lost ships was a perilous challenge to fearless adventurers, but in the near future science will make it possible to recover the contents of at least three-quarters of these sunken ships and this salvage work, as well as the incidental work of constructing scientific salvage equipment, will provide employment for thousands.

So believes Capt. Simon Lake, the world's greatest living authority on salvaging sunken treasure. Capt. Lake, himself, has located over thirty sunken vessels. He has at the present time a contract with the British government to recover the wealth aboard the sunken "Lusitania," as well as a contract with the United States treasury for the salvaging of the "Hussar" that was sunk in New York's East River Hell Gate in 1780 with considerable treasure aboard.

"I believe that the commercial development of the bottom of the sea, with the help of science, will provide many industries in the future, industries that are, perhaps, even greater than any to be found on land today," states Capt. Lake.

"People generally think of lost and sunken treasure as something only fools put any faith in and adventurers seek; but they are wrong. There is probably more gold lost on the bottom of the sea than there is now in the treasuries of all of the countries of the world combined."

Capt. Lake has a ledger listing over 7,000 sunken vessels whose contents are worth recovering. Some of these are ancient treasure ships and others are comparatively modern vessels sunk in near-by coastal waters, and whose cargoes consisted of modern, useful commodities. Yet, large as this list of sunken vessels seems, it is in fact but a small part of the thousands of vessels that are on the sea's bot-

tom with neglected millions in their holds.

Some idea of this vast number of sunken ships may be gained from a report of Lieut. Comm. Richardson Clover, chief of the hydrographic office of the U. S. navy, who, as long ago as 1893, stated: "The most reliable statistics show an average annual loss of 2,172 vessels in the commerce of the world." Since that report was made, forty-one years ago, more than twenty million tons of shipping were lost in the world war alone.

Multiply these 2,172 vessels by a hundred, and one finds a staggering number of boats were sunk during the nineteenth century. Then consider that ever since man first learned to sail there have been shipwrecks, and the tremendous number of wrecks on the bottom of the sea can just begin to be visualized.

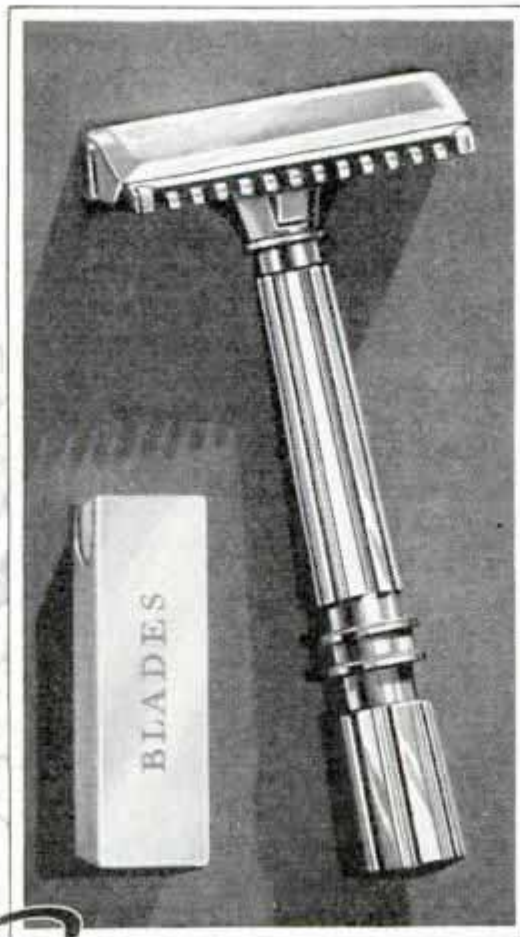
How many of these countless wrecks may be successfully salvaged with the aid of modern scientific equipment especially designed for the task? Fully seventy-five per cent is the estimate of Capt. Lake. He bases this opinion on the fact that, with equipment which he has designed and is now completing, gold, as well as less valuable commodities, may be safely retrieved from a depth of 300 feet.

Successful salvaging is by no means a modern development, although safety and economy in salvaging operations are. As early as 1686, with primitive equipment, Capt. William Phips successfully recovered more than \$2,000,000 from one of the sixteen treasure-filled galleons which had sunk on the Silver shoals between Santo Domingo and the Bahamas. There are still millions to be taken from the Silver shoals wrecks as well as perhaps the greatest of all single pieces of sunken treasure. This is the solid golden table of Bobadilla, whose exact weight in gold is believed to be 3,310 pounds.

Capt. Lake's plans for salvaging the cargoes of sunken vessels include ultra-modern, scientific devices designed to thoroughly explore the depths to an extent of 300 feet and recover the located cargo swiftly and economically.

He has already demonstrated the practicability of a submarine tube in which men may conduct salvage operations safely and efficiently, and he has utilized a tube sixty-seven feet long for this purpose. Now he is building one 300 feet in depth, incorporating many new devices.

