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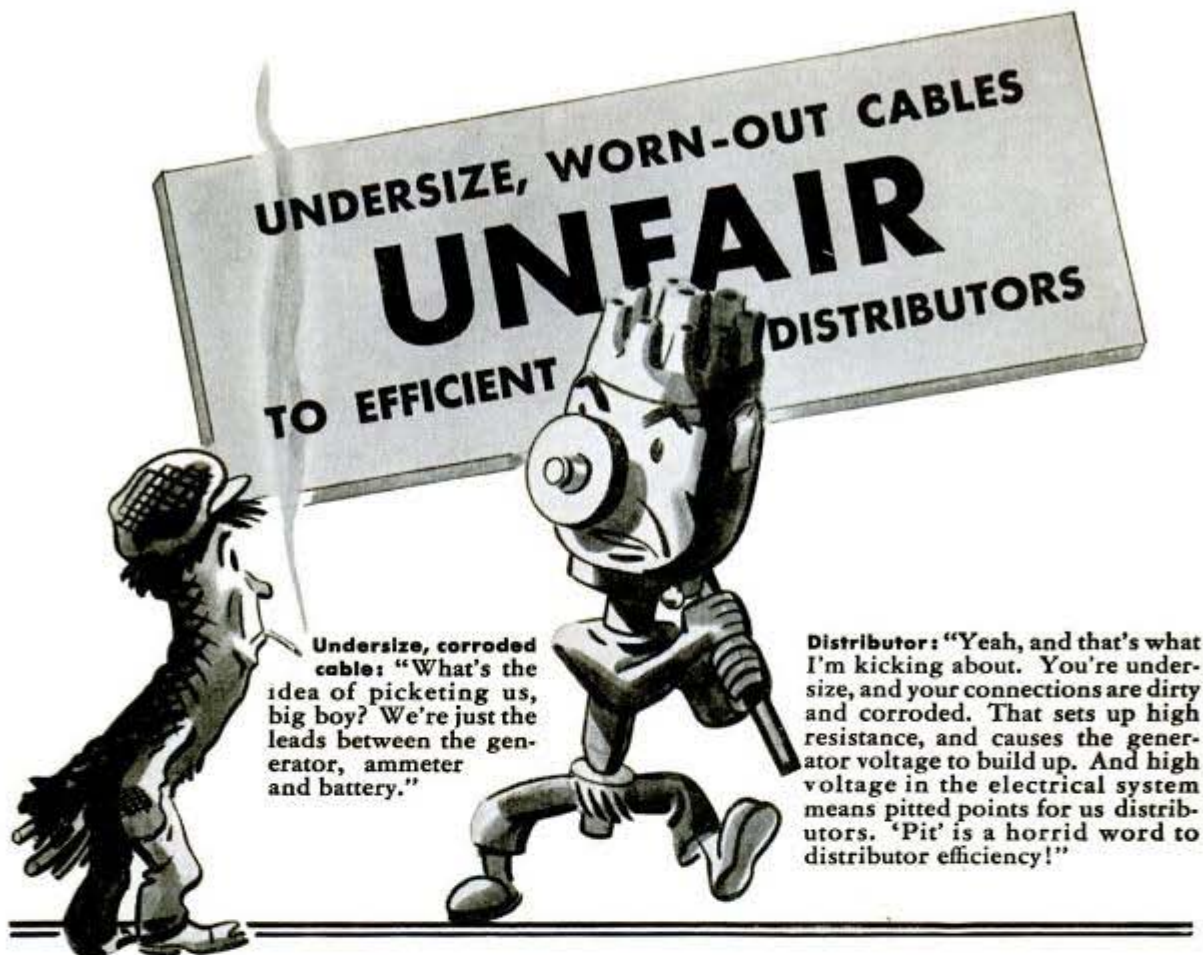
REG. TRADE MARK, GERMANY

REG. U.S. PAT. OFF.

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25 CENTS
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SEE PAGE 514



Undersize, corroded cable: "What's the idea of picketing us, big boy? We're just the leads between the generator, ammeter and battery."

Distributor: "Yeah, and that's what I'm kicking about. You're undersize, and your connections are dirty and corroded. That sets up high resistance, and causes the generator voltage to build up. And high voltage in the electrical system means pitted points for us distributors. 'Pit' is a horrid word to distributor efficiency!"

Get a Thorough Electrical Check-up at a PACKARD CERTIFIED RE-WIRING STATION

Pitting of distributor points is just one of the results of "bottle-neck" cables and connections in the electrical circuits. Other results are hard starting, sluggish engine performance, poor gas mileage, dim headlights, and unsatisfactory accessory performance.

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By figuring the financing cost on that new car for themselves, these young people are being thrifty. Maybe you can save some money, too.

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different financing plans available to you. Check them carefully for financing cost and the completeness of the insurance included. Determine which one gives you greatest value for your money. See for yourself just where and how you can save!

Write for *your* Figuring Chart today! Learn about the many advantages of the General Motors Instalment Plan! Fill out and mail the coupon now.

This plan is available only through dealers in Chevrolet, Pontiac, Buick, Oldsmobile and Cadillac cars.

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Please send me copy of GMAC Figuring Chart for the car checked below:

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Address _____

City _____

County _____ State _____ U.S.A.

**GENERAL
MOTORS
INSTALMENT
PLAN**

This One



0A71-50X-KG21

EACH CAN SAY



"I WAS A CLERK"



"I WAS A LINEMAN"



"I WAS A DRAFTSMAN"

THIRTY-SEVEN years ago, in 1904, the president of the American Telephone and Telegraph Company went to work as a clerk in one of the Bell System companies.

About that time, the 18 men who are now the presidents of the Bell telephone companies were starting their careers. For, like the head of the System, they have worked many years in the business — an average of 38 years each. Each of them can say: "I was a clerk," "I was a lineman," "I was a draftsman"—and so on.

The "know how" is here — for the every-day job of running the telephone business or to serve you in emergency. Up-from-the-ranks management is doubly important these days.



**BELL
TELEPHONE
SYSTEM**

*The Bell System is doing
its part in the Country's
program of National
Defense.*

Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

April, 1941

Vol. 75, No. 4

Next Month

IN THIS ISSUE

Aviation Unlimited	481
With the Mosquito Fleet	487
Television in Color	Coloroto
Soldiers With Wings	508
Throwing Light on U. S. Security	514
Dog "Policemen" Join the Force	520
Winged Classrooms for Navigators	526
Wild Game—Our Latest Crop	531
Setting Spies to Catch Spies	536
Charting the Ocean for Defense	546
Winning Races Before They Start	552
School for Smoke Chasers	558
Packages Designed to Catch the Eye	562
Cashing In on a Fantasy	568
Teaching the Three R's by Touch	572

(Continued on next page)

America on the Firing Line

YOU start your first year in the army with calisthenics, ball games and boxing to develop wind and limb. You end it with mastery of a rifle that will fire eight straight shots in two seconds. For after all, sharpshooting is the principal business of the soldier, and the U. S. Army intends that every volunteer and "selectee" shall become an expert marksman. A May feature, "America's Defenders on the Firing Line," tells how a rookie learns to shoot—and how, before he fires a shot, he learns to take a Garand apart, see how it works, then put it together again.

Reclaiming a Farm Empire

IT'S impossible to avoid superlatives in talking of our reclamation projects. To save California's central valley from flood and drought two mighty rivers are being rerouted, one made to flow backward, 250 miles of canals dug and tremendous dams thrown up. The \$228,000,000 undertaking is shown in full color in the eight-page Coloroto section next month.

THAT camping trip next summer needn't be a nightmare of mosquitoes and damp nights and burdensome equipment and sunburn. With the camping outfits available today for as little as \$10 for two weeks you can live outdoors with the comforts of home. Among other things there's a pup tent of waterproof balloon cloth that you can carry in your hand; it has a zipper opening and screened window. Before you head for the woods, read the tips in "Roughing It the Easy Way," a May feature.

Clearing the Rails

WHATEVER comes, the railroads are ready. They must be, for in a land stretching 3,000 miles between seacoasts the railroads are mainsprings of defense. Can they move an army of a million and a half in an emergency? Over the four-day Labor Day holiday they carried 750,000 to and from resorts on the eastern seaboard alone. Next month J. F. Deasy, operations vice-president of the Pennsylvania, tells how the rails are being cleared for Uncle Sam.

Super-Fuels Ahead

TODAY'S high-octane aviation gasoline is the automobile fuel of tomorrow. In your 1950 car you can expect a smaller engine with higher compression, greater power and efficiency. For a look ahead, read the May story by Earl Bartholomew, director of engineering research for Ethyl Gasoline Corporation, who writes of "Baby Engines and Super-Fuels."

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(Contents—Continued)

AUTOMOTIVE

Whistle warns driver emergency brake is set.....	484
Crankcase ventilator aids winter starting.....	550
Refuse truck has own conveyor.....	551
One-man dump bed for truck.....	557
Electric speed trap spots speeding cars.....	557
Rubber fender for trucks.....	561
Plastic panels tested for car bodies.....	575
Rubber covers for door handles.....	576

AVIATION

Lastex suit keeps flyer warm.....	486
One pilot can fly two planes with aid of radio.....	486
25,000 parts in bombing plane.....	506
Planes have 2,656 landing places in U. S., Canada.....	513
Machine gun fires backward.....	519
Big Clipper ready for wings.....	525
Fluorescent light illuminates instrument panel.....	530
Trainer plane anchored to pylon.....	540

HOUSEHOLD

Pillow around neck rests head in chair.....	485
Wallpaper grease spot remover.....	492
Illuminated frame holds color picture.....	496
Drawer in seat of kitchen chair.....	524
Whipped cream shot from compressed air gun.....	528
Room cooler thrown in reverse delivers heat.....	529
Coffee urn in table lamp.....	534
Cream whipper.....	535
Revolving spit for fireplace.....	540
Fluorescent "pin-up" lamp.....	541
Tips for gardeners.....	542
Clockwork turns roasting jack.....	544
Tier table has mirror top.....	544
Cabinet doors of woven plastic.....	550
Wheeled grass catcher for mower.....	565
Combined table and buffet.....	566
Feet massaged between rubber rollers.....	566
Roof guards prevent snowslide.....	566
Faucet handle fits any shank.....	571
Headrest for bathtub.....	576

MODELS

Toothpick building is national hobby.....	534
Relief of U. S. scaled four miles to an inch.....	545
Midget guns and village aid war practice.....	567

PHOTOGRAPHY

Developing kit for movies.....	486
Long-range aerial camera records bombardment.....	539
Flash bulb on flexible arm.....	540
Negative viewer varies light and magnifier.....	555
Folding reflector for flash bulb.....	560
Enlarging meter shows time and paper grade.....	571
Floodlights "panoram" with camera.....	128A

RADIO AND ELECTRICITY

Plug with "anchor loop" makes tight contact.....	550
Tester finds bad Christmas-tree bulb.....	557
Eight-foot microphone picks up distant sounds.....	560
Flashing lights trace radio circuit.....	615
Flashlight cells operate receiver.....	616
C. W. transmitter for beginner.....	618
Practical radio suggestions.....	619
Ornamental receiver.....	620
Portable phono recorder.....	620
"F. M." converter for standard sets.....	620
Automatic marine phone.....	620

SCIENCE AND INDUSTRY

Testing airport floodlights.....	485
Helical shaft pumps water.....	496
Electric-sign letters are removable.....	524
Fish grunt, bark, drum and sing.....	534
Polariscope predicts formation of clouds.....	550
Power shot through air like light.....	556
Transparent side shields for goggles.....	566
Machine tool cuts 14 miles of steel in hour.....	570
Bats fly blind on inaudible sound waves.....	570
Wood made elastic by urea treatment.....	576

SPORTS

Putting trap for practicing golf at home.....	492
Stationary skis used for summer practice.....	492
Billiard-golf played on pool tables.....	519
Line-casting gun shoots plug at fish.....	528

(Continued to page 6A)



As if it weren't enough to have a howling April blizzard descend on us in place of spring zephyrs, Uncle Jim, (laid up with gout) asked me to drive his car to the garage for a long overdue change of oil and grease.

The way Uncle Jim misuses his car made me fear the worst. Sure enough! Heading into the drifting sleet and snow, the engine began to labor and miss. "The way this tub performs is a crime," I sputtered! Then it stalled!



She wouldn't budge. She just quit. It took me an hour to get a tow truck. I was frozen and miserable.



To top the whole thing off, while phoning to Uncle Jim from the garage, my coat actually caught fire from crowding the red hot stove!



"The oil in your car was like molasses," I hollered to Uncle Jim. "There was enough water in the crank case to float a ship. Valves are half burned out from hard carbon, and every bearing in the shaft is loose. What your car needs is a good dose of Pyroil," I told him. "And Pyroil in her all the time!"

In any weather—cold or hot—Pyroil improves the operation of your car. Pyroil is a special, highly refined, balanced additive used for more than ten years by millions of motorists. It keeps out hard carbon, gum and sludge. Prevents the damaging attack of acid-corrosion. Keeps a clean engine clean.

So, next time you drive in for service, ask the salesman to "add a little Pyroil" to gas tank and crankcase. Manufactured and guaranteed by Pyroil Company, W. V. Kidder, Founder, 54 Main St., LaCrosse, Wisconsin, U. S. A.

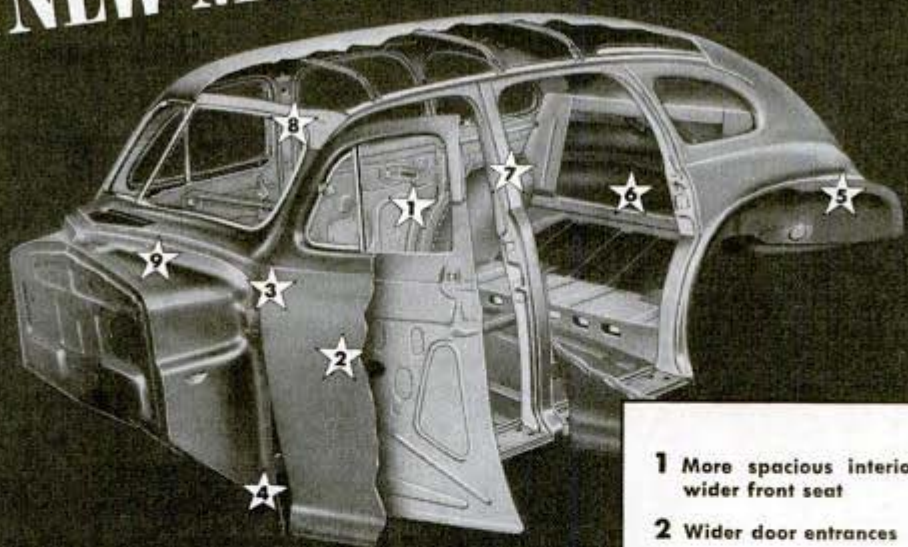


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- 6 More available space in luggage compartment
- 7 Dome light operates automatically as well as manually
- 8 New sliding panel sun visors
- 9 Scientific insulation with thick rock wool pad on both sides of cowl

DESPITE the more sleekly streamlined appearance of the new Unisteel Turret Top Body by Fisher, it is actually roomier than ever. Note, for instance, how it adds to the spaciousness of the 1941 Oldsmobile Dynamic Cruiser De Luxe illustrated here. Its inside seating width is increased 6 inches in favor of front-seat passengers. And the rear seating width is $4\frac{1}{4}$ inches greater. Note, too, in the panel on the right some of the other outstanding comfort and safety features that apply to the new Body by Fisher on General Motors cars in every price class. You can see there are good reasons for saying, "Body by Fisher is '41's guide to better value"—which leads you, of course, to a General Motors car.

They're saying the new Oldsmobile's "the car that has everything modern!"—and there's a major reason for that in the new Body by Fisher on the 1941 Oldsmobile Dynamic Cruiser De Luxe; with its concealed running boards, foam rubber seat pads, almost 6" more over-all length and 8" more over-all width.



To be sure of flashing acceleration
 be sure your spark plugs
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If your car starts hard, is sluggish and gives you poor gas mileage, your spark plugs probably look like this. For economy replace all spark plugs, even CHAMPIONS, every 10,000 miles.

You're always ahead with Champion!
SPARK PLUGS

(Contents—Continued)

Phonograph starts harness race.....	530
Squid fishing introduces new thrills.....	541
Knife with cork handle floats in water.....	549
Oarsmen work out before mirror.....	551

TOOLS

Bucksaw frame is steel tube.....	525
Head of screw comes off, leaving smooth surface.....	539
Adjustable tool solves cut-off problems.....	544
Square-head screw turned with wrench.....	565

WAR

Lighted match seen half mile in blackout.....	496
Gun towed by ski-mobile.....	513
"Blackout" cane has headlight.....	513
Floating "clinic" for airmen shot down at sea.....	555

MISCELLANEOUS

London firemen drill for air raids.....	484
Tester measures moisture in crop.....	484
Junior squad aids fire fighters.....	493
New ideas for boat owners.....	494
Music box plays 100 records.....	519
Transplanting tool.....	524
Inventors get 42,248 patents in 1940.....	524
Sponge-rubber relief maps.....	528
Dog fitted with false teeth.....	529
Washable sport shoe has detachable upper.....	535
Portable indicator shows speed of yacht.....	535
Tumblers on wrists show typewriter's smoothness.....	549
Light sub-machine gun for army.....	560
Schools teach visual signaling.....	561
"Black light" reveals potato rot.....	567
Three-dimension pictures in coin machine.....	571

Craftsman and Shop Notes

AUTOMOTIVE

Bicycle-carrying rack clamps on car bumper.....	607
Repairing damaged fenders.....	636
Simple method of making gaskets.....	639
Heating oil on cold mornings.....	639
Secret pocket in car holds valuables.....	639
"Quick-change" license-plate bolts.....	639
Joining copper tubing with solder.....	639
Floor mats patched with rubber shoe soles.....	640
Reflector on side of towed car help.....	640

FARM

Hinge hasp swings down when open.....	592
Low roosts help keep poultry house clean.....	625
Rubber insulators for electric fence.....	630
Headlight reflector behind lantern.....	632
Disk-harrow blade on wagon box to clean shovels.....	634
Hog trough adapts itself to uneven ground.....	634
Poultry nests dusted with flour sifter.....	634
Lifting heavy wagon boxes.....	635
Screen and tar protect bottom of truck box.....	640

FURNITURE

Gate-leg table for child's room.....	579
Tilt-top lamp table in Chippendale.....	585
Ready-made drawers in this tool cabinet.....	633

GARDEN

Cool birdhouses of asbestos cement.....	590
Piece of auto casing provides spring for gate.....	596
"Old oaken bucket well" and birdbath in one.....	599

HAND TOOLS

Abrasive sticks are timesavers on sanding jobs.....	582
Small vise made from pair of pliers.....	584
Screws wedge hammer head on handle.....	584
Non-tip container for soldering flux.....	587
Tool oiling pad under bench is fed from top.....	596
Small hammer made from faucet handle.....	598
Bench vise serves as punch press.....	608
Rubber ball good hand grip on turning chisels.....	608
Improvement on plasterer's hawk.....	624
Burning broken handle from pitchfork.....	632
Cleaning slots in small collets.....	632
Buffer and sander for hand grinder.....	635

HOUSEHOLD

Twist-neck candlesticks dress up your table.....	577
Increasing life of window screens.....	578
Solving home problems.....	580-581

(Continued to page 8A)



Now
is the time!

Business is Searching

..... **for YOU, if**

RIGHT now, in many lines, there is a search for really *good* men—managers, leaders—men who can take charge of departments, businesses, branch offices, and get things humming.

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Ordinarily, there would be plenty of men to fill these jobs—men in junior positions who had been studying in spare time. But most men have been letting their training slide during these dark years of depression . . . "What's the use?"—You have heard them say. Perhaps there has been some excuse for sticking to any old kind of a job one could get the past few years—but the door is wide open for the man with ambition and ability *NOW!*

And don't let anyone tell you that "Opportunity Only Knocks Once"—that's one of the most untruthful sayings ever circulated. Op-

portunities flourish for *every* American every day of his life.

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3-IN-ONE OIL

(Contents—Continued)

Protecting unused heating plants from rust.....	582
Invisible bookends puzzle your friends.....	582
Decorative plates dress up doorbell buttons.....	587
Wax applied to mop evenly with clothes sprinkler.....	588
Place cards made with alphabet noodles.....	592
Picture "frames" and tray edging of rope.....	593
Two plant stands in wrought iron.....	594
Ice cube serves as label moistener.....	596
Bottle cap improves flowerpot.....	596
Non-draining flowerpots vented to prevent souring.....	599
Waxed paper prevents ice trays sticking.....	608
Potato keeps cut flowers fresh.....	608

METALWORKING

Can opener cuts sheet metal without bending it.....	582
Electric-motor shafts welded in lathe.....	624
Washer serves as reservoir for drill lubricant.....	634

PHOTOGRAPHY

Safelight from plastic tumblers.....	609
Distance scale on portrait attachment.....	609
Pointer on clock times development.....	609
Lighting interiors for good photos.....	610
Paper clamp holds film on drying line.....	612
Tripod attachment permits use of dropping bed.....	613
Slats make laundry tub a darkroom sink.....	613
Developing several rolls at once.....	613
Giving prints a linen-like finish.....	614
False bottom in tank recovers dropped films.....	614

POWER TOOLS

Jigsaw blade twisted for greater compass in sawing.....	598
Roller bearing disk sander.....	621
Support for long work has a tilting head.....	623
Aligning bar checks lathe centers accurately.....	631

STORE AND SHOP

Drawing board on wall folds flat.....	579
Visible holder for jigsaw blades.....	584
Maps stored in mailing tubes.....	584
Cork and rubber band hold flags in display.....	588
Brackets on folding shelf made from hinges.....	588
Reels for wire made from can lids.....	608
Window trimmer carries pins under pencil clip.....	623
Sun visor displays doctor's in-and-out sign.....	625
Grain chute delivers measured quantities.....	630
Ball in gluepot keeps brush handle clean.....	630
Display rack of lamps aids in selecting right size.....	631
Triangle useful for pressmen.....	631
Welder's rugged stand.....	632

TOYS AND NOVELTIES

Fences for model railroads from soda straws.....	588
Jigsawed easter-egg carts.....	589
Sailing merry-go-round.....	597

WOODWORKING

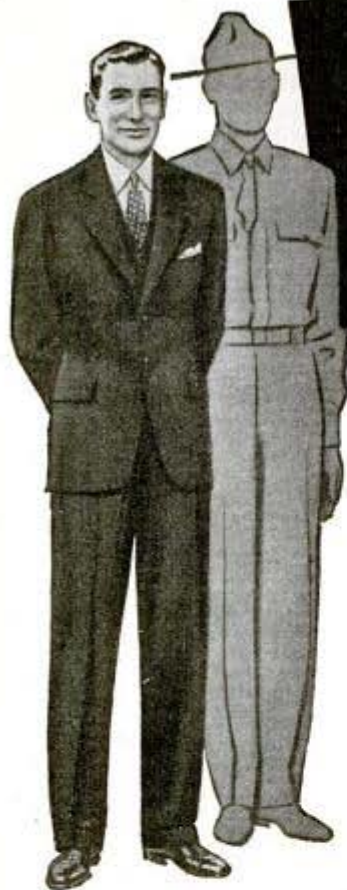
"Drawstring" bowl.....	583
Seat for forcing live lathe center into work.....	598
Double-faced sandpaper saves time and labor.....	598
Hinged block on sawhorse squares boards.....	624

MISCELLANEOUS

Threads in hole counted with aid of match.....	579
Match and rubber band keep test tube from rolling.....	582
Anchoring steel hoops on wooden barrels.....	584
Preventing fraying of hemp rope.....	586
Stick through jug handle makes carrying easy.....	588
Cardboard aids in stringing beads.....	588
Rubber band makes comfortable watch strap.....	592
Artist uses match book as emergency rule.....	592
Bottle cap in funnel speeds up filtering.....	592
Severing spring wire.....	592
Knee pads for carpenters.....	596
"Falcon" trim, sturdy 18 ft. inboard—Part I.....	600
Template of model hull made with solder.....	607
Sheeting lining makes sleeping bag easy to clean.....	607
Mortar tubs from steel oil drums.....	624
Notched putty knife pulls glazier points.....	624
Carrying case for blueprints from stovepipes.....	624
Dust shield on typewriter cuts repair bills.....	625
What you can do with liquid plastics.....	626
Workman supports tree trimmers in belt pouch.....	630
Brush for rubber-cement jar assures clean handle.....	632
Non-spilling brush holder for sign painters.....	634

IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.



What about I.C.S. students who are drafted?

MAYBE you've learned that only with *proper training* can you hope to get ahead on your job — maybe you've often said, "Some day I'll take an I. C. S. Course, and really amount to something!"—but because of the draft, you've decided to put it off. *Don't do it!*

If you're drafted, you'll be encouraged to continue your I. C. S. studies — for the U. S. Army, like business and industry, needs trained men—and *pays them well!* Furthermore, you will have real training by the time your term of enlistment is over, and you'll be ready to step into a bigger, better-paying job than you have now.

Figure it out for yourself — training pays in peacetime or war-time, in army or civilian life. Mail this coupon *right now* for information on low-cost I. C. S. Courses in your line of work. *The I. C. S. Limited is headed for Success — climb on!*

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| | | <input type="checkbox"/> Mechanical Engineering |
| | | <input type="checkbox"/> Mine Foreman |
| | | <input type="checkbox"/> Navigation |
| | | <input type="checkbox"/> Patternmaking |
| | | <input type="checkbox"/> Pharmacy |
| | | <input type="checkbox"/> Plumbing |
| | | <input type="checkbox"/> Poultry Farming |
| | | <input type="checkbox"/> Practical Telephony |
| | | <input type="checkbox"/> Public Works Engineering |
| | | <input type="checkbox"/> Radio, General |
| | | <input type="checkbox"/> Radio Operating |
| | | <input type="checkbox"/> Radio Servicing |
| | | <input type="checkbox"/> R. R. Section Foreman |
| | | <input type="checkbox"/> R. R. Signalmen's |
| | | <input type="checkbox"/> Refrigeration |
| | | <input type="checkbox"/> Sanitary Engineering |
| | | <input type="checkbox"/> Sheet Metal Work |
| | | <input type="checkbox"/> Steam Electric |
| | | <input type="checkbox"/> Steam Engines |
| | | <input type="checkbox"/> Steam Fitting |
| | | <input type="checkbox"/> Structural Drafting |
| | | <input type="checkbox"/> Structural Engineering |
| | | <input type="checkbox"/> Surveying and Mapping |
| | | <input type="checkbox"/> Telegraph Engineering |
| | | <input type="checkbox"/> Textile Designing |
| | | <input type="checkbox"/> Toolmaking |
| | | <input type="checkbox"/> Welding, Electric and Gas |
| | | <input type="checkbox"/> Woolen Manufacturing |
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| <input type="checkbox"/> Accounting | <input type="checkbox"/> Advertising | <input type="checkbox"/> College Preparatory |
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| | | <input type="checkbox"/> First Year College |
| | | <input type="checkbox"/> Foremanship |
| | | <input type="checkbox"/> French |
| | | <input type="checkbox"/> Grade School |
| | | <input type="checkbox"/> High School |
| | | <input type="checkbox"/> Illustrating |
| | | <input type="checkbox"/> Lettering Show Cards |
| | | <input type="checkbox"/> Managing Men at Work |
| | | <input type="checkbox"/> Railroad Postal Clerk |
| | | <input type="checkbox"/> Salesmanship |
| | | <input type="checkbox"/> Secretarial |
| | | <input type="checkbox"/> Sign Lettering |
| | | <input type="checkbox"/> Traffic Management |
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| | | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |
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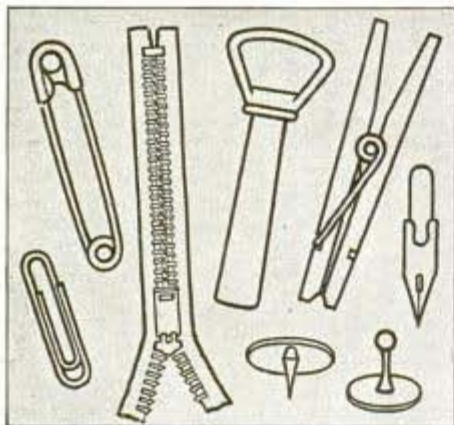
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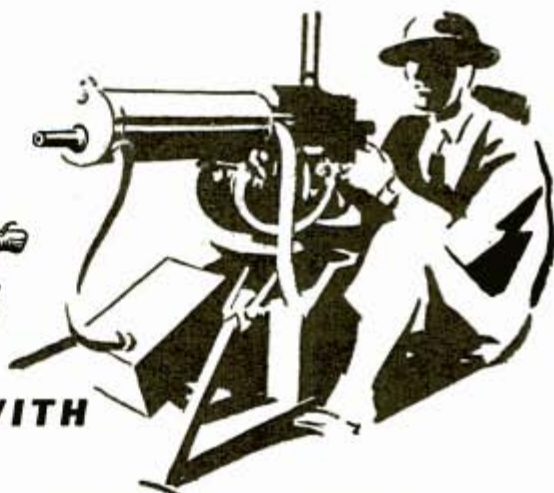
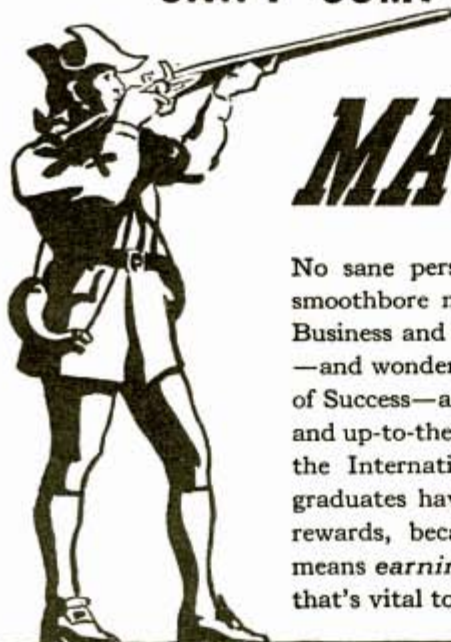
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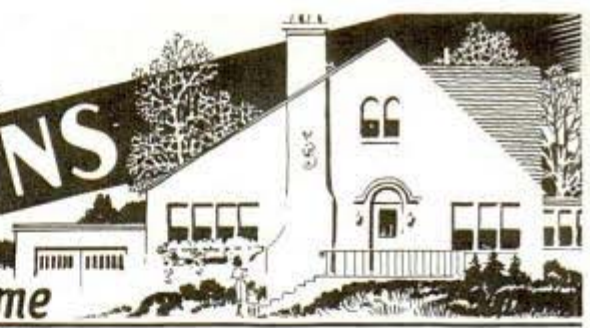
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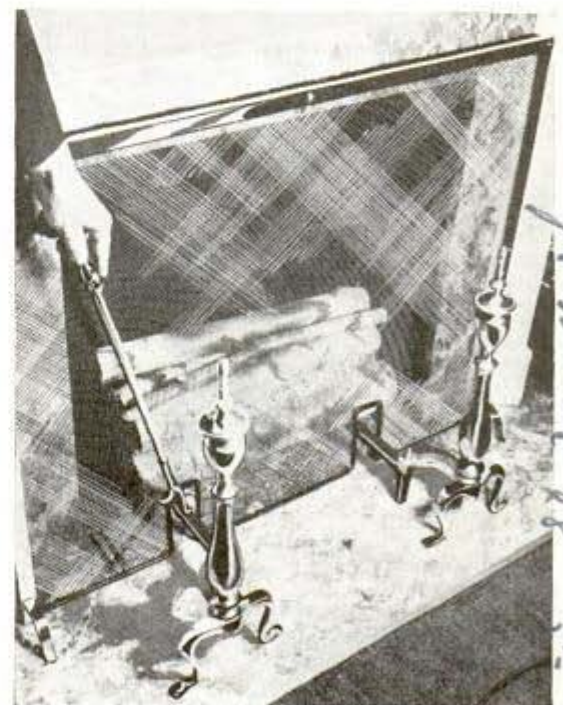
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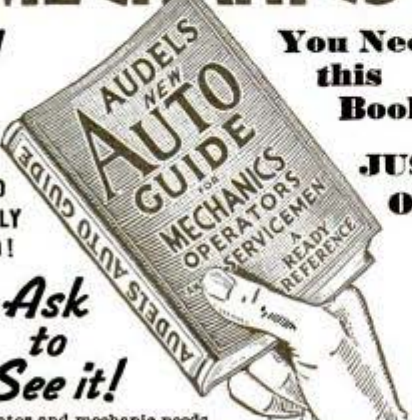
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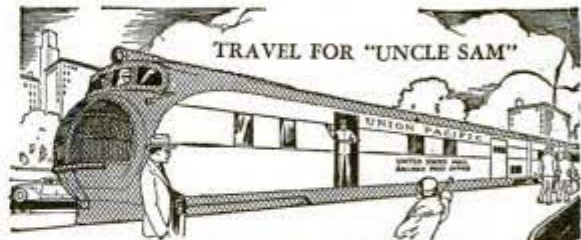


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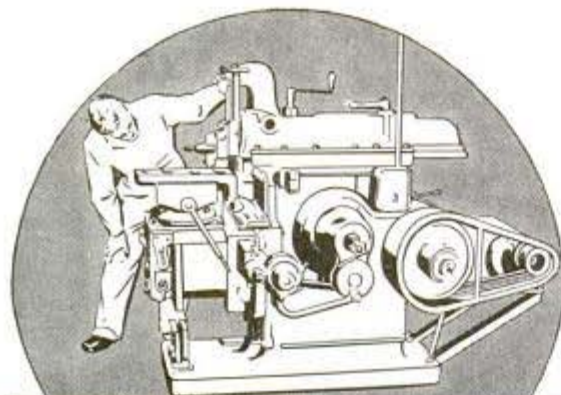
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\$5 **TO** \$500 Each paid for hundreds of old or odd coins. Keep all, get posted. Many very valuable. Send 10 cents for illustrated coin value book, 4x7. Guaranteed buying and selling prices. 34 years in business. Coin Exchange, Box 5, LeRoy, N. Y.

WILL Pay \$15 each for certain Lincoln pennies! Indianheads \$200; dimes \$1,000. Catalogue 10c. Federal Coin Exchange, Columbus, Ohio.

ILLUSTRATED Retail coin catalogue 10c (refund). 3000 quotations. James Randall, 37 West Van Buren, Chicago.

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WE Pay highest cash prices in United States for old coins. Up to \$2000.00 each paid for large cents. Indian head pennies \$100.00; Lincoln head pennies \$2.00; half cents \$300.00; nickels \$350.00; dimes \$500.00; 2 cent pieces; 3 cent pieces, half dimes, quarters wanted. Gold coins worth up to \$6,000.00 each. Send 10c today for 1941 catalog. American Rare Coin Co., 1069 Transportation Bldg., Chicago, Ill.

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BEGINNERS Coin guide. Selling, collecting, etc., 20c. Lawrence, Plentywood, Montana.

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SENSATIONAL Prices paid. Catalogue 10c. Sibert, 17 Middagh, Brooklyn, N. Y.

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I WILL Pay \$100.00 each for 1924 1c green Franklin stamps, rotary perforated eleven (up to \$1,000.00 each if unused). Send 6c for large illustrated folder showing amazing prices paid. Vernon Baker, (PM-4), Elyria, Ohio.

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8x10 SILK Finish enlargement—20c. Irving Studio, 4006A Irving Park, Chicago.

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100 REPRINTS \$1.00, 116 or smaller. Rex Photo, Oden, Utah.

THREE Prints each good negative in roll 25c. Reprints 3c. Fred D. Eastman, Bode, Iowa.

OVERSIZE Prints. Your roll developed and 8 oversize prints 25c; from 116, 120, 127 size negatives you receive 4x6 inch prints, all smaller sizes receive 3 1/2" x 4 1/2" inch prints, 12 exposure rolls 35c; 16 exposure rolls 50c. Reprints 3c each. Everlasting Hi-gloss finish. Overnight service. Pacific Photo Service, Box 666, San Francisco, Calif.

CANDID Special, 35mm. rolls enlarged to 3 1/4" x 4 1/2", \$1.00. 18mm. rolls 60c. 3 1/4" x 4 1/2" reprints 3c. Brown Photo Company, 1910-61 Emerson, Minneapolis, Minn.

8 ENLARGED Prints (nearly postcard size) or 16 regular size prints from your roll or negatives 25c. Willard Studios, Dept. 47, Cleveland, Ohio.

19c ROLL Finishing, 8 prints guaranteed. Nu-Tone Fotos, Schwenksville, Penna.

ROLL Developed and 8 beautiful enlargements 2 to 6 times larger—high gloss—deckled edge. Any 8 exposure roll 25c coin. Reprint enlargements 3c each. Alden Photos, 94-B Astor St., Boston, Mass.

BEAUTIFUL Enlargement from each picture on roll 25c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

FOR The discriminating amateur—8 exposure rolls, 2 prints each 25c. Miniature rolls enlarged 3 to 6 times, 8 exposures 25c, 16 exposures 50c, 35mm, 36 exposures, 3x4 enlargements \$1.00. Unexcelled quality, prompt service. Paramount Photo, 327 E. 92nd Street, New York.

IMMEDIATE Service! Pictures returned same day order is received. Sixteen guaranteed deckled-edge prints from roll 25c. One colored or two plain enlargements plus 8 deckled-edge Velox prints only 25c. Special! Coupon for 8x10 enlargement given with each 25c order. Any 36 exposure 35mm. film fine-grain developed Vaporate treated and each good negative enlarged to 3x4 on deckled-edge Velox paper, only \$1.00! Reloads: 36 exposure, 50c; 18 exposure, 35c. 3x4 deckled-edge reprints, 4c each, 24 hour service. Details, sample and mailers free on request. American Studios, Box 51, LaCrosse, Wis.

EXTRA Special: Five 5x7 enlargements, 25c. Cardinal Photos, Summit, New Jersey.

ROLL Developed and 8 lustrous distinct flash permanent Velox glossy prints 25c—reprints 3c each. Fotoprint Service, Box I, Roanoke, Virginia.

18 LIFETIME Prints, 3 sparkling Hollywood enlargement coupon, each roll 25c. 21 reprints 25c. 100—\$1.00. Finished 3 hours. 25 other bargains. Overnight Studio, Albany, Wis.

20 REPRINTS 25c. Hundred reprints \$1.00. Rolls developed and 16 prints or 8 prints and 2 enlargements—25c. Mercury Studios, Dept. L, 109 N. Dearborn, Chicago.

FREE Trial—16 sparkling Lifetime prints, three lovely Hollywood enlargements, and free Leathertone frame with roll—25c. 20 reprints 25c; 100—\$1.00. Overnight service. Lifetone Studios, L-39, Des Moines, Iowa.

ROLL Developed—16 guaranteed prints, two coupons on enlargements, 25c. Smart Photo, Winona, Minnesota.

PROMPT Service! Rolls developed, two Velox prints each negative 25c. Hench Studios, Harrisburg, Penna.

FREE 3 Professional 5x7 enlargements of your own choice, 2 guaranteed sets of prints with your roll film developed—all for 25c, original order only. Aro Studios, Dept. 12, Des Moines, Iowa.

ENLARGE Your own photos. Make money doing work for others. Build your own enlarger. Complete details on four enlargers 25c. Popular Mechanics Press, 200 E. Ontario St., Chicago.

MOTION PICTURES AND SOUND EQUIPMENT

USED Projectors for sale, excellent condition. Keystone 16mm, 750w \$46.50; Keystone 16mm, 500w, \$38.50; Kodascope 16mm, 750w, \$43.50; Keystone 8mm, 300w, \$29.50; Keystone 8mm, 500w, \$34.50. Write for free 16mm.-8mm. film rental catalog. National Cinema Service, 71 Dey St., New York City.

TAKE Movies indoors; 100 ft. 16mm. Tunstun 20 \$2.98. Outdoor film 100 ft. 16mm. \$1.50. Processing included. Bulk film, 8 or 16mm, 95c—100 ft. Whitman Cine Lab., 479A Quincy St., Brooklyn, N. Y.

35MM TALKIES Sold, rented anywhere. Bargain equipment list, Simpson, 1275 South Broadway, Dayton, Ohio.

BARGAIN Offer, 16mm., 8mm. sound, silent. Please state requirements. Institutional Cinema Service, Inc., 1560P Broadway, New York City.

35MM. COLOR. Silent, sound \$1.00. Elite, 1157 McCadden, Hollywood, Calif.

GENERA Films for movie cameras. Save 50%. Two films "The End," 10c. (Size?) Bargain circulars. Promaders, Davenport, Iowa.

16MM. SILENT. Sound films, projectors. Zenith, 308 West 44th, New York.

HOME Movies—Sold, exchanged. S. R. Sales, 3690 Warren Rd., Cleveland, Ohio.

16MM. SOUND Film rentals. Independent Motion Picture Exchange, Cudahy, Wisconsin.

SILENT 35mm. Films, 95c reel, Demsey, 1223 Berkley, Youngstown, Ohio.

GLAMOROUS Movie productions, sample scene dime. Erwine's Laboratories, Allentown, Penna.

LOOK! Nationally advertised movie cameras, projectors, films, accessories. Payments low as \$2.50 monthly. Send 10c for large two color catalog. Don Elder's, Dept. 25, 739 Boylston Street, Boston, Mass.

8-16-35MM. Silent-sound subjects \$2.00 up. Odd reels \$1.50. Three 16mm. end titles—catalogue, lists—10c. Covel, 2120 Strauss, Brooklyn, N. Y.

RENT 16mm. sound programs cheap. Many features. Large 8-16mm. silent library. Free catalog, Asha Films, 785 St. Johns, Brooklyn, N. Y.

FREE Sample and lists, all kinds movies. Goodwill Company, Jackson, Tennessee.

8MM., 16MM. silent and sound films exchanged. Special new kings and queens visit San Francisco. 8mm. 200 feet \$3.50. Free lists. Arverne Films, Box 65, Arverne, N. Y.

DEVELOP Your own movies. Complete instructions 10c. Corona Laboratories, 200 East 34th, Brooklyn, N. Y.

MONEYMAKER! "The World's Greatest Passion Play," 16mm. and 35mm. Specify sound or silent. Rent or purchase. Superior than Oberammergau play. Hemerway Film Co., 37P Church Street, Boston, Mass.

CAMERAS, Projectors, films, lists free. (Art sample 10c.) Box 108, Lefferts, Brooklyn, N. Y.

BASS Says: Shrewd buyers send for the new Bass Cine Bargaingram No. 245, an 84-page catalog exclusively cine. The new Revere Double 8 with Bausch & Lomb F-3 lens at \$37.50 is the buy. The RCA 16mm. SOP news reel camera at \$275.00. Write Cine Headquarters for your copy of this great free book. Bass Camera Company, Dept. A, 179 W. Madison St., Chicago, Ill.

16MM. Laboratory. Color, black and white. Sound recording. Titles. Send for list. Film Associates, Dayton, Ohio.

GUARANTEED 8mm., 16mm., 24-hour reversal processing. Eso-S, 3945 Central, Kansas City, Missouri.

FREE 16mm., 8mm. bargain lists. Home Movies, Box 216, Easton, Penna.

LEARN Motion picture theatre projection, management. Free catalog. Give age. Theatre Institute, Elmira, N. Y.

GLAMOUR Films, sample 10c. Passion Play, sound \$30.00. Artcraft Productions, Hammond Bldg., Hammond, Indiana.

8MM.-16MM. Art films. Free catalogue sample 10c. Parkway Exchange, 961 Eastern Parkway, Brooklyn, New York.

8MM. - 16MM. Films silent - sound. Bought, sold, exchanged. Films rented everywhere. Free catalogue (with sample 10c). Garden Film, 317 West 50th, New York.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

MUSIC AND MUSICAL INSTRUMENTS

SONGWRITERS! Words, melodies. Amazing offer. Hibbeler, C-5, 2157 No. Avers, Chicago.

PHONOGRAPH Records 10c. Catalogue. Paramount, AN-358 East Market, Wilkes-Barre, Pennsylvania.

MUSIC Printing, publishing, composing, arranging. Auto-Litho Co., Jensen, Fla.

MELODY To your words, \$1. full price. Professionals, Sausalito, California.

LYRICS Wanted, beginning writers, excellent offer. Basil Alt, Otterville, Ohio.

SONGWRITERS—Send poem for offer and free rhyming dictionary. Richard Brothers, 24 Woods Building, Chicago.

SONGWRITERS. Write for free booklet. Profit sharing plan. Allied Music, 7608 Reading, Cincinnati, Ohio.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

DISCONTINUED Classical and popular records, send wants, no popular list. Caidin, 825 Seventh Ave., New York City.

SELL Your poems, music, stories for cash or royalty contract with down payment. Frank W. Ford, 311 Fifth Avenue, New York.

SONGS—Song poems wanted. No charge for melodies. Free examination. Hollywood Recording Studios, 87G5 Preuss St., Los Angeles.

SONGWRITERS—Write for free book—plans, information. Variety, Dept. V, Salem, Indiana.

SONGS. Poems, published, royalty basis. Your song recorded free. Unlimited opportunity. Write today. Dept. M, Radio Music Company, 6912 Hollywood Blvd., Hollywood.

PLAY Violin. Amazing system, no notes. Melody Masters, Box 82, Beloit, Wis.

PUBLISHERS Need new songs. Poems wanted immediately. Five Star Music Masters, 687 Beacon Building, Boston.

MAIL Dime for regular \$1.00 transposing chart to Hollywood Swing Piano School, 6842 Sunset Boulevard, Hollywood, Calif.

SONGS; Song poems; bought, published. Free advice. Liberty Music Publishers, San Francisco.

POSTCARDS. Back songs, records, orchestras. Fore's, 2841 Franklin, Denver, Colorado.

MUSIC Composed to words. Special offer. Wendell Givens, Orrville, Ohio.

PIANO By ear. Free booklet. Write Day-V-Way, Dept. 8-A, Dearborn, Mich.

PHONOGRAPH Records 10c. large quantities 8c. Free list. Hoodwin Company, 4419 Broadway, Chicago.

SONGWRITERS Outstanding proposition. Newark Song Publications, 1207 Carbon, Syracuse, N. Y.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

ORIGINAL Music composed to your words \$5. Song recording, printing, orchestrating. Reginald Belcher, Chatham, New Jersey, 30 years church organist.

LEARN Swing piano! Postal brings free folder. Christensen, 451 Kimball Hall, Chicago.

SONG Poems wanted. Free examination. McNeil, Master of Music, 510-PM South Alexandria, Los Angeles, Calif.

MUSIC Composed to words. Rhyming pamphlet on request. Phonograph recording of completed songs. Send poem for consideration. Keenan's Studios, Dept. PM, Box 2140, Bridgeport, Conn.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

SONG Writers. Send for publishing agreement. McKinley Music Publishers, 1501 E. 55th St., Chicago.

RADIOS, SUPPLIES, INSTRUCTION

SAPPHIRE Phonograph needle \$1.50. Plays over 2,000 recordings. Alfanco, 23-30 Newtown Ave., L. I. City, New York.

REVISED Plans 18 record crystal sets: "Radiobuilder"—year, 25c. Laboratories, 1406-C 77th Avenue, Oakland, California.

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NEW Zenith, RCA-Victor, Crosley radios. Get discounts—Save plenty on electric sets—battery models. Combinations records. Write Gravler, Kennedy, Ala.

QUESTION? About radio? Write William D. Hayes, Box 1433-C, Oakland, Calif.

RADIOS. Standard brands \$7.50 up. Fluorescent fixtures, save 60%. Wilson, 2509 North 3rd, Milwaukee, Wisconsin.

CLEAR Reception pocket radio only \$1.00. Radio Sales, Southington, Conn.

RADIO Kits—\$3.95 up. Complete. Single band; all-wave. Save 50%. Radio and parts catalog free. McGee Radio, PP 20, Kansas City, Mo.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Ames St., Valparaiso, Ind.

RADIO Service men and experimenters send for our giant radio catalog. Save dollars. United Radio Co., 1000 M, Newark, N. J.

RADIO Books—Latest—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

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HANDY Men—Earn money home operating Community "Fix-It" Shop. Stafford, 708 Rawlins, Carbondale, Illinois.

WORK Profitable advertising plan. Assures your independence. Complete plan 25c. E. P. Behnen, Deaver Lane, Creve Coeur, Missouri.

MAKE Suspenders at home—We supply high grade electric strips with all fittings, and packaging supplies. Free particulars. Worthington Mfg Co., Box 676, Brockton, Mass.

START Profitable sideline. Sample, details free. Wedding-Crafters, Box 36, Arlington, New Jersey.

START Home business making statuary, plaques, art goods, novelties, souvenirs, concrete pottery, garden furniture, artificial marble flooring, liquid marble. Make your own flexible molds. Amazing profits. Valuable folder free. Creative Publishers, (PM-4), Glenoco, Illinois.

FOR An extremely profitable lifetime business, operate a collection agency-credit bureau. Free folder. Write Cole & Associates, Syracuse, New York.

EXTRAORDINARY Ideas! Nationwide propositions. Details time. Robert Cole, 515 Jefferson, Loveloy, Ill.

NEW York City mail address, business or personal, \$1.00 monthly. Fareast Merchants, 309-311 Fifth Avenue, New York City.

"LUMINOUS Paint" shines in dark. Easily made. 300 other formulas, plans—all 25c. Ideal Service, 300P4, Park Ridge, Ill.

\$15 DAILY! Make-sell quality cosmetics, flavors, specialties. Employ agents yourself. Albert Wilcox, Nicholls, Ga.

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 31 articles. Rubber moulds furnished for speed production. Small investment brings good returns. War stopping imports causes biggest demand ever. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

GRIND Lawn mowers. Factory process! \$2.00 capital! Mowers, Janesville, Wis.

COLOR Concrete with chemicals. Wishing wells. Stucco-rock. Benches. Spin concrete pottery. Cement artistry. Garden ornaments. Cold glaze. Concrete paints. Marbling. Sample 10c. Hollywood Cement Craft, 8527 Wonderland, Hollywood, Calif.

BABY-SHOE Metallizing makes you money! Simple! Novel! Eager market. Small investment. Fine profits. Free particulars. Novelty Metallizers, Box 933M Church Street Annex, New York.

AUTOMOBILE Mechanics: Earn extra money at home by using your spare time building tractors with secondhand automobile parts. Write for information, Nolan's Machine Shop, East Wareham, Mass. Cape Cod.

POPCORN Machines, caramelcrisp crispettes, cheese coat, potato chips. Long Eakins, 2035-D High St., Springfield, Ohio.

MAIL Order business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-catching schemes. Free details. Nelson Company, 500 Sherman, Dept. 404-D, Chicago.

SELL by mail. Book explains everything 25c. Whitney, 1357, Allentown, Penna.

RAISE Rabbits: A profitable industry. Our association book of 64 pages gives all details—10c. A. Weygandt, Sect'y, Dept. A-4, Chicago, Illinois.

YOU'LL Like resilvering mirrors, tableware, making chipped glass nameplates, signs. Write Sprinkle, Plater, 127, Marion, Indiana.

SWISS Music box works—\$1.25 to \$2.10. Suitable for many novelties. Mermod Manufacturers, 147 West 46th Street, New York.

MAIL Order business chances. Write Goodall Company, 628 Montgomery, San Francisco.

HOME Money-makers. Copy "Star Bulletin." All free. Star, Box 7055, Portland, Oregon.

MAIL Order beginners. Write me for latest money making opportunities. Roy Sureau, 549 Stuedwood, Houston, Texas.

SINGLE-INGREDIENT Formulas! No manufacturing! B. Kinford, Fort Lauderdale, Florida.

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\$50 \$100 WEEKLY Using sawdust. Clement, 943 Arthur, Rochester, N. Y.

300 MONEYMAKERS—25c. Mailorder directory—15c. Professional mailorder magazine—10c. Kraft Publications, Syracuse, New York.

SOAPMAKING. Learn home. No machinery. Stamp, Posera, AD-4545 Bartlett, Milwaukee.

MANUFACTURE Money-makers. Highly profitable, specialty-necessities; sure successes everywhere! A few dollars starts you in this "big-money" business! Dr. Liscombe Miller, Chemist, Tampa, Florida.

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MAKE Sell luminous paint. Literature free. Gordon Laboratories, 1265-H Broadway, New York.

FREE—200 Clever mailorder, homework, local business, agency offers—all snappy money-makers. Lewis Co., 828-C Carpenter, Oak Park, Ill.

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FORTY Plans for camera money; only 50c. Charles Pritchett, Greenville, Ky.

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MAKE Artificial marble, glazed tiles, uncanny, Tabletops, plaques, floors, homes, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

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START Own business, home-office. Our tested, proven plans will convince you. Investigate immediately. Anthony Book Service, 963 East 223rd, New York.

QUICK, Steady income making fast-selling products. Literature free. Law, 1700-M Madison Avenue, New York.

HOME Mail business. Everything furnished. Mission, 2328B West Pico, Los Angeles, Calif.

SUPPLY Sources for thousands of articles. 10c coin. Geo. Gundrum, Leroy, Mich.

LIFETIME Business! Extremely profitable. Write! Service (5), Drawer 339, Butte, Montana.

TURN Tin cans into money. Instructions 25c. H. Chaney, 1130 E. 16th St., Jacksonville, Fla.

SOAPMAKING: Money-making home business. No machinery. Literature free. Kemico, 179SM, Park Ridge, Ill.

COMPOSITIONS and Plastics offer opportunities. Liquid marble. "Snow-white," "Tinted," "Mottled." Useful, Practical, Economical. Colorful composition flooring. Life time wear. Low cost. Simulated rubber molds. Make your own. Profitable. Literature free. Compo-Text, Box 786, St. Louis, Mo.

SMALL Capital starts "route" coin operated peanut, gum and amusement machines. Particulars free. Robbins Co., 1141P DeKalb Ave., Brooklyn, N. Y.

CASH For butterflies, insects. See Sinclair display advertisement page 12A.

MAKE Money raising broilers. With Brover's Battery Brooders, plus good chicks, you can start selling broilers profitably in 8 to 10 weeks. Complete broiler plants as low as \$27.65, freight paid. Small down payment, easy terms. Free—Brover's 100 page catalog explaining broiler business. Brover Mfg. Co., Box H-61, Quincy, Ill.

OWN Your own cash in advance business. Distribute mail order plans, books, courses by mail. Start spare time home office. Rush dime for satisfaction guaranteed information. Hamilton System, Box 1572-A, Hollywood, Calif.

NOW—Only 2c daily pays for New York office under your own name. Co-operative Offices, 126 Lexington Avenue, New York.

MAKE Miniature houses, sceneries, novelties, reliefs. Unique methods. Weidler, 1171 Wilshire Blvd., Los Angeles, Calif.

OPERATE Newspaper clipping service—Pride, Vanity, Worth money. \$1.00 brings plan. Tulsa Clipping Bureau, Box 583, West Tulsa, Okla.

MANUFACTURE—Sell your products. Formulas—\$1.00. Becco Laboratories, 304 Maritime, Seattle.

MAKE Money quick! Steady income. No experience necessary. Publish your own magazine. Sample copy and instructions \$1.00. Arizona News, Box 3911, Phoenix, Arizona.

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MAKE Color-glazed concrete pottery, statuary, gravestones, tiles, walls, floors, basement waterproofing. Booklet, colorplates 10c. National Potteries, Minneapolis, Minnesota.

SENSATIONAL Money-making business! Free literature. Loicco, 5400 - 24th Street, Cicero, Illinois.

MAKE Genuine rubber molds. Details free. June, 101-B Beech, Holyoke, Mass.

LIQUID Marble—Marvelous, colorful! Brushed, molded, sprayed. Rubberlastic molds! Composition flooring! Particulars free. Marbleizing Service, Edwardsville, Illinois.

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INCREASE Your earnings in a business of your own, with all the trade you can attend to. Become a foot correctionist and in a few weeks earn big income in service fees—not medical or chiropody. Easy terms for home training, no further capital needed, no goods to buy, no agency. Address Spencer System, 576 Back Bay, Boston, Mass.

ELITE Collection of business plans, contains 127 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

POPCORN Machines, used Burch, Long-Eakins, Dunbar, caramelcorn equipment, reared popping kettles. Northside Mfg., Indianapolis, Iowa.

BE Your own boss. Amazing profits. Nassau Co., Winston-Salem, N. C.

MAIL Order business is your opportunity. Many begin small now earn thousands yearly. No personal contacts, boundless selection. Have over 40 years experience, will help you succeed. 25c brings 2 valuable booklets. None free. B. Breniser, 257 S. 21st, Philadelphia.

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START Plating business at home. Amazing profits. Make your own outfit. Inexpensive. Illustrated instruction booklet 25c. **Popular Mechanics Press, 200 East Ontario, Chicago.**

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COMPLETE Mail order treatise 10c. **Hoehn, 645 Second Ave., New York.**

FASTEST Growing mail order business of today. Enormous demand. Details free. **Charles Schroeder, 56 West Washington, Chicago, Illinois.**

YOU'LL Like resilvering mirrors, tableware, making chipped glass nameplates, signs. Write **Sprinkle, Plater, 287, Marion, Indiana.**

START Successful moneymaking home mail-order business. Write **Lawson's, Dryden, Virginia.**

TWENTY Dollars daily reclaiming lube. **Boisset, Box 483 A, New Orleans, La.**

OPERATE Home mailorder business. Details dime. **Alexander's, Box 367, Hannibal, Missouri.**

WANT To make money with your own home business? Then write: **P.O. Box 36, Sta. "N," New York City.**

SELL By mail! 100 moneymaking opportunities free! **American, 491-P William, East Orange, N. J.**

MAILORDER Opportunities! Send name—postal. **Schroeder, 803 Wisconsin, Peoria, Illinois.**

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YOUR Name on 5,000 mailing lists—25c. Get free samples, opportunities alone from all over world. **Eastern, P-961 - 46th, Brooklyn, N. Y.**

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AMATEUR Cartoonists, earn big profits, duplicating comical advertising cartoons. **Komic-Ads, Argyle, Wisconsin.**

CASH For butterflies, insects. See Sinclair display advertisement page 12A.

MONEY. Success for you. Definite instructions. Others profited, you can 25c and two stamps. (Returnable.) **Reichert Service, 1838 Van Buren, E. Cleveland, O.**

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MAKE Money easily, pleasantly with roadside stand. Write **Fame-S-System, Lathrop, Calif.**

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SINGLE-INGREDIENT Formulas! No manufacturing! **A. Kinford, Fort Lauderdale, Florida.**

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CONFIDENTIAL Chemical service. Improving formulas, processes or developing new ones. Analyses. Thirty-five years experience. **Central Laboratories, David Whitney Bldg, Detroit, Michigan.**

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FREE! Catalog chemicals, laboratory supplies for students, new idea chemical kits, apparatus-outfits. Scientific books at discounts, telescopes, microscopes, biological needs, photographic chemicals, scales. Write **Winn Mfg., Dept. JE4, 124 W. 23 St., New York.**

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SPECTROSCOPE For quick chemical analysis \$2.50. **Kutting Sons, Campbell, California.**

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FREE—Big list of helpful books. **Popular Mechanics Press, 200 E. Ontario St., Chicago.**

HELP WANTED

WANTED—A budding genius to work in my shop, which is devoted to the development of inventions. Must be between 16 and 19, with proven aptitude and good character. Applications by letter only. **Perceval White, Springdale, Conn.**

PERMANENT Representative wanted for Hoover uniforms to call on restaurants, hotels, beauty parlors, doctors, nurses, others. Excellent income. Leads furnished. Equipment free. **Hoover, Dept. RK-10C, 251 W. 19th, New York.**

AMAZING Offer! I'll send you absolutely free big assortment of actual, full size foods. Household products worth \$6.00, and show you how to earn money in spare time, without experience. **Zanol, 2245 Menmouth, Cincinnati, Ohio.**

OUR Letters are job-getters! Proof furnished. Send qualifications and \$3.00 for your letter. Leads guaranteed. **Jepson & Associates, 15 West Tenth, Kansas City, Mo.**

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, sweaters, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-BG Lincoln, Chicago.

STEADY Work—Good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Big money every day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 484, Freeport, Illinois.

AGENTS WANTED

SELL Nylon hosiery and give fine silk hose for half price in combination order. Guaranteed against holes, snags, and runs or replaced free. Hose for your own personal use given with large outfit. Rush name and home size today. Wilkint, Desk BD-37, Greenfield, Ohio.

NEW Kind of man's shoe zips on and off. Pays salesmen ready cash every day. New big direct-to-wearer line of 250 styles includes amazing air-cushion insole shoes for men and women. Complete sales outfit sent free by sales division of manufacturer established 38 years. No experience needed. Factory-fitting shoe service training furnished. Write today for valuable sales kit. Consolidated Shoe System, Dept. CC-5, Chipewawa Falls, Wis.

ACIDPROOF Double coated white and maroon rubber aprons. Samples. 24" x 36" long, 60c. 36" x 42" long, \$1.00. Postpaid. For every home and industrial work. Windermere Prods. Mfg. Co., Rubber Mfrs., Box 2662, Akron, Ohio.

AGENTS, Fast seller, everybody a prospect. Big opportunity, permanent, dignified. Write today. Smith Co., 1905 So. 3rd, Louisville, Ky.

MAGIC Roach box. Attractive sales article. Sample 10c. Nock, 1712 Valmont, New Orleans, La.

500% PROFIT Selling "Spots-Off"—New, all-purpose cleaner. Amazing demonstrator. Fast repeater. Fuller Sales Co., Bx 495, Kalamazoo, Mich.

"VISIBLE" Glass mail boxes help sell themselves; then on homes, sell others for you. Sample \$1.00. George P. Collins Company, Drawer, Sapulpa, Oklahoma.

CALL On gas stations, garages, stores. New chemical sponge whirlwind seller. Cleans autos like magic. Samples sent on trial. "Kristee," Dept. 126, Akron, Ohio.

WINDOW Sign letters, Penny each. Large sizes. New styles. Absolutely beautiful. Free samples. Atlas, 7941 Halsted, Chicago.

"SWANKY-SERVERS" Easy to sell. Circulars and details free. The Oster-Bauer Shop, Rockford, Illinois.

REVOLUTIONARY Tieless shoelace sells instantly. 31% profit. Samples, two pairs 10c. Mercer, 307 East 105th, New York.

SCHOOL Seniors—Sell graduation cards. America's largest, fastest selling display. 30% commission. Free cards. Universal Engraving & Printing, Box 745-M, Pittsburgh, Penna.

DON'T Be a job hunter. Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. D-U-PPM, Freeport, Ill.

FREE "Service Signal" demonstrator. Post card brings details. Knipp, Long Beach, California.

ROYALTY Paid to agents, we manufacture your patented, unpatented devices. National Employment Foundation, Marietta, Ohio.

PHOSPHOLENE Cleaning crystals 1c package; bleach 2c gallon; glass spray 3c gallon; hand soap 2c pound; shampoo 25c gallon; and others. Samples 25c. Literature free. Western, 401 Climax Bldg., Cleveland, Ohio.

COMPRESSION Increased 27 pounds. New gas-oil pills. 10c. "Reardon," Peoria, Ill.

SELL The South's great literary magazine. Liberal commissions. Premiums. Free booklet. Southern Literary Messenger, Richmond, Virginia.

NEW Defense game. Easy seller. Manufacturer, 1123 Cherokee, Louisville, Ky.

FREE Water and our concentrates make 72 products. We supply lab'ls, bottles. Enormous profits. Qualeo E-20030 Russell, Detroit.

YOU'LL Like resilvering mirrors, tableware, making chipped glass nameplates, signs. Write Sprinkle, Plater, 128, Marion, Indiana.

WHERE To buy 800,000 articles direct from manufacturers; save middleman's profit. Folder free. Glass Publishing Co., Ellwood City, Penna.

MAKE, Sell your own electric water heater—good profits—pocket size—parts and equipment furnished. Speed-EE Mfg. Co., Goshen, Indiana.

SELL Practical necessity to stores and shops. Good margin. Get details. C. A. Kuehn Company, 2753 LaSalle St., St. Louis, Mo.

POWERFUL Mile increasing anti-knock compound. Speedy, powerful motors. 35 gallon sample 25c. Thermoxil, Peoria, Ill.

"FREE" Mexican curios, novelties, 100% profit! Marquez, Apartado 1176, Mexico City.

NEW, Unique cosmetic bracelet complete with secret compartments containing powder, rouge, lipstick, puffs, mirrors. Exclusive! Sensational \$1 seller. Write Gift-house, Box 2008-MP, Miami Beach, Fla.

AGENTS Price list and sample. Agents Supply, 1017 Seventh, Washington, D. C.

AMAZING Zipper clothesline. Instant demonstration. Sells on sight. Dunn Mfg., Hemstead, N. Y.

SENSATIONAL Revolving colorful motorless window display. Every merchant a prospect. Sells for \$2. Geller, 1532-P University Avenue, New York City.

APPOINT Dealers for automobile necessity. Every car or truck a prospect. 120% on \$2.00 sale. Exclusive territory. Axion, Inc., 9308 Santa Monica Blvd., Beverly Hills, Calif.

AMBITIOUS School seniors—Sell classmates the "tops" in graduation name cards. Lowest prices featured today. 35% commission. Free cards. Agencies going like wildfire. Hurry! Craftcards, Box 235, Pittsburgh, Penna.

AGENTS—To handle fast selling hand soap, unlimited field, good opportunity, business now on up grade. R. G. Propp, 4511 N.E. 20th Ave., Portland, Oregon.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, sweaters, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

SELL New used clothing from home, auto, store. Men's suits 77c, leather jackets 29c, top-coats 38c, dresses 20c, ladies' coats 35c. Other bargains. Catalog free. National, 436-M East 31st, Chicago.

GOOD Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also make money applying initials on automobiles. Free samples. "Ralco," 727 Atlantic Ave., Boston, Mass.

AGENTS! Men's suits 85c, pants 23c, topcoats 49c, ladies' coats 36c, dresses 19c. Other bargains. Catalog free. Portnoy, 566-P Roosevelt, Chicago.

EARN \$10-\$15 Daily applying beautiful, goldlike sign letters. Cost 1c. Sell for 25c. Free samples. Hurry! Modernistic, B-3000 Lincoln Ave., Chicago.

WE Pack products under your label. Cleaners, food products, etc. Big profits, low prices. Samples free. Bestco, 5007 Irving Park, Chicago.

SELL 1941 Tax records—Every type business. Huge profits. Records Co., 2626 N. Irving, Minneapolis, Minn.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, P.O. St. Louis, Mo.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-U Dodder, St. Louis, Mo.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address. 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

SUCCESS With your products. Make-sell them. Formulas, Processes, Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

AGENTS—300% Profit selling gold leaf letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

GOOD Paying business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures by late method. Free particulars and proofs. Gunmetal Co., Ave. N. Decatur, Ill.

AGENTS—Opportunity make money; book containing 127 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

SALESMEN, Distributors. Sell something that is used, wanted, and bought every day. Sell an article that you can build a repeat business around. New, dyed, reversible, Chenille rugs are made in 30 beautiful patterns and 100 sizes. Many orders are coming in with a profit to distributors up to \$30 each. Sample 21x42 inches showing 8 popular, best selling colors, order book, catalog picturing complete line and all information necessary for you to commence making money at once—\$1.00, returnable for cash refund or deductible from your first order. The OR Rug Co., Dept. W, Lima, Ohio.

OPPORTUNITY With future. Nationally-known firm requires capable men to handle complete line high-grade maintenance paints, roofings, floor mastics, etc. Experience unnecessary, as men selected will be trained and equipped. Excellent financial arrangement. Sound immediate opportunity and rapid advancement assured right men. Surety Products Company, Desk P, Cleveland, Ohio.

ELECTRICAL Wonder machine. One of America's greatest inventions, World's largest exclusive manufacturers of special unit. Tremendous sale—already being used by such nationally known concerns as General Motors, Woolworth's, Sears Roebuck, Coca Cola, etc., but now available to all businesses, factories, offices, stores, homes, etc. Men earning \$100 to \$150 week. Sold on open account. Free trial for customers—sells itself. Experience unnecessary. Free demonstrator offer. No matter what you are now selling—answer this ad. Protected territory available. Get in on ground floor of tremendous new market. Salesmanager, 2440 Lincoln Ave., Dept. R-1023, Chicago.

"THE Super Chef," new automatic electric wiener cooker. Our salesmen make enormous profits. 90 second demonstration makes easy sales. Write or wire immediately. Super Chef Mfg. Co., Blackstone Bldg., Cleveland, Ohio.

BRUSH Salesmen, distributors—You can make more money with Neway brushes, mops, chemicals, 200 items. Exclusive territory, higher commissions. Neway Brush Co., Hartford, Conn.

SELL Business cards, stationary, book matches, gummed tape, restaurant necessities, salesbooks, adv. specialties, pencils, picture cards, tags, pricing sets. Exp. unnc. 40% comm. Free deals. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. 74, Chicago.

SELL Four 3c ads. Large, beautiful, lithographed, patriotic cooperative calendar, 200 calendars shipped. Pays you \$4. Ferguson Mfg. Co., Indianapolis.

ADVERTISING Book matches. America's largest manufacturer of union label book matches. Fast selling line. Large sales producing kit. Sample matches. Complete cut catalog, 13 color combinations makes selling easy. Commission in advance. Superior Match Company, 7530 Greenwood, Dept. M-4, Chicago.

UNDERSELL All competition. Inside neon signs, 25% commission. Henry Hitt, 2526 Indian Mound, Norwood, Ohio.

SELL Printing at lowest prices. 5,000 5 1/2 x 8 1/2 statements \$5.50; 5,000 24 lb. envelopes \$6.50; 2,000 business cards \$1.50; 1,000 envelopes or statements, etc. \$1.75; 25 printed sales books \$1.50; 1,000 process embossed cards \$1.50; 2,000 two-color labels, free holder \$1.50. Big cash comm. Free outfit. Bargain Prtg. Co., 189-F W. Madison, Chicago.

SELL To every business absolute necessities—over 2,000 items. Lowest prices. Beats competition. Commissions advanced. Experience unnecessary. Samples free. Federal, 301-BC South Desplaines, Chicago.

MAN With car to cover retail store route. Openings in almost every locality. Handle orders for nationally known manufacturer-jobber. Average 50% commission. Good income at once. Permanent proposition backed by national advertising and full cooperation of home and branch offices. Sales experience desirable but not necessary. Right man can get quick advancement and chance to operate own big day wholesale business. Write fully: President, World's Products Co., Dept. 10-K, Spencer, Ind.

HOWES, 110 East 31, Erie, Penna. Bill-fold deals that click.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, sweaters, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-CG Lincoln, Chicago.

FACTORY Establishes local dealers in own business. Pays advance profits—no "down" payments, capital, or experience necessary. Winona Monument, Winona, Minn.

CALENDARS—Beautiful complete line, all sizes including jumbos. Samples free. Start now be the first in the field. Fleming Calendar Company, 6539 Cottage Grove, Chicago.

\$3.00 TO \$9.00 A day profit possible, jobbing new 10 cent seller. Lovely, 1734A Washington, St. Louis, Mo.

SALESMAN—Wagon jobbers. Sell dealers. Counter cards. Southern Supply, 1017 - 7 Street, Washington, D. C.

SPECIALTY Men. Hot new patriotic item. Big commissions. Write today for information. Mr. Morgan, 111 W. Jackson, Chicago.

BIG Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

MAKE \$10.00 TO \$100.00 per day selling overhauled garage doors. We sell either the hardware, or plans for manufacturing hardware. Superior Doors, La Habra, Calif.

SALESMEN Calling on farmers; sell new plow attachment. Covers corn stalks, weeds, tall sweet clover. Saves discing, time, money. Photographs, literature free. Coverall Co., Lapel, Indiana.

ADVERTISING Book matches offer liberal earnings—full, spare time. Experience unnecessary. Factory direct. Low prices for fine quality, quick deliveries, help get orders faster repeats. All business firms prospects. Free outfit, instructions. American Match & Printing Co., Dept. 64, 4822 South Trumbull Ave., Chicago.

MAKE More money selling Red Comet Fire Control Products. Write today for free facts. Red Comet, 704 Comet Building, Littleton, Colorado.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Parrell cleared over \$1,000.00 monthly. Write F. E. Armstrong, President, Dept. PM, Mobile, Ala.

BLADES—Big profits. Best quality. Factory prices. Postpaid. Ace Blades, Buffalo, N. Y.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

EDUCATIONAL AND INSTRUCTION

LEARN Watchmaking. Material instructions for start and wholesale supply catalog, all \$1.00. Refund not satisfactory. Stewart's, 721 Olive, St. Louis, Mo.

TYPISTS Enter International Artistic Typing Contest. Rules free. Julius Nelson, Windber, Pennsylvania.

AVIATION Needs instrument men. Ever-increasing numbers of great airliners and mounting thousands of military planes mean more and more jobs—and greater opportunities—for trained instrument technicians with aircraft plants, airlines, instrument manufacturers, and civil service repair bases. Prepare for this interesting, well-paid, lifetime calling—your choice of four intensive training courses—one all home study. Write American School of Aircraft Instruments, Dept. M, Glendale, Calif.

BOOKS of all publishers on advertising, engraving, printing, offset, silk screen and kindred subjects. Current trade magazines, Discounts. Lists free. Commercial Engraving Publishing Company, 34-C North Ritter Avenue, Indianapolis, Ind.

NEW Opportunities in air conditioning, electric refrigeration and auto body-fender including metal work, welding, painting. Many trained men earn up to \$35-\$50 weekly. Start preparing now. Get free facts. Utilities Engineering Institute, 1314 Belden, Dept. 114, Chicago.

LEARN Auto finance business. Inexpensive home course. Nebraska Finance Co., Lincoln, Nebraska.

WATCH Repairing is steady profitable work. Experts usually in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., 500 Sherman, Dept. D-2001, Chicago.

WELDING—Electric arc. Learn profitable trade quickly through actual practice. Individual welder instruction at bare cost of materials. Full particulars free. Valuable welding lessons book 50c. Hobart Welding School, Box M-415, Troy, Ohio.

WANT To learn dancing? Write, H. Stokes, Jr., Bamberg, S. Car.

INVESTIGATION Pays big. Detective experience unnecessary. Study under former federal special agent. American, Room A, 808 14th St., N. W., Washington, D. C.

MEN—Women. Get U. S. government jobs. Commence \$105-\$175 month. Prepare now at home, for 1941 examinations. Full particulars—list positions, free. Write today. Franklin Institute, Dept. R3, Rochester, N. Y.

DRAFTING. Sheet metal layout. Blueprint reading. Bookkeeping. Home taught. Davison Tech, 7 Grand Avenue, Detroit.

LEARN A good trade now. Big demand for welders and mechanics. Complete practical courses in arc and acetylene welding, auto and aviation mechanics, body and fender bumping, spray painting, metal finishing, etc. Low rates. Pay after graduation plan. Write today for big illustrated catalog. Michigan Trade School, 3754 Woodward, Detroit, Mich.

AMAZE! Astound! Succeed! with Super-Memory. Write "DS." Info Company, Box 1122, Chicago.

STRENGTH, Boxing, wrestling. Free lessons, 10c postage. Studio Mart, Box 2842, Beaumont, Texas.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Monticervy, Ala.

CLINICAL Laboratory technic taught in your own home. Practice outfit supplied. Bulletin free. Imperial Technical Institute, Box 494-E, Elkhart, Indiana.

LEARN Figuring the new fast way. Frederick Smith, Consulting Engineer, 2410 Bernard St., Chicago.

LEARN Big pay trades in a few weeks. Decorating, paperhanging, staining, marbling, sign and pictorial painting. Catalog free. Chicago Painting School, 102 West Lake Street, Chicago.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

LEARN Telegraphy! Opportunities now available to beginners due to new railroad retirement act. Expenses low. Catalog free. Dodge's Institute, Hiatt Ave., Valparaiso, Ind.

U. S. Gov't jobs pay up to \$40 a week to start. Get ready for next examinations; railway postal, rural carrier, mail carrier, office help and others. Free book tells how you may qualify. Write quick. Patterson School, Dept. P. M., Rochester, N. Y.

SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

HAVE Your own money making business. Learn show card writing, sign painting. Write for details. Begley Specialty, 1472PM Broadway, New York.

ORIGINAL Drawing, lessons, markets, cartoon, 10c. Studio Mart, Box 2842, Beaumont, Texas.

DRAW! Learn in 3 hours, 3 lessons, \$3. That's all! Draw beautiful scenery. Amazing discovery! Profitable. Materials included. Townsend Studios, 309-M Cutler Bldg., Rochester, N. Y.

GAGS! By idea juggling! Basic approach to unthinkable gag situations. Formula \$1.00. Welton Tinney, Winnsboro, Texas.

MAGAZINE Cover artist Parsons' special pen drawing lesson \$1. Humiston Illustrations, Freeport, Maine.

SELL Your gags. Stamp brings in'or'mation. Servart, 126 Lexington, New York.

CARTONISTS Wanted for copying. Describe training. Box 1970, Cleveland, O.

CARTOON Ideas written. Stamp brings particulars. Dick Hanlon, 95 Franklin, Auburn, N. Y.

ART Work—Fast 24 hour air mail service. Accurate attractive commercial work on all subjects. Roughs submitted. W. Luckett, 538-M South Dearborn, Chicago.

AMATEUR Cartoonists, earn big profits, duplicating comical advertising cartoons. Komic-Ads, Arville, Wisconsin.

ILLUSTRATING, Lettering, reasonable. Samples free. Trapkus, 349 Tenth, Moline, Illinois.

PEN And ink drawings. Let us draw your advertising and catalogue illustrations from photos, copies or objects. Best work and fair prices. Heraldic Studios, 1914P Oskdale Avenue, Chicago, Ill.

MONEY In portrait sketching. Progressive steps teach you, 20 complete lessons \$1.00. Harold Parks, R. 3, Ypsilanti, Mich.

PLAYS, STORIES, MANUSCRIPTS

PUBLISHERS Want stories! I type-write; help sell. Hursh, Box P-1013, Harrisburg, Penna.

STORIES Wanted. Information free. Paragon Publishing Company, 436 S. Baxter, Tyler, Texas.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

SELL Your product through agents, mail order, special combination newspaper rates. Write for free rate book. United Advertising Agency, 287-P Broadway, New York City.

MAIL-ORDER Or agent ad reaching 1,000,000 families throughout United States \$14.00 incl. Newspaper, magazine, mailing-list, rate-book, free. Chicago Advertising Agency, 20-PM West Jackson, Chicago.

ADVERTISE. 40 Words 50 magazines \$1.00. Tietton's Agency, Moulton, Iowa.

LEARN Advertising at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 1315 Michigan Avenue, Dept. 3431, Chicago.

ADVERTISE—24 Word in 71 newspapers \$2.04. Classified and display ads placed in all publications. Lowest rates. Complete direct mail campaigns. Outline proposition for free suggestions. Kirkpatrick Advertising, 540 North Michigan, Chicago.

ADVERTISING Placed all magazines, newspapers U.S.A., Canada, Mexico, Central-South-America, West-Indies. Lowest rates. Free service. 54 page catalog free. Baker Advertising Agency, A-189 West Madison, Chicago. Established 29 years.

