

ANC



POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

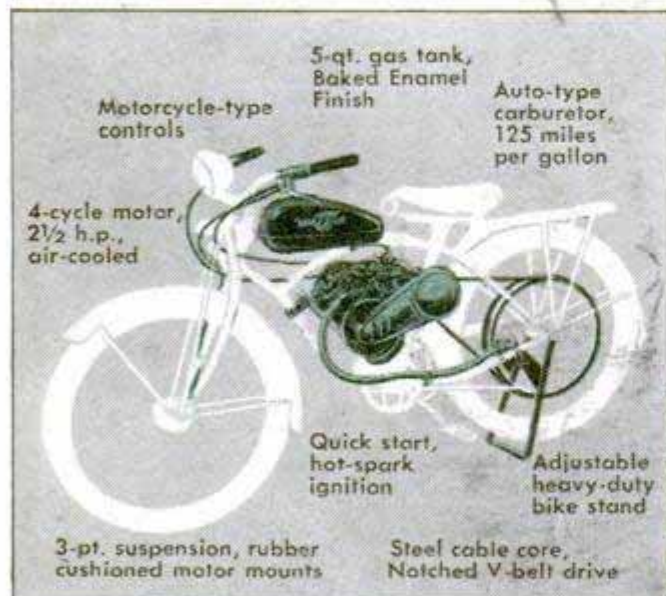
REG'D. TRADE MARK, G.E.

REG. U.S. PAT. OFF.



See Page 73

"Hey Jack, put a *Whizzer*^{*} on it!"



***THE WHIZZER MOTOR** — a compact, lightweight power unit — fits any man's balloon-tire bike. Precision-engineered, 5/10,000" cylinder-tolerance, finest in the field. Also available — the Pacemaker — a complete motor bike, ready to run. Over 4,000 Whizzer dealers, coast to coast. For fun, work, thrift, it's wise to go Whizzer.

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FREE "FULL-DETAIL" CATALOG. Close-ups of Whizzer motor. Describes parts. Explains installation. Shows complete line of motor bike accessories. Also pictures the Pacemaker, a complete motor bike. Write "WHIZZER," Pontiac, Michigan.

I'd like the full Whizzer story. Please send catalog.

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COMPLETE MOTOR WITH ALL NECESSARY ATTACHMENTS... \$109⁹⁷ Fed. Tax Included. F.O.B. Pontiac, Mich.

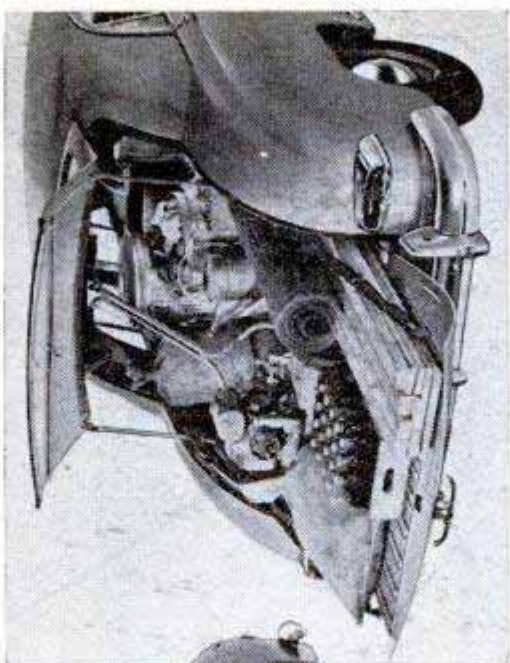
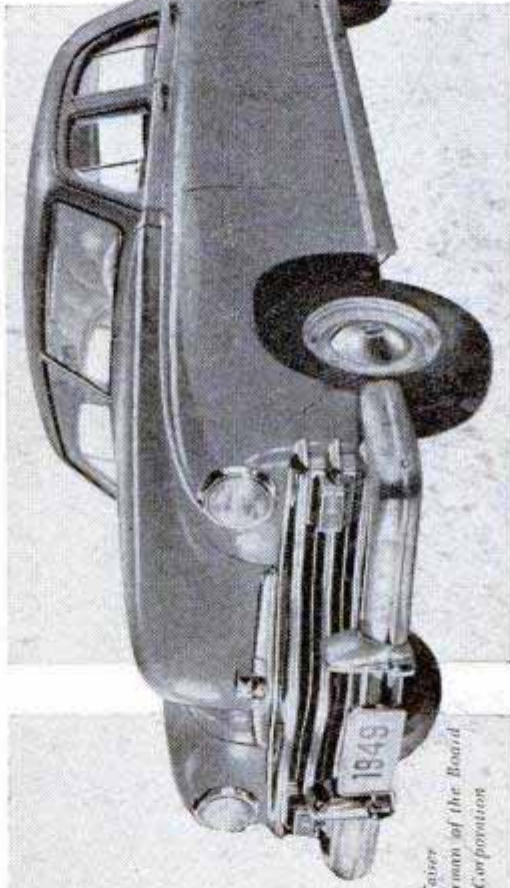
“I'm proud the name Kaiser is on the first really new idea since the self-starter...it's 2 cars in 1...I'd like you to see it!”

Henry J. Kaiser

Kaiser Traveler only \$2088*... world's most useful car!



Henry J. Kaiser
Chairman of the Board
Kaiser-Frazer Corporation



1 “For a long time, I’ve thought that many Americans want and need a practical kind of automobile that can do double duty as a passenger car for pleasure and a cargo carrier for work. So I talked to the boys of our engineering-production team, and the result was the all-new Kaiser Traveler. One minute it’s a big, beautiful 6-passenger sedan any family would be proud to own. Ten seconds later it’s a roomy, steel-shod cargo carrier. I believe the Kaiser Traveler is the practical answer to the problem of thousands who need two kinds of cars but can afford only one.”