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THE LOTTERY AND "NUMBERS" RACKET

(Continued from page 203)

They turned their salaries back into a pool which was divided by the promoters.

In the numbers racket several things can happen to "gyp" you out of your money—if you are lucky enough to win. For one thing, the pay-off man can skip town—and he usually does if the winnings against him are large. Or he can have the police tipped off to his "headquarters," an action usually followed by a raid. With the raid the game is killed and also your chances. Sometimes out-of-town operators drop into the city, take up a collection, then vanish.

The odds of a lottery are always against a player—terribly so. In a lottery syndicate prosecuted a few years ago by Uncle Sam one of its organization men testified that a player's chance of winning a lottery award ran as low as two million to one, and that he knew of instances where it ran even broader. Mathematically, numbers also shows a huge profit to the operator. That is why pay-offs are so large, so inviting to the chance taker. Here is the explanation as worked out by a mathematician:

"If the winning number has only one digit, you would have one chance in ten of hitting it, for there are only ten numbers it could be, counting from zero through nine. If the winning number has two digits, it must be included in the numbers from "double zero" to ninety-nine, so that the odds are one in 100. Similarly, if the winning number has three digits, it must be somewhere between zero and 999, and the chances are one in 1,000 of choosing it. The method used in choosing a number has nothing at all to do with one's chances of getting it in a lottery."

Can this crooked stealing from the public be stopped? Representative Edward Kenney of New Jersey has advocated before congress a national lottery law designed to put Uncle Sam in the lottery business like so many countries throughout the world. The federal government, he thinks, should get the lottery revenues that are now going out of the country. The idea back of it is twofold: first, easy revenue in stringent economic times; second, stopping the flow of millions into gangster hands, thus protecting society from lawlessness and wholesale money mulcting.

WORLD'S LARGEST MAIN STREET

(Continued from page 250)

engineers are stationed all along the road. There is still one stretch of about fifty miles, through high mountains, where the road is no wider than ten feet, although the surface is solid lava rock.

The authorities advise you to divide your Mexican auto journey into three stages. The first, from the Texas border to Victoria, a distance of 315 miles, can be covered in about ten hours. All save the last 124 miles of this stage are paved with asphalt. The last miles are smoothly graveled. The first stage carries you through Mamulique Pass, a very picturesque mountain region, and on to Monterey.

On the second lap, you cross the Tropic of Cancer soon after leaving Victoria, pass through El Mante, and at the end of about eight hours reach Tamazunchale, the overnight halt for the second lap. Here you are at the base of the magnificent climb to the great plateau of central Mexico.

Immediately on leaving Tamazunchale you are led into the midst of green-clad mountains forming one of the great scenic wonderlands of America. For 100 continuous miles you ride through ever-changing panoramas that make you believe that the Rockies, the Alps and Sierra Nevadas have been rolled into one and spread out for your inspection. You see Indians living and working in the most primitive fashion and great colonial churches and convents that have descended from the first days of the Spanish conquest. At the end of about ten hours driving on the third day, you arrive at Mexico City.

The new road involves the excavation of 900,000 cubic yards of earth, 700,000 cubic yards of loose rock and 800,000 cubic yards of solid rock. The builders will lay the equivalent of about four miles of culverts. Begun in 1925, the highway will cost the Mexican government about \$15,400,000. The road traverses lowlands only 100 feet above sea level and mountain passes as high as 8,000 feet, with no grade exceeding six degrees. To finish this highway even in ten years is a signal achievement. All the heavy machinery had to be brought from the United States. Solid rock road foundations had to be blasted out on mountain sides and untamed streams had to be bridged and feeder roads built to bring in supplies.

WARNING! EVERY YEAR THOUSANDS ARE KILLED OR INJURED WHEN BLOW-OUTS THROW CARS OUT OF CONTROL



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WHERE would you land if *you* had a blow-out? You *might* come out of it safe and sound. You *might* be able to avoid ditches, poles and oncoming traffic. But isn't life too sweet to take chances?

Today, due to high-powered motors and whirlwind revolutions of small, modern wheels, the heat generated *inside* the tire is terrific. Rubber and fabric begin to separate. A tiny blister forms and grows—bigger—BIGGER until BANG! A blow-out!

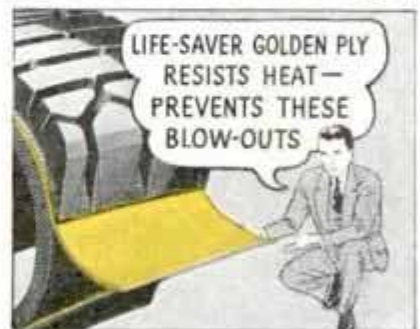
To protect you from blow-outs, every new Goodrich Safety Silvertown has the amazing Life-Saver Golden Ply. This invention resists intense heat. Rubber and fabric don't separate. Thus, blisters don't

form inside the tire. The great, unseen cause of blow-outs is prevented before it begins.