ADVERTISE: Newspapers, magazines, periodicals, lists free. Fidelity Advertisers, 3838-N Washington, Chicago.

INCH Display advertisement fifty magazines, year \$15. Wood's Popular Services, Atlantic City, (N. J.)

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, Merchandise Mart, Chicago.

ADVERTISE: 24 Words, 149 newspapers \$6.50. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

BUSINESS SERVICE

SAN FRANCISCO. Your mail reforwarded daily \$2.00 monthly. Reply with two dollar (bills) only. Goode, 85, Room 230, 742 Market.

YOUR Broadway address. Only \$1.00 monthly. Particulars free. Karavan, 1241-M Broadway, New York.

YOUR Mail received and re-mailed, showing Washington, D. C. postmark. Hawkins Mail Service, 908 Fourteenth.

RUBBER STAMPS AND OFFICE SUPPLIES

SUPERIOR. Cushioned, indexed, two lines 25c; three 35c. Army, navy, regulation, indelible clothes markers, \$1.00. Slocum, 814 Bradley Peoria, Illinois.

KNOB Handle, cushioned, 2 lines 25c. 3-35c. Stamp Works, Centerport, N. Y.

2 LINES 25c, 3 Lines 35c. Stamp Works, Auburn, Nebr.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

DECIMALIZER For slide-rule and other computers. Pocket size. \$2 postpaid. George H. Morse, 927 South 28th St., Arlington, Va.

WANTED—Model one fifty Elliott card-ventilator. Box 348, Eau Claire, Wisconsin.

INCREASE Business now. "Excellograph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

TYPEWRITERS. Adder, mimeograph, multigraph, addressograph. Send for free lists of machines that will help you at half price. Pruitt, 28 Pruitt Bldg., Chicago.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

FIFTY Each envelopes, cards, noteheads, 50c postpaid. Cleprint, Stanchfield, Minn.

\$1.00 POSTPAID—250, 6 3/4 Envelopes, Samples. Pohle Press, Honesdale, Penna.

500 8 1/2x11 LETTERHEADS Or 6 3/4 Envelopes \$1.25. Vicks Print, Exeter, N. H.

500 LETTERHEADS, Envelopes \$2.85. Multigraphing. Universal Supply, Midland Park, New Jersey.

100 LETTERHEADS 95c, 1000 Multigraphed, 40 line message \$5.75. Cabies, Norton, Kansas.

FIFTY Personal or business cards 35c. Atlantic, Box 653-H, Rock Hill, S. C.

THOUSAND Business cards \$1.00. Send for samples. Eaton Press, 1320 Main, Gardner, Kansas.

1,000 BOND Letterheads, 8 1/2x11, \$2.75. Prepaid. Crowe Printshop, Bozou, Nebr.

MIMEOGRAPHING—Letters, postals, booklets, etc. Toole's, 101 Adams, Evansville, Indiana.

5000 ELEGANT Envelope slips, \$3.50; 6x9 circulars, postcards, envelopes, letterheads, \$9.45. Typewriter letters, folders, all printing low prices. Samples. Goodprint, Harrisonburg, Va.

5,000 PRINTED Envelopes \$5.25. Economy Envelopes, 116 West 14th, New York City.

PRINTING Special—100 8 1/2x11 bond letterheads, 100 6 3/4 envelopes, 4 lines both \$1.00. F. C. Cramer, Box 993, Chicago.

\$1.00 POSTPAID—100 8 1/2x11 Bond letterheads and 100 6 3/4 envelopes. Benneville, 907 West Roosevelt, Philadelphia.

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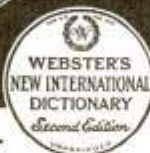
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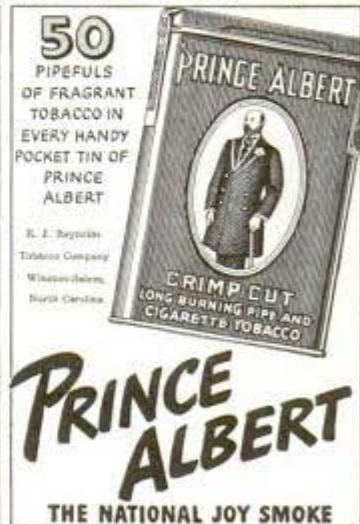
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Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 75

APRIL, 1941

No. 4

AVIATION UNLIMITED



Comparing standard airplane propeller with "hammerhead" propeller which inventors claim is superior to those now in use. Above, group of big airliners at New York ready for a day's work

By Robert H. Hinckley
Assistant Secretary of Commerce

BY THE end of 1941 there will be about 100,000 civilian pilots in the United States and at that point we will begin taking one million as our objective. Air traffic in 1945, federal airways experts estimate, will be twenty or thirty times today's volume.

Of course all our predictions and all our long-range plans must be based upon the assumption that, sooner or later, there will

come an end to the sickness which now afflicts the world, and we can return to our traditional way of peaceful commerce. We must take this for granted, because upon it rests the very reason for our existence as a free people.

On this assumption, then, a not-too-distant tomorrow is almost certain to bring these things: small "safety" planes for the average citizen, thousands of air parks

APRIL, 1941

481

Cont. Rudy Arnold, Floyd Bennett Airport, Brooklyn, N.Y.

231

Cont. Light Plane

William H. Hettner

James J. Sorena

W. H. Hettner, 135 Eastern Parkway, Brooklyn, N.Y.

Cont. James J. Sorena, 84 St. Brooklyn, N.Y.

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Above, flying once was a man's game, but now women in steadily growing numbers are operating lightweight private planes, such as the Piper shown. Below, map dotted with locations of civilian pilot training activities—flight and ground-school centers



Below, design for 100-passenger super-liner submitted to Pan American Airways by Sikorsky. Plans for building such a plane were shelved when the war began; peace is expected to revive these plans



competing for the business of the private pilot, vastly larger commercial airports operating primarily for transports traveling established routes, heavier and larger air liners, freight planes serving communities along far-flung networks and perhaps special mail planes helping to carry all first-class mail by air.

Not a fantastic picture at all if we look at what has happened in only two years. In that time, air transport has grown from a very shaky industry to a very sound one. The passenger business of the air lines has increased

ninety per cent, their mail business by one-third, their express business by one-half. Air line revenues have increased from about one and one-half million dollars in 1938 to six million dollars in 1940.

In private flying—non air carrier operations—the record is just as good. The number of miles flown has nearly doubled. The number of airplanes has increased more than fifty per cent and now includes nearly 16,000 aircraft. The number of civilian pilots, of all grades, on our certified list has jumped from 20,000 to 55,000, an increase of well over

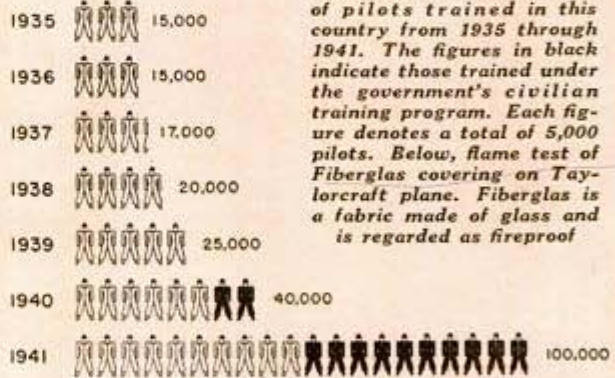


Above, construction view of giant war-plane being built by Douglas. One of the world's largest aircraft, it marks another milestone in aviation's program of building them "bigger and better"

150 per cent. Consumption of fuel has increased sixty per cent.

Government research people right now are conducting experiments with new type small airplanes which already indicate a safety factor far above anything known, and which the average man can learn to fly in a fraction of the time formerly required. These experiments are not yet complete, but I can say that the day of easy, safe, cheap flying for the average citizen is much nearer than you think. This will mean a tremendous volume of civil flying that is not very compatible, considering the safety factor, with scheduled air transport of passengers, mail, express and cargo. Particularly is this true of training—of instructional flying. In general it also is true of all types of small-plane private flying, because the bulk of these small aircraft is not

(Continued to page 144A)



These figures show number of pilots trained in this country from 1935 through 1941. The figures in black indicate those trained under the government's civilian training program. Each figure denotes a total of 5,000 pilots. Below, flame test of Fiberglas covering on Taylorcraft plane. Fiberglas is a fabric made of glass and is regarded as fireproof



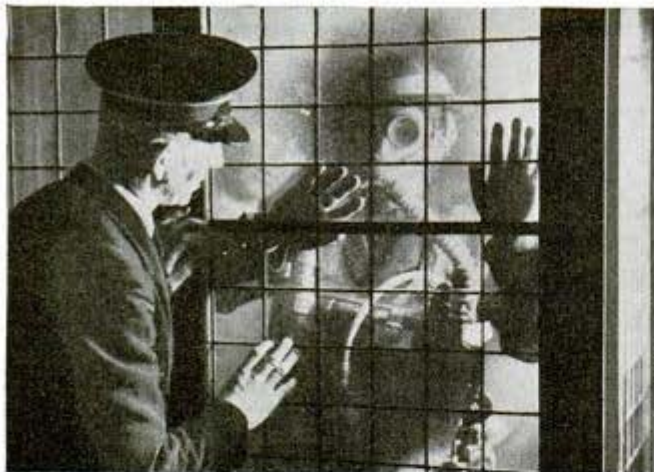
Owens-Corning Fiberglas Corp
Toldeo, Ohio

L 66.

Blindfolded 'Smoke Eaters' Drill for Air Raids

In training for one of the world's most dangerous jobs—that of the London fireman in wartime—the "smoke eaters" are

drilled under conditions as much like those of an actual incendiary bomb raid as can be created. They are taught to grope their



way into a smoke-filled building blindfolded, since in an actual fire the smoke makes vision impossible. In the first stages of training they are blindfolded and led by the voice of an instructor, learning caution in feeling their way around unseen obstacles. All firemen, too, must periodically check their gas masks in a testing chamber to be certain they are safe, and here also they are accustomed to working in masks.

acme

London firemen test gas masks regularly in chamber where recruits accustom themselves to wearing masks

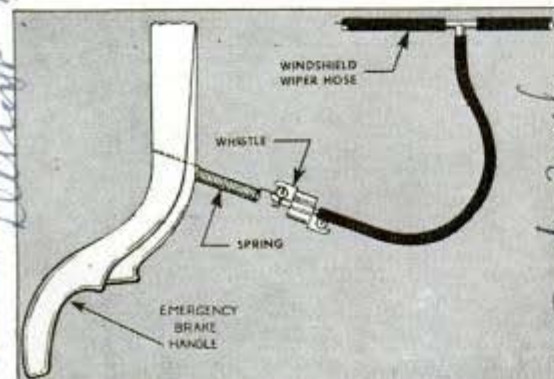
Fire fighters are trained to grope their way while blindfolded, led by the voice of their instructor



Brake Whistle Warns Driver if Emergency Lever Is Set

Held open only when the emergency brake is set, a whistle connected to the lever issues a shrill warning to release the

hand brake as soon as the automobile engine is started. A rubber hose connected with the whistle fits into the vacuum line to the windshield wiper through a "T" connection, providing power to blow the whistle when the engine starts.



Drawing shows hookup of whistle to windshield-wiper hose and how it is connected to the brake lever

Moisture in Crop Is "Weighed" by Simple Farm Tester

Simple to operate, a testing device for rapid determination of moisture in forage and grain crops, will help solve one of the farmer's most puzzling problems. Rights to the method and invention have been assigned by Robert Q. Parks, the inventor, to Ohio State University research foundation,

Portiac div. General Motors Corp. Research Dept. 33

Patent, trade mark registered in Ohio & state

monarch is overman Co 1832 W Bethune

Columbus Ohio will receive

293

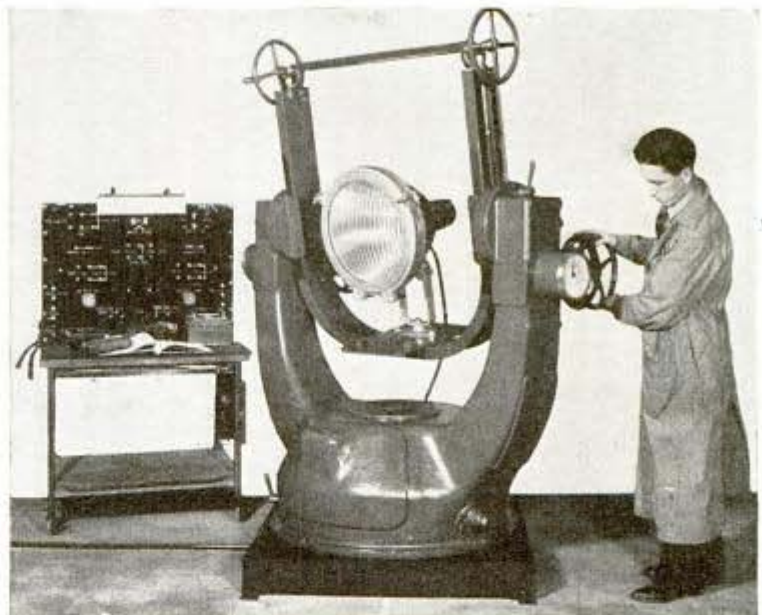
Airport Lights Put to Test in Revolving "Horseshoes"

which will license manufacturers. It is said that it will be sold at a price within any farmer's pocketbook. In the process, calcium carbide is added to a sample of the plant tissue, and then the loss of weight produced by the reaction which takes place is measured. The measuring device consists of a balance operating on a lever principle. It has an eight-inch scale which is calibrated directly in percentage of moisture, from ten to eighty-five per cent.

261

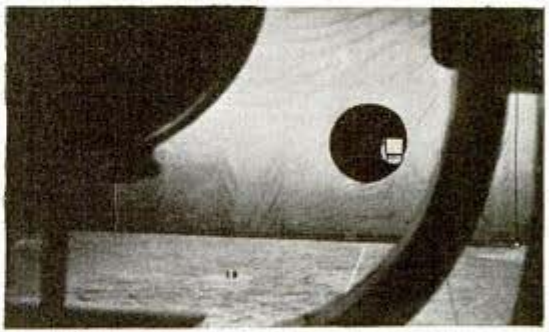
Pillow About Neck Rests the Head While Sitting

More comfort is provided while at rest in a sitting or inclined position with the aid of a horseshoe-shaped pillow that encircles the neck, supporting the head at a natural angle. It also relieves strain on the neck when reading or traveling. The cushion is especially restful for invalids unable to sleep lying down.



"Horseshoe" test cradles turn light vertically or horizontally to any angle, above

Curtains on test range, shown at right, prevent reflection from affecting light measurement



Airport beacons, floodlights, searchlights and similar units are put to accurate tests on a double rotating platform in the Westinghouse illumination laboratory. The lamp is placed in a steel bow that rotates vertically, while its cradle turns horizontally. Thus the lamp can be swung to any angle and then locked in position for measurement of candlepower or light distribution. The measurement apparatus can be set at any range up to 100 feet, and curtains and screens are placed at intervening positions to prevent extraneous or reflected light from affecting the measurement. Watching the dial, the operator can rotate the cradle on either axis to within one minute of any angle, with high precision.

▣ Rubber hose capable of withstanding internal pressure as high as fifteen tons per square inch is being developed.

Thompson's Neb. Egg 5422 Neosho, Mo. St. Louis



Worn like a neckpiece, pillow provides comfort and rest for head while reading or sleeping in a chair

Lighting Div. Cleveland, Ohio

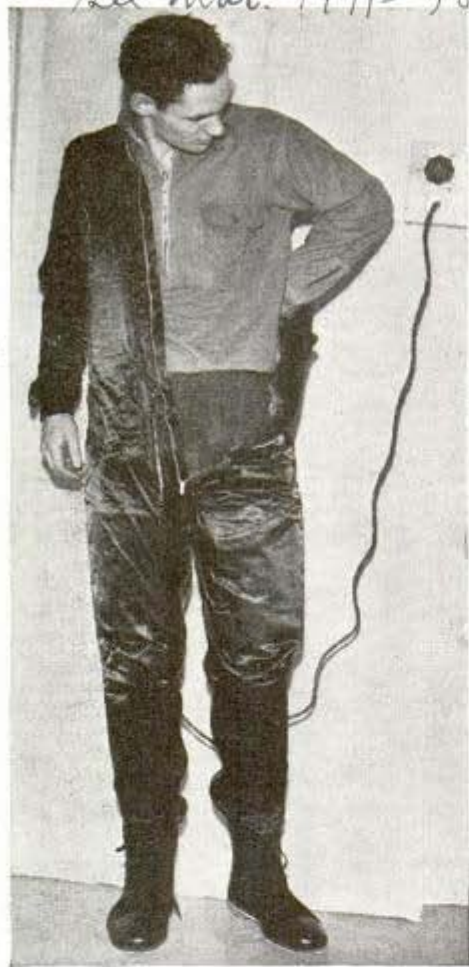
D. J. Woodruff Co. Akron, Ohio

Thompson's Neb. Egg 5422 Neosho, Mo. St. Louis

S 3 2

Aviator's Heated Suit Defies Temperature Sixty Below

See Mar. 1941-389



Heated flying suit, equipped with electric cord and plug, keeps aviator warm in sixty-below temperature

Clayton
Demonstrated recently at Wright Field, O., an electrically heated flying suit being introduced into army use is reported to keep a flyer warm even when the temperature is as low as sixty degrees below zero, Fahrenheit. The suit weighs seven pounds.

Illinois

One Pilot Can Fly Two Planes by Transmitting to Robot

Robot planes flown by radio signals transmitted from a companion plane or from a truck are undergoing army tests at Selfridge Field, Mich. Theoretically the pilot of one army plane could actually fly two planes at once. In the current experiments, however, a pilot rides in the robot plane ready to flip a switch and take over manual control in an emergency. Remote

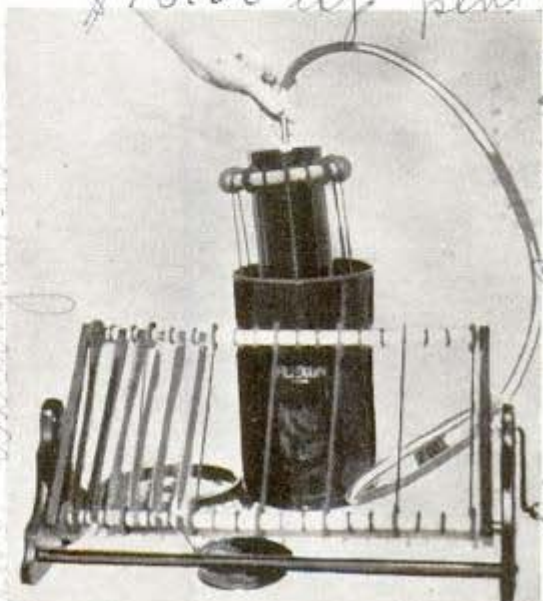
343 in 33-47 City

control has proved feasible so long as the robot is in sight of the operator. The airplanes being used were originally two-place ships, now converted into single seaters and carrying the intricate radio-receiving apparatus in the fuselage behind the pilot's cockpit. Tricycle landing gear has been added to simplify takeoffs and landings. The control pilot uses a wheel resembling that of a transport plane, which he manipulates as in normal flight to operate the controls of the robot plane. Coordination of the aileron and rudder controls into a single unit, which is directed by the wheel instead of foot pedals, limits maneuverability so most acrobatic stunts become impossible.

267

Developing Kit for Movie Maker Lets Amateur Process Film

Amateur motion picture fans as well as professionals can process their own films with a developing kit brought out by a Chicago firm which has applied for patents on the outfit. Instructions are furnished, and all the equipment necessary for turning out film ready for projection is supplied. Inner and outer developing tanks are made of heavy-gauge steel coated with acid-resistant Bakelite finish, and there is a handy rack, also acid-resistant, for drying the film. The hose for the washing system connects with any ordinary water faucet.



The Flexon Co. 1910 Robinson Ave. Chicago

Here is the developing tank for home moviemakers, showing film drying on the acid-resistant rack

With the "MOSQUITO FLEET"



On the "bridge" of the sixty-knot "PT-9," flagship of the mosquito fleet, is Lt. Commander Earl S. Caldwell, squadron commander of the Navy's first motor torpedo boat squadron; the flag skipper is at the steering station below him. Emblem of the squadron is a mosquito riding a torpedo

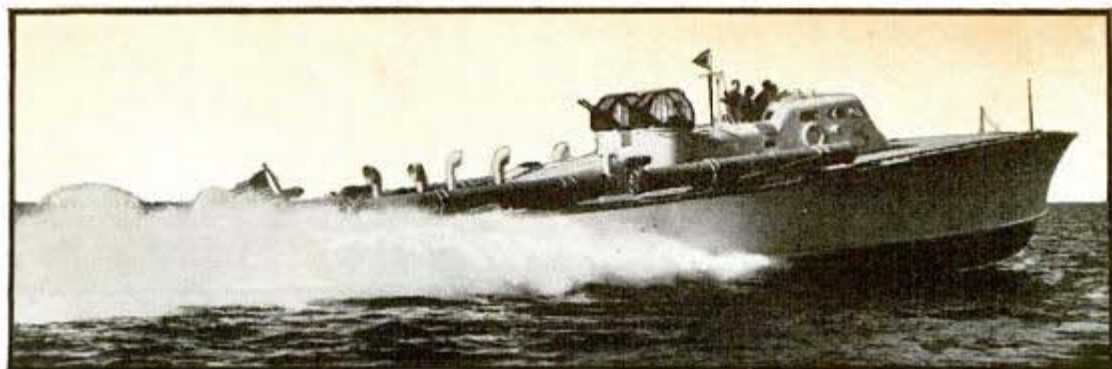
EVEN in a calm sea the toughest tars in Uncle Sam's Navy feel their knees buckling as the mosquito fleet bangs across the bay at fifty knots.

And when you ride one of these floating bronchos at top speed down the slope of a fifteen-foot wave and smack head-on into that green wall of water on the other side—well, this is no place for a weak pair of

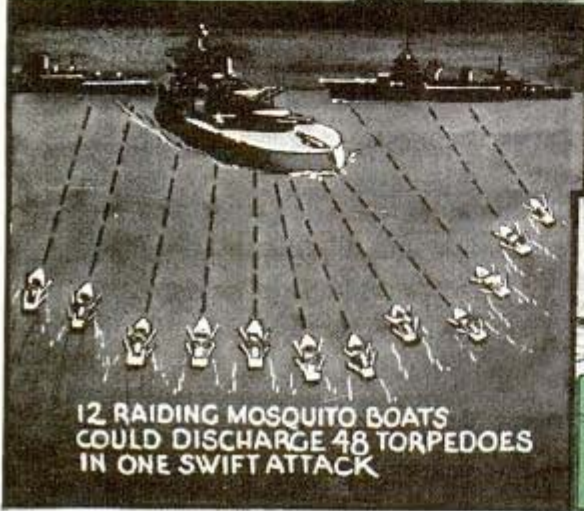
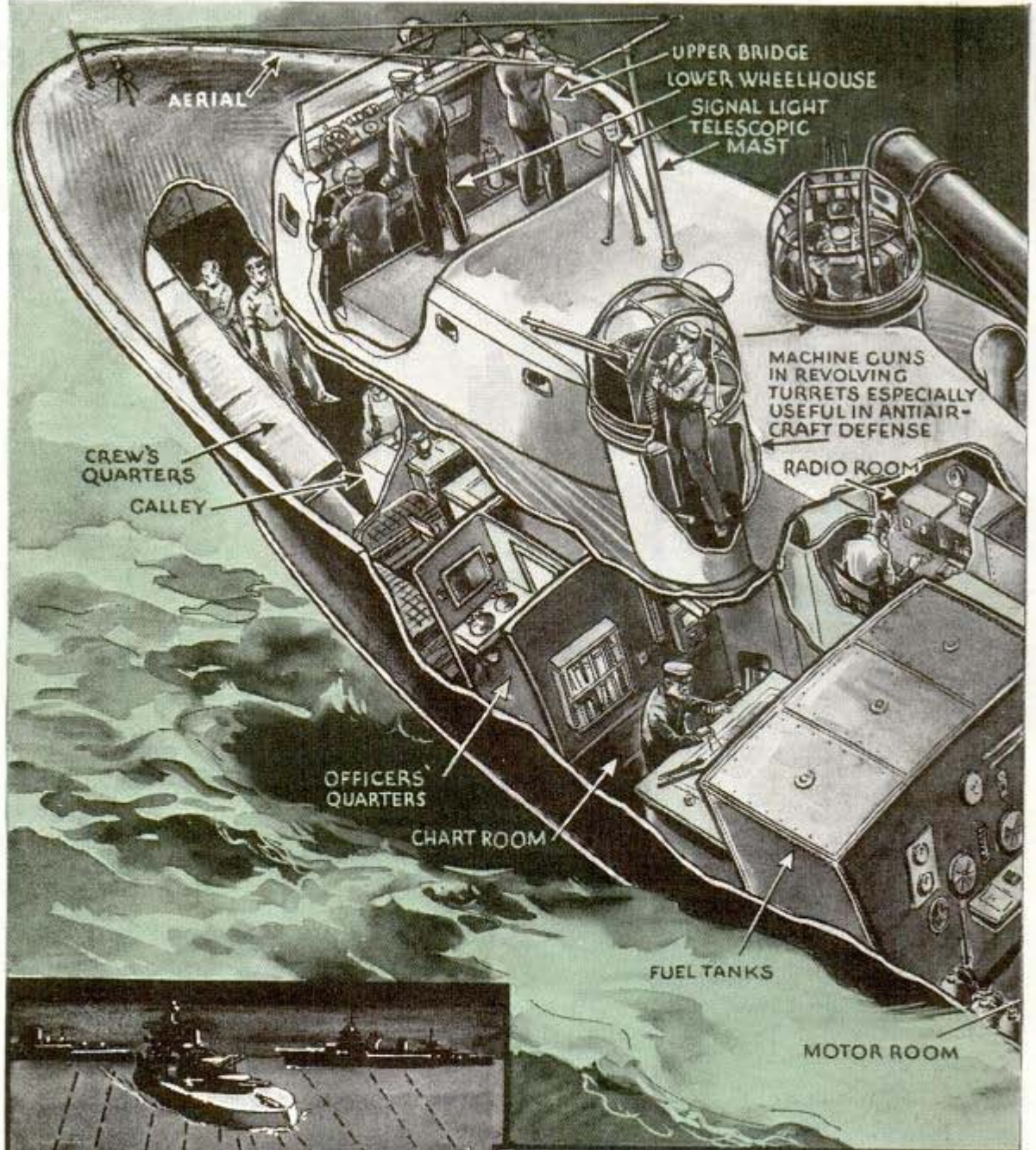
legs or an uncertain stomach. Hand and toe grips are no great aid and comfort, and the old boatswain's command of "Both feet on the deck, sailor!" brings a grim laugh.

The men who designed these boats planned them to fulfill a mission—getting somewhere in a grand hurry, doing a job, and pulling away with the same initial speed. It's up to the crewmen to work out

One of the mosquitoes sends foam flying on a fast trial run. Even at top speed, however, these trim vessels cause remarkably little swell. Notice the torpedo tubes and twin revolving gun turrets



K1260

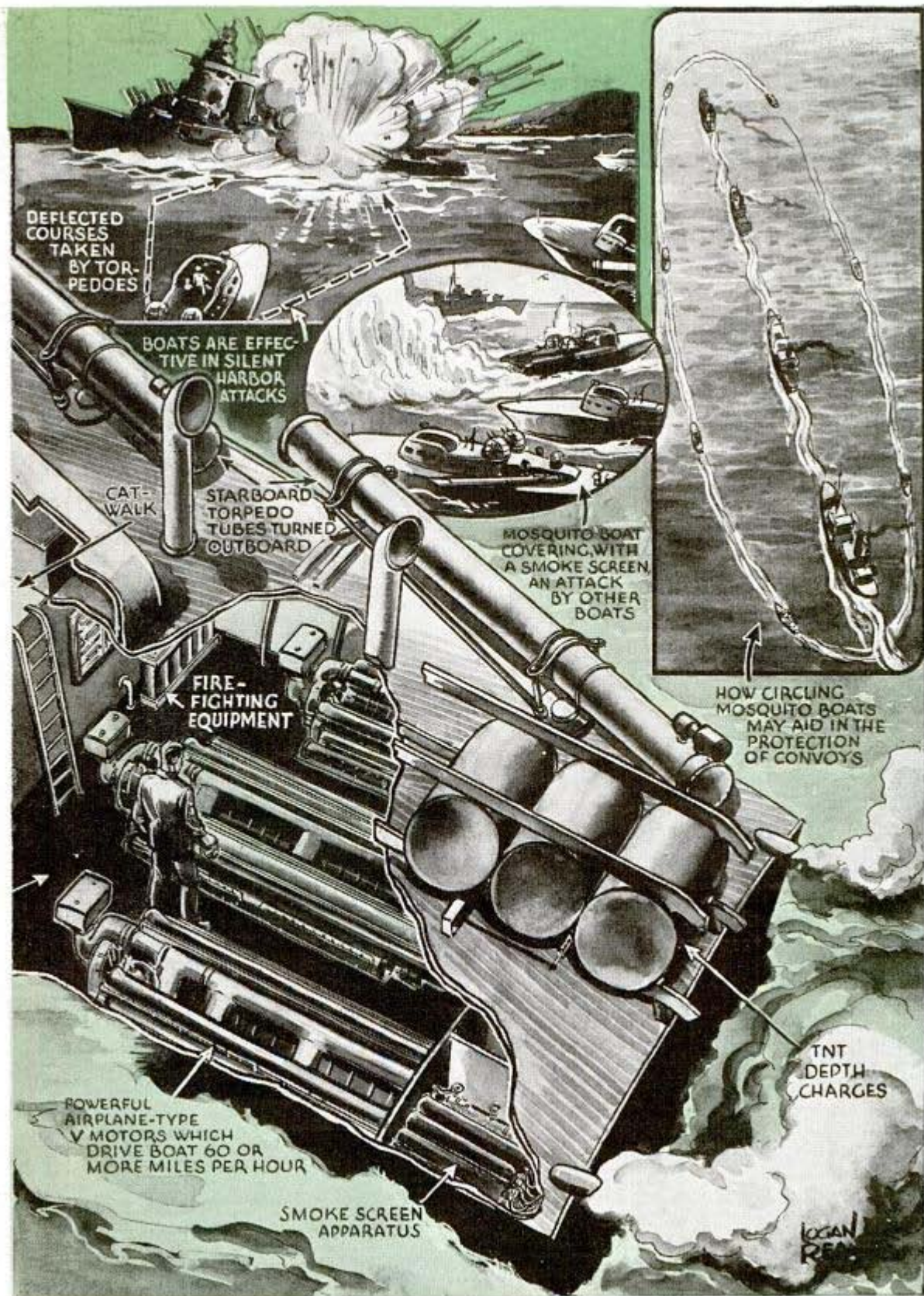


**12 RAIDING MOSQUITO BOATS
COULD DISCHARGE 48 TORPEDOES
IN ONE SWIFT ATTACK**



**ABILITY OF A MOSQUITO BOAT TO
PASS OVER A MINE FIELD**

Cutaway view across the pages gives a glimpse of the compact quarters aboard a motor torpedo boat. Sketches below suggest the terrific sting of a mosquito fleet attack, and the advantage of shallow draft.



The upper sketches indicate some of the uses of the mosquito in cooperation with larger warships of the fleet and in convoy duty. It will be observed that the four torpedo tubes are pointed obliquely forward

K12:60



Above, the PT-9 shows New York's waterfront a burst of speed. Left, boring a cylinder for one of the Packard marine engines with a vertical turret lathe

their personal problems. Grabbing a bite to eat is one of them, and a serious one. You may be able to munch a sandwich while clinging to the saddle of a wild horse, but try downing a cup of coffee; and coffee is the standby of all good sailors. Manning battle stations, firing machine guns, launching torpedoes must all be accomplished under the same violent conditions—plus, in actual combat, the hazards of facing dive bomber and battleship fire.

No wonder the sailors of the mosquito fleet have to be tough. They may be called upon to "take it" for twenty-four hours at a stretch. Some Navy veterans who volunteered for the service had to quit and go back to the broad decks of the battleship, quiet as

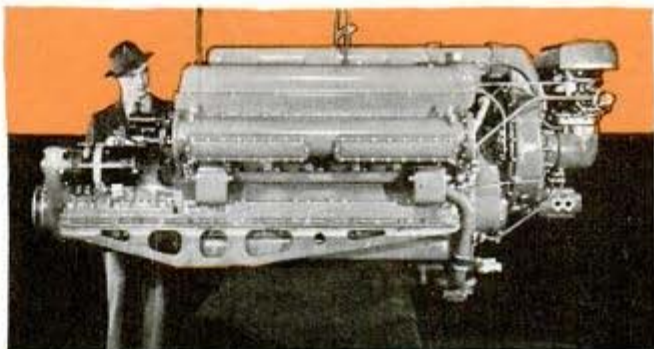
country lanes in comparison with the fast little torpedo boats.

Changing of watch and shifting stations must always be done beneath battened-down hatches. To use the deck would be suicidal. Going off duty, the men climb into their bunks and immediately strap themselves in to relax and dream of tobogganing through a boulder field.

Seamen in every sense of the word, these men are also specialists in gunnery, torpedo work or mechanics. Their training in these boats has been carried out hand in hand with construction development; they are familiar with the capabilities as well as the limitations of the craft. Their job thus

(Continued to page 149A)

Three of these engines drive the mosquito's three propellers.



25

Deer Animated by Motor Is Archers' Target

Two sportsmen have constructed an animated target in the form of a deer that bobs up and down in imitation of a live animal. Eccentric gears driven by a gasoline engine impart the action. Their biggest thrill, however, is found in chasing jack rabbits and coyotes with bow and arrow in the Mojave desert, where they ride trucks instead of horses on adventurous



Left, removing an arrow from animated figure of deer which bobs up and down realistically. Above, truck in which the brothers hunt jack rabbits and coyotes with bow and arrow in the Mojave desert

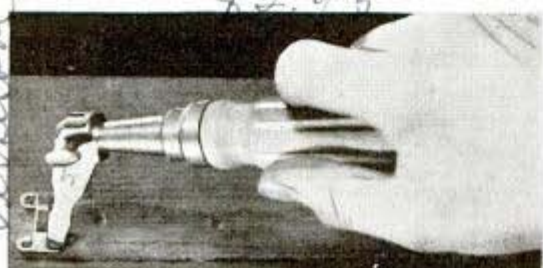
prove a match for the rugged country. For added fun special controls permit the trucks to be run driverless either in a straight line or a wide circle. To stop the truck, one of the brothers fires an arrow against a target

outings. These "mechanized cowboys," who are brothers, Walt and Ken Wilhelm, of Yermo, Calif., built two trucks from parts of discarded automobiles. The vehicles travel far off the beaten paths over ridges and down gullies, breaking through hedges and crossing ditches, where the huge tires

on the back of the car, which disconnects a switch and shuts off the engine. After long training with bow and arrow on the desert, Ken Wilhelm claims a distance record for arrows of more than half a mile. The brothers play archery golf as others do the conventional game.

Three Lines

Five Handy Tools in Pocket Kit All Fit the Same Handle



Readily assembled for doing virtually any small mechanical job that may arise in the home or shop, a pocket set of five tools, used interchangeably in a single handle, is available. Tools include wood chisel, cutting blade, wood reamer, screwdriver, and a hacksaw blade. For places hard to reach the tool may be inserted at an angle. The entire set is carried in a folding case.

Barry-Gordon Sales Co
11 W. 42nd St. New York

United

L 48
 The Polster Co. 124 S. Broadmoor
 Albany, N. Y.
 Bergin & Co. 1417
 Washington Blvd.
 492
 Maynard
 Ch. H.

Grease Cleaned from Wall Without Marring Paper



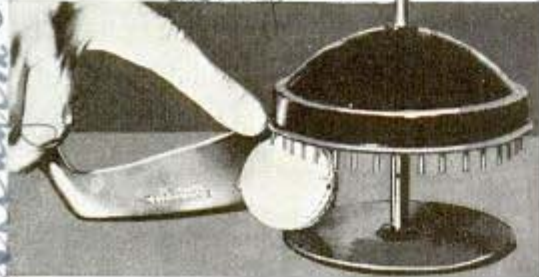
To show how cleaner works, only half of grease spot was covered, and then brushed off as shown in inset

Applied like putty to the wallpaper, a new grease-spot remover absorbs oily marks without harm to the paper. Mild chemicals dissolve all grease, and a combination of capillary attraction and osmosis draws the dissolved grease into the body of the cleaner. Butter, lard, linseed oil, hair oil, olive oil and other oils and greases will yield to the action, the manufacturer states. It will not affect color or design of the wallpaper.

Trap for Indoor Putting Practice Helps Golfer Improve Play

Conditions on the putting green are simulated by a portable golf "cup" offered for practice at home on the living room carpet. A stroke that would sink the ball in

\$1.00. Bobby's Portable Golf Cup



Fringe of teeth at top of golf practice "cup" trap the ball unless the stroke was too hard

the cup will cause the ball to be caught in the trap by teeth that fringe the upper section. On the other hand, a force that ordinarily makes the ball hop out of the cup on a green would also cause it to bounce away from the trap.

"Stationary Skis" Give Training During Summer Months

In order to learn the fundamentals of skiing at home and keep in practice through the summer, Edward Traver, of Schenectady, N. Y., has invented a stationary type ski. Held in position by a tongue-and-



Skier keeps muscles in shape and learns tricks of balance on this pair of sliding footplates

groove arrangement, the footplates on which he stands slide back and forth over two waxed surfaces with a resistance similar to that experienced with skis on snow. Roughened surfaces of the plates make the use of footstraps unnecessary.

ⓈA train starts on its scheduled run somewhere in the United States on the average of every two and two-thirds seconds.

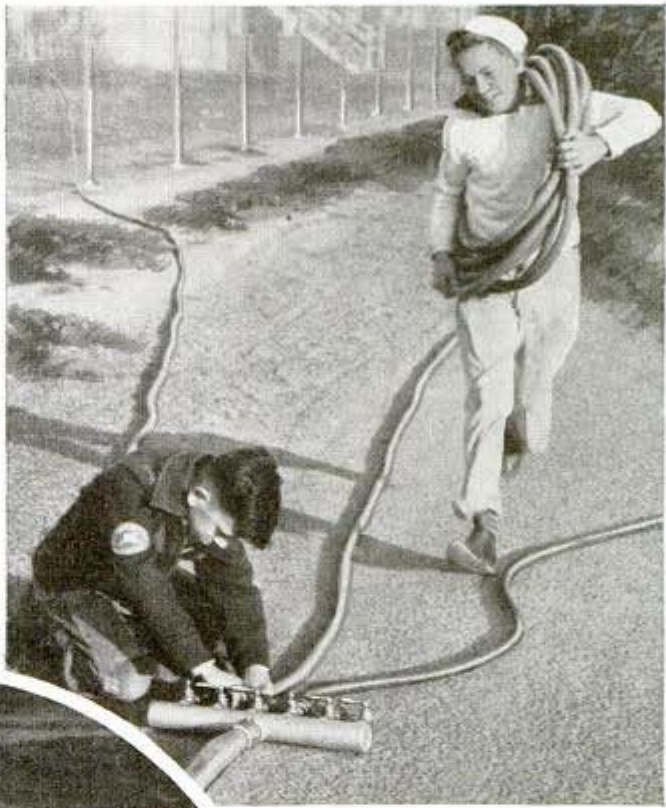
Fillmore Central A. R.

441 cont. The Seaside team, Calif. Fire

Junior Squad Aids Suburban Fire Fighters



Practicing the fireman's carry, best method for rescues



Above, a young smoke eater comes on the run with a garden hose to be hooked up to the fire-truck feeder



Below, a squad of Junior Firemen demonstrate right way to climb a ladder with hose over the shoulder



When the siren wails, the Junior Firemen (circle) grab coils of hose, hop on their bicycles and head for the blaze

Chasing the fire engine is no longer a game, but serious business to the youth of Colonial Heights, suburb of Sacramento, Calif. Volunteer boys between ten and eighteen formed a Junior Fire Department and are trained by adult "smoke eaters" to fight flames. They aid in handling crowds and traffic, carry hose, raise and climb ladders, learn to administer first aid and make rescues, survey fire hazards. Where hydrants are lacking they connect garden hose to a feeder and fill the tank truck from nearby home faucets

276

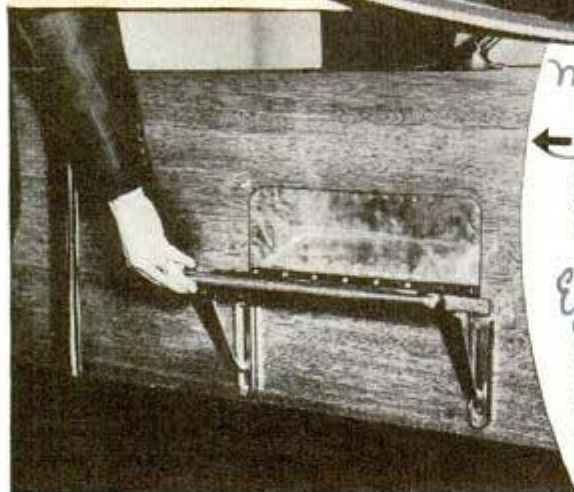
Carl Allen Warren, Elliott
343 E 33rd Street, New York

NEW IDEAS



*Shanagately Boat Corp
Shanagately NY*

For the small-boat owner, new ideas in styling and new conveniences are being introduced. Left, sixty-pound plywood dinghy can be carried easily by one person



*Matthew
Co. Paul Clinton
Chicago*

Cockpit step folds up when not in use and gives the boatman more room. It also eliminates barked shins



*Evynude
Corp 4/43*

Outboard motor, weighing eight and one-half pounds, has one cylinder and can drive rowboat one to four miles per hour



see next page

Model of mechanical hoist which lifts your boat out of the water and keeps it under roof over the hoist

*Shanagately
Boat Corp
Shanagately
NY*

for BOAT OWNERS

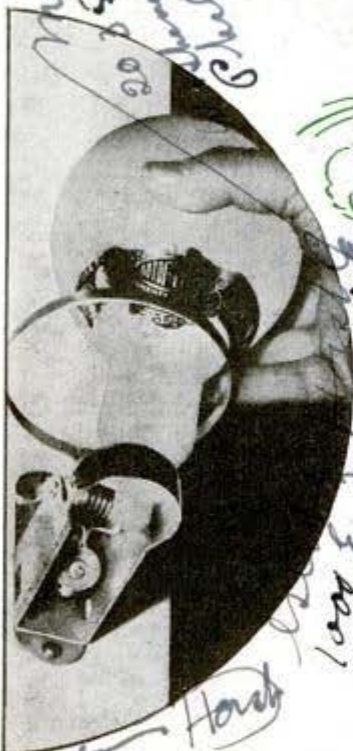
Luders Marine Construction Co, Stamford, Conn. L 76

Merchant & Evans

Radical style innovation is patented round bow yacht tender which may be headed into larger craft without damage. The tender is sixteen feet in length



Hydraulic



Fire extinguisher for small boat discharges cartridge as alarm and then releases the fire-fighting fluid

Refrigerator bag keeps foods or liquids cool one day. It uses a piece of Dry Ice or dozen ice cubes



Coollette

Hodgman Rubber Co

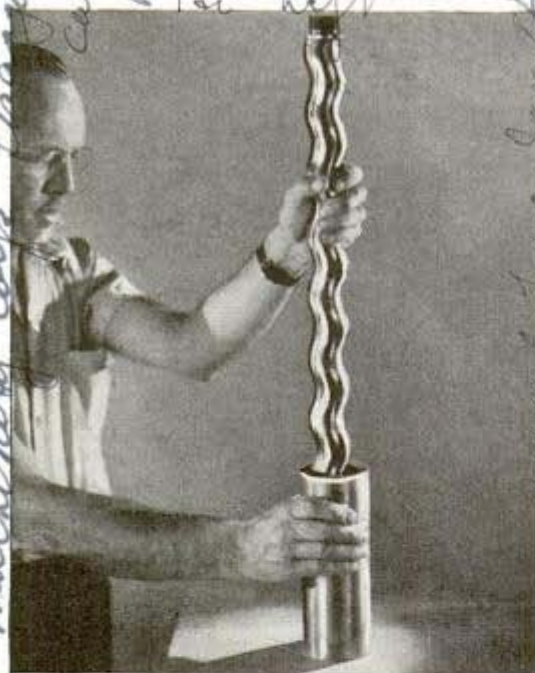
"Landlubber's seat" for dinghy is welcomed by persons not accustomed to sitting in small boats



Edward A. Murphy Niagara

*Greenwood Motors Corp Milwaukee, Wis
7143 N. 27th
outboard motor*

Helical Shaft Pumps Water from Deep Well



Spiral shaft of type shown can draw water from 100-foot well when rotating inside four-inch pump column

Application of the lifting force generated by a helical rotor to the task of raising water from wells, does away with the use of impellers, plungers, pistons and valves usually associated with ordinary methods of pumping. First conceived by a French inventor, the idea has been developed by an American manufacturer to pump water from deep wells. The original pumping element consisted of a short helical rotor turning within a resilient stator, or tube, having a helical interior; but in the latest design the rotor has been lengthened, thus compounding the lifting power so larger quantities can be lifted from a small bore. Made of hard chrome, heat-treated stainless steel, the rotors are precision-turned, ground and polished, to fit exactly the spiral surface inside the stator to prevent water slippage. A helical rotor, like the one illustrated, is used in a four-inch-diameter pump column, which can be driven into a well drilled to a depth of 100 feet or more. Supported within the pump's casing by water-lubricated bearings, the rotor element is connected to a shaft extending to the surface of the ground where it is hooked up directly with a motor on top of a built-in pump head. The stator, in

which the rotor turns, is locked to the bottom of the pump column inside a metal sleeve, and in case the pump is to be removed for inspection this can be done without lifting out the column or casing.

Lighted Match Seen in Blackout at Half-Mile Distance

In experiments to determine various degrees of light that may afford guidance to British flyers during a blackout, German scientists are reported to have found that a lighted match is visible more than half a mile away. A stable lantern could be seen for a mile and a quarter, and light from one window of a fully lighted room for twelve and one-half miles.

Frame Illuminated from Behind Adds Beauty to Color Film

Beautiful effects of a color transparency may be enhanced by framing the picture in an illuminated holder that vividly brightens the film. Lighting is provided by a seven-watt lamp housed within a box that forms the back section of the frame and also serves as a stand. The frame is mounted on the box by means of flanges which permit it to be removed by sliding it upward. To diffuse the light a sheet of opal glass is placed between the lamp and the film transparency.



Color transparencies are given lifelike brilliance when mounted in this frame illuminated from behind

TELEVISION *in* COLOR



K13 49
Above, scene in Columbia Broadcasting System's studio in which color television shot is being made. Right, approximately what you will see on television receiver screen. Taking a photo of color television is difficult because camera catches only color lines showing at moment picture is snapped.

New York City





498

By JULIAN LEGGETT

AFTER five years in its "swaddling clothes" of black and white, television is on the verge of changing to fancy dress. Within a short time, experts tell us, pictures in all the colors of the rainbow will be flashing through the air to the receiver screens of a favored few Ameri-

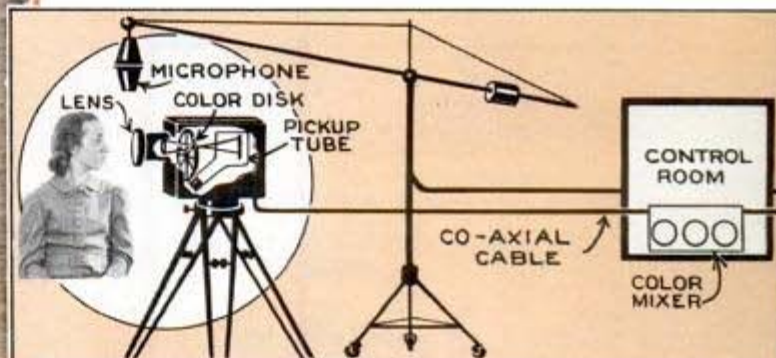
cans living near transmitting stations.

Television in color has come with a rush, having been developed and demonstrated successfully in the laboratory while most of the nation still awaited the arrival of black-and-white television. Its secret is a couple of disks containing red, green and blue filters. One disk rotates



Columbia Broadcasting System, New York City

(Top, viewing General Electric Company's demonstration of color television. Here only a revolving color disk has been added to standard television receiver; another disk is used at transmitting end. Left to right, Dr. P. C. Goldmark of Columbia, P. D. Reed of General Electric, Dr. E. F. W. Alexander of General Electric and G. H. Payne of Federal Communications Commission. Left, new Du Mont twenty-inch television receiver.



K1349

in front of a pickup tube at the transmitting end. Synchronized with it is the second disk which rotates in front of the receiver tube in the individual set. When the red filter is in front of the pickup tube, only those parts of the scene or picture being televised which contain red register in the pickup tube. At the same instant the red filter in front of the receiver tube in the individual set permits only red portions of the picture to reach the viewing screen. The same holds for the green and the blue filters, with each operation performed at lightning speed.

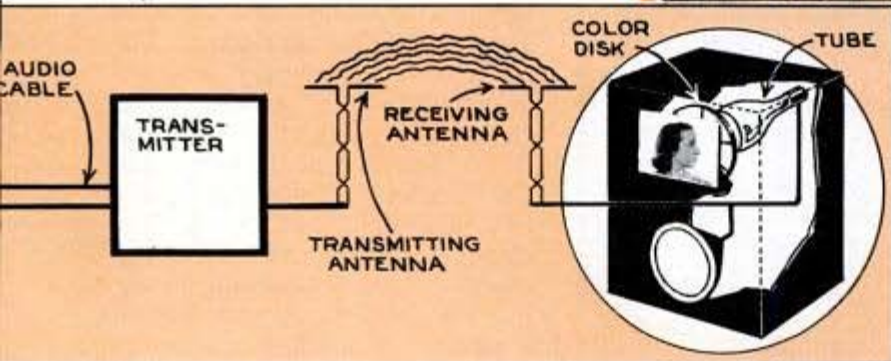
Comparatively few people understand how television works, even the black-and-white variety. If you place a strong magnifying glass over a photograph reproduction in a daily newspaper, you see that the original photograph, when it was made into an engraving, was broken up into a field of black dots varying in diameter and hence, to the eye, in density. To get a television image, the original subject in effect is broken into a number of electrical impulses which do approximately the same things when they arrive on the television viewing screen—they



499

Above, Rockwell Kent, looking in mirror, sees how he appears to television audience. Mirror is shown above lens of television camera in General Electric's studio at Schenectady, N. Y.

W 2 X B



Above, Dr. Goldmark, CBS engineer, at still projector of color television equipment which he developed. Left, sketch of how color television works. The setup is identical with black-and-white television, save that color disks are used at transmitting and receiving ends and that controls include color mixer.



Bernard Cruger

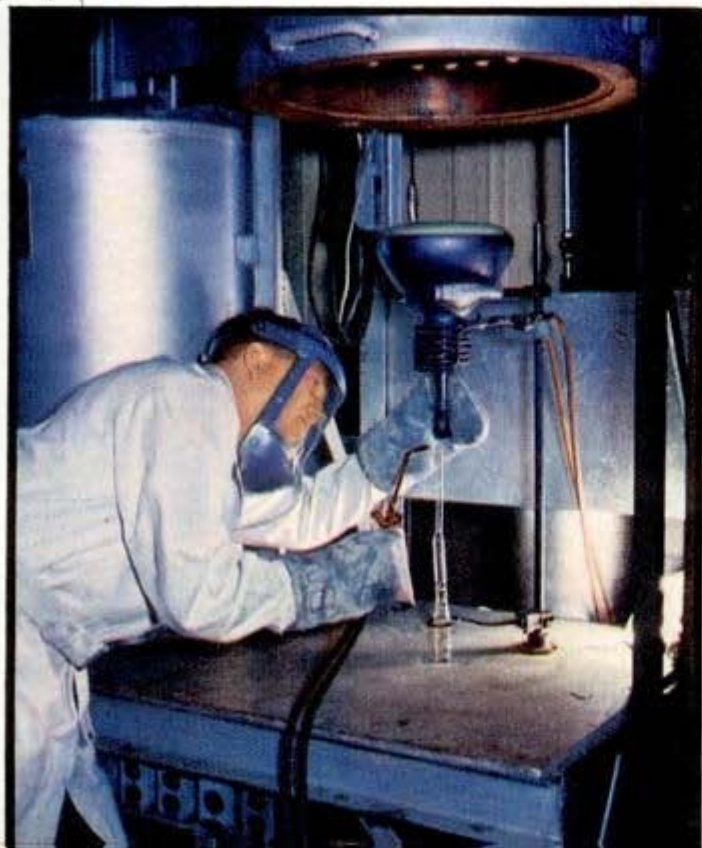
R. L. Smith John L. Hulmar

Above, at the controls in General Electric's television studio. This is a natural-color photo, as is the one below which shows a tester applying voltage to television receiving tube. The mask is protection against tube explosion.

appear in lines which create a picture. This picture is composed of 441 tiny lines—a standard in the industry.

Special equipment scans, or goes over the entire scene or picture being televised, picking up light waves which in turn are converted into the electrical impulses that are transmitted, then changed back into light waves at the receiving end, thus forming the picture. Dr. Peter C. Goldmark, chief engineer of Columbia Broadcasting System's television department, who developed the tri-color television system demonstrated recently, employs a scanning method different from that used in most black-and-white systems. The picture is completely scanned every sixtieth of a second, instead of every thirtieth of a second. However, at the end of the first sixtieth of a second, only two colors have been used. The third color requires an additional 1/120 of a second, bringing the total to one-fortieth of a second for a single picture in

500
K1349





full color. The Goldmark system works like this:

Odd-number lines are scanned in red in $1/120$ of a second and the even-numbered lines are scanned in green in $1/120$ of a second. At this point the whole picture has been scanned, but there is no blue. Time thus far: one-sixtieth of a second.

Now the red on the odd-number lines has faded and these same lines are scanned in blue in $1/120$ of a second. Now the whole picture has been scanned one and one-half times, but in full color only once. Time: one-fortieth of a second.

The green on the even-number lines has now faded, so these same lines are scanned in red in $1/120$ of a second. At this point the picture has been scanned twice, but in full color only one and one-third times. Elapsed time: one-thirtieth of a second.

Now the blue on the odd-num-

501 *Berbert School of Dancing*
 Above, typical scene in studio, with dancer and others performing for General Electric's television camera. This is a natural-color photo. Below, Dr. Alexanderson holding color disk of the type used in color television work. This also is a color photo.



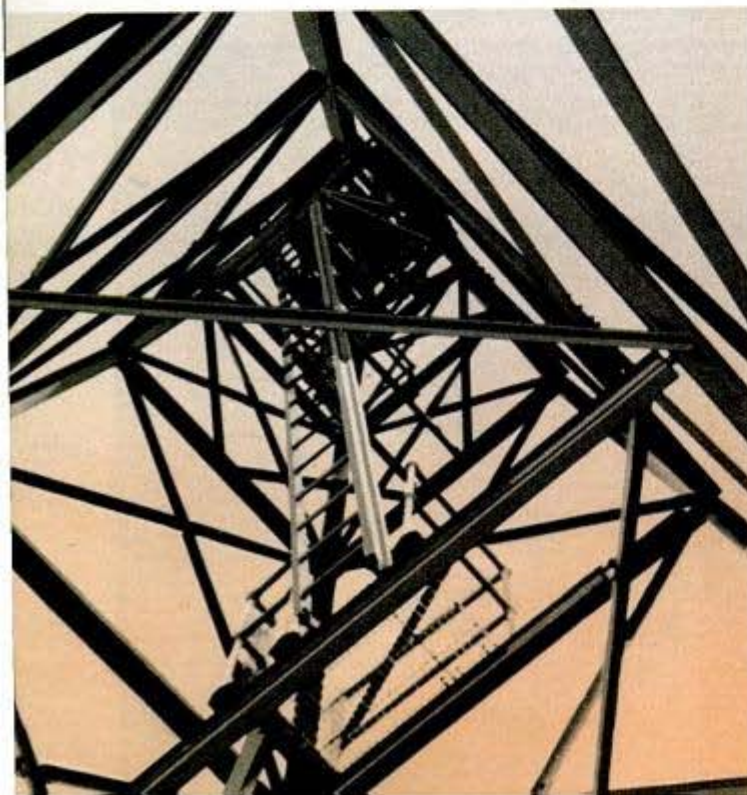


*P. A. Society
Duplex technical
operation supervised*

602

K1349

Above, making adjustments on CBS telecine camera in studio control booth. This camera is used to telecast motion pictures from films. Below, unusual view of antenna employed to get good results in television work.



ber lines has faded and these same lines are scanned in green in 1/120 of a second. Now the red on even number lines has faded and these lines are scanned in blue in 1/120 second. At this point the picture has been scanned three times, twice in full color. Total time: one-twentieth of a second. And now the whole cycle begins again.

Dr. Goldmark's system is based largely on the fact, which he proved to his own satisfaction, that the human eye will remember a succession of three pictures, each in a different color, long enough to blend them into a single full-color image. Of course the pictures must be passed very rapidly before the eye to achieve this illusion of spontaneity, as well as simultaneity.

Students of color photography know that most color pictures are produced through the use of at least three separate elements. No matter what the process, the final photograph usually requires three elements—three negatives or three transparencies superimposed upon mounting paper. On this basis, one would assume that projection of color television would require three projectors, all focused on the same scene and the resulting light mixed. This might be fairly simple if it weren't for the fact that each color beam needs the same transmitting area. In other words, a picture in three colors would require approximately three times as much space in the comparatively narrow transmitting band of ether assigned by the Federal Communications Commission.

The Goldmark system, by which only a single color is transmitted at one time but so rapidly that the human eye blends the colors to form the full-color image, solves this problem.

Originally the Columbia system employed motion-picture film, with the scene being first photographed on the film and then televised. Now Dr. Goldmark has found that direct pickup, televising the scene without using the film, is possible. In the direct pickup method achieved experimentally in the Columbia laboratories, no more intense light level is required than has been needed for



603 K649
 Du Mont television equipment—camera, controls, synchronizing signal generator, power supply and other units—all capable of being packed into auto (above) and (right) applying anode coating to television receiving tube at General Electric.

black-and-white television. In actual practice, however, color pickup probably will be improved by employing additional light, but the amount of light needed does not appear to present a problem, Dr. Goldmark points out.

An additional feature of the Columbia color television is color control, which will be used to justify the color values of scenes televised out of doors with those taken indoors. Sunlight has a different color from artificial light and refracts in different shades. With color, during a dramatic scene on the screen a room will suddenly, in effect, leap into flame at the turn of a dial. The same room, with another turn of the dial, will be made to shift from afternoon sunset to moonlight



to morning glow. To establish a musical theme, an actual aura of "blue" can be cast on the image of a dance orchestra and character hints, emotional phases or "cooler" settings will be at the transmitting engineer's finger tips.

Color television, as demonstrated by Columbia, gives lifelike realism, seeming to add a third dimension. An idea of



R1349

what it is like may be gained from this:

Two receivers stand side by side, one showing black-and-white pictures, the other color pictures. On the first screen a girl appears strolling through a garden. The picture is just what you would expect to see in a vacation snapshot. On the other screen, the girl is discovered wearing a gay yellow hat, a bright blue dress and colored ribbons, the garden lawn has come to life in a gay green, and flowers in pink, blue, red and orange literally have leaped into being. The contrast is startling. In another scene the blue of the water stands out in sharp contrast to the blue of the sky as a trim yacht scuds by—evidence of the effect of color control.

Dr. E. F. W. Alexanderson of General Electric also is working on television in color. In a recent demonstration, no additional equipment other than a revolving disk was employed to convert black-and-white pictures to color.

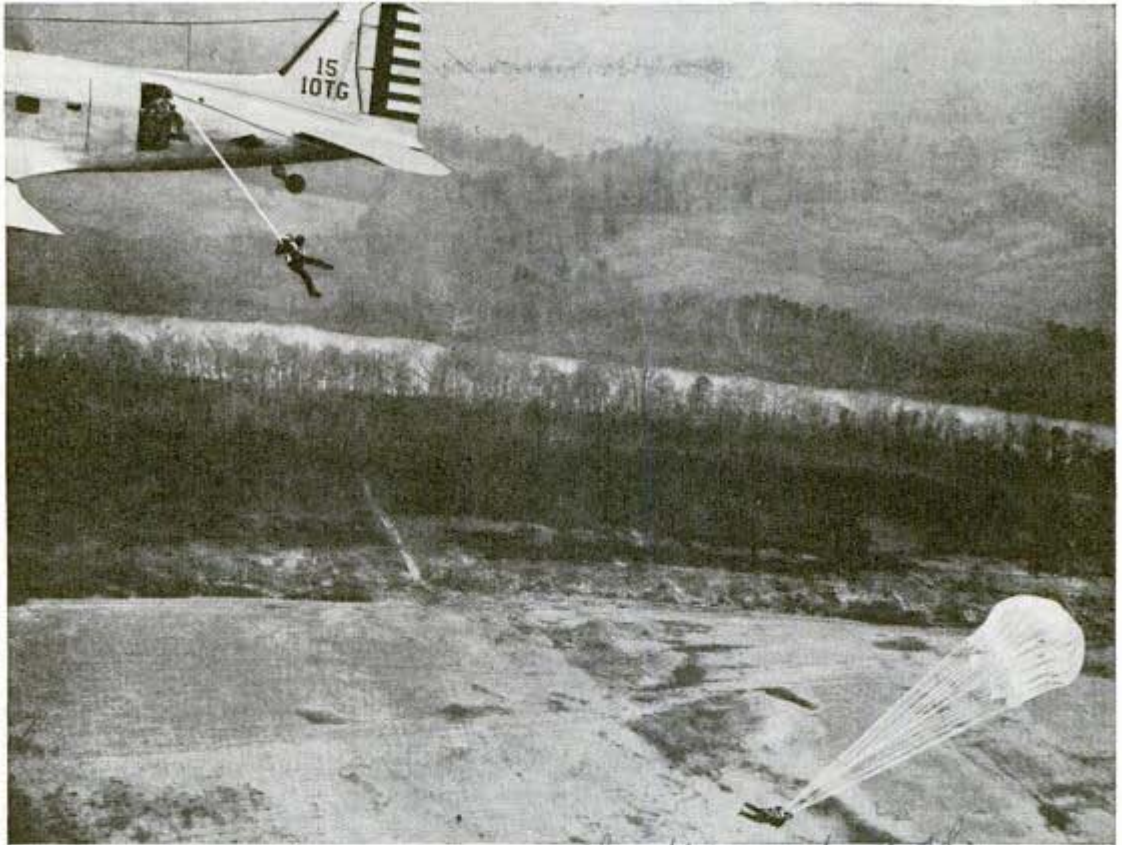
A two-color twenty-four inch revolving disk was installed about twelve inches in front of the picture end of the cathode-ray tube in a standard receiver. As the disk whirled at 1,800 revolutions per minute, its transparent field of orange-red and greenish-blue reproduced a program coming from a distant studio in realistic colors. At the studio a similar disk was whirling in front of the iconoscope pickup tube of the transmitter. In early experiments, General Electric engineers tried both two and three-color disks. With two colors and a speed of 1,800 revolutions per minute, the same colors succeeded each other thirty times per second. With three colors they (Continued to page 128A)



Top, Dr. Goldmark threads colored movie film into machine which projects it for telecast in full color. Bottom, examining fifty-kilowatt broadcasting tube which undergoes tests similar to those employed for television transmitting tubes at General Electric. Both these photos are taken from natural-color film.

L 53 Science Service
Jan. 10, 1941

Parachute Opens Itself When Cord Is Broken



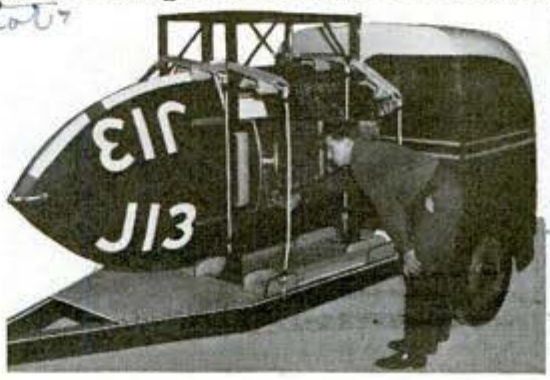
Line connecting parachute with plane pulls rip cord when jumper is safe distance below the ship

Fire-fighting aviators of the northwestern timberlands and parachute troops of the U. S. Army are pioneering a new technique that makes it unnecessary for the jumper to worry about pulling his rip cord at just the right moment. The 'chute is opened automatically when the jumper is a safe distance beneath the plane, a sturdy line attached to the airplane pulling the rip cord and then breaking loose from the

plane. This method is used by the parachutists of the U. S. Forest Service who drop from the sky to strategic spots for fighting forest fires, and is now being practiced by the army parachutists who are undergoing a special training course at Fort Benning, Ga. Until now, teaching the beginner the exact moment to release his parachute has been considered one of the most difficult parts of the training.

Trailer for Outboard Racer Has Compartment for Motor

At least one outboard racer rides overland in royal style, having a specially designed aluminum-floored trailer of its own. In the rear section there is an enclosed compartment to house the motor, tools and accessories. The boat is the Annihilator, which holds the mile record of 40.958 miles per hour, and the three and one-half mile competitive record of 37.527 miles an hour.



Outboard racer rides highways on special trailer

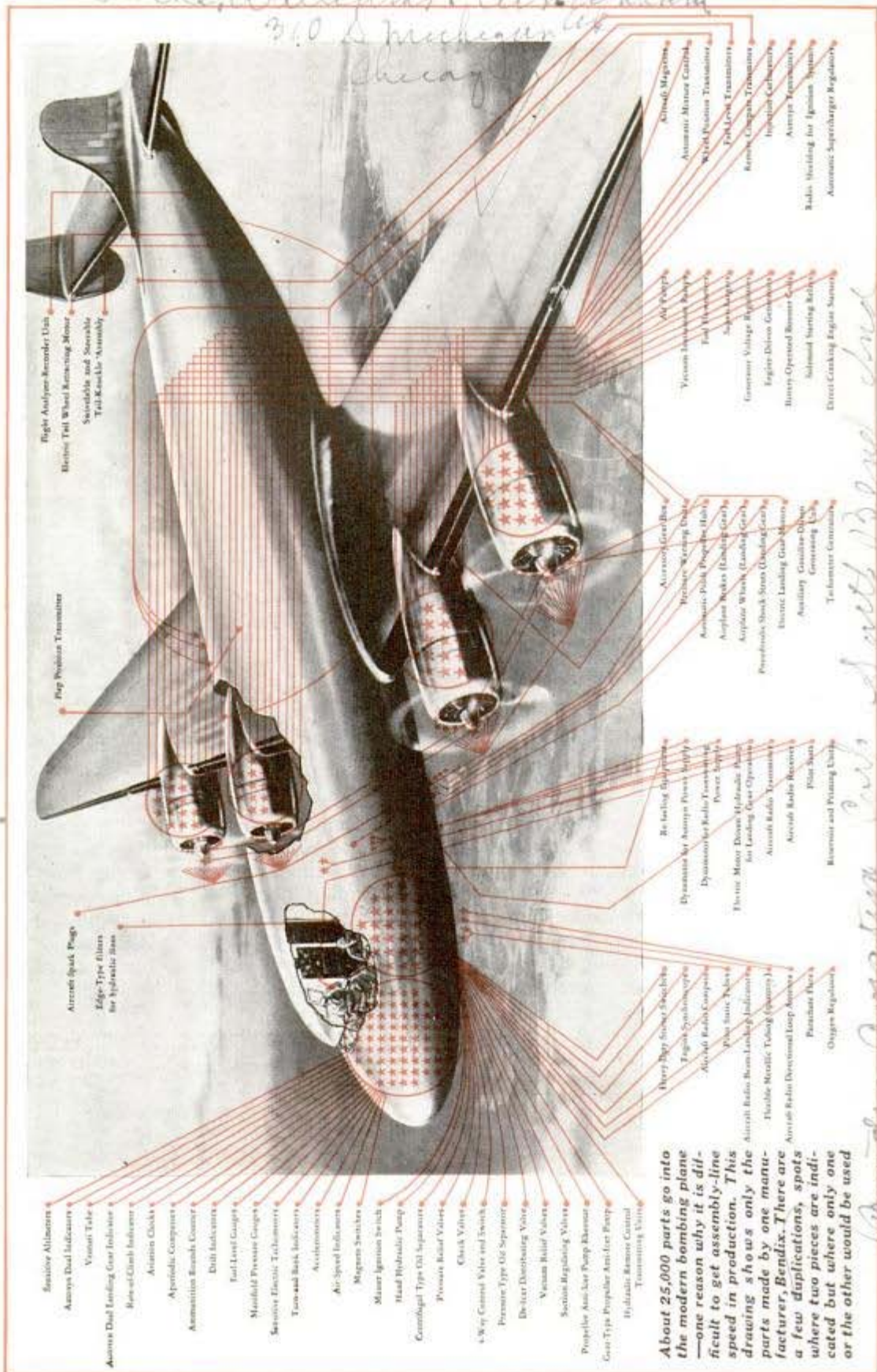
There are approximately 33,200 freight and passenger trains in operation daily on the railroads of the United States.

APRIL, 1941

Allen's Central
CR

Cent. Warren Elliott
343 & 33rd New York

210. *Unidentifiable Project, Dec. 30, 1940*
Roche, Willogis, Comptel, Inc.
310 S. Michigan St.
Chicago



About 25,000 parts go into the modern bombing plane —one reason why it is difficult to get assembly-line speed in production. This drawing shows only the parts made by one manufacturer, Bendix. There are a few duplications, spots where two pieces are indicated but where only one or the other would be used

Wander Averted Corp. and with Bendix

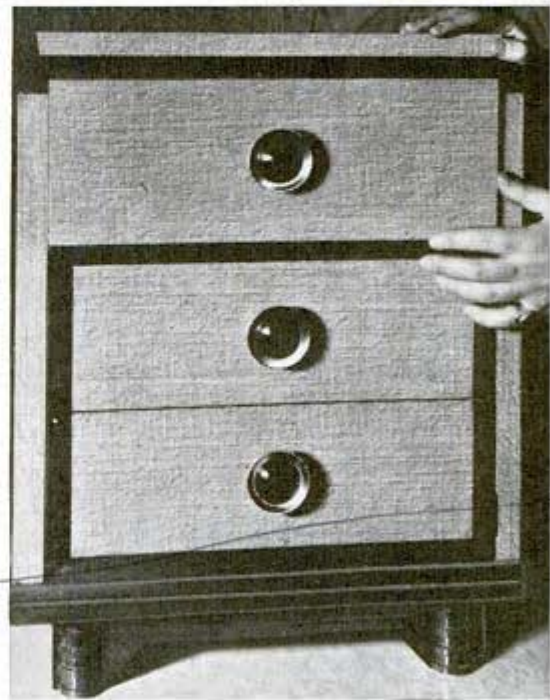
274. Smith-Isaacs, Inc.
666 Lake Shore Drive
Chicago

Thin Plastic Sheet Is Latest Furniture Veneer



Thin sheet of plastic may be put on furniture manually, as above, or mechanically at factory. Upper right, Paneloid is easy to apply to walls without special preparation. Chest, bottom, shows one style of finish

Applied like veneer to household furniture, radio sets and pianos, a wafer-thin plastic sheet, made in laminated form, offers a wide variety of modern designs and a new kind of surface that is remarkable for its endurance and resistance to damage from anything but severe abuse. The furniture is available for every room in the home. Since the colors are an integral part of the plastic surface, they will not fade or wash off. No furniture polish or wax are needed to keep it clean, but the surface may be washed with soap and water, or even scouring powder, without risk of damage. "Plastyle" furniture, as it is called, resists warping; is highly resistant to scratches, mars, nicks, chipping or flaking; is unaffected by oils, ordinary acids, perfumes, alcohol or nail polishes, and resists extreme temperature changes. It can be exposed to direct rays of the sun for long periods without discoloring, and hot dishes or platters placed on the table top leave no marks. In another form, under the name of Paneloid, the same plastic sheet, bonded to a flexible backing, may be applied to walls instead of tile, or used for refinishing old furniture and fixtures. Special glue is available for applying it to fur-



niture as well as to walls, although certain types of casein glue and cold synthetics will do. Sheets of the plastic are two-one-hundredths inch thick, and their flexibility permits them to be applied to any flat surface or a curved surface of reasonable radius, using a press or set of clamps.

☐ Farm products from 2,500,000 acres went into manufacture of motor vehicles in 1940.

Saginaw Furniture Shop 666 Lake Shore Drive, Chicago

Material, энциклопедический авторский перевод

SOLDIERS



Right, parachute trooper, jumping from plane preparatory to going into action. Above, he has pulled the ripcord and is floating to earth



Above, making a landing. Below, 'chutists with machine gun set up and ready for firing less than two minutes after landing. Twelve jumpers can leap from plane in ten seconds



TO COMBAT sudden attacks on any of this nation's defense bases, the U. S. army has organized a new military arm known as the Air Infantry. An attacking force with hitherto unknown mobility and speed, it can be rushed almost anywhere in record-breaking time to meet any threat of invasion.

The purpose of the unit is to surprise the enemy behind the lines, disrupt communications and destroy bridges, airports and other vital military centers, with a minimum of time, effort and expense.

Under the new procedure, several hundred parachute soldiers, armed with light weapons, are dropped in a military zone, followed immediately by the landing of troop planes carrying three or four hundred heavily armed infantrymen, machine guns and



ent. Can't help: Roberts, 4-6, 34. Rec. Hampshire. No. 1325. 11-11-41. 11-11-41. 11-11-41.

with WINGS

1325



Club.

California National Guard.

other fighting equipment. In case of a more serious emergency, even more soldiers could be transported by air. A number of large transports could carry 1,000 aerial infantrymen 200 miles in less than an hour.

Above, company of soldiers with complete equipment undergoing inspection prior to takeoff in big plane to practice landing attack on airfield. Below, parachute jumpers inside navy blimp on way to practice leaps into space. Heavy clothing protects men from cold

Such a force, Air Corps tests prove, could be dropped within a few minutes near an enemy airdrome, power plant or key bridge. Twelve men can jump with parachutes from a plane in ten seconds and open fire with machine guns in less than two minutes after landing. But this merely hints at the military potentialities of the procedure. Russia's Red Army in practice warfare has dropped as many as 5,300 'chute soldiers in a single operation. And large-scale landing of fighters via the "giant umbrella" is only one phase of the U. S. Army plan.



This new unit is divided into four major groups: par-

Lakehurst, N.J.

7112 2.5



Above, loading a three-inch gun into a bombing plane. Below, a small part of air infantry's equipment that must be carried in plane. Included are motorcycles and life preservers. Each big transport can carry about two tons on normal hauls. Entire regiments, with equipment, can be transported easily by air



enemy. "Jumpers," for instance, armed with pistols, rifles and machine guns, could seize an air field or other strategic objective and cover the landing of squadrons and transports carrying infantry and artillery. This might further exert a decisive influence on the course of operations and bring about complete defeat of the enemy in a particular area.

Two widely separated "test spots" in the south are being used by the Air Corps to develop its new striking force. A special unit, known as the 501st Battalion, created out of the Twenty-ninth Infantry at Fort Benning, Ga., is pioneering the work

achute detachments, detachments landed by airplane, a combination of the two, and high-speed aerial transportation of war equipment and supplies.

The landing of troops by plane and parachute was achieved by the Germans with spectacular success in several of its recent conquests, notably in Norway. Their experience has shown that parachute landing units under certain conditions may serve as a quick means of disorganizing the control of troops and communications of the

with parachutes. The main experimental unit for working out new methods for carrying troops and equipment by planes is the Ninth Infantry Regiment at Fort Sam Houston, Tex. In command of the parachutists is Maj. William B. Miley, an infantryman who also graduated from the Air Corps tactical school. He has introduced tumbling as part of the training of his troops. It keeps them in shape and helps them in landing, he says.

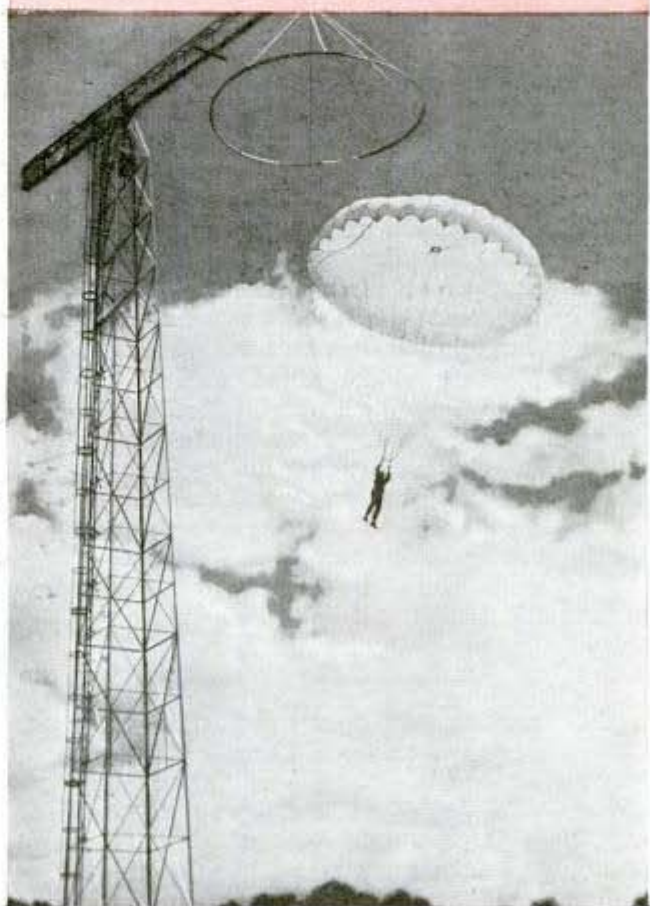
The battalion, numbering 412 men and



fifteen officers, soon will have its own training field. A 900-acre tract next to the Fort Benning air field has been set aside for their use, and two 350-foot training towers will be built. They will be similar to those now owned by a commercial firm at Hightstown, N. J., which were used to train some of the veteran members of the battalion. One of the towers will be used for "controlled" jumps, opening the 'chutes by mechanical means and guiding their course downward. The other will open the "umbrellas" mechanically, but will permit free descents.