2 “The Kaiser Traveler is a luxurious 6-passenger sedan, with a wheelbase of 123½ inches. It is also a sturdy cargo-carrier with a ten-foot-long, steel-shod hold. It’s powered by the mighty Kaiser engine, with its high compression ratio of 7.3-to-1. Just fold down the rear seat, flip open the cargo-hatch and let down the tailgate. Springs and shock absorbers have extra muscles to carry a big load, and give a grand ride. The upholstery is long-wearing and easy to wash. With three people in the front seat there is over 190 cubic feet of storage space in the cargo hold...with six, 78 cu. ft.

3 “Price of the Kaiser Traveler is only \$2088.* Merchants and salesmen, traveling men, housewives, sportsmen...almost everybody can put this Kaiser Traveler to practical use. It’s the one car that gives you everything you want... comfort, safety, the prestige of big car ownership, plus the extra advantages of owning a fine-performing cargo carrier that costs several hundred dollars less than the cheapest station wagon, and is much more practical. Write me what you think of the Kaiser Traveler. Address me at Willow Run, Michigan. I’d really like to hear from you.”

★ f.o.b. factory, including Fed. tax, factory equipment. Nothing more to buy. Only transportation, State, local taxes (if any) extra. © KAISER-FRAZER SALES CORP., WILLOW RUN, MICH.

This One





YOUR telephone receiver should treat each tone in the voice alike; that is important to you, because proper balance makes pleasant listening and easy understanding. Naturalness in receiver performance is pictured in a matter of seconds by the apparatus shown at left.

The receiver is clamped in place and an oscillator feeds into it frequencies representing all talking tones. Then a bright spot darts across an oscilloscope screen leaving behind it a luminous line which shows instantly

**It listens so
YOU
can hear better**

the receiver's response at each frequency. It is precise; and it is many times faster than the old method of measuring receiver performance point-by-point and then plotting a curve.

At Bell Laboratories, development of techniques to save *time* parallels the search for better *methods*. For each time an operation is made faster, men are freed to turn to other phases of the Laboratories' continuing job — making your telephone system better and easier for you to use each year.



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EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.

Popular Mechanics Magazine

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H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

WHEN our young friend, Stanley Hiller, Jr., of Hillercopter fame first told us about the passenger rocket he had designed to carry a two-man crew we turned on our skepticism. We are not interested in airplanes that don't fly and we are shy about publicizing inventions that have not progressed beyond the model stage. But Hiller contends that his model and plan are worth national attention even before test flights are made, and after reading Thomas E. Stimson's article (page 73) we think you will agree. As a captive model the rocket did perform as the engineers planned, taking off vertically and then flying horizontally. The cover painting by Bruce Bomberger depicts the rocket being prepared for a take-off in the early dawn, with a sister ship in horizontal flight in the distance. We are personally not interested in being aboard for the first flight, but we'll accept an invitation to be on the sidelines.

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Volume 92 JULY 1949 Number 1

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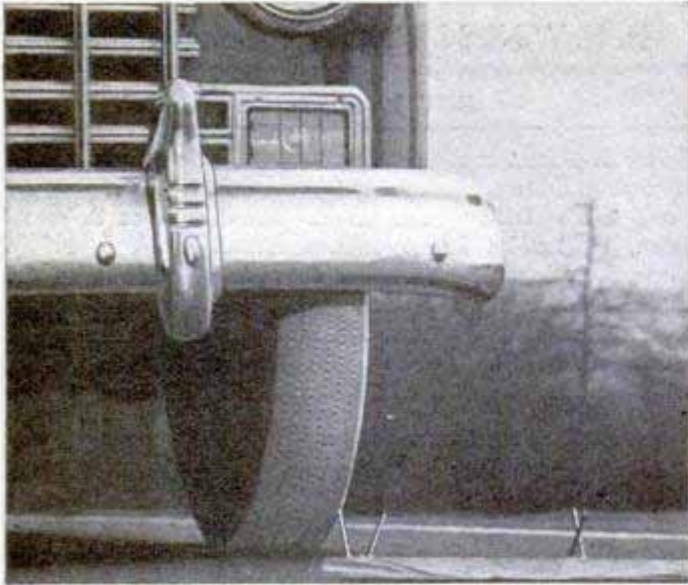
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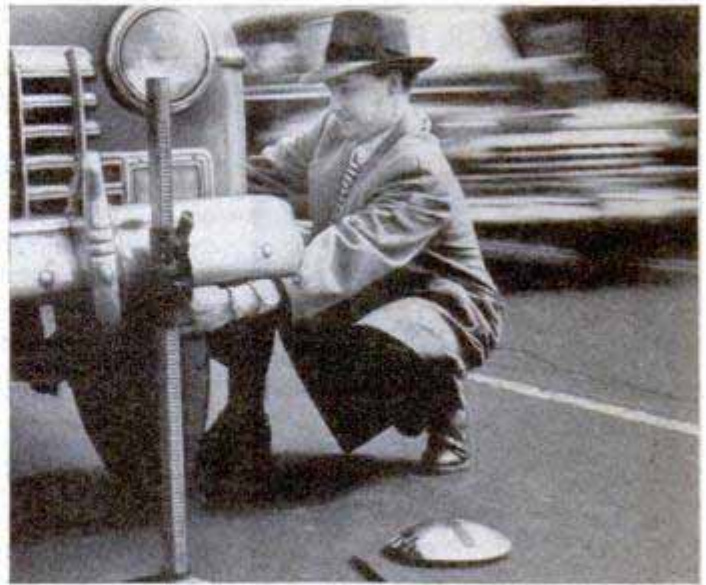
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Other items, and manufacturers of available products described, are listed on pages 10, 12 and 14

How to Fix a Flat BEFORE it Happens!



1. Running nails, glass, or other sharp objects into tires can (and does) happen to almost everyone who drives. But punctures need *not* mean flat tires, thanks to Bulkheading—a revolutionary principle of tube construction perfected and patented by Seiberling.



2. A dangerous tire change, lost time, dirty clothes, repair bills—and maybe a ruined casing if you've rolled too far on the flat—they are the usual results of a puncture. But *not* if you're driving on the *only* tubes with patented Bulkheads!