Racing daredevils tested the Golden Ply out at breakneck speeds. On the world's fastest track. *Not one blow-out.* Similar tires *without* the Life-Saver Golden Ply failed at one-third the distance the Golden Ply Silvertowns were run.

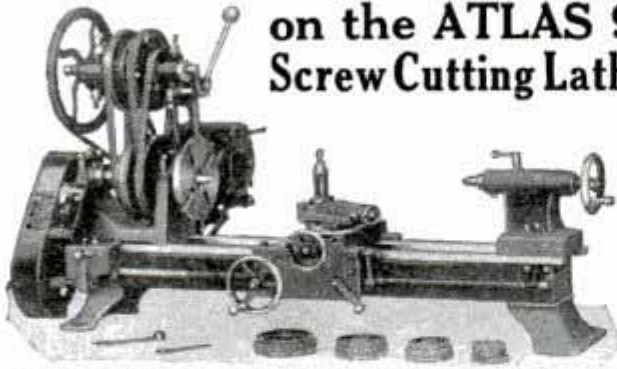
No extra cost!

Remember, you pay no price premium for this extra safety—this extra mileage. The new Goodrich Safety Silvertown, the only tire with the Life-Saver Golden Ply, costs no more than other standard tires. Get a set of Goodrich Silvertowns for your car.



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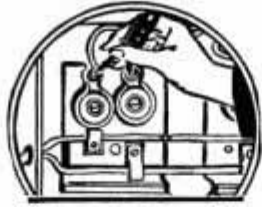
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PULVEX

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THE SECRETS OF THE "BLACK CHAMBER"

(Continued from page 223)

given number of words or letters. By this method it was found that in any text the vowels represent 38.7 per cent; the consonants L, N, R, S, T, represent 31.8 per cent and the consonants J, K, Q, X, Z, stand for only 1.7 per cent. Having gone this far, the expert figures how many times he can expect to find two letters occurring together. One learns that A H will show up once in a thousand letters while H A will be found twenty-six times. These double-letter combinations form a separate table all their own. Tables of frequency are figured out for the various languages and the ciphers are divided into two chief classes, substitution and transposition.

When a message is picked up the government expert counts the times the vowels recur and if they do not check up with the forty per cent for the common vowels, with the consonant figures tallying within five per cent of the key, then he knows he is up against a substitution cipher. Knowing this, he is ready to apply the figures and patiently unravel the secret message. It may take him hours and may be days, but he'll succeed sooner or later.

If he has picked up a transposition cipher he proceeds to examine it geometrically, placing the letters so that they will form all sorts of squares and rectangles that come under the general headings of simple horizontals, simple verticals, alternate diagonals, spirals reading clockwise and spirals reading counter-clockwise. Once the expert gets the arrangement of the letters the reading is simple.

Automatic cipher machines are available today, some of which have a maximum possibility of ninety billion combinations. Most of these work by electricity and look like typewriters. Without necessarily knowing a thing about cipher writing you can run off a message in ordinary English on the keyboard. Immediately the device puts it into cipher form. When your correspondent receives this by cable or wireless, his job likewise is simple. He sits down at a machine like yours and types off the cipher letters exactly as they appear in the secret message. The robot cipher-solver at once translates the message back again into English.

IMPERILED SENTINELS OF THE DEEP

(Continued from page 167)

steamers, guided by them, go ashore. The "Nantucket," for instance, was sidwiped two years ago by the "Washington," which carried away the lightship's antennæ. A few years previously a freighter rammed the Fire Island lightship and cut her open to the water line. By promptly shifting ballast, she managed to stay afloat and make port. About the same time the Old Dominion liner "Princess Anne," feeling her way into New York bay, guided by Ambrose lightship, missed her course and grounded heavily off Rockaway Point.