Training procedure has several phases. First, each man must learn how to prepare and fold his own 'chute. Next he is given thorough instruction, on the ground, concerning how to jump. He is told that the umbrella takes about one and three-fifths seconds to open. Steering is done by pulling down the shrouds on the side toward which the jumper is headed. Now the parachutist is ready to jump. But he isn't allowed to go aloft, even on the training tower, until he learns to fall properly from an eight-foot platform. Next he takes to the tower and finally to the air. The entire course takes four to six weeks. Practice is conducted regularly in collapsing 'chutes to prevent being pulled by the wind

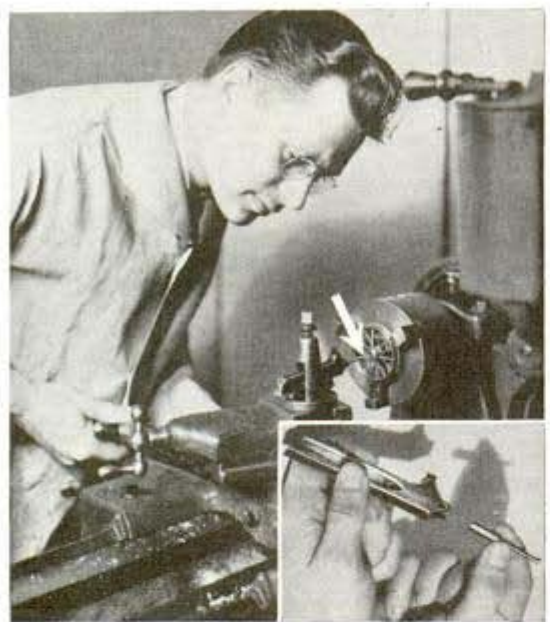
Left, leaping from troop plane in simulated attack. Right, teaching men how to fall properly from eight-foot platform is one step in training. Below, jumping from practice tower. 'Chutist is pulled to top and released for free descent



(Continued to page 155A)

2120

Any Lathe Bores Tiny Holes With Aid of Small Holder



Using small-diameter tool in holder to bore hole in model locomotive. Inset, inserting tool in holder

Small-size boring tools for lathes may be fashioned quickly and cheaply to fit a tool holder, now on the market, that is attached to the lathe. The boring of small holes is a problem, for the smallest boring tool regularly found on the market uses a bar which must have a bent or up-set end to act as the cutting point. This means that the hole to be bored at the start must be several times the diameter of the bar to give it clearance all the way around. The new holder, which can be operated on small or large lathes, has a recess accommodating quarter-inch round tool bits made from ordinary drill rod, which can be machined down to any diameter required. In grinding the end, the small tip or cutting edge is left on it, and then the bit may be hardened with a blowtorch or Bunsen burner. Thus bars of any reasonable diameter or length are readily made in the lathe, and after being hardened and ground they are ready for work.

Split-Second Switch Puts Out Arc to Guard Power Line

Accidental arcs occurring between wires on high-voltage power lines, started by lightning, wind storms and other uncontrolled conditions, are snuffed out in 1/20

512 Science Service
Jan. 28, 1941

Es. A. Matthews
National Edison Co. with

of a second by the action of switches that can be hung on the poles, thus greatly reducing the number of cases in which arcs sever wires by burning them in two. Some of the new high-speed switches are completely automatic, eliminating the unnecessary blowing of high-tension fuses (yet permitting them to blow if the trouble warrants it) and then serving to reclose the circuit when the trouble has passed. In some cases the "offender" is destroyed immediately by the arc, as when a small wire like a radio antenna falls across the lines. However, many instances occur where the fault is persistent, such as a heavy metal object that cannot be destroyed by the arc or a condition where wind may wrap adjacent wires firmly about each other. The switches can be depended upon to act correctly in all emergencies.

Safety Gun-Rest on Hunter's Belt Points Barrel Upward

Fastened to the belt by metal loops, a patented rest for the hunter's shotgun or rifle holds the muzzle aloft to avoid accidents, and reduces muscle fatigue by supporting the gun's weight. It also helps get a faster bead on game since the gun is always in readiness for quick action. Built to accommodate average-size gun butts, the rest works on a swivel permitting an inch of movement for convenience when worn on either the right or left side. It is made of steel and aluminum and weighs only six ounces.

Carl A. Thompson
5237 Chicago
Ave. S.
Minneapolis
Minn.



Gun rest, fastened to hunter's belt, relieves strain of carrying gun and keeps it handy for quick action

C. B. Burns made by R. B. Burns, Ottawa, Ill.
541 W. Washington St.

Ski-Mobile Tows Anti-Tank Gun in Snow Drill



acme.
Whiteclad ski troops of Sixteenth Infantry hauling an anti-tank gun over snow at Lake Placid, N. Y., use a "snowmobile" equipped with skis at the front end to tow the gun which also rides on skis

Over snow-covered ground at Lake Placid, N. Y., a specially constructed ski-mobile was put into service transporting an anti-tank gun also mounted on skis.

This mode of travel was tested in maneuvers carried out by Sixteenth Infantry ski troops while training for winter warfare. Track-type tread was used on the auto.

Wheeled Cane With a Headlight Aids Walking in Blackout



acme.
Pedestrian lights way through blackout in Holland with aid of headlight mounted on a wheeled stick

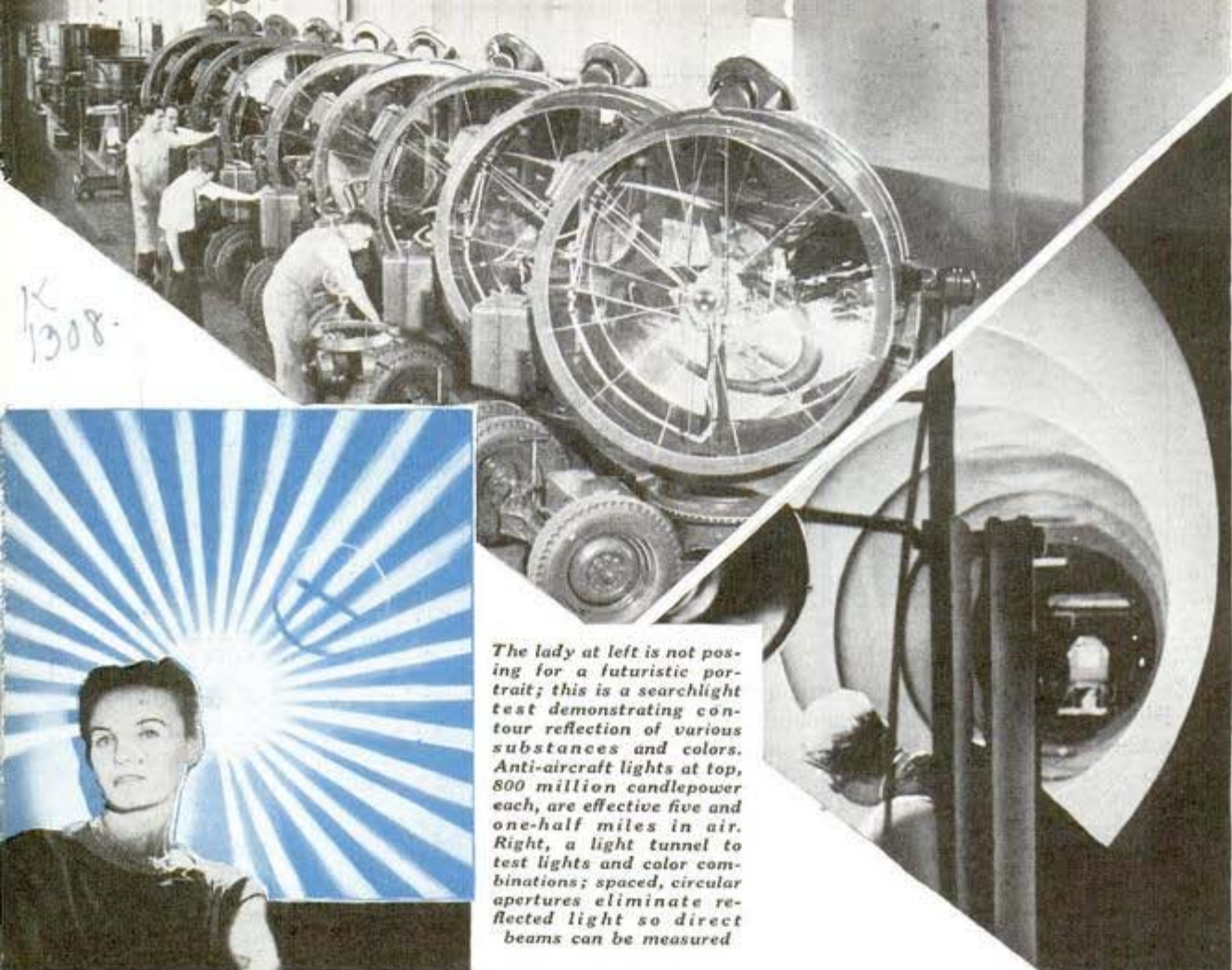
Dangers and difficulties of trudging about in blackout-darkened streets have been minimized by the introduction in Holland of a walking stick equipped with a wheel and a spotlight that illuminates the ground a few feet in front of the pedestrian. Electric current may come from flashlight batteries or from a generator powered by the wheel as on a bicycle.

262. Amsterdam.

2,656 Ports Dot Aviation Map of United States and Alaska

In the United States and Alaska on January 1, 1941, there were 2,656 airports, landing fields and seaplane bases, an increase of 205 over the figure for January 1, 1940, according to Donald H. Connolly, Administrator of Civil Aeronautics. The total includes 788 municipal and 496 commercial airports; 289 Civil Aeronautics Administration intermediate fields; 507 auxiliary fields; 21 naval air stations; 69 army fields, and 161 miscellaneous government, private and state airports and landing areas. Of these, 776 were either fully or partially lighted for night flying. In addition there are now 325 seaplane bases and anchorages, compared with 171 a year ago, fifteen equipped to operate after dark.

*Dept. of Commerce 513
Washington, D.C.*



K
1308-

The lady at left is not posing for a futuristic portrait; this is a searchlight test demonstrating contour reflection of various substances and colors. Anti-aircraft lights at top, 800 million candlepower each, are effective five and one-half miles in air. Right, a light tunnel to test lights and color combinations; spaced, circular apertures eliminate reflected light so direct beams can be measured

THROWING LIGHT



One of the army's sixty-inch lights points a searching finger in the direction of an invading airplane

THE forward march of science has been so rapid most of us have missed the significance of one far-reaching change—the overshadowing of the picturesque, lone inventor by the huge research laboratory.

Everyone knows what men like Edison and Marconi did for civilization, but no one can name the sole inventor of dozens of new things like rayon, synthetic rubber, plastics, pliable transparent fabrics, television or the modern, practical automobile and airplane. They are many-sided research laboratory inventions in which many men and many minds contributed anonymous parts.

This teamwork system may have eliminated some independent experimentation, but if giant enemy bombers ever dot our night skies we will have reason to appreciate the coordination made possible by these laboratories.

K1308 Com. Allen Warren Elliott
3438 33rd Avenue



At left, General Electric engineers test one of the five-foot, parallel beam searchlights developed for the U. S. Army. This same type is being used in defense of London. An airplane (right) is caught in the beam, so powerful that passengers in a plane twelve miles away can read newspaper by its light

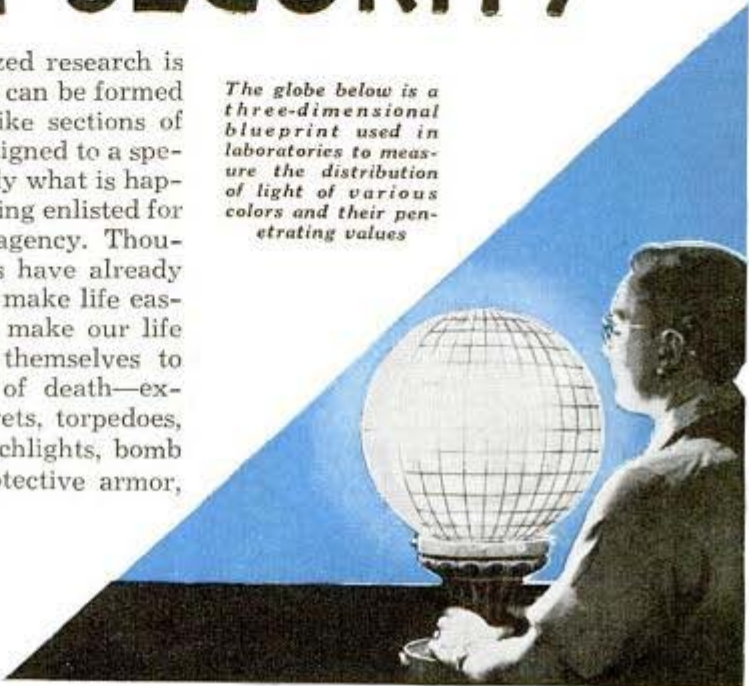


on U.S. SECURITY

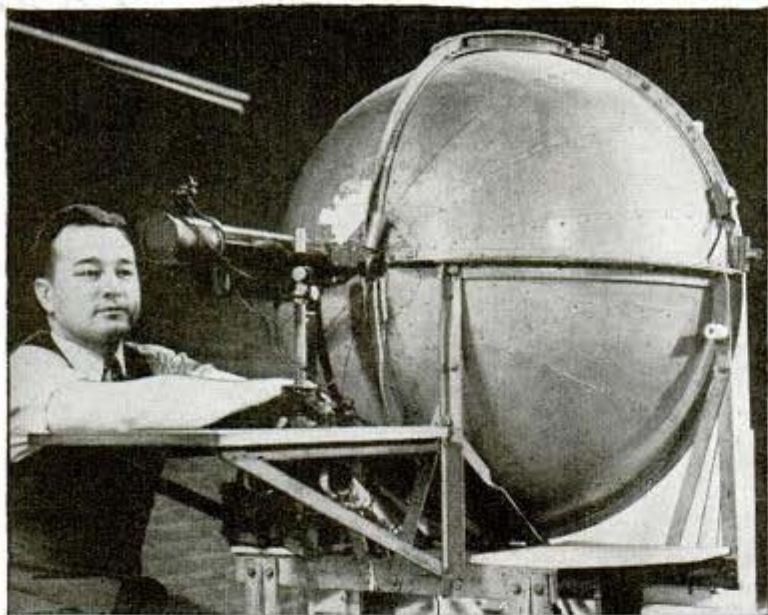
One advantage of organized research is that these trained engineers can be formed into specialized divisions, like sections of an army, and each group assigned to a specific problem. That is exactly what is happening. Laboratories are being enlisted for war duty by a government agency. Thousands of research engineers have already turned from their efforts to make life easier to a grim, new task, to make our life safer. They are applying themselves to improving the accessories of death—explosives, weapons, gun turrets, torpedoes, anti-aircraft detectors, searchlights, bomb sights, gunfire controls, protective armor, communications systems, warfare chemicals, black-out devices, gas masks and so on.

Naturally most of the results these experts have

The globe below is a three-dimensional blueprint used in laboratories to measure the distribution of light of various colors and their penetrating values



X1308



This specially designed photometer measures light output of searchlight

light on U. S. defense, for light is their specialty.

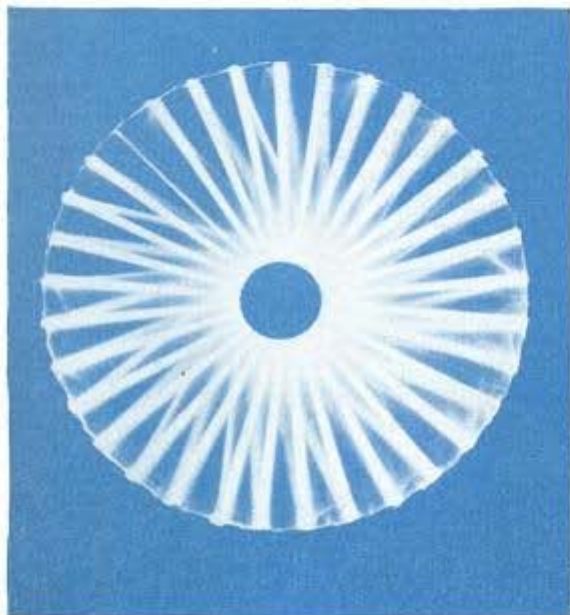
For instance, it will not be necessary to "black out" American homes and industrial plants, as they have in Europe, by turning out lights, or covering windows and doors with stuffy fabrics or solid shields. H. A. Breeding, physicist at the Schenectady illuminating laboratory has shown that a combination of blue-painted windows and yellow sodium lighting in factories and homes is one answer to this problem. Breeding uses ordinary paint treated with a special blue dye; win-

obtained are secret, so secret indeed that if war is to be the fate of this nation, Americans themselves will be surprised at some of the things they have developed. But the preparations for civilian protection already worked out by one of the dozens of great research organizations are no secret. The organization is the illuminating laboratory of the General Electric company at Schenectady, N. Y. And the activities of these scientists go a long way toward throwing

dows so treated will admit daylight. But, more important in war time, buildings can be lighted inside with sodium lights, not one flash of which will escape through the blue windows at night to guide raiding planes. A sheet of this blued glass blots out sodium light completely because, unlike daylight and incandescent light, it contains no blue to be transmitted.

The ultra-violet rays of the mercury lamp, popularly known as "black light,"

Below, horizontal section through a "stepped" reflector. Right, light from incandescent lamp shines through blue "blackout" glass held over window (left panel) but sodium light (right panel) is blotted out



can also be used if enemy air raids reach this continent. "Black light" rays are invisible to the eye, but can be detected by fluorescent paints which could be used on sign posts at street intersections to direct pedestrians, and along curbing to guide motorists.

In the event of all-night blackouts, the lighting of store windows can be so arranged as to be invisible from the sky by using low-intensity lights and special reflectors which would direct light away from the street and toward the back of the window where it would be absorbed in a dark backdrop. Luminescent paints and black light will also find application here.

General Electric engineers are experimenting with another device which would enable electric power stations to turn out street lights in five seconds without disrupting other electrical service to homes and industry, if air raids threaten. The lights can be returned to normal operation five seconds after the "all clear" signal.

At present, such quick control of street lights is not possible without disruption of all electric service or the use of expensive equipment now in operation in only a half dozen cities. Most street lights are turned on and off by time switches, or by power men who must travel to numerous control points in a city. Obviously these methods are outmoded in time of war, unless all street lights



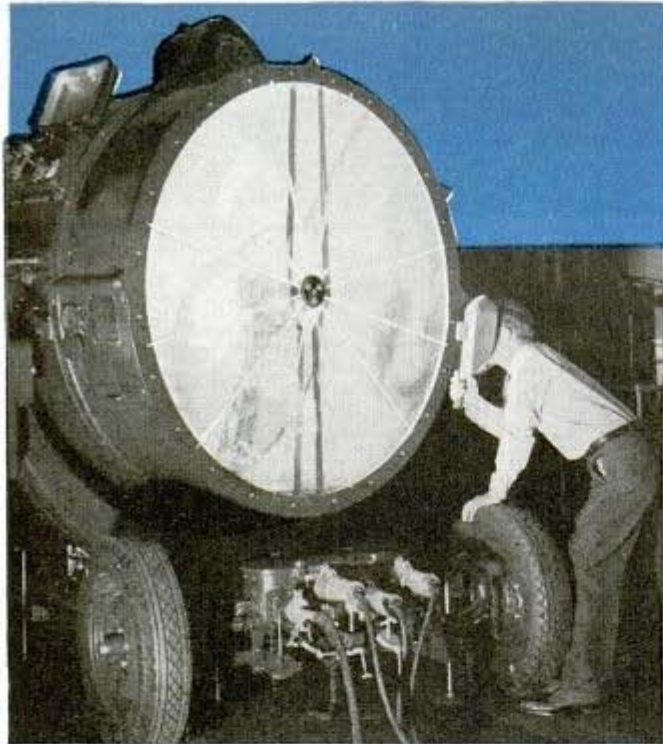
Top, new type of anti-aircraft finder manufactured at G. E. plant. Right, anti-sabotage floodlights at a war industry factory



The Venice oil fields in California are studded with lights



71308



Protected by a mask, the engineer above is studying the carbon action of an 800 million candlepower anti-aircraft "eye"

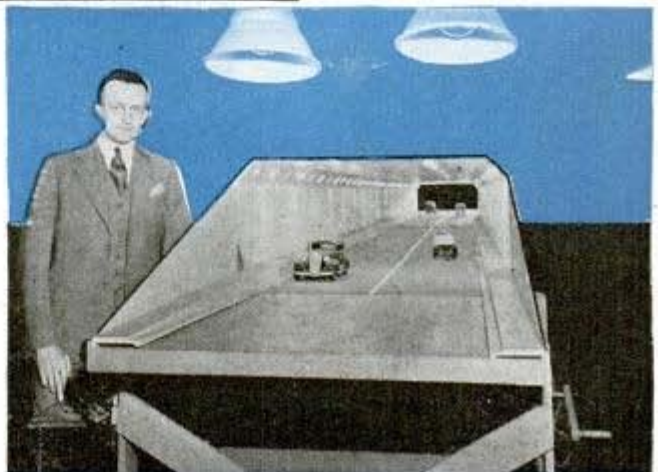
are made to operate at a very low intensity, invisible to aerial raiders. The scientists are also working on this angle. According to these experts, present street lights can be virtually blacked out by the use of low-intensity shaded bulbs barely visible to persons on the ground, and completely invisible to air raiders.

For defense against enemy planes, General Electric is building giant sixty-inch searchlights. The powerful lights spot airplanes five miles high, and help keep them at a great height where accurate bombing is difficult. These same lights can be used in coast defense work against warships, spotlighting them far out at sea and enabling shore guns to be brought into action. A newspaper can be read by their light in an airplane twelve miles away.

Many factories are already on twenty-four-hour-a-day produc-



Left, a G. E. scientist is photographed in the fluorescent glow of a softball used in laboratory experiments with "black light." The model tunnel below is used to study lighting problems of vehicular tunnels



tion schedules to speed construction of war equipment. Saboteurs will try to destroy plants and the products they are making. These agents prefer to work at night, but the illumination engineers have worked out protective apparatus—brilliant lights to protect the fences which surround most industrial plants, and high-powered searchlights atop guard houses to spot the saboteur. In restricted areas, the photoelectric eye is being employed to detect persons who try to gain access without permission.

Auxiliary lighting systems, which might be used if the main power supply fails, have been developed. These operate from gasoline generators or storage batteries and are also being built into trucks, forming portable emergency lighting equipment that will step in when central power stations are bombed. Floating power stations are also planned.

Just as the General Electric illuminating laboratory did not wait to be recruited for war time service, the functions of the research lab-

(Continued to page 142A)

L 78. From Sorbetman, by date
3.9 W. 66 the new ad

Nine-Hole 'Cue' Golf Played on Billiard Tables



Foursomes can play this billiard game designed to present problems similar to those on a golf course. No two tables can be played alike since each is fitted with hazards dissimilar from all the others

Ad. New York

Company out of business

Tables take the place of golf greens, and cues replace clubs, in a sporty game that combines billiards and golf, introduced recently in Florida. Nine pool tables complete the "course," each "hole" being different and having its own arrangement of

bunkers and traps. Sand traps and water hazards are absent, but the average player finds it difficult to break par of twenty-four. Players progress from one "tee" to another, just as in golf, and it takes a high degree of skill to match par all around.

New York, Chas. Ave. W. 83

Music Box Plays Disk Records in Old-Fashioned Tones

One hundred different melodies in the tinkling tones of grandfather's day are

possible with a music box that plays disk records. The instrument runs by clockwork mechanism and will play a dozen records on one winding. A storage box for sixty records, matching the finish of the music box, also is available.



Music box clicks melodies recorded on metal disks

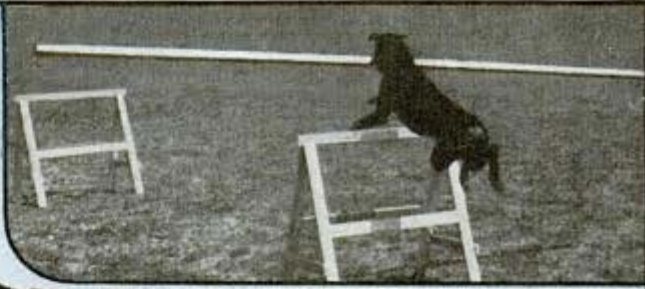
Airplane Gun Fires Backward

Said to be the first of its type, a machine gun that fires backward is being used by the British Royal Air Force. It is fitted under the plane's nose in position to guard the tail and engage attackers who come up from below. The backward-firing gun is operated by the navigator, who aims it through a series of mirrors.

New York - Thorens, Chas. Ave. W. 83

4-14-67 Conto J. Leland Plain
Box 175, El Estero, Calif

DOG "POLICEMEN"



Above, dog being trained to hold on to assailant until command to let go. Inset, dog taking the hurdles with fifteen-foot board in mouth

Palancho

Trained dogs are used in Berkeley squad cars, thus eliminating need for a second policeman to make trip except in emergencies

IN THE war on crime, policemen in several cities are being given valuable assistance by trained dogs. When some of the Berkeley, Calif., patrolmen start their night "beat," they are accompanied by alert Doberman pinschers schooled to help catch law-breakers.

Training of the dogs is under supervision

of C. A. Roy, official "schoolmaster" of the Berkeley police department's dog force and owner of the International Police Dog Training School at Richmond, Calif. At this school the dogs undergo eighteen months of training that equips them for trailing, protecting officers, facing gunfire, disarming criminals, taking sticks or other weapons away, locating hidden persons, jumping walls and other obstructions in chasing criminals, guarding officer's car when he is away from it, guarding prisoners, warning officers of the approach or change of direction of someone who is moving about, and finally, among many other things, always warning the officer of impending danger.

In Berkeley the dogs are useful in the widest variety of ways of any police department in the United States. For instance they are used in the patrol cars,

8-1967

JOIN *the* FORCE

which is an innovation in police work.

Chief of Police J. A. Greening of Berkeley, says:

"In Berkeley we have the University of California, and our dogs have completely stopped theater crashing by celebrators after big football rallies. The crowds used to force their way in without paying admission. We stationed four dogs at each lobby entrance, with four policemen four paces behind each dog. The crowd moved forward, the dogs growled, bared their teeth and advanced a step



Dog learning to wrest club from trainer (above), another being tested by trainer with burlap-protected sleeve on ability to guard anything left with it (left), and learning to scale nine-foot wall (below)

to meet them. Those in front retreated and pushed those surging from the rear into the street. We've had no trouble since the first few lessons of this kind."

An important work is training a dog in trailing by nose. Once the dog has become proficient in the country he is brought to the city and given experience in trailing on crowded city streets, through the multitude of scents which he will encounter.

Quite often police departments in other California cities call on the Berkeley department for help with their dogs. Recently a girl was reported missing in Oakland. It was thought she had been kidnapped.

A dog was taken to the scene





Dog being taught to bite ropes binding person with whom it may be working (above) and dog and officer ascending stairs to investigate door that should not be open (below)

where she was last seen talking to a man in a car. He picked up her trail and followed it for several blocks to where she had walked and gotten on a streetcar. Checking places where the car stopped revealed she had gotten off near a bus station. The dog trailed her from the streetcar stop to the bus station and later she was found in Los Angeles to which she had gone of her own accord and not as a kidnapping victim.

"My dog Fritz has been of great value to me," says Police Officer O. W. Rouse, "and I always use him on prowler calls and alarms, and in door shaking and routine checking. One occasion stands out in my mind. I was about to enter an alley after midnight to make a routine check when the dog refused to enter and indicated that something had drawn his attention down the street. Fritz, released immediately, ran to the middle of the block where he cor-

nered a man and held him at bay until I arrived. I found him carrying loot taken from a Berkeley home and a box which he used to gain entrance to windows. Later we found he was wanted for burglary in San Francisco. I was entirely unaware of the burglar until the dog notified me."

"The training of a dog begins when he is a puppy," explains Roy, "and all training is done without the whippings so commonly employed. At the age of three months he is broken to the leash. Common sense is used in the training of any dog, puppy or otherwise. It is always remembered that no dog should ever be whipped or beaten, and that it is a simple matter to impress upon him what is desired without abuse of any sort.

"Obedience training is next in line, and is very important because police dogs must obey their superiors or they are just as useless as a police officer that will not obey his superiors."

Teaching a dog to heel at command is probably as difficult as any of the obedience commands, but it is very important that he be taught this thoroughly in police work. Let's take a look at Roy's



training methods. While on the leash the dog is always kept in position, with his shoulder at the left knee of the trainer and this he must learn first in his obedience training. A short leash is used to pull the dog's head to the trainer's left thigh. Then, circling to the left, the pressure of the leg against the dog's head automatically keeps him in position. Once the position becomes familiar, and the dog falls into it naturally, the trainer starts to vary the procedure, stepping away to the right, or forward, or backward, keeping the dog always in position. All of these commands are done on the leash until the dog answers perfectly, then the leash is removed and the dog is worked without it.

Of vital importance to dogs in police work is the ability to climb and jump, for without it they are no good for chasing criminals or investigating places which an offi-

(Continued to page 118A)



Trained dog climbing ladder (above) and carrying decorated dumbbell to make task harder. Left, dog will not attack as long as man's hands are up. Below, investigating open window



L 28

Drawer in Kitchen Chair Handy for Tableware



Sliding under the seat where it is out of the way, this drawer is handy for storing table accessories

In a kitchen short of drawer space, a chrome chair with a drawer beneath the seat, now on the market, would be a welcome addition. It contains storage space for linens, napkins, silverware and towels. A small catch prevents the drawer from sliding out accidentally when the chair is tilted, but slight pressure releases the catch so the drawer may be pulled forward. The chair is leather upholstered.

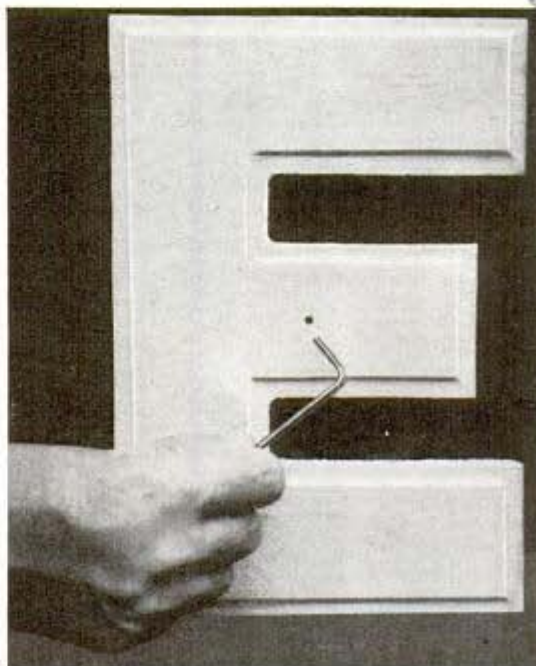
form two trowels. As a transplanter it digs the hole by removing a core of soil, then lifts out the plant, keeping the soil packed about the roots, and sets it in the hole intact. In the same way it digs holes for planting bulbs, leaving loosened soil at the bottom to receive the bulb. The tool is made of heavy-gauge steel.

Inventors Get 42,248 Patents in U. S. During 1940

There were 42,248 patents granted last year by the U. S. Patent Office, a slight decrease from the 43,030 total for the year 1939. This brought to 2,227,417 the number of patents awarded since the present system of numbering was adopted in 1836. While small numerically, the number of patents for new plants was eighty-five, nearly double the forty-five plant patents issued in 1939.

Removable Outdoor Sign Letters Permit Changes in Wording

Wording of outdoor signs may be changed easily by using interchangeable letters that fasten to a specially constructed, stainless-steel strip. The strip is countersunk for screws used in mounting it on the face of a building. The cast-aluminum letters are locked to the strip by a master key.



Small wrench shown is the master key for locking letter to strip which fastens to wall of building

Tool Used as Transplanter or as Two Trowels



Many garden tasks can be performed neatly with a two-piece tool which transplants without disturbing roots, digs or plants bulbs, serves as a gauge to measure depths and distances for planting, and can be taken apart to

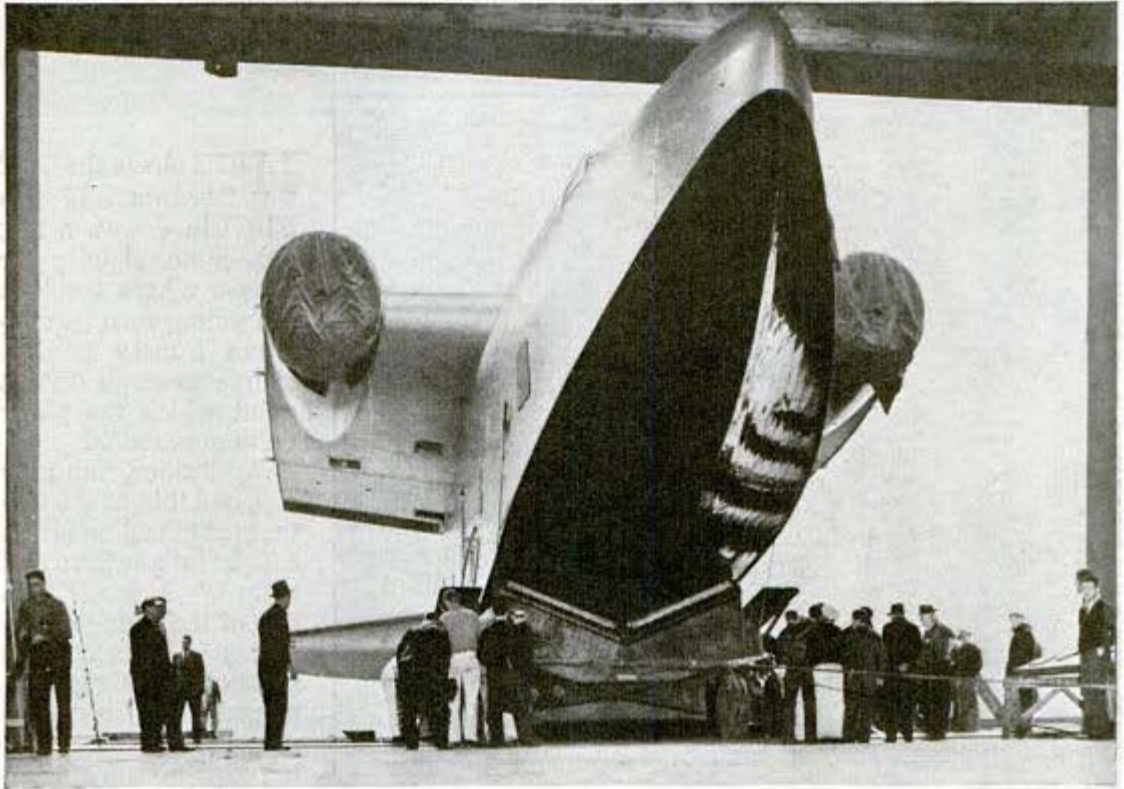
Chicago Table Co. 827 Fremont
market Chicago

new York Times June 21, 1941

Wagner Sign Service, Inc. 218 S. Hayme Ave Chicago

C. L. Products Co
Toledo, Ohio

Huge Sea Bird Awaits Wings to Take to the Air



Soon this Boeing Clipper, first of six being built for Pan American Airways, may be in British service, for it is to be resold. Here the vast hull, outgrowing its factory, moves outdoors to receive its wings

Boeing Airplane Co

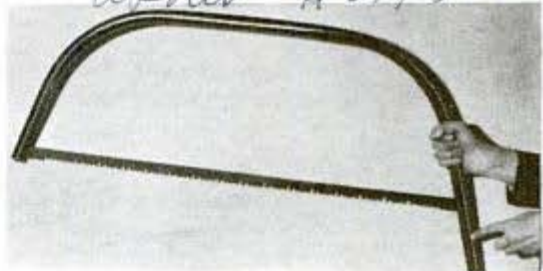
Looking like some giant fledgling bird of the sea that had not yet grown its wings, the hull of a big Boeing Clipper emerged from the plant at Seattle recently. The wings of this forty-two-ton flying boat are so broad it could not be assembled under the roof, and the unfinished craft was rolled to the launching dock to await its tail surfaces, wings, engines and hydro-stabilizers. This was the first of six clippers ordered by Pan American Airways and scheduled to take off soon from the

waters of Puget Sound. Three of the six are to be resold by Pan American to Great Britain. Identical in size and general design with the Clippers already in transatlantic and transpacific service, the new flying boats will have four 1,600-horsepower engines instead of the 1,500-horsepower units of the earlier planes. Larger propellers will be installed, fuel capacity is increased by 1,200 gallons to a total of 5,400 gallons, and cruising range is stepped up to more than 4,000 miles.

Bow-Shaped Bucksaw Frame of Steel Holds Blade Rigid

Ease of operation is claimed for an all-steel bucksaw now available, having a handle extending below the blade for a better grip. The frame, a single tempered-steel tube of great tension, rigidly holds the blade which is of highly tempered Swedish steel. Alternating round so-called raker gullets draw out the accumulation of sawdust, so fewer strokes are required. The blade becomes thinner toward the back, reducing the friction and preventing pinching as it cuts into the log.

about 2.75



Tube of tempered steel makes rigid bucksaw frame that allows clearance of fourteen inches above the blade and measures thirty-six inches overall

*Sandwich Saw & Tool Co
47 Warren St. New York*

WINGED CLASSROOMS



Above, two U. S. Army students watch instructor plot course in "flying classroom."
Below, instructor aiding student using the drift indicator

HIGH above the Gulf Stream off the Florida coast, a big four-motored Clipper drones while inside it ten young men in uniform busily plot a course to some distant point which the plane will never reach.

Mysterious, you may say, and it is, to the extent that the plane is on a flight to "nowhere and return." Actually it is one of the flying classrooms in which navigators are being prepared for the grave responsibility of directing Uncle Sam's giant bombing planes to an objective, then safely home again. And the ten uniformed men are from a class of fifty or 100 which Pan Ameri-

Below, sighting sextants through openings in roof of the Clipper

Photo courtesy
Pan American Airways



X1283

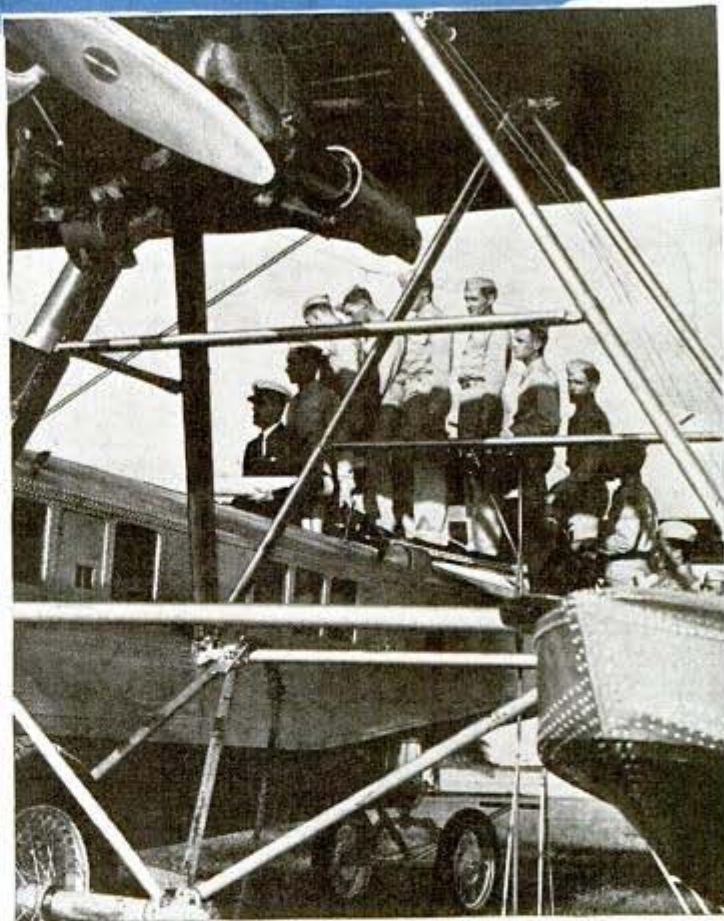
for NAVIGATORS I

can Airways will develop into full-fledged navigators in twelve weeks. Eight hundred and fifty students will complete the course by January 1, 1942.

But why train navigators; why not let the pilots do the job, as they do in the big commercial air liners? The fact is, bombing planes have grown so large in the last few years that a crew of several highly trained specialists, each assigned to a certain part of the operation, is necessary to handle an aircraft like a forty-ton "flying fortress." And bombing planes much larger are almost ready to be placed in service.

A crew for a super-bomber might include a captain, who would be chief pilot, two assistant pilots, an engineer to take care of the huge power plant, a navigator to plot the course for the pilots to reach an objective 1,000 or even 2,000 miles

(Continued to page 122A)



Above, instructor leading students aboard flying classroom at Miami, Fla.

Below, left, working with artificial celestial globe. Right, practicing with bubble octant before boarding plane



L 25

Angler Shoots Lure at Fish With Line-Casting Gun



Better aim for inexperienced fishermen is possible with this line-casting gun that holds the reel

Rankest amateurs are enabled to match the casting skill of expert fishermen with the aid of a recently patented "fish gun" that holds the reel and line. The fisherman aims the pistol at the spot where he thinks there is a fish and pulls the trigger, shooting the lure at the mark.

without damage. They are less expensive to manufacture, since they do not require the costly hand labor involved in making plaster of paris maps, and in addition they lend themselves to mass production. In the process, a wax model is prepared first, and from this a plaster cast is formed, the latter providing a pattern for an aluminum casting that serves as a mold for liquid rubber. Any printed matter or color work, normally painted by hand on plaster maps, is drawn and lettered in reverse on the back of a sheet of thin, semi-transparent rubber, which is stretched over the mold before the liquid rubber is poured in. In the baking treatment, the rubber sheet bearing the colored and printed matter is vulcanized to the finished map.

Whipped Cream Shot from Gun by Compressed Gas



Decorating a pie with the oxide-gas gun that whips ordinary cream at the touch of a button

Pour ordinary cream into a gas-operated kitchen "gun," press the button and out comes whipped cream. This handy aerator is charged with an oxide gas which forces the cream out in just the right consistency and quantity for decorating pies, cakes and other pastries. By its controlled inflation process a pint of cream is turned into one and one-half quarts of whipped cream.

Sponge Rubber Relief Maps Are Light and Flexible

Relief maps of sponge rubber, made under a process invented by Herb Jensen, of Minneapolis, Minn., are six times lighter than the plaster type now used generally in schools, museums and public libraries, and they are virtually indestructible. They can be folded, bent or rolled up like paper

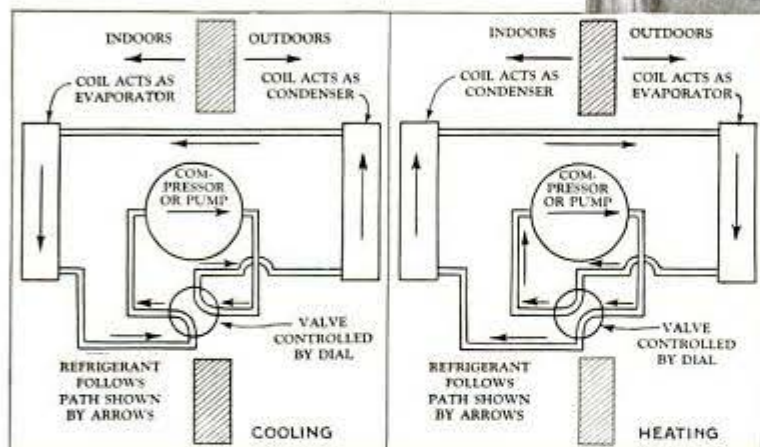


Examining samples of sponge-rubber relief maps made by pouring liquid rubber into aluminum mold

Cooler Heats Room by Reverse Refrigeration

Mansfield Ohio

By simply turning a dial, a home air-conditioner, which cools the room by refrigeration in summer, can be thrown into reverse to deliver warm air instead of cold. Designed to fit in any ordinary window, the Westinghouse Mobilair unit operates from an electric outlet. As a cooler it works like an electric household refrigerator, extracting heat from the air in the room and discharging it through a coil outdoors. To warm the room, you turn the dial, thus reversing the flow of the refrigerant gas. The outdoor coil then becomes the evaporator, absorbing heat units from the outside air. The gas, retaining the heat, is



Diagram, above, shows how flow of refrigerating gas is reversed in coils by turning the dial, but does not change its direction through the pump. Upper right, unit as it appears when installed in a window at home

pumped back under high pressure to the indoor coil, which is now the condenser. As room air is blown over the latter coil it picks up enough heat to keep the room comfortable in chilly weather. The amount of fresh air brought into the room also can be regulated. A unit is easy to install, since it is self-contained and requires no connection with the plumbing.

False Teeth Are Made for Pet Dog by Dental Mechanic

Sympathy for his toothless pet bulldog led a Chicago dental mechanic to prepare a set of "store" teeth to take the place of the missing ones. With the aid of the new dentures, Buster again can display a row of threatening white teeth to intruders and in addition find renewed enjoyment—at mealtime.

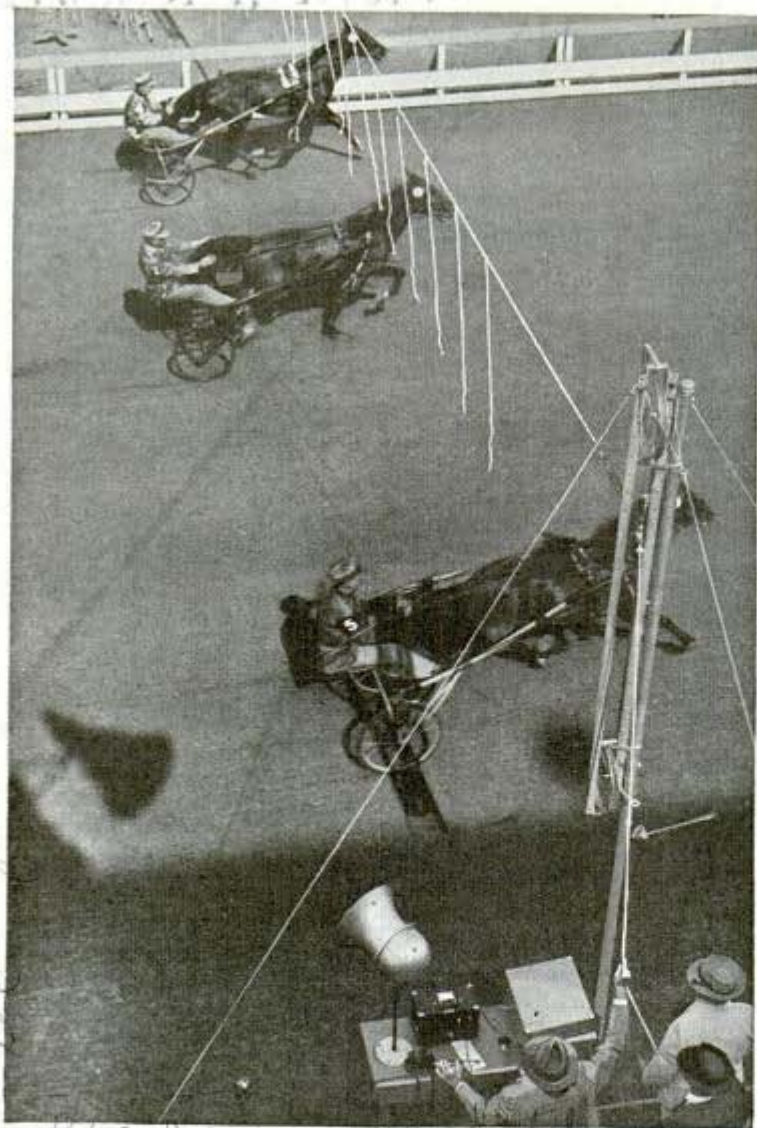


Left, owner adjusting artificial teeth he made for pet bulldog. New equipment, right, restores chewing ability

Max Finkel (Chic) Chicago

X 14 26

Cable Gate Starts Race on Phonograph Signal



At the "go" signal sounded by a phonograph record, a cable barrier stretched across the track at Pomona, Calif., is lifted out of range and the race is on. Suspended from the cable are knotted thongs resembling guards hung over railroad tracks near tunnel entrances. The starting gate keeps horses and drivers in line while a phonograph record counts out fourteen through a loud speaker, and then it releases them simultaneously upon the signal to go.

They're off! The operator has just sprung the cable barrier, lifting the knotted thongs high overhead to start the race. Located in the foreground, the turntable and loud speaker count out fourteen before giving the signal to go. Before the race begins, the cable remains stretched across the track in lowered position to keep the horses and drivers back of the starting line

Air Corps 'Twas War Sec'd
Chief of Air Corps, Dayton
Wright Field

X 13 82

Dials of Plane's Instrument Panel Glow in Invisible Light

Fluorescent lighting has been employed to illumine the instrument panel of army airplanes without throwing a glare into the pilot's eyes. Luminous paint is applied to standard instrument dials, and is made to glow under the invisible light from three fluorescent lamp assemblies mounted between seats and instrument board. Figures, scale divisions and range markers on a score of instruments shine softly but clearly, some red, others vivid green. A special four-watt, six-inch ultra-violet lamp was developed, and a filter glass shuts out the germicidal and sun-tanning rays that might be injurious to the pilot.



Battery of ultra-violet lamps making dials luminous can be seen at center of this Air Corps photo

Material used by V. L. Air
Wright Field
Cleveland, Ohio

K 1235

Cont. Thos. E. Stinson, Jr.
10442 Debron Lane,
Los Angeles
Calif.

WILD GAME - Our Latest Crop



SPORTSMEN are bagging hundreds of thousands of wild animals and birds in the United States every year but if it were not for these same hunters our wild game would long ago have disappeared.

This paradox is due to the fact that civilization has usurped much of the feeding and grazing land that wild life needs. Deer have been driven into the mountains; wild duck have been robbed of the marshes. Sportsmen, alarmed by the dwindling game, have sponsored strict game laws to limit their own bags and are putting through conservation programs to put wild game on a crop basis. State fish



Top, fawn raised in California state refuge for release in wilds; below, preparing to turn loose a wild turkey

APRIL, 1941

Ref: C. S. ~~Baldwin~~ ^{Baldwin}, California
State Fish and Game 531

Commission, State Bldg.
Los Angeles, Calif.

K1235



Game wardens release partridges on abandoned farm land

and game commissions, and the Fish and Wildlife Service of the federal government are engaged in comprehensive programs of wildlife restoration. Two hundred sixty-four national wildlife refuges embrace more than 13,000,000 acres. Purchased with money from direct taxes on hunting equipment, the sanctuaries are also a vital part of the plan to control dust and erosion

bits and game birds, thrive in agricultural areas. Seventy per cent of the game killed in Michigan comes from private farm lands. Landowners can help conservation by providing food and cover for wildlife, leaving clumps of brush in the fields and along fences, and sowing small areas to seed for birds. In return, the landowner can charge hunters for permission to hunt

areas and to remove submarginal lands from cultivation.

Game management has been put on a scientific basis at the same time that hunting and fishing have gained recognition as big business. Bird farms have been established for replenishing wild flocks in depleted areas and laboratories have been opened for studying and controlling wild life diseases.

Counting ammunition, food, and travel costs, sportsmen spend \$150,000,000 a year in pursuit of game. The value of food and fur obtained in Maine alone is estimated at a million dollars a year, exclusive of the tremendous benefits to agriculture that game birds provide in consuming weed seeds and pests.

Recently the conservation program has been broadened to enlist the aid of farmers because most upland game, including rabbits and game birds, thrive in agricultural areas.

The game warden at left, below, is loading an explosive bomb into a mortar to frighten ducks away from rice fields. At right, a pheasant wins its freedom after being raised in captivity



over his land. In California an owner of 120 or more acres may be licensed to stock his grounds with game birds and charge a fee for hunting them. He may set his own bag limits but no more than eighty per cent of the birds in the flocks may be killed, in order to leave breeding stock. "Game farming" is a profitable adjunct of ordinary farming.

Disease, predatory animals, and nature kill far more game than are killed by hunters' guns. Last year bullsnakes destroyed forty per cent of the wild duck eggs on one 43,000-acre Nebraska sanctuary. Skunks, crows, and magpies are also destructive. More than 100,000 coyotes, wolves, bobcat, lynx, and mountain lion are captured each year by game authorities. Four hundred bobcat alone were taken in Wyoming last year and fifty-nine wolves were captured in Missouri. Still,

(Continued to page 130A)

Attwater's prairie chicken, top, once on verge of extinction, now is found in four Texas counties. About 8,700 of the species are estimated surviving. Right, netting quail to be banded and released



Above, feeding water and oatmeal gruel to rescued Canada goose with medicine dropper at "bird hospital" in Lake Bowdoin National Wild Life Refuge, Montana. Right, wild ducklings hatching from eggs in a test incubator at game refuge



119 National Pickbuilder Club, Inc.
119 W. 57th St. New York

Toothpick Modeling Is Fast-Growing Hobby

see ad (157a) Mrs. Stein

Mr. M. Russell Stein,
founder of club



Ferris wheel, above, driven by small motor, required 25,000 toothpicks and was built in one and one-half months of spare time. Model builders, upper left, are constructing a fire tower from plans; part of Eiffel tower base may be seen in background. At left is model of Pennsylvania type truss bridge

With a supply of toothpicks, a tube of household cement and simple tools, models of bridges, towers and other steel structures can be built. The cost is nominal, since only a few hundred toothpicks are required for the smaller models. The largest ones such as a seven-and-one-half foot copy of the Eiffel tower, may take more than 30,000 pieces. This new hobby is

growing fast under the sponsorship of the National Pickbuilder Club, organized to supply its members with specially designed plans, ranging from playground slides, houses and cranes to Ferris wheels, giant swings and various types of bridges. One cantilever bridge model is nine feet long, and there is a five-foot arch bridge that can carry a fifty-pound load.

Electric Urn in Table Lamp Serves Piping Hot Coffee



Urn in lamp base pours coffee from a small faucet

Coffee may be kept hot at the table in an urn that forms a decorative crockery base for a table lamp. To pour coffee into the urn, the top which holds the shade is removed. There are two switches, one for lighting the lamp and the other to turn on the urn's heating unit, a single cord supplying the current.

Some Fish Grunt, Bark or Drum While Others Can Sing

If you ever use the common simile "dumb as a fish," it would be well to specify the species, since scientists of the U. S. Fish and Wildlife Service remind us

C. W. Alexander Co
merchandise mark

Science Service
Can. 3, 1941

L 44.

that many fish make sounds even though they have no vocal cords. The noises range from grunts and barks to actual musical notes. Most audible fishes produce their sounds by vibrating their air-bladders, either by rapid tugs of attached muscles, or by sliding muscles over the tightened membrane; others grate their teeth or rasp with their gill-covers. The most musical of American fishes is the singingfish, also called the midshipman, that lives in the Gulf of Mexico and in the Pacific ocean. Fishes named for the grunting, drumming and croaking sounds they make are the pigfish, grunt, drumfish and croaker, the latter being regarded as the loudest of all our native fishes. The sound of the conger eel is a bark.

R1396

Shoe Has Washable Upper Attached to Sole by Snaps

Storothy Peacock

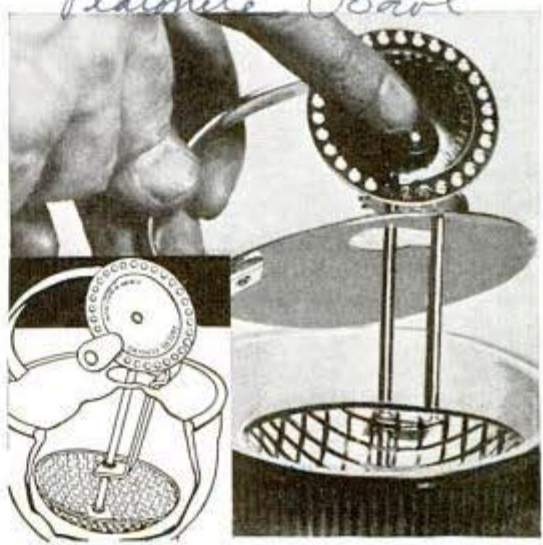


Upper part of sport shoe may be detached from sole for washing, and snapped back in place after drying

As easy to clean as a pair of gloves, washable kid sport shoes now on the market have uppers that come off so they may be laundered separately. The uppers are fastened to the soles by "invisible" snaps.

Whipper and Bowl Combination Beats at Proper Angle

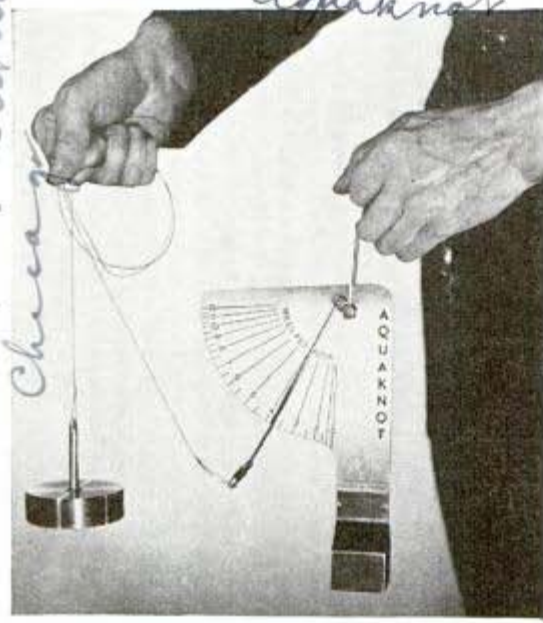
Beating at the angle used when whipping cream with a spoon, but with less physical exertion, a covered cream whipper spins the beating disk in an up-and-down motion that breaks up the cream and aerates it. The cover prevents spattering.



Bowl cover, attached to handle of cream whipper, holds beating disk at angle shown in the inset

Speed of Yacht Checked by Hand with Portable Indicator

Amahnak



Quadrant shows boat's speed in knots when weight, here held in right hand, is lowered into the water

Yachtsmen need no longer guess at the speed of their craft, if they use a portable speed indicator operated by hand alongside the boat. There is nothing to be installed or attached. You merely hold the device over the water about ten inches from the boat, either port or starboard, at a point somewhat forward of midship. The sinker, connected to the indicating arm by a steel cord, is lowered into the water, and the speed of the boat in knots is read from the scale on the quadrant. For high free-board yachts, an extension cord is used.

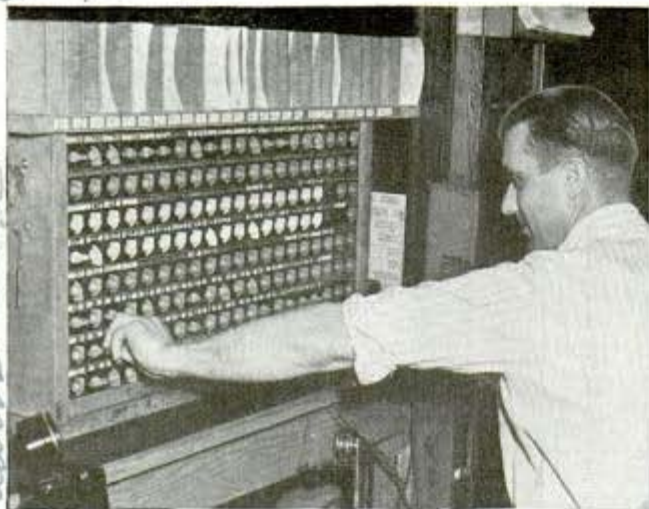
Antoine, 9 N. Wabash
Chicago
Von Zengerke

Peacock - Shoe Co
St. Louis Mo.

Platonite Bowl

The Washburn Co 535
Rockford, Ill.

Marshall Perham Perry
1128 Stearns Ave
K/10 45



Here is a typical dispatcher's panel where activities of various agents are recorded by turning a knob

SETTING SPIES to CATCH SPIES

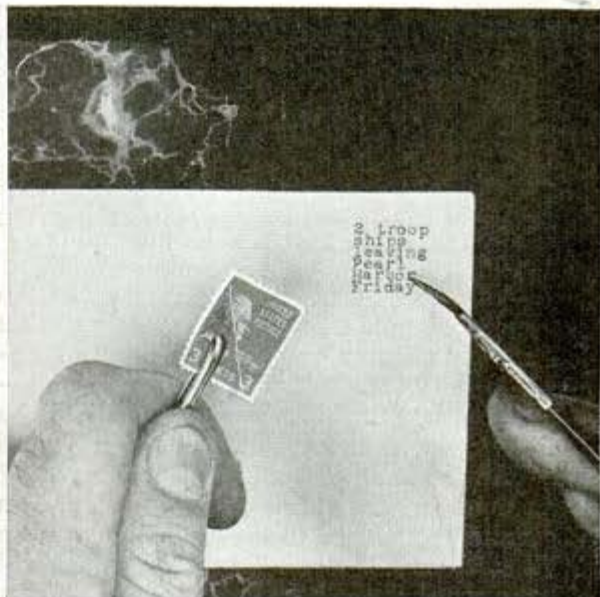
FOREIGN agents may have well-laid plans to sabotage American railroads and harbors, to blast key factories and to sever our vital lifeline, the Panama Canal. But Uncle Sam is not asleep. Quietly he has already set spy against spy, cataloguing the agents of potential enemy powers against the day when he may have to strike.

In the world war our counter-espionage service proved itself the best ever organized; today, fortified with the technological progress of the last quarter century, it is poised ready for any emergency.

The peacetime function of counter spies is to learn the identity of foreign-intelli-

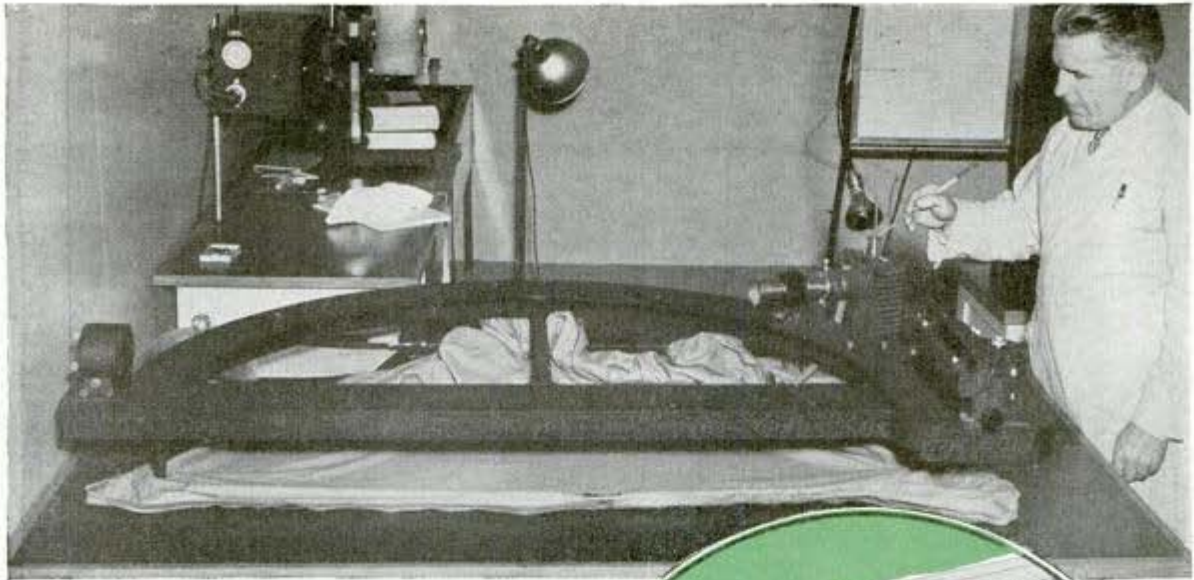
gence agents, but to watch rather than apprehend them. The reason for this is seen in a dramatic victory of the British Secret Service. When war broke out in 1914, they had long known where to lay hands on the best German spies, but refrained from doing so until hostilities broke. Then in a matter of hours, the German Intelligence Service in Britain had faced a firing squad.

This alone was a crushing blow for Germany. But Britain went still farther. Berlin knew nothing of what had occurred, so the British continued to send messages, using the spies' names and codes. German armies and ships were led into trap after



From broadcast headquarters at left, messages are flashed and received by short waves. Secret message hidden under postage stamp (right) is revealed by brushing stamp with chemicals to dissolve glue

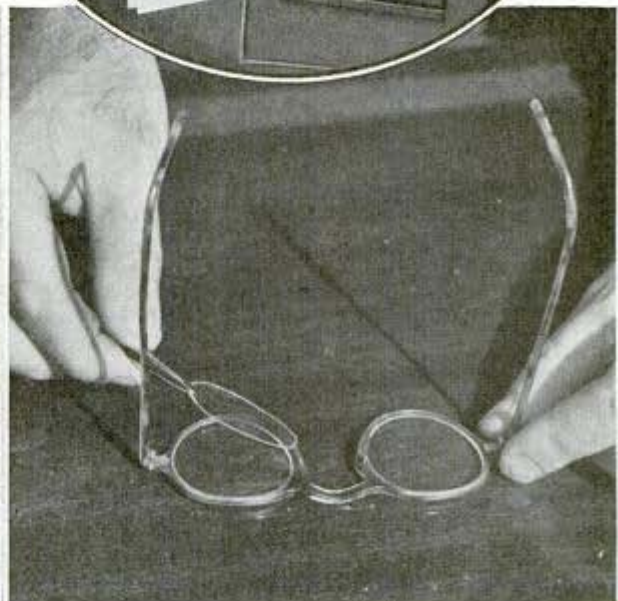
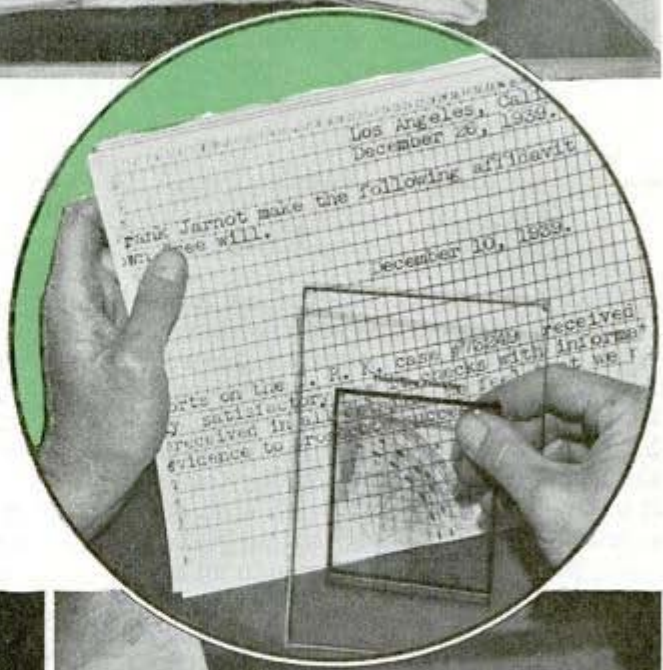
K1045



Top, spectrograph analyzes substance heated in oven and records findings on film. In circle, measuring the arc and angle of typewritten letters for identification

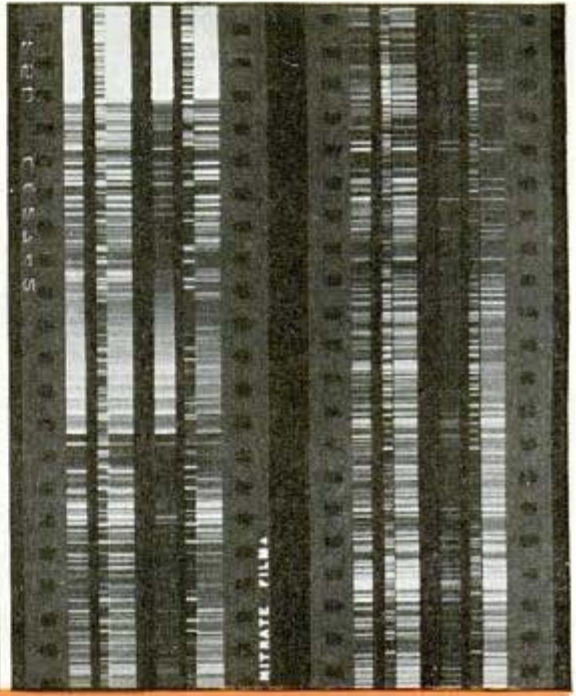
trap before Berlin realized what must have happened. German Intelligence in England was hamstringing the rest of the war.

This is the technique of American counter espionage. They make few arrests, but they have names and data on innumerable spies and every furtive move is followed by unseen American eyes. At first, this looks impossible. With countless foreign agents



Left, searching clothing with microscope lenses for invisible writing. Right, tiny messages written with invisible ink on transparent paper and pasted to an eyeglass sometimes escape discovery

R10 45



At right is a spectro-analytic film from which the expert can discern the elements in the substance studied; at left the film is being placed in projection machine

operating in a vast country, the efforts of every loyal citizen seem required to watch them. What is to prevent them from giving their pursuers the slip—they are extremely clever at such things—and showing up where they are unsuspected to continue spying? Modern technology renders it unlikely. Men cannot watch each other constantly, but machines can.

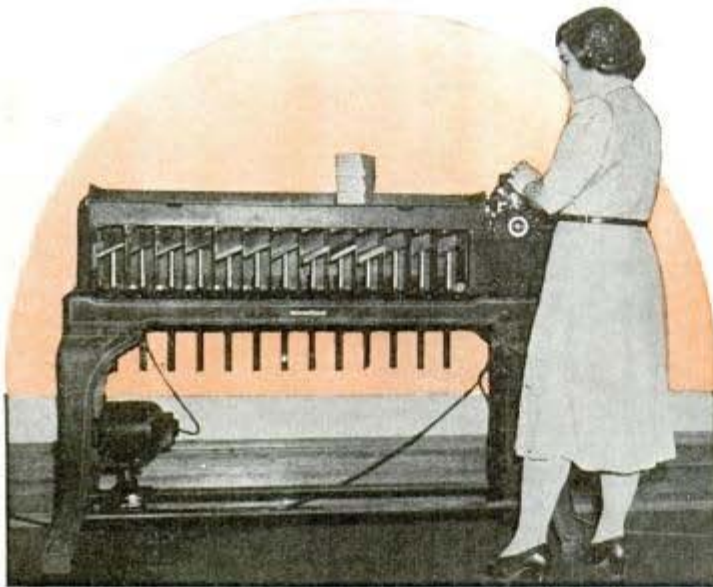
Suppose an expert mechanic in an east-

ern factory is suspected of spying. He is thirty, height six feet, weight 185, has blue eyes, brown hair, and a trace of foreign accent. With this bare data on him, it will be almost impossible for him to go elsewhere and continue spying, no matter how cleverly he slips away.

But one day he tries it—vanishes. The agent watching him reports to headquarters, where the spy's file card is noted.

Then everybody waits. Presently a batch of names of applicants for employment in a western aircraft factory comes through on the Teletype for checking. No one notices that the description of an expert mechanic corresponds with that of the missing spy; no one has to. A machine operator merely punches holes in a card for each name, file cards are pulled, and all are piled in a sorting machine.

When they come out, the card of the expert mechanic with the foreign accent and the card of a job applicant are together. This does not prove he is the missing spy, but it warrants investiga-



This sorting machine is one of the most efficient robots in counter-espionage service, making the apprehension of spies mechanical

tion. Teletype flashes instructions to give him a job, and obtain his fingerprints without arousing suspicion. Headquarters probably has his prints already. If not, the program of fingerprinting all aliens will soon remedy that.

Later, the suspect, working at his bench, lays down a wrench. His neighbor unobtrusively stirs up dust, which settles on the handle, bringing fingerprints into sharp relief. Then he stands above the wrench and a hidden camera photographs that wrench. Counter espionage will soon know if the missing spy has been found.

Once this would have been impossible. Men could not possibly sort by hand the bulky files necessary to keep track of thousands of individuals by description. Sorting machines do the job in a few seconds.

But why does Intelligence suspect a man is a spy? If he is clever, won't he avoid throwing suspicion on himself? Perhaps, but someone else is likely to throw suspicion on him. All spies are part of organizations. There will always be one spy who will brag too loudly, or spend more than his salary, or get clumsy trying to steal secrets. He will be watched constantly. His mail will be scanned. This may lead to spy headquarters. If so, Intelligence will watch mail entering and leaving the place. Often letters coming to such a place will have no signature. Counter spies learn who wrote it by teletyping headquarters, "Who could know—" and repeating the message. Again the sorting machines go to work. A list of suspects is compiled. Counter spies investigate each individual. A sample of his handwriting or from his typewriter is measured against intercepted messages for comparison. A bit of his stationery will be taken for spectro-analysis to see if the intercepted message is on the same paper.

Spies have devised many clever means to shoot messages past counter agents. Writing a message on transparent paper with invisible ink, and pasting it to an eyeglass is one that still works. Writing minutely under a postage stamp is another. Maps have been drawn on women's fingernails and covered with polish. An Oriental importer was a known spy, but they couldn't find where he concealed messages until someone realized that Chinese characters decorating pottery, statuary, etc., were in reality writing in Chinese. Even the

(Continued to page 133A)

APRIL, 1941

Powerful Telephoto Lens Films Effect of Bombing



This long-range camera is focused on English coast across the channel to film the effects of Nazi bombs

While Nazi bombers drop explosives on the English coastline, photographers of the German army take long-distance pictures from across the channel to record results of the bombardment. The cameras, equipped with powerful lenses, are set up on the coast of German-occupied France.

Extra Head of Screw Comes Off When Driven in Permanently

There is a two-headed screw for use in places where the screw is to be left in place permanently. The upper head has the conventional slot for the screwdriver, and after it is driven into place the top is decapitated with a chisel or saw.



Drawing shows where slotted head is sawed off, leaving smooth-head screw or bolt permanently in place

Stanley Tool Co. 539
New Britain, Conn.

K 1479

Flash Bulb on Flexible Arm Casts Light from Angle

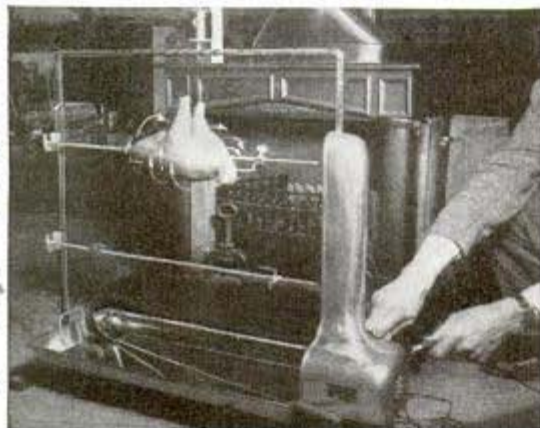


Extending from the flash gun on a flexible holder, bulb and reflector light scene from various angles

Greater leeway in taking flash pictures is permitted with a flash gun that carries the bulb on a flexible steel stem, so the light may be directed at the subject from any angle, regardless of the position of the camera. An adjustable reflector on the flexible arm focuses the light beam for distant or close-up shots.

Revolving Spit for Home Fireplace Aids in Roasting Meat

Driven by a small motor plugged into the wall socket, a portable spit revolves



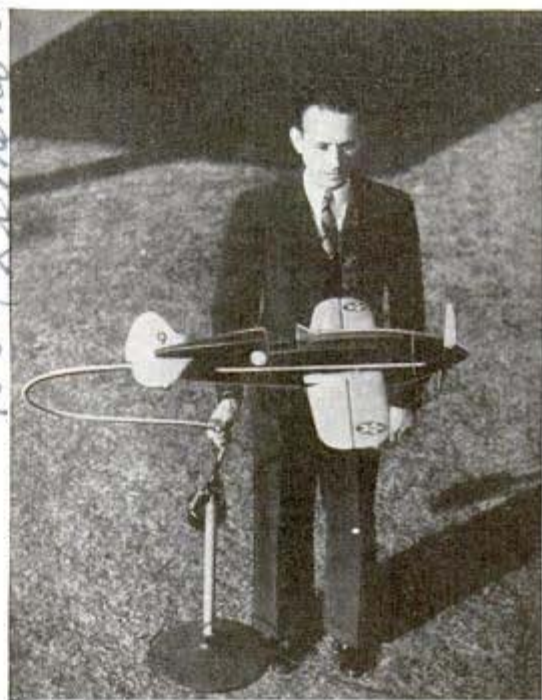
Fowls or large chunks of meat can be roasted before your own fireplace on this spit rotated by a motor

the roast or fowl before the home fireplace at the right speed suitable for cooking. A large drip pan below catches the drippings, and a large ladle is furnished for basting or retrieving the juices.

1481

Training Plane Anchored to Pylon Teaches Flying in Safety

Student pilots soon will be making their first solo flights in a captive airplane which is regarded as crashproof and foolproof. A model of the training plane has been built by the inventor, Elden Dale, to demonstrate how the plane, anchored to a pylon by a curved arm, will take off, perform maneuvers and land in safety. In operation the craft flies around the pylon at any speed, a bearing at the top supporting the weight of the motor, plane and arm. The



Working model of captive training plane that can duplicate many maneuvers without danger of crashing

full-size trainer will be designed to do both an inside and outside loop, to spin, dive, fly upside down or bank, responding instantly to the pilot's control. At the juncture of the pylon and arm is a patented steel safety device which will always land the plane on its wheels and prevent the propeller or tail from striking the ground. The inventor states that remote control could be installed, allowing the instructor to control the ship from the ground.

Von Lengerke - Antoine
of H. Wabach, Chicago

Low speed drive / height
2 20 5 1/2 in

100% Superior Air Long Beach Calif

Elden Dale
Dale Electric Airplane Co

214. Crazy Wars April at 8:30
 new or

Squid Fishing Introduces New Sporting Thrills

Fishing for squid as performed by members of the Michael Lerner expedition to South American Pacific coastal waters, conducted for the American Museum of Natural History, might well be the envy of many an angler who craves new deep-sea excitement. Big-game fishing methods were followed, the fisherman handling a large rod and reel with a line equipped with gang hooks baited with chunks of other squid or fish. Those caught ranged from four feet to an overall length of eight feet, the largest weighing about 100 pounds. Squid are quick to bite but hard to hold, and a fair average is the boating of one squid out of every eight hooked. Their tentacles and sharp, parrotlike beaks make them fierce and dangerous fighters. The fishermen wore hoods to protect their faces from the inky fluid ejected by the squids, as the liquid is irritating if it gets into the eyes.