3. Best way to fix a flat is *before* it happens, by equipping your car with Seiberling Sealed-Air Tubes, the *only* tubes with patented Bulkheads. Sealed-Air Tubes repair themselves, *seal punctures permanently while you ride*. Nearest you ever come to "repairing" a Sealed-Air Tube is pulling out a nail whenever you happen to see one.

HOW TO END THE DANGER AND NUISANCE OF FLAT TIRES . . . AND SAVE MONEY AT THE SAME TIME!

If you drive a car or truck, *find out more about the world's safest tubes*. How can Seiberling Sealed-Air Tubes, the *only* tubes with patented Bulkheads, enable you to drive year after year *without a single flat tire*? How can they protect you against blow-outs, too, and outlast set after set of tires? How can they do all this—and *save you money at the same time*? Get the answers in a fascinating new book which we'll be glad to send you. Mail the coupon *now*.

SEIBERLING

Sealed-Air TUBES

WITH PATENTED BULKHEADS

FREE! "10,189 Punctures and not ONE flat!"—the inside story of Seiberling Sealed-Air, the world's safest tube, the *only* tube that gives you the extra puncture and blow-out protection of patented Bulkheads. Mail this coupon now, *before you have another dangerous flat!* Send it to Seiberling Rubber Company, Dept. P-4, Akron 9, Ohio.

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NEW!

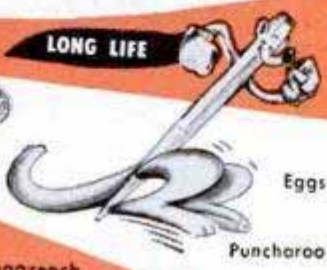
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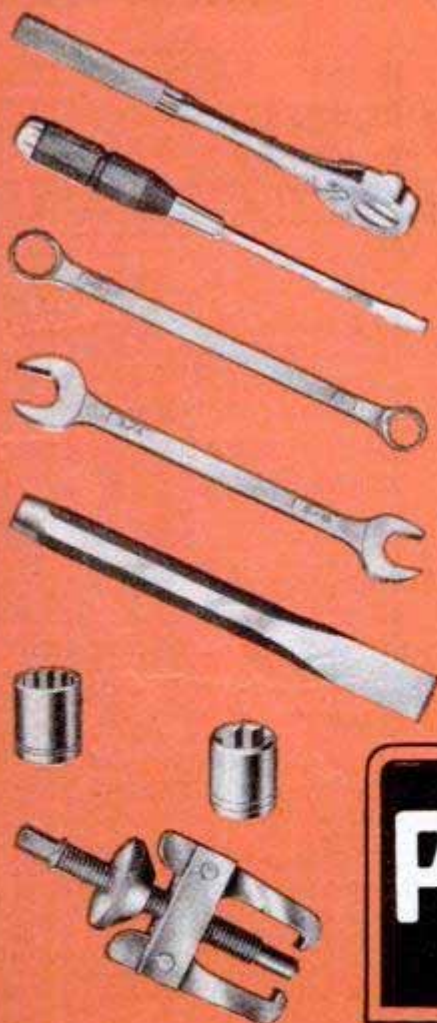
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4982

in this corner.....

THE EDITORS



Joe's Medicine Works

After "putting to bed" his three colorful articles on "How to Tempt a Fish" in our April, May and June issues, Joe Godfrey, Jr., headed for Florida to try out his own medicine. It worked.

In a report to the editor on the efficacy of his fly strategy the sportsman-writer enclosed photographic proof. The bonefish (fastest fish that swims, writes Joe) that he brought in from the flats of Key Largo weighed 9 pounds, 15 ounces, just 10 ounces under the world record bonefish taken on a fly.

* * *

Letter to the Editor:

My 14-year-old son, Michael, devised the enclosed gadget last summer when wearied of my complaints in the series of mishaps that befell my driving glasses. He started with a leather glass case attached to tin strips, riveted together to fit on the sun visor of the car. The device did the job so well that my friends induced him to make a number of replicas. It was then that Mike suddenly realized that his allowance was much too small and he therefore decided that no one should be denied the usefulness of his "invention."

He bought some sheet plastic, and ex-

(Continued to page 8)



Ever Fly a bike?*

*Translation: Ever know the thrill of New Departure 2-speed biking? It turns cycling into soaring. Works like the gear shift on a car—**LOW SPEED** for quicker getaway, easier pedaling on hills, better control in traffic; **HIGH SPEED** for making time on the level runs. The "Speed Changer" fits right into your New Departure Coaster Brake. Ask your bicycle dealer about it today!

This unit does the trick



On your new bike insist on America's favorite

New Departure COASTER BRAKES



1864

FREE! Have fun mystifying your friends! Guess their ages, read their minds! Send a post-card for Magic Packet P4. Address:

NEW DEPARTURE • DIVISION OF GENERAL MOTORS
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MORE MONEY \$\$\$ a BETTER JOB



YOU'RE in the biggest competition—yes, the biggest battle in the world—that of making a living. You have to work for a living—so does everyone else. Competition for

promotion is keen—people all around you are looking for more money—a better job—and so are you.

You can get a head start. Other men have—and in a short time you should be able to out-distance those who have no progress plan, make more money—have a better job—a more certain future.

Few people prepare themselves for that promotion—that better job and more money. Not many are making any special effort to learn outside of the time they put in each day on their work. They're taking the long, hard road to success. *How about you?* Are you, too, taking that same old, winding road—with its many disappointments and heartbreaks?

Here at LaSalle we have been training ambitious men and women for success for more than 40 years—enrolled hundreds of thousands of students—and our files overflow with grateful letters from students who have attained success and earnings far beyond their fondest dreams.