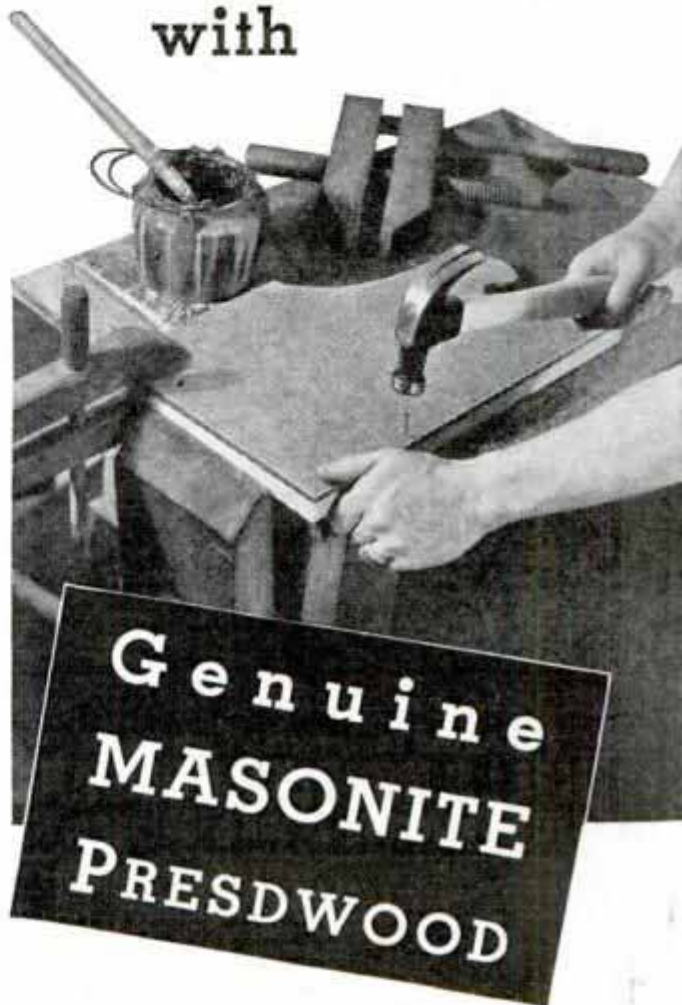
Considering that such accidents continue to happen, the judicial opinion must be that both the signaling equipment and the method of using it for safe navigation require further refining. It is admitted that a lightship's fog horn is not a fully safe guide, because atmospheric conditions distort the sound so that its direction cannot be determined and even cause "silent zones," where the sound cannot be heard at all. Dense fogs reduce the visibility of the lights to a bare 300 yards.

Radio waves are not distorted by transmission across open water, but may be affected as they pass over a short line. The principal difficulty in following radio signals by the aid of the directional compass is to determine how far the listener is from the lightship.

One of the newer systems, which is in operation at Nantucket alone of all our lightship stations, is to synchronize the radio beacon and oscillator signals so that both start on their way at the same time. The listener on board a steamer presses a button, which starts a clock ticking quarter-seconds, as soon as he gets the first dot or dash of the radio signal. This reaches him instantaneously with the speed of light. Some seconds later the underwater oscillator signal arrives. He stops the clock. The number of elapsed seconds multiplied by 1,620 yards, the underwater speed of sound, gives him the distance to the lightship.

With the perfection of existing signaling devices and a sharper discipline of the human element, there should be an end to the greatest danger to which lightships are exposed—that of being run down by the very ocean giants they guide to safety.

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FROM COWBOY TO SPEED CHAMPION

(Continued from page 245)

hardest kind in the world to fly and most of Miles' training had been in larger types.

"The greatest danger was the possibility of making a slight mistake in landing," Miles recalls. "In these small planes the wheels touch the ground while you are traveling at ninety or 100 miles an hour. With no shock absorbers and with the tires pumped up to fifty pounds, even a small rock might turn the plane over. The hardest part is after the plane slows down to fifty or sixty miles an hour. By then the controls are getting sloppy and the plane tends to yaw around. A ground loop at that speed would be fatal because the cockpit cover unfastens from the outside and you must be helped out. No matter what happens, you have to ride the plane down and stay with it until it stops rolling.

The controls of a racing plane are supersensitive in the air and a slight touch on the stick puts the plane in a dive or flips it over on one wing. In a race the pilot flies close to the ground to take advantage of the denser air and to prevent an overtaking pilot from diving under and passing him.

A racing pilot has to fly almost by instinct because his attention is focused on the instrument board in front of him. The engine is his main worry. A highly supercharged aviation engine is built to develop full horsepower at high altitude and it takes terrific punishment when flown wide open near the ground. Once Miles' motor literally exploded in the air while he was flying at full throttle only thirty feet above the ground. It was at the New Orleans races in February. There was nothing but swamp under him and not a landing place in sight. Miles did the only thing possible, taking advantage of his tremendous speed to "dead stick" up in a sweeping zoom that carried him 2,000 feet above the ground. From this altitude he successfully glided to the airport three miles away. One thing that a racing pilot dreads to meet in the air is a bird. At the New Orleans races one of the pilots flew into a seagull, shattering the plywood leading edge of the wing and nearly carrying away the main spar. Had the bird struck two inches lower on the structure the wing would have sheered off in midair.

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BRINGING IN THE BIG ONES

(Continued from page 234)

It takes half a mile to stop from this speed, with the engines fully reversed, but we must go this fast or it will be impossible to steer. The rudder must have a moving stream of water to "bite" on.