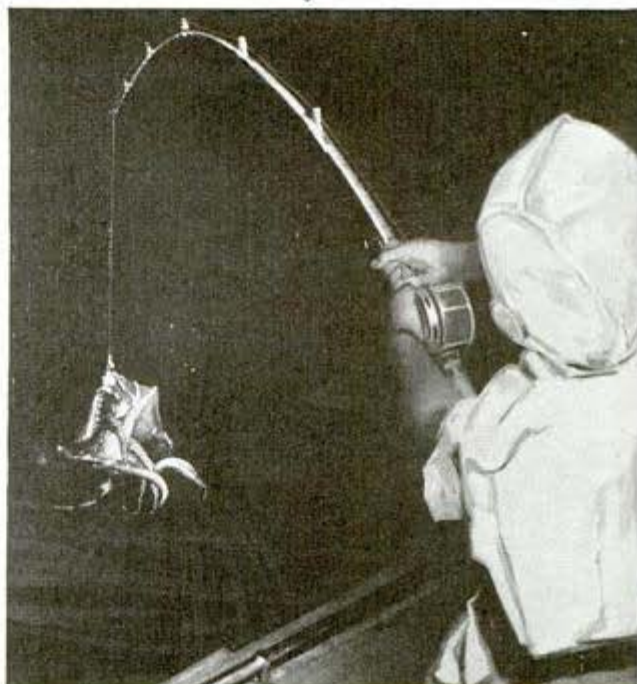


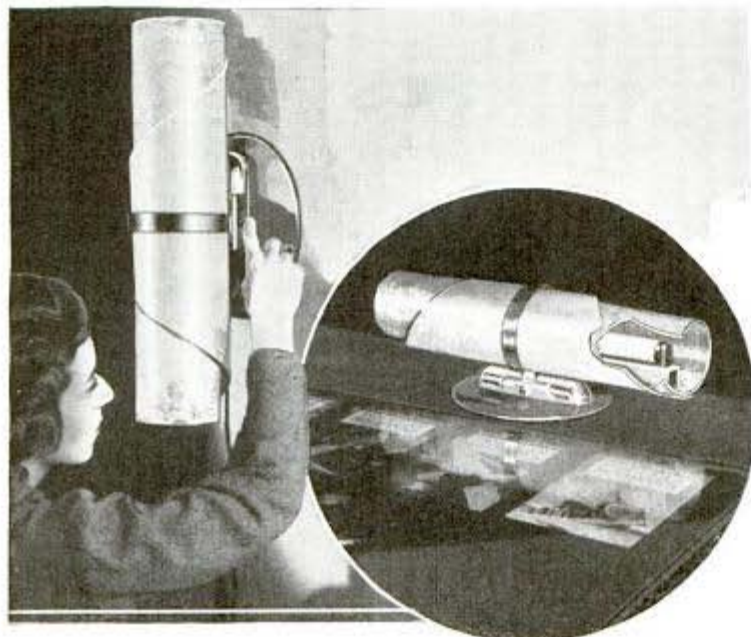
Photo by David Duncan for Michael Lerner-American Museum Fifth Big Game Fish Expedition
Pole bends under heavy tug as fisherman, wearing white hood to protect his eyes, attempts to land the squid he has hooked

223

Fluorescent Pin-Up Lamp Shade Spreads Glareless Light

Wider use for fluorescent lighting in the home is made possible with the introduc-

tion of a "pin-up" lamp using a tubular bulb. Simple to install, it is hung on a nail or screw driven into the wall, and the cord plugs into any convenient outlet of 110-120 volts alternating current. A translucent shade made of Lumarith in the form of a scroll that covers the entire tube prevents glaring light from striking the eyes. The lamp may be hung on the wall over a mirror, used as a bed lamp, or it can be placed on a desk or end table.



Pin-up fluorescent lamp, its tube shaded by scroll of translucent Lumarith, may be hung on wall, as at left, or placed on top of desk, right

APRIL, 1941

Fluorescent for hire mfg Co.
 1260 S. Michigan Ave Chicago

Ⓛ Bowling alleys built of steel instead of wood, and conforming to standard regulations of the sport, have just been introduced. The balls return to the bowler through an underfloor tube.

Essex Bowling
 Co 95 2866 E.
 41st Chicago

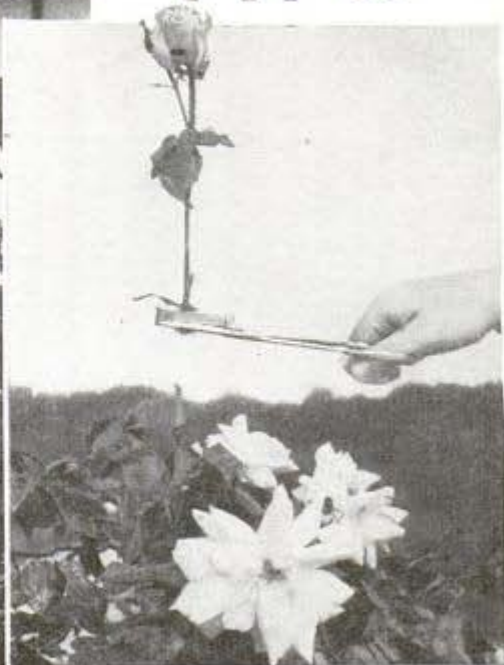
K1106

see Arch 1940
5-34
Thomas & Swinemore Jr
Los Angeles
10442 Lebrun Lane



For the home gardener many decorative and useful articles are appearing on the market. For instance there is a figure made of metal strips (above) which holds a flowerpot in each arm and which has a ring of smaller pots extending around the "skirt." The figure makes an attractive addition to the lawn or flower garden. At right, a kneeling box with sponge rubber pad makes garden work easy and comfortable

TIPS



Here is a useful tool, gardening scissors, for cutting flowers (above). It has a grip of spring metal on each blade that grasps the flower stem when it has been cut. Flowers can be removed from the plant with only one hand in this manner



Left, slow-flow baffles at the end of this aluminum-rod extension of the garden hose slow down the flow of water and prevent the soil from being washed away. This method of watering also reduces damage to plants caused by a hard stream striking them



Ref: Paul J Howard
 Horticultural Establishment K1106
 11700 National Blvd
 Los Angeles
 Calif

for the GARDENER



Above, weed puller for removing dandelions and other undesirable plants from the lawn has two stout prongs. The ball on the handle serves as fulcrum for pulling weed up by the roots. Right, heavy metal tamper drives small holes into lawn for aerating roots and to admit water. This tool is especially useful where the lawn soil is in packed condition



Above, gardening apron of heavy cloth has large pockets, a chain for carrying scissors, clips for holding gloves and a padded inset across the bottom for kneeling. The lower half of the apron may be removed by means of a zipper. In addition to being useful to the garden worker, the apron protects the clothing from earth and plant stains



Left, seedlings planted in containers of thin wood instead of ordinary flowerpots may be transplanted, container and all, in the ground. The containers are wide bands of thin veneer, similar to the material of which strawberry boxes are made. They have open bottoms and are absorbed by the soil within a few weeks after they have been transplanted. This idea will save considerable time for the amateur gardener with little knowledge of proper methods of transplanting

Ref: Paul J Howard
 Horticultural Establishment
 11700 National Blvd. L.A.

Tier Table with Mirror Top Does Make-Up Duty



Mirror in upper tier tilts at convenient angle for applying cosmetics. Inset, attractive tier table

Its upper tier equipped with a mirror top that may be tilted at any angle, a new tier table does extra duty as a make-up table. It may be placed at the window in a position that will give full advantage of daylight. The lower tier is handy for holding the cosmetics. As a tier table it is smart looking, the top locking in level position for holding a lamp or decorative article.

Adjustable Angle-Marking Tool Solves Cut-Off Problems

Problems of cutting structural wood or metal at correct angles are solved easily with the aid of an adjustable measuring and marking tool that combines square, protractor, rule and several other features in one unit. If a timber is to be framed on a diagonal, it may be figured either on the square or protractor. Then the tool is set

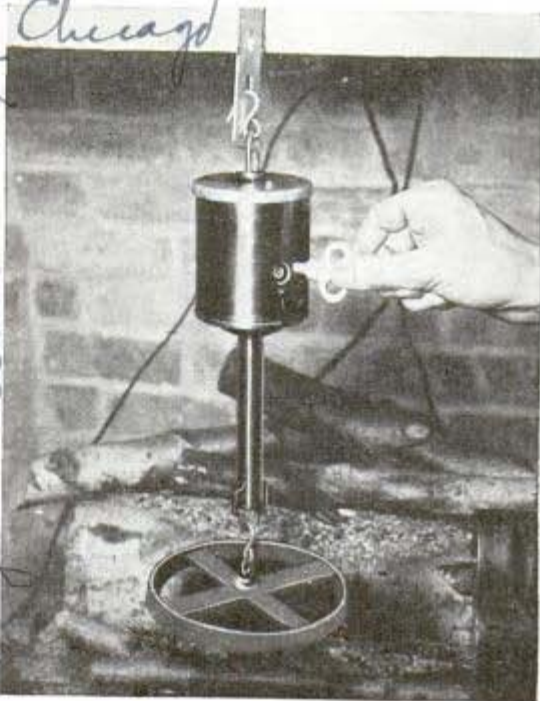


Automatic tool for laying cut-offs figures out the angles in marking ends to give them the right pitch

for that angle, the cut along the width is marked, and the joining cut along the width is determined automatically by an adjustable guide. At the same time the necessary angle for the other end of the stick, to give it the correct pitch, is figured. If notching is necessary, to cross another member, that is figured automatically also. In this way complex cut-offs may be solved in one operation.

Clockwork Turns Roasting Jack to Cook the Meat Evenly

Roasting meat before the fireplace in the old-fashioned way is a chore if someone must stay at the fireside to turn the roast or fowl constantly. However, a new English roasting jack is equipped with a clockwork mechanism to rotate the meat continuously. Wound up by a key, it will run



When clockwork of this roasting jack is wound up, it will turn meat for two and one-half hours

for two and one-half hours, rotating for two or three revolutions in one direction and then reversing. Several small fowl can be hung from the wheel, or a large roast may be suspended from the hook underneath. Fully fifteen pounds of meat can be accommodated thus.

☐ Railroads have invested approximately \$80,000,000 in streamline trains.

246

Huge Relief Model Shows Entire U. S. Area

Constructed on a scale of four miles to an inch, a large relief model of the United States has been completed at the Coleman Map building, in Babson Park, Mass. To facilitate its assembly, the model was prepared in "degree blocks," each block representing an area bounded by one degree of latitude and one degree of longitude. The relief contains 1,216 such blocks, and is sixty-five feet long and forty-five feet wide.



Relief model of United States, made up in "degree blocks," gives bird's-eye of country

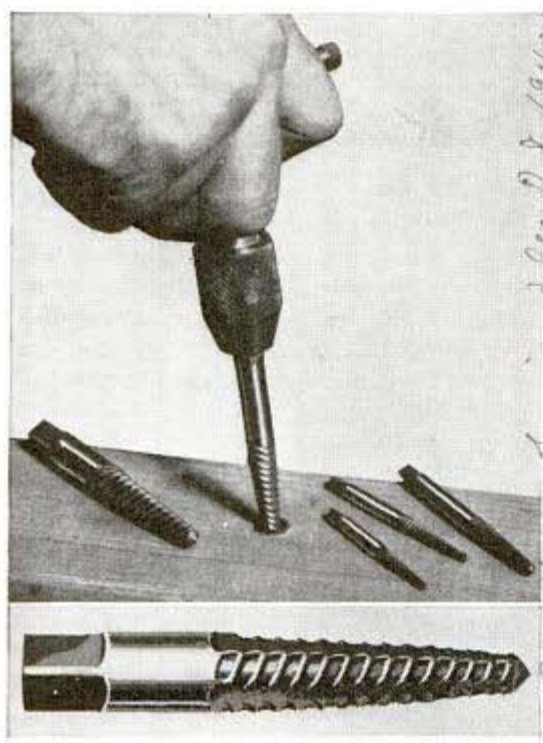
K1399

dent

Tool Removes Broken Screws or Bolts Easily, Quickly

Tightly lodged screws, bolts and other threaded pieces that have heads broken or damaged so they cannot be unscrewed in the usual way with a screwdriver or wrench, can be removed easily by using a threaded tool designed for that purpose.

First a small hole is drilled in the stem from the top of the unyielding screw. Then the tool, which has a left-hand thread, is inserted in the hole and rotated to the left. The screw extractor "feeds" itself into the stem until it takes a grip firm enough to twist the screw out on its own thread. The tool comes in five sizes so a variety of screws may be handled.



Stubborn screws come out when this tool is inserted and turned to left. Bottom, close-up view of tool

Aurora Reproduced in Test Tube Solves Mystery of Upper Air

Effects produced by the northern lights were duplicated recently by Professor Joseph Kaplan and Dr. S. M. Ruben of the University of California, when they mixed helium and nitrogen in a tube and exposed it to a high-frequency electrical discharge. Under the electrical bombardment, the molecules of which the gases are composed danced madly in glowing colors. When the current was turned off the dancing molecules changed their color into an afterglow. Examined through the spectrum, the lines and patterns were found to be identical with those in the mysterious lights emanating from an auroral display. From this experiment it is learned that helium is one of the constituents of the upper air. Other recent researches showed that some of the green colors in the aurora are produced by oxygen in a similar state of excitation.

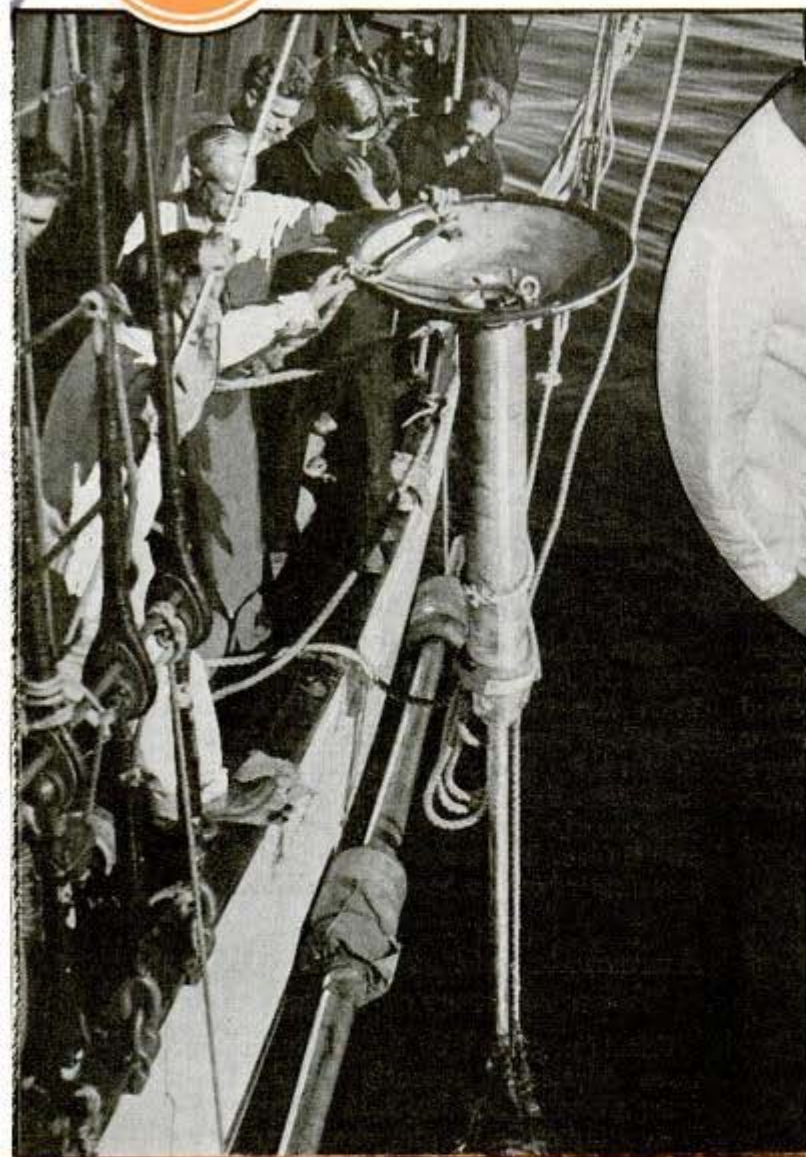
APRIL, 1941

Stanley
Tool Co
New Britain
Conn

Los Angeles, Calif 545

R 116 - 9 cm Marshall Perham
1128 Stearns Blvd
Los Angeles

CHARTING the OCEAN



Left, corer being lowered to sample ocean bottom. Circle, centrifuge which whirls sea water at high speed to separate elements for analysis

CRUISING in the Pacific is a tiny craft that our most obsolete warship could blow out of the water. Yet in some future naval battle, that little craft may have more influence on the outcome than a squadron of powerful battle-wagons. For aboard this ship are scientific men who have been quietly charting the ocean, until our navy knows more about the waters it defends than any other navy in the world.

This craft is the "Scripps," of the Scripps Institute of oceanography in La Jolla, Calif., and it is carrying science down to the sea

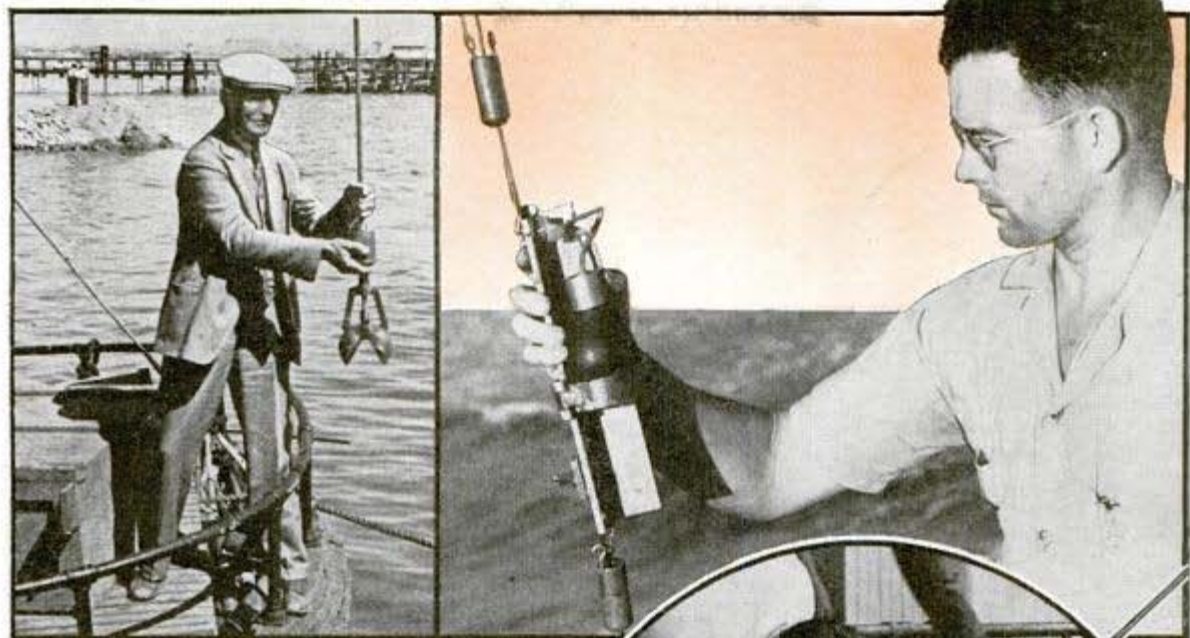
for defense. The Pacific is our Achilles' heel. On it border our longest coast lines, and in it lie our most far-flung possessions—and one entrance to the Panama Canal, less defended by natural conditions than the Atlantic entrance.

Suppose a hostile fleet tried to attack this vital artery at Panama. It would first have to destroy or outmaneuver our Pacific fleet. An excellent strategy would be "crossing the T." That is, the enemy steaming out of the west would try to out-run and out-gun our ships, so that a turn could be made in front of them. This not only would put the enemy between the U. S. Navy and the canal, but it would bring the fire of all enemy ships on the first ship in our line, while the remainder trailed out of range, only to be blown to bits as they came up one by one.

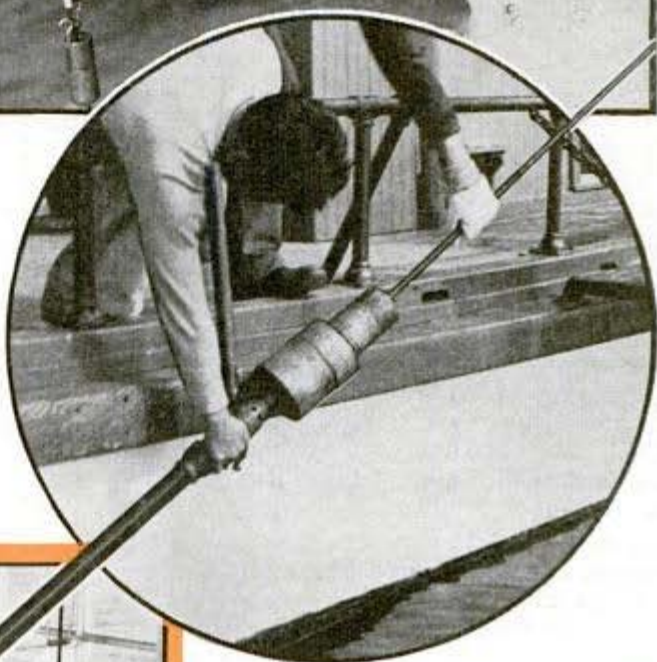
Since American ships are admittedly heavier armed, and therefore slower than many other ships, this looks possible. But findings of the ocean scientists render it

K1157

for DEFENSE



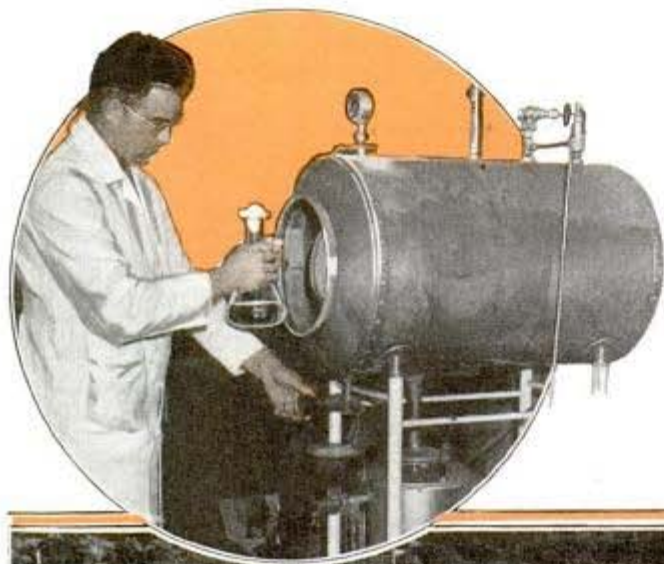
highly unlikely. They have found two great currents flowing off the canal, one moving due east, the other due west, very close together. If we were attacked, our fleet could choose the site of action, and you may be sure our ships all would be in that east-flowing current. The enemy, coming out of the west, could be forced by our fire power to buck the west-flowing current, or abandon the fight.



Top, left, ocean-floor sampler used in shallows. Right, water sampler being lowered. Circle, lowering corer into sea. Bottom, recording rise and fall of tides

If he chose the former, he would find our ships with a ten-mile-per-hour speed advantage he had not expected, for these two currents often flow five miles per hour apiece. Under such circumstances, there would be no "crossing the T." Our ships would have such speed that even a small squadron could slash a numerically superior enemy to ribbons.

R1157



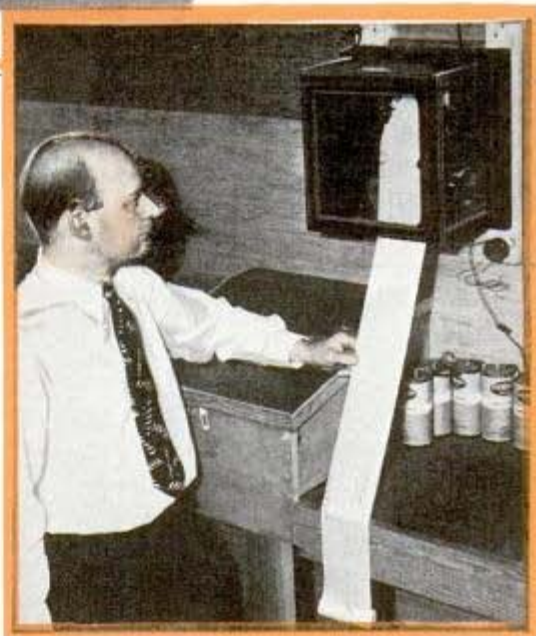
container called a Nansen bottle. This is lowered away on a line, and when at the proper depth, a "messenger" is sent down the line, which opens the bottle. These samples are then brought home for painstaking analysis. Stretches of ocean down to thousands of feet below the surface, in area exceeding continental United States, have been charted this way.

Studies of ocean bottom are also important to submarines. Often a sub will lie on the bottom if attacked. But this is fearfully dangerous. If the bottom is rocky, it may spring a leak, if clay, it may become stuck fast. American subs are unlikely to meet either fate, for ocean floor compositions have been dredged up for analysis, and commanders know where it is safe and where dangerous to go to the bottom.

An important instrument for this task is the "corer," a gigantic bor-

Submarines, even more than surface craft, have been benefited by the scientists' findings. Chief among these are investigations of the saline content of water. Some parts of the sea are more salt than others, and how far and how fast a submarine will go down when taking on a given content of water depends greatly on the density of salt. When a submarine has to dive under fire, it must go fast. Yet if it goes too fast, it may overshoot its limit, and spring the plates; and if it goes too slowly, depth bombs may find it. American scientists have told American submarine commanders a great deal about the influence of different concentrations of salt, which allows them to dive more swiftly than many submarines dare. That information may mean much to us some day.

Gathering of such knowledge requires super-human patience. Vast stretches of empty sea are patrolled, and samples of water are gathered at varying depths in a



Top, sterilizing seaweed preparatory to analysis. Center, lowering weight of sounding machine to test shifting of sand, as washed by waves and currents. Bottom, making chart of currents along the California coast to give U. S. Navy important data on where greatest speed is possible

ing machine which obtains samples for analysis; another is the Ekman ocean floor sampler, a miniature "orange peel" like those used on certain dredges.

Topographic studies of the ocean also have immense value to submarines. There is little likelihood that undersea craft will crash into shoals, even in uncharted regions, for sonic depth finders warn against them. But if the topography is known, the submarine may use these same depth finders to navigate without ever coming to the surface. Much Pacific topography is now well enough known for this.

What of naval aviation? It, too, has come in for large benefits, particularly in weather and weather forecasting. For instance, it is known that a high fog bank often extends off the California coast for as much as seventy miles. Then it clears for thirty or forty miles, and there is another which may extend two hundred miles. These banks would make excellent ambush spots or refuges for Uncle Sam's war birds, if they were lying in wait for an unwary foe, or seeking shelter from superior numbers. It is highly important that we know when and where to find such banks, for in the air, hiding places are few and far between. Naval aviation has also learned from American scientists where to get the best tail winds. On a long hop above the Pacific, they would alternate many times between flying high and low for tail winds. With our knowledge of air currents, even cumbersome bombers could often escape the fleetest pursuit ships.

Compiling this information has involved exhausting work. Hydrogen-filled balloons have been released by the thousand and watched to see where the wind carried them. Now we know; and some day the knowledge may be worth more than all the gold we have buried.

What about oceanic life—does it have any relationship to our defense? Indeed it does. There probably have been as many naval battles won or lost by barnacles as by bullets. These heavy growths attach themselves to the bottoms of ships and the pontoons of planes, causing enormous losses in efficiency. It has been estimated that in as little as a week, enough marine growths can get on pontoons to reduce speed twenty-five per cent. Here again science has aided our defense. It is known that Scripps, in cooperation with the navy,

(Continued to page 125A)

Glasses of Water on Wrists Test Typewriter Touch

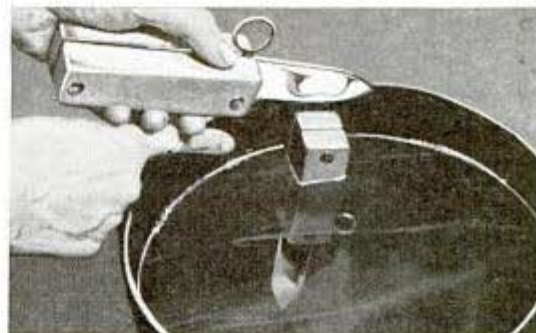


Wrist movement is so slight when running this typewriter that no water was spilled from the glasses

To demonstrate the smooth operation of a new typewriter, a typist wore two glasses of water strapped to her wrists while running the machine. All shifting and spacing are achieved electrically, and the touch is so light there is no need for jerky wrist action. Without spilling a drop, the stenographer typed 100 words per minute.

Cork Handle Keeps Knife Afloat Until Sportsman Retrieves It

Designed particularly for yachtsmen, a cork-handled knife will stay afloat if it flies out of the user's hand while working on his yacht or in a boat. The two large pieces of cork which flank the blade form a convenient handle. The blade itself is four inches long and has a handy locking device which releases the blade for closing by pulling a steel ring.



Notice the knife floating, point down, in the bucket of water, buoyed up by its cork handle

Von Lengerke & Antoine
92 Wabash Chicago 549

Selen Andruch
International Business Machines 233 W. Wacker Drive

*Ypsilanti Reed Furniture Co
Delonia Ypsilanti, Mich*

Door of Cabinet Is Woven of Unbreakable Plastic



Inset in lower corner shows the translucent quality of the unbreakable plastic door panel

Although they appear to be made of glass, even a hammer blow does not shatter the door panels of a new china cabinet. They are woven of an unbreakable translucent plastic material. A clear plastic is also available. Besides their resistance to breakage, the doors present an interesting decorative pattern.

Winter Starting Is Made Easier by Crankcase Ventilator



Crankcase ventilation is started immediately by an automatic vent operated by manifold vacuum, instead of waiting until the car is traveling thirty to forty miles an hour. Since combustion of a gallon of gas forms a gallon of vapor, some of which is forced past the piston rings, this effective ventilation keeps water and other impuri-

ties out of the crankcase, helps improve filter performance, keeps engine fumes out of the car, and makes winter starting easier. Inadequate ventilation would permit condensation of vapor to form sludge, which may freeze during cold weather.

Electric Plug Anchored Tightly by Looped Contact Prongs

An "anchor" built into a new type attachment plug increases its holding power and improves contact with the wall outlet. The prongs are looped in such a way that they fit firmly in both old and new convenience outlets. Tests indicate that long use of plugs with the new contacts does not affect the ability of outlets to hold the standard solid-prong type.



Formation* of Clouds Predicted with Sky Analyzer

With the aid of a queer-looking instrument known as a polariscope, cloud formations may be forecast two to four hours

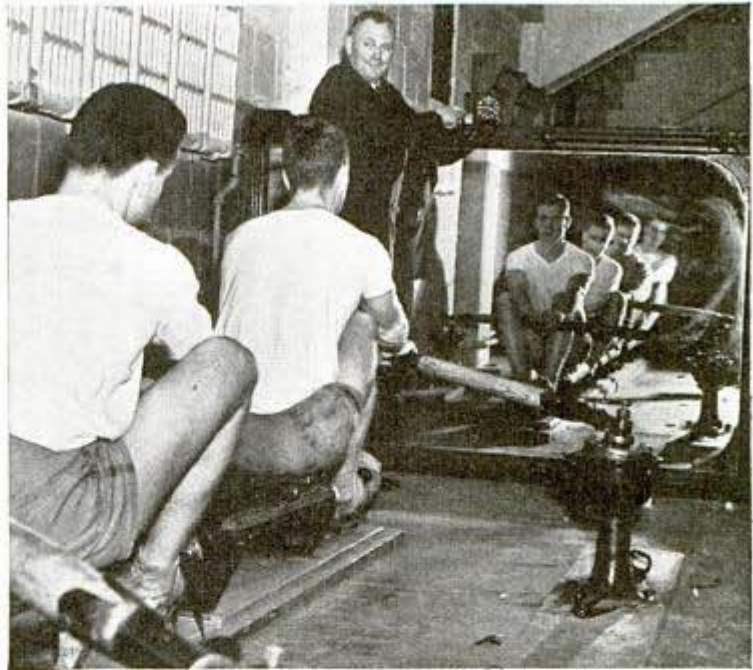


This is how Dr. Neuberger uses the polariscope to predict, hours in advance, the formation of clouds

State College Pa. 1932

before they appear. It is the result of the discovery by Dr. Hans Neuberger, scientist at Penn State College, that cloud formations appear invariably within four hours after a sudden increase in the size of condensation particles in the air. These particles, made up of such things as soot and dust, normally are in equilibrium with the moisture. However, when the moisture rises sharply, the balance is destroyed and the moisture starts to condense rapidly on the particles, forming water droplets, which in turn eventually group together to form clouds. By means of the polariscope the first swelling in the condensation particles can be detected. Although this type of forecasting is limited to periods when there are no clouds in the sky, it may aid in the prediction of adverse weather conditions when used in combination with other local observations.

Practice in Front of Mirror Helps Crew Correct Faults



Oarsmen studying themselves in mirror can quickly remedy faults pointed out to them. Coach, in background, points to timer that sets the pace

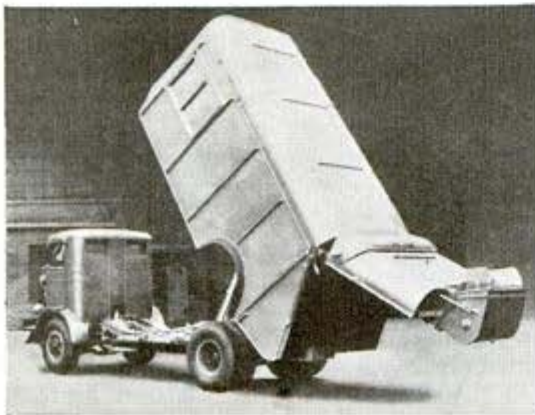
Crewmen of the rowing team at University of Pennsylvania look into a mirror as they take their workout on an indoor rowing machine. The mirror idea was introduced by the head coach to show the men their mistakes in form and rhythm as he drills them for races.

Ref: Coach "Vern" Callow
Univ. of Pennsylvania
Gar Wood Industries
7924 Pfeiffer St.
Detroit, Mich.

Conveyor in Roof Packs Refuse toward Front of Truck

One of the newest types of garbage removal truck, having a fully enclosed steel body, employs a conveyor to pick up refuse from the rear receiving hopper and push

it to the front, thus making it unnecessary for men to distribute the load. Extending along the entire length of the top, within the body, the conveyor fills the front end first, and then gradually works the material toward the rear. It also helps dump the contents when the body is tilted upward with the tail gate open. The truck, made by Gar Wood Industries, uses a Link-Belt double-strand flight conveyor operating over sprocket wheels, and may be run in either direction. The mechanism is driven by a fluid motor powered by the oil pump, which in turn is operated by a power take-off on the truck transmission.



When refuse truck is tilted for unloading, conveyor in roof helps push the contents through tail gate

Leaner air-fuel mixtures of modern automobiles save eighteen per cent in fuel consumption compared with the car of 1927, studies by researchers has indicated.

7/4/41

R1154. Leggett



Left, ready for the big race. Right, testing a tire for balance. Below, Wilbur Shaw at wheel and wearing special face shield

WINNING RACES BEFORE THEY



By Wilbur Shaw

Three-Time Winner at Indianapolis

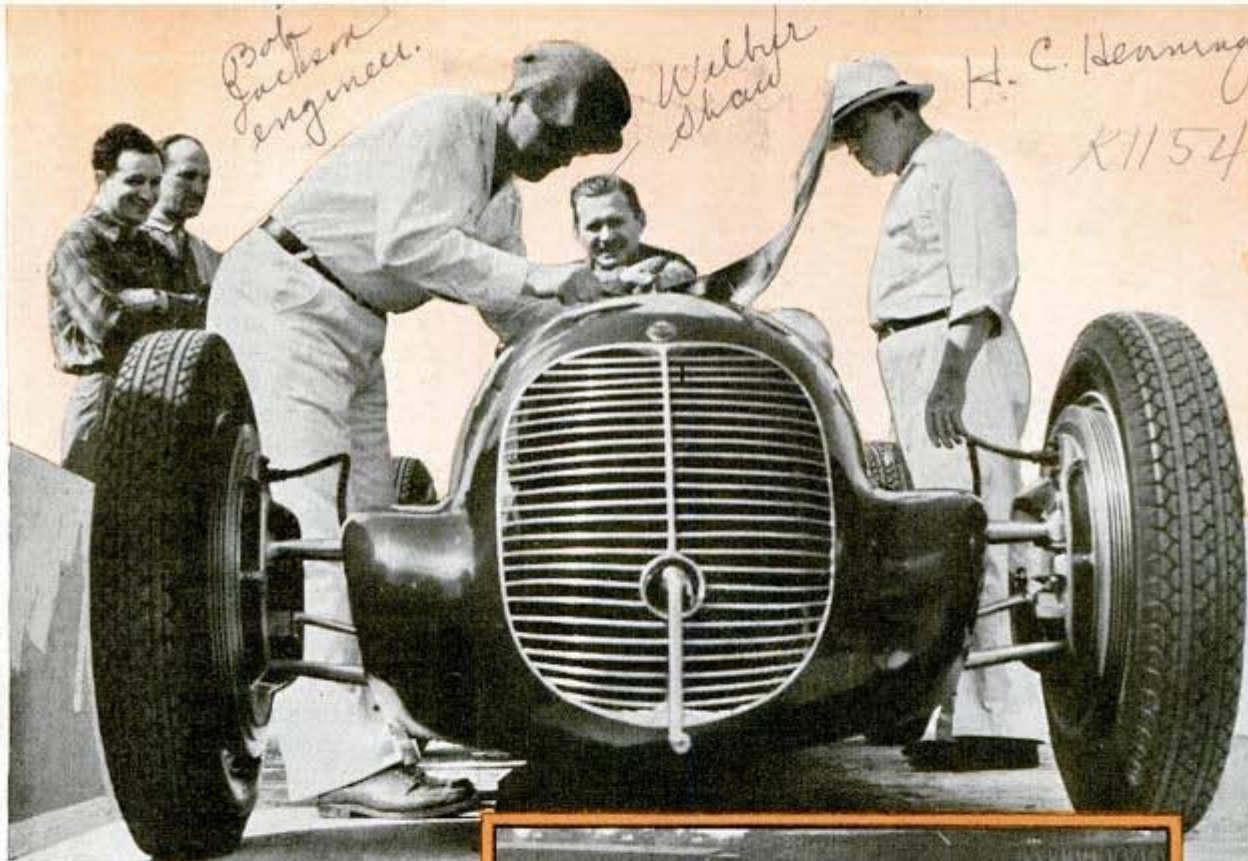
IF I should have the good fortune to win the 1941 race at the Indianapolis Speedway—and I hope that I shall—it will be the result of making and following a blueprint.

Long before the 500-mile event, I begin planning with members of my crew. In the manner of the stock market operator

charting the ups and downs of a security on the "big board," we determine what average speed probably will be required to win. The full case history of each "also-ran" for several years back is examined to determine why he didn't finish in the money. Equal attention is centered on the number of stops he made at the pits and other factors leading to the victory of one driver. Then the record is checked for data on drivers who, but for some little incident, might have won if they had been able to maintain their speed throughout the race. All this information is boiled down and we

shoot at the very best performance.

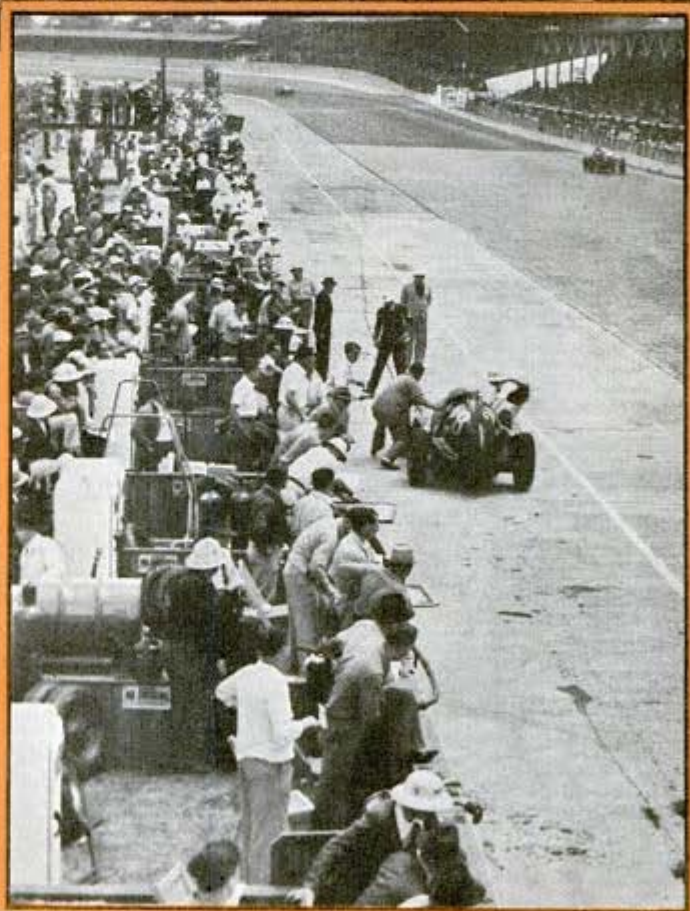
This year's race will be won, I believe, at an average speed close to 125 miles per hour. If three or four of the cars are "hot," the drivers continually forcing the speed, and the weather and track conditions good, certainly the 1940 speed of 123 miles per hour at 350 miles will be exceeded. In that race, we were putting on the fastest performance in the history of the track until



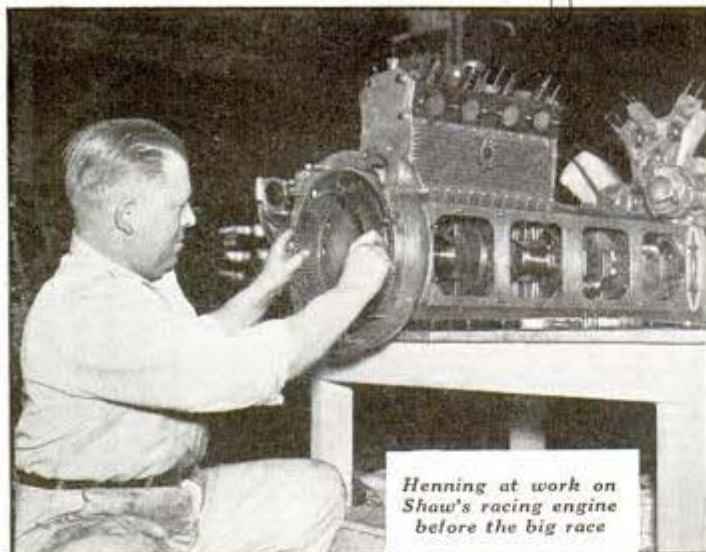
START

rain and the yellow caution flag slowed down the pace. From that point to the finish, we traveled under the caution flag, which compels all drivers to reduce speed and hold their positions, thus preventing any driver from taking unfair advantage to gain ground on the slippery bricks.

Suppose our "blueprint" shows that we are shooting at 125 miles per hour to win? That means that I shall try to average 126-plus, because I will run into traffic and be forced to do a slow lap or I may be obliged to make an extra stop at the pits. Our plan figures in the regular pit stops, of course. For instance, the fuel supply must be replenished at about one-third of the distance and again at about two-thirds. Last year I stopped at 73 and 145 laps. At that time, my crew must check the tires and anything else



Above, looking over Shaw's speedster. Below, scene in the pits on race day. Note crew feverishly working on a balky car. If the men in the pits do their job well, the man at the wheel has a better chance of winning



Henning at work on Shaw's racing engine before the big race



Center, coming around the turn with pace car in the lead. Below, Shaw supervising some last minute touches on his car. If his speedster is put together so it will stay, the champion believes he has a good chance for his fourth victory

that may need attention. In the 1940 race I changed only one tire—the right rear—and that only as a precaution. It would have finished the race without difficulty. However, it takes no more time to change a tire—not as much, in fact—as it does to refuel. Putting in the alcohol which my Masserrati uses requires about sixty seconds; changing a tire about one-third that time.

It's wise to watch the tires, however, as every driver knows. One bad slide at 140 to 160 miles an hour will grind all the rubber off the tire because the track is like a big emery stone turning very fast under the car.

My pit crew follows the race plan just as carefully as I do. One man clocks every lap and makes a chart on a board containing 200 squares. Any stop I make at the pits gives him a chance to tell me how the race is going. We use few signals, the principal one being an "O.K.," with hands clasped above the head. That gives me moral support. Too many signals sometimes confuse the driver.

And we try to take precautions against little things that may happen, for we know that usually it's the little things that put a driver out of the race. A piece of paper six inches square can stop a powerful speedster if it should blow onto the track and be sucked into the carburetor or supercharger. A cotter pin put in improperly can work loose and cause failure just when victory seems to be in sight. Drivers have been knocked out by sparrows. In 1936, I was out in front when hood fasteners which had been installed improperly released the hood on my car, forcing me into the pits where I spent nine-

teen minutes, and finished seventh.

So our plan must be drawn to include as many of the little things as possibly can be foreseen. Also, it must be designed to meet rapidly changing conditions during the race. Just as an example of how the best-laid plans of mice and racing drivers can go wrong, Rex Mays had hoped and prayed for rain in the 1940 race, figuring that he would be out in front. His plan called for rain at about 300 miles. But the rain started later, at 350 miles, and I was in the lead then, upsetting his scheme.

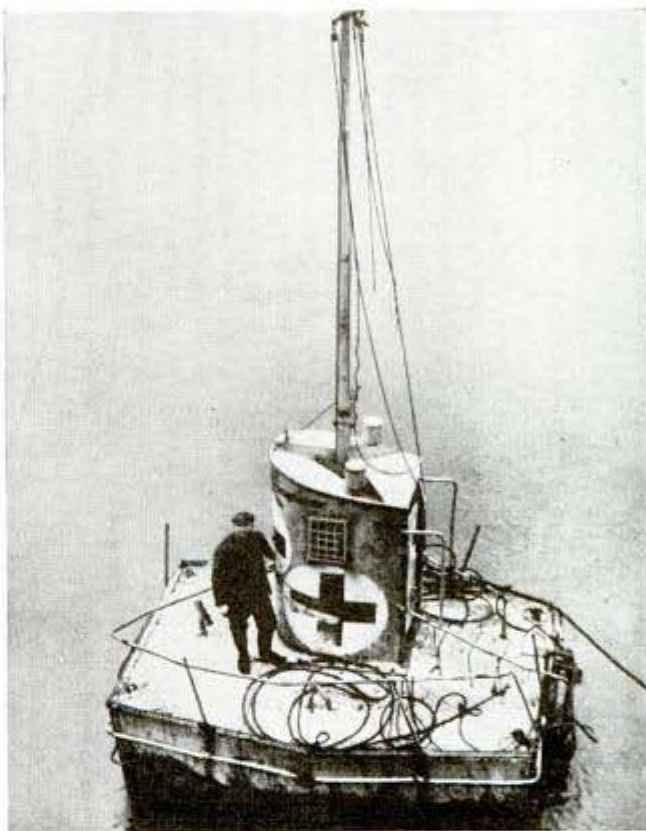
Ten years ago I thought a driver had to be lucky to win. Now I believe he can't afford to be unlucky if he expects to win. In the past when I won or lost, people called it good or bad luck. But I always knew it wasn't a matter of luck. Usually my failure could be traced directly to someone's negligence in some small detail, such as not replacing the oil plug properly in the crankcase of my car one year. The plug worked loose and dumped the oil—and I failed again. I find that if a driver comes back to Indianapolis year after year, the good and bad breaks just about balance.

Speaking of bad breaks, it seemed before the 1940 race that I was bound to have trouble. First, it was the thirteenth year that I had entered the 500-mile classic, and my friends and other drivers kept reminding me of it. Second, the old, oil-soaked, dirty shoes that I had worn in twelve previous races disappeared. While I am not particularly superstitious, the loss of those shoes made me feel awful. For one thing they were as comfortable as house slippers. Too, they had been with me through several victories. Finally I bought another pair, bowling shoes. Came the day of the race and to my amazement, the only shoes I could find were an apparently old, oil-soaked dirty pair. So I put them on and then discovered that Ford Moyer, a member of my

(Continued to page 116A)

APRIL, 1941

Floating 'Clinic' Houses Supplies for Airmen Downed at Sea



Four bunks and supplies for wounded or marooned German airmen were found on this craft when it floated to an English shore

When a strange craft drifted to the English shore recently the British found it was a floating rescue station which apparently had been moored to aid German airmen shot down over the water. Inside it were bunks, medical supplies and food. Planes disabled at sea would alight as near one of these floating clinics as possible, and the crew would wait there to be picked up later by hospital planes.

L 26.

Negative Viewer Magnifies the Image and Controls Degree of Light

Both the degree of magnification and intensity of light can be regulated in a focusing viewer designed to help photographers select negatives for enlargement. Minute details of the negative may be examined at a distance with both eyes



as the image appears flat overall without distortion. The viewer is suitable for examining negatives in strips, color transparencies and slides.

E. Leitz, Inc. 730
Fifth Ave. New York City

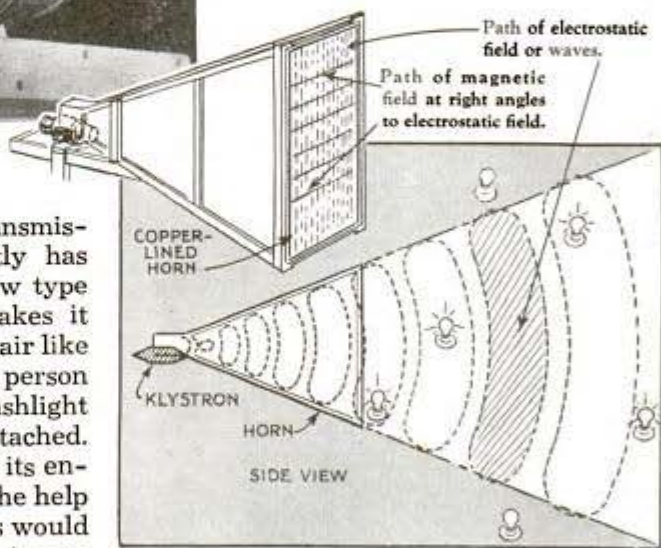
Power Shot through Air Like a Beam of Light



shorter than the shortest radio wave now in use. It does this by means of two small doughnut-shaped copper tanks, called "Rhumbatrons," in which radio waves are made to surge rhythmically back and forth, thus increasing the intensity of their oscillations. The present Klystron is capable of producing electrical waves varying in frequency from some 750,000,000 to 3,000,000,000 cycles a second and a wave length of sixteen to four inches, compared

Left, adjusting the Klystron tube. Below, sketches showing how horn helps to direct or "shoot" the power beam so that small electric bulbs in its path will light up

Because science has learned to make radio waves do the rhumba dance in a copper tank, wireless transmission of electrical power apparently has been brought nearer reality. A new type generator, called the Klystron, makes it possible to shoot power through the air like a beam of light. For instance, every person in an audience could be given a flashlight bulb with a short wire antenna attached. If the Klystron were turned on and its energy focused on the audience with the help of a megaphone-like horn, the bulbs would light up as though connected to storage batteries. In this development, Westinghouse engineers see a means of greatly increasing the number of television channels or the number of messages transmitted simultaneously over a telephone wire, as well as producing heat for medical purposes by ultra-short wave. Another logical use is as an improved means for aircraft navigation; indeed, homes might even be illuminated some day by power picked up from the air as we now pick up radio programs. The Klystron sends out beams of power by breaking up an electron stream bunching the individual electrons and converting their energy into ultra-high frequency oscillations which are ten times



to ordinary short-wave frequencies of around 15,000,000 cycles and wave lengths of 300 to ten yards. And even today the tube is able to broadcast its high-frequency waves with a power of 200 to 500 watts, comparable with the power of many commercial long-wave radio transmitters. The waves travel very much like light waves and even somewhat like sound waves. Like light they pursue a line-of-sight course. Instead of spreading out and passing through non-metallic materials, as do radio waves, the Klystron waves can be interrupted. If a slab of wood is interposed between the Klystron and a lamp glowing in its beam, the light will go out.

L24. Converter mfg Co
Cambridge City Ind

Dump Body for Small Truck Works by Crank

One man can install, remove or operate a dump bed now available for half-ton pick-up trucks. Simple in design and easy to operate by a hand crank, the new bed is especially useful on small construction work or for hauling grain and other fine materials.

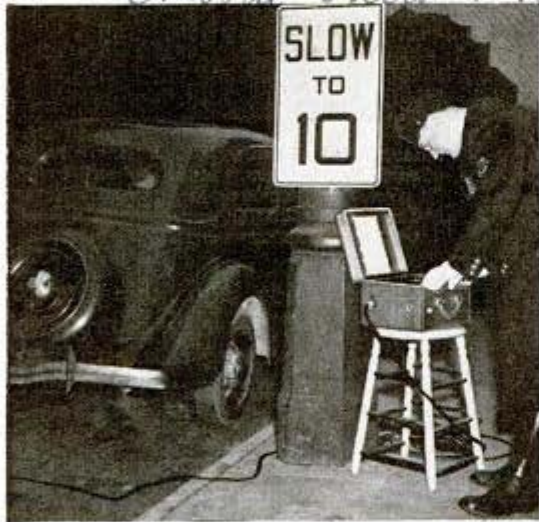


Truck operator ready to slide removable dump-bed into place. Frame at head supports crank and pulleys, one-man mechanism for tilting the body to dump the load

R1474.

Electric "Trap" Measures Speed of Passing Automobiles

Traffic Patrolman Russell Hebee



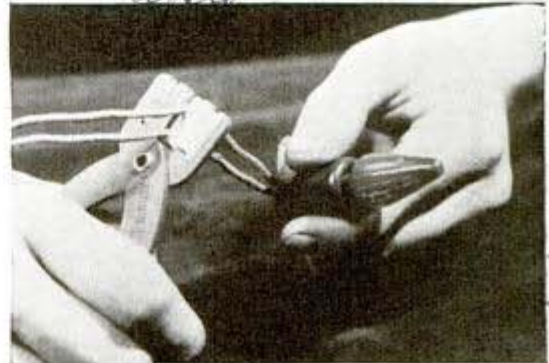
Motorists who fail to observe speed limits and "slow" signs in Detroit, Mich., are likely to be caught by an electric "speed trap," several of which have been placed in operation. The apparatus is portable and inexpensive, and may be set at any intersection. Speed of the car is clocked as wheels pass over wires stretched across the road twelve feet apart. The time lapse according to impulses received is registered on a dial and conversion into miles per hour is shown on a chart. If any car's speed is excessive a motorcycle patrolman catches the violator.

As car passes over first wire, patrolman watches dial of the electric speed trap box to determine whether driver has observed speed limit. The apparatus is portable and easy to set up

L3. Wade World.

Tester Locates Burned-Out Bulbs without Removal of the Lamps

Bad lamps in a series of Christmas-tree lights can be found quickly with a plier-like tester without removing the bulbs. In making tests, tiny projections in the jaws of the tool are forced through the two wires that connect each socket, causing a "short." When the faulty bulb is reached, the rest of the lamps will light, since the current is thus permitted to pass around it.



Jaws have sharp metal points that pierce insulation, revealing quickly which lamp in series is burned out

Fluorescent powder added to plastic golf tees just put on the market makes them shine in the sun so that they can be found easily after the drive.

Plastarche

APRIL, 1941

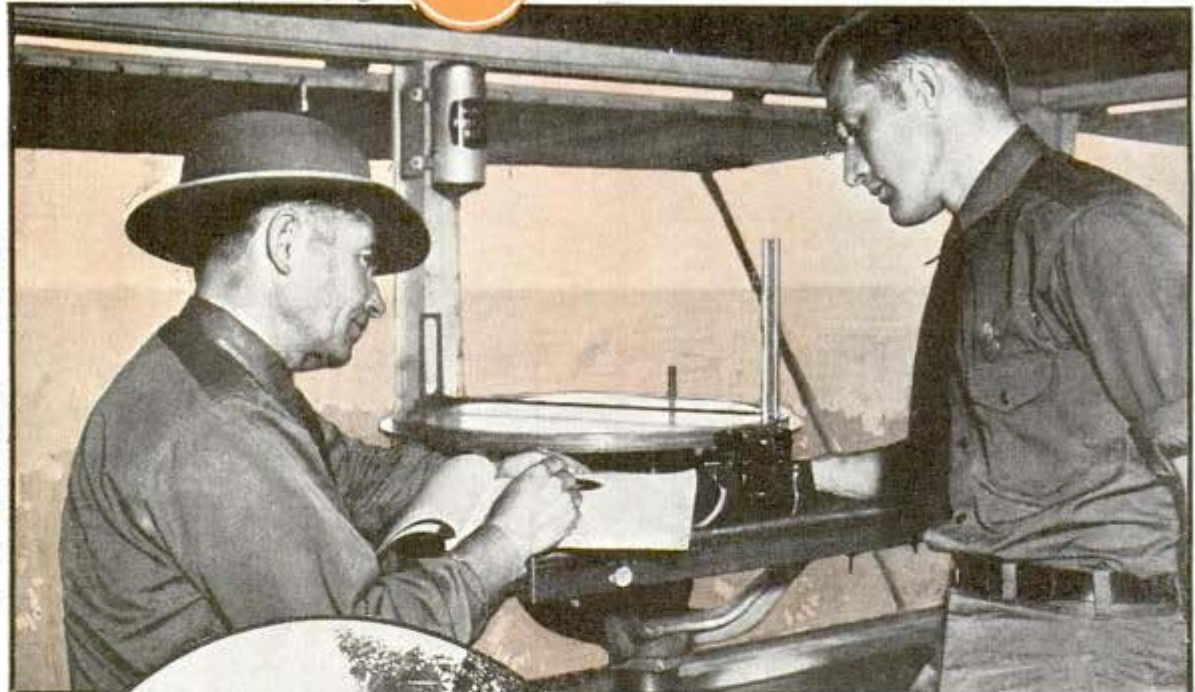
American Molded Products Co 1753 N. Honore St. Chicago

Applied Products Co
1753 N. Honore St.
Chicago, Ill.

Suggested one made by Austin Western machy to Curvora. D. H. Barrows. 1936

K12-7 Cont. J. W. Roberts
Apr 2 46.30
Washington
Se. C.

SCHOOL for



Above, student ranger learns how to make observation from mountain lookout tower. In circle, "school" meets on the fire line; the nearest smoke chaser is using a hand pump containing five gallons of water

IN THE midst of a raging forest fire, near Missoula, Mont., two men are operating a contraption that looks like a cross between a motorcycle and a plow. At tremendous speed it clears a trench eighteen inches wide, throwing clouds of dirt over the blaze.

It is a super-trencher, brain-child of Forest Service experts. Equipped with loose steel teeth that rotate, it is operated by a nine-horsepower gasoline engine, but requires one man in front to guide by pulling a rope while another man does the "plowing." The machine can be used on steep slopes and is so light it can be taken to fires easily.

This scene is a part of the service's new system of training schools for smoke-chasers. The 161 national forests cover more

Big bulldozer at left, with angled blade like a snowplow, outdoes 100 men digging trenches and throwing dirt on flames

SMOKE CHASERS



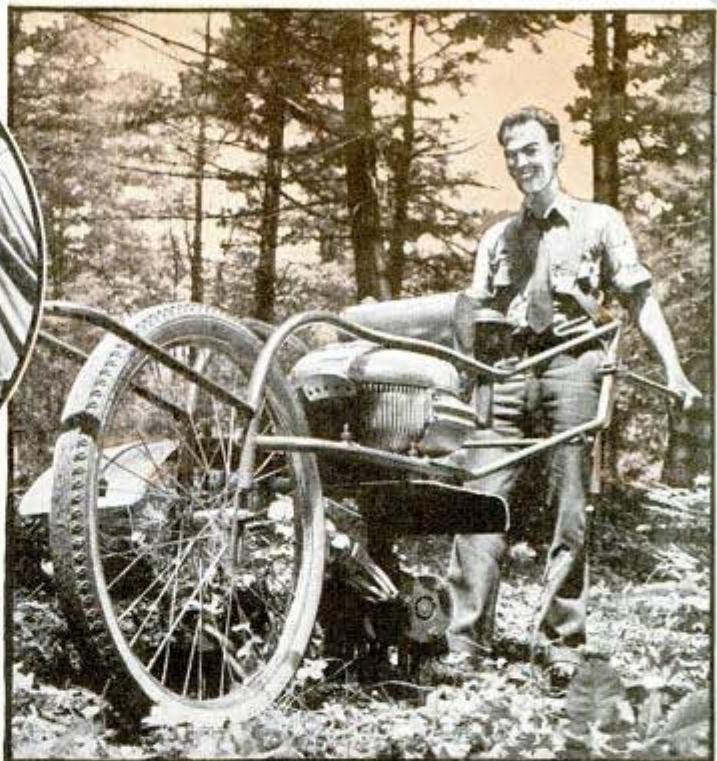
Above, using special compass to locate line for a truck trail, a vital part of new training procedure

than 175,000,000 acres, mostly in mountainous country. Naturally Uncle Sam wants well-trained men to protect these valuable timber and recreation areas. The forests are divided into ranger districts which average nearly 300,000 acres with a forest ranger in charge. Some 450 rangers are on the job.

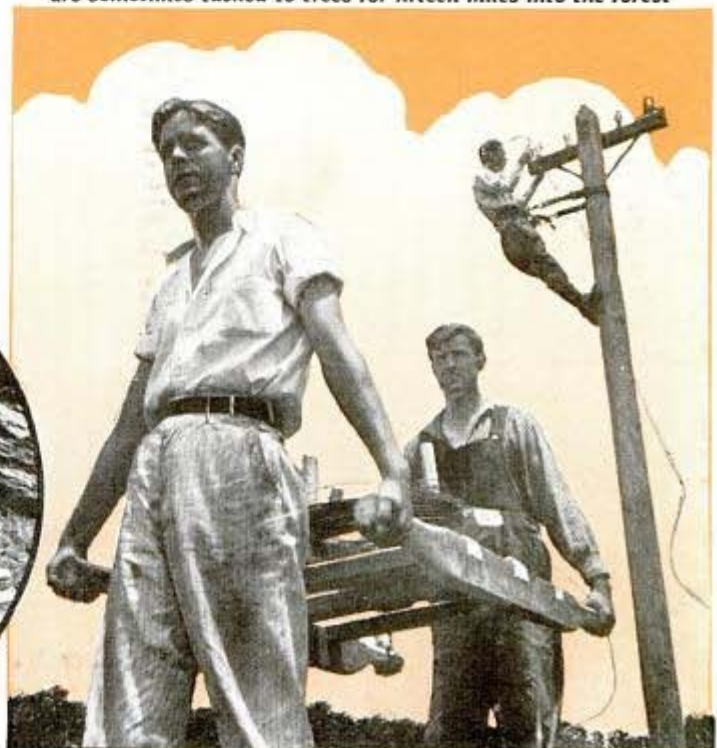
Schools are maintained for

(Continued to page 139A)

Below, a novice forest fireman practices communication with mountain lookout by short-wave radio set



Above, clearing an eighteen-inch ditch with the Bosworth trencher; one man pulls, the other plows. The trencher has a five-to-nine horsepower gasoline engine. Below, Forest Service men must learn to construct telephone lines. Temporary lines are sometimes tacked to trees for fifteen miles into the forest



K1473

Long "Mike" Traps Sounds from Far-Away Points



Elongated microphone is "all ears," each tuned to pick up certain sound frequencies from far corners

Along its eight-foot length, a new "telescopic" microphone is fitted with many earlike tubes to pick up distant sounds for both recording and broadcasting. Each "ear" is attuned to catch certain frequencies, bringing within focus all the sounds emanating from far points of the movie lots, radio studios or theaters.

Light Sub-Machine Gun for Army Fires 500 Shots a Minute

Possessing all the fire power and effectiveness of the army's standard weapon in

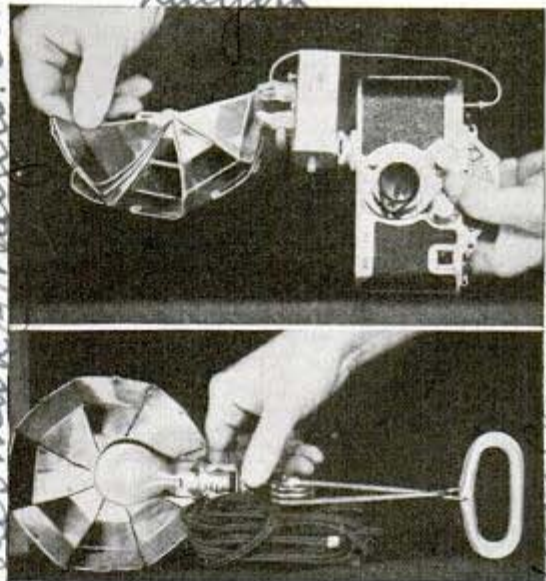


Aiming light sub-machine gun, inexpensive to make

its category, a new type sub-machine gun weighs one-half as much and costs only one-third as much to manufacture. Bearing the name Reising, after its inventor, the six-and-one-half-pound gun is suitable for regular army use and especially meets the need of parachute troops. It fires forty-five caliber shells at the rate of 500 per minute, and can be dismantled for cleaning in about one and one-half minutes. Plans are made to produce the gun at the rate of 1,000 a day.

Folding Reflector Fits in Pocket with Flash Synchronizer

Equipped with a collapsible reflector that opens and closes like a fan, a flash-bulb synchronizer now on the market can be folded and carried in a coat pocket. The reflector measures six inches when opened. The unit weighs only twelve ounces. It fits all cameras, operates on two pen-type batteries, and has a trigger for cocking the



Reflector, top, opens fanlike for use in flash gun. Bottom, similar one for side lighting has long cord

flash mechanism. Used bulbs are removed without touching the hot glass by opening a clip. A side-light extension, for filling in shadows or to give an effect of modeling to the face, is available with a similar folding reflector. This plugs into the synchronizer and both bulbs fire simultaneously.

(So flexible is a new fire-resistant wall-board of asbestos and cement that it can be bent around a four-foot radius.

R.C.A. Co. Inc. Camden, N.J.

Mrs. Harrington and Richardson Arms Co.

Worcester Mass. 90 West St. Worcester Mass. Carey Stone

Dr. Eugene H. Reising

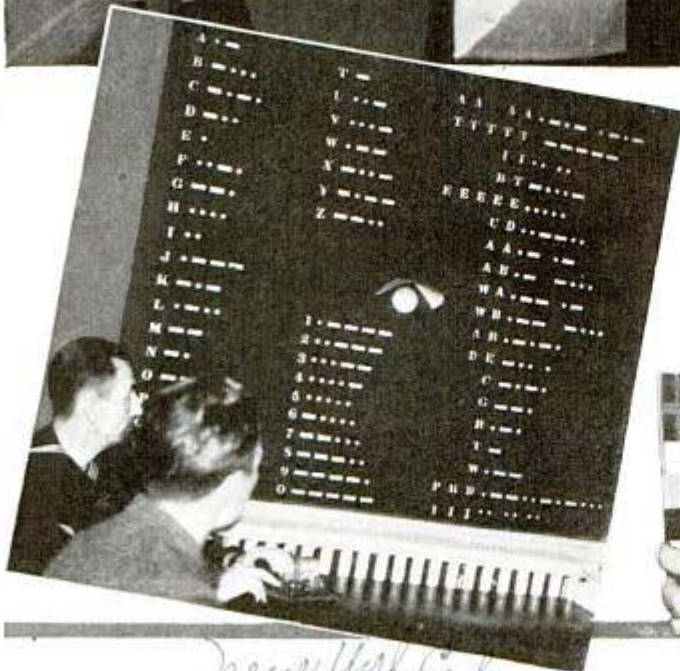
Carey Stone
Lockton and
Cincinnati Ohio

*R 1485 Maritime Schools
New York San Francisco New Orleans*

Signal Language of Sea Taught at New Schools



Group of students, left, forming letter "O"; proper position of flags is stressed, to avoid confusion in signals. Bottom, left, large black-board aids in teaching use of flashing light, or "blinker," signaling in Morse code; this method is important at night or when weather is unsuitable for flag messages. Below, instructor shows use of flag hoists: the one at left means "Mine field ahead"; right gives the bearings



*Senior instructor A. A. Rother
C. B. M. U. S. Coast Guard
New York City*

New York City

Because many merchant vessels of the United States failed to answer visual signals transmitted by U. S. navy or coast-guard vessels, or showed lack of skill in answering, the U. S. Maritime Commission has ordered the establishment of schools for teaching communication by visual signals. The course of instruction is offered to all licensed masters and mates of the merchant marine, and to cadet officers and cadets of the maritime commission. To obtain his certificate the student must attain a high standard of proficiency in both sending and receiving by the three usual methods of visual signaling, including international code flag hoists, semaphores,

and flashing light. Schools will be located at the coast-guard district offices in New York, San Francisco and New Orleans, and at stations in several other principal ports.

234

Molded Rubber Truck Fender Straightens Out after Bump

Fenders of molded rubber are being used increasingly on trucks and buses in England. They have the advantage of straightening out their own dents after a collision—and collisions are frequent in the nightly blackout. The use of rubber also frees that much more steel for war purposes.

*St. Louis Herald
an 16*

K1264. 1st Allen Warren Elliott
243 E 33rd Street

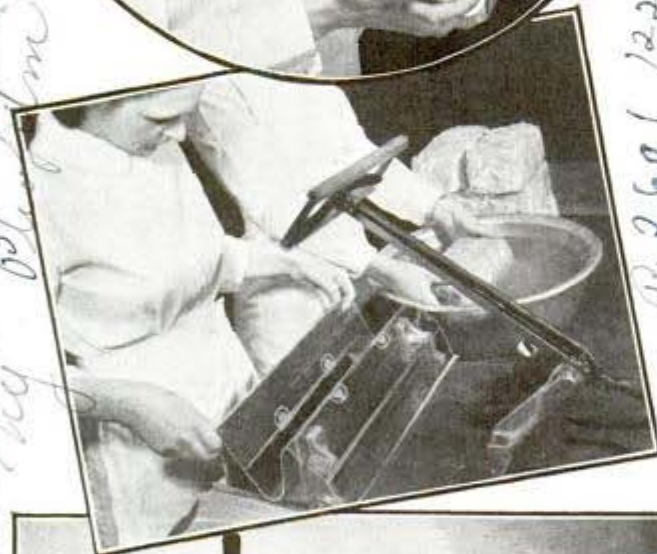
PACKAGES DESIGNED



ALTHOUGH the lowly hen presented man with a perfect example of efficient packaging in the form of the egg—an airproof, moisture-resistant, germ-free and well-designed container—it was a long time before he did anything about it.

Not until 1809 was food preserved in glass bottles and this was thought up by a Frenchman during a stimulating period of war, to feed soldiers sent abroad. A year later the tin can was patented and the two just about had the packaging field to themselves until 1899 when a biscuit company designed a well-known cardboard cracker box that ran the familiar cracker barrel right out of the grocery store.

With the development of plastics and transparent packaging materials during the past few years, things began to boom again and the Institute of Package Research in New York recorded



Wrapping meat loaf in Pliofilm (top) prevents shrinkage. At left, one girl dips loaf in gelatin, the other prepares wrapper

Below, tomato juice pours from red plastic tomato, and a variety of products are packaged in transparent plastic containers



General Plastics, Inc.
North Conoverdale, N.Y.

Pl. 2601, 122 E 42nd St

Celluloid Corp
10540-th
New York

*Isadyer's Chapter
about this*

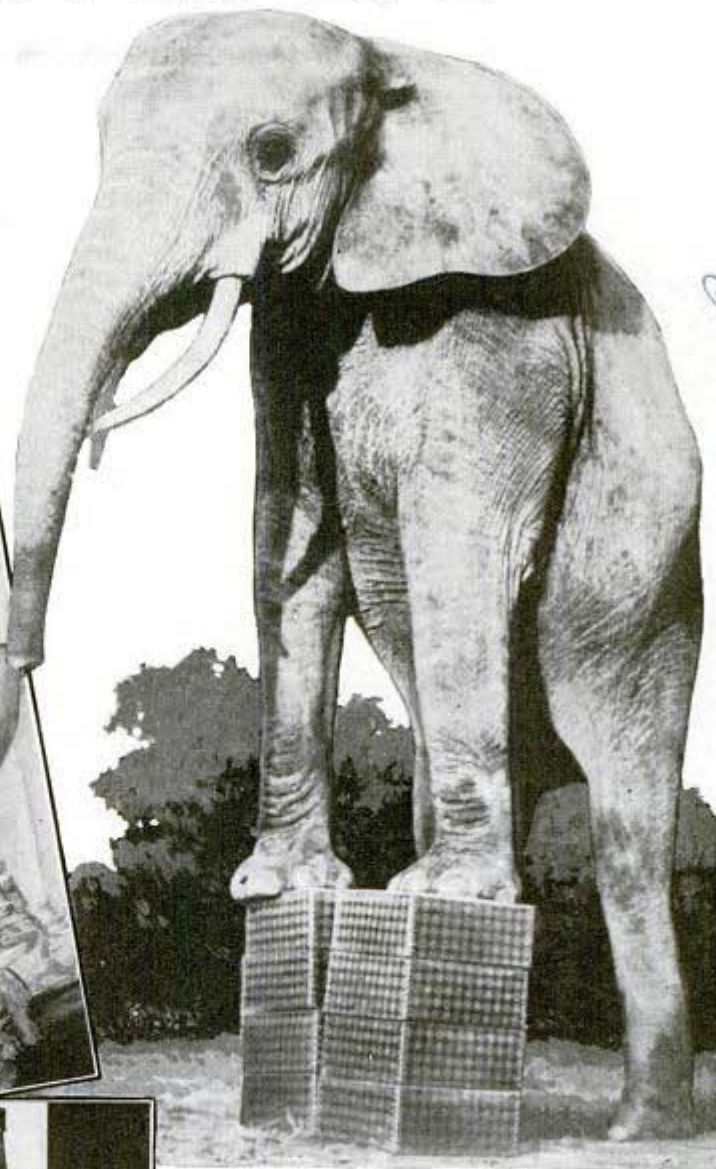
to CATCH the EYE

K 1264

more than 30,000 packaging developments in materials, design or uses created by Americans in the last year.

Just as in 1809, war and threats of war have caused many inventors and artists to turn their attention to the modernization of the package to fit new situations. Many

Celery stays fresh (below) in transparent film that covers stalk but lets leaves "breathe." The 1941 catsup bottle (bottom) has lost its neck and may be served on table



*National Metal Edge Box Co. Phila
344 N. 22nd St.*



Three tons of elephant demonstrate the strength of new metal-edged cardboard and paper boxes, which can stand a compression load of 1,500 pounds

have been spurred by the rumor that another reigning sovereign—King Tin Can—is about to topple from its shining throne because, if war comes, the United States will not be able to import enough tin from British Malaya and the Dutch East Indies to keep this country's hundred or more plants turning out the customary 16,000,000,000 tin cans a year. However, stocks of tin plate are being piled up rapidly by the government-sponsored Metals Reserve Company and mountains of tin cans and tin plate are being stored. Besides, a tin

*J. Putter Co.
Budgeton, N.J.*

are being tied with strips of paper instead of wrapped, inserted advertising matter is banned and labels are limited in size. Cans for cocoa are made in seven-pound size, for coffee in four-pound size and these cans must be returned to the factory to be used again, along with cardboard cartons, milk bottle caps, soap boxes and indeed, almost any container which will stand re-use.

But the war scare is only one angle and natural progress is changing the shape of old, familiar packages. The milk bottle, for example, has been hit from three directions—the high cost of deliveries, the compactness of new refrigerators and the growing cash-and-carry habit. Now it is thirty per cent lighter, short and squat to fit refrigerator shelves. It also finds competition from the waxed-paper container. The slim catsup bottle is being replaced by wide-bottomed bottles which do not tip over, and its shorter neck ends the banging of inverted bottles. The latest catsup bottle has practically no neck and the catsup is dipped out with a spoon.

Hundreds of modern containers using transparent materials made from cellulose and rubber derivatives have been devised for quick-frozen food, and a novel package employing latex, a form of rubber, will soon be on the market. This thin rubber bag is dropped into a cardboard box and filled with liquid or solid food. The neck of the bag is placed over a square fiberboard frame. The frame is turned a few times, which closes the neck of the bag. Food and all are frozen solid in a rectangular shape.

Paper, fiberboard and cardboard boxes are being reinforced with light metal edging so strong that the boxes will stand a compression load of 1,500 pounds without breaking. Packed with glass bottles, these boxes have been bounced through 470 revolutions in a testing drum without breaking a bottle.

A rigid transparent plastic package was recently devised to hold a long-life phonograph needle which not only keeps the needle from being lost when not in use, but magnifies the point so that its playing condition can be determined. Another clever plastic package soon to be marketed is a transparent pillbox which releases one pill or tablet as a slide is pulled out and shows at a glance how many are left.

A new safety-razor container serves as

(Continued to page 114A)

APRIL, 1941

Grass Catcher on Wheels Carries Load Easily

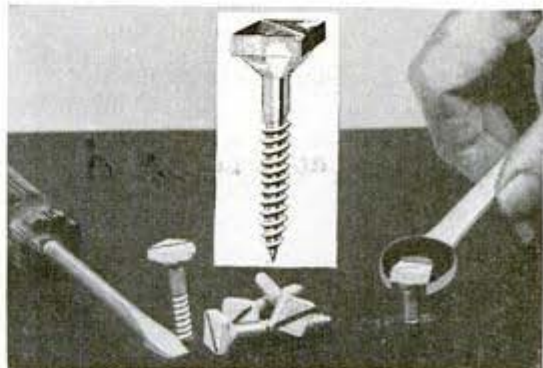
Equipped with a pair of wheels, this catcher rolls its heavy loads of grass across lawn to save heavy work of carrying it



Cut grass can be carted away with ease in a large-size grass catcher equipped with wheels. When the handle at the side is engaged it raises the catcher from the ground so it may be rolled freely.

Square-Head Screw Is Driven in Hardwood with a Wrench

Where the wood is hard and an ordinary screwdriver finds the going tough, a square-head screw may be helpful. These



After starting this square-head screw into a hard surface, the wrench can be used to turn it

new bolt screws can be started with a screwdriver, then tightened with a small wrench. They are available in several sizes.

dist: Lentgen & Associates 565

K12C4
 K1465
 To Sullivan Mfg. Co.
 Ellis Bldg. Worcester, Mass.
 1029th
 1029th

K 1444

Combined Table and Buffet Has Tiny Stove in Drawer



Modern in appearance, this handy end table and buffet encloses a small stove for preparing snacks

Hidden in the drawer of a combination end table and buffet for the small home and apartment is a tiny stove for cooking snacks. It can be used for broiling or making coffee, and there is plenty of space in the storage compartment beneath for the dishes and cooking utensils.

K 1443

Roof Guards Prevent Snowslide on People or Shrubbery

Danger of an avalanche from the roof falling upon pedestrians or damaging shrubbery beneath the eaves can be averted-



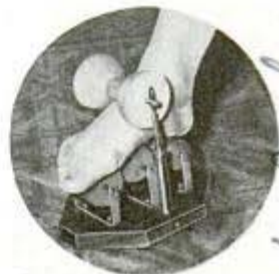
By staggering these snow guards on the roof, an avalanche to the sidewalk or shrubbery is prevented

Henry J. Thomas
Box 725, Tulsa, Okla.
ed by installing snow guards on the roof. These ornamental guards are placed in staggered positions to check a slide in any part of the roof. They also help prevent the snow from overloading the gutters. Simple bolts are used in wooden shingles; for slate shingles there is an extra metal piece that reaches back of the guard.

K 1464

Feet Massaged between Rollers Formed of Sponge Rubber

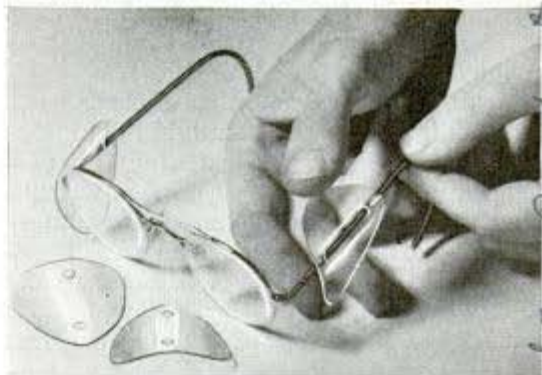
Four sponge-rubber rollers designed to fit the contour of the foot constitute the working parts of a massaging device that enables a person to massage his own feet while seated comfortably. Spring tension presses the top roller against the upper part of the foot to give the user a beneficial massage as he moves his foot back and forth between the rollers.