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Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

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I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

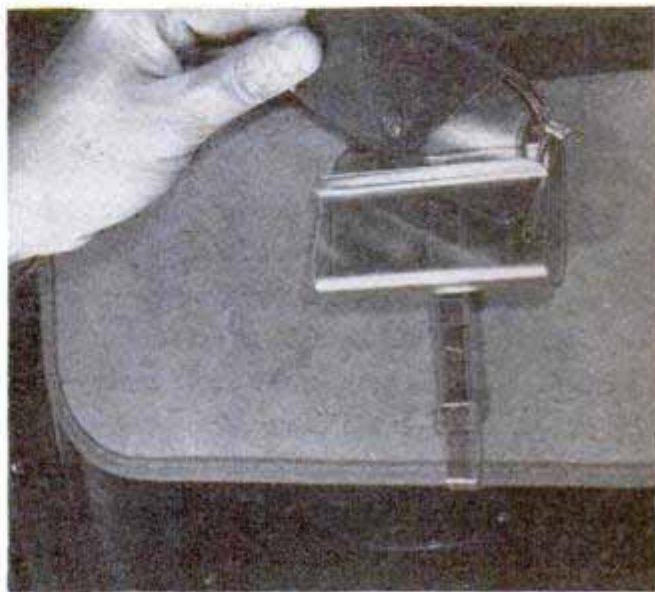
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perimented with it tirelessly in his small workshop. On my best electric iron he heated the plastic and formed it over his wooden molds. He designed the clip to hold a glass case of any size and fabric, developed a shape for the extremity of the bands that would grip a visor of any thickness, and made the bands adjustable in length to lock in place on a visor of any width. He thus made the original models which were turned over to a patent attorney, as well as the models which were sent to the plastic factory now producing them in quantities by extrusion.



Since this time, Michael has persuaded most of my adult friends who have never worn glasses that they really should. He demonstrates with gestures, to all who will listen, that the nuisance of forgetting driving glasses on the table and the calamity of sitting or stepping on bifocals in the car—both belong to a day that is gone forever.

Very truly yours,
Elaine J. Ackerman, (Mrs. Wm. G.)
893 Oakdale Road,
Atlanta, Ga.

* * *

Next Month

"How the Atom is Working for You" is the title of an eye-opening feature which leads off the August issue. Vice-president Lynn A. Williams, Jr., of the University of Chicago, fits together the pieces of the atomic jigsaw puzzle and comes up with a clear picture of how the atom already is affecting our daily health and wealth. An article in the Craftsman section shows how to use vacation snapshots to dress up titles for travel movies. Another feature shows how easy it is to cut ornamental moldings for your home projects on a circular saw.