A sailor steps onto a little platform projecting over the side and swings what looks like a clothesline with bits of ribbon and leather at irregularly spaced intervals. At the end of the line is a lead weight with a bit of beeswax imbedded in its hollow tip. He is sounding with the hand line. After each swing the sailor glances at the beeswax to see if it has touched, mud, silt, sand, shell or gravel, and then calls the depth and bottom to the bridge. The pilot merely nods. The depth and bottom tell him exactly where he is without reference to a chart. The captain, for his own peace of mind, verifies the sounding with the fathometer—an instrument that automatically measures the distance from keel to bottom by emitting sound waves and recording the time taken for the echo to return.

The pilot is hugging the right edge of the channel. There's the bell of No. 26 buoy, and presently its red flash appears through the fog. Another bell and a white-flashing buoy and No. 28 is passed. Then the sound of a reed horn and soon the red and white flashes of the light on Governor's Island appear. The fog lifts enough for us to see the lights in the skyscrapers of downtown New York.

As the light of the Empire State building comes abeam the engines are given full speed astern, but we are still moving forward as the pier is approached. Half a dozen tugs are lined up off the port bow, while a motorboat comes alongside and the tug pilot climbs aboard.

The tug pilot now takes charge and the six tugs push their noses against the bow of the liner. Another tug takes a line and begins pulling the stern toward mid-stream. Its own efforts carry it against the side of the liner, so at a signal from the new pilot another tug passes a line to the bow of the one pulling on the stern and keeps her pointed upstream.

Foot by foot the squat tugs maneuver our ship until she is pointed for the pier. Then a few turns from our own propellers and we glide slowly to the dock.

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Classy! Roomy! Easy to build at low cost! Plans and instructions only \$1.00—include all Diagrams, Sketches, Photos, Material List, etc. Big Value! Mail Dollar Bill to Jim Dandy, Box 125-A, Wausau, Wis.

MAKE MONEY MAKING DO-NUTS

Steady income in spare or full time making the new, greaseless do-nuts, baked by electricity. Delicious! Healthful! Start in your own kitchen. No canvassing. Stores, lunch rooms, buy all you make. Cash daily. Big profits. Start with \$25. Total investment \$60. Write today for FREE PLAN.

RINGER DO-NUT COMPANY
141 Main St. N.E., Minneapolis, Minn.

Make up to \$150 Weekly GIVING AWAY FREE RCA LICENSED RADIOS



R.C.A. Licensed Home Model and Automobile Radios and our 10 STAR items all given away absolutely FREE with our new sensational unique PUNCH SALES CARD PLAN. The only one of its kind in the country. With our new 10 STAR SPECIAL everyone is interested. This is the opportunity of the year—make up to \$150 cash each week for yourself. Every home, car owner, store, office, factory, lodge, club or individual wants these marvelous new FREE R.C.A. LICENSED RADIOS or any of the valuable 10 STAR items listed.

Write Today for Our 3 New Starting Offers
Start at once making money with our unique sales plan. Write for full information how you can secure any or all of these plans.
DELUXE MFG. CO.,
Dept. 85, 173 W. Madison St., Chicago, Ill.





PAINT SPRAY OUTFITS

Big bargains in nationally known paint spraying equipment. Also motors and electric tools for home workshops. 2 cu. ft. De Vilbiss Paint & Spray gun, \$5.95 prepaid. Send for FREE CATALOG.

NATIONAL ELECTRIC TOOL CO.
560 W. Washington Dept. 328 Chicago, Ill.

STRANGE NEW INVISIBLE FILM PROTECTS SKIN FROM PAINT, VARNISH, GREASE, OIL, DIRT, ACIDS, ETC.



Lifetime opportunity for salesmen, agents, distributors, and crew managers to join the fastest growing sales organization in America.

MAGIC GLOVE introduces revolutionary new method of keeping hands clean by protecting the skin from grease, oil, paint, acid and dirt of every kind, before the skin gets soiled.

MAGIC GLOVE eliminates old style soaps and hand scrubbing. Opens up a new million dollar market with tremendous money making possibilities for wide-awake sales people.

The fastest selling specialty today. Up to 300% profit. Big repeats. Write quick for sample offer and exclusive territory. **WOLOSH SALES COMPANY, 65 E. So. Water St., Dept. 12A, Chicago.**

WINGS FOR THE "IRON HORSE"

(Continued from page 173)

greatly increasing their per-train-mile cost of doing business.

Streamline design on the railroads probably does not justify the additional expense which it entails until speeds reach approximately sixty miles per hour. It is not likely, therefore, that there will be much incentive for some time to come to spend money on streamlining either freight cars or freight locomotives, but new freight locomotives are justifiable on a basis of economy of operation and low first cost and no other machine has yet been designed which promises to supplant them.