K 1471

Transparent Shields for Goggles Filter Glare at Sides

Transparent side shields for industrial goggles, tinted to eliminate glare, are now offered welders and others who work near



Side shields, easily slipped onto industrial goggles, stop flying particles but not the workman's vision

sources of high temperatures and piercing light rays. Made of lightweight cellulose acetate, they do not obstruct vision as is the case with ordinary shields, yet they give added protection to the eyes from flying particles and from dust. Should they become scratched or unfit for service, the shields may be replaced at little expense.

Berger Bros. Co. 229 Arch St. Philadelphia, Pa.
Berger Bros. Co. 229 Arch St. Philadelphia, Pa.
Berger Bros. Co. 229 Arch St. Philadelphia, Pa.

Wade Park Ave
Cleveland, Ohio
Kimball Safety Products Co. 7314

R1467 186th Field Artillery National Guard (Brooklyn, N.Y.)

Miniature Guns and Village Aid War Practice

Two target guns used in "miniature war," right, are posed with their original, a 155-millimeter howitzer, in the background. Below, artillerymen at practice can watch scores on board to correct their aim. Man with rake, (bottom, right) salvages steel balls that become buried in the sand when fired at tiny village



Judy Arnold Photo

Tiny training guns, equipped with sighting devices identical with those on their full-size prototypes, offer the equivalent of regular field practice for artillerymen. One-inch steel balls are the projectiles fired by twenty-two caliber cartridges, "short" or "long" blanks being used, depending on the range and elevation desired. The target is a midget village built in a sand pile across the armory floor. An observer stands back of each gunner, noting the result through field glasses and reporting the information to a board marker. Shots that fall short are indicated by a minus sign, and those over the mark score a plus. Gunners watch the "scoreboard" and correct their fire to make hits. When firing is over, a clean-up man scoops the steel balls from the sand with a special rake. The salvaged ammunition is then put away for the next practice session.



"Black Light" on Seed Potatoes Reveals Ring Rot

Invisible ultraviolet light now provides a quick and cheap method of revealing the presence of ring rot in seed potatoes. When ultraviolet rays are turned on a lot of seed potatoes in the dark, the good ones remain invisible, but diseased tubers glow, making them easy to spot and cull out. Since it is known that the germ does not live in the soil but comes in with the seed, a grower can protect his crop by using certified seeds that have been treated in this manner.

Prof R. W. Harvey. 567 Univ of Minnesota

Regiment Armory, Bedford Army, Atlantic City, Brooklyn, N.Y.

CASHING IN



Completing the drawing of a dinosaur battle which will become basis for a movie. Note the model used by Ray Harryhausen

FILMING weird monsters has been converted from a hobby into a profitable venture by Ray Harryhausen of Los Angeles, Calif. Part of his work is pure fantasy, while other of his films of prehistoric life are so highly authentic that they have been used for educational purposes.

But whether he's filming a fantastic attack on a rocket ship by a monster from Jupiter, or a highly authentic fight between

prehistoric plants. He molded woolly mammoths, three-toed sloths, sharp-toothed flying reptiles—and strange monsters born of his own imagination. This last type he used only in his films of pure fantasy, never mixing the imaginary and the authentic.

Early in his work Harryhausen developed an efficient system for evolving his films. His first step is to write a scenario. If the film is to be purely fantastic, no re-

earth-shaking dinosaurs, Harryhausen's ability to create naturalistic, smoothly moving miniatures is the secret of his success. It is this skill in making animals of the past, or monsters of fantasy, look and move as if alive that has turned his hobby into a successful job with Hollywood motion-picture companies.

Beginning with inexpensive photographic equipment plus an ability to draw and sculpture, this man worked for eight years to perfect his technique. He created dinosaurs of all sizes and placed them in settings of strangely exotic pre-

Below, left, when everything is ready to begin shooting, the animals and trees are placed on the set. Right, setting dinosaur's mouth in new position for the shooting of another frame in movie



1/1221

ON A FANTASY



Above, shooting prehistoric scene. One frame is shot, camera is stopped, the animals moved slightly and another frame shot. Circle, trimming fur of model mammoth. Basis of the monster is a ball-and-socket jointed metal frame

search need be done, but if it's to be one of his highly authentic prehistoric movies, he does elaborate research before starting his scenario. A dinosaur must not only be correctly modeled, it must move in the right way. Moreover, the background must be correct for the geological period in which the monster lived. The next step is to make a series of drawings showing the general trend of the action. From these drawings sets are designed and the monsters sculptured.

The basis for each of Harryhausen's weird beasts is a jointed metal frame. All joints are ball and socket, to give both strength and flexibility.

(Continued to page 126A)

Right, moving head of monster to correspond with action shown in drawing at left. The movie is first plotted in drawings

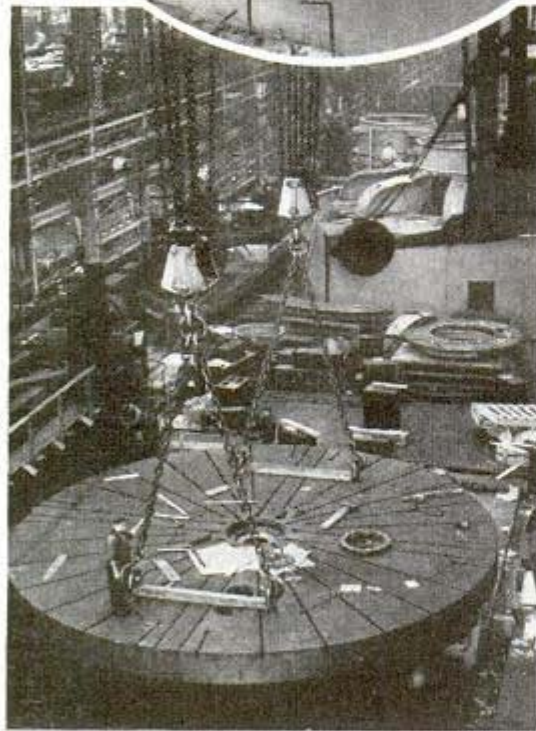


K 1486

Machine Giant Cuts 14 Miles of Steel in Hour



Circle, giant "nails"—steel piles driven down twenty-nine feet and filled with concrete so each could support thirty tons. Right, twenty-four ton "chair of concrete on which 350-ton boring mill has been installed. Below, installing mighty cutting tool



nograph needle moving across a record. A pit large enough to hold four six-room houses had to be dug for the machine's twenty-four ton foundation of steel and concrete. Despite its mass, however, the steel giant makes its cuts with an accuracy of four-thousandths of an inch, and even this can be increased by controlling temperature conditions to prevent contraction and expansion. Largest of the mill's thirty-four electric motors are two 300-horsepower units which drive the turntable; smallest are two one-half horsepower midgets which "float" the table by pumping lubricating oil into the grooves between the table and its circular track. The 600,000 watts of electricity consumed by these motors is equal to that required to light 10,000 sixty-watt lamps.

Capable of cutting fourteen miles of steel shavings from a 500-ton piece of steel in one hour, a 350-ton machine tool has been installed by Westinghouse to speed production of large waterwheel generators and other power equipment required for national defense. One of the largest boring mills in the world, the machine supports its work pieces on an eighty-eight-ton turntable when two special chisel-like tools do the cutting in the manner of a pho-

Bats Fly Blind on Sound Waves Unheard by Human Ears

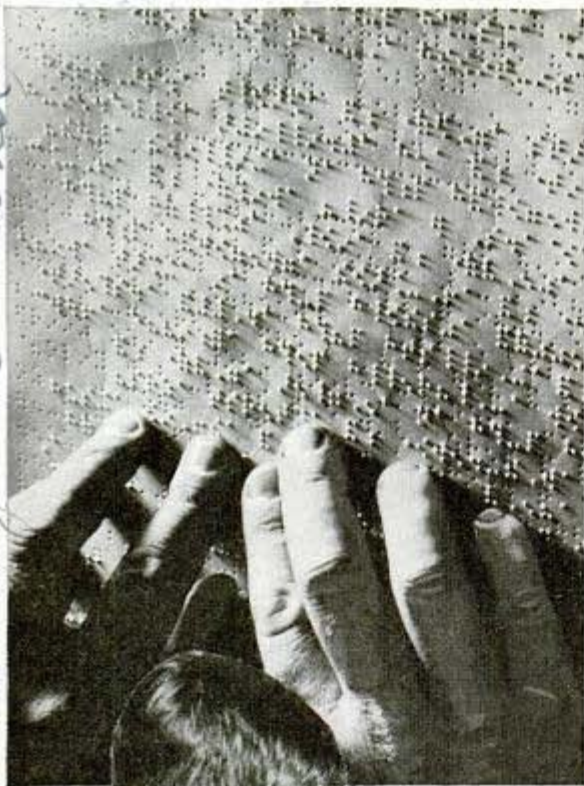
Blind-flying bats are now known to pilot themselves in pitch-dark caves by means of echoes of inaudible sound waves which they create. Two Harvard scientists explain that these sounds bounce off objects to warn the bats of obstacles in their path, enabling them to escape crackups. To

Science Service 12/26/40
K 1497
Biological in literature

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1128 8 learn level

TEACHING The

American Foundation for the Blind



Above, left, sample of Braille type, harder to learn than Moon (right), but generally taught because it is cheaper to produce

Young blind, or partially blind children learn quickly to use the Braille typewriter, which writes almost as fast as ordinary machines.

MODERN science has devised new techniques of education, exemplified by those now used in Los Angeles, which have solved the problem of how to educate and train in useful crafts persons who have little or no eyesight, or who might lose their vision if eyes were subjected to normal tasks.

New machines, new methods, new theo-

15 W-16 the new year
eral belief, most "blind" persons are not totally blind at all. They just have very defective vision, often nothing more than an extreme case of common eye disorders. Unless the eyeballs are gone, or the visual apparatus has been damaged by disease or injury, almost all persons can distinguish light, darkness, form and movement. The theory of these classes, then, is to save

K1214

THREE R's *by* TOUCH



what sight remains by not subjecting it to undue strain.

First and most necessary step is to provide proper light without glare. Classrooms are being outfitted with revolutionary lighting systems that may become universal in all schools. Indirect systems are controlled automatically by photoelectric switches. When the sun fails, electric illumination instantly replaces it, and turns off again if the sun reappears.

These classes have a double curtain system to cover windows both top and bottom, so plenty of illumination can get in between, but no glare can fall across a child,

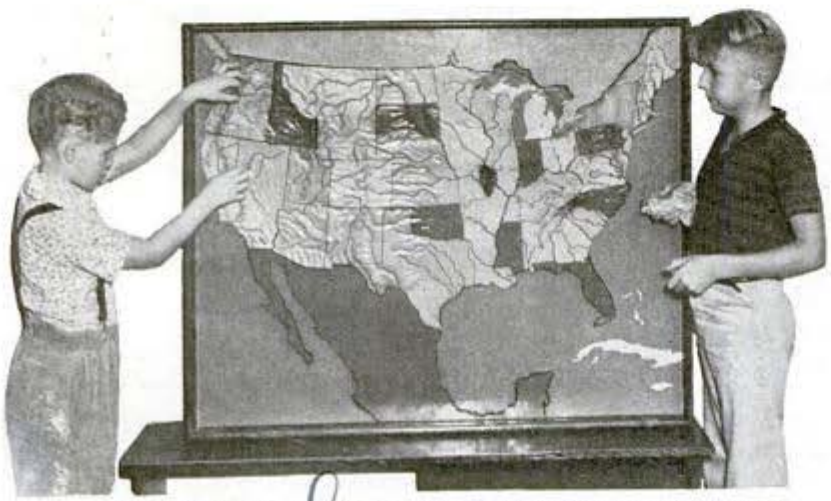


Top, left, comparing text of sight-saving book with that of ordinary book. Right, studying a Braille globe with the finger tips

nor can shadows increase his visual task.

For these classes, be the students children or adults, all the usual classroom tools are specially made. Desks have obliquely rising tops, so print is always on a level plane with the eyes. Blackboards are deeply and dully tinted, and chalk is of a hue that stands out sharply but without brightness. Everything these students look at is clear and sharp, but not bright. Maximum vision with minimum glare is the objective.

Pages of books and their print are composed the same way. The paper is dull mat, with a slight yellow tint, and the print is large twenty-four-point type, deeply pigmented. Writing tablets are composed of similar



Boys studying map which has lakes, rivers and mountains in relief. Each state is separate unit fitted in like a jigsaw puzzle section

APRIL, 1941

American Library for the Blind, Louisville, Ky. 573

R 1214



Above, Braille slate and stylus enable almost blind boy to write quickly without strain on his eyes

material, and have widely spaced lines to encourage large writing. These students form letters and numbers about three times as large as those made by normal pupils.

Handwriting involves considerable eyestrain at best. As soon as their hands are more skilled, they learn to type, using machines that make bold, black letters. A special guard covers the keyboard to prevent motion of the fingers, seen only in the peripheral vision, from tiring the eyes.

By these techniques, the pupils are prevented from falling into the other category—those whose vision is so bad that to use it might mean blindness. Classes are taught for this type, too, and here a greatly different method is employed. This type of student doesn't use his eyes at all—his education comes through his fingers, just like a blind student's. In fact, there are some blind in these classes.

Again we have a twofold purpose—to

save existing vision and provide a normal education. Most of these students could read type—but they are encouraged not to. Their reading is the Braille touch system, and, in cases of adults, the simpler but bulkier Moon type.

This is a guarantee that if the eyes ultimately fail, as they sometimes do in these extreme cases, the individuals will have a firm foundation for continuing their lives—and it also lessens the likelihood of such a failure. These students learn to write rapidly in Braille as well as read it. They have a small Braille pocket slate for this purpose, and in addition, there is a Braille typewriter, simpler than an ordinary typewriter, on which they learn to write swiftly in a short time.

Mathematics may now be taught quickly on the Taylor arithmetic slate, a device with checkerboard grooves into which Braille number blocks fit. Geography is one of their easiest subjects. They have maps with

(Continued to page 114A)



Left, reading Braille thermometer. Below, adding up a column of figures on a Taylor arithmetic slate



1319
 6392
 Robert A. Boyer
 Chemist in Charge
 Soybean Experiments
 Laboratory

Plastic Panels Tested for Use in Auto Bodies



Left, Henry Ford compares damage caused by ax striking metal panel, to which he points, and plastic panel. Below, Mr. Ford in act of swinging ax against plastic body panel. Bottom, left, one step in molding of plastic panel



Pointing to the time, perhaps the near future, when automobile bodies may be made entirely of plastics, Ford Motor company experimenters have produced and tested panels which appear suitable for such a purpose. The panels are made of soybean fiber and resin. In one test a steel panel struck with an ax was pierced at the point of impact and the surrounding area badly dented; in comparison, a plastic panel was scarcely marked. The Ford company is preparing to extend the scope of this work, ordering dies for production of

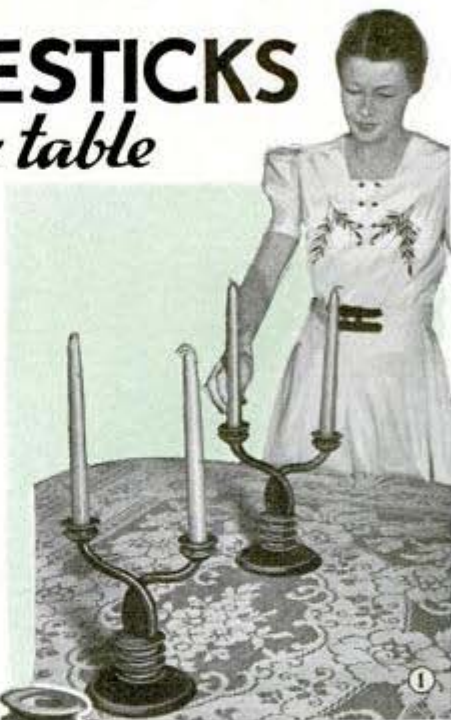
plastic parts for auto bodies. Among advantages claimed for plastics, in the manufacture of cars, are: ease of casting and forming, ease of coloring—the color may be introduced into the plastic parts, thus eliminating painting—and an increase in impact strength over certain metals used for the same purpose. At present bodies made of plastics would cost more, probably, than those of metal, but experimenters believe mass production would solve this problem. Other auto body builders are experimenting along similar lines.



The CRAFTSMAN

Twist-Neck CANDLESTICKS *dress up your table*

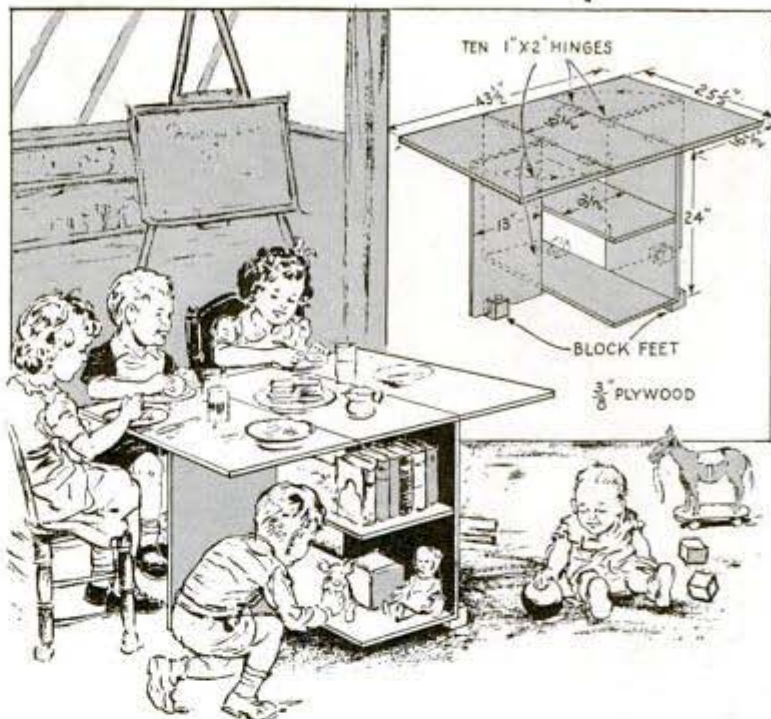
DUPLICATING a pair of the beautiful walnut candlesticks shown in Figs. 1 and 2, is not as difficult as it may appear. Actually it involves only simple lathe work, the twist-neck effect being achieved mainly with the aid of a disk-shaped jig. Fig. 6 shows how the various parts fit together. The base is faceplate-turned, bored to receive a $\frac{3}{4}$ -in. tenon and recessed on the underside by reversing the work. The body of the candlestick is turned from a $2\frac{1}{2}$ -in. block 4 in. long, leaving a tenon at each end. To form the gothic-shape centerpiece which is doweled to the body as shown in Fig. 3, a jig like the one shown in Fig. 7, is required. Two 1-in. blank pieces having a radius of $2\frac{1}{4}$ in., are cut to fit the curved edges of the disk and are fastened to it with screws placed as shown. Then the assembly is pressed tightly on a wood shaft which is afterward mounted between centers as shown in Fig. 5. Each outer edge of the pieces is grooved as shown in the



section detail in Fig. 7. This groove must conform to the diameter of the neck pieces, and should allow the latter to overhang the edge slightly. Each face is scored $\frac{1}{16}$ in. deep with a small pointed tool, after which the pieces are removed, Fig. 8, turned end for end and re-screwed to the jig to complete the criss-

Gate-Leg Table Saves Space in Child's Room

The space-saving possibilities of a gate-leg table led a father to make one for his young daughter's room. The room being small, it was necessary to conserve as much space as possible, yet have a table, around which she could seat her friends for tea parties and games. The table shown was found to be the answer to the problem. The table was made of plywood and assembled with screws, brads and hinges, as indicated. Four discarded play blocks were used for the feet, and the center and bottom shelves provided space for dishes, toys and books. Half-round molding was glued to the edges of the top to finish it off and provide further rigidity. Clean lines and good balance make the table attractive.

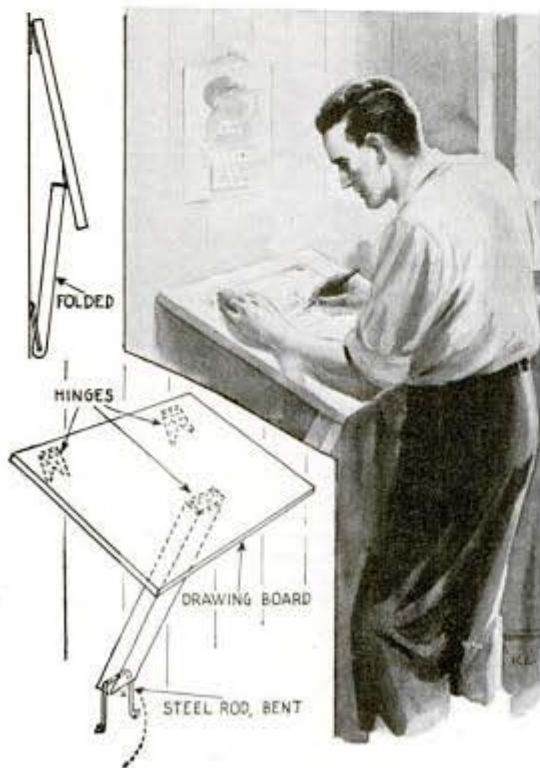


finish it off and provide further rigidity. Clean lines and good balance make the table attractive.

The wide smooth sides, top and shelves can be decorated in many attractive ways.

—Carl S. McKnight, Winnetka, Ill.

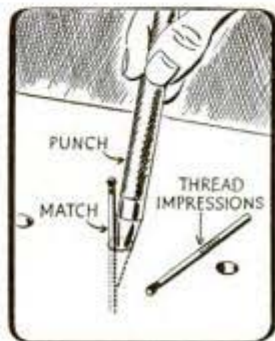
Drawing Board on Wall Has Eccentric-Hinge Support



With the aid of an eccentric like the one shown hinged to support a drawing board on the shop wall, you have a worktable that can be raised for use or folded flat in an instant. The lower support hinge is made from a length of steel rod bent to shape and fastened to the wall with staples.

Threads in Tapped Hole Counted with Aid of Match

Determining the thread count in a tapped hole is a simple matter if you take an impression of the threads with a match. To do this, place the match in the hole and insert a tapered punch to press against the match. This will force the threads into the soft wood, leaving sharp impressions.



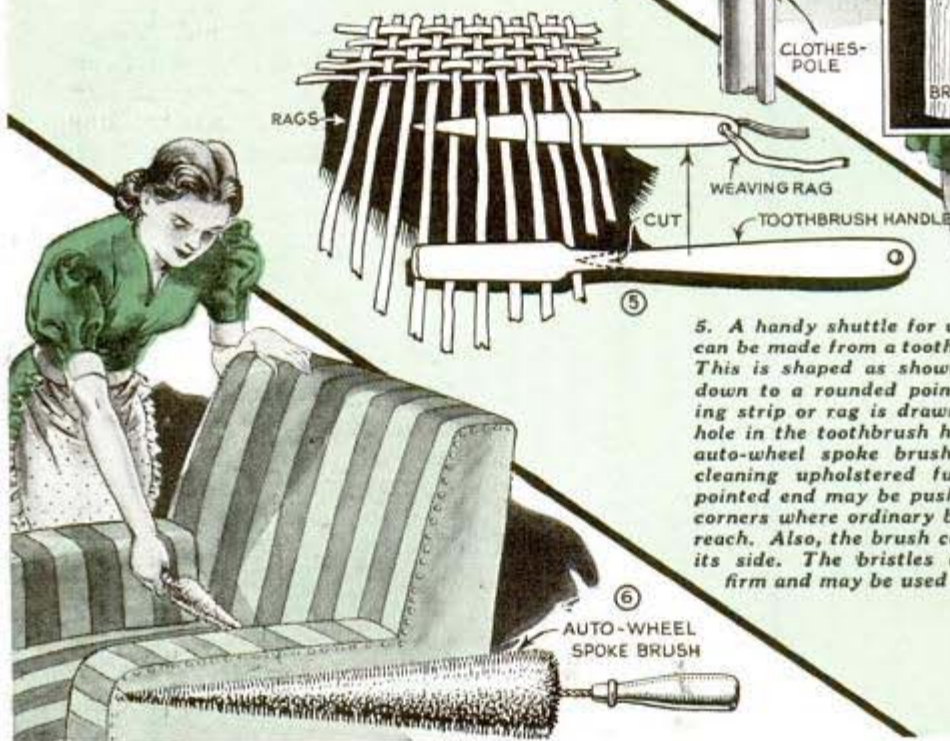
Solving HOME



1. By hinging one side of a clothes chute so that it can be lowered to provide a sorting table, time is saved on washday. A support hinged to the outer end of the table keeps it in a horizontal position. 2. A wide rubber band snapped over the holes in a condensed-milk can seals them thoroughly and is easy to remove



3. Instead of wrapping strips of paper around a small candle to make it fit snugly in a candlestick, split the end of the candle with a hot knife to a depth of 1 in. and spread the sections slightly. When forced into the holder and cooled, the candle will remain securely in place. 4. The unpleasant job of digging a clothespole out of the snow during winter can be avoided by keeping it in a broom clamp



5. A handy shuttle for weaving a rug can be made from a toothbrush handle. This is shaped as shown and sanded down to a rounded point. The weaving strip or rag is drawn through the hole in the toothbrush handle. 6. An auto-wheel spoke brush is ideal for cleaning upholstered furniture. The pointed end may be pushed down into corners where ordinary brushes fail to reach. Also, the brush can be used on its side. The bristles are hard and firm and may be used vigorously

PROBLEMS



7. No matter how you work it, a coffeepot handle usually gets scorched and too hot to pick up. A good way to protect the handle is to slit one side of an empty can so that it fits under the handle. When it's time to remove the pot, simply slip the can to one side and grasp the handle. 8. Disks of felt glued on the ends of chair legs will help prevent them from marring floors when pushed over them



9. If you desire to attach a hose to a water faucet, you can get a coupling for the purpose by utilizing part of a five-cent anti-splash water filter, which is equipped with rubber parts that make a tight fit around both the end of the hose and the faucet. 10. To keep garment hangers from sliding back and forth on a clothesline, and to space them apart so that suspended garments will air out and dry quickly, insert a length of light chain between the post and the line, and hook the hangers into the links



11. When using a can of paint and the lid is out of shape and does not seal it tightly, a disk of waxed paper laid on top of the paint will prevent a scum forming for a day or two. 12. If fruit jars and other glass containers are used to protect plants and increase sun warmth, ventilation is assured if two sticks are pushed into the bottom of the jar a little above it

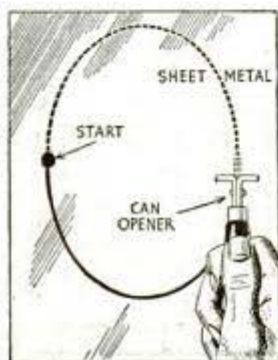


Invisible Bookends Will Puzzle Visitors to Your Home



Several books standing in a row on a table with apparently no support to keep them from tipping, will not only be a puzzler to your friends, but you will also find the arrangement much neater than the usual bookends. In this case, the bookends are merely blocks of wood nailed to pieces of sheet metal and fitted with covers removed from a couple of discarded books. The exposed edges of the blocks are sanded smooth and then painted, after which a fine-tooth comb is drawn over the surface while the paint is still tacky, making lines that resemble the edges of book leaves.

Can Opener Cuts Sheet Metal Without Bending It

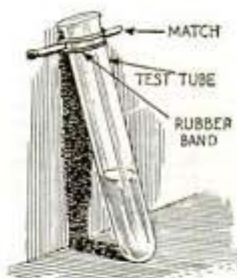


The next time you have an opening to cut in light sheet metal and want to save the unused portion, do the job with an ordinary can opener instead of using a metal shears or chisel. It will not be neces-

sary to bend the metal when cutting as the opener can be operated without either piece interfering with the hands.

Test Tube Prevented from Rolling by Match and Rubber Band

In using a test tube which you wish to keep in vertical position temporarily, place a match against the upper end and snap a rubber band around the tube and over the ends of the match. The tube then may be leaned against a wall or any other handy object where it will not roll or fall over.



Protecting Furnaces from Rust During Summer Months

A firebox and other interior exposed surfaces of a heating plant that "sweat" and tend to rust during summer months when not in use, can be protected as follows: Thoroughly clean them with a flue or scratch brush. Then dip the brush in oil, and swab all surfaces, repeating this several times during the summer.

Abrasive Sticks Are Timesavers on Intricate Sanding Jobs

You can save time when sanding small models and scrollwork if you keep an assortment of abrasive sticks of various sizes and shapes on hand. The sticks are shaped from scrap wood, and sandpaper is applied to one side with glue or rubber cement.



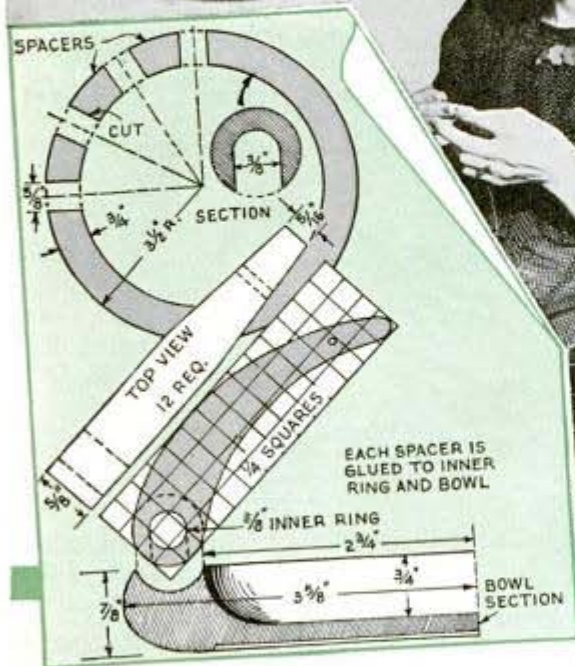
"Drawstring" BOWL



FOR FRUIT

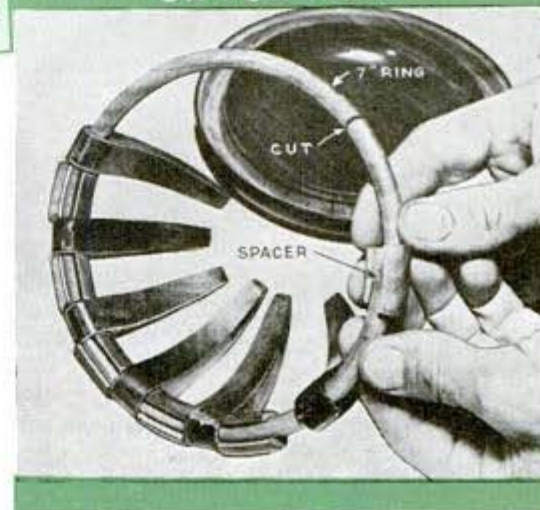


BLOCK
GLUED TO
BOTTOM
OF TRAY

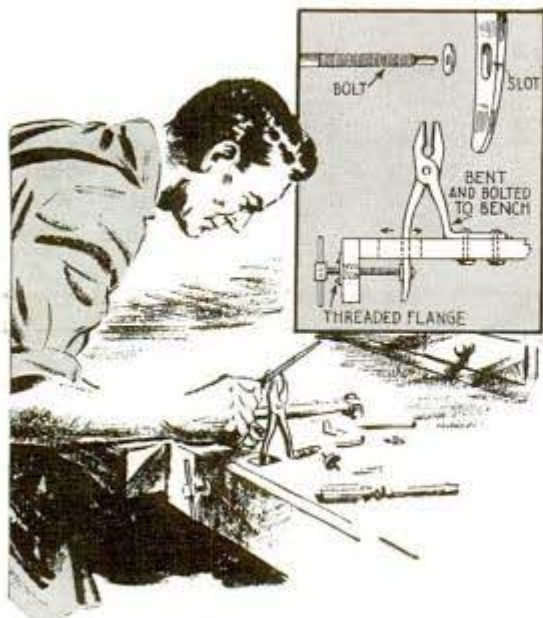


OR FOR YARN

When it is not being used to hold fruit or flowers, this unusual bowl can be closed to form a clever "cage" for a ball of yarn. The base is recessed as shown in the section detail above. Then a concave groove in which the fingers actuate, is turned in the rim to conform with the rounded ends of the latter. Holes of the proper size are bored through each end of the twelve fingers, after which they are slipped on a turned wood ring as shown at the right. Segments which space the fingers equidistantly around the bowl, are cut from a 3/4-in. ring that is grooved to fit snugly over the inner ring as shown above in the upper detail. Each spacer is glued to the ring, between the fingers, so that one spacer will come directly over the severed section of the ring. The assembly is attached to the base by coating the bottom of the spacers with glue and pressing in place in the groove. Be careful to see that the glue does not adhere to the fingers. A small 1/8-in. chain is threaded through the holes in the ends of the fingers

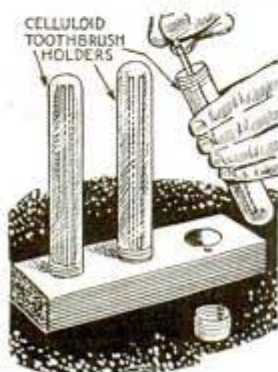


Inexpensive Vice Made from Pliers Is Handy for Small Work



An excellent little vice for small work can be made from a pair of pliers. Heat one of the handles and bend it as shown, drilling a couple of holes for bolting to the bench top. The other handle should project down through a slot cut in the bench. Near the lower end of this handle a hole is drilled and filed to form a slot. A small pipe flange or large nut is fitted in the front of the bench to take a long bolt, the head being drilled to take a handle. The other end of the bolt is filed down to fit into the slotted handle, after which the end is peened over. When the bolt is turned up it pushes the handle, closing the plier jaws and when the bolt is unscrewed the peened end pulls the jaws open.

Jigsaw Blades in Visible Holder Are Easily Selected



With your jigsaw blades in this portable holder, it takes only a glance to locate the blade desired. All materials necessary to make it are three celluloid toothbrush holders and a small block of wood drilled to take the

caps, which should be a pressed fit in the holes. While this holder will accommodate small, medium and coarse blades, more tubes could be added, if desired.

—J. O. Clickenger, Los Angeles, Calif.

Maps Stored in Mailing Container Protected Against Dust

Maps, charts, sketches and drawings that you want to protect against dust and moisture can be slipped into a cardboard mailing tube that has been varnished. Cap the ends with small-size oiled-silk jar covers. Besides protecting the papers, this method of storing makes it easy to file the work.



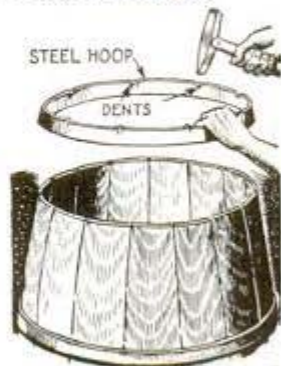
Hammer "Wedged" on Handle with Wood Screws



If your hammer works loose on the handle, screws driven into the end to expand the wood will stop the trouble. Drill holes to start the screws which are dipped in shellac.

Steel Hoops Anchored to Barrel by Dents in Upper Edges

To anchor steel hoops on a wooden barrel, dent one edge of each hoop with a peen hammer at intervals of 3 or 4 in. before driving them in place. The dents bite into the wood to keep the hoops from slipping.



☐ A damp dish towel or other large piece of cloth should be placed over the top of a radiator while brushing it, to keep the dust from flying out into the room.

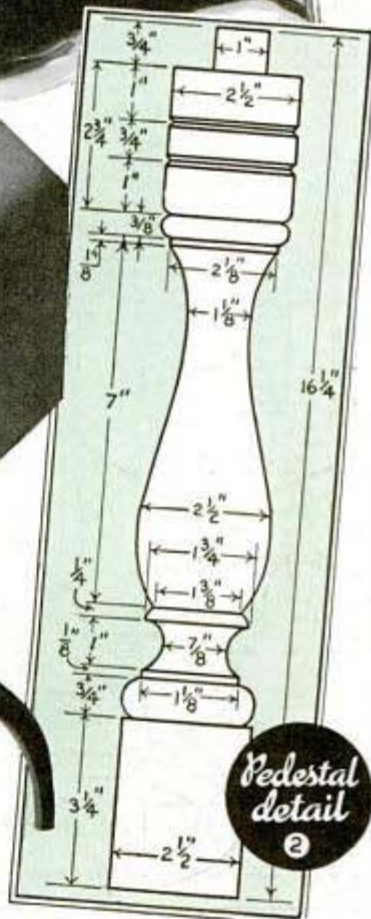
Tilt-Top LAMP TABLE in Chippendale

By R. O. BUCK

A TILT-TOP table is convenient in the small home or apartment as it can be set against a wall with the top tilted as in Fig. 1, to serve as an attractive ornament, yet it is always ready for use by simply turning the lid down. A pair of these little tables, with matched lamps, are effective at the ends of a davenport.

As mahogany or walnut is rather expensive, birch or gum are woods suggested for this table, because either one of these will take a mahogany or walnut finish satisfactorily. In starting on the construction, you can first turn the pedestal to the shape and dimensions given in Fig. 2, leaving a 1-in. tenon end at the top. If you do not have a piece of hardwood large enough to turn the pedestal, it may be necessary to glue up several thicknesses of stock.

Next, you make the three legs. These can be cut out by means of an ordinary keyhole saw, although the job is accomplished much more quickly on a scroll or band saw. A pattern for the legs is given in Fig. 3. To enlarge this to the right size you rule off $\frac{1}{2}$ -in. squares on a sheet of paper 8 by 11 in. in size, and then proceed to draw the legs, closely following the pattern given here. Notice especially the direction that the grain should run so that the leg will have maximum strength. If a little planning is done, the pieces can be laid out side by side to save material. Sanding the curved surfaces of the legs may be done by hand, but quicker results are obtained by using a drum sander on a lathe. If sanding is done by hand, wrap sandpaper on a large dowel. After the legs have been cut and sanded, they are doweled to the lower

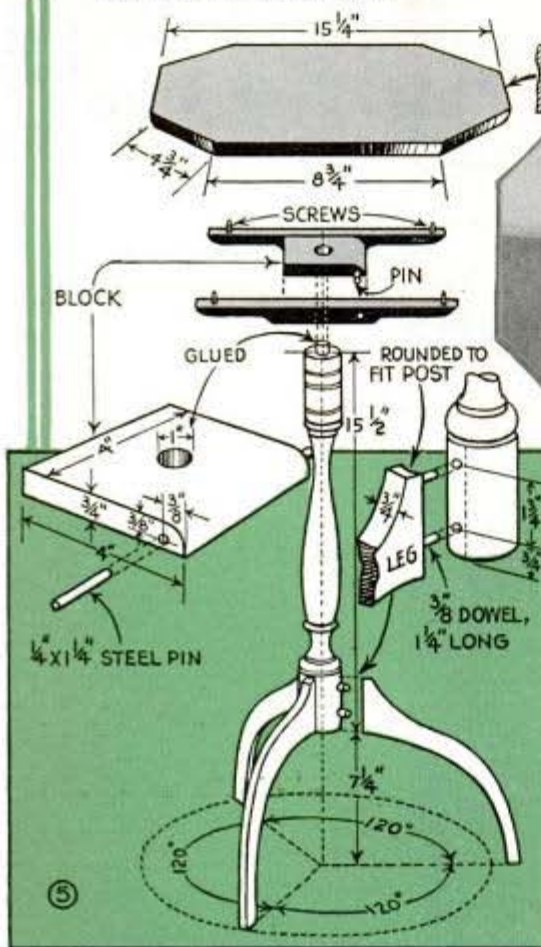
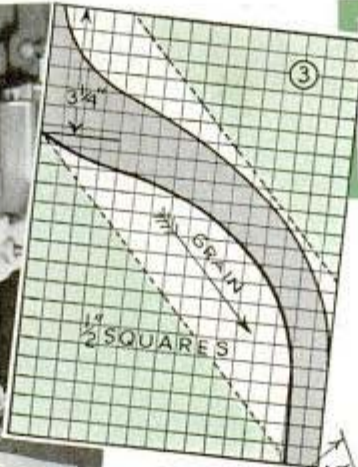




The simplicity of construction and assembly of this tilt-top table is apparent from these drawings. The top has two cleats on the underside, which pivot on a block glued to the pedestal. An elbow catch prevents the top from tipping when in horizontal position.

MATERIAL LIST

- 1 pc. $\frac{3}{4}$ by $15\frac{1}{2}$ by $15\frac{1}{2}$ in.—Top
- 1 pc. $\frac{5}{8}$ by 1 by 24 in.—Cleats
- 1 pc. $\frac{3}{4}$ by 4 by 4 in.—Block
- 1 pc. $2\frac{5}{8}$ by $2\frac{5}{8}$ by $16\frac{1}{2}$ in.—Pedestal
- 1 pc. $\frac{3}{4}$ by 4 by 46 in.—Legs



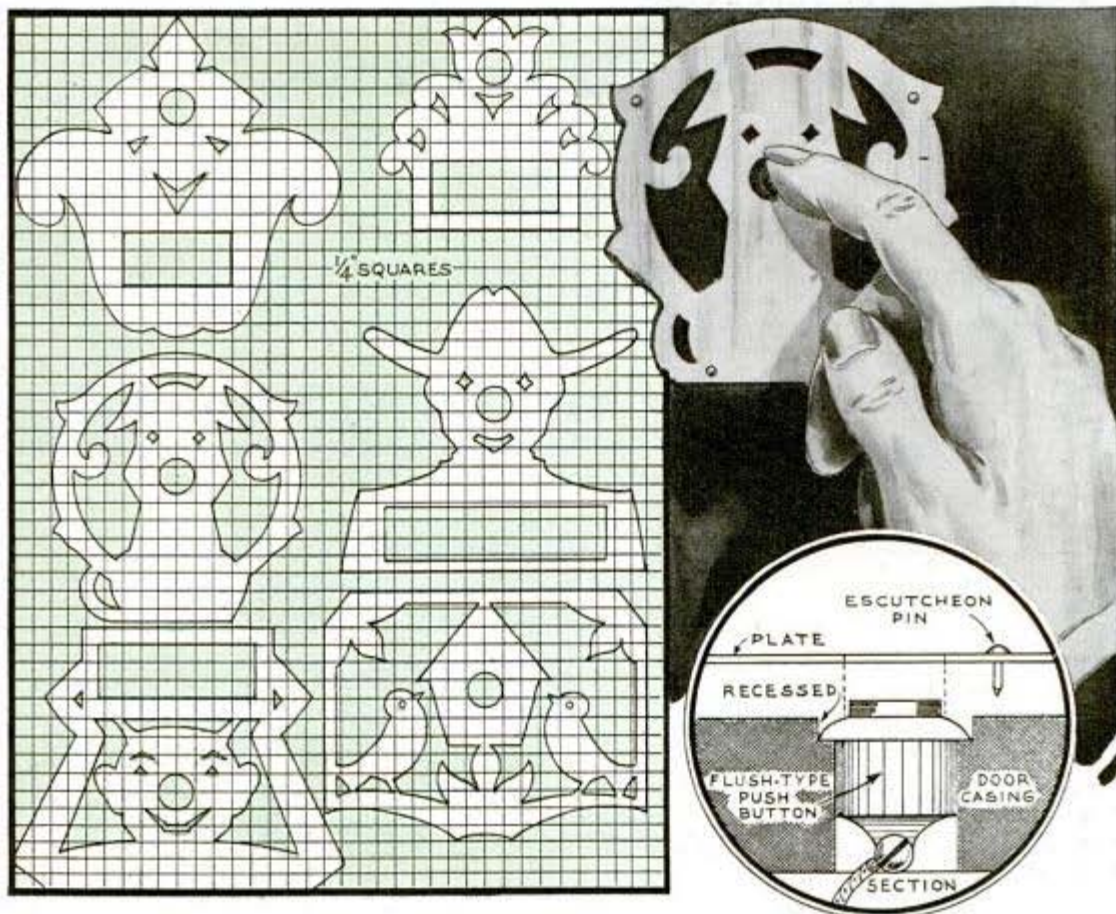
end of the pedestal. In laying out the position of the dowel holes, proceed as follows: Wrap a strip of paper around the post and cut it off so that the ends just meet. Remove and fold three times, replace and mark the fold lines on the post to locate the lines of the dowels.

The top is made of solid stock with the top surface veneered with mahogany or walnut if desired. After cutting the top to the shape and dimensions given on Fig. 5, the lower edge is rounded. Figs. 4 and 5 show the arrangement of the various parts of the top assembly. Cleats are screwed to the underside of the top and are pivoted to a block with two steel pins. The block, in turn, is glued to the tenon at the top of the pedestal. If desired, you can also use screws for fastening at this point. As shown in Fig. 5, one edge of the block is rounded to clear the underside of the top when the latter is swung up or down. The hole for the pivot pin must be located very carefully, both in the cleats and block, so that the top will swing smoothly and plumb. To hold the top in a horizontal position, an elbow catch of the type shown is used.

Fraying of Hemp Rope Prevented

The ends of hemp rope may be prevented from unraveling by wrapping them with strong twine and then dipping the bound ends in shellac. When dry, the ends will remain firm indefinitely, making the rope much easier to handle.

Decorative Plates Dress Up Doorbell Buttons



If you have a flush-type doorbell push button which guests find hard to locate, especially in the dark, an ornamental cut-out placed around it will overcome the trouble and add a novel touch to the doorway. Several designs of cutouts for this purpose are shown here as suggestions, or you can make one to suit your own fancy. You can use just one piece of metal, or you can obtain contrast by mounting the cut-out on a plate of different metal, as for in-

stance aluminum or brass over copper or iron painted black. Simple silhouettes in hammered iron, painted black, are very effective against light-colored surfaces. The work can be done with a hand coping saw or on a power scroll saw. All edges and corners are carefully rounded with a file before painting, or in the case of brass or copper, you polish the metal and then apply a coat of clear lacquer.

—Bess Livings, Batavia, Ill.

Rubber Soldering-Flux Container from Brake-Pedal Pad

Brake-pedal pads of the slip-on type serve nicely as containers for soldering



flux around a workbench. Being wide and flat, there is little chance of tipping them accidentally, and they are acid resistant and non-breakable. Rubber disks or pieces of glass make good lids for the containers.

❑ Flower beds and borders which have been protected by straw or other coverings during the winter should be uncovered a little at a time, to avoid exposing young shoots too suddenly.

Scale Fences for Model Railroad from Thread and Soda Straws



The tedious task of building scale fences for model railroads may be simplified by using soda straws for the posts. Lengths of black thread inserted through these with the aid of a needle will serve as the fence wires. The posts can be held in place vertically with spots of glue.

Small Stick Through Jug Handle to Carry It Easily



Carrying a filled glass jug of the type shown is simplified if a stick is slipped through the handle as indicated. It will provide a comfortable grip for all four fingers.

Sprinkler Distributes Wax Evenly

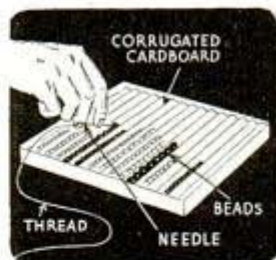
It is much easier to distribute polish evenly on a mop or dust cloth if the polish is applied with a clothes sprinkler. To do this, simply remove the cap from a bottle of polish and insert the sprinkler. If the wax tends to fill the holes



in the sprinkler when it dries, put the sprinkler in boiling water to clean it. Or, better, clean the sprinkler after using each time.—Benj. Nielsen, Aurora, Nebr.

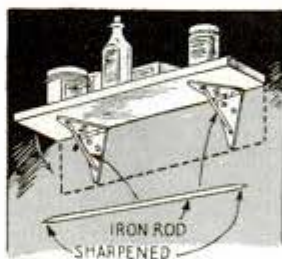
Beads Separated as to Color with Corrugated Cardboard

When stringing beads in making rings, bracelets and other novelties, you can save time by keeping them separated according to size and color. This may be done by



placing a sheet of corrugated cardboard in a shallow box, fitting it snugly in place and on a slight incline. The beads may then be poured into the separate channels.

Strap Hinges Serve as Brackets on Folding Shelf



In cramped quarters where a shelf is needed occasionally, one of the folding type can be made in a few minutes from a couple strap hinges and a board. Hinges are screwed to the wall and shelf, leaving the end holes in both hinges to take pointed rods, which hold the shelf in position, as shown. When not in use, the rods can be removed to let the shelf down.

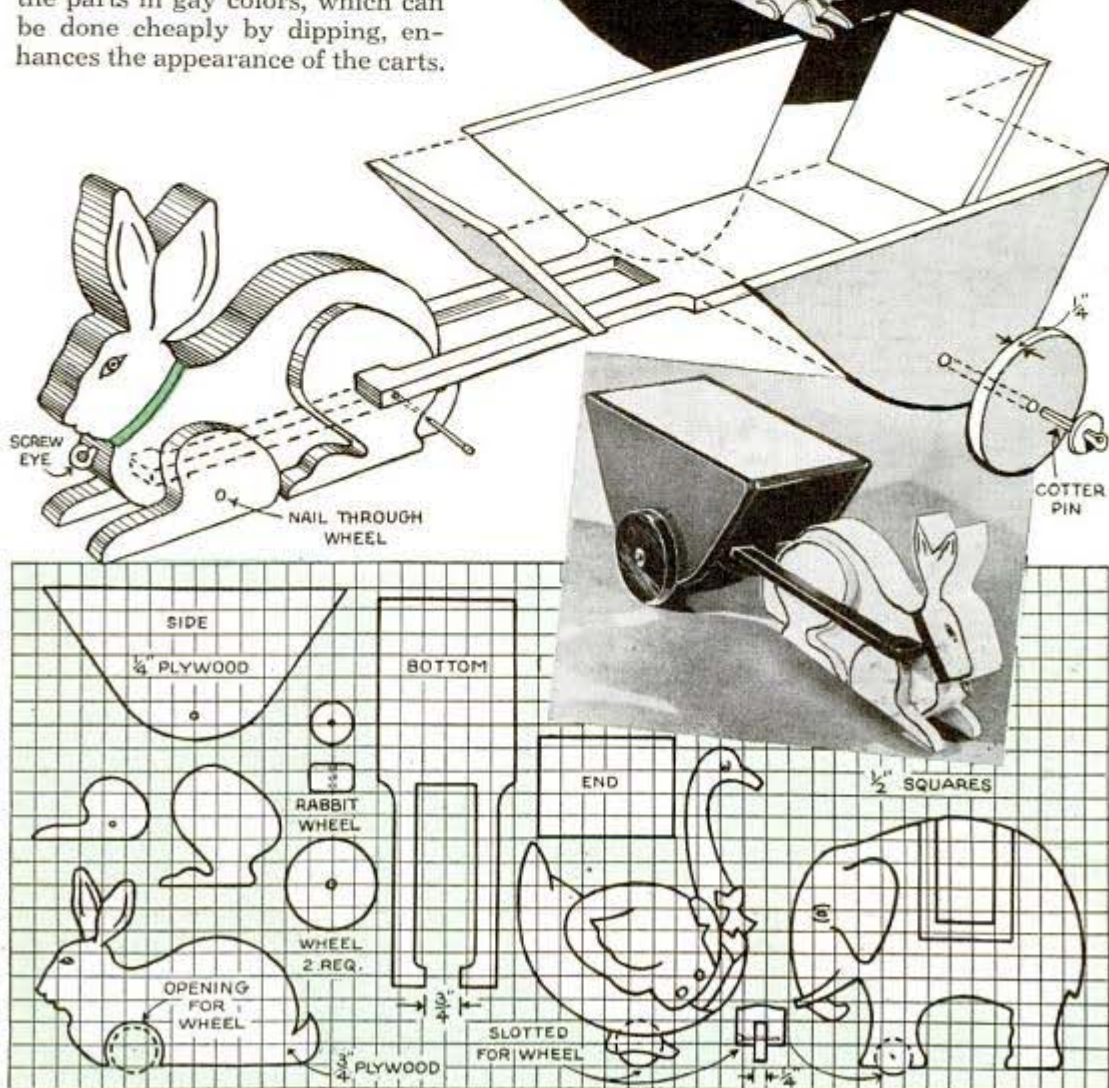
Flags Are Made Self-Supporting by Cork and Rubber Bands

To hold clusters of small flags so that they could be set in a window, one decorator assembled them around corks and held them in place with rubber bands. The taper of the cork spread the flag staffs so they formed a tripod.



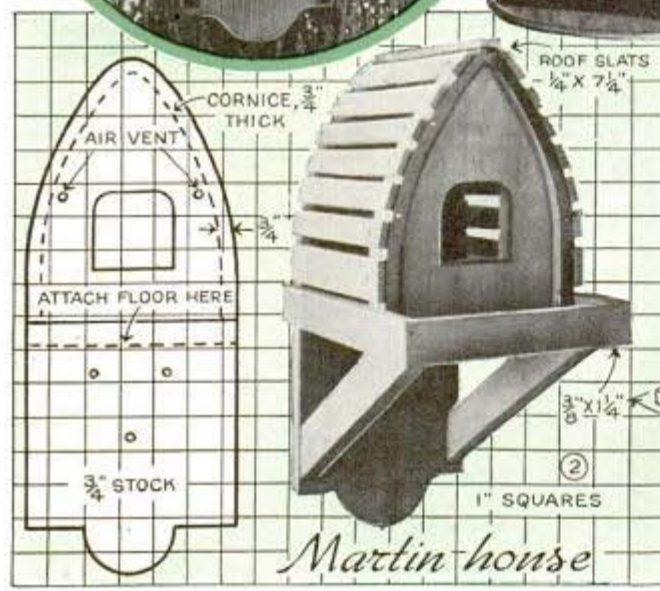
Jigsawed EASTER-EGG CARTS

One of these carts filled with brightly colored eggs will make any youngster's eyes shine on Easter morning. And, the carts are not necessarily a seasonal toy, as birds or different animal cutouts can be substituted for the rabbit. Or, you can reduce the size and use them as candy or nut carts. In this form, they are ideal bridge or party prizes. The home craftsman can make and sell them at a profit, too, because the material can be stacked and several pieces of each part sawed at one time. Painting the parts in gay colors, which can be done cheaply by dipping, enhances the appearance of the carts.



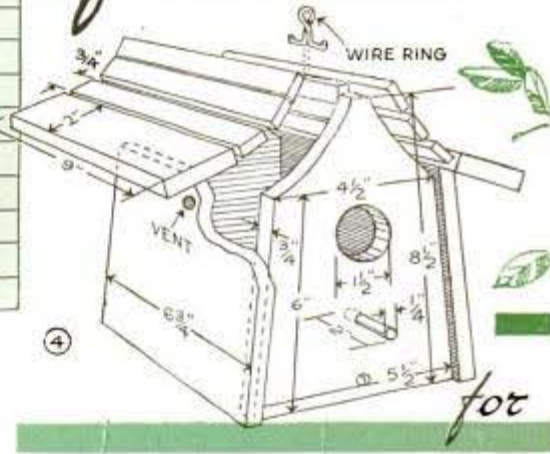


Robin shelter



Martin house

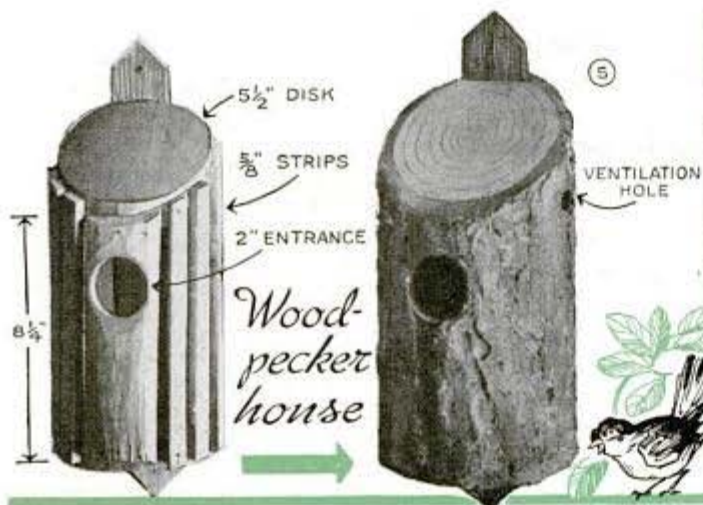
COOL
of asbestos



By DICK HUTCHINSON

EVERYONE who has built houses to attract birds around the home probably has wanted to make round and odd-shaped houses with irregular roofs either for the novelty of appearance, or to blend in with the surroundings. Those who have foregone this pleasure because of the difficulty of shaping the desired houses from wood—metal being out of the question because the houses would be too hot—can get any shape desired by covering them with a plastic material consisting of portland cement, 1 part, and asbestos cement, 3 parts. This material dries slowly so that you have plenty of time to mold it as desired, and if kept out of the sun and wind so that it dries as slowly as possible, it will become very hard. It can be troweled smooth or left rough, and will take paint nicely, making it possible to finish the houses in bright colors to help dress up the garden.

In using the plastic, all you need is a framework on which to apply it. The martin house in Figs. 1 and 2 is a good example. The ends are solid wood and the roof, which is covered with the plastic, is made of slats. Robins usually build on a shelf of some kind, but will not nest in a closed house. The shelter in Fig. 3 is attractive to them. The roof only is covered with the plastic, which is molded to resemble bark. A few small nails projecting from the roof slats help to anchor the plastic. The bluebird house in Figs. 4 and 7 is of solid wood, but the roof is covered with the material and molded to simulate shingles. A woodpecker is one bird that insists on building in a hollow log, but it is easier to make the "log" shown in Fig. 6 than it is to find a real one that is hollow. Assemble the skel-



BIRDHOUSES

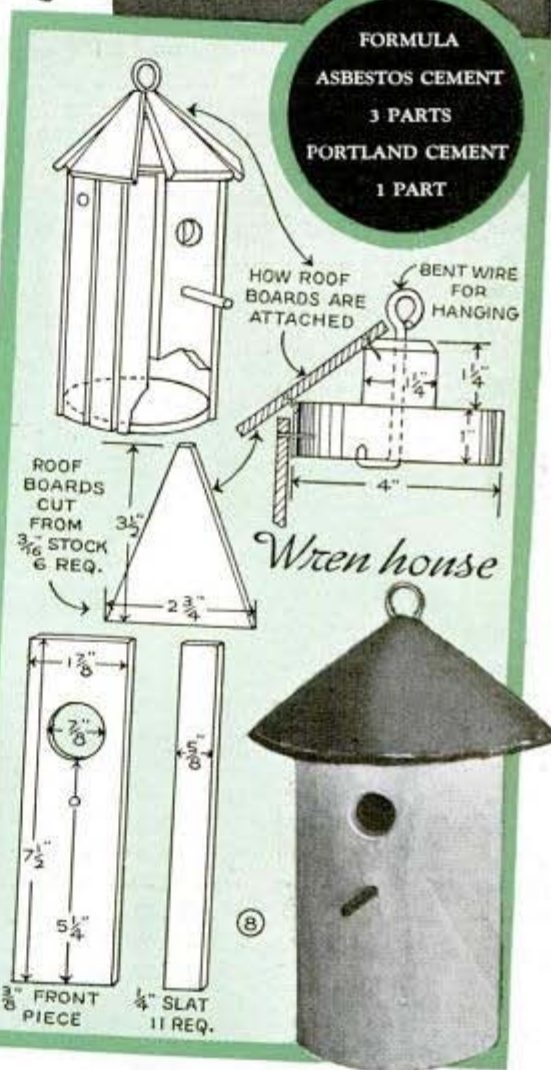
cement



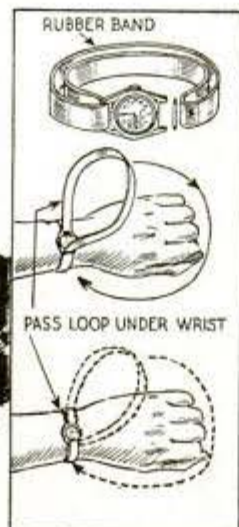
bluebirds

eton framework and cover the outside roughly with the plastic, allowing it to dry for a day or so. Then apply a second coat, reproducing as nearly as possible the bark of a tree.

Now comes a home for the little house wren. The one shown in Fig. 8 is easy to make and is entirely covered with the plastic. The framework consists of slats nailed to wood disks at the top and bottom. Also, the roof is made of slats, which are shaped and assembled as in the upper detail. Be sure to make the entrance opening small enough to keep out other birds or the wren will vacate its home. The house can be hung in the branches of a thickly foliaged tree or under the cornice of a building.



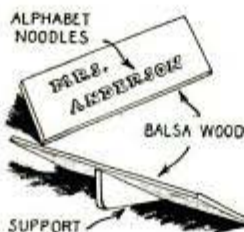
Loop-Type Strap on Wrist Watch from Rubber Band



Having no ends to buckle, this rubber-band watch strap will give you long service. A $\frac{5}{8}$ -in. rubber band about 5 in. long is suitable for the average wrist. The top detail shows how it is fastened to a watch. To put the band on your wrist, one end of the loop is slipped under the wrist, while the other end above the watch is passed over the hand.—Andrew Vena, New York.

Novel Lettering on Place Cards Done with Alphabet Noodles

Party place cards may be made by using alphabet noodles. Thin strips of stained balsa wood are used as the card, and the noodles are cemented in place.—Harry Thomas, Chicago.



Match Book Serves as a Rule in an Emergency

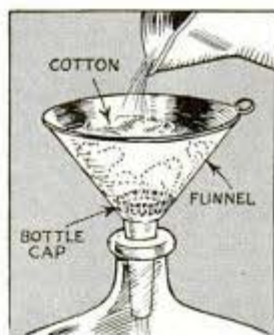


An artist who frequently has occasion to do outdoor mapping of fields and building sites, sketching them roughly for office reference, says that he finds a common match

book helpful in his work. It can be used as a rule or square for rapid sketching and is always at hand without being cumbersome.

Inverted Bottle Cap in Funnel Speeds Up Filtering

When cotton is placed in a funnel to be used as a filter, it usually packs into the spout and slows up passage of the liquid. To avoid this, one laboratory worker drops an inverted soda-bottle cap into the funnel before putting in the cotton. The crimped rim of the cap provides tiny openings through which the liquid can pass.



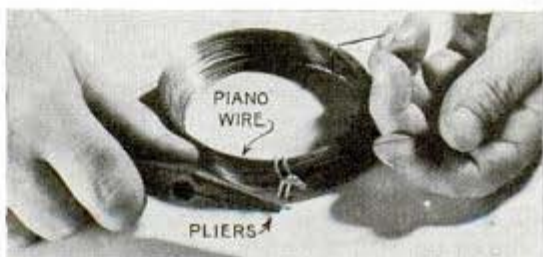
Hinge Hasp Fastened at Angle Swings Back When Open



To prevent the hinge hasp on his granary door from swinging out where it might catch and tear clothing or get bent if the door were blown open, one farmer attached it at a slight angle as shown. This caused the free hinged section to swing down against the door when open.

Use Pliers to Sever Spring Wire

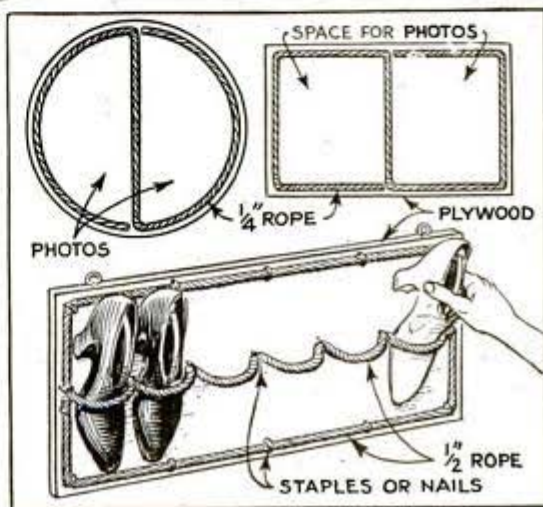
The steel of which piano wire is made is so tempered that if it is cut with ordinary tools, the cutting edges will be nicked badly and resharpening will be necessary. A better way is to bend the wire sharply and pinch it with a pair of pliers. When the bent portion is straightened, it will break easily.



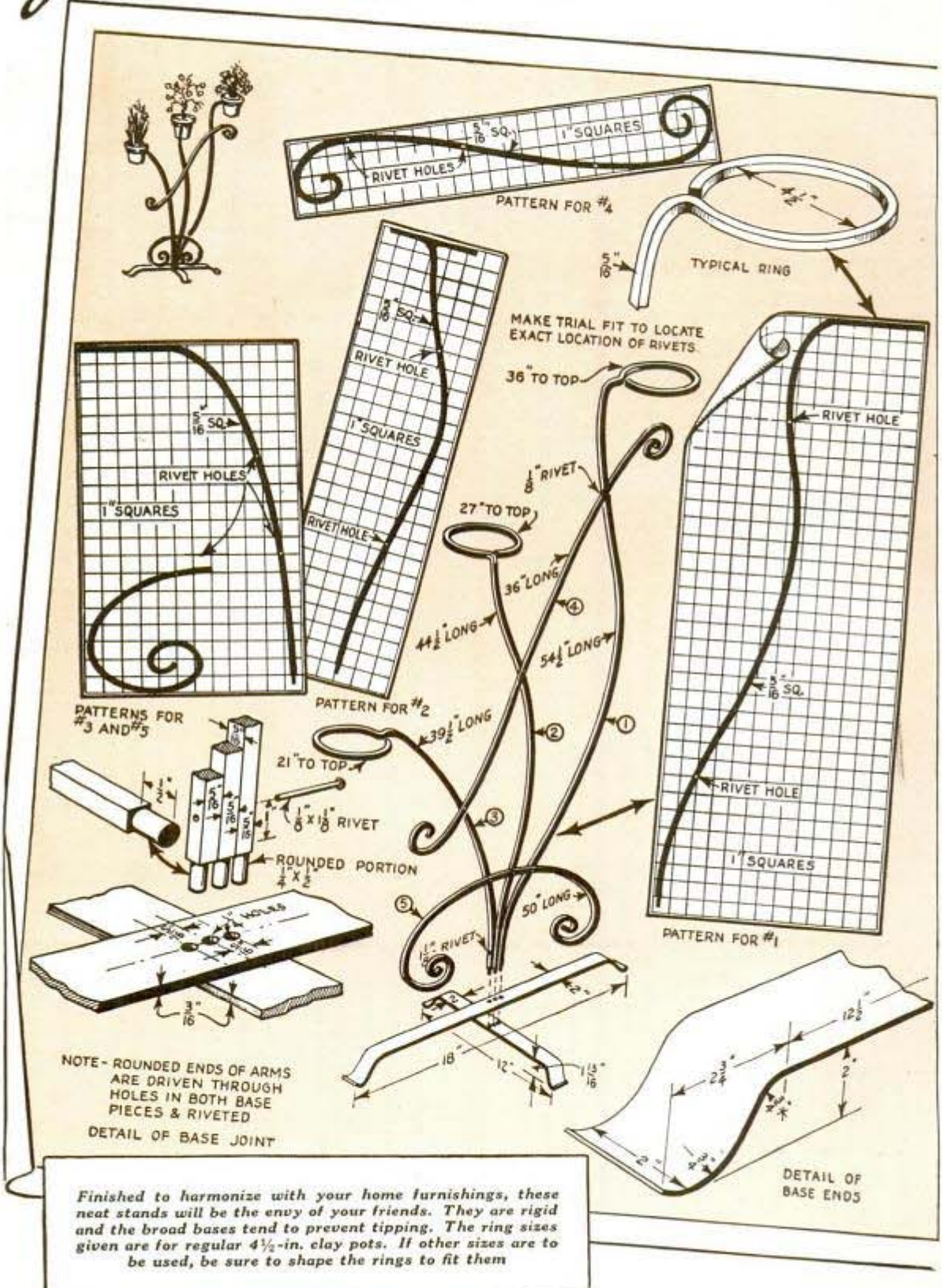
Picture "Frames" and Tray Edging of Rope



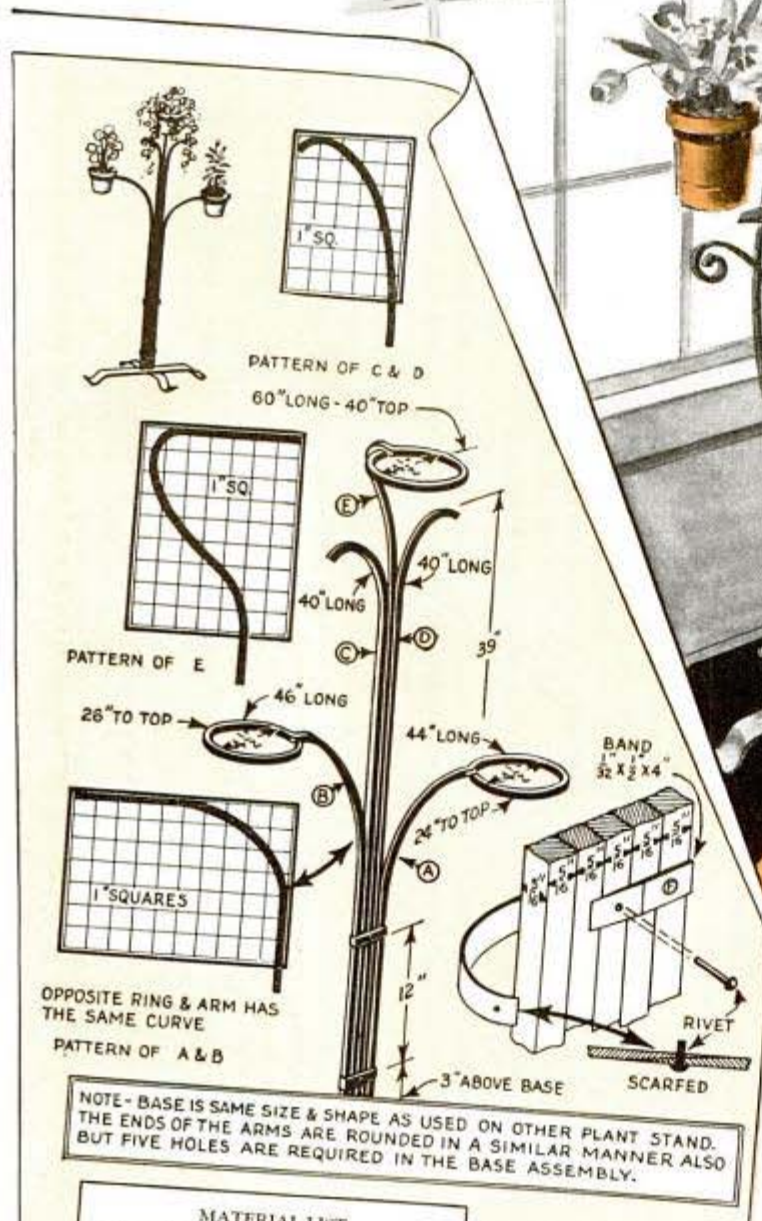
Ordinary rope can be utilized on your craftwork to give it a rustic or marine effect. The tray shown above is just a piece of $\frac{3}{8}$ -in. plywood with $\frac{1}{2}$ -in. rope bradded around the edges and fitted with handles, one of which conceals the ends of the rope. It may be lacquered or just varnished, and then a decalcomania transfer can be applied if desired. Picture frames are made in a similar manner. The prints or photos are cemented to plywood and the rope is attached so that it conceals the edge of the paper. Frames of any desired shape can be made in this way, and you can use more than one photo to a frame as shown in the lower right details. Also, rope can be used for many other purposes. A shoe rack is just one suggestion. The rope is bradded around the edge and across the center of a piece of plywood, loops being formed in the center rope to take the shoes.



Two PLANT STANDS



in Wrought Iron



OPPOSITE RING & ARM HAS THE SAME CURVE

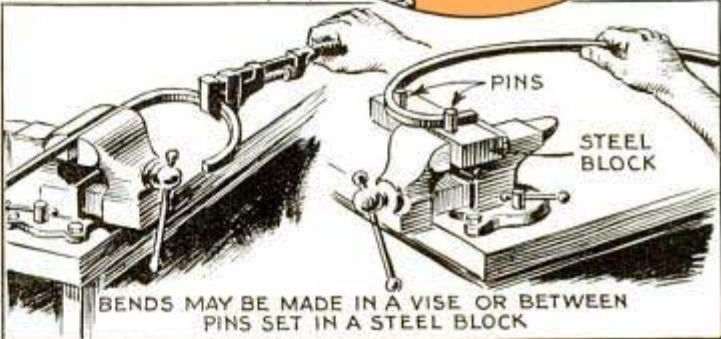
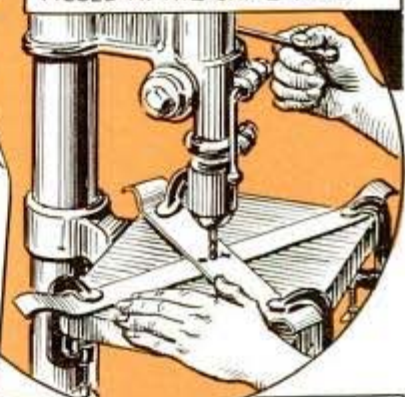
NOTE - BASE IS SAME SIZE & SHAPE AS USED ON OTHER PLANT STAND. THE ENDS OF THE ARMS ARE ROUNDED IN A SIMILAR MANNER ALSO BUT FIVE HOLES ARE REQUIRED IN THE BASE ASSEMBLY.

MATERIAL LIST

- 1 Pc. 3/16 x 2 x 14-1/2 in.—Base *
 - 1 Pc. 3/16 x 2 x 20-1/2 in.—Base *
 - 1 Pc. 5/16 x 5/16 x 54-1/2 in.—No. 1 Arm
 - 1 Pc. 5/16 x 5/16 x 44-1/2 in.—No. 2 Arm
 - 1 Pc. 5/16 x 5/16 x 39-1/2 in.—No. 3 Arm
 - 1 Pc. 5/16 x 5/16 x 36 in.—No. 4 Stretcher
 - 1 Pc. 5/16 x 5/16 x 50 in.—No. 5 Scroll
 - 1 Pc. 5/16 x 5/16 x 44 in.—A Arm
 - 1 Pc. 5/16 x 5/16 x 46 in.—B Arm
 - 2 Pcs. 5/16 x 5/16 x 40 in.—C and D Arms
 - 1 Pc. 5/16 x 5/16 x 60 in.—E Arm
 - 2 Pcs. 1/32 x 1/2 x 4 in.—F Bands
- * Base is identical for each stand
All pieces soft wrought iron



THE HOLES FOR THE ARMS ARE DRILLED THROUGH BOTH BASE PIECES AT THE SAME TIME



BENDS MAY BE MADE IN A VISE OR BETWEEN PINS SET IN A STEEL BLOCK

Section of Auto Casing on Post Keeps Garden Gate Closed



A light spring that will help close a garden gate can be made in a few minutes from a section of heavy auto casing. It is attached to the gate post between hinges, as shown, so that the tire beads press against the sides of the gate when opened.

Tool-Oiling Pad under Bench Is Fed Through Hole in Top

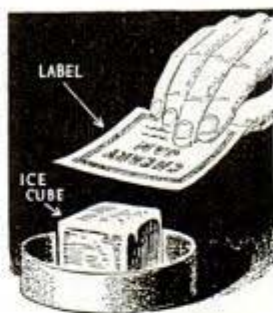
An oiling pad for saws and other hand tools that is convenient and yet out of the way, can be made in a few minutes by fastening an 8-in. pad of folded cloth to the



underside of the bench top a few inches from the edge. The pad is supplied with oil through a hole drilled in the bench directly over it. A small piece of copper or rubber tubing should be slipped into the hole to prevent the oil from discoloring the bench top.—W. C. Wilhite, Carlinville, Ill.

Ice Cube Makes Ideal Moistener for Gummed Labels

When you have a number of labels to apply to fruit jars, etc., drop an ice cube in a small dish or pan and use this to moisten the gummed surfaces. The film of water on the ice will give the gum just the right amount of dampness for quick and easy application of the labels.



Carpenters' Detachable Knee Pad Buttons in Place



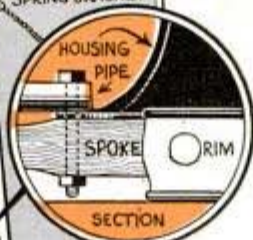
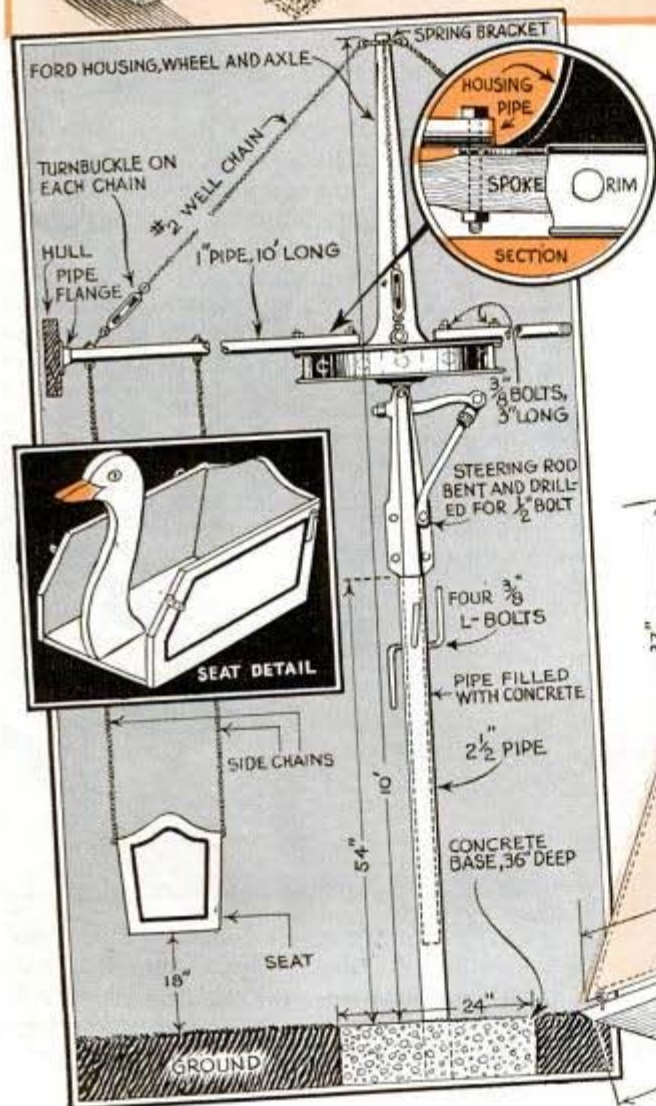
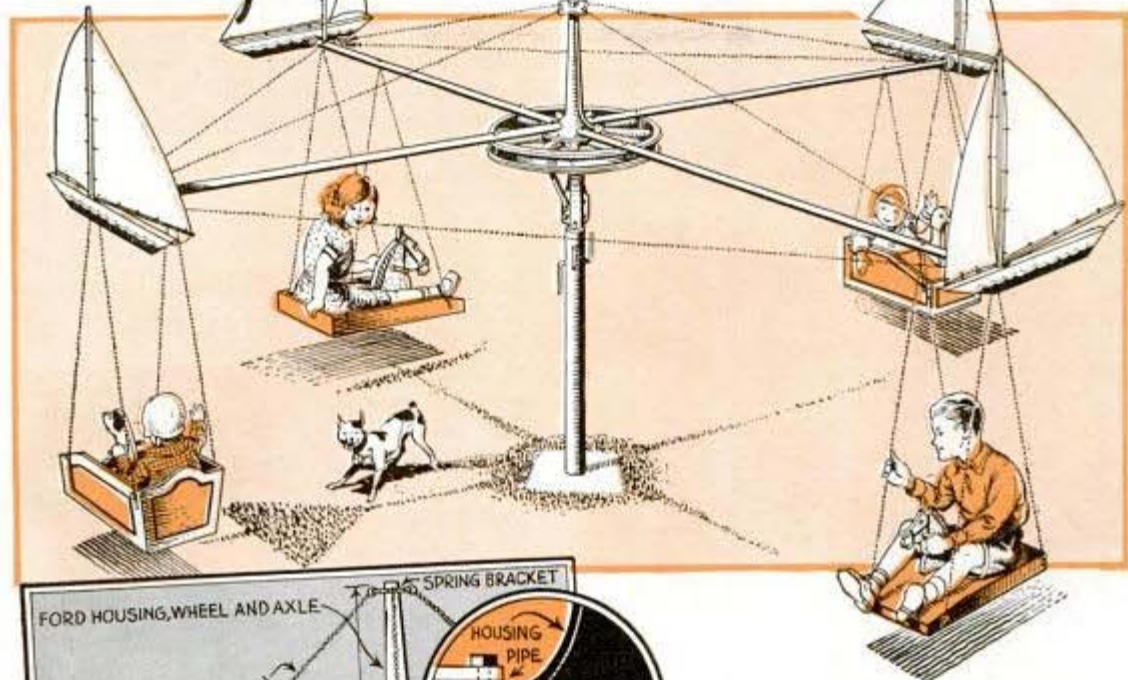
Pockets of denim, filled with cotton and quilted, and provided with buttonholes for attachment to the knees of one's overalls, will add much to your comfort on jobs which require working in a kneeling position. The pads will be found especially handy when laying flooring.