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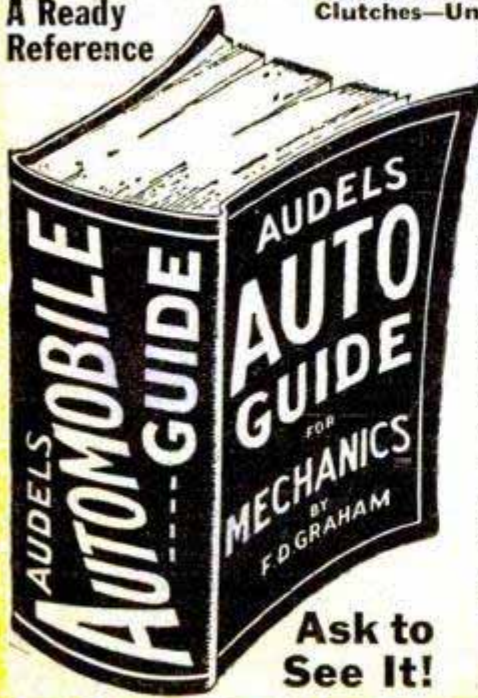
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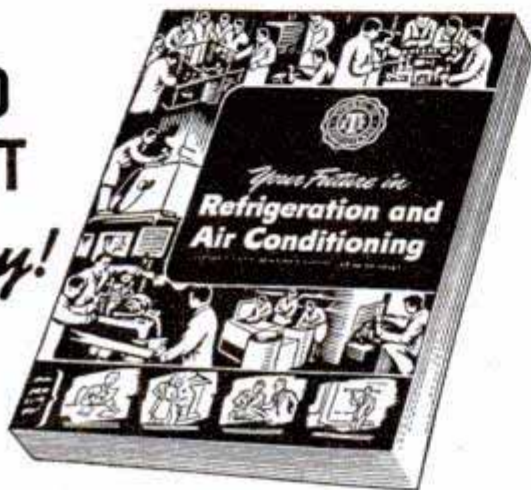
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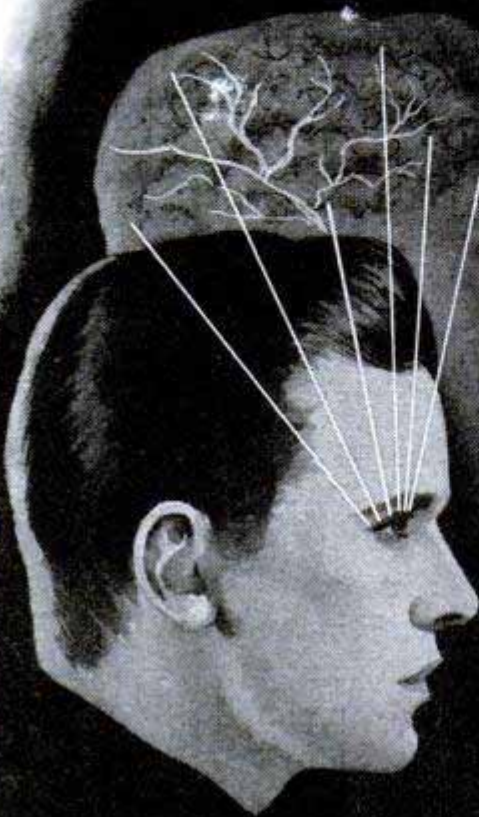
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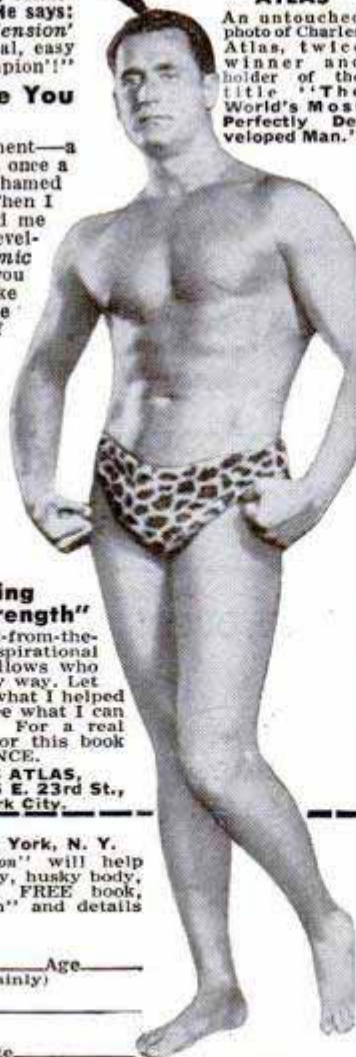
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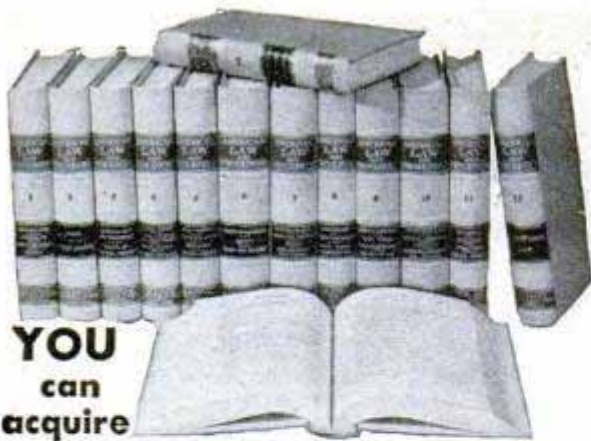
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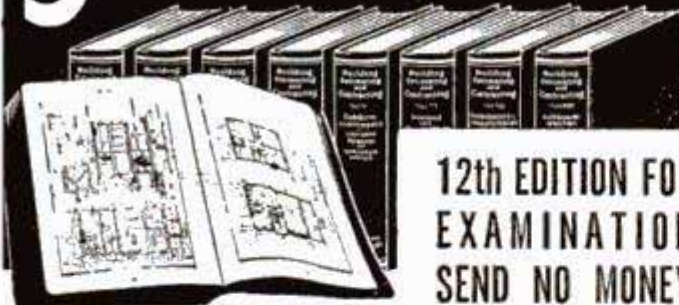
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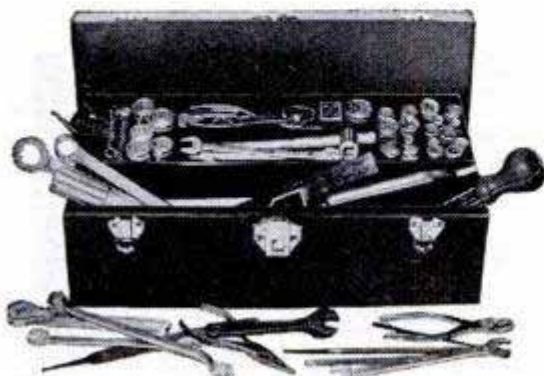
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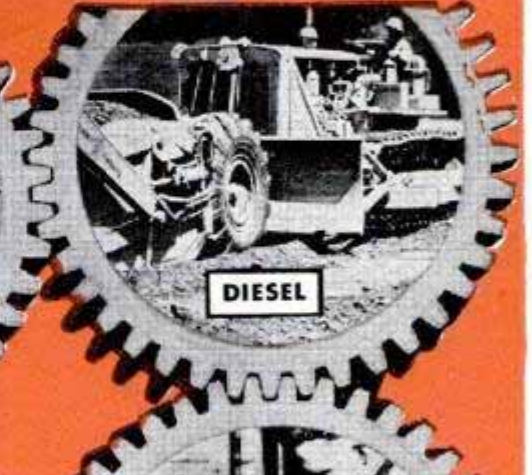
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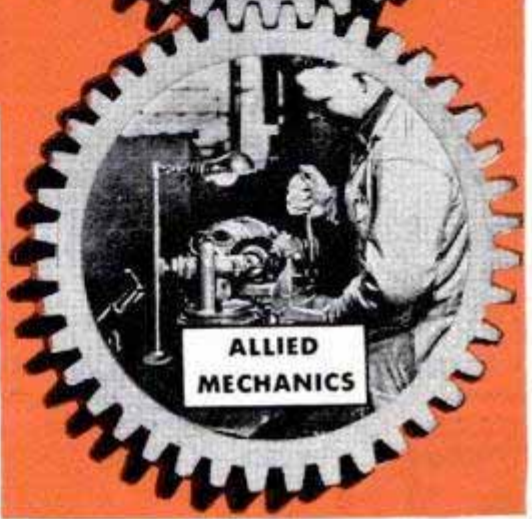
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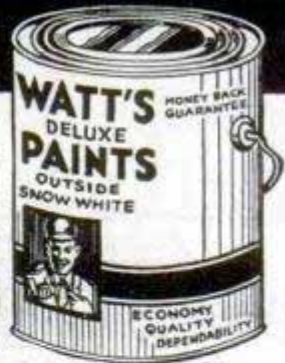
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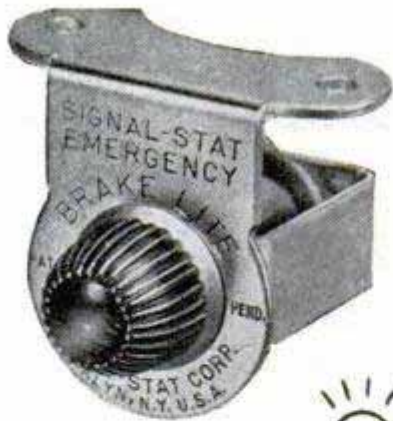
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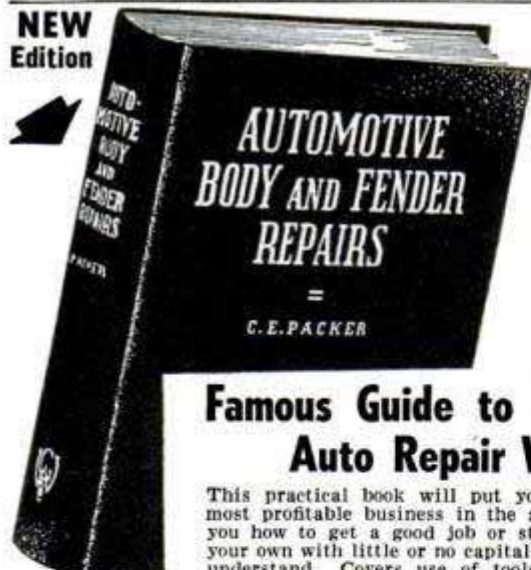
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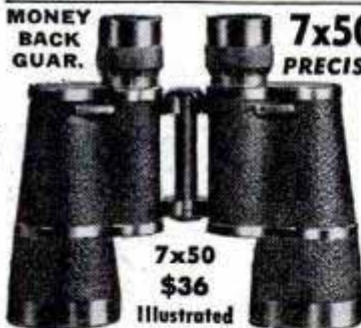