This does not dispose of the fact that the Burlington's "Zephyr" constitutes a definite challenge to the present overweight, regularly scheduled limited train and the locomotive which pulls it. It is a challenge in which the challenger may well be the victor in many cases if the characteristics expected of these units are achieved in practice. The fastest speeds usually attained in North America are well below sixty miles per hour; most of them indeed are below fifty miles per hour. It is proposed to operate the new trains at speeds as high as 100 miles per hour or more, and also to maintain terminal to terminal schedules with them of sixty miles per hour or even better.

Some doubt has been expressed as to the feasibility or safety of such high maximum speeds, but it would appear that these fears are groundless as far as most main lines are concerned. There will, to be sure, even on the most highly developed lines, be occasional curves where reduced speed will be necessary, but there are plenty of stretches of main-line track, including some curvature, where maximum speeds as high as ninety miles per hour are made today with conventional equipment without discomfort to passengers. The lower weight of the new units should permit operation at high speeds around curves designed for much heavier weights at lower speeds without the necessity for strengthening the track structure.

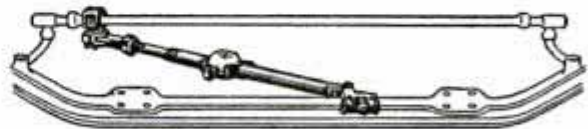
Come what will, the effect of this new "Zephyr" will be seen in practically all future passenger equipment. Lighter passenger trains are coming and in many cases with higher speeds, greater comfort and lower costs.



**Eliminates Road Weave
Holds Car Straight
Prevents Accidents**

Your car shimmies? For safety's sake stop it quick! Install the STEER-O-LATOR, the dependable aid to safe driving. Sturdy steel friction ball-check piston mounted parallel to tie rod equalizes road shocks, stops shimmy, prevents "weaving." Gives smooth, easy, shockless steering on any road. Not an experiment. Thousands in use. A proved success on any make or model car. Dependable. Guaranteed.

Stabilization Parallel to Tie Rod



Easy to Attach to Any Make Car

Install the STEER-O-LATOR yourself. Anyone with a wrench can do it in a few minutes. Attaches to tie rod and axle, as shown above. Holds them rigid against shocks; gives smooth, easy steering and parking. All parts for mounting completely furnished. Don't confuse STEER-O-

LATOR with other shimmy devices. It is effective, dependable. Sent anywhere in U.S.A. postpaid for \$6 cash or money order. Or sent C.O.D. plus postage. When ordering say STEER-O-LATOR, giving make and model of car.

P. O. B. MANUFACTURING CO.
1407 CENTRAL PARKWAY CINCINNATI, O.

HOME LABORATORY SUPPLIES AT SCHOOL PRICES

For reliable results you must have materials of unquestionable merit. You can buy from us the same high quality laboratory supplies we furnish schools and colleges — AT SCHOOL PRICES. All chemicals guaranteed to be standard grade, as represented, in plainly marked containers.

Send 10c for new 32-page catalog listing more than 1,500 items of chemicals, apparatus, glassware, microscopes, books and accessories. Deduct price of catalog from payment for first order.

Source of Scientific Supplies for schools and colleges.



NEW YORK BIOLOGICAL SUPPLY CO. - DEPT. 15-34 UNION SQ. N.Y.

Catch Fish!

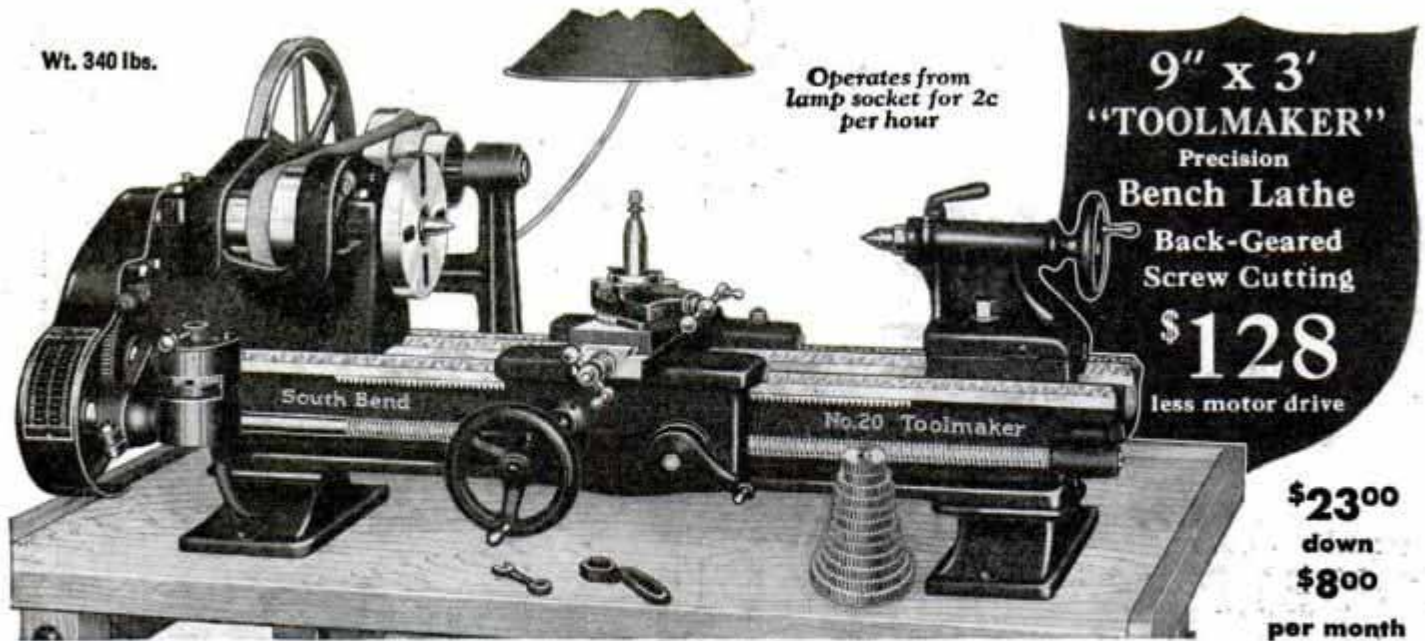
Muskrats with Our Folding Steel WIRE TRAP 51 Box of Magic Fish Bait FREE to introduce our traps. Write for Free Trap Offer and Bargain Catalog. Walton Supply Co., c-10, St. Louis, Mo.