Bottle Cap Improves Flowerpot

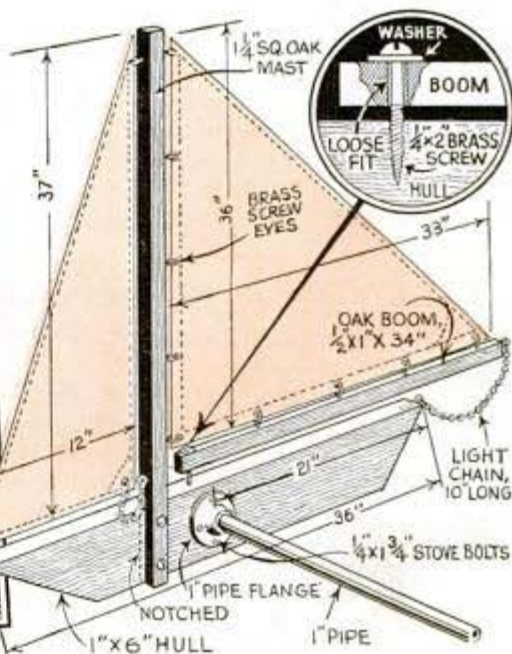
To keep dirt from packing so firmly over the drain opening of a flowerpot that it will not serve its purpose, drop a bottle cap over the opening before putting in the soil. The crimp rim of the cap will allow excess water to escape easily.



Sailing MERRY-GO-ROUND



Your youngsters will get a real thrill out of riding in this wind-driven merry-go-round. Mounted on the front wheel and spindle of a car axle, it will rotate even in a breeze because of roller bearings in the wheel. One half of an axle housing is bolted to the wheel to hold chains for supporting the pipe arms from which the seats are hung and to which dummy boats carrying the sails are attached. The assembly is supported by a pipe set 3 ft. in concrete. The stub end of the axle is inserted into the pipe and held by L-bolts



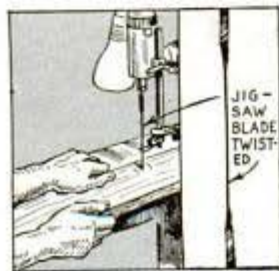
Floor Flange on Bench Forms Seat for Inserting Live Center



Instead of trying to seat a live center of a woodworking lathe in the work while a center is in the spindle, which is not advisable, use a seat like the one shown. This is nothing more than a floor flange having an opening of a diameter just a trifle larger than the largest part of the center. In use, the flange is screwed to a bench over a hole drilled through the latter to allow insertion of the center. Then the work is placed on top of the center and forced into it by tapping with a hammer in the usual way.

—Howard R. Heydorf, Missoula, Mont.

Twisted Jig-Saw Blades Provide Greater Compass in Sawing



If the saw-blade chucks on your jig saw are not of the type that can be turned around so that you can feed the work in from one side, you can do this by simply

twisting the ends of the blades. Given a half twist at each end, the blade will then face sideways when reinserted in the saw chucks. If desired, the blade can be strengthened with a rest of the usual type except that it is notched from the side to support the back of the blade. Care should be taken to leave enough of the blade straight to allow free movement through the entire length of the stroke.

—W. Jack Ewing, Atlanta, Ga.

Modelmakers' Ball Peen Hammer from Faucet Handle

A small ball peen hammer can be made from a faucet handle. To do this, saw off about half of the larger end of the handle and file it smooth, removing all the burrs. A piece of hardwood whittled and sanded to shape will provide a handle. Grooves will have to be made in the end of the handle to take the splines in the hole of the faucet handle.



—Lawrence Balanchuk, Cleveland, Ohio.

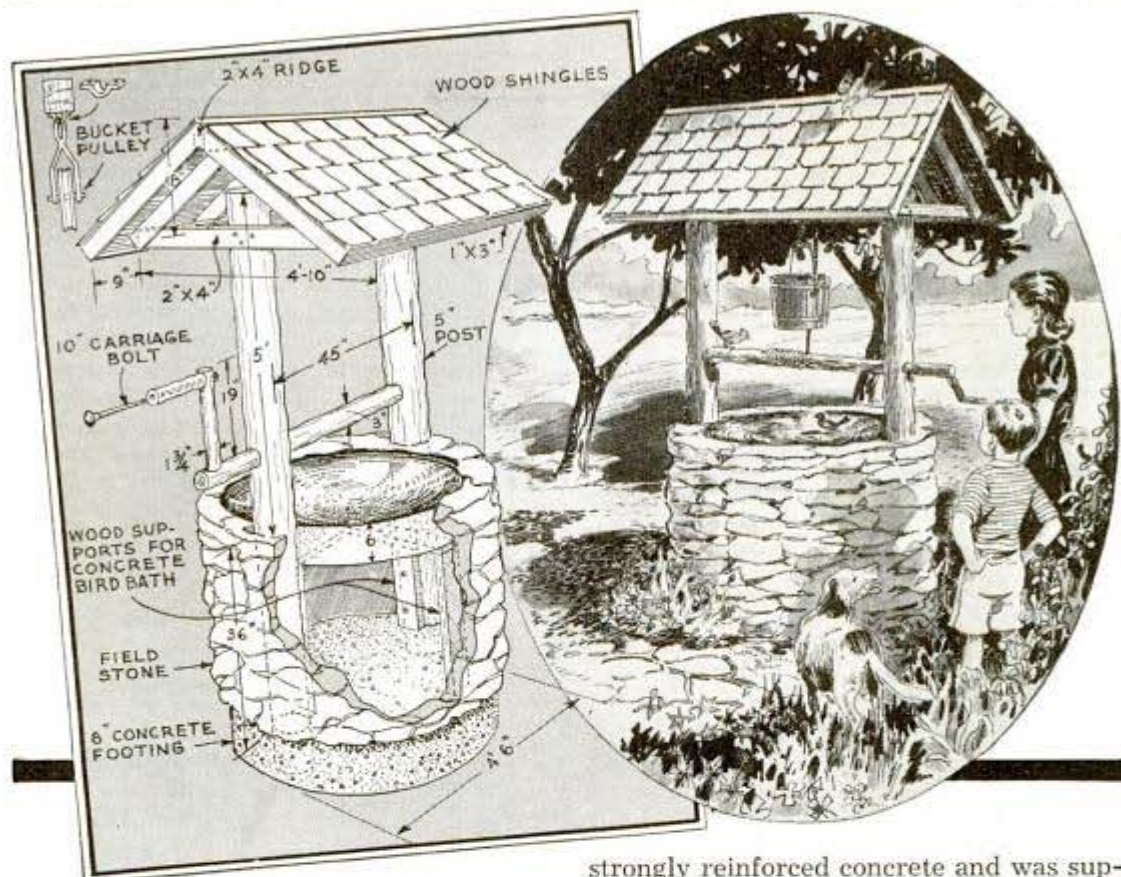
Double-Faced Sandpaper Sheets Save Time on Lathe Work

To save time changing from coarse to fine sandpaper when finishing a number of small pieces in a lathe, one workman glues



a strip of coarse paper and a strip of fine paper back to back. Then when it is necessary to change an abrasive all he has to do is just turn the paper over. Furthermore, the double strength of the abrasive strip makes it last longer.

Birdbath Is Combined with Imitation Well



Desiring a birdbath and an old well with its oaken bucket for a garden decoration, one home owner combined both of them in one unit. The well was simulated with field stone laid up on a reinforced concrete footing, the roof-supporting posts of the well being set in the footing. The bath at the top of the well was made of

strongly reinforced concrete and was supported on the ends of vertical wood pieces, which rest on the footing. Wood shingles were used on the roof, which was framed in the usual manner. A wooden bucket, rope and windlass help to carry out the realistic effect. If a rustic appearance is desired, the shingles and roof frame members can be stained dark, and poles with the bark left on them can be used.

Flowerpot Vented in Bottom to Prevent Soil from Souring

Non-draining pots of the type used in plant stands and hanging baskets can be vented to prevent the soil from souring because of excess moisture. To do this, a sump is formed in the bottom of the pot by inserting a perforated metal disk and running a glass tube from the top of the pot through the soil down to the sump. This allows air to circulate underneath the soil and dissipate excess moisture.

☛ When building a rock garden be sure to tilt the stones slightly backward and rain will be less likely to wash soil from the pockets between them.



"FALCON"



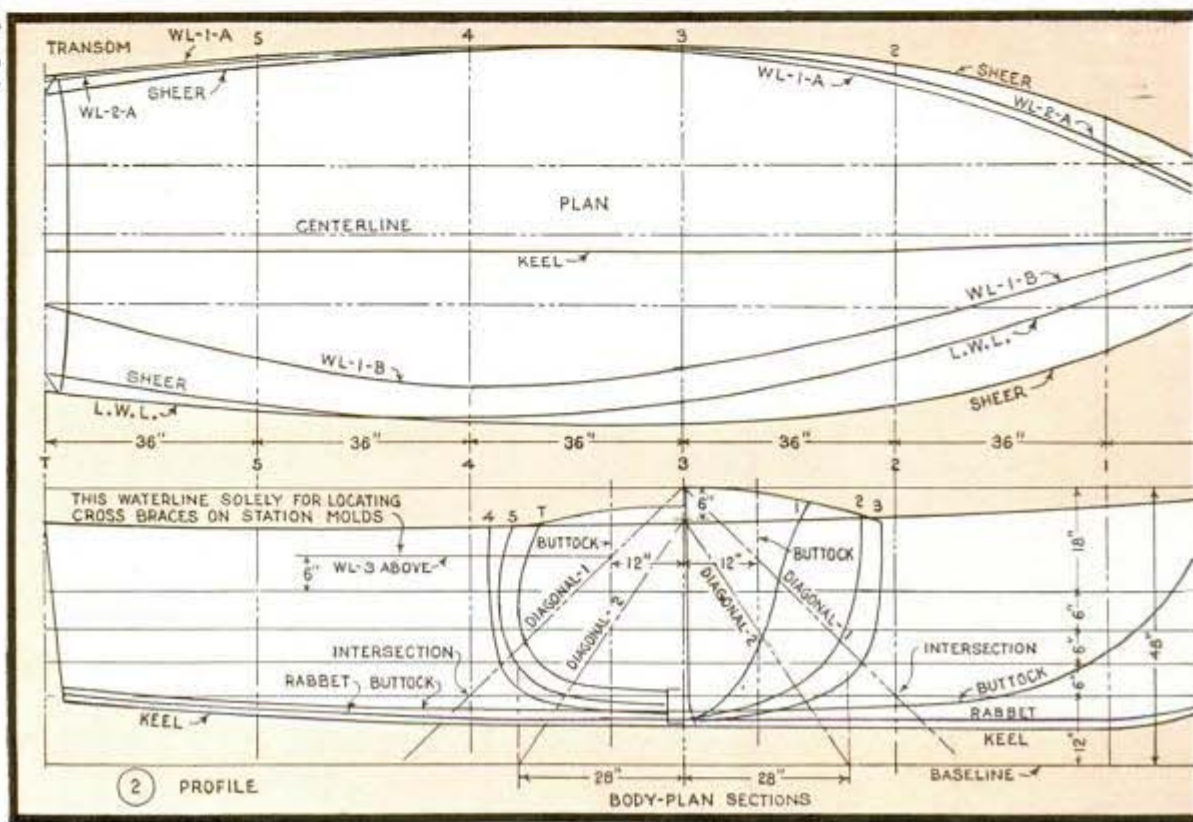
Incorporating the latest developments in boat construction and eliminating many problems which usually confront the average novice in boat building, "Falcon" is an all-around utility runabout which can be transformed easily into a sleek cabin cruiser if desired. The cost of building the original boat as a runabout was \$125 at Newport Beach, Calif. The hull is adapted for use of almost any marine engine from 5 to 20 hp. Total depth 16 in., beam 66 in., draft 12 in., passengers 7 or 8 and speed 17 m.p.h. with a 20 hp. motor. The boat planes at 7 m.p.h.

By DON B. PEDERSEN

Part I—Building the Hull

BEFORE starting actual construction on the hull, which is the same for either the runabout or cabin cruiser, Figs. 3 and 5, the plan, profile and the body sections Fig. 2 are drawn full size on two plywood pan-

els placed end to end on the floor as in Fig. 6. A 1-in. strip added to the top edge of the panels will enable you to work from a baseline drawn $\frac{1}{2}$ in. up from the bottom edge. Referring to Fig. 2, first mark off the



Arnold motor & Sea mite marine engine 20 h.p. Warsaw, Ind.

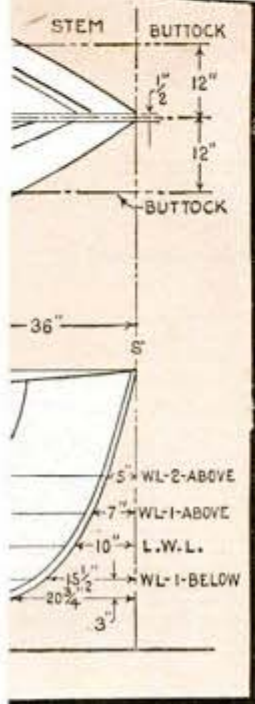
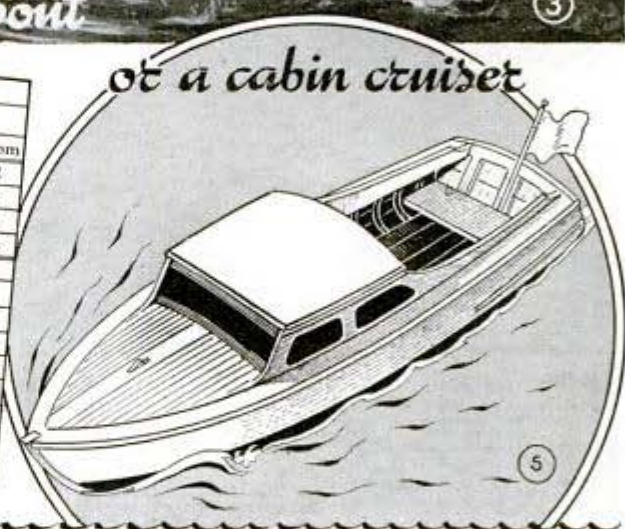
Trim, Sturdy 18-ft. Inboard



④

TABLE OF OFFSETS
Dimensions in feet, inches and eighth-inches

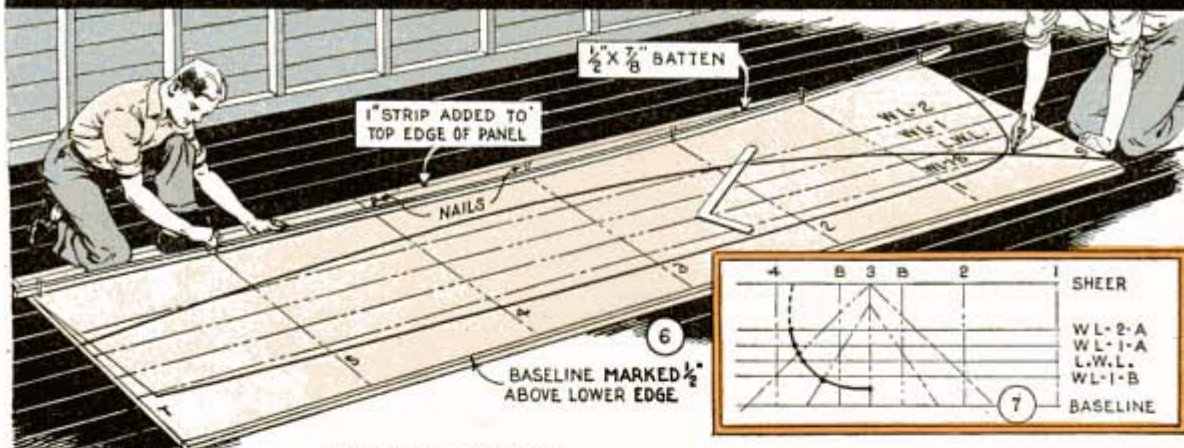
Stations	Stem	1	2	3	4	5	Transom
Sheer	4-0-0	3-9-4	3-7-2	3-5-7	3-5-2	3-5-4	3-6-2
Buttock		1-7-4	0-10-0	0-8-4	0-9-2	0-11-0	1-1-2
Rabbit		0-7-4	0-7-4	0-7-4	0-8-2	0-10-0	1-1-0
Keel		0-6-4	0-6-4	0-6-4	0-7-2	0-9-0	0-11-6
Sheer	0-0-2	1-9-0	2-6-4	2-9-0	2-8-2	2-5-0	2-0-4
W. L. 2-A	0-0-2	1-3-2	2-4-4	2-9-0	2-8-6	2-6-6	2-4-0
W. L. 1-A	0-0-2	1-1-6	2-2-4	2-8-4	2-7-6	2-7-0	2-4-2
L. W. L.	0-0-2	0-11-2	1-11-4	2-6-0	2-7-2	2-5-6	2-3-0
W. L. 1-B	0-0-2	0-6-2	1-4-0	1-11-2	2-2-6	1-9-4	
Rabbit							
Keel							
Diagonal 1							
Diagonal 2							



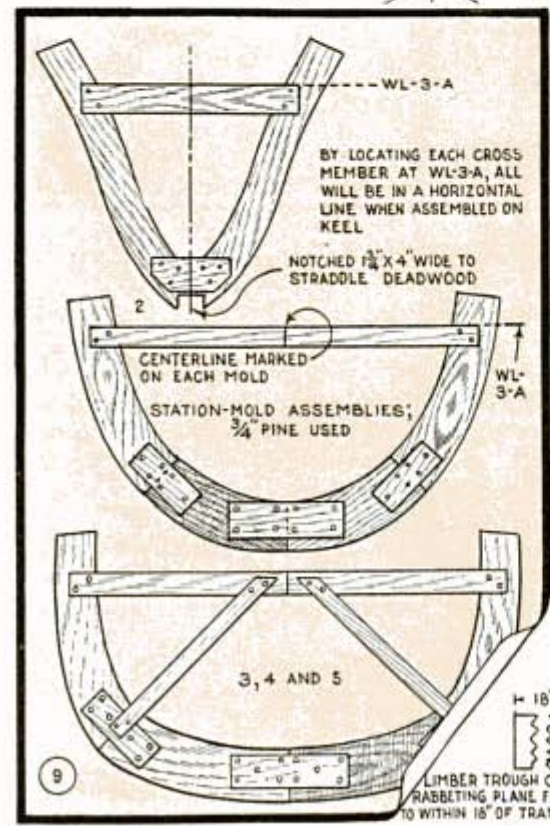
vertical stations, which are spaced 36 in. apart. Then draw the five waterlines, the diagonals and finally the buttock lines. Use a thin batten to obtain a sweeping curve while an assistant does the marking. For the sake of clearness in the plan view, Fig. 2, some of the lines such as the sheer, WL-1-A and WL-2-A, are shown above the centerline, while others are below. However, in a full-size layout, all lines can be drawn above the centerline, making it necessary to draw but half of the plan. To explain how the table of offsets, Fig. 4, is used in determining the shape of the five molds, an example is given in Fig. 7 for finding the outline of station mold No. 3. In the offset table under "half breadths" you will note that the dimension at the sheer line is given as 2-9-0, which means 2 ft., 9 in. and no eighth inches. This distance is marked from the centerline on the plywood panel. Follow this method for the four waterlines, then the distances given for the diagonals. Next drive a nail at each mark and bend a thin batten around them to trace the curve, as shown in Fig. 10.

The simplest method to use in transferring the outlines directly to your mold material is to use nails in the manner shown in Figs. 12 and 13. To do this, arcs are scribed as in Fig. 11, using a compass set to equal the thickness of the planking which is $\frac{11}{16}$ in. Now, following Fig. 12, shingle

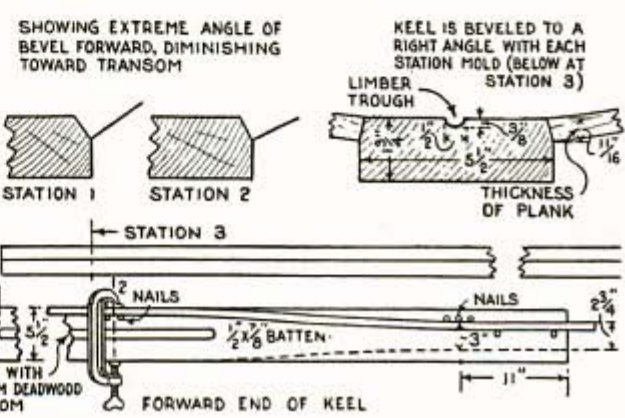
HULL LINES ARE DRAWN FULL SIZE ON TWO 4x9-FT. PANELS



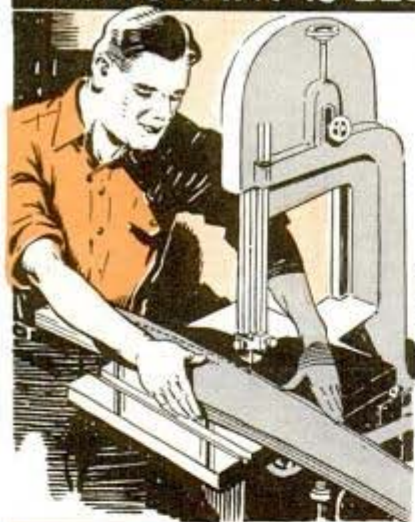
nails are set with their heads in the arcs, over which your mold stock is placed as shown in Fig. 13. Then, being careful not to disturb the position of the nails, apply your weight to make slight impressions on the underside of the work. Drawing a line through the impressions just made, Fig. 14, gives a true outline of the station mold. Repeat this method for transferring the lower curve of the outline. Pieces comprising each mold are nailed together using blocks to straddle the joints as shown in Figs. 8 and 9. The horizontal braces of the molds are located on waterline WL-3-A so that a longitudinal brace placed across the top of the former will be horizontal and perfectly level. Unless you intend to make several hulls from one set of molds, white pine will do. Otherwise hardwood should be used. Except for appearance, it is not necessary to curve the inside edges of the molds as shown.



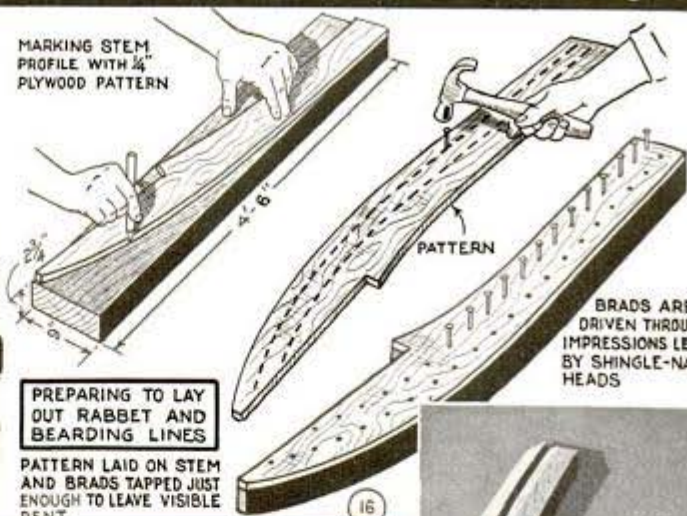
The outline of the stem is transferred in the manner described for the molds, except that instead of being impressed directly upon the mahogany stem blank, plywood



MAHOGANY IS BEST FOR THE STEM AND TRANSOM



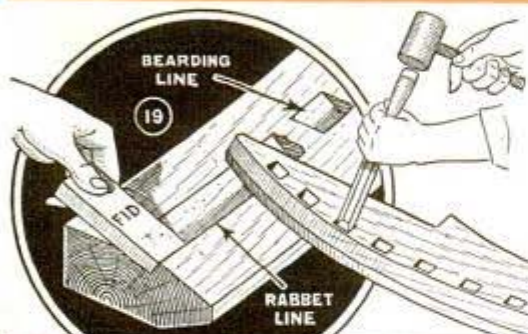
MARKING STEM PROFILE WITH 1/4" PLYWOOD PATTERN



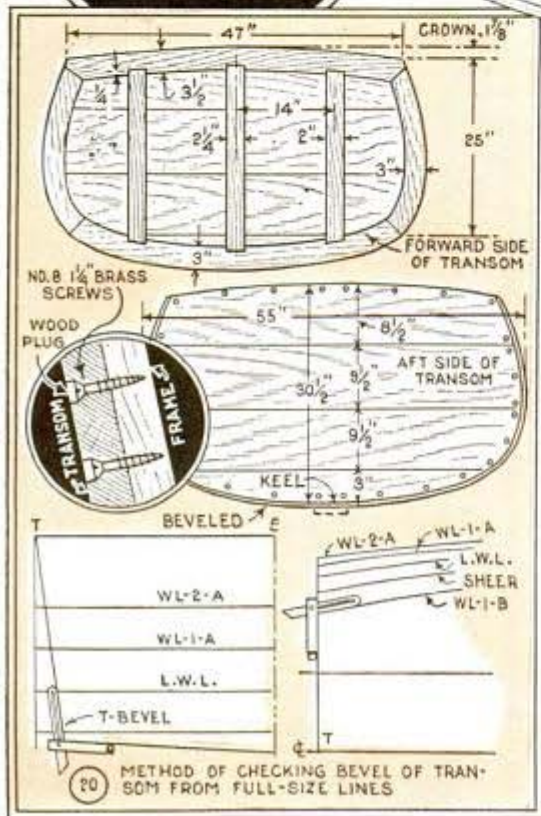
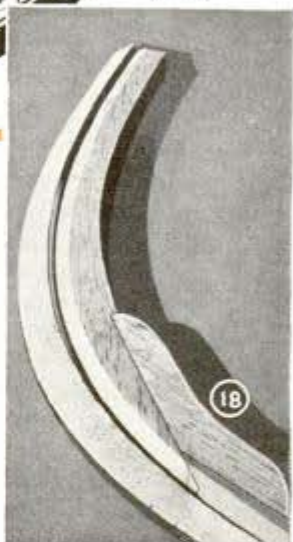
PREPARING TO LAY OUT RABBET AND BEARDING LINES

PATTERN LAID ON STEM AND BRADS TAPPED JUST ENOUGH TO LEAVE VISIBLE DENT

BRADS ARE DRIVEN THROUGH IMPRESSIONS LEFT BY SHINGLE-NAIL HEADS



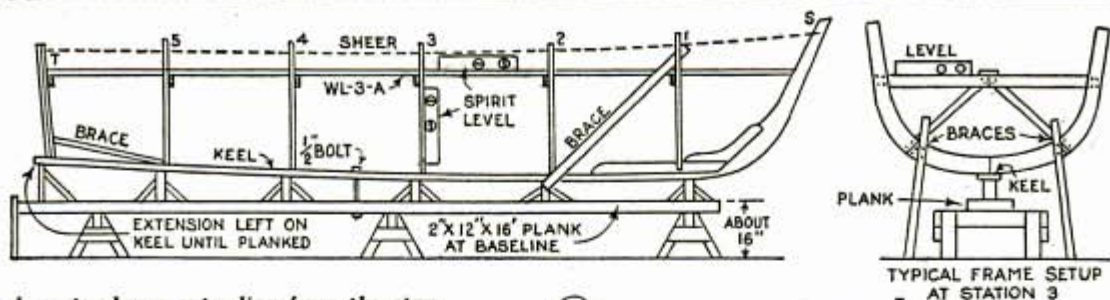
While a portable router can be used to cut the planking rabbet in the stem quickly, a neat job can be done by hand with a chisel. Notches are made at intervals between the rabbet and bearding lines, after which the waste between each is pared away



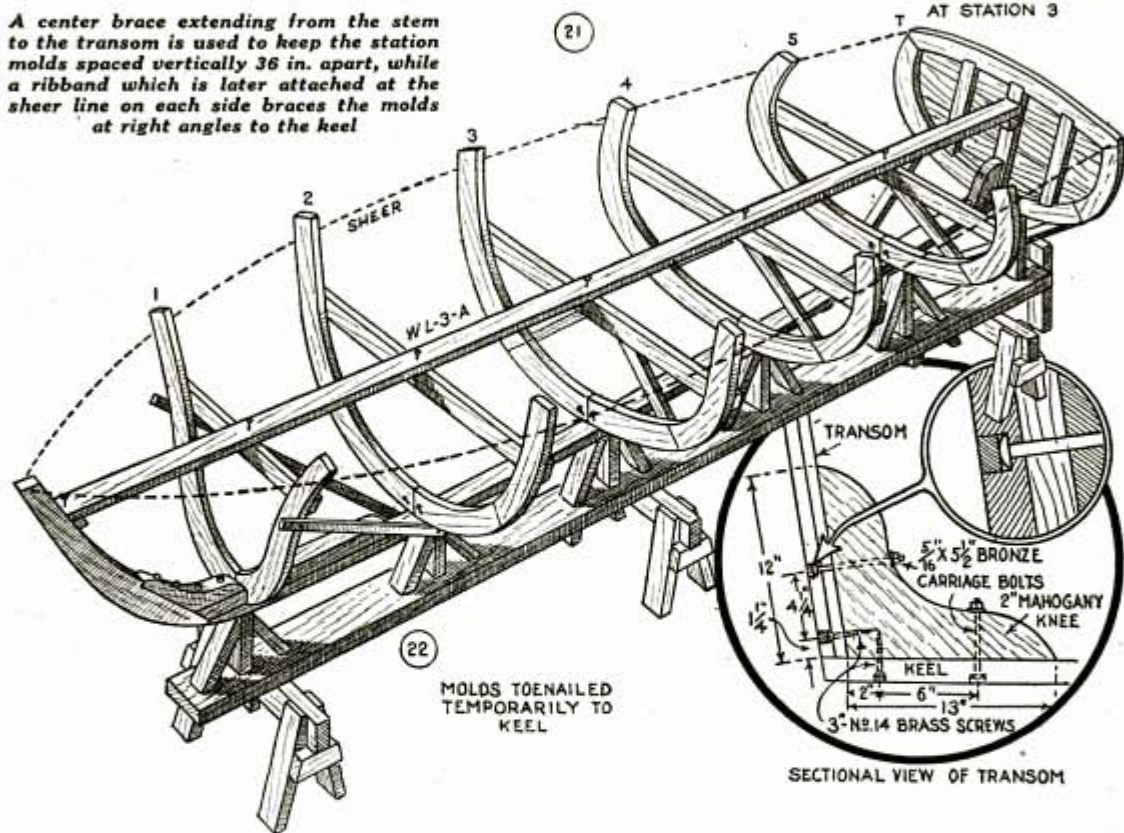
No. 1 and the waterlines. All three pieces are checked with the full-size floor plans as in Fig. 1, and are bolted together with four 8-in. brass bolts, the heads of which are ground flat to fit tightly in slots made in the cutwater or front edge of the stem. Also, two stopwaters are inserted where indicated. These are simply 3/8-in. white-pine dowels driven tightly in undersize holes. When these become wet, they swell to make a watertight joint.

The keel is cut from a Douglas-fir plank 16 ft. long and is tapered from station No. 1 to where it meets the stem. This taper is marked with a batten as shown in the detail to the right of Fig. 9. A limber trough is made from the end of the deadwood to within 18 in. of the transom, to permit bilge to flow to the lowest point under the ribs. This can be cut by machine, or by hand with a rabbeting plane. Cutting the rabbet along the keel is simply a matter of planing a bevel, pronounced at the forward end and diminishing toward the

SEE THAT THE BUILDING FORM IS RIGID AND LEVEL



A center brace extending from the stem to the transom is used to keep the station molds spaced vertically 36 in. apart, while a ribband which is later attached at the sheer line on each side braces the molds at right angles to the keel



transom at which point it becomes nil. It is most important that the plank for the keel be perfectly straight. If there is the slightest curve in it, it must be planed true.

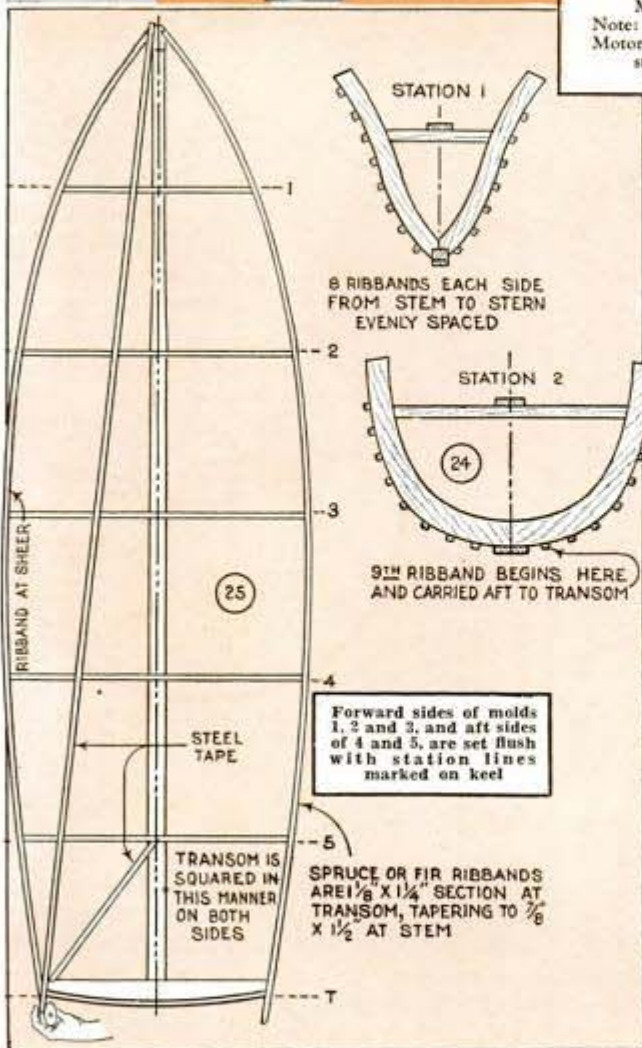
The transom frame is made of $\frac{3}{4}$ -in. thoroughly seasoned dark-red Philippine mahogany and covered with the widths of stock as specified in the upper detail of Fig. 20. The outline for this is taken from the full-size plans. The angle of the bevel varies, of course, and can be determined with the use of a sliding T-bevel as shown in Fig. 20. From the aft side, screws are used around the edge only, after which the heads are capped with wood plugs as shown in the circular detail. Those on the inside may be left exposed. Use marine or casein waterproof glue in assembling.

Constructing a building form that is square, true and rigid is as important as the work on the boat itself. Figs. 21 and 22 show how the form is assembled. This must be set up absolutely level. If set on the ground, be sure that it is placed on firm soil. Note the 2 by 4-in. braces under each station and the diagonal braces from No. 1 to No. 2 and from No. 5 to transom. The keel is bolted to the plank which later serves as a baseline. Use a spirit level and square to see that each mold is at right angles to the keel and absolutely vertical. The end view in Fig. 21 shows additional braces supporting each mold from the floor.

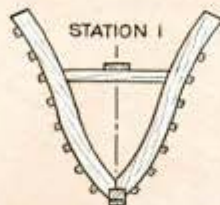
At this stage a knee must be installed at the base of the transom as shown in the circular detail of Fig. 22. Bolt and screw



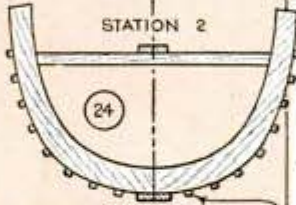
23



25



8 RIBBANDS EACH SIDE FROM STEM TO STERN EVENLY SPACED



9th RIBBAND BEGINS HERE AND CARRIED AFT TO TRANSOM

Forward sides of molds 1, 2 and 3, and aft sides of 4 and 5, are set flush with station lines marked on keel

SPRUCE OR FIR RIBBANDS ARE 1/8 X 1 1/4" SECTION AT TRANSOM, TAPERING TO 1/8 X 1 1/2" AT STEM

TRANSOM IS SQUARED IN THIS MANNER ON BOTH SIDES

STEEL TAPE

RIBBAND AT SHEER

MATERIAL LIST (All dimensions net)

- 80 ft. 3/4 x 12 in. No. 2 pine—forms
 - 16 pcs. 1 1/8 x 1 1/2 in. x 20 ft. spruce or fir—ribbands
 - 2 pcs. 1 1/8 x 1 1/2 in. x 16 ft. spruce or fir—ribbands
 - 1 pc. 2 3/4 x 8 in. x 6 ft. Philippine mahogany—stem and knee
 - 1 pc. 3/4 x 10 in. x 16 ft. Philippine mahogany—transom
 - 1 pc. 2 3/4 x 4 in. x 4 ft. Douglas fir—deadwood
 - 1 pc. 1 3/4 x 5 1/2 in. x 16 ft. straight-grain Douglas fir—keel
 - 26 pcs. 13/16 x 1 in. x 10 ft. white oak—ribs
 - 250 ft. 11/16 in. random widths and lengths (8 to 10 in.) Philippine mahogany—planking
 - 2 pcs. 1 3/8 in. x 19 ft. half-round mahogany—rub rails
 - Scraps from planking—decking and floor
 - Hardware
 - 12 gr. No. 8 1-in. brass f.h. wood screws
 - 4 3/8 x 8-in. bronze carriage bolts
 - 2 3/8 x 5-in. bronze carriage bolts
 - 2 pr. chocks, fore and aft
 - 2 mooring cleats, ensign socket
 - Miscellaneous screws, bolts, etc.
- Note: Material for cabin and seats not included
Motor: 4 cyl. 20 hp. Propeller, 11-in. dia. 10-in. pitch, shaft, strut and fittings



26

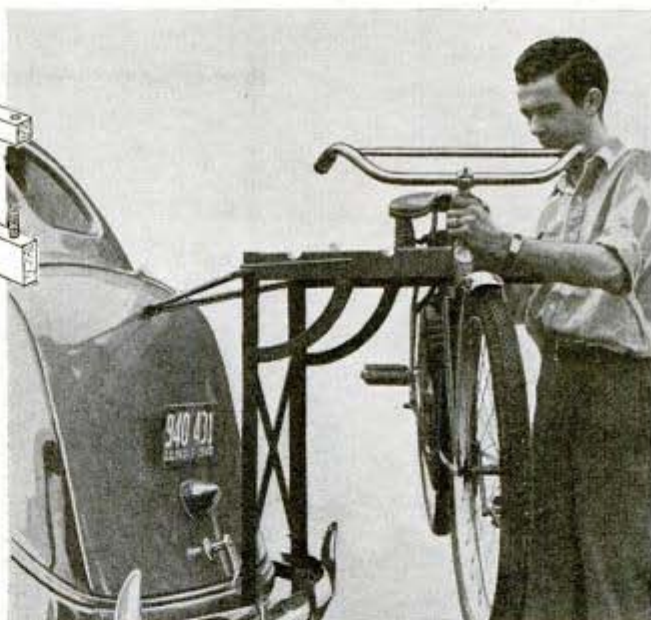
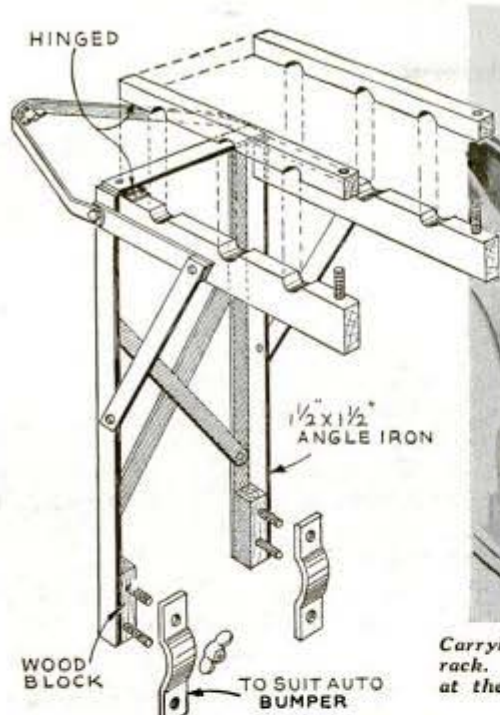
as in Fig. 25. When all the molds have been properly squared and braced, a ribband is fitted below the sheer line on each side to hold each mold in its relative position. These ribbands are tapered toward the stem to make them bend easily. From stem to transom there are eight of these spaced evenly on a side. From station No. 2 back to the transom, a ninth ribband is added nearest the keel on each side, Fig. 24. At the stem the ribbands are nailed in the planking rabbet as shown in Figs. 23 and 26, being removed later, one at a time, to make room for the planks. As

heads are countersunk and plugged, and clinch rings are used under the nuts on the inside. Like the knee at the stem, this should be fitted accurately, using casein waterproof glue. In squaring up the transom, a steel tapeline is run from the stem rabbet to the upper corner of the transom on one side and then the other side, and likewise on the bottom from station No. 5,

these ribbands serve to form a temporary shell on the inside of which ribs are later installed, they should be fastened securely in place either with nails or screws to prevent being forced out of shape. Spruce or fir is the best material from which to cut these as this wood will bend readily without splitting.

(To be continued)

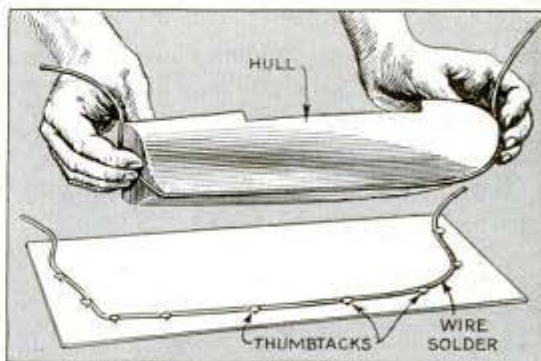
Bicycle-Carrying Rack Clamps on Car Bumper



Carrying one or more bicycles on a car is a simple job with this rack. Easy to remove, it clamps to the bumper and is supported at the top by one bolt through the trunk. Notched arms and clamping cleats support the bicycles

Template to Form Keel of Model Hull Made with Solder

If the keel, stem and rudder of a model boat are to fit the hull neatly, they must be shaped to its exact contour. This work can be done easily and accurately if you have a template of the hull to use as a guide in laying off the three parts. To make an accurate template, form a length of wire solder over the hull as indicated, taking care to mold the wire exactly to its contour. Then, without disturbing the shape of the wire, place it on a piece of cardboard and trace the outline, using thumbtacks to hold the solder in place. After this has been done, cut the cardboard



on the traced line and you will have an accurate template of the hull.

Sheeting over Flannel Lining of Sleeping Bag Makes It Easier to Clean

When using a sleeping bag, dirt, pieces of grass and leaves invariably get into the



flannel lining where they are difficult to remove. By using an old sheet or some similar material, the bag can be lined so that it is not only easy to clean, but the lining can be removed and washed.

WHAT HAVE YOU DONE?

Have you solved some troublesome everyday problem of a mechanical nature pertaining to your home, work or occupation, your hobby, play or recreation? If so, why not send a short description and a sketch or photo to our Homecraft Editor. Many other readers might benefit from what you have done. We pay promptly for accepted material.

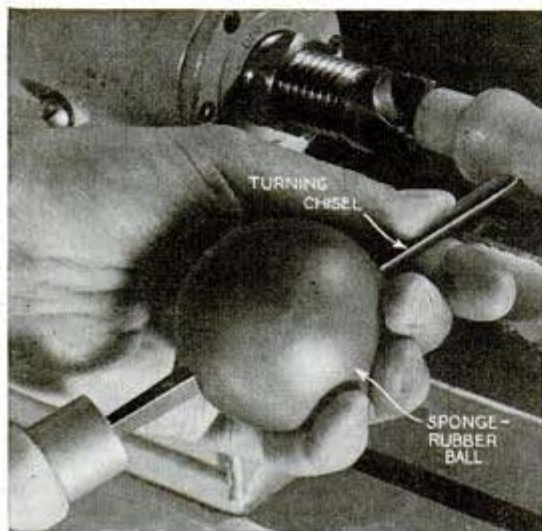
Bench Vise Serves as Punch Press for Light Sheet Metal



The home craftsman who occasionally has a number of holes to punch in sheet metal, can convert his bench vise easily for the job. Just drill and tap the inner faces of the vise jaws to take a punch and a die. Several of these can be made up, making the outside diameters the same size, but having the punches and the holes in the dies of different sizes.

Rubber Ball on Turning Chisel Makes It Easy to Grasp

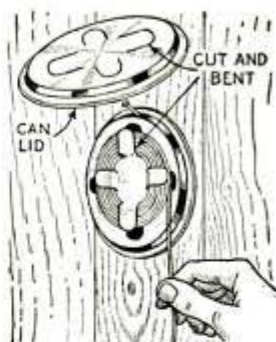
Slipped over the shank of a wood-turning chisel, a sponge-rubber ball will pro-



vide a good hand grip, especially when the chisel is in use for long lengths of time. The ball fits into the palm of the hand as the tool is grasped in the regular manner, and tends to relieve muscle strain.

Reels for Wire and Twine from Can Lids

Reels on which to keep wire and twine around the home shop are made easily from can lids. Just mark off the lid as shown in the upper detail, and then cut it to form four tongue-like pieces when the cut portions are raised. The reel can be pivoted to the wall with a nail.



The reel can be pivoted to the wall with a nail.

Sticking of Ice Trays Avoided with Waxed Paper



If your refrigerator ice trays have a tendency to stick in the freezing unit, fold wax paper around the bottoms and sides before inserting

them. This will tend to prevent moisture on the tray from freezing to the unit, and the trays will slide in or out easily.

Potato Keeps Cut Flowers Fresh

Before wrapping a bouquet of flowers to send through the mail, one housewife punches holes in a raw potato with an ice pick and inserts each stem separately to prevent the flowers from wilting. The bouquet can still be tied in the usual way and will keep fresh for a considerable length of time while en route.—Edith Swope, Danville, Pa.



Colored Plastic Tumblers Used as Safelights

Plastic tumblers in different colors are used interchangeably in this darkroom safelight. A metal lid of a jar is cut out in the center to fit on a lamp socket and is soldered to the latter all around to avoid leakage of light. Two small hooks are soldered to the lid for attachment of coil springs, which hold the tumbler inverted against the lid. A layer of sponge rubber between the tumbler and lid makes a lightproof joint. Use a $7\frac{1}{2}$ or 10-watt bulb. Tumblers should be tested to make sure that they will not fog the sensitized material.—Robert J. Williams, Chicago.



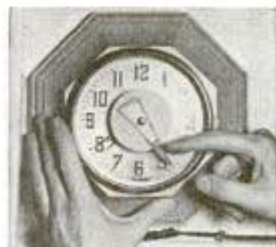
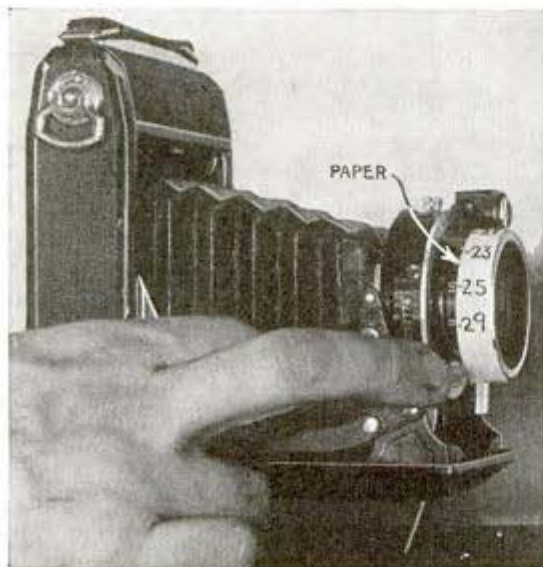
Scale on Portrait Attachment Shows How to Set Camera

Figures on a piece of white paper pasted around the rim of my portrait attachment make it unnecessary for me to carry a chart showing where to set the camera distance scale when using the attachment. With the camera set at $3\frac{1}{2}$ ft., the portrait attachment brings objects 23 in. away in focus, so, opposite $3\frac{1}{2}$ ft. on the camera scale I have marked 23 in. The correct marking in inches is placed on the portrait

attachment opposite each division of the camera scale, up to infinity, which is 50 in. All numbers are black ink except 50 in., which is red. When placing the attachment on the camera, the red number is set opposite infinity on the camera scale, making all other marks fall in their proper place.—Lawrence Gottlieb, New York.

Pointer on Darkroom Clock Times Tank Development

Cut from cardboard and mounted on the face of the darkroom clock, this pointer tells when films in a tank have developed the proper length of time. The pointer is fastened to a cardboard disk with a brass paper fastener and the disk is cemented to the clock face. At the time you start developing, turn the pointer the correct number of minutes ahead of the minute hand of the clock. When the minute hand is exactly under the pointer, the time is up.



Use an exposure meter

LIGHTING

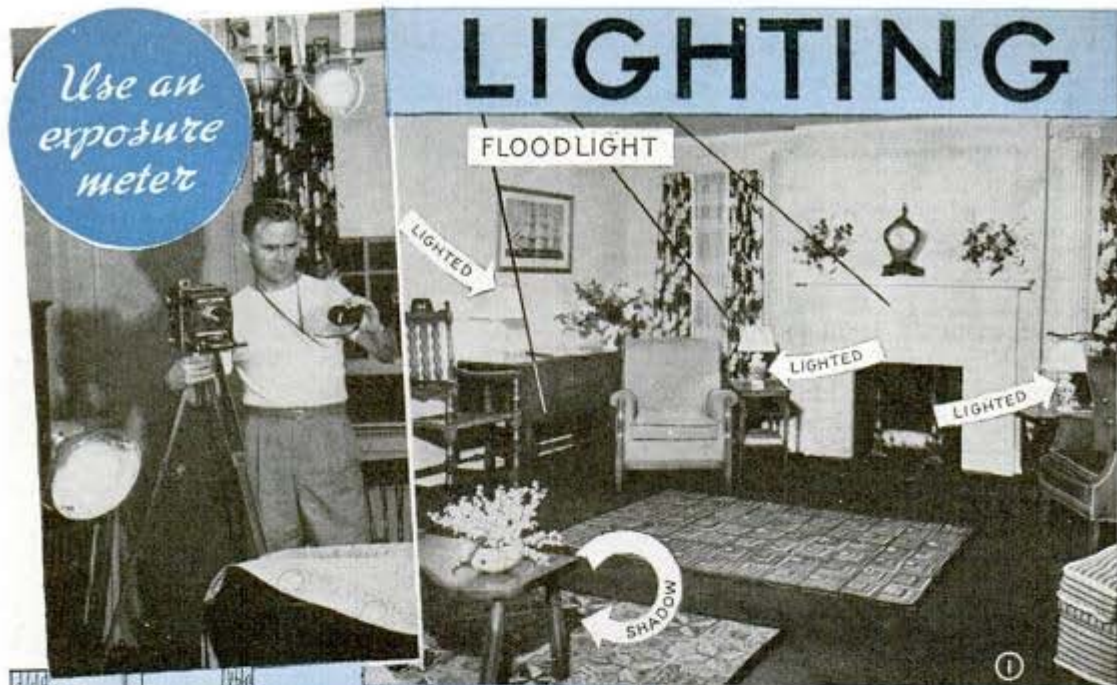
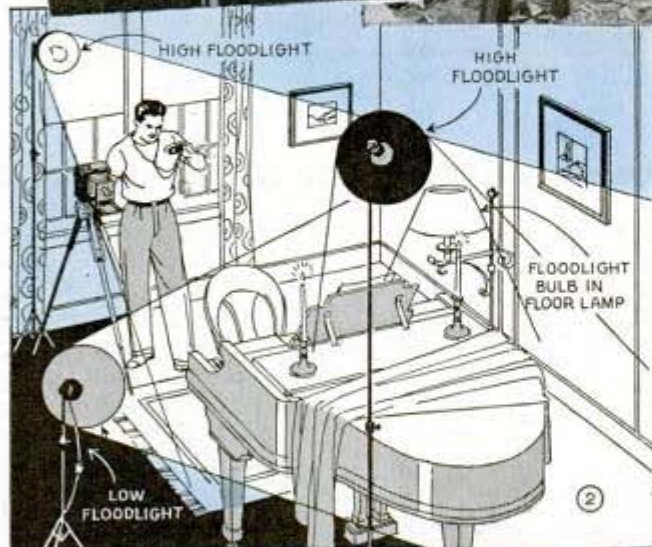


Photo of this living room was taken by the simplest form of lighting. Just one floodlight was used above and to the left of the camera, and the three table lamps were lit



Ebony piano featured in photo below needed three floodlights to avoid cross or conflicting shadows



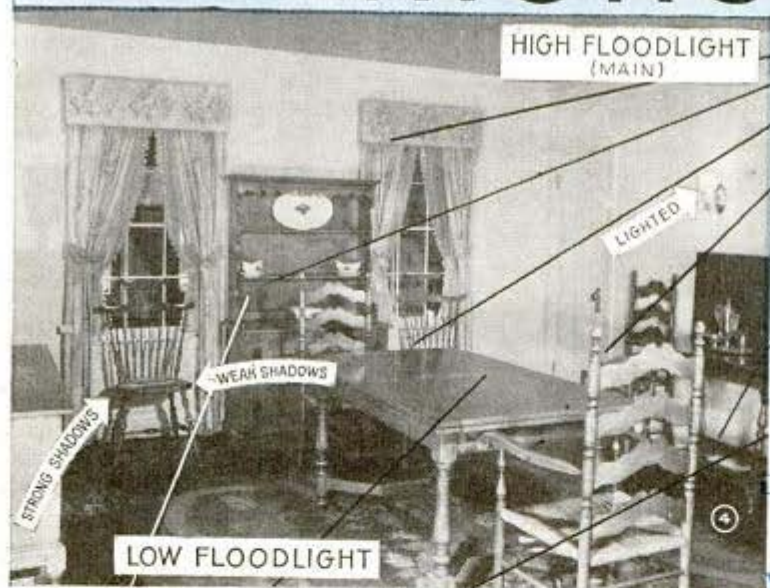
IN LIGHTING interiors for good photos, the main thing to keep in mind is that one source of light should dominate a scene, and that other light sources are to be subordinated. Fig. 1 illustrates the use of a single floodlight. The three table lamps were lit to produce a natural effect and to add touches of life through the bright areas at the tops of the pottery bases. However, they supplied little light for the general scene.

Figs. 2 and 3 illustrate the lighting setup for a large dark piece of furniture, an ebony piano. In this case the basic lighting, again overhead and to the left, was so inadequate that it had to be assisted by a floodlight to the right, which was directed on the folds of the drapey on the piano, and another floodlight placed high and to the right, and directed against the further wall. Although three sources of light are used, note that conflicting shadows have been avoided. The subordinate lights have been placed so that they illuminate the immediate areas requiring it, and do not add much

INTERIORS

for
Good
Photos

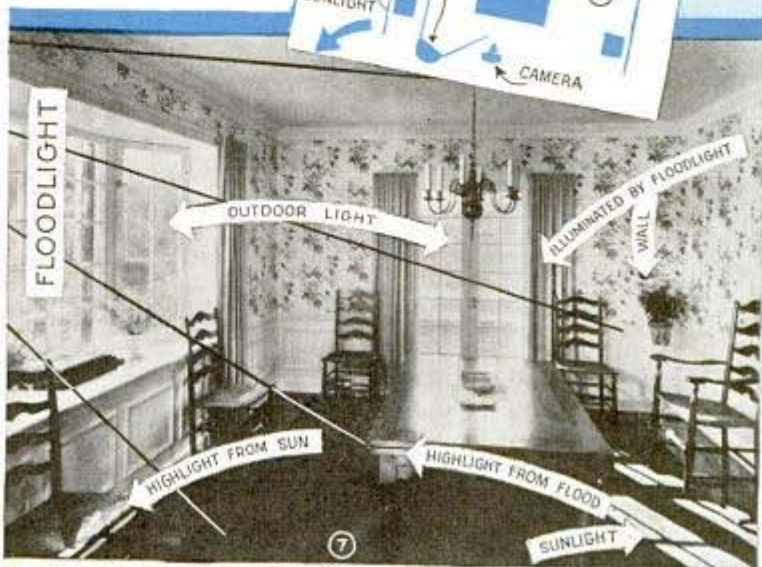
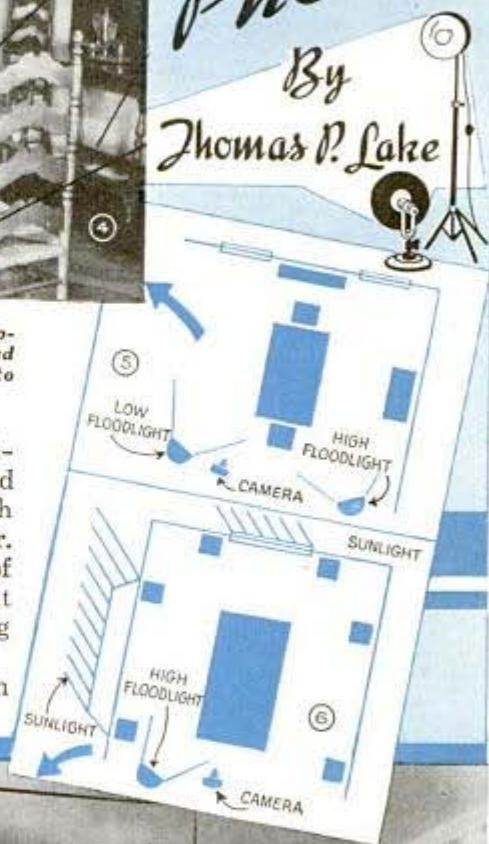
By
Thomas P. Lake



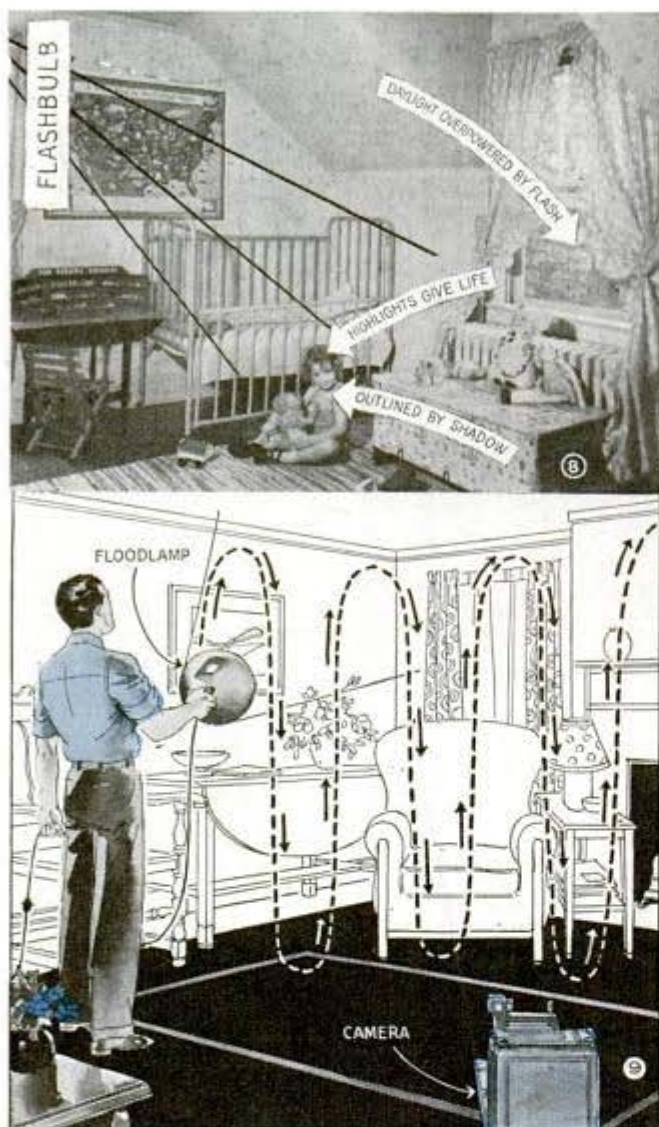
Two floodlights located as in Fig. 5 were necessary in properly illuminating the dining room above. The low light served to reduce large shadows caused by the high light, and to bring out the pattern of the rug

light to other parts. In Fig. 4 the room was illuminated by two floodlights, one high at the right, and one low at the left as shown in Fig. 5. The high light is dominant, and its shadows are stronger. The low light serves to bring out the pattern of the rug and to highlight parts of the furniture that were not lighted by the high light. Conflicting shadows have been avoided.

In Fig. 7 an entirely different lighting problem is illustrated—mixed daylight and floodlight. Only one floodlight bulb was used. Strong sunlight poured in through windows on two sides, leaving portions of the walls, rug, and furniture in comparatively weak light. By placing a floodlight to the left and above the camera position, as in Fig. 6, the dark areas have been illuminated so that they balance with the sunlit portions. If the walls had been dark in color, more light would have been required. In exposing for the interior, the bits of outdoors visible through the windows



With sunlight streaming into this room, the dark, unlighted areas had to be given sufficient artificial illumination to balance the sunlit portions. Fig. 6 shows the lighting arrangement



The nursery above, although open to daylight, was photographed practically by flashbulb alone. Fig. 9 shows how interiors can be illuminated by "washing" walls and furnishings with a floodlight while the camera is opened for a time exposure

are considerably overexposed. This is a fortunate circumstance, for it means that these portions print very light when pictures are made, and this aids the picture in two ways: It gives a realistic, bright atmosphere to the outside view that is similar to the visual effect of being in such a room, and it subordinates the outside detail, thereby concentrating attention on the inside. In Fig. 8 the outside light is comparatively weak, necessitating more artificial lighting. In this case, a large flashbulb was used. Shadows caused by daylight are completely missing. The only shadows are those caused by the flashbulb itself. The light was placed well forward of the camera position, but far enough to one side

to be out of the field. The lens was well shielded by a hood.

Fig. 9 illustrates another method of interior lighting. It is a form of time exposure in which the operator "washes" the walls and furniture with a floodlight, gradually covering the complete scene and building up the exposure correctly. Due to the fact that the light source is constantly moving, this method produces a shadowless picture. Some difficult situations can be pictured easily by this method, especially when stationary floodlights introduce conflicting shadows that cannot be eliminated. To determine the exposure, take a reading of a moderately light portion of the room when the floodlight is playing on it from an average distance. Calculate the proper lens diaphragm setting for any convenient exposure interval, say 1 or 2 seconds, or even longer if the required depth of field necessitates a very small opening. Set the camera shutter for time, open it, and then methodically play the light over all portions of the scene. Keep the light moving constantly, but keep it in a given area long enough to give it the chosen exposure. Keep the light directed away from the camera, and stand so that your figure will not be silhouetted against light portions. When using this method it is easy to give darker objects longer exposure and to skip rapidly over light objects.

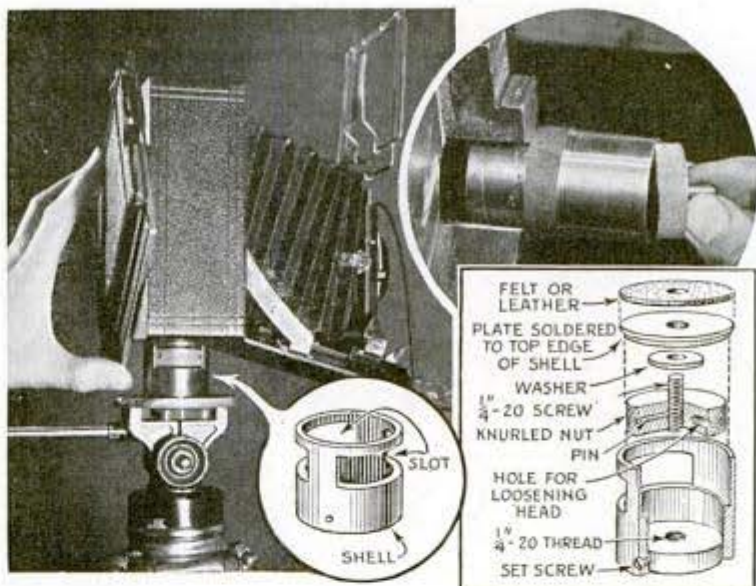
Paper Clamp with Slotted Handle Holds Film on Drying Line

Regular spring-steel clamps, used to hold sheets of paper together are handy for hanging films on the line for drying if the handle is slotted as shown. The slot, cut at an angle, makes it easy to slip the clamp on and off the line but will keep it from coming off accidentally.



Tripod Head Permits Use of Dropping Bed

Unable to lower the bed or revolve the back of my camera when it was mounted directly on the large head of a tripod, I solved the problem by equipping the tripod with an auxiliary head to give the necessary clearance between the two as shown. This fixture which must be made of a size to suit the camera at hand, is attached to the original tripod stud bolt by means of a tapped disk fitted in the base of the counterbored brass shell. Slots cut in the side of the tubing provide access to a knurled thumb wheel for clamping the camera. Radiating holes in the edge of the wheel are provided to engage a pin for loosening



the wheel in case it should become overly tightened with the fingers.

—Walter E. Burton, Akron, Ohio.

Rack on Basement Laundry Tub Holds Photographic Trays



Your basement laundry tub can serve as a darkroom sink if you fit it with a wood rack that can be put in place or removed easily. The rack illustrated was made of 3/4-in. stock, the strips being held together at the back by a cleat that extends at each side to rest on the sides of the tub. The front cleat is nailed to the underside of the strips, which are beveled at the ends to fit the sloping front of the tub.

—Robert E. Krause, Duluth, Minn.

Roll Films Clamped in Trouser Hangers Developed Three at a Time

Three or more film rolls, depending on the size, can be developed at one time by clamping their ends in a couple of trouser hangers. Once the films are clamped securely in the hangers, they can be put through the developing and fixing solutions in the usual way. The hangers must be the type that have straight, not curved, wood pieces and it may be necessary to build up the inside surfaces of these pieces with a strip of rubber or blotter to make them grip the film tightly.

☐ Prints wash slowly in cold water, so if the temperature is below 65° the washing time should be increased considerably.



Prints Are Given "Linen" Finish by Pressing on Screen Wire



Prints made on smooth paper can be given a linen-like finish by pressing them face down, while slightly damp, against a piece of fine-mesh wire screen. A convenient press for doing this is made of two pieces of hardwood hinged together with butt hinges. The bottom piece is covered with the screen and the top piece with

blotting paper. Be sure the screen lies flat and build up blotter sheets until pressure is uniform over the print. After a little practice you will know just how much pressure is needed to give the effect desired.

False Bottom in Developing Tank Recovers Dropped Films

Films dropped accidentally to the bottom of a deep developing or fixing tank can be recovered easily if the tank has a false bottom that can be lifted out. A piece of Bakelite or hard rubber is fitted with a long rod to hook over the top edge of the tank so it can be lifted. Holes drilled in the false bottom provide drainage, making it easy to raise. If metal is used for the lifting rod or any other part, be sure to coat it with acid-resistant darkroom paint.



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These figures are approximately 20 in. high. Patterns are actual size

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Chicago



SUNBONNET GIRL—35c

Roosevelt Junior High School.
 R. 304, 1771 Lee Road
 Cleveland Heights, Ohio



Radio

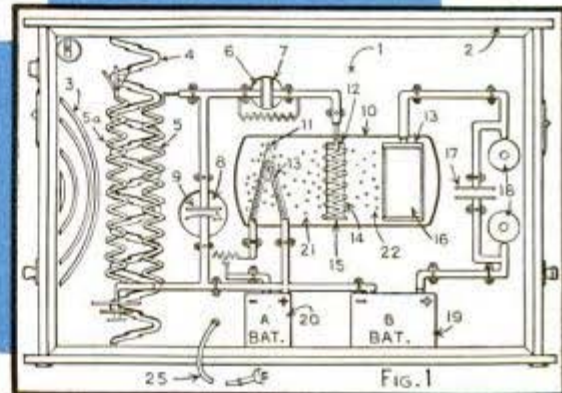
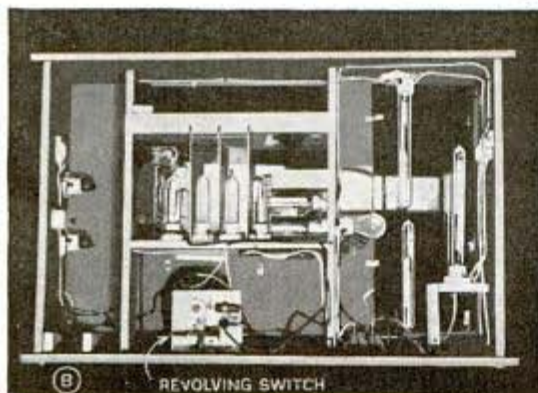
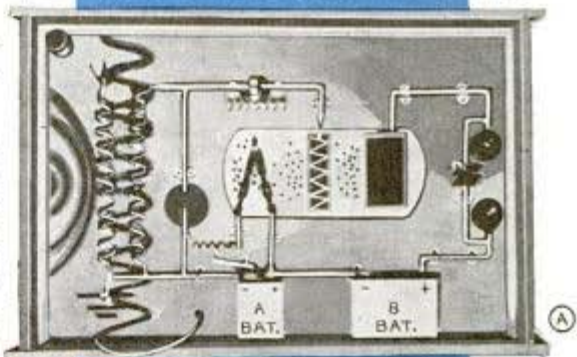
Flashing Lights Trace Radio Circuit

By Albert L. Daugherty

DESIGNED for teaching the principles of the vacuum tube, and a one-tube receiver in radio and science classes, this visual demonstration unit is housed in a large brightly painted cabinet. The wiring diagram is made of copper tubing and the various elements have openings behind their diagrammatic representation through which lights shine in the same sequence as the electric impulses travel in a real receiver. The openings are covered with red, yellow and green Cellophane so that the different electric circuits are easily traced as a revolving switch moves from one set of contacts to another. When the "phone" lights go on a buzzer sounds to indicate that the program is coming in. Photos A and B show front and rear views.



KEY TO FIG. 1: 1—panel; 2—cabinet; 3—incoming radio wave; 4—R.F. current; 5 and 5a—coils; 6—port for light; 7—grid condenser and grid leak; 8—port; 9—variable condenser; 10—area painted to indicate triode tube; 11—filament; 12—grid symbol; 13—translucent mirror for plate; 14—area with green Cellophane; 15—slot for grid light; 16—area behind plate, yellow Cellophane; 17—condenser; 18—actual phone caps with yellow lights in place of diaphragms; 19—yellow for B battery; 20—red for A battery; 21—holes representing electrons passing from filament; 22—holes in panel for electrons going to plate; 25—cord for 115-v supply for lights and switch



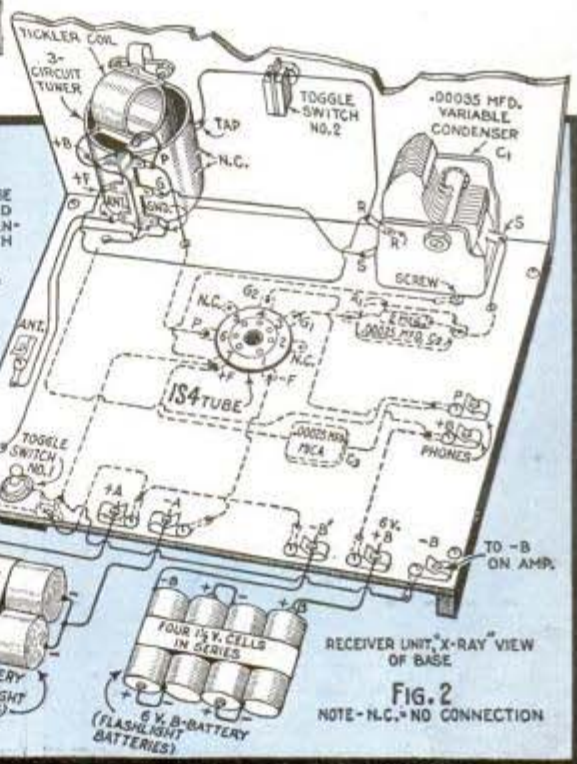
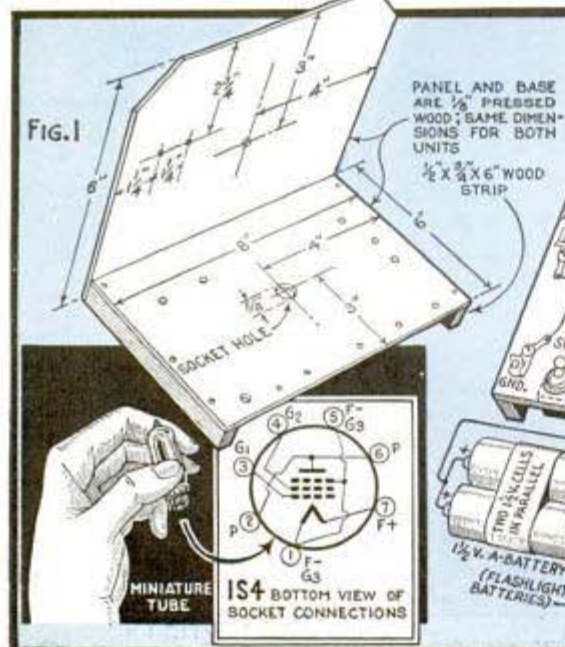
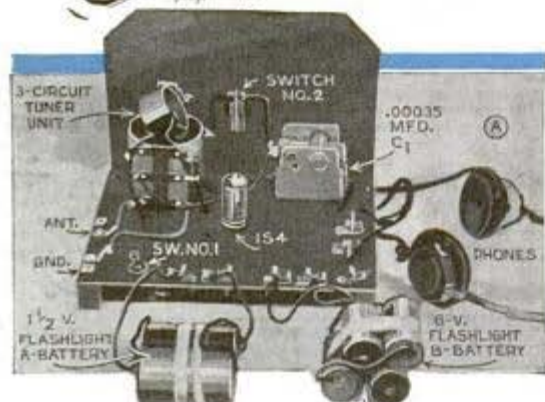
MINIATURE-TUBE SET



FLASHLIGHT-BATTERY receivers which have appeared in past issues have been very popular with beginners because the sets combine excellent performance with low cost. This latest set in the series is a 2-unit, 2-band receiver which is so easy to build that it makes an ideal "first set" for anyone who wants to try his hand at radio.

Despite its simplicity the set is capable of excellent performance. With a good antenna and ground, it will pull in just about all the stations that can be picked up on the usual home radio. It covers not only the broadcast band, but also the 160 meter and 80-meter amateur bands, and includes the police and aircraft bands. The receiver unit, Fig. 2, photo A, is complete in itself and will give good headphone volume. It is powered with 6 flashlight batteries that can be obtained from any "dime store" for 30c. The batteries furnish the low voltage necessary for one of the new low-drain RCA 1S4 "super midget" tubes in a special screen-grid detector circuit.

The amplifier unit, Fig. 3, may be added at a later date or built at once as desired. This unit employs the same type of tube



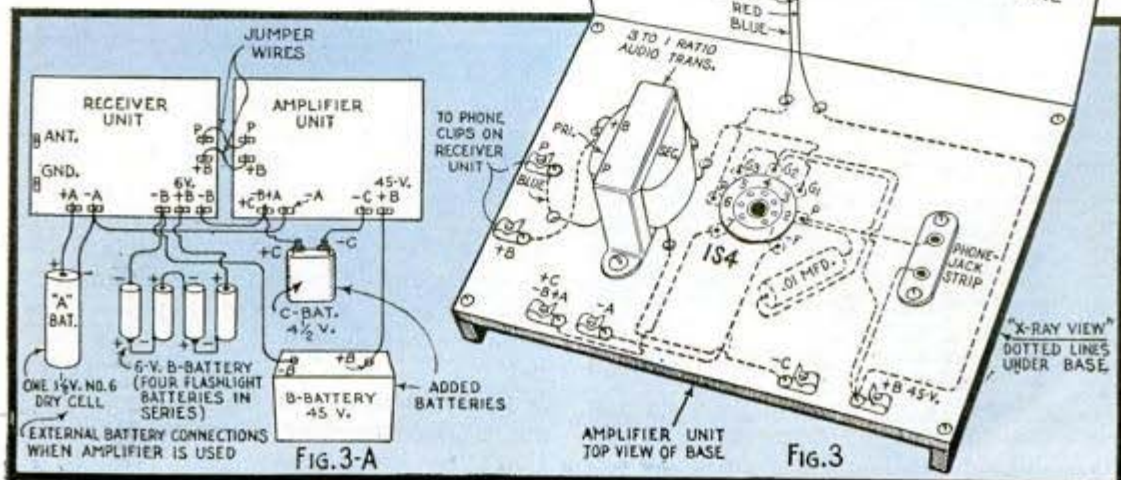
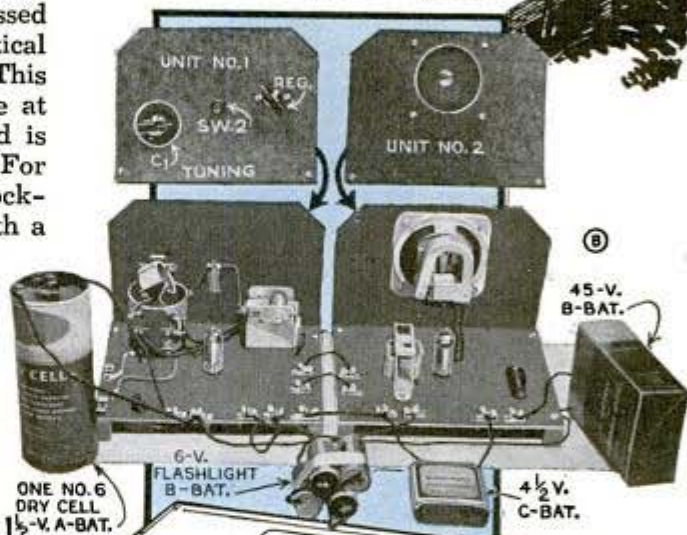
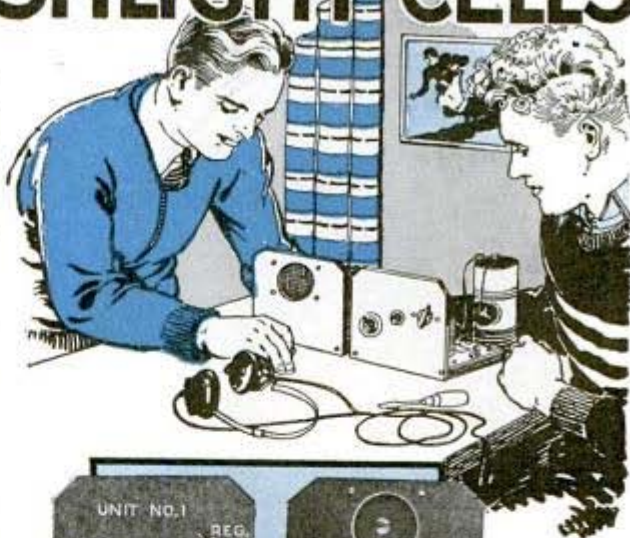
works on FLASHLIGHT CELLS

and increases the output to operate a 3-in. magnetic speaker with good volume on local stations. The additional parts required include, a 3 to 1, or 3½ to 1 ratio audio transformer, a few clips, tube socket and terminal strip for phones which give best results on distant short-wave stations. A small single-pole, single throw switch can be connected in series with the blue speaker lead to cut the speaker in or out as desired.