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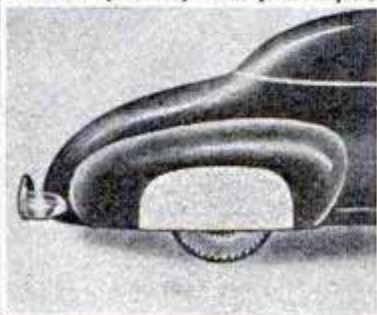
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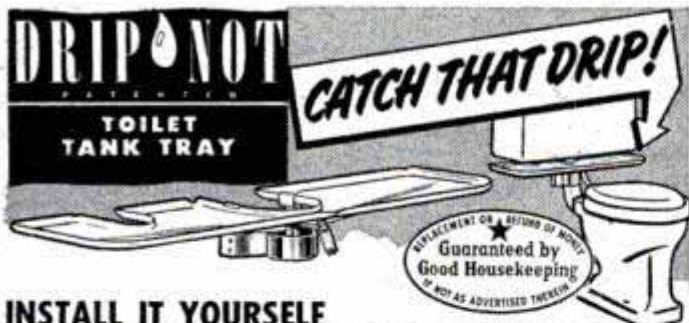
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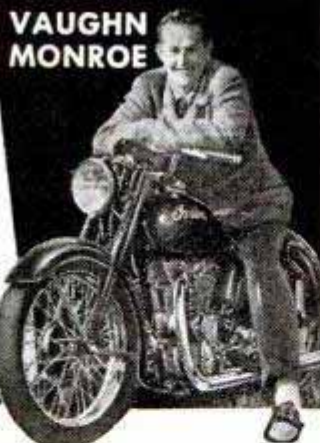
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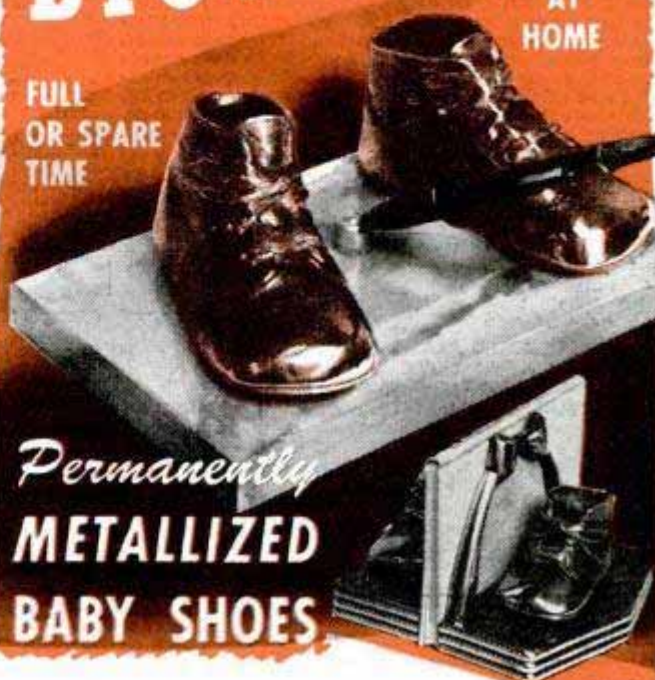
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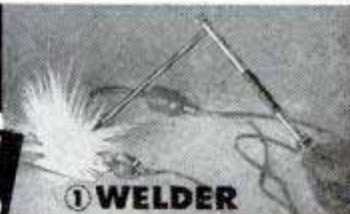
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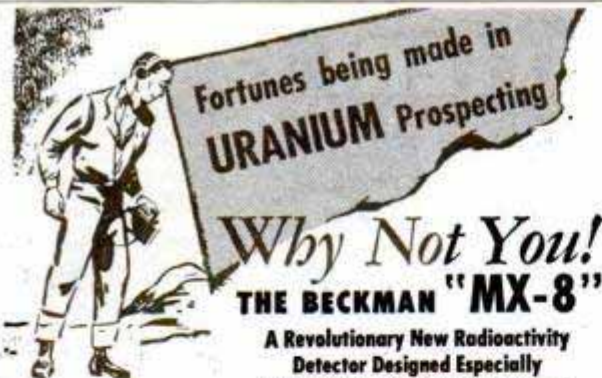
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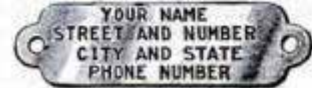
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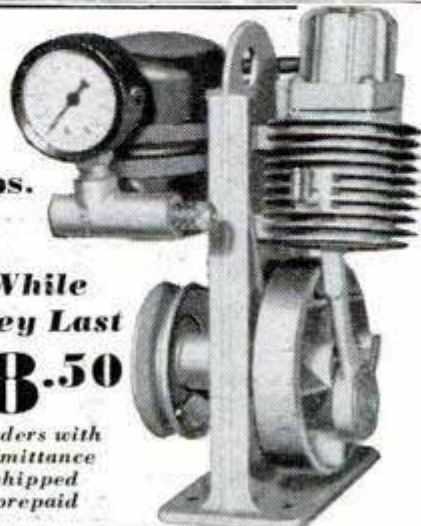
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BE Independent—Operate America's lowest price penny vending machine. Big profits. Immediate shipments. Write for bulletin and prices. Fielding Mfg. Co., Desk 79, Jackson, Mich.