TYPEWRITING COURSE...and new REMINGTON PORTABLE

ONLY 10¢ A DAY

Think of it! A splendid practical course in Modern Touch Typewriting. Makes you an expert in a short time. Also a brand new regulation Remington Portable typewriter. Not a used or rebuilt typewriter. Standard keyboard. Carrying case included. You get all this for only 10c a day. You can try the typewriter and course 10 days without cost. Send no money. Write for full facts about this amazing offer. Say: Please tell me how I can get a new Remington Portable and Course in Typewriting on your 10-day free trial offer for only 10c a day. Remington Rand. Dept. 608, Buffalo, N. Y.





Wt. 340 lbs.

Operates from lamp socket for 2c per hour

9" x 3' "TOOLMAKER"

Precision Bench Lathe Back-Geared Screw Cutting

\$128

less motor drive

\$23.00

down

\$8.00

per month

9" x 3' "TOOLMAKER" Precision Bench Lathe Complete with Reversing Motor, Reversing Switch and full Horizontal Motor Drive Equipment..... \$158

Used by Industry Everywhere

South Bend Back-Geared, Screw Cutting Precision Lathes are being used by the U. S. Government, General Motors, Kelvinator, R.C.A.-Victor, Curtis-Wright, Eastman Kodak Co., New York Central R.R. Co., U. S. Steel Corp., and by hundreds of other leading industries in the U.S. and 96 countries throughout the world. South Bend Lathes for nearly 30 years have been used and recommended for manufacturing, tool rooms, machine shops, automotive repair shops, engineering laboratories and home workshops.

96 Sizes and Types of Lathes

South Bend Lathes are built in 96 sizes and types from 9" to 18" swing, in bed lengths from 2' to 16'. All sizes made are available in countershaft drive and motor drive. Two popular sizes are illustrated at right and several popular sizes are priced in the tabulation below.

Size	Weight Crated	Countershaft Drive	Motor Drive
9"x3' "Workshop" Bench Lathe....	300 lbs.	\$ 85.00	\$ 94.00
9"x3' "Toolmaker" Bench Lathe...	340 lbs.	128.00	158.00
9"x3' Junior Bench Lathe.....	416 lbs.	170.00	188.00
9"x3' Standard Change Bench Lathe	461 lbs.	225.00	244.00
9"x3' Quick Change Bench Lathe...	471 lbs.	265.00	284.00
11"x4' Quick Change Lathe.....	920 lbs.	340.00	433.00
13"x5' Quick Change Lathe.....	1460 lbs.	402.00	535.00
18"x8' Quick Change Lathe.....	3140 lbs.	705.00	895.00

Write for New Catalog No. 94

Showing all sizes and types of South Bend Back-Geared, Screw Cutting Lathes, 9" to 18" swing, \$75 to \$1500. Catalog also shows Tool Room Lathes, special large swing lathes, gap bed lathes and Brake Drum Lathes. 72 pages. Sent free, postpaid, on request.



SOUTH BEND LATHE WORKS

638 East Madison St., South Bend, Ind., U. S. A.

Use Coupon or Write

SOUTH BEND LATHE WORKS

638 E. Madison St., South Bend, Ind., U. S. A.

Please send me descriptive bulletin on lathes checked below.