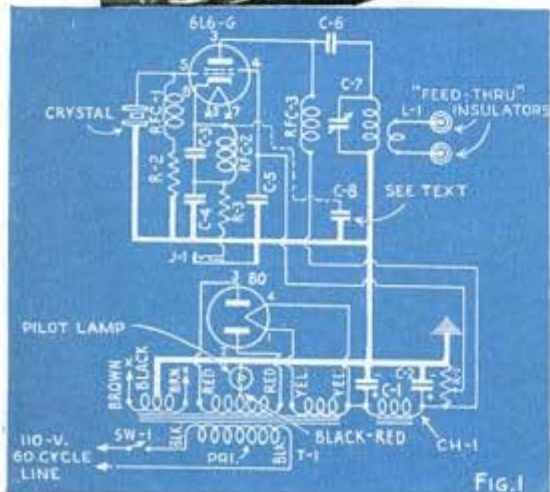
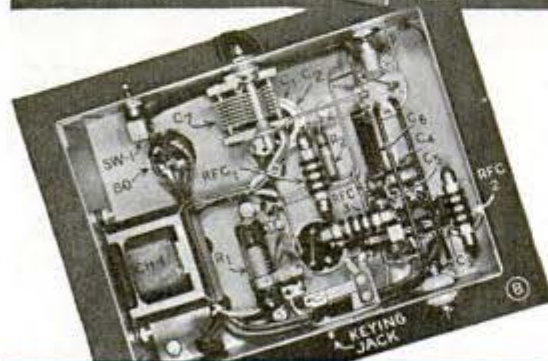
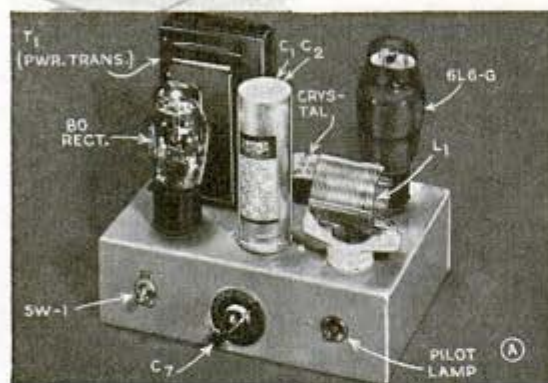
For sake of easy construction the set is built on ½-in. hard pressed wood bases and panels of identical dimensions as detailed in Fig. 1. This inexpensive material is available at practically all lumber yards and is easy to work with simple tools. For example, the holes for the tube sockets, speaker, etc., can be cut with a sharp knife; the panel, base and wood mounting strips are fastened together with small wood screws, holes for which are easily drilled with a small hand drill. To mount the tube socket merely push it through the hole and then force on the retainer ring with two screwdrivers.

In constructing the receiver unit, Fig. 2, the variable condenser is bolted to the base panel. The rotor plates being common with the frame, soldering lugs may be fastened directly to the frame as shown for the condenser rotor-plate connections. The coil is of

(Continued to page 134A)



CW Rig for the Newcomer in Amateur Radio



CRYSTAL controlled operation on five amateur bands is possible with this simple yet reliable beginner's transmitter. Easy to assemble and operate, this small unit is similar to hundreds now in use by so-called low-power and "flea-power" stations. Ideal as a starting rig for the newcomer, it also can be adapted for use at some later date as a very stable oscillator in a larger multi-stage assembly.

The kit consists of all parts, punched and drilled metal chassis base and instructions, for slightly more than \$13.00 as listed by mail order radio parts houses. Accessories not supplied in the kit are crystals, coils and tubes, crystals and coils being selected for the bands desired. Designed for the beginner by radio engineers who are also active amateurs, and understand the limitations and problems confronting the newcomer, this circuit is highly flexible and provides maximum power output from the single 6L6-G tube. On all of the five amateur bands from 160 to 10 meters, the oscillator will work "straight through," that is, the crystal frequency and the output frequency are the same. In addition, the oscillator will give good outputs when doubling, using 160, 80 and 40-meter crystals.

Photos A and B show top and bottom views of the completed instrument. The plug-in coils (L₁) are "Bud" OEL type having a built-in link on the "cold" end of the coil. If used as an exciter for a larger rig this unit is easily link or capacity coupled to the succeeding stage. The parts layout as shown in the photos should be closely followed for best results. Fig. 1 shows the schematic circuit diagram which includes the built-in power unit. When properly loaded the input to the 6L6-G plate is about 20 watts. The screen voltage may be adjusted by moving the tap on the bleeder resistor R₁. A pilot lamp in the negative high-voltage lead makes an inexpensive yet effective tuning indicator.

The small 2-tube short-wave receiver shown at the left of the transmitter in the photo at the head of this article is R-286, described for construction in the January, 1941, issue. Covering all popular bands from 9½ to 550 meters, this little a.c.-d.c. unit makes a simple, inexpensive and highly efficient companion for the 20-watt CW rig, thus completing the newcomer's station at minimum cost.

Microtube Laboratories 2414 Lawrence Chicago

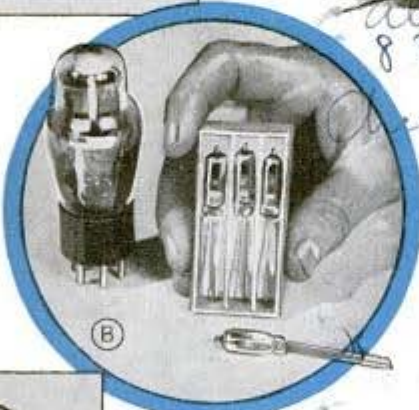
Impacite Co 561 Broadway New York

Practical RADIO SUGGESTIONS

(A) Harmonica melodies can be amplified through the audio stages of your receiver by means of this contact-type microphone. No tools are required to install the small unit which plugs into the phono pick-up jacks of modern broadcast sets. Faithfully reproducing music over the entire usable range, it may also be used with guitar, violin, piano, and many wind instruments. Any number up to five units can be wired in parallel and employed with a high-gain amplifier for complete orchestration



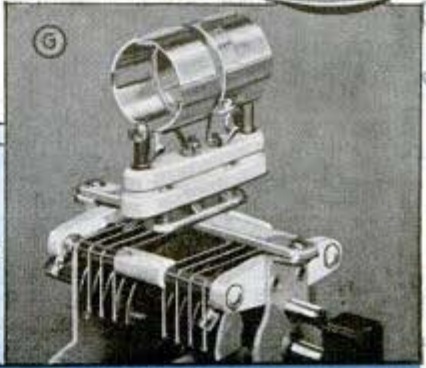
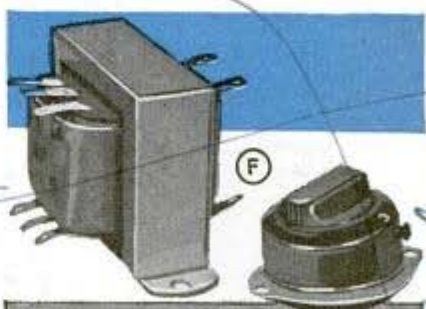
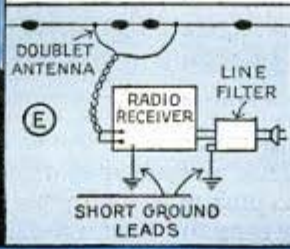
(B) "Microtubes" now available for pocket-type hearing-aid amplifiers and similar applications. Truly miniature as compared with an ordinary receiving tube, these tiny low-drain tetrodes provide beam power performance, and are actually no larger than a pilot lamp



(F) Bring your old tube tester up to date with this tube-tester modernizing transformer and rotary switch. Gives extended filament voltages from 25 to 117 volts; only two wires need be connected to the tester; switch can be mounted in a spare socket hole. Switch has snap-on cover, tap numbers are visible through window. (G) Swivel coil mount to eliminate stray fields. Coil may be mounted on top of condenser as shown, or, on rear if desired



(C) Multi-section plug-in filter for use on sources of radio interference. (D) Learning code by the "ear-eye" method; records employed as in teaching foreign languages. (E) Doublet antenna connected to receiver employing line filter. Separate short ground leads eliminate common impedance in filter and receiver



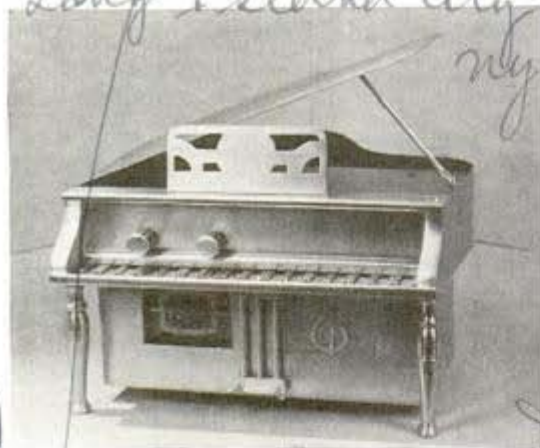
Insuline Corp of America Long Island
National Co. Inc
Sherman
61

Prague Products Co. North Adams Mass

*Hada Radio & Electric Co. Hawaii Waikiki
30-20 Thompson Ave. Curly Chicago*

Ornamental Radio Receivers

Long Island City N.Y.



number by means of a bell similar to the one on your telephone at home, thus eliminating delay on important messages.

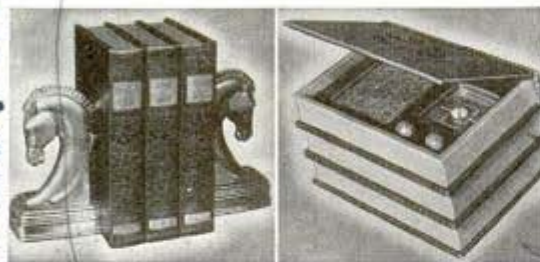
'F-M' Converter for Standard Sets

This small conversion unit can be plugged into any present style radio equipped with phonograph jack, for "F-M" reception without rewiring or other alterations in your set. It provides push-button tuning for 6 stations.



Portable Phono-Recorder Unit

Complete in every detail, this versatile 3-purpose unit makes excellent recordings, plays them back at good volume, and the



Recent productions of well known manufacturers, these small 5-tube sets are good performers as well as decorative objects. The miniature replica of a baby grand piano is finished in 24 kt. gold plate. Bound in maroon-colored simulated leather embossed in antique gold finish, the "book" set is a highly decorative addition to any home or office.



Marine Phone Nearly Automatic



As near fully automatic as possible, this compact two-way marine radiotelephone has provision for automatic bell-ringing attachment which permits coastal harbor stations to call the ship on its own

built-in amplifier may be employed as a portable auxiliary public-address system. It operates from any 110-volt 60-cycle power line.

Blueprints covering 80 simplified radio construction articles in this and past issues are available for 25c each. Original parts lists, names of manufacturers and dealers, can be obtained from Popular Mechanics Radio Department upon receipt of postage.

NEXT MONTH—How to Build Your Own "Hi-Fidelity" Record Player. For direct connection to any a.c.-operated radio receiver by means of a standard tube-socket phono-adaptor plug, or to phono pickup jacks if your set has them. Also—"Tuning Eye" Set Tester. A simple highly sensitive vacuum-tube voltmeter and signal tracer.

*436 N. Cavalon Blvd
Washington, Calif*

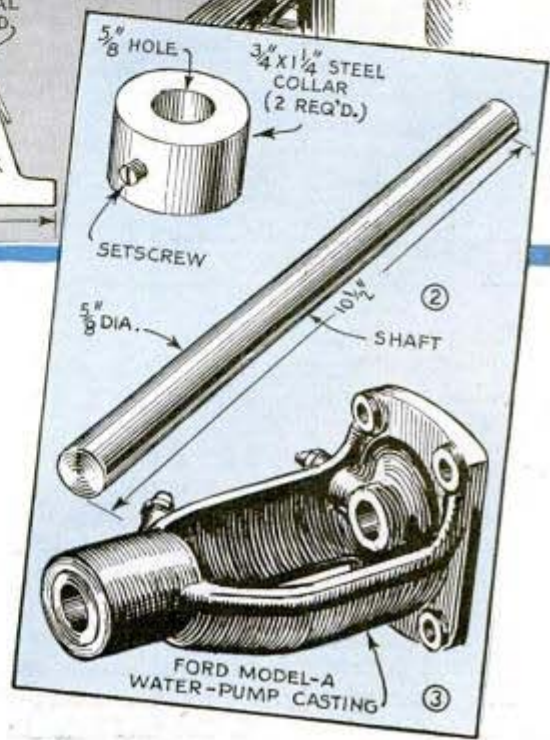
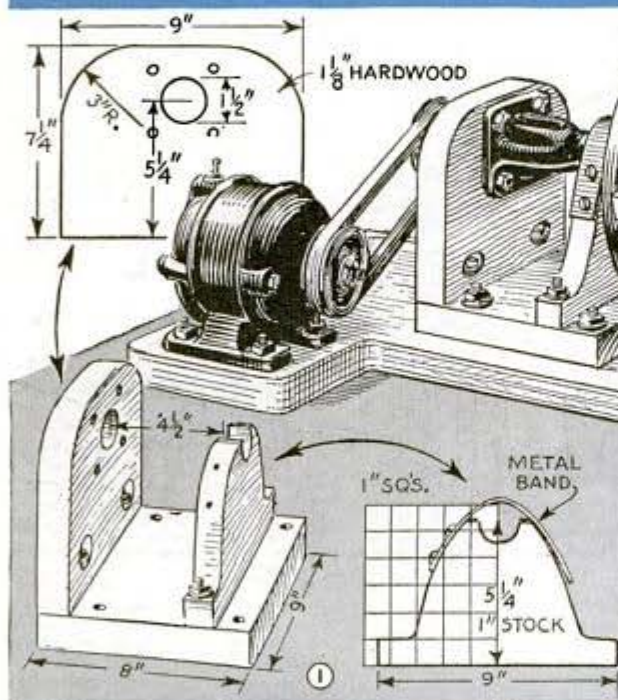
*Marine Radio Service, Inc.
Sentinel Radio Corp
Warrenton, Ill*

*Messner Wg Corp
Mt. Carmel, Ill*



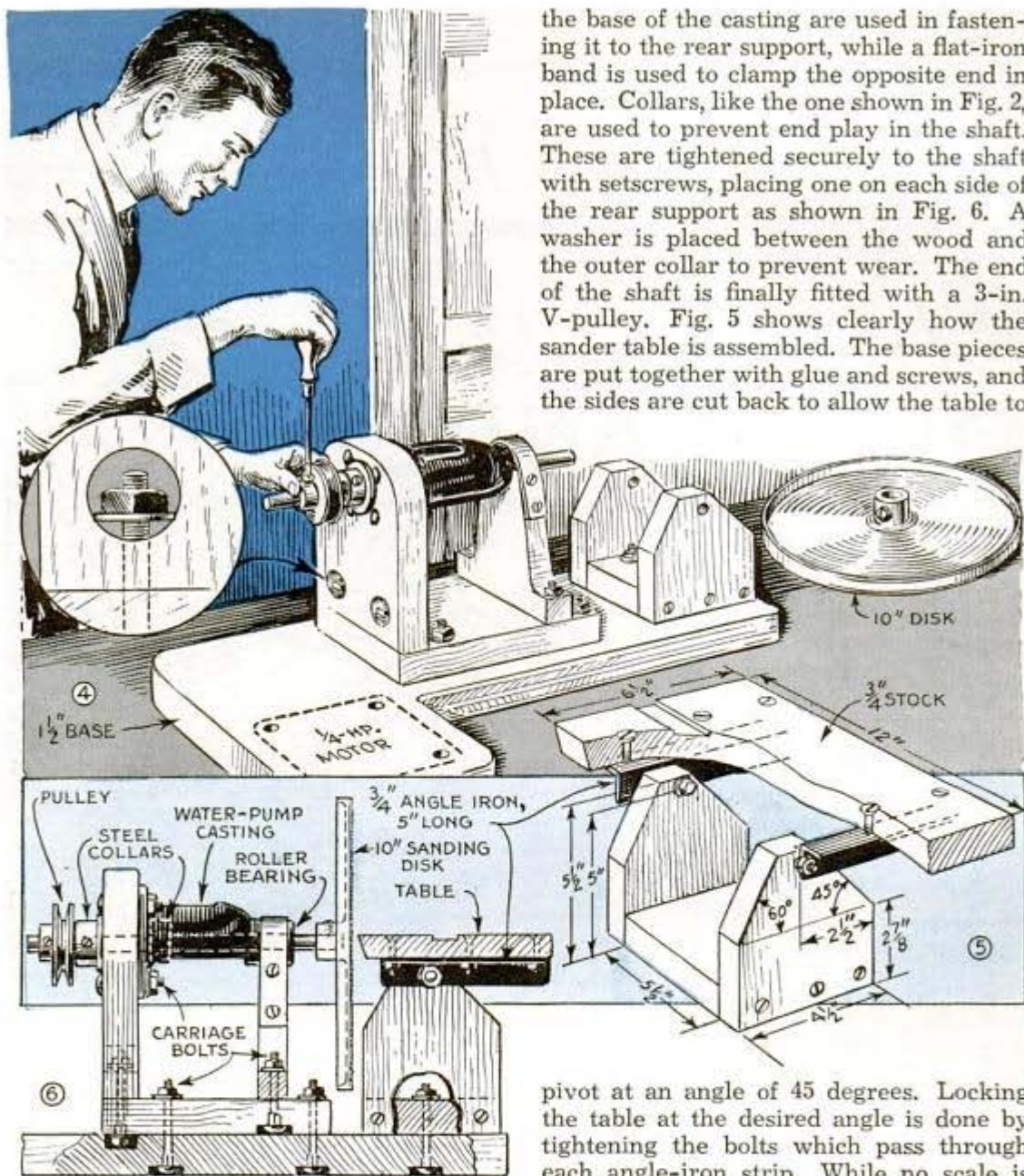
SHOP NOTES

A 10-in., Roller-Bearing DISK SANDER



By RALPH SCOTT

EXCLUSIVE of the abrasive disk, this sturdy sander can be made from a few odd parts which you can obtain almost anywhere, and the cost is practically negligible. Work can be sanded accurately at any angle between 45 and 90° on the tilting table, and by grooving the table surface to take a standard miter gauge, the utility of the unit will be increased considerably, as this enables you to sand work at compound angles. To drive the sander you will need a motor of 1/4 to 1/2 hp., preferably one having a fully enclosed casing.



the base of the casting are used in fastening it to the rear support, while a flat-iron band is used to clamp the opposite end in place. Collars, like the one shown in Fig. 2, are used to prevent end play in the shaft. These are tightened securely to the shaft with setscrews, placing one on each side of the rear support as shown in Fig. 6. A washer is placed between the wood and the outer collar to prevent wear. The end of the shaft is finally fitted with a 3-in. V-pulley. Fig. 5 shows clearly how the sander table is assembled. The base pieces are put together with glue and screws, and the sides are cut back to allow the table to

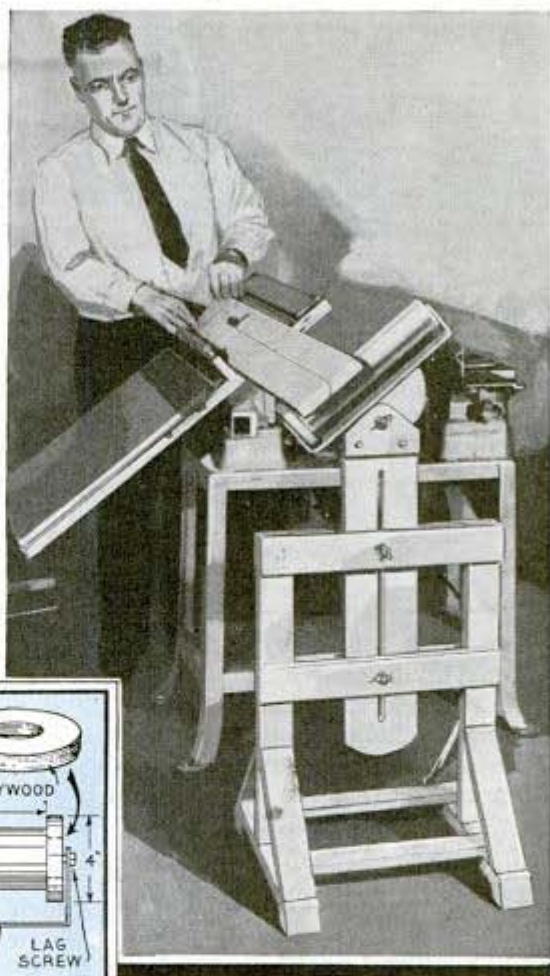
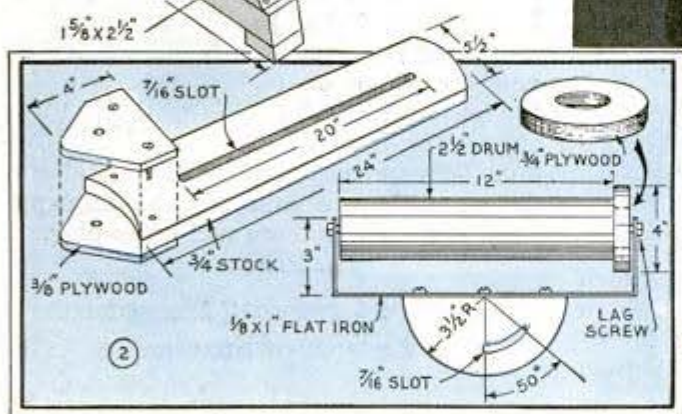
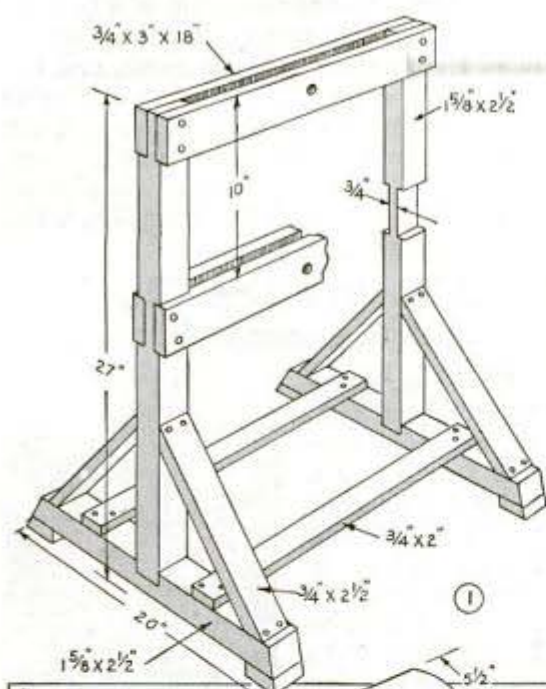
Construction centers around an old Ford model-A water pump which is used as a mandrel for the disk. Select a pump having the least shaft play and remove the shaft, pulley and packing nut as shown in Fig. 3. In place of the original tapered shaft, a length of cold-rolled steel shafting is used, Fig. 2. One end of the shaft is turned down or threaded, as may be necessary, to take a 10-in. sanding disk. The pump casting is mounted horizontally in a hardwood frame, the parts of which are bolted together rigidly in the manner shown in Figs. 1, 4 and 6. Original holes in

pivot at an angle of 45 degrees. Locking the table at the desired angle is done by tightening the bolts which pass through each angle-iron strip. While no scale is provided, the table can be set quickly with a try square and T-bevel.

If desired, the sander can be made portable by mounting it, complete with a motor, on a baseboard of 1-in. plywood as in Fig. 1, or it can be bolted permanently to a bench top and the motor can be located underneath. A 1,750 r.p.m. motor fitted with a pulley the same size as the one on the drive shaft, will operate the machine at a sanding speed suitable for most work.

☛ Fine asbestos mixed with white lead provides a durable putty for sealing joints between cast-iron surfaces.

Support for Long Work Has a Tilting Head



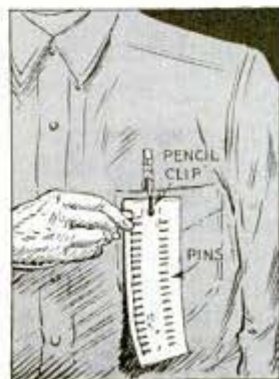
Owners of circular saws with tilting tables will find this support convenient for long work. It differs from the fixed horizontal type of support in that the roller or head can be tilted to correspond to the angle of the saw table. The framework, Fig. 1, can be made of pine, but the trunnion mounting, or tilting device, Fig. 2, should be of hardwood, and should be attached to the flat-iron frame of the roller with screws. The roller, which is turned from a wood block, has lag bolts driven into the ends to serve as axle shafts, which turn in holes through the metal frame. A collar on the end of the roller supports the work when a bevel cut is made. The long slotted piece that supports the roller assembly is cut from pine, two $\frac{3}{8}$ -in. plywood pieces being provided at the upper end for pivoting the trunnion. Tilting and height ad-

justments are locked with $\frac{3}{8}$ -in. carriage bolts, which are run through holes drilled in the two upper cross members of the supporting frame.

—Frank Hegemeyer, Monterey Park, Calif.

Window Trimmer Carries Pins under Clip of Pocket Pencil

To keep a few pins at hand when decorating windows, one workman cuts a paper of pins into strips and slips one of these under the clip of his pocket pencil. In this position, the pins are removed easily from the strip.



Sturdy Tubs for Mixing Mortar Made from Oil Drums



Mortar tubs that can stand hard use are made inexpensively by cutting off the ends of steel oil drums. Such tubs will not warp or crack, and they can be pounded with a hammer to help remove dried mortar. It is best to file or grind the edges of the tubs, after cutting them, to smooth them.

Putty Knife Pulls Glazier Points



By filing a notch in the end of a putty knife slightly narrower than the head of a glazier point, one painter constructed a tool that removes glazier points from old window sash in a jiffy. In use, the notch in the blade is slipped over the projecting point to pry it out.

Rubber on Plasterer's Hawk Protects the Hand

Slipped over the handle of a plasterer's hawk, a sponge-rubber disk will prevent pressure of the hawk from causing the hand to become sore. For further protection,



glue a tire-patch disk to the sponge-rubber disk before slipping it over the handle of the hawk, so the tire patch will be next to the hand. The sponge pad cushions the hand from pressure of the hawk, and the tire patch keeps out particles of plaster which otherwise collect in the pores of the sponge rubber, and usually result in a sore hand from friction and ground-in plaster.
—Verne Van Horn, Oklahoma City, Okla.

Block Hinged to End of Sawhorse Aids in Squaring Boards

To square the ends of boards on a sawhorse, a carpenter uses a block hinged near one end of the cross member to serve as a straight-edge. This may be lifted up into marking position or dropped out of the way in an instant. The block must be mounted exactly at right angles to the top of the sawhorse, and the hinge pin must fit tightly so there will be no play.



Case for Carrying Blueprints Is Length of Stovepipe



A length of stovepipe makes a good container and carrying case for blueprints. A regular metal handle is riveted in the center of the pipe as indicated. Thus the unit is easy to handle, and because of the metal, the prints are well protected.—O. Read, Jr., Chicago.

Electric-Motor Shaft Welded in a Lathe

During the course of work in a factory it was necessary to provide extension shafts on thirty electric motors. Having only a 3-jaw scroll chuck on the lathe, the job was done as follows: A piece of round stock long enough for several extensions

was chucked in the lathe, allowing it to project slightly more than enough for one extension. A projecting center was then turned on the end and the shoulder beveled about $\frac{1}{8}$ in. back. With the piece still in the chuck, the armature shaft was placed between the turned center and the tail center, leaving the tailstock slightly loose to allow for heat expansion. Then wrapping a wet cloth about the windings on the end of the armature, the extension was bronze-welded to the shaft with an oxyacetylene flame, using a good grade of bronze welding rod. After cooling the work and tightening the tailstock, the welded end was turned to size and cut off. Be sure to shield the lathe bed against excessive heat from the torch.—C. C. Heyder, Buffalo, N. Y.

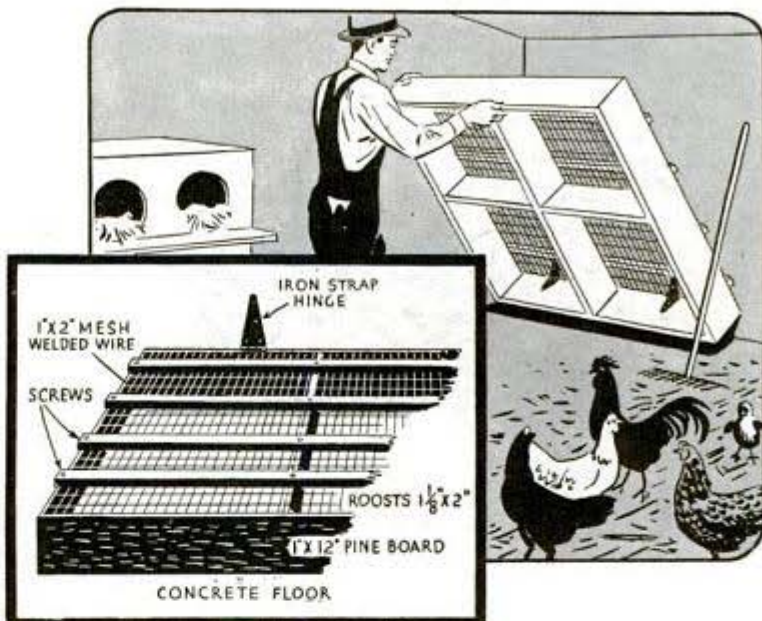
"In-and-Out" Sign Displayed on Sun Visor

An unusual sign for indicating to visitors whether the doctor is in or out may be made by printing the words on the front and back of an auto sun visor and attaching it to the office door. Turning the sign up or down displays the proper message.



APRIL, 1941

Low Roosts in Poultry House Aid in Keeping It Sanitary



Low roosts in the brooder or laying house are coming more and more into use because of ease of cleaning, greater convenience to the birds in getting on and off the roosts and less danger of infestation with parasites. The frame supporting the roosts is of 1 by 12-in. stock. It can be made in sections if desired with as many as three units hinged in line to one side of the house. The top of the frame is covered with 1-in. mesh welded wire. This size allows droppings to pass through the floor, yet catches any eggs that may be laid on the roosts. Some poultrymen prefer to have the roosts somewhat higher above the wire. Where this is desirable, the roosts may be raised on a 1 by 2-in. strip of wood.

—W. C. Lammey, Naperville, Ill.

Shield on Typewriter Cuts Repair Bills

Many expensive typewriter cleaning and repair jobs can be avoided by attaching an eraser dust shield to your portable machine, as shown. It is made from a strip of aluminum or brass and fastened to the machine by drilling holes to take screws already in place.—Allen Fiske, Chicago, Ill.



not on market - aluminum not available

What You Can Do With



emulsion. The former sets very quickly and has amazing strength as an adhesive, while the emulsion dries slowly and has advantages for inlaying and for surface coating. For some purposes either the emulsion or the full-strength liquid can be used, but each form has definite advantages for certain purposes as will be explained.

Used as an adhesive: Delays occasioned by the use of slow-drying glues while making or repairing furniture are reduced to a matter of minutes if full-strength resin plastic is used and the article being glued is set in an oven. As an adhesive, this plastic is highly satisfactory on wood and other porous materials, but it is not suitable for use on metal and glass. Negligible shrinkage in hardening makes it especially valuable. Wooden surfaces to be joined should be thoroughly

cleaned and roughened with a fine grade of sandpaper. Just before using the plastic, it must be mixed with a hardening solution, which is made by adding C.P. hydrochloric acid, 3 volumes, to distilled water, 1 volume. One part of the hardening solution is added to 9 parts of the liquid plastic, and the solution is mixed well by vigorous stirring until uniform. See Fig. 5. The cement begins to set almost at once, and so no more should be mixed than can be used immediately. A thin layer of the mixed plastic is applied to both surfaces to be joined and the parts should be clamped together tightly, or pressed under weight to assure good adhesion. Ordinarily, and particularly with small objects, the work

1st
MAKE HARDENING SOLUTION
C. P. HYDROCHLORIC ACID,
3 VOLUMES TO DISTILLED
WATER, 1 VOLUME

5 as an adhesive

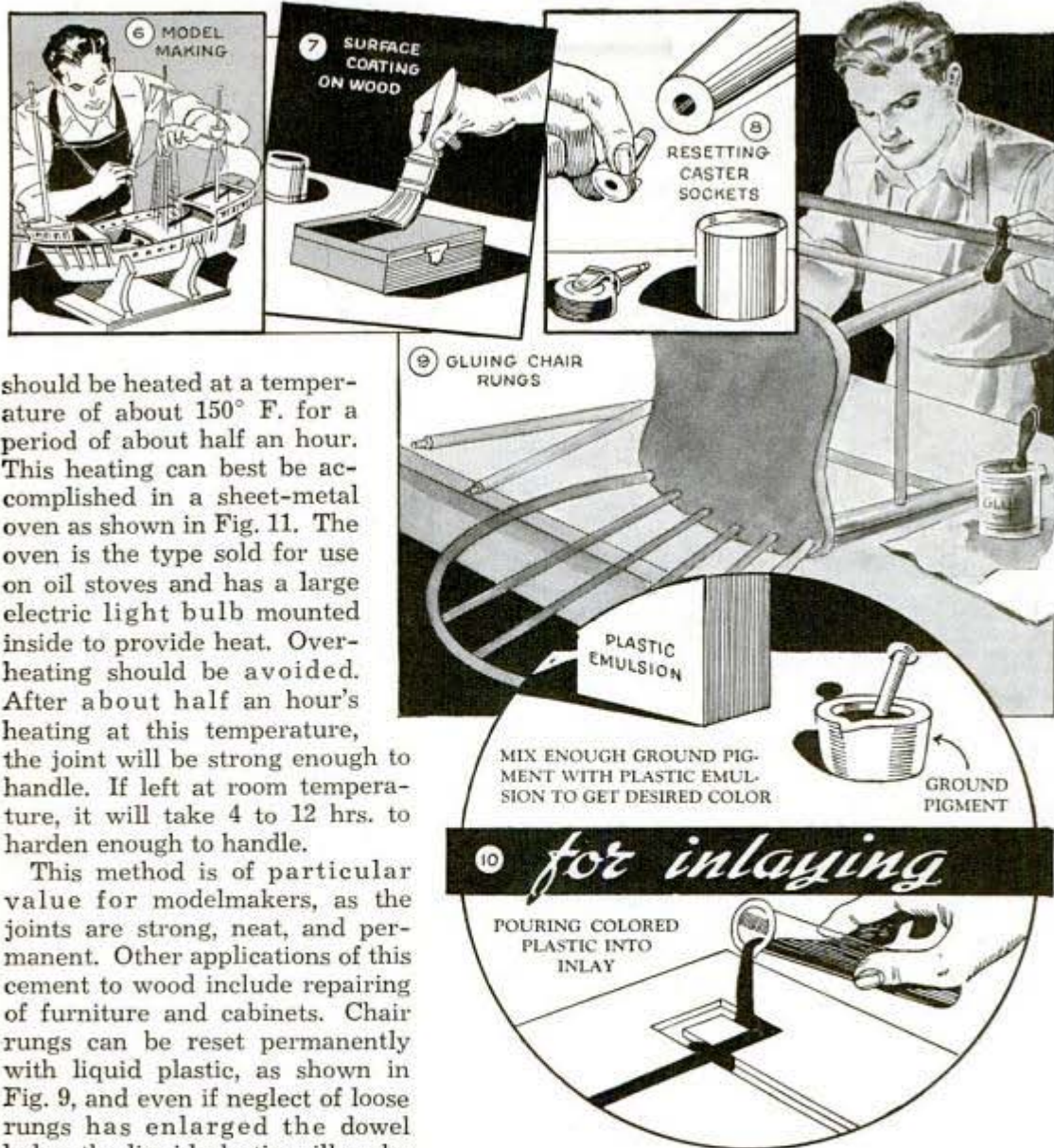
2nd
MIX (JUST ENOUGH TO USE),
HARDENING SOLUTION,
1 VOLUME IN LIQUID PLAS-
TIC, 9 VOLUMES. THEN
STIR THOROUGHLY

GLASS OR
PORCELAIN
DISH

By C. A. CROWLEY

YOU can use liquid plastics of the resin type for inlaying and veneering, cementing and applying surface coatings as pictured in Figs. 1 to 9. When inlaying, colors can be obtained by adding pigments. Surface coatings can be applied with a brush or a spray gun. The plastic is obtainable in two forms: as a full-strength liquid, which is sirupy and light colored, and requires the addition of a hardening agent,—and it comes in the form of an

LIQUID PLASTICS



should be heated at a temperature of about 150° F. for a period of about half an hour. This heating can best be accomplished in a sheet-metal oven as shown in Fig. 11. The oven is the type sold for use on oil stoves and has a large electric light bulb mounted inside to provide heat. Overheating should be avoided. After about half an hour's heating at this temperature, the joint will be strong enough to handle. If left at room temperature, it will take 4 to 12 hrs. to harden enough to handle.

This method is of particular value for modelmakers, as the joints are strong, neat, and permanent. Other applications of this cement to wood include repairing of furniture and cabinets. Chair rungs can be reset permanently with liquid plastic, as shown in Fig. 9, and even if neglect of loose rungs has enlarged the dowel holes, the liquid plastic will make a strong and permanent joint. For repairing rungs or other doweled joints, the dowel pins should be coated lightly with the liquid plastic, and the inside of the dowel hole should also be filled with enough of the liquid plastic to completely fill the dowel hole after the pin is inserted. One side of the dowel should be flattened to permit the excess plastic to flow out; otherwise the wood may be split. After the rungs, or dowels, have been set, the joint should be clamped to hold it firmly.

Caster sockets which have become worn so that the casters slip out can also be re-

paired with liquid plastic as in Fig. 8. In this application, enough of the plastic should be placed in the hole to build it up to the desired size and the caster socket is inserted before the plastic has set. If the leg has split, liquid plastic can be used at the same time to repair the split.

Inlaying with plastics: Inlaying can be done with the full-strength resin plastic, but it has a disadvantage in that working with it must be done rapidly since it quickly becomes too stiff to apply after the hardener has been added. In view of this the emulsified form of plastic is generally bet-

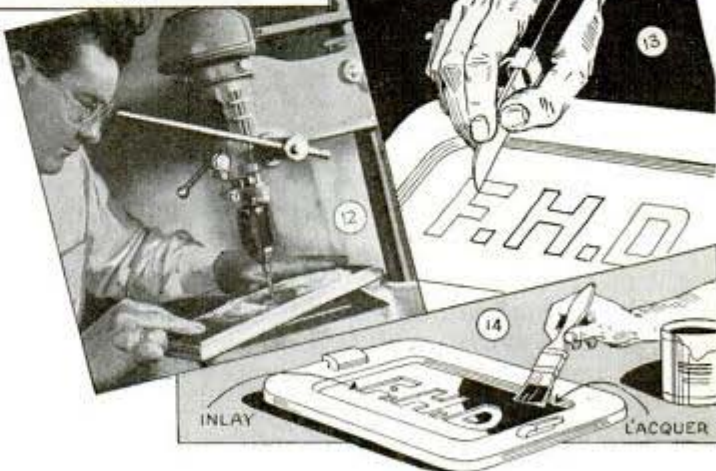
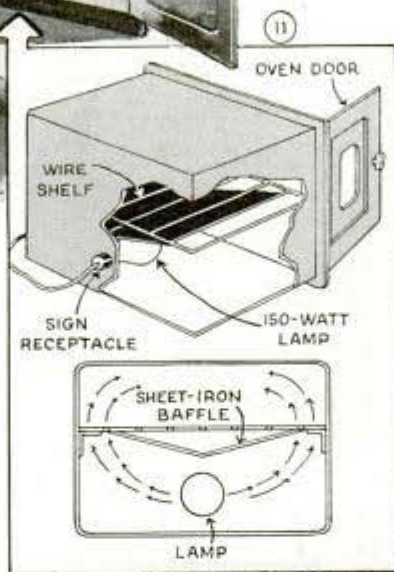
TAKES THIRTY MINUTES TO HARDEN IN OVEN



ter for the purpose of laying as it does not set so quickly as the other type. In this work, the wooden article into which the design or initials are to be inlaid is first selected and the design laid out. The areas to be inlaid are carefully cut out with a sharp knife, a chisel or are routed out as shown in Figs. 12 and 13. The inlaying need not be very deep, $\frac{1}{16}$ to $\frac{1}{8}$ in. is sufficient. The entire surface, except the areas cut out for inlaying, should be given a coating of varnish or lacquer, as shown in Fig. 14. A plastic coating can be used if desired, as described below. Some coating is necessary since the emulsion plastic is absorbed into the pores of the wood and may spread a little if this precaution is not taken.

The plastic emulsion is a thin, white suspension of plastic in water, containing 50 per cent of plastic. To color the plastic, grind into the emulsion enough pigment of suitable color to give the desired shade, using a glass mortar and pestle, Fig. 10. Many pigments will mix satisfactorily, including "Monastral" fast blue BSN, "Lithosol" red 2BD powder, and "Monastral" fast green GS. Grinding

should be continued until the color is even and all lumps or clots have been broken up. Then the colored plastic emulsion is filled carefully into the inlaid areas, taking care not to spread it beyond such areas. If any spills over it can be wiped off at once with ammonia, diluted with water. Household ammonia should not be used. The emulsion is allowed to dry in air for about an hour, and then it is transferred to an oven, where it is cured at a temperature of about 250° F. With small articles, $\frac{1}{2}$ hour at this temperature will suffice but larger articles will need to be cured for longer periods. A certain amount of shrinkage will occur, and so after removing the article from the oven, a second application of the plastic emulsion will

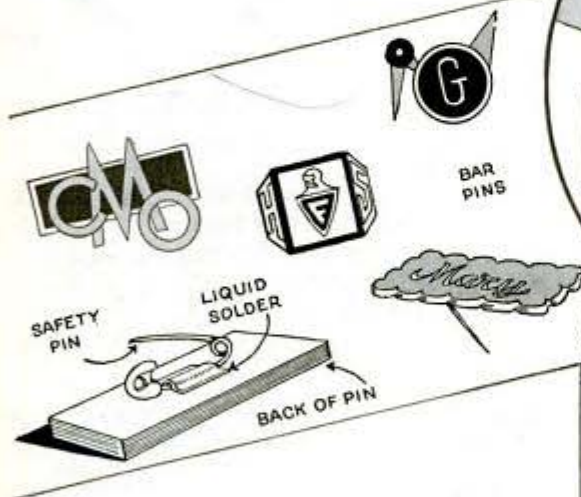


have to be made. This can be applied so that it rises slightly above the level of the wood surface, without spreading beyond the design area, and after drying and curing, it should be substantially level with the surface of the wood. If the inlaid areas were cut too deep, a third application may be required. Intricate designs in several colors can be made by this method.

SURFACE COATINGS SPRAYED OR BRUSHED

The liquid plastic described first can also be used for inlaying but because it requires such fast work its value for this purpose is not great. However, it has the advantage of negligible shrinkage on curing. Liquid plastic can be colored by grinding a suitable pigment into the liquid before it is mixed with the hardening solution. The pigments used must not be affected by the acid hardening solution; the pigments recommended above for the plastic emulsion are satisfactory for the liquid plastic also.

Surface coatings with liquid plastics: The plastic emulsion as well as liquid plastic can be used as surface coatings on trays, tabletops, etc. After curing, the coatings are waterproof, heat-resistant, and resistant to many chemicals including alcohol. The plastic emulsion can be applied by



brushing or spraying as in Figs. 15 and 16. If the emulsion is too thick for spraying or easy brushing, it can be thinned with water to the consistency necessary. After drying, the coating should be cured at 250° F., if possible. It will harden in air rather slowly, but heating with a radiant heater or a group of lamps in a reflector will help cure more rapidly.

As illustrated in Fig. 18, attractive individualized novelties such as bar pins, bracelets, monograms and pendants can be made by staining or dyeing pieces of wood a suitable color, and coating all over with a clear plastic emulsion. Colored plastic emulsion can also be used to give a solid colored background. The owner's name or

initials can be applied to the pin in colored plastic using a loop of wire as in Fig. 17, to hold a drop of the emulsion and to spread it as desired. After drying, the pin is cured in the oven as usual. The finished bar can be fastened to an ordinary safety pin by means of "liquid solder" type of cement, as shown in Fig. 18.

ⓁPunches and chisels for model makers can be had by grinding ice picks to shape, taking care not to burn them.

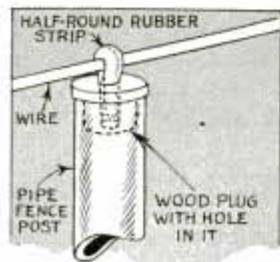
Adjustable End on Grain Chute Delivers Measured Quantities



In a feed and seed store where grain was kept in bins above the store and delivered downstairs by means of chutes, the owner rigged up an adjustable measuring device on the end of each chute. This consisted of a wooden sleeve, which could be raised or lowered to decrease the space between the slide or grain valve in the chute and the one in the sleeve. As the customers usually designated the amount of feed or seed desired by the amount of money they wanted to spend, a scale was marked off on the chute so that when the upper edge of the sleeve was adjusted to the desired marking of the scale the space between the two slides would hold that amount of grain. This arrangement saved time and reduced spillage of grain, as it was unnecessary to weigh or measure out the desired amount in a sack or separate container.

—A. H. Waychoff, Phoenix, Ariz.

Insulator for Electric Fence



In order to move an electric fence to change his pasture location frequently with the least effort and time, a farmer uses half-round rubber strips as insulators

on the posts. Pipes are used for posts, as they can be driven and pulled easily. Each pipe is fitted with a wooden plug, drilling a hole in it just large enough to retain the rubber strip. In driving a post, a cap which fits over the plug and prevents it from splitting is used.

—Albert Clark, Everett, Mass.

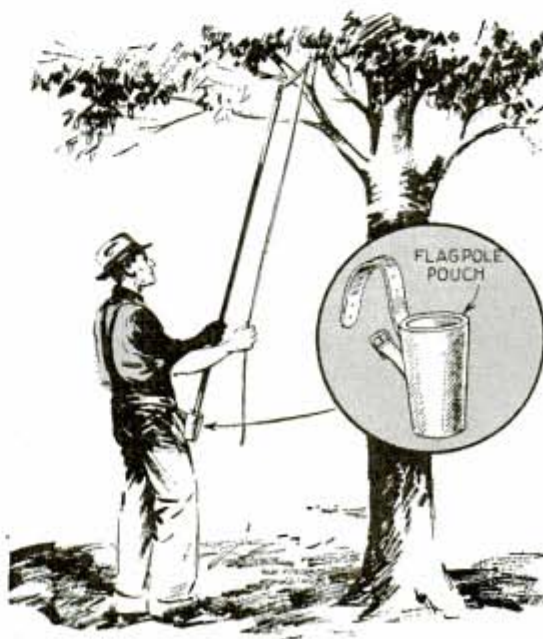
Turned Wooden Ball in Glue Pot Keeps Brush Handle Clean

One carpenter solved the problem of messy glue-brush handles by turning a wooden ball to fit inside the glue pot. The floating ball prevents the brush from sinking and also rolls to supply glue evenly to the bristles.

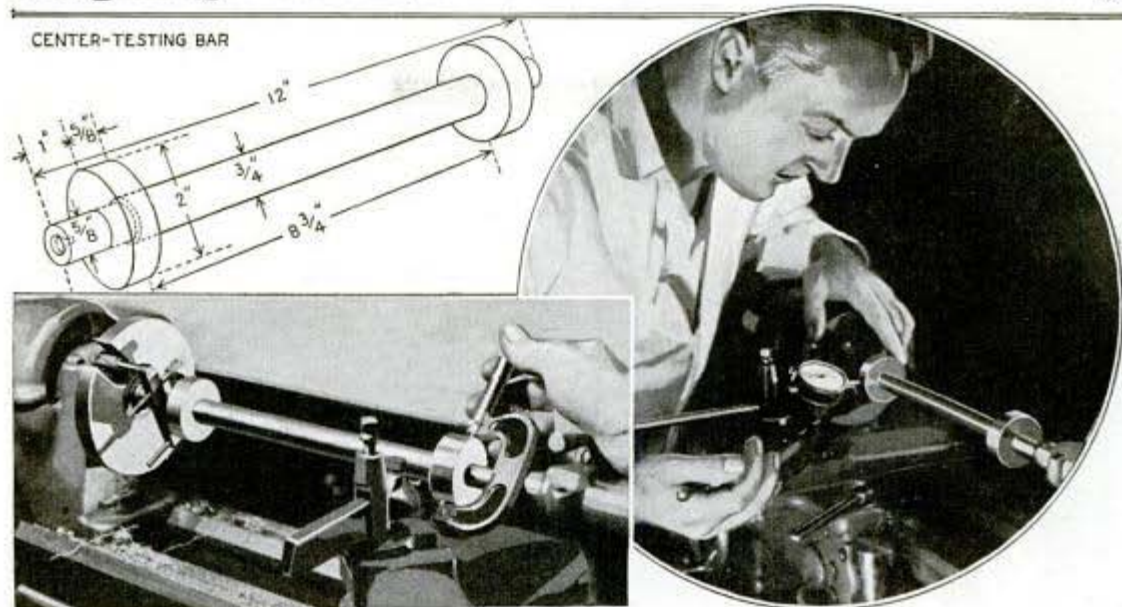


Tree-Trimmer Handle Supported in Pouch on Workman's Belt

A telephone lineman who had to remove branches from trees to keep them off the lines, saved strain on his arms by using a pouch on his belt to support the handle of the trimmers. The pouch is of the type used by flag bearers in parades.



Aligning Bar Checks Lathe Centers Accurately



Checking lathe centers for perfect alignment, which is necessary in precision work, is a simple matter when this testing bar is used. It consists of a steel shaft turned accurately to size with shoulders formed on the ends to take steel disks with a light, drive fit. In use, the bar is mounted between the centers to be checked. Then a dial indicator is placed in the tool post, and moved up against the disk at the headstock

end, after which the indicator is adjusted by means of the cross slide so that the dial reads zero. Now, without changing the adjustment, the carriage is moved to bring the indicator against the disk at the tailstock end of the bar. By adjusting the set-over screw on the tailstock base until the needle on the dial again points to zero, the centers are aligned accurately.

—C. W. Woodson, East Aurora, N. Y.

Display Rack of Lamps Aids in Selecting the Correct Size

Customers who have difficulty in selecting an electric lamp of a size to provide the illumination desired, will appreciate a display rack of the type shown in your store. One each of all sizes of lamps carried in stock is screwed into a socket on the rack, which is wired so that the lamps can be turned on individually. With this arrangement, a customer can check the illumination produced by each lamp by reading printed material held directly under it.

Triangle Useful for Pressmen

One of the handiest tools to have around a platen press is a transparent celluloid triangle. Nonpareils and picas can be scored on the two edges for ascertaining the margins when drawing lines before setting the gauge pins, thus assuring a straight margin on the printed sheet.

—W. F. Hagerman, Quincy, Ill.

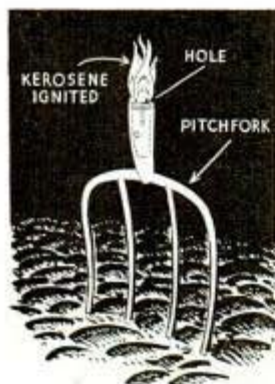


Car-Motor Oil Pan Provides Base for Welder's Stand



Using a discarded brake drum, a length of pipe and the oil pan from a car motor, a garage mechanic constructed this welding stand. A reducer screwed into the drain hole of the inverted oil pan takes the threaded pipe, which serves as a standard, the other end of the pipe being welded to the brake drum. This serves as the tool and sand tray.

Broken Handle in Pitchfork Burned Out of Ferrule

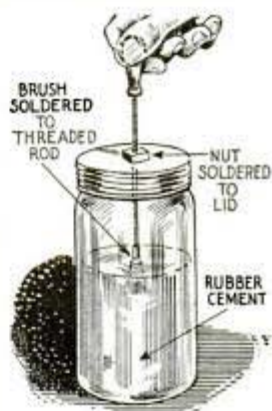


To remove a broken handle from a pitchfork without drawing the temper from the tines, saw off the broken handle close to the ferrule, drill a small hole in the center down to the anchoring rivet and fill the hole with kerosene. After the oil has had a little time to soak into the wood, ignite and let it burn until the charred wood may be removed. The fork can be pushed into the

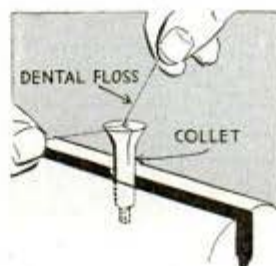
ground to hold it vertically while the work is done and also to afford further protection of the tines from the heat.

Brush Used in Rubber-Cement Jar Adjustable for Clean Handle

If a brush used in a jar of rubber cement can be adjusted to just keep the bristles in the cement regardless of its depth in the jar, it will always be ready for use and the handle will be clean. One way of accomplishing this is to fit the brush with a threaded handle as shown. A hole punched through the jar lid and a nut soldered over the hole will enable you to lower the brush as the cement is used.



Cleaning Slots in Small Collets



Dust and dirt that enter the slots of small collets, making them difficult to draw up, can be removed by using ordinary dental floss. Obtainable at any drug store, this thin thread can be run into and through the narrowest slots without trouble. A little oil on the floss will lubricate the slot sides and help prevent rusting.

Headlight Reflector on Barn Wall Serves a Double Purpose

Besides directing the light of a lantern, an old auto-headlight reflector mounted on the barn wall as shown, also protects the wall from heat. It can be fastened under the hook with a bolt or nail and washer.

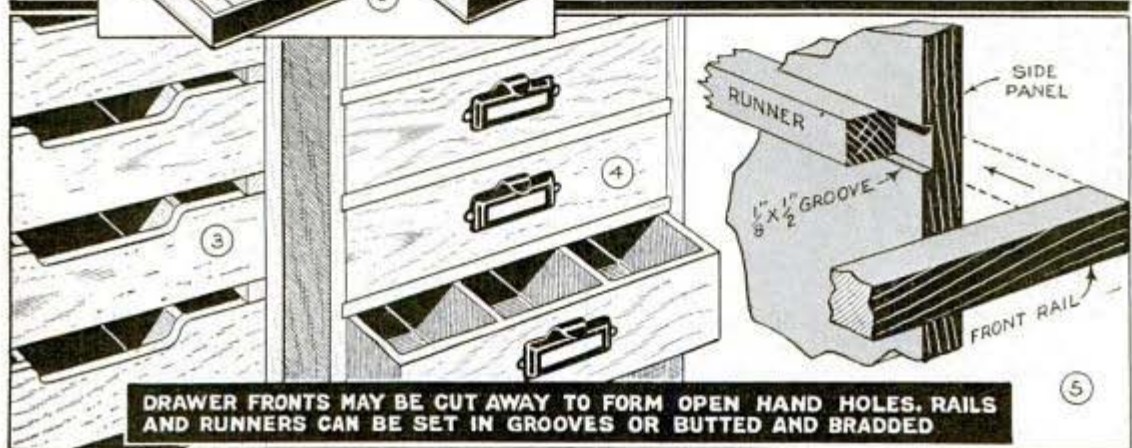
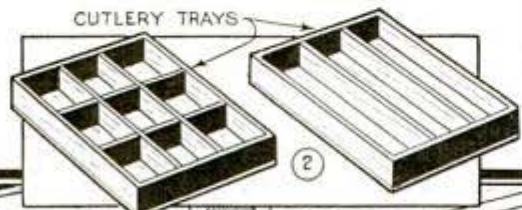
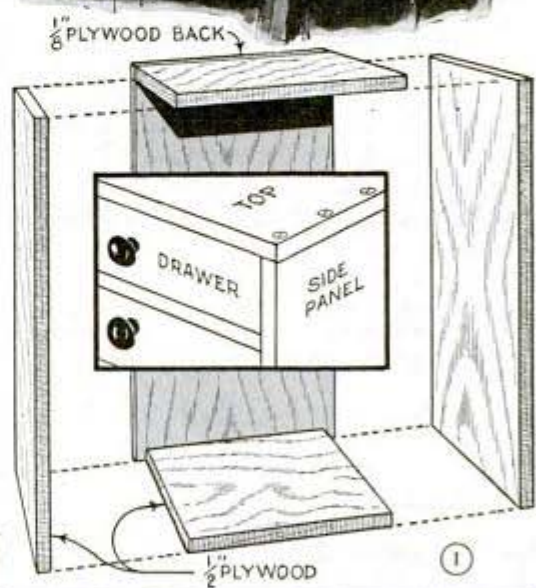


READY-MADE DRAWERS

in this tool Cabinet



Here's a way that you can make a neat tool and small-parts cabinet without a lot of tedious drawer making. You simply purchase some of the cheaper type of cutlery trays that are divided into two or three compartments. Most dime stores have them. They are ideal for keeping small tools, nails, screws, etc., and if you desire, the trays can be partitioned into still smaller compartments as shown in the left-hand detail of Fig. 2. As the trays vary slightly in size, cabinet dimensions cannot be given in Fig. 1, but this detail shows the method of construction. Top and bottom of the cabinet are attached to the plywood sides with flat-head screws, while the back can be nailed on. Figs. 3, 4 and 5 suggest ways of fitting the drawers and cutting hand openings or providing pulls.



DRAWER FRONTS MAY BE CUT AWAY TO FORM OPEN HAND HOLES, RAILS AND RUNNERS CAN BE SET IN GROOVES OR BUTTED AND BRADDED

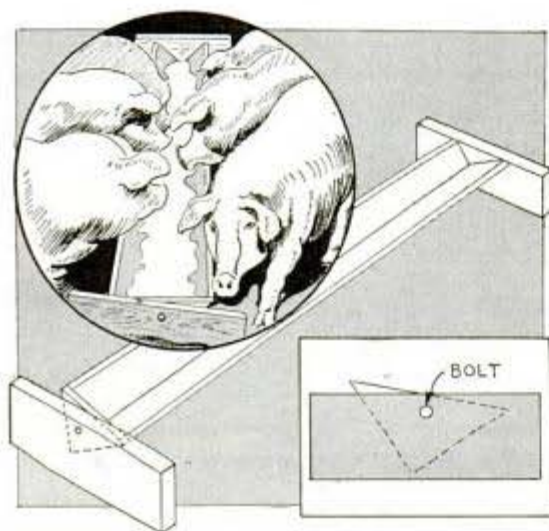
Disk-Harrow Blade on Wagon Box Cleans Shovel Thoroughly



When loading clay or other sticky soil into a wagon or truck, attach a disk-harrow blade to the box and you will have a handy place to clean your shovel. A good way to attach the blade is to use bolts and washers as indicated, the washers merely engaging the edges of the blade so that it can be removed by lifting it up.

This Hog Trough Adapts Itself to Uneven Ground

To prevent a long hog trough from twisting and warping out of shape when placed on uneven ground, one farmer fitted a V-shaped block into one end to close



it, after which a wood block was pivoted to it. This allowed the trough to be set on uneven ground as the end could follow the slope of the ground.

Poultry Nests Dusted Easily with a Flour Sifter

One farmer applies insect powder uniformly and economically to his poultry nests by using a flour sifter. In this way, every bit of the nesting material is covered with the powder, yet more than necessary is not applied in spots, which often happens when the powder is applied with the hands.



Metal Washer Is Handy Reservoir for Drill Lubricant

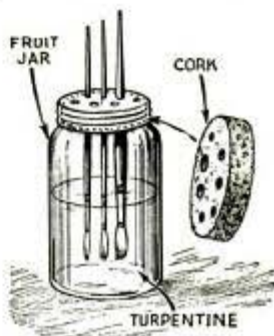


If you are drilling holes in steel or iron that has a smooth surface, place a washer over the portion to be drilled and feed the lubricant into it. The washer provides a reservoir,

enabling the operator to continue the work without frequent applications.

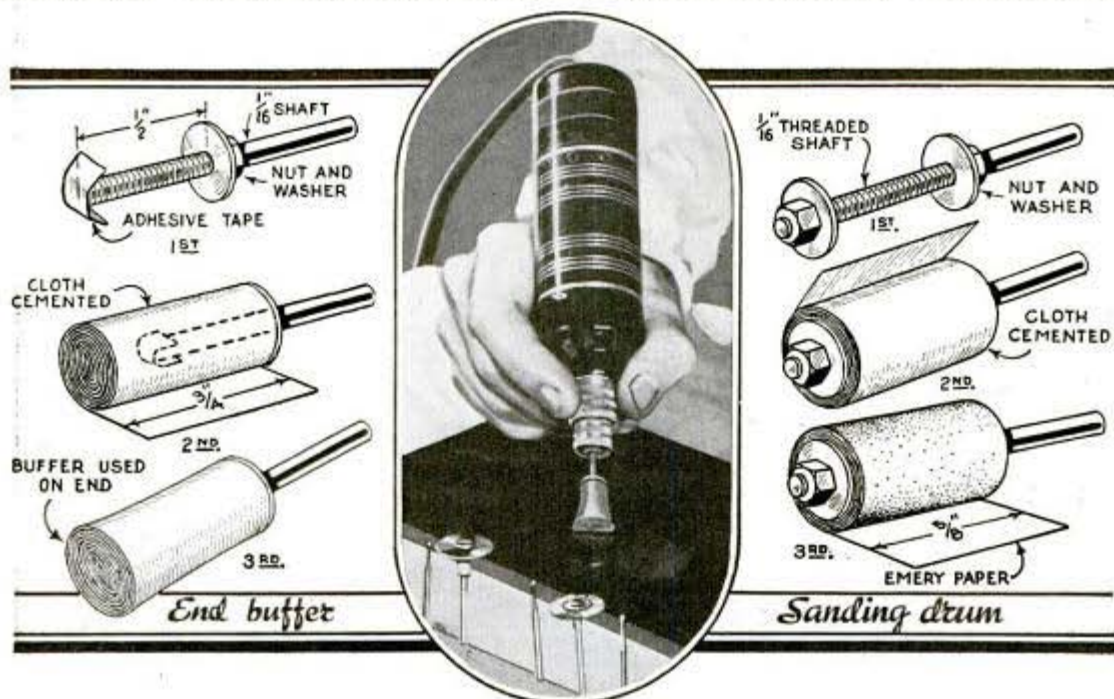
Painter's Non-Spill Brush Holder

Instead of keeping his brushes in oil-soaked cloths, one sign painter suspends them in a mixture of oil and turpentine in a leakproof container. This is a fruit jar with a thick cork gasket inside the lid, which has holes to accommodate each brush. When a job is finished, the brush handles are pushed up into the holes for a tight fit and the lid screwed on.



—L. B. Robbins, Harwich, Mass.

Buffer and Sander for Small Hand Grinders



If you have a small hand grinder, these two accessories will be useful in the tooling of metals and plastics. The end buffer will get into light places, and consists of a strip of cloth wound on a mandrel, which must have a nut or collar to prevent the roll from slipping upward. The cloth should project about $\frac{1}{4}$ in. beyond the end of the mandrel. The sanding drum has a core of cloth, which is wound counterclockwise on a mandrel with a little cement between each turn. Medium-grit abrasive paper is wound on the core with a liberal applica-

tion of cement on the grit surface between each turn. The cement must be flexible and of good quality. A high-grade rubber-base cement such as comes in the form of a thick, white liquid is excellent. When this adhesive is used, the worn surface of the paper may be peeled off to present a fresh layer from which the cement can be rubbed with the fingers. If a cement of inferior quality is used on the abrasive paper, the layers will loosen and tear off when the drum is rotating.

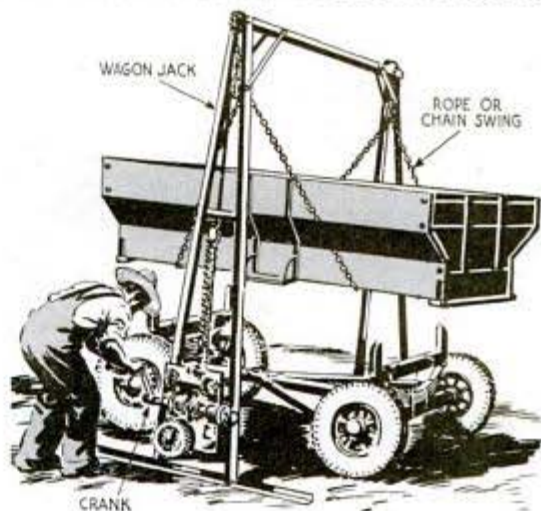
—Harry Walton, New York, N. Y.

Heavy Wagon Boxes Are Lifted with Grain-Elevator Jack

To raise heavy wagon boxes or grain racks with little effort, one farmer uses the overhead wagon jack of his portable grain elevator. To do this, he fitted a hand crank on the outer end of the jack drive shaft. This permits use of the shifting worm gear for raising a load. To lower the load, the worm is shifted to engage a double-induction reverse gear, the crank being turned in the same direction. A rope or chain sling is used around the wagon box.

—W. C. Lammey, Naperville, Ill.

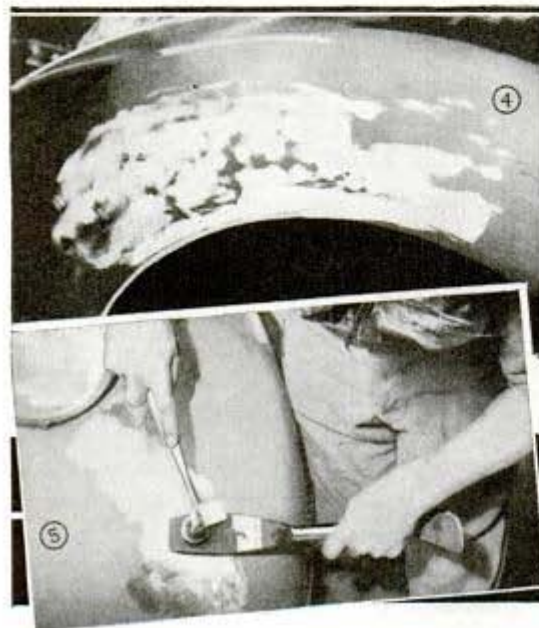
Wood ashes poured in the center of an old auto tire laid on the ground provides a good "dusting box" for poultry.



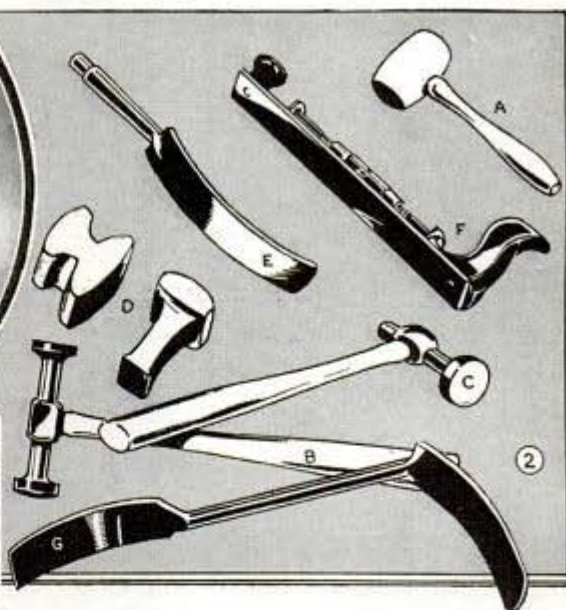
OUT WITH



It is a simple job to remove small dents quickly with a dinging hammer and a dolly



Dinging will smooth up the job after all large dents have been removed



By RORY O'SHANE

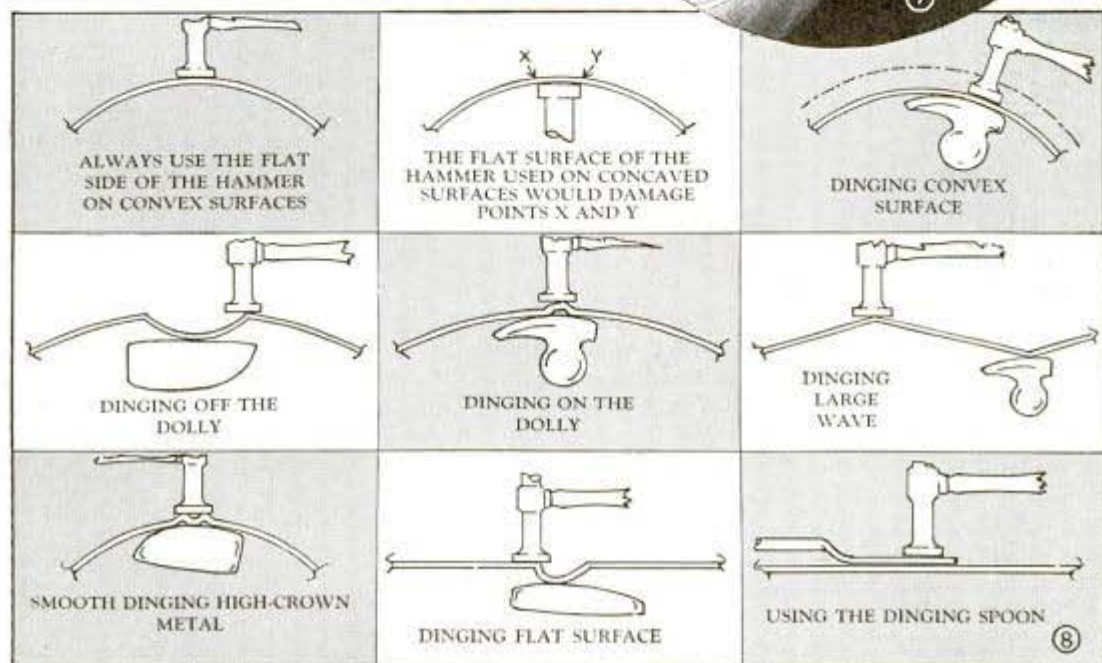
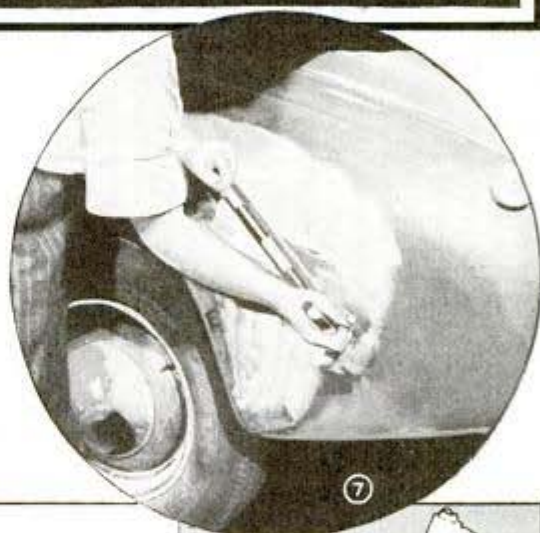
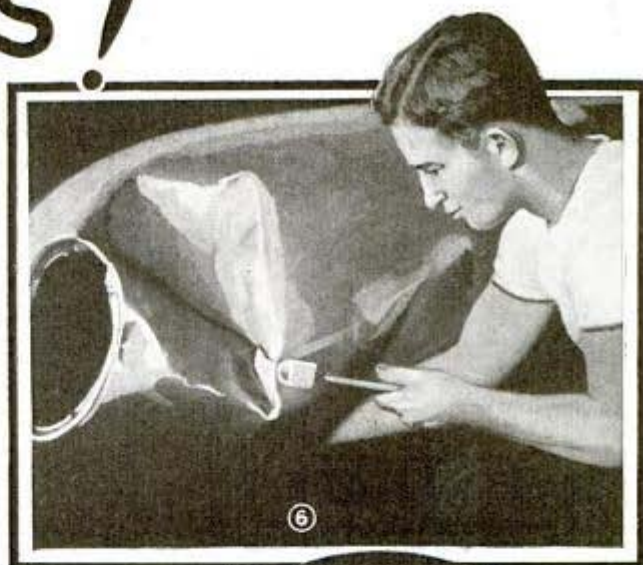
FEW motorists think of repairing a damaged fender, yet it's not so difficult if you have some spare time and exercise a little patience. Your tools, Fig. 2, should include a bumping hammer, A, for heavy work, a dinging hammer, B, for light work, and a half-hammer, C, for use where space is limited. Be sure to get several dolly blocks, D, and an assortment of dinging spoons, G and E. The former are used primarily in raising low metal during the dinging process, while the latter act as pads between hammer and metal in transferring the force of the blow to the fender without marring its surface. An adjustable file, F, completes the list.

The first step is to remove all dirt from the top side of the fender, and then scrape the underside free of tar and clinging particles with a wire brush, Fig. 1. Next, spread a thin film of oil over both sides of the fender. It will reflect light into hidden indentations, and also protect the paint while the fender is being repaired. A basic rule of fender repair is that the dent must come out the way it went in. Though no two damaged fenders look alike, they are nothing more than a differently patterned series of ridges and valleys. Therefore, determine the path of the force that caused the pattern. In repairing, work from the last buckled ridge back to the point of first

the DENTS!

contact. The larger dents are removed first, Fig. 6. This process is called bumping. Never try to bump out small dents. If the fender is folded into tight "accordion" layers, bring these out by pulling on the fender or by prying the folds open with a dinging spoon.

Place a dinging spoon on the first ridge and strike the spoon a sharp blow with the bumping hammer. Never hammer at an angle; bring the hammer squarely down on the ridge. This starts the high metal down. Then start on the next high ridge and go through the same process until all the high metal has been beaten to the contour of the fender. The general rule for using a dolly is to hold it against the low spot while you hammer at the high spot. Figs. 3 and 8. Hammer off the dolly rather than squarely on it to prevent the metal from stretching. In the case of a deep, narrow dent, remember to place the dolly directly underneath, exerting a vertical pressure while you hammer at the rim of the dent. When the dent is broad and shallow, place a dolly block opposite the side on which the dent was made and bump at the outer edges, working in toward the center. Al-





ways use a dolly block having the same contour as that of the fender before it was damaged. Several light blows are better than a few heavy ones. Be sure your hammer and dolly surfaces are free of scratches and nicks to avoid scarring the fender surface. When the high metal has been backed down to normal, the low metal can be sprung into position. It will go quite easily because the removal of the high metal has eliminated most of the strains on the fender. All you have to do is bump lightly from underneath with a dolly block. If you fail to bump systematically, you may bring the high metal down farther than it should go. A few careless blows may mean extra hours of work.

After all the larger dents have been smoothed out, dinging to remove the smaller dents is next, Fig. 5. The principle behind it is similar to working metal on an anvil, the dolly block being the anvil. The diagrams in Fig. 8 illustrate the principle. A dinging hammer should not be gripped too tightly, but should be swung with enough flexibility so it will rebound to the starting position. Strike with the entire head of the hammer rather than with the edge. Use the crowned face on concave surfaces and the flat face on convex surfaces. A dinging spoon should be balanced loosely in the hand. The hammer blows should be directly on the ridge of the dent being dinged.

After the bumping and dinging processes have brought the fender into normal shape,

it is ready for finishing and painting. Sight across the back or front of the car to see if the fenders line up evenly. If both have been damaged, compare fenders with a car of similar make and age. You can bring a fender that is out of line back to its original position with a fender jack or by heating the brace. Though the fender may now seem perfectly smooth, slight irregularities still exist. The metal finishing operation will take care of this. The defects may



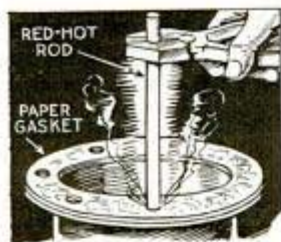
be detected by holding a long piece of chalk flat against the damaged portion and rubbing up and down. The high spots will be white and the low spots will be dark, Fig. 4. The fingers alone, Fig. 9, are not sensitive enough to find the irregularities. The correct way is to lower the elbow, lay the palm and fingers flat against the fender, and rub the hand up and down over the damaged area. Remove the small dents with a hammer and dolly.

Now use the adjustable file to smooth the surface as in Fig. 7. However, be careful not to file away too much metal. Pulling the file evenly along the contours of the fender will remove the tops of the high spots thus revealing the final dents to be dinged away. Use the file again to prepare the surface for sanding.

Wetting the sandpaper with gasoline will clear the surface of dirt and polish. When it shines like new, it is ready for painting, Fig. 10. First comes a coat of primer. After this, brush or spray on three or four coats of lacquer about 20 min. apart. When the final coat is dry, sand it with fine-grained sandpaper. Then apply a good body polish.

Simple Method of Making Gaskets

A simple, yet accurate way of making paper gaskets is to burn the holes in them



with a red-hot iron. To do this, first place the gasket paper over the casting on which it is to be used, cementing it temporarily in place.

Then heat a short length of rod of suitable diameter and push it through the paper into the holes. Have the rod red hot and plunge it through quickly in order not to burn the edges of the paper around the holes more than necessary.—Ivan J. Stretten, Detroit, Mich.

Heating Oil in Motor to Start Car on Cold Mornings

On cold mornings when the oil in my car has congealed so that the motor is difficult to start, I warm the oil with a small, electric hair dryer. The nozzle of the dryer is inserted into the oil vent or filter pipe



as indicated. After exposing the oil to the hot blast from the dryer for 5 to 10 min., I usually can start the motor easily.

—V. Robinson, St. Paul, Minn.