BIG Money. Spare or full time in your home. No selling! Spray new miracle finishes, plush and suede on signs, radios, automobiles, figurines, lamps, toys, etc. Our business is booming—new easy Flok-Kraft methods—material costs few pennies, you get dollars. Free samples, complete powerful money making plan free. Write now! Coast, 1010 F S. Los Angeles, Los Angeles 15.

EXCEPTIONAL Money making opportunity for live-wire distributor. Dealer's county franchise now available for fast selling low-priced fire extinguisher and alarm. Made of glass, modern as tomorrow. Tremendous market. Big profit. Write for full information. Autofirstop Co., Dept. E-7, 2035 Washington Avenue, Philadelphia 46, Penna.

FIRE Control men selling automatic extinguishers handle Red Ball for dependability, beauty and extra profits. Box 1552, Salt Lake City, Utah.

FOR An extremely profitable lifetime business operate a collection agency-credit bureau. Easily learned. Free folder. Cole & Associates, Syracuse 2, New York.

START Your own business on credit. Always your own boss. 1554 dealers, sold \$5,000 to \$26,500 in 1948; their average \$6,742. We supply stocks, equipment on credit. 200 home necessities. Sales experience not needed to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh Co., Dept. G-U-PPM, Freeport, Ill.

FREE Particulars of money making plans. Pierce, Box 235, St. Louis 3, Mo.

RAISE Earthworms. Easy, profitable. Send for free literature or send dollar bill for illustrated book. Money back guarantee. Earthworm Culturists, Dept. P, Box 83, Station C, Atlanta 5, Ga.

THE Excel electric pop corn machine will put you in business. We can now sell you machine with complete supplies for \$110.90. Indiana Pop Corn Co., Muncie, Indiana.

LIFETIME Repeat orders! Sell our business cards by mail, your territory. Small "starter" plan. Lynn Art Products, 5711 Bankfield, Culver City, California.

PART-TIME. All ages. \$2.00 hour up. Sell creme shampoo. Every home uses. Free sample, details. Twice, 5672-A Fernwood, Hollywood 28, Calif.

FREE! "How to Sell by Mail." 39 page booklet on mail selling sent free with latest copy of Opportunities Preferred magazine 25c. Culver Enterprises, 16102W Via Descanso, San Lorenzo, California.

START Home manufacturing business making Cleaning Compounds, Soaps, Insecticides, Cosmetics, Polishes, Food Flavors. No machinery. Literature free. Kemix, Park Ridge, Ill.

SELL By mail. Write today. Gladson, Box 62A, Packer's Station, Kansas City, Kansas.

PROFITS In mail order business. Spare or full time. Details free. Mail Order Service, Box 3923, Portland 8, Ore.

BABY-Shoe mountings, ash trays, frames, etc. St. Alban's Plating & Casting, 135-17-135 Ave., So. Ozone 20, New York.

X-RAY Mirrors. You can see through them from the back—you can't be seen. Used by stores, offices, banks, police departments. Material and instructions for making \$80 worth of X-Ray mirrors, \$4 postpaid. Satisfaction guaranteed. Gateway System, Waynesville 2, Mo.

MAIL Order News (55th year) brings you the mail order ideas you're looking for. Copy 25c. Clarence Woodfall, Route 3, Charleston, Ill.

SELL By mail! Ideas galore! Join mail selling opportunities club! Details free! P. Wehner, Box 142-A, Roxbury 19, Mass.

START Profitable mail order business. Amazing profits—literature free. United Mail Service, Box 355, Roselle, Ill.

LEARN Sewing machine repairing at home. Install our wholesale motor kits. Make \$125 to \$300 in a week. Free particulars. Taylor Service Co., Hamilton PM, Ohio.

"ELECTROPLATING-Know-How" includes baby shoe metallizing and other lucrative fields for you. Write for my free illustrated booklet! Joseph B. Kushner, Electroplating Consultant, Stroudsburg 18, Penna.

I Received 200 orders from first small ad. Operate at home this profitable mail-order business, selling to women everywhere. Folio, 25c, explains. Grant Lovell, 2166 South Shore, Erie 9, Penna.

FREE Literature. Start a home business in spare time. Experience not essential. E. Teator, 6206 Hedge Ave., Cincinnati 13, Ohio.

FORTUNE For you in formulas. Eye-opening details free. Write today. Allen, Box 132, Ganges, Michigan.

\$15.00 - \$50.00 WEEKLY. Sparetime. Anxious customers everywhere. Lifetime opportunity. Puraclean, 17-E East 42nd, New York 17.

OWN Your mail order business. No investment. Omaha Envelope Service, 4721-B California, Omaha 3, Nebr.

OPERATE Profitable mail order business. Splendid opportunity. Standard Supply Co., P.O. Box 360, Donelson, Tennessee.

NEW Industrial hand cleaner. Free manufacturing-distributing plans. Unusual money-making proposition. "Acro-Sol-Ex," 623 West 14th Ave., Denver 4, Colorado.

BRONZED Baby shoe mountings. Reasonable prices. Write for price list. Standard Bronze Co., 311 N. Desplaines, Chicago 6, Ill.