- 9" Workshop Lathe...\$ 75 to \$118
- 9" Toolmaker Lathe...\$128 to \$241
- 9" Junior Lathe.....\$170 to \$312
- 9" Standard Change...\$225 to \$367
- 9" Quick Change.....\$265 to \$407
- 11" Lathes \$276 to \$507
- 13" Lathes \$337 to \$651
- 16" Lathes \$480 to \$1020
- 18" Lathes \$585 to \$1324
- General Catalog No. 94

My work is.....
 Name.....
 Address.....
 City..... State.....

The 9 1/4" swing by 3' bed "Toolmaker" is a South Bend Back-Geared, Screw Cutting Precision Lathe capable of handling the finest machine work in any shop where a small precision lathe is required. This lathe has the power to reduce the diameter of a steel shaft 3/4" in one cut. In addition to metal working the "Toolmaker" can be used for machining fibres and compositions, and for woodworking.

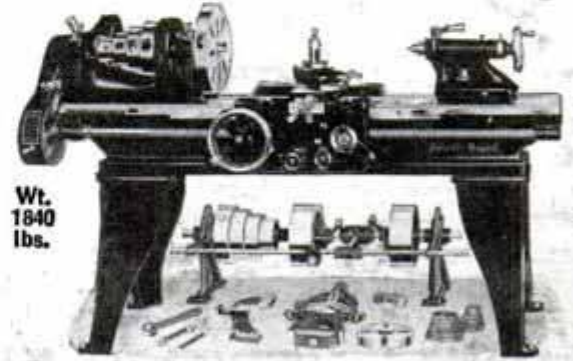
Features of this lathe include: back-geared headstock; six spindle speeds; automatic longitudinal feed; graduated compound rest; 3/4" hollow spindle. Takes 18" between centers; cuts screw threads 4 to 40 per inch. Available in Countershaft and Motor Drive types. Bed lengths 2' to 4'.



Operates from lamp socket for 2c per hour

Wt. 300 lbs.

Price 9" x 3' "Workshop" Back-Geared, Screw Cutting Bench Lathe Without Motor Drive..... \$75
 Price with Horizontal Motor Drive, Reversing Motor, and Switch as shown.... \$94.00



Wt. 1840 lbs.

16"x6" Standard Change Gear Precision Lathe, Countershaft Drive..... \$480
 Other 16" Lathes in Quick Change and Standard Change Gear types, bed lengths 6' to 14', up to..... \$1020.

PLEASE LET ME GET UP, DEAR. IT'S TOO WARM TONIGHT TO SIT IN ANYBODY'S LAP

AND IN MINE ESPECIALLY? YOU DIDN'T TALK LIKE THAT WHEN WE WERE FIRST MARRIED. BUT I SUPPOSE ROMANCE NEVER LASTS



NO, IT DOESN'T! NOT WHEN PEOPLE GROW CARELESS. OH, I DIDN'T MEAN TO SAY THAT

BETH, CARELESS ABOUT WHAT?



LATER

BETH WOULDN'T EXPLAIN— BUT PERHAPS THIS ARTICLE WILL! *FAMOUS FAULTS THAT BREAK UP MARRIAGE.* WHAT, NUMBER ONE IS *B.O.* ME FOR LIFEBOUY QUICK!



"B.O." GONE — *happier days for both!*

WHEN WE GO ON OUR VACATION THIS SUMMER, IT'LL BE JUST LIKE A SECOND HONEYMOON

EVERY DAY IS A HONEYMOON WITH YOU, DARLING



GOSH, HONEY, EVERYONE I MEET LATELY TELLS ME I'M LOOKING BETTER

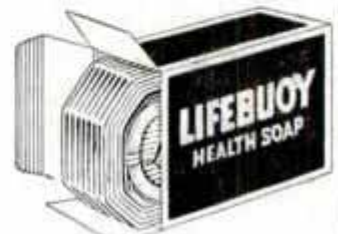
THAT'S BECAUSE LIFEBOUY IS KEEPING YOUR SKIN SO CLEAR AND HEALTHY

YOUR complexion can "make" or "break" your whole appearance. For a fresh, *pleasing* skin—let Lifebuoy help you. This delightful toilet soap gently yet thoroughly cleanses the pores of dirt and clogged wastes. Brings to dull complexions radiance and youthful charm.

Hot weather warning

"B.O." will get you—if you *don't watch out* these sweltering hot days! Take no chances—bathe regularly with Lifebuoy. Its rich, refreshing lather—abundant in hot or cold water, hard or soft—purifies and deodorizes the pores. Stops "B.O." (body odor). You can tell by its fresh, clean, quickly-vanishing scent that Lifebuoy gives *extra* protection.

Approved by
Good Housekeeping Bureau



... alone - no

They Satisfy



the cigarette that's **MILDER**
the cigarette that **TASTES BETTER**