Secret Pocket on Car Seat to Hide Your Valuables



Sewed to the rear edge of the car-seat cushion, a cloth pocket provides a handy place to store trinkets or small papers that you do not want to carry on your person. Located in this position, the pocket is so well hidden that there is little possibility of any intruder noticing it.—Opie Read, Jr., Chicago.

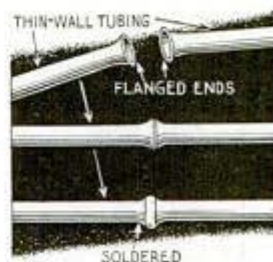
License Plates Changed Quickly with Adjustable "Bolts"



Needing some kind of an attachment to fasten dealer's license plates to cars so that they could be attached or removed in a few seconds, one mechanic made up some bolts for this purpose from 3-in. cotter keys. Assembled as indicated in the detail, the bolts are used by merely pushing the bent ends of the cotter through the slots in the plate and holder and then giving them a half twist. The springs on the bolts provide sufficient tension to prevent the cotter key from turning and allowing the plates to come off.—Morris Katz, Aurora, Ill.

Ends of Copper Tubing Joined by Soldering Them

When there are no special tools at hand for joining the ends of thin-wall copper tubing, the job can be done in an emergency by soldering them together. To do this, flare the ends as much as possible and then flange them to provide two faces. Butt the flanged ends of the two pieces of tubing together and solder, forming a raised ring of solder around the joint as a reinforcement.



—A. H. Waychoff, Phoenix, Ariz.

Auto Floor Mat Patched Neatly with Rubber Shoe Sole



Floor mats that have become worn in spots by shoe heels can be repaired easily with rubber half soles that sell for 10 cents a pair. Just wash the mat with gasoline where the patch is to be placed and apply the patch according to directions.

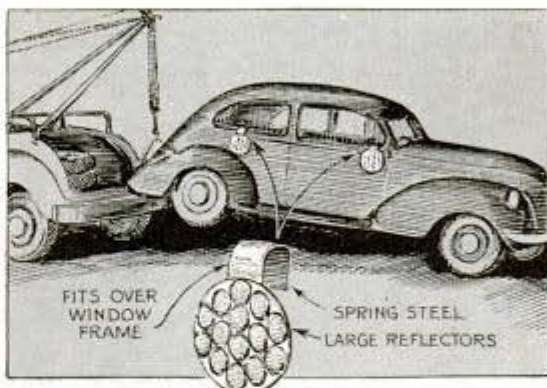
Bottom of Truck Box Protected with Screen and Tar

If you have a truck which is being used for hauling grain and the scoop shovel splinters up the box bed, get a piece of

ordinary window screen and tack it to the floor. Then take some roofing tar, which has been melted over an open fire, and mop it over the screen. The result will be a good shoveling surface, which also enables stock to move around in the truck with less danger of slipping. A few pails of water poured over the floor cleans it.

Reflectors on Side of Towed Car Help When Crossing Streets

To help prevent a motorist from running into the side of a car being towed across intersections, a garage owner slips large reflectors over the frames of each window on both sides. Each reflector is made up of several small ones, which are fastened to a metal disk attached to a large spring clip.



Two 'What-to-Make' Books for Craftsmen



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Packages Designed to Catch the Eye

(Continued from page 565)

the handle and the blade and protective head are removed from its interior and screwed right on the package.

One company is selling wedding rings in a heart-shaped, hinged plastic container which enables the flustered bridegroom to find it easily in his vest pocket during the wedding ceremony. The container, strung on a chain, can be presented to the bride as a locket in remembrance of the occasion.

The thin, pliable transparent sheets first used for candy and cigarettes and then for bread, cereals, and dry beans, are now wrapped around fresh soup mixes, vegetables, and even mashed potatoes, which have been pre-cooked and need only the addition of hot water. The discovery that if meat loaves were dipped in gelatin and then wrapped in these pliable coverings a tremendous loss from shrinkage would be eliminated led to adoption of this method by more than thirty packing houses.

Oranges, tobacco and prepared coffee are protected in thin aluminum foil and the creation of a thin lead tube to hold pigments which may be mixed into white

paint for any desired color has stripped paint-store shelves of hundreds of slow-moving cans of paint colored at the factory. By cutting stock, this is reducing prices.

But the dazzling stream of modern packages has not even reached its peak, according to a leading expert, Albert Q. Maisel, of New York City, editor, and author of the book "One Hundred Packaging Case Histories."

"The public has not yet caught up with the scientific advances in packaging," he says. "There are hundreds that will open the eyes of the consumers, but the big corporations cannot adopt them until the market has absorbed present innovations.

"Like the thousands of recent designs and materials which have made the modernized package one of the most efficient examples of our industrial and esthetic civilization, these future improvements will pay their way in savings and in sales.

"And there is still plenty of room at the top in package design for anyone with an inventive or artistic mind and a flair for mechanics."

Teaching the Three R's by Touch

(Continued from page 574)

geographical characters raised and lowered in relief, and boundary lines indicated by studded pins. Through sense of touch, they often learn more fine points than one who skims a map with his eyes.

Most important of all, students with bad eyes are learning useful trades. Some things the blind and semi-blind can do better than the sighted. Pottery making, typesetting, music, weaving, all reach high perfection under their sensitive hands.

There are plenty of courses in such subjects. They teach the students self-reliance—and even more important, they build morale. These people know they are handicapped, but armed with useful trades, they know they will not be denied a place in the world of men.

The question arises as to how successful these experiments are in preserving sight. The answer is, Los Angeles has sixty-five students enrolled in blind classes, not all of them truly blind, out of an enrollment of 300,000. According to laws of averages,

there should be at least 140, totally blind. If one-third of the 235 students enrolled in sight saving should become worse, this figure would be reached. It is safe to say that many more than that would grow worse under ordinary educational methods.

All this has been made possible only by the strides of modern technology. Once all blind printing was a tedious process, done mostly by hand. Now sleek, streamline machines do the job. Braille and Moon presses cut type on soft plates, and ordinary printing presses, with the inking system removed, can turn out books.

Once the photoelectric control of light would not have been possible, nor did we have enough knowledge of pigments to produce the inks and chalks so easy for weak eyes to see. And not so long ago, we didn't know enough about the eye to say what was good for it and what was not. Science and the machine probably have never done a nobler job than they do now as they light dark worlds.

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Winning Races Before They Start

(Continued from page 555)

pit crew, had taken this new pair out and soaked them in oil and grease, then rubbed them in dirt until they looked just like the pair I lost. That made me feel swell because it proved that my crew was backing me up in every little detail, not even letting me go through the mental hazard of putting on the new pair of shoes just before the race.

And after all, winning at Indianapolis is as much a psychological job as it is mechanical and physical. So far as the last factor, physical, is concerned, I try to stay in good condition all the time. No driver can carouse eleven months and whip himself into shape one month before the race. I confine myself to about thirty days preparation, mostly driving at the Speedway.

Back in the old days, we frequently had to change tires as many as fifteen times during the race. That one set of modern tires can last out the race may be credited to untiring engineers, including Firestone's E. A. Roberts, who is in charge of racing tire development. Because all Indianapolis racing cars run on tires made by this company, Roberts has contributed as much to the development of tires as any man in this country. Throughout the year he supervises severe tests, such as running tires to destruction at the Speedway so that any weak spots in the casings may be detected and remedied before a driver risks his neck on a set. In this work, a fifth wheel is used to safeguard the test-car driver. Smaller in diameter than the regular wheel to which it is bolted, this fifth wheel catches the weight of the racing car when the right rear tire finally breaks down at excessive speeds above 125 miles per hour. Thus, much of the danger is eliminated.

One recent development—and one which may be expected to find application on passenger automobiles in the future—is the use of rims about one-third wider than those ordinarily used at the track, thus giving the tire a safer footing. Roberts finds that the wider rim reduces tendency of the tire to roll under the rim's edge when the car takes a turn.

Racing tires are made the same way and of the same materials as passenger-car tires, save that side walls are thinner and the tread made lighter on the racing tire, thus reducing heat. If the tread is too

heavy—gives too much traction—it will slow down the racing car and actually increase danger to the driver, because we employ the slide frequently on turns. One peculiar thing is that we must turn to the right if we want to make a left turn on the speedway. That's because the rear end is constantly trying to get around in front. As I approach a turn, I humor the rear end, letting it come around on the right side, which gives the car a turning movement to the left. Then I turn my wheels to the right. I "steer" through the turn with the foot throttle, increasing the spin of the wheels to increase the slide of the wheels or decreasing it to get good traction.

Few, if any, new cars will be entered in this year's classic. The international formula, under which the race is run, will be subject to change before the 1942 event and no driver nor owner wants to be caught with a new car whose specifications may bar it from future races. It's too expensive, for one thing. Personally, I hope the formula will be changed to give us larger motors, and thus a chance to attain higher speed.

The car in which I won last year, a Maserati, is a well-balanced job made in Italy, where the Italian government has paid for experimental work, thus enabling us to buy for a comparatively low price what might have cost a young fortune if we had started from scratch. Whereas American-built cars usually give their drivers a beating, because they handle so roughly, my car handles smoothly. It has fine brakes—one feature sadly neglected on racing cars in this country—and a transmission that enables me to get away like snapping a rubber band. Some of the materials used in it aren't as good as those made in the United States, but if you know where they are, you can jerk them out, like a bad appendix, and replace them with dependable heat-treated American parts.

And its speed? Well, it isn't as fast as some of the cars I'll compete against this year, but if "Cotton" Henning puts it together so it will stay I'm sure it will carry me to my fourth victory at Indianapolis.

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(Continued from page 118A)

in variations of his own in the training. He has the supposed criminal, after being cornered, drop his hands and again attempt to escape, at which time the dog is allowed to resume the chase without command.

In training a dog to attack a gun, the trainer takes considerable precaution against making him gun shy. He works first with an empty gun. He permits the dog to attack the man with the gun for a few days, the "criminal" making threatening motions with the gun, and snapping the hammer on the empty cylinder. The dog learns to grab the gun arm and hold on until the weapon is dropped. When the dog is ready to work with a loaded gun, the trainer lets the dog attack once or twice on the unloaded gun as outlined above. It is loaded with blank shells and the person with the gun moves away but remains within sight of the dog. From that distance he makes the same threatening gestures as before, and with the trainer encouraging the dog to "watch him," fires a blank. At the report, the trainer starts for the gunman who retreats until cornered by the dog. After a short time, the man with the gun moves closer and repeats the proceeding, retreating each time the gun is fired, and permitting the dog to attack each time. The trainer and the gunman move succeeding closer to each other until the dog is not alarmed by the report, even when the gun is fired near his head.

Once the dog has taken the gun or club away from the "criminal" and the trainer arrives on the scene, the dog is not allowed to attack again without provocation. At this point the value of previous obedience training is apparent. The dog is commanded to guard the prisoner, and may be expected to stay with him until relieved. The dog is also trained to escort the prisoner to some distant point.

Very definitely a part of the attack is training the dog to guard properly an article or object at command. First, and most generally useful, is guarding an automobile. A well trained dog permits no unauthorized person or persons to enter or molest a car in which he is seated during the absence of his master. Neither will he jump out to attack unless it is absolutely necessary. With a little care the dog soon learns when and when not to show fight during his guardianship of an automobile.

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Winged Classrooms for Navigators

(Continued from page 527)

away, a radio operator, a bombardier to operate bomb sights and releases and two or three gunners. Since the success of a long-range bombing flight depends first of all upon reaching the objective, the navigator's role is highly important.

Because Pan American Airways had developed the multiple-crew system to a high degree of efficiency in commercial service that spanned the Atlantic and the Pacific oceans, the War Department called upon that organization to train navigators for the Air Corps' bombers. The airways company provides the instruction, which is given by some of its most experienced personnel, and all flight-training facilities, including three big Clippers, on a non-profit contract basis. The Clippers are the only big ships capable of taking ten to twelve men aloft at one time with the large desks and many instruments required for each student. Too, by operating from the navigation training base at Miami, Fla., the Clippers afford an opportunity for the students to gain experience on long flights over the Caribbean and the Gulf of Mexico. Pan American's direction-finding stations cover the Florida waters and offer the embryonic navigators additional facilities for their work in the flying classrooms.

As the big Clipper soars above the Florida shore, one of Pan American's experts walks from one to another of the ten navigating compartments into which the ship's interior is divided. Here he finds a student entangled in the complexity of a drift problem, there he discovers an error in course that would result in the Clipper missing its mythical destination by hundreds of miles. Quickly he solves the problems, then goes on to others.

Under his watchful eye, the students learn the three methods of position finding—dead reckoning, radio direction and celestial navigation. The last mentioned is important in wartime flying when radio beams cannot be used lest they become an aid to enemy pilots. The students must become proficient in determining position by observation of the sun, moon, stars and planets. Each must know the relative positions of more than fifty prominent stars. Ground practice with instruments comes first, so the cadets may be able to work

K 128 ?

swiftly aboard their school ship. Only ten to fifteen minutes can be allowed for calculations made from sights of celestial bodies, for instance, due to the speed of travel.

Meteorology is another subject of serious study in the navigation training. It includes information on fronts and their effects, reading and analyzing of weather maps and coordination of government and private weather information and data. In the short course of twelve weeks, it is impossible to go into the detail necessary for students to learn formulation of weather maps, so merely the interpretation of them is undertaken.

How to determine and conquer that enemy of aviation, drift, is another important phase of work for the cadets, but they have an invaluable aid in an instrument which measures the angular difference between the directional line of the airplane and the apparent line of motion of a single wave sighted on the ocean far below, thus enabling the navigator to estimate accurately the drift of a bombing plane and so maintain a predetermined course.

The cadets spend each day, six days a week in this manner: four hours of navigation, divided into two sessions of two hours each; one hour of meteorology; one hour for lunch; two hours of military training and two hours of homework. When ground lessons have been completed, four hours in actual flight are substituted for the navigation period. Each flight occupies four hours and one-third of the flights must be made at night, to accustom the cadets to conditions under which they may find themselves plotting a course through inky darkness for the pilot of a bombing plane bound for an objective hundreds of miles away. Flight courses are never announced in advance, so the students literally are bound for "nowhere and return" when they board the flying classroom.

Although the navigation students do not learn to pilot a plane, they are chosen in much the same manner as those accepted as flying cadets. They are enlisted in the U. S. Army Air Corps; they are between twenty and twenty-seven years of age, unmarried and they agree to serve for three years, then hold themselves ready to serve an additional three years if needed.



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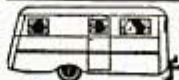
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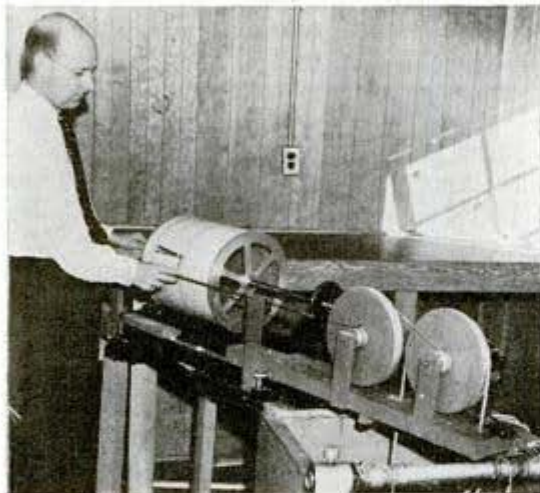
K1157

Charting the Ocean for Defense

(Continued from page 549)

has developed a paint which repels marine organisms. It is a strict naval secret—but we know it exists.

But all marine life is not a nuisance. Iodine is as important to a modern army as food, and almost all of it comes from kelp. Too, in the last war, people were urged to eat more fish, since they require no feeding and care. Indeed, there are countless uses for marine life that help us



Wave recorder produces for navy files a complete record of every wave striking shore

defend ourselves, and findings at Scripps make its exploitation more efficient. They are doing much to protect our marine life, both plant and animal. Heretofore, we often have been puzzled when a species of fish disappeared. Now we know it is usually due to disappearance of some other sea creature first, possibly a microscopic one, on which the larger fish depended for food or protection against enemies.

At Scripps, they have done great amounts of work to keep the balance of life in the ocean steady. It is a far more delicate balance than we have on land, and a slight shift in it may upset everything. If this happened in time of war, when food was scarce and we were ringed by enemies, the result might well be fatal. But have little fear. Science has rendered such a catastrophe unlikely.

It is striking to note that while we have been letting our armaments decline, and now have to rearm with feverish haste, science has been going ahead quietly in its own way to close the gaps in our ramparts.



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When Williams developed an improved type of carbon steel wrench, many different patterns of these tools were given exhaustive strength tests. Williams' engineers discovered some startling facts: these "Superior" Wrenches, as they are called, were nearly twice as strong as old-fashioned carbon wrenches; they averaged 93% as strong as the strongest alloy wrenches . . . in fact, were actually stronger in certain cases where corresponding patterns were compared.

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K122.1

Cashing in on a Fantasy

(Continued from page 569)

ity. Over the metal frame, sponge rubber is modeled. This is done directly on the frame, without the use of a mold or cast. The method is Harryhausen's secret. After the monsters are modeled, their skin is painted with a special coloring matter which adheres to the rubber. Realistic eyes are installed, and the beasts are ready for filming. Shaggy mammoths are covered with goat's wool, their tusks being carved from wood and painted to resemble ivory.

Sets for prehistoric dramas are made of plaster of paris, and covered with sand, rocks or other material to simulate conditions as they existed in the dim past of the planet. Prehistoric trees and plants are cut from tin or other metal. Harryhausen has found that metal trees are most satisfactory, as they do not jiggle during the filming of a scene. Canvas backgrounds are skillfully painted to blend with the sets.

Harryhausen's movies are actually made by shooting a series of stills. A motion-picture camera is used, but only one frame is shot at a time. After each frame is exposed, the camera is stopped, and the animals moved slightly. A dinosaur's mouth is opened a little wider, a reptile's tail is twisted a tiny bit, or a monster's head is tilted a fraction of an inch. When the small changes in the position of the animals have been made, another frame is shot and the camera again stopped. Then the animals are moved once more, and still another frame shot—until the entire sequence is exposed. Although a sequence runs but a moment on the screen, it may have taken hours to shoot. When the film is projected, the animals appear to move as smoothly as if they had actually performed in front of the camera. What was a series of still life shots has become a swift moving picture of monsters in action.

Of course, the great problem is to keep from making a false move when changing the position of the animals. When something is disturbed by mistake, the whole sequence—sometimes a day's work—may have to be shot over.

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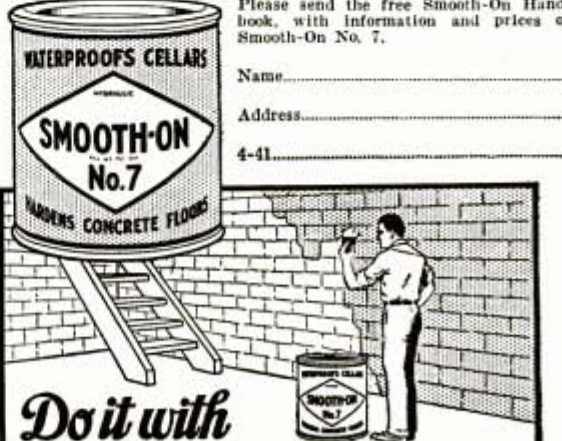
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K1349

Television in Color

(Continued from Coloroto Section)

succeeded each other twenty times per second, producing a color flicker. Therefore, the two-color disk, which gives good results without flicker, is being used experimentally for the present, the engineers feeling that this type is most practical for standard commercial receivers.

Allan B. Du Mont, television manufacturer, revealed recently that his engineers are developing a purely electronic means of producing television in color. This method is intended to eliminate the use of filters at the pickup, and color wheels at the receiver, substituting a special screen for automatically selecting and rendering the elementary colored images in proper sequence, without color wheels or other moving parts. For the present, Du Mont believes the industry should concentrate on commercializing good black-and-white television, since he views the problems as being rather in the direction of evolving satisfactory flexible standards which would allow either transmission of black-and-white or colored pictures agreeable to the majority of television interests. Thus, he reasons, might be laid a firm foundation for scheduled television broadcasts to be enjoyed with mass-produced receivers that will not become obsolete over night.

Although this lusty scientific "baby"—television—is some five years old, dating from its introduction in the present form, comparatively few Americans have seen a single black-and-white picture. Television transmitting stations are scarce, being limited to New York, Schenectady, Los Angeles, Chicago and a few other areas. Since the picture-carrying radio waves are extremely limited in range, reaching only to the horizon—usually about twenty-five miles, though General Electric picks up New York 129 miles away—reception necessarily is limited to those persons owning the proper equipment and living almost within sight of a transmitting station. Another obstacle to television progress is the fact that each station is forced to produce its own program. One means of producing chain or network programs is by using a coaxial cable, the cost of which is virtually prohibitive, and the other is a relay station system, such as General Electric employs to carry programs from New York to receivers more than 150 miles away. Of

course, a relay system would call for the expenditure of large sums, too.

An invention that may give great impetus to television is a multiple arrangement of small cathode-ray tubes for projection of a large image instead of the present method of a single expensive cathode tube. The system would depend upon mass production of the small tubes, thus cutting costs considerably. The invention, by ingenious electrical circuits, provides that each small tube in turn is to scan a small section of a large screen. If a tube burns out, only a small part of the received image would be lost. To cover a wide theater screen, the inventor, Dr. Alfred N. Goldsmith, proposes to use as many as six, eight or twelve cathode tubes in a row. Below the first or top line of tubes would be another row of the same number, and so on until the bottom of the screen is reached—or the entire scene covered. The same system for the receiver in the home would employ a similar arrangement, save that smaller tubes would be used.

Dr. Goldsmith predicts that a home television screen, with tubes installed behind it, some day will be wheeled into the drawing room or living room like a tea table, connected to an existing television receiver and scenes projected on it "comparable in a small way to anything one now sees in the average movie."

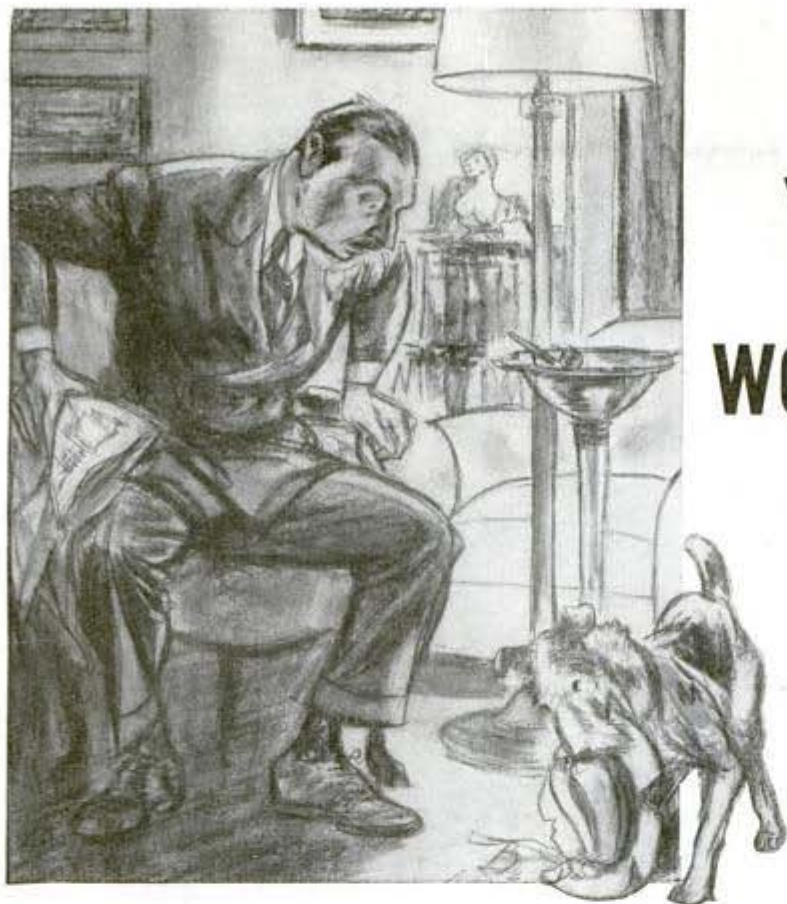
K 1450

Floodlights on Swinging Bracket "Panoram" with the Camera

So that floodlights can follow the action in making indoor movies, there is a bracket that mounts on a panoramic head to swing freely with the camera. The bracket fits all types of reflectors and its arms can be set at any angle.



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Wild Game—Our Latest Crop

(Continued from page 533)

not every predatory animal is as bad as supposed; marsh hawks, for example, live on mice and are beneficial to agriculture.

Epidemic diseases sometimes attack flocks of birds and in a few weeks destroy more than years of hunting would do. Western duck sickness is fought by supplying fresh water to stagnant marshes. Eelgrass is the most valuable of all water-fowl foods and ten years ago it was virtually wiped out in the east by a blight. It is only now reappearing. Storms also



Banding and boxing quail for removal to hills, where thousands raised in captivity are released yearly

take their toll. One hailstorm killed more than 5,000 birds on a North Dakota refuge. The 1939 freeze in the south killed thousands of woodcock.

There are more than 5,000,000 big game animals in the United States, including deer, bighorn sheep, antelope, moose, caribou, and bear. Deer is the most numerous; some 800,000 deer each are found in Michigan and Pennsylvania. Wyoming leads in buffalo, elk, and bighorns; Texas numbers 32,000 peccaries among its animal population. There are 81,000 black bear and 1,100 grizzlies in the country.

When animals become a nuisance to industry or agriculture the game wardens have to correct the trouble. White-necked ravens in Colorado were disrupting communications by using bits of fencing wire in building nests on poles, causing short

K1235

circuits, until wardens trapped the offenders and provided new nesting sites.

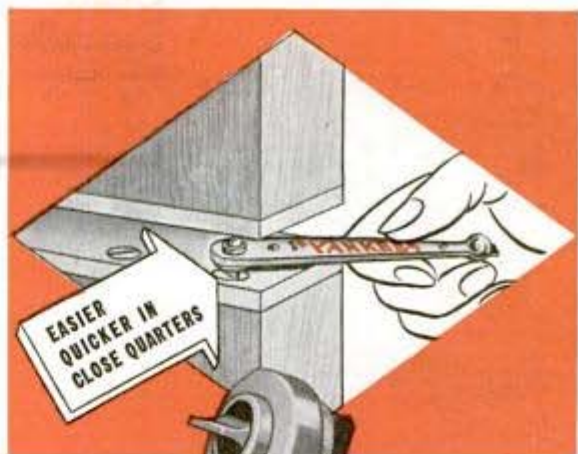
Scarecrows can't keep ducks out of cultivated rice fields, so, the wardens set off noise bombs to scare them. One ingenious device has large steel sheets and a number of bombs attached to a time fuse. By the time the ducks recover from their scare and are settling again, another bomb goes off, rattling the metal sheets, and scattering the birds until finally they seek another area. In New Mexico spinning reflectors frighten sandhill cranes from grain.

Introducing new breeds is another conservation activity. Ring-neck and Chinese pheasants have been imported, and these are uniting to create a new breed that probably will be called the American pheasant. Chukar partridges from Asia and Hungarian partridges have also been introduced. Among fish, the striped bass from the Atlantic has been transplanted to San Francisco bay. Rainbow trout flourish only in cold mountain streams but recently a rainbow that has adapted itself to warm water has been imported from Lower California, Mexico.

The last fresh water fish in America would have been caught years ago if it were not for the fish hatcheries that restock the lakes and streams. The fish and game commissions likewise plant aquatic vegetation for fish food and keep a close watch to prevent lakes from becoming "sour" and unfit for fish.

The result of these activities is that many kinds of wild life are being saved from extinction. In the last five years the wild duck population has doubled in number to an estimated 60,000,000 birds. The passenger pigeon, Labrador duck, heath hen, and Carolina parakeet are species that no longer exist. In most cases the breeds were destroyed by over-hunting in the last century. Until a few years ago the sage hen, band-tailed pigeon, Sierra grouse, California condor, antelope, elk, sea otter, and mountain sheep were also threatened with extinction. Now it appears they will be restored to safe numbers. In 1920 the big trumpeter swan was supposed to have died out but a few of the birds were later found in Montana and now the flock has increased to more than 200 birds.

Eventually, conservation enthusiasts hope, game can be put on a crop basis and there will be good hunting year after year.



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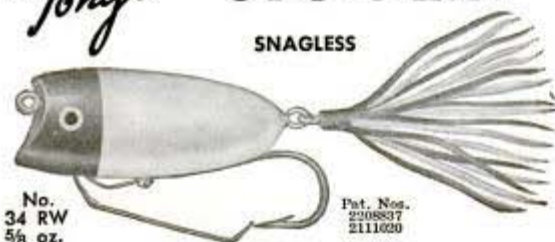
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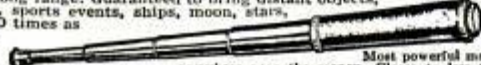
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POPULAR MECHANICS

K1045

Setting Spies to Catch Spies

(Continued from page 539)

once reliable writing in invisible ink is of little value now. One of the routine tasks of a censor is to hold every opened letter beneath an ultra violet lamp, where invisible writing shows up vividly in colors.

There are, however, hard messages to intercept, and chief of these is the stencil type. A spy writes a chatty, gossipy letter about nothing much, which contains a hidden message which will be revealed when a stencil, with slits at intervals to reveal only the key words, is placed over the entire message.

Here is an example: "On June 1, Virginia is getting married, and mother is all broken up over the division of the family. They are leaving to live permanently in New York on the 5th, after their honeymoon."

Would a good censor pass that? Never! Censors are trained to look for words with double meanings, and two here would stop a good censor short: "Virginia" and "division." One is a girl's name, but also the name of a place; the other means a split, but also a contingent of soldiers.

In a few moments, a skilled censor would detect the message: "Virginia division leaving New York on the 5th."

Not all stenciled letters are that easy, and some do get by. It is probably the best means of war-time communication between agents, save when a spy can slip through and deliver his message in person. Isolation from our possible enemies by oceans makes that practically impossible for spies operating here. We are truly as hard to spy on as to invade, because of a fine organization and fortunate isolation. That is why most spy scares turn out to be sheer moonshine, and would be funny if they didn't send frightened people on a witch hunt that sometimes results in injury to an innocent party.

Recently there was a "hot" story about a plan to blow up Boulder dam. Vigilantes stood by with rifles, fortunately shot no hapless tourist, and nearby residents prepared to flee. Finally someone calmly inquired where was the carload of explosives necessary to do such a job, and panic retreated before common sense.

There is a spy menace, and it is a serious business. But Uncle Sam has it in hand.

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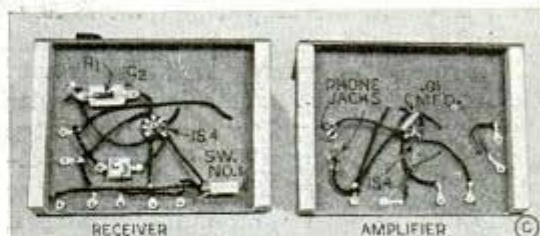
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Miniature-Tube Flashlight Cell Receiver

(Continued from page 617)

the 3-circuit-tuner type which has a terminal strip clearly marked for proper connections, greatly simplifying the circuit wiring for the novice. In addition, the coil has a movable "tickler coil" which makes the usual volume control or variable condenser for controlling regeneration unnecessary. Two small machine screws are used to bolt the coil assembly to the front panel. Finally mount the row of Fahnestock clips with machine screws and nuts, placing a round-hole soldering lug under each nut. One extra clip is mounted to connect in the negative-B lead so that when the loudspeaker stage is added it can be controlled



by the same "on-off" switch. The small round tuning dial plate is fastened to the front of the panel with china cement.

In assembling and wiring these units, follow the diagrams carefully, checking each wire as you put it in. Make all connections with rosin-core wire solder making sure that your iron is bright and well heated. Good mechanical and electrical connections are important in radio work. Although all parts for both receiver and audio amplifier are inexpensive, they should be of good quality, and just as specified. A detailed list of the original parts used in both units, is available from Popular Mechanics radio department without charge.

After the receiver is wired, you are ready to solder the flashlight batteries together. Scrape the ends with a sharp knife where they are to be soldered to insure a good connection. It will be noted that two of the cells are connected in parallel for the 1½ volt "A" battery. Connected in this manner the voltage remains at 1½ volts but the amperage is increased to double the usable life of the cells. Use a good set

(Continued to page 136A)



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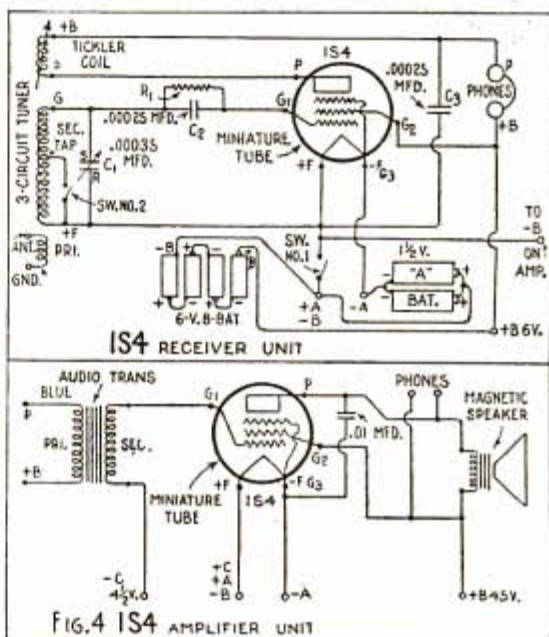
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RED WING MOTOR CO. 27 RIVER ROAD, RED WING, MINN.

(Continued from page 134A)

of, preferably new, 2,000-ohm headphones; old phones usually lack sensitivity. To test the receiver, connect the antenna, and a good ground on a cold water pipe; throw switch No. 1 "on" and turn the "tickler coil" until it lines up with the large coil. Now rotate the variable condenser slowly. Whistles indicate stations. When one is heard, rotate the "tickler coil" until the whistle stops and the station comes in



clearly. To tune in short-wave stations, throw switch No. 2 and tune slowly and carefully as these stations tune very sharp. Best results on the short wave bands will be obtained at night, especially the amateur and police stations. Some of the type IS4 tubes seem to operate more smoothly on 4½ volts of B-battery. If the set "pops" noticeably as the coil is turned, or breaks into squeals, use three of the cells in the B-battery instead of the four shown.

Construction details for the amplifier unit are clearly shown in Fig. 3 and the battery connections for using both units in Fig. 3-A and photo B. It will be noted that a large No. 6 dry cell is used for the A-battery and that a 4½ volt "C" battery and a 45-volt B-battery are added; the No. 6 dry cell replacing the two-cell flashlight A-battery in order to operate both units more economically. Schematic circuit diagrams for both units appear in Fig. 4. The blue-print number of this article is R-289.

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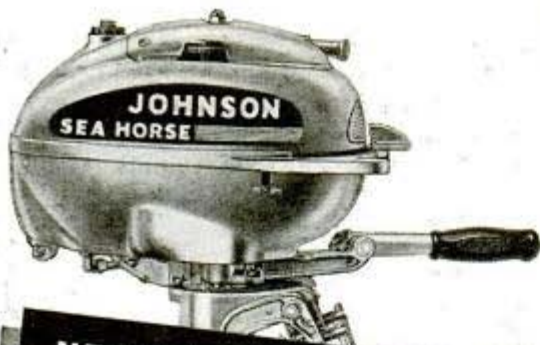
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It's fast . . . cuts on an average of 1 ft. per minute up to 3" medium hard wood. Operates on 110-120 V. 50 or 60 cycle alternating current. If your dealer does not yet have MOTO-SAW, send \$4.85 . . . we'll pay postage. Or send \$1.00 postman balance plus postage. **MONEY BACK!** If not delighted after inspection.

GARDEN TRACTORS



SPEEDEX

6-H.P. riding type, 3 & 5 H.P. walking types, also 1-H.P. cultivator for the small tracts. Prices start at only \$94.50 with cultivator and equipped with rubber tires.

Before you buy—Write for FREE 48 page illustrated folder.

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PLUGS IN ANY SOCKET **FLUORESCENT FIXTURE \$3.75 LESS LAMP**
ALL ASSEMBLED—NOT A KIT
 Complete with 15 in. lamp. The extra. Install it yourself. Take out bulb, screw in fixture. Equals 60 watts. A.C. or D.C. 110 volts. Save over 50% on Electric bills. Weights only 3 lbs. Gives perfect white light for Desks, Work Benches, Counters, Drawing, Game Tables, Windows, Laboratories, Displays, etc. Beautiful lasting enamel. **ORDER TODAY. SEND NO MONEY.** Pay Postman price plus few cents postage. **FULLY GUARANTEED.**
AJAX FLUORESCENT LIGHTING CO., 252A-West 26th St., New York.

PUSH BUTTON CONTROLLED GAS TANK LOCK
NO KEYS—Electrically operated from dashboard. One model fits all cars including tender door type. Greatest thing out! Sells on sight! Fully guaranteed. Distributors, dealers, here is your money making opportunity. Write for free literature and NEW sales plan.
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 are better, finer, and more desirable for the good tools of Machinists and Toolmakers. Free Catalog.
GERSTNER TOOL CHESTS
 441 Columbia St. Dayton, Ohio

UNUSUAL OPPORTUNITY for man or woman, young or old, to establish money making business selling our "Quick-Easy" Cleaner for Venetian Blinds. Keeping blinds clean is a problem to everyone. This cleaner makes it easy. Not necessary to remove blinds from window. Dissolves all dirt, smudge, grease, soot, stains almost instantly. Also cleans the tape. A product of home, office and store. 10¢ for sample and proposition.

VENETIAN BLIND MFG. & SUPPLY CO., Dept. 2, 1612 Farwell Av., Chicago, Ill.

Wonder-Tone NOISE ELIMINATOR
 Just attach to your radio (long, short wave) and enjoy reception free from distracting noises. Send-No-Money Pay Postman 50¢ plus postage or send 50¢ and we'll send postpaid. Return in 5 days for refund if not delighted.
WONDER-TONE COMPANY, Dept. 2, 7978 N. Clark St., Chicago, Ill.

OWN A Printing Business
 Cards, Tickets, Stationery, etc. Good profit in spare time. **PRINT YOUR OWN** greetings, movie titles, church work, etc. Save money. Easy rules supplied. **Junior Press 58¢, Senior Out-Rits \$10 up.** Have home shop. Raised printing like engraving too. Sold direct from factory only. Write for free catalog and all details. **KELSEY, INC. X-37, MERIDEN, CONN.**

MYSTERIOUS DEVICE WELDS BRAZES AND SOLDERS ANYONE CAN OPERATE
 Now, an electric welding, brazing and soldering Torch, complete with power unit, goggles and supplies. **Works INSTANTLY off any light socket.** Does a thousand and one repair jobs at amazing LOW COST on aluminum, iron, steel and other metals. **Indispensable** for Auto, Body and Fender Repairs, and home repairs—shop, factory, farm, engineer, janitor, sheet metal, radio and bicycle repairs. Anyone can handle without previous experience with our simple instructions. **10-DAY HOME TRIAL**
 Write at once for Special Introductory Low Price Offer. Try 3 in 1 Electric Torch for 10 days at our risk, or get one free by helping to introduce it. **ELECTRIC TORCH CO., 2613-MS Michigan Ave., Chicago**

K1267

School for Smoke Chasers

(Continued from page 559)

employees from rangers, assistant rangers, fire guards, lookouts, road and trail builders, down to plain laborers.

Most rangers' schools, of four to six weeks duration, are held in the off-season. Assistant rangers usually are taught on the job. Guards and lookouts, seasonal employees for an average of four and one-half months, are tested at regular intervals for skill, dependability, physical condition and practical knowledge.

Not only in the regular schools, but during daily scouting work, the rookies attend lectures and demonstrations. "Teacher" is always a veteran forester. A typical laboratory assignment is to build a trench around a fire to stop its progress. In general, a hand-made trench is dug a foot deep and eight to twelve inches wide. Another vital subject is the proper way to fell a snag (burning tree). When a snag falls on the fire line without control it's a hazard to fire fighters and may scatter fire into new timber. When felled by trained men, however, the direction is controlled and there's slight chance of accident or spread.

This year every fledgling ranger must become expert in making plaster casts from footprints, automobile tires and horses' hoofs to detect incendiaries. It's important after the cast is made to put some identifying mark on it in the presence of witnesses. Rangers must be able to prove in court where and how the cast was made.

Courses in telephone and radio communications are conducted. Uncle Sam's foresters use over 3,000 two-way radios, transmitting voice as well as code. Stringing telephone lines is part of the day's work for foresters. Sometimes temporary lines must be built fifteen or more miles through the woods, tacked to trees in such a way that if a tree falls it cannot break. For special training in telephone work, rookies are taken out on the line where all details of construction and maintenance are explained. They make splices and ties and build miniature lines. Then they put up regular-size lines, climb the poles, learn all about the standard hookup and are taught how to perform every type of repair job.

Radio communication serves as a supple-

(Continued to page 141A)

**Increases
GAS MILEAGE
10% or more**

Make this test and prove it. Jack up rear wheels of your car and start motor. Set hand throttle so speedometer registers 20 m.p.h. Then use quart of WHIZ MOTOR RHYTHM, following simple directions. Almost immediately speed will increase 10% or more! Proving more power, less friction.

MOTOR RHYTHM is the unique tune-up that cleans, lubricates and protects. Banishes carbon, gum. Saves on gas bills, repairs. Will not harm motor.

If your Service Station Garage or Dealer cannot supply MOTOR RHYTHM, send coupon below.

R. M. Hollingshead Corp. PM 41
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For enclosed \$1.25, please send* me one quart of MOTOR RHYTHM, enough for a complete tune-up. You agree to refund my money if I am not entirely satisfied. *Postpaid in U.S.A.

Name _____
Street _____ State _____
City _____ Year _____
My car is a _____ (MAKE)

**World's Oldest and Largest Manufacturers
of Automotive Chemicals**



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CHICAGO FLYING SCOUT
Roller Skates
Go Like The Wind!

Skate Like a Champion

More Speed! Action! Longer Life with Triple Tread Wheels—Oversize Ball Bearings and Shock Absorbers. Demand Genuine "CHICAGOS". Write for FREE BOOK on Skates and Games. Send 10c if you want beautiful Gold f. Skate Club Pin.

CHICAGO ROLLER SKATE CO.
4414 W. Lake St., Chicago, Ill.



No. 181
Noiseless Rubber Tires



No. 173
Solid Steel Wheels



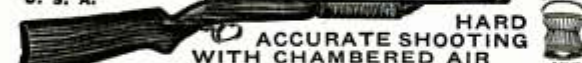
Quality Rink and Sidewalk Roller Skates for 33 years.

Get FREE Booklet and CLUB PIN VALUE 25¢



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ACCURATE SHOOTING WITH CHAMBERED AIR

You can use new model BENJAMIN AIR RIFLES WITH LEVER HAND PUMP anywhere, for practice firing or just plinking. Shoot the house or company, flying, hunting, etc., at lowest cost. Shooting force is adjustable with amazing maximum power and accuracy—no recoil or forward lunge to disturb your aim. Bolt Action—Hammer Fire—Hair Trigger—Safety Lock—Hand Pump. Single Shot BB with 1 lb. Shot \$8.50; Single Shot Cal. 177 or .22 Blot—with 200 pellets \$10.00; BB 25 Shot with 1 lb. shot \$10.00. Also a complete line of BENJAMIN GENUINE COMPRESSED AIR PISTOLS from dealer or factory. Write Today, BENJAMIN AIR RIFLE CO., 355 Marion St., St. Louis, Mo., U. S. A.



STOP Itching GET RELIEF This Fast Way -or Money Back

For quick relief from itching of eczema, pimples, athlete's foot, scales, scabies, rashes and other externally caused skin troubles, use world-famous, cooling, antiseptic, liquid D. D. D. Prescription. Greaseless, stainless. Soothes irritation and quickly stops the most intense itching. 35c trial bottle proves it, or money back. Ask your druggist today for **D. D. D. PRESCRIPTION.**

COMPLETE Flexible SHAFT WORKSHOP



PENCIL-SIZE HANDPIECE For "FINGER-TIP" CONTROL
You, too will win real pleasure and profit by using a Foredom Flexible Shaft Workshop. Performs countless tasks quickly, efficiently, effortlessly in home or shop. Thousands use them on wood, metal, glass, plastics, etc. Pencil-size handpiece affords sensitive "finger-tip" control, easy accessibility. Assures unobstructed view. You can grind, polish, mill, engrave, sharpen, slot, saw, carve, clean, sand, etc. Ideal for glass etching, gem-setting and finishing dies, molds, castings, etc. Only \$14.95 for complete Portable Workshop, including 50-piece accessory set as illustrated.

10-DAY FREE TRIAL
Money back if not satisfied. Enclose \$1.00 with C.O.D. order, or send \$14.95 check or M. O. FOREDOM—free tools since 1922.

FREE! NEW CATALOG
Write for it! Illustrates complete line Flexible Shaft Tools and Accessories.

FOREDOM ELECTRIC CO.
Dept. 202
27 Park Pl., New York, N.Y.



at only \$14.95

PAINT STRIPING TOOL **ONLY \$1.00 POST PAID**

As Easy to Use as a Pencil!

With this NEW TOOL (not a brush) everyone can now draw lines with paint. Used on autos, models, toys, tiled walls, cabinets, furniture, linoleum floors and all home workshop projects.

Send only \$1.00 for complete tool for painting a 1/16" wide stripe, including adjustable guide, operating instructions, etc. Tool uses paint, enamel, lacquer, etc. Patented interchangeable tips are available for wider or narrower stripes.

Every Painter and Craftsman Should Own One. Send for your tool today. Use it. If you don't double the appearance value of your painting to your entire satisfaction, return the tool and we'll refund your money promptly.

Dealer: Write for literature, etc.

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Automatic Hand Saw Punch

Makes New Teeth in 50 seconds! Any size tooth from 4 to 11 points. Simple to operate. A perfect job by simply Pushing The Switch. Write for full particulars.

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Amazing new kind of lighting fixtures cut light bills in half, give brighter, better light like real daylight. Plug in anywhere. Sell to hotels, stores, offices, factories, etc. Over 50 models for every need. New C.O.D. catalog-order plan starts you without investment. Time payment plan clinches big sales on **EASY TERMS.** Territory for responsible distributors and agents. Build Big, Steady Business. Fine Profits. **FREE** details, pictures, order-taking supplies by return mail. You make money same day. **WRITE TODAY.**

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SHAW DU-ALL GARDEN and SMALL FARM TRACTOR

Small sizes, for gardens and lawns. Larger sizes do ALL JOBS on small farm—small jobs on ALL FARMS. Walk or ride; sizes 3/4 to 8 H.P. Write for Factory prices—Free Catalog.

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Beautiful Gold Colored. New Styles. 5 Year Guarantee. Large Sizes—Penny Each. Tremendous Demand. Amazing Profits. Write for FREE Samples—Starting Outfit. Hurry!

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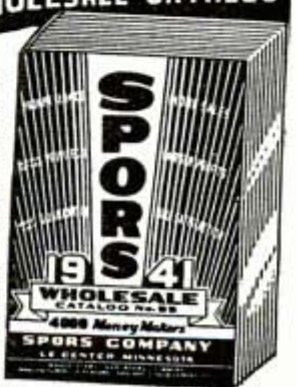
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Household goods, display card items, wearing apparel, cosmetics, foods, jewelry and toys are a few of the thousands of articles shown in this exciting catalog, for salesmen, agents and dealers.

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SPORS CO., 241 HURON, LE CENTER, MINN.



11267
(Continued from page 139A)

ment to the telephone and doesn't replace it, except in rare instances. Recently the Federal Communications Commission okayed ten radio frequencies for Forest Service use in the ultra-high frequency band, 30,000 to 40,000 kilocycles. A western state has submitted a plan for 400 stations operating in these wave lengths. High-frequency signals are useful for 100 to 200 miles. But they're subject to severe fading and static interference during storms. Ultra-high frequency signals are good for shorter distances, but they involve no fading nor static, so they can be used during storms and thus are better than telegraphy for reporting lightning fires. In the Challis Forest, Utah, tests are being conducted in the use of ultra-high frequency at seven experimental stations. One radiophone being tested weighs only six pounds with dry batteries and is smaller than a loaf of bread. It operates on 30,000 to 40,000 kilocycles and has a two-way voice range of 100 miles.

Rookie foresters are learning to use a new kind of water-tank truck equipment—a power pump with adjustable hoze nozzle. The pump is operated by the truck's gasoline engine. Nozzles of three sizes are carried. Another new tank truck has four-wheel drive mechanism for negotiating swamps, mud and sand.

Besides the new super-trencher mentioned, another newcomer, equally deserving of superlatives, is being used to train foresters in Montana. This "bulldozer," resembling a snowplow with angled blade, digs trenches in fast time, throwing dirt on all sides to extinguish the blaze. Two bulldozers stopped a fire in Montana that covered 1,200 acres and threatened to get beyond control. The machines built a gigantic fire line nine miles in diameter.

Important as such tools are, all tools have limitations, for there are many serious conflagrations where power-driven tools cannot be employed. At such times the nation must depend on man-power alone. An excellent reason why Uncle Sam insists that the guardians of his valuable timberlands be hand-picked men with superlative training.

Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.

NEW, STRONGER, EASIER TO USE!



MIXED IN A MOMENT—in cold water. No heating. No waiting.

WATERPROOF—Shear tests prove *Cascamite* is stronger than the wood, even after prolonged soaking. Ideal for boats, outdoor construction.

DURABLE—Unaffected by mold or climate.

STAINFREE—Won't discolor thin veneers, oak, mahogany, etc.

ECONOMICAL—Spreads *thin*. For veneering and indoor work, *Cascamite* can be mixed with ordinary household flour to make a strong, water-resistant glue that costs no more than Casein.

RELIABLE—*Cascamite* is made by Casco, the makers of famous Casco Powdered Casein, and America's pioneer in the development of synthetic resin glue. Sold by leading Hardware, Paint and Lumber Dealers. 3½ oz., 25c. ½ lb., 50c. 1 lb., 85c.



"Send 10c for a trial can of CASCAMITE, the biggest news in glue since Casco Casein!"

CASEIN COMPANY OF AMERICA, Dept. PM-441
350 Madison Avenue, New York, N. Y.

Here's my 10c. Send me trial can and booklet,
"Mighty Facts on Cascamite".

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How to touch up a lathe tool or a bit



● The secret of touching up lathe tools as well as fluted reamers, auger bits, plug cutters or similar edged tools lies in using an abrasive stick of the right grit and shape. Carborundum-made abrasive sticks are available at your hardware store in a wide variety of shapes. This type of stick is only one of the many abrasive products made by Carborundum that can make your work easier and more fun.

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● Tool room wheels by Carborundum are tops in industry for their fast, cool-cutting operation and for the fine, accurate work they turn out. The same basic materials, the same skill and experience that go into their manufacture are also incorporated in the Carborundum Brand Abrasive Products offered for use in your shop. Send 10¢ for souvenir sharpening stone and 95-page illustrated manual on home craftsmanship.

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ABRASIVE PRODUCTS

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Niagara Falls, N. Y.

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Throwing Light on U. S. Security

(Continued from page 518)

oratory will be shifted until it is operating almost entirely on the problems of U. S. defense, according to Laurence A. Hawkins, executive engineer. He says:

"Research is essentially building for the future. It is a systematic search for new knowledge on which new industries may be erected or old industries radically improved. It leads to increase in the national wealth and a raising of the standard of living. But there come times when even such worthwhile aims must be temporarily abandoned. If a conflagration threatens one's house, it is foolish to sit planning additions while the flames creep nearer.

"This is precisely the situation as regards research in this country today. Once again our nation has been aroused from complacent unpreparedness to mobilize its great resources. Once again American research must and will play its part.

"War is mechanized as never before. Given time, American research, American engineering and American genius for mass production, which have made this nation the strongest industrially in the world, can make us also the strongest in arms.

"Not a day must be wasted. We must not gamble with the national safety. We, in our laboratory, are more than eager to help to the utmost limit of our ability."

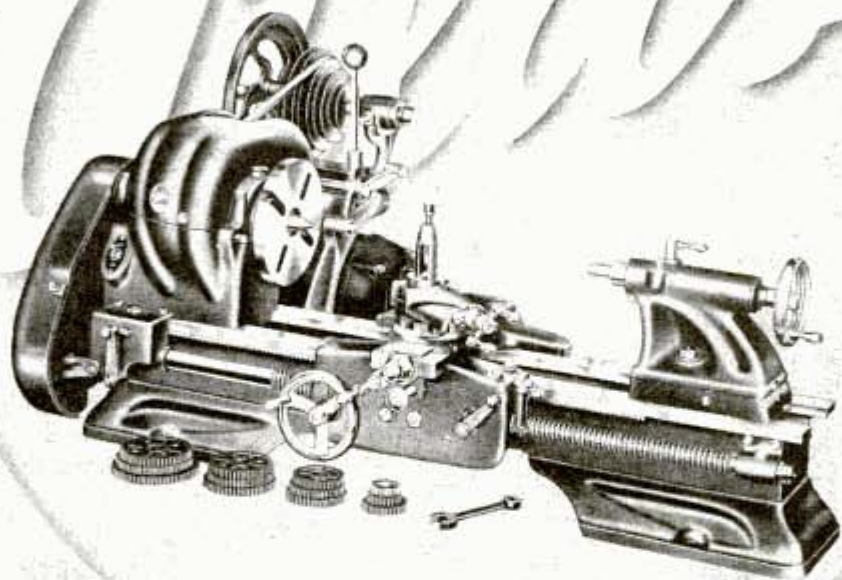
Which is one way of warning the embittered world: "If war comes, we'll be ready over here."

Auto Light Diffuser Circles Bulb to Eliminate Blinding Rays

Headlight glare that would blind oncoming motorists may be eliminated by a metal "cage" that snaps over the bulb. It consists of several curved blades that break up the filament light before it strikes the reflector, resulting in an even distribution of light over the entire width of the road.



30th Anniversary 1911-1941



FAR SEEING Atlas engineers started a new chapter in machine tool history when the first Atlas Lathe was introduced. It was the first practical low-cost precision metal lathe. It was the first time the fine new tough metal alloys were used for lathe parts, the first time precision production methods were used in lathe manufacture.

TODAY Atlas Lathes, Shapers, Milling Machines, Drill Presses are rapidly changing production ideas in many plants. Modern production engineers have discovered that Atlas Equipment can be used for machining countless small parts that formerly tied up larger expensive machines. And as Atlas Machine Tools are constantly improved to handle new industrial operations, their exceptional values continue to increase for men who select these tools of industry for personal craftsmanship. Atlas Press Company, 443 N. Pitcher Street, Kalamazoo, Mich.



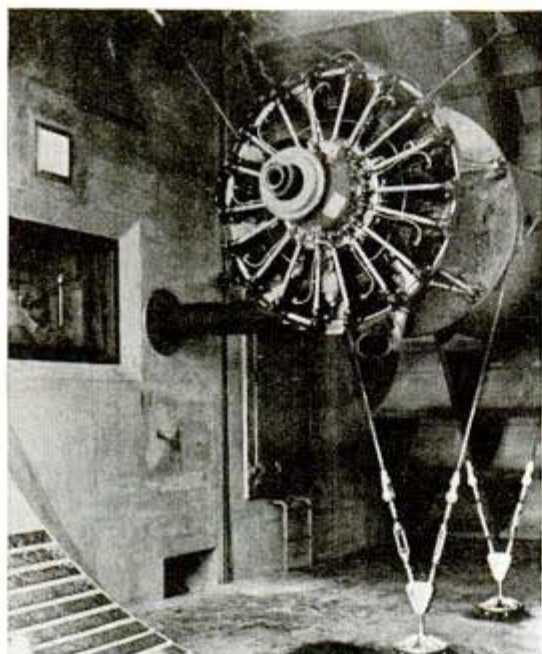
LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS • MILLING MACHINES

Aviation Unlimited

(Continued from page 483)

equipped with two-way radio apparatus.

Therefore it is going to be essential that private flying be provided with airports of its own. This type of flying will be primarily recreational in character. The facilities will be entirely the responsibility of each city or town. Main outside benefits will come—believe it or not—from air tourist travel. I firmly believe that in five or six years, cities will be competing for



Big American Airlines engine under test with a mechanic watching from window at left

this sort of tourist trade. It seems to me that what is coming is a sort of recreational air park, with a good turf landing field and servicing facilities, a community-center clubhouse with concessions, and some other types of public recreation at the same spot. There could be a small auxiliary field for flying model planes and there could be game courts and swimming pools.

The big commercial airports of tomorrow are going to exceed even our present ideas. I can remember, back about 1926, when most people felt that 1,500-foot runways were good enough for any purpose. Now we want them more than a mile long for the top traffic, and already the big new airports are being laid out with future provisions for dual, parallel runways. There is a school of thought, even more advanced than this, which takes the position that

solid landing-mats will replace even the best runways in the near future.

Smaller cities which cannot afford to build and maintain super-airports, even with some federal aid, will have of course more modest plants able to handle smaller aircraft on commercial "feeder" lines. Towns and villages probably will stop with the air parks catering to the flying tourist.

The airport shortage is acute right now. The air lines, which now use 185 fields, could serve some fifty other communities if there were adequate airports. The armed forces are occupying about 100 civil airports now, or will be soon. And of course civilian flying is on the increase, with the number of private pilots operating their own planes growing at a tremendous rate.

The phenomenal growth in aviation caused the Civil Aeronautics Administration to present, a short time ago, a long-range plan in which we listed the airport facilities in existence and gave the opinion that there will be need for a system of 4,000 landing areas, requiring additional investments of more than \$550,000,000, in the next six years. The present facilities and the proposed improvements were listed item by item, after consultation with our own experts and those of the Army and the Navy. Some items were purely military in character.

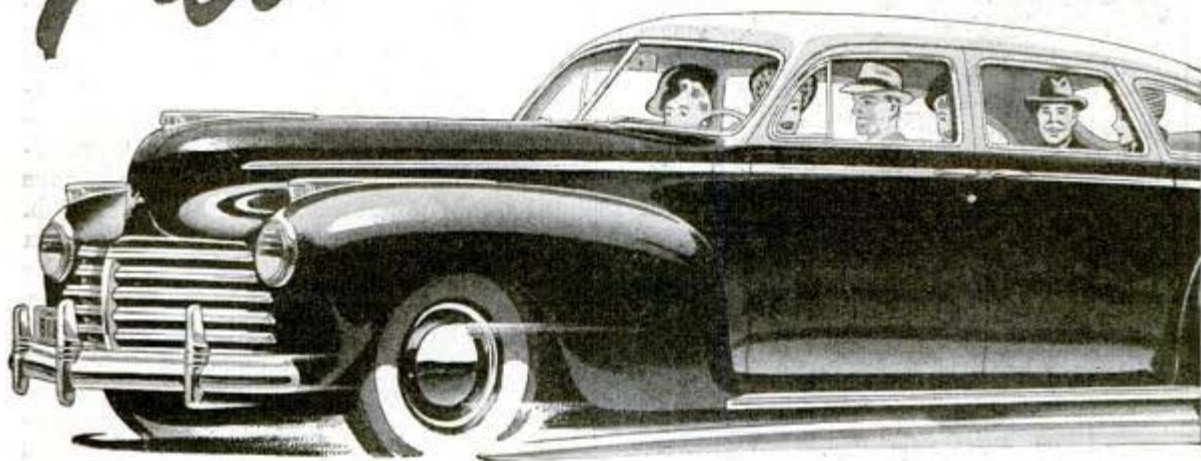
The current airport program, enacted into law by Congress, calls for \$40,000,000 to be expended on not more than 250 locations, the sole consideration in picking these locations being their importance to national defense. This program forces us to omit, for the present, many municipal airports which from a standpoint of commercial aviation may be relatively more important. But most of the fields which are improved will be convertible back to civil aviation, and aviation as a whole will gain materially.

And what is going to happen, you may ask, when the national defense emergency is over and the airplane factories have very few military orders? Suppose we take a look at the picture. Remember that for ten years this country has been in desperate need of sound new industries to employ idle men and idle money. The present defense drive is creating an aircraft manu-

(Continued to page 146A)

**There's No Substitute
for**

Fluid Drive



THERE'S NO POWER SO FLUID AS THE POWER OF FLUID DRIVE!

ONCE in a blue moon, a really big advance sweeps into motoring. Everybody talks about it . . . alert people try it . . . enthusiasts rave about it . . . and smart buyers get tomorrow's car today!

When are you going to try Chrysler's *Fluid Drive* with Vacamatic transmission?

Slip behind the wheel of a Chrysler and go adventuring. Drive for hours without a thought for clutch or gearshift. Get the feel of driving in high and still having dozens of speeds without a shift! Stop . . . start . . . stop . . . all without touching clutch or gearshift!

See how Chrysler's Vacamatic transmission gives you the power you want when you want it . . . like the variable-pitch propeller on a plane!

Get the feel of the combination of Chrysler's Spitfire engine and *Fluid Drive*! It takes a great engine to give great performance . . . but there is no substitute for *Fluid Drive*. It takes a great engine and *Fluid Drive* to give you the kind of power you get in a Chrysler! There is no power so fluid as the power of *Fluid Drive*!

Try these things before you buy any new car. Be critical. Judge for yourself. See if you can afford to buy any new car without *Fluid Drive*. Your Chrysler dealer cordially invites you. Make a date today!

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Why Chrysler includes a Safety Clutch with *Fluid Drive*!

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Buy Chrysler!

231

(Continued from page 144A)

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P & K live rubber natural acting lures will make you a better fisherman! These amazing life like reproductions—in soft, resilient, long lasting rubber and true, natural color—wriggle, jump, dart and swim in use, like the real thing!



Softly the Wonder Crab.
Midget fly—50c, Fly rod, 75c.
Medium, 85c—Bait Casting, \$1.00.



Sooty the Wonder Frog.
Fly rod, 75c. Bait rod, \$1.00.



P & K Shiner. Fly rod, 40c. Bait rod 85c.

OTHER GREAT NUMBERS:
GRASSHOPPER, GRUBWORM, MOUSE, HELLOGRAMMITE, DRAGON FLY, CRICKET, RIVALURE, MINNOW SAVER HOOK, MARVELURE, FIVE FEATURE TROLLING RIG, SNELLED HOOK HOLDER, RAPAROUND SINKER, TOURNAMENT CASTING PLUG, HOL-TITE POLE HOLDER, SNAIL-GARD, GUT LEADER HOLDER, P & K MOSQUITO REPELLENT.

P & K lures are famous everywhere. Each and every one developed only following exacting tests of their ability to catch fish and be of sensible aid to fishermen. See them at your dealer's today. Try them! **Pachner and Koller, Inc., 2326 West 69th St., Chicago, Ill.**

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Get into something where your income is only limited by your ability to get ahead. The American electric method of floor surfacing gives you the opportunity to make more money for yourself—work easy to get and no previous experience required. If you are not afraid to put on a pair of overalls and go to work, here is the chance of a lifetime.

Let us tell you how to be a success in this business and tell you how many other men who started like you have made themselves independent for life. As little as \$75.00 will start you today on the road to success.

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Gentlemen:
Send complete free details on how I can make big money with an American floor surfacing machine—no obligation.

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facturing industry far beyond the expectation even of airplane advocates. This vast plant capacity, these multiplied thousands of trained workers must and will be used when the war clouds are no longer in the sky. They will be shifted from production of the machines of war to the production of aircraft for pleasure and commerce which far surpass in efficiency, comfort and economy anything we have yet seen.

It is wise and proper that even in the midst of our great defense drive some of the best brains in both industry and government already are planning how to use the great advance of aviation constructively as a post-emergency expansion for peaceful commerce. Of course the cessation of war contracts will cause a tremendous industrial shock which must be cushioned. If aviation has the future we believe it has, then civil expansion will do the job. Already many specific steps have been proposed. My guess is that there will be tremendous expansion of air-line routes, that all first-class mail will go by air and that a complete network of air-cargo routes will be added to the services now in existence. The type of aircraft for passenger, mail, express and freight business will grow steadily larger and heavier.

These huge aircraft can operate—and this expansion can take place—only to and from such points as have well-located, well-planned, well-protected major airports. That is each community's stake in the situation. The various commercial transportation services of the air will be absolutely indispensable to any important community, and their availability will depend upon high grade landing facilities.

One of the greatest men I know said to me more than two years ago, when I first became a member of the Civil Aeronautics Authority, that the one fatal thing in this line of work would be conservatism. "It will require a superlative imagination," he told me, "just to keep abreast of the progress in aviation—just to keep your policies from falling behind the facts." And truer words never were spoken.

More than a million frozen-food lockers are now available to American housewives, about three-fourths of them used by farm families; this represents an increase of 200,000 lockers in the last year.

Dept. of Agriculture
2/9/41

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Start Your Own Business
Great quantities of Chips are eaten daily. Profit large—unusually so. You can start this money-making business on a SMALL outlay of cash. Write for Potato Chip Booklet.

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K1260

With the "Mosquito Fleet"

(Continued from page 490)

far has been to test the mosquito boats to the limit and report any weakness. Already the first boats of the fleet are back from the prescribed test runs for certain modifications to improve their performance, changes that are being incorporated in the boats now building. Ask any member of the crew what he thinks of the new boats and he'll tell you: "They're pretty good, but we're not finished with them yet. Wait until we've had a chance to test out the latest modifications, and if those boats can take it, so can we."

The latest mosquito boats are considered self-sustaining for five days—that is, living quarters and other arrangements are supposed to be adequate for that time. Why was the five-day period decided upon? That's a Navy secret, but it is possible to visualize certain uses to which the boats could be put and to make a logical surmise of areas where they will operate which would require five days' absence from regular bases; patrol in the Caribbean and off our own coasts, the entrances to the Panama Canal and the areas around our island possessions. These operations would call for definite assignment to the fleet, for they would be part and parcel of the possible major engagements. At this stage of the game their assignment is pure conjecture, but not for long. Right now every opportunity is being given to these boats to demonstrate their greatest usefulness to our Navy. That is the main reason why both the boats and the sailors who man them are being subjected to such grueling tests of endurance. Only in this way can be determined the highest capabilities of both under the most trying and hazardous conditions. This work is listed in Navy records under the prosaic heading "Third stage of development—Operations."

The war in Europe brought to the attention of the world many new instruments of warfare and new employment of old ones. Certainly the motor torpedo boats used by Germany, Italy, Great Britain, and France fired the popular imagination. In addition, the official mind was vitally interested. No one had forgotten the spectacular use of small high-speed boats in the first World War, against the largest units of opposing

(Continued to page 151A)

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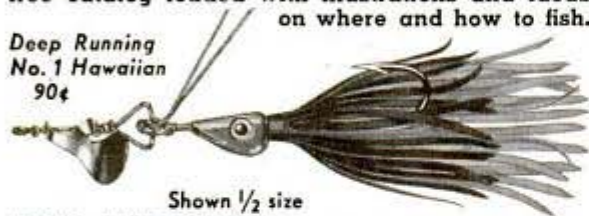


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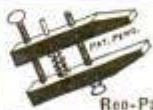
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Say you saw it in Popular Mechanics!

K1260
(Continued from page 149A)

fleets. And the United States had not been calmly viewing the developments of other countries and doing nothing itself. When word came from the commander-in-chief in 1939 to investigate the possibilities of the small-boat field, the Navy was ready to "up-anchor" on the project immediately.

The Bureau of Ships at once purchased the latest design of British motor torpedo boat. Demonstrations were conducted and performances compared with the known capabilities of similar boats used by France, Italy and Germany. These data were compared with those of our own efforts of the past twenty years with aviation rescue boats. Within a few months developments had reached the point where the Secretary of the Navy could award a contract for twenty-three boats. Eleven were fitted as motor torpedo boats and twelve as motor submarine chasers. All were powered with the latest type of Packard engine. First, our own geographical situation, continental and outlying possessions, had been considered; second, the greatest value to be derived from their employment was studied. On these considerations the building specifications were based. The Italian government had found that boats varying in length from forty to seventy feet, powered with Isotta-Fraschini engines, capable of over forty knots were most suited for warfare in the Mediterranean. The French favored boats not over sixty feet, with one or two torpedo tubes and possessed of forty-five knot speed. The British boats varied in length from sixty to seventy feet and were powered with Rolls-Royce engines. The Germans had adopted a boat approximately ninety feet long with two twenty-inch bow torpedo tubes and were convinced that the Diesel engine, and thirty-knot speed, fitted their particular needs.

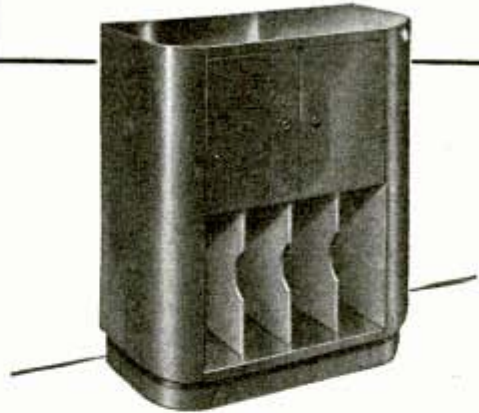
Information concerning operations abroad, combined with experience in the operation of our own twenty-three boats, gave a pretty good survey of the small boat field. The Navy arranged a design competition, and the final design allowed for fifty-nine and eighty-one-foot lengths of V-bottom, hard-chine, stepless boats.

Contracts were let for quantity production. Primary consideration was given to weight saving wherever practicable. Aluminum was widely used for superstruc-

(Continued to page 152A)

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(Continued from page 151A)

tures, gasoline tanks, drainage piping, doors, hatches, manholes and scuttles, ladders and engine foundations. Also, a great amount of plywood was employed. These measures have resulted in approximately a ten per cent lighter boat than the original models of the design competition.

In preliminary tests the smaller mosquito boat hit sixty-two knots, or seventy-two miles an hour. The eighty-one-foot craft should hit eighty-five miles an hour. On a trial run in New York harbor the PT-10, American-built, with three Packard supercharged marine engines of 1,500 horsepower each, amazed skippers of passing tugboats by roaring along at fifty knots without disturbing the waters, for even at high speed they leave little wake.

The Scott-Paine type of mosquito boat, following a British design, mounts four eighteen-inch torpedo tubes and four machine guns in turrets, and carries an officer and eight men. The boats have small electric refrigerators and hot plates; cooking at sea is limited generally by cramped quarters, slapping of the sea, and appetites of the men to soup, coffee, sandwiches and fruit.

At twelve knots the mosquitoes can cruise over a 3,000-mile range. They will probably take on a variety of missions in war: coastal patrol, convoying, attacks against enemy vessels—at night they can muffle engines for a silent approach; by day, a dozen mosquitoes could dash against an enemy squadron at a mile a minute, fling out forty-eight torpedoes in five seconds, wheel around and be gone. They also carry smoke-screen apparatus.

The boats are standing up in great style. Training of men especially picked from volunteers goes on without interruption, both ashore and afloat. They know intimately the construction of their boats as well as every phase of operation. They are sure of the amount of punishment their craft can take if put to it. The least of the Navy's worries is the performance of its personnel, for nowhere in the world is there a group so distinguished by their intelligence, loyalty and ability—both officers and enlisted men. In their hands may safely be placed the problem of finding the most effective use for the boats, whether as single units or in swarms, emulating the mosquito for which they are named.

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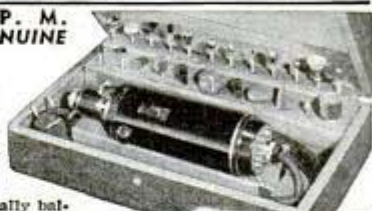
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K1325

Soldiers With Wings

(Continued from page 511)

after landing. No jumps are made from less than 750 feet, though it is known that men could "bail out" from as low as 300 feet. It is not necessary to pull a ripcord since the silk envelope opens aboard the plane as the jumpers go out. Each man carries a spare 'chute.

Six landings, each of them well nigh perfect, are required to qualify as a parachute soldier. One is a "spot" landing in which the jumper must land at a designated spot, meantime making thorough calculations as to the speed of the plane, altitude, wind currents and weather.

Although the unit is equipped with tommy guns, machine guns and folding bicycles, officers have a feeling that the 'chutists will carry with them only a pistol and a hand grenade. Tests indicate that jumpers can learn to fire their pistols and throw their grenades with reasonable accuracy while in the air. Machine guns, in the new procedure, probably will be lowered by special parachute, simultaneously with the mass jumping of the parachutists.

Many interesting conclusions have been produced by the tests recently conducted at Fort Sam Houston, Tex., concerning the carrying of troops and fighting equipment by air. Entire regiments can be transported with comparative ease. Carrying the regimental equipment, however, is a problem, for no less than twelve thirty-seven-millimeter guns must be packed in planes. Each of the guns weighs 950 pounds and with its crew of nine, ammunition, rifles and water, fills one plane. Cargo planes, with their wide doors, must be used, and then the gun must be rolled in with less than an inch clearance.

It's no trouble at all, loading an infantry battalion. Combat elements of such a unit, consisting of thirty-one officers and 838 enlisted men and equipment weigh around 200,000 pounds, or 100 tons. Each Army transport can carry a load of about two tons on normal hauls and 3,300 pounds when carrying extra fuel for a long hop. Fifty transports can carry a battalion of infantry on a mission not requiring extra gasoline loads. The unit would carry sufficient ammunition and supplies to conduct limited operations for twenty-four hours.

(Continued to page 157A)

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ALL THE TIME



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The Leading
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Quick HEAT. Regulated by Turn of Valve!

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K1325

(Continued from page 155A)

Each rifle company, complete with light machine guns, mortars and automatics, weighs about 43,000 pounds and can be carried in eleven airplanes. The heavy weapons company, including mortars and fifty-caliber machine guns, fills twelve planes.

Experiments are now under way concerning the carrying of artillery by planes. Tests of this type were conducted by the Air Corps eight years ago. In Panama ten bombers transported an entire battalion of field artillery by air for the first time in history. It required only seventeen minutes to load the artillery, which consisted of three-inch mountain howitzers. The guns were flown from Bejorca, Panama, to La Chorrera, Canal Zone. The entire movement, involving a trip of about eighty miles, was completed in a little over an hour from the time word was received of the imaginary invasion; and military experts believe that today it could have been achieved in half that time. Only twelve minutes after their arrival at the Chorrera landing field the howitzers were in action, firing on an imaginary enemy.

256

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JIG SAW**



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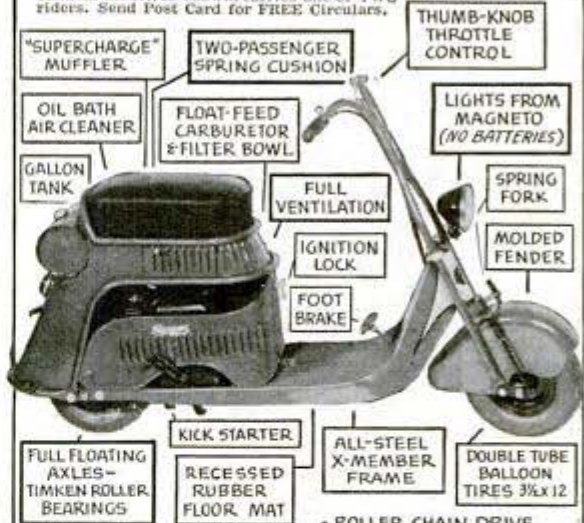
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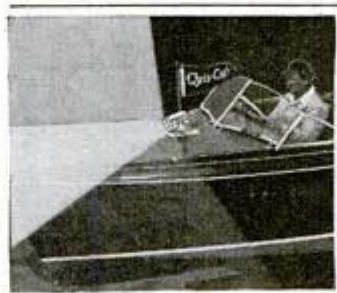
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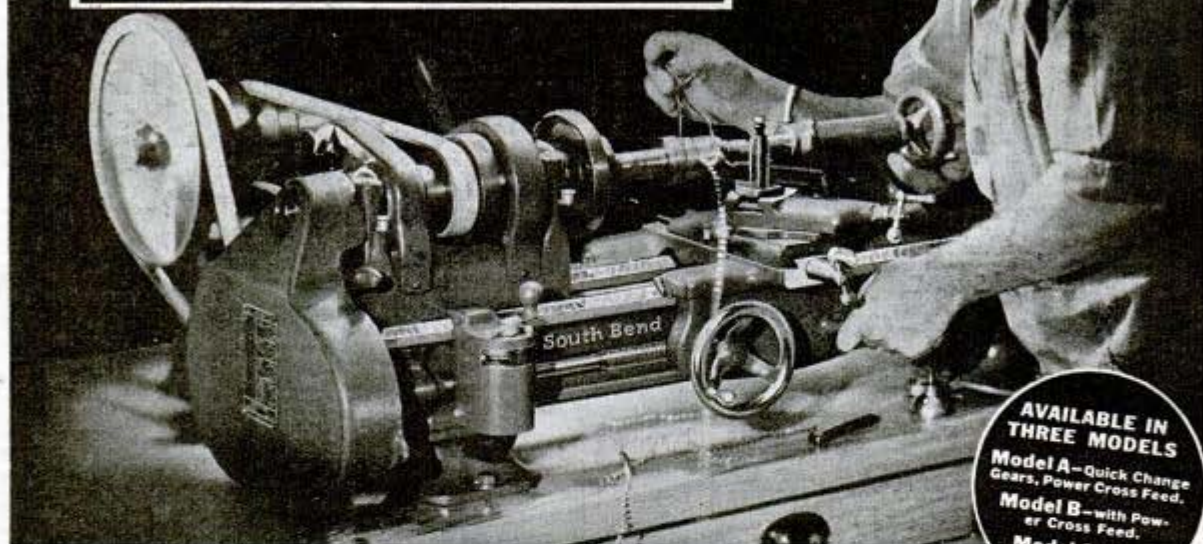
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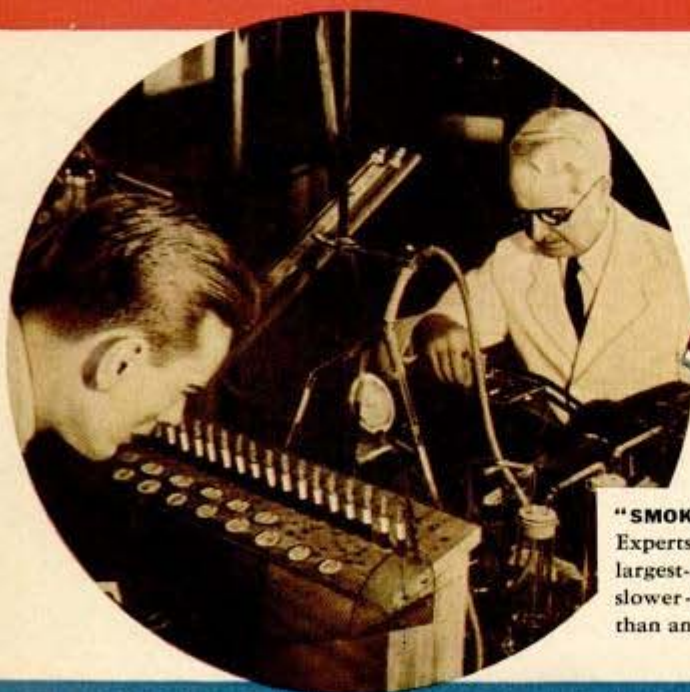
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