MAKE Perfume—Profitable mailorder business. Information free. International, 6347 Parnell, PM-7, Chicago 21, Illinois.

SHARE In million dollar industry manufacturing new deodorizer solution used in homes, institutions, factories, theaters. Easy to mix. No machinery. Operate from home. \$2.00 will start you in business. We furnish ingredients, labels, instructions for packaging and selling. Franchise basis. Don't wait. Send check or money order. Kalom, 5027 N. Francisco, Chicago 25, Ill.

BE Your own boss. Earn \$6000.00 or more a year. For only \$2.85 you will receive this copyrighted book, "How to Successfully Operate an Employment Agency." This book gives you the know-how on opening and operating an agency, samples of all forms you will need, addresses of the state offices in your state controlling agencies, and free consultation-service. We will send c.o.d. or send check and save postage. Business Enterprises Company, P.O. Box 1472, Longview, Texas.

MAKE Money at home by mail! Thousands do! Fascinating details free! Write: Morris, 356 South Spring Street, Concord, North Carolina.

300% PROFIT Manufacturing an amazing product. No special equipment. Samples and information \$1.00. Box 924-Z, Fort Wayne, Indiana.

YOUR Own exceedingly profitable year around business. 20 to 50 dollars a day. Manufacture potato salad, macaroni olive salad. Wholesale, retail. Fresh, canned. Every grocery, meat counter handles. Complete details, business procedure, factory plans, recipes, consultation service—\$2.75 postpaid. Fryette's, Box 1832, Sta. A, Brentmont, Wash.

FREE Book "372 Unusual Worldwide Business Adventures!" Australia, South America, New Zealand! \$800 month reported (exceptional). Work delightful enterprises home. Prepare for surprise! Publishers-F3, Carlsbad, Calif.

MAIL Business magazines two different 10c, five different 20c. Lincoln, Box 449, Irwin, Penna.

ANNOUNCING: Complete simplified shoe repair course, big demand, in depression proof trade. \$7.95 complete, information free. Shoe Service System, Oonway, New Hampshire.

100 BUSINESS Ideas-formulas. Mail order-farm-workshop. Particulars free. Flasco Sales, 2505VB 150 Street, Flushing, New York.

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GLASY-Cast, the liquid plastic that works the quick and easy way. Cold-set. 15 to 30 minutes for finished product. Free samples and instructions. Make embeddings, novelties, plastic frames, machine parts, etc. for real profits. Two lbs. for \$2.95. Elasto-Mold: Flexible production molds made in 20 minutes. Also finest quality rubber latex. Wholesale prices. Plastic Service, 294 Washington St., Dept. H-1C, Boston 8, Mass.

SELL By mail. Unusual opportunities. 10c brings 60 page informative trade magazine. Isbell, Suite 619-PM, 216 West Jackson, Chicago 6, Ill.

AMAZING New hobby or profitable business. Make rubber molds, cast stone-like merchandise for resale. No experience, heat or pressure needed. Complete information and catalog 10c. Hobby Rubber Craft, Lake Villa, Illinois.

HOME Business! Learn how to fix cracked batteries! Money-maker! Instructions \$1.00. Batteryman, Grand Junction, Colorado.

DOLLARS in personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, California.

SAWDUST. Turn it into cash. Six methods. Instructions 25c. Charles, 12-APD, Norwood, Ohio.

UNPAINTED Figurines—Wholesale, retail. Illustrated list free! Oman, 642L Broadway, St. Paul 1, Minnesota.

WOULD You pay 3¢—first \$350 made? Color-illustrated book "505 Odd, Successful Enterprises" free! Work home. Expect something odd! Pacific, Oceanside, Calif.

CARPENTERS—Own profitable business installing kitchen cabinets. Write Thombert Company, Box 447C, Newton, Iowa.

FIGURINES, Gift ornaments. Unpainted, many to choose from. Start a profitable business—hobby. Write for free circular and information. Suiter Art Industries, 314 Westport, Kansas City, Mo.

SELL Big money-maker to men and women. Easy handwork makes fast-selling useful articles. Sunmade Company, Brockton 64, Mass.

CO-PUBLISH And advertise in The Central Mail Advertiser. Sample copy 10c. Low rates. Large circulation. Bagby Printing Co., Georgetown, Ohio.

10,000 FORMULAS And trade secrets. Free literature. Stillman Co., 555 Kingston Ave., Brooklyn 3, N. Y.

DEPRESSION Insurance! Own money-making business. Information free. Pru-Ax, Kingsport, Tennessee.

TESTED Money-makers: 68 page book, 25 cents, postpaid. Ideas, plans, formulas, supply sources. Money back if dissatisfied. L. Clay, Box 1063, Wichita, Kansas.

BABY Shoe metallizing. Secrets never before revealed. Schoettle, Friendship, Ohio.

"HOW To get the job you want." Amazing plan. Works wonders. Secrets revealed. Write: Parker, Box 576, Cleveland, Tenn.

BIG Money! Made in lettershop operation! Easy pleasant work. Free details! Woods Letter Service, Bedford, Penna.

BRONZING Baby shoes is big business, start your own business for \$4.95 includes materials and instructions. No equipment required. Particulars free. Metaloids, Box 2095, Wichita, Kansas.

HOW And where to obtain capital. Small and large loans. Free particulars. Star Service, Wapakoneta, Ohio.

GET Free literature. Wholesale supply sources. Money making items. Formulas. Allen Service, 245 Main, Ganges, Mich.

BRONZED Baby shoes mountings; metals, onyx, plastics. Hardening solution. Wholesale, Box 2095, Wichita, Kansas.

LEARN Piano tuning, repairing at home. Tremendous field! Piano parts, tools furnished. Established 1935. Empire School of Piano Tuning, Dept. 16-A, 1753 S.W. 23rd Terrace, Miami 33, Florida.

START Mail order business. Postal brings helpful hint. Shaw, Box 438, Coconut Grove, Fla.

STEADY Cash income by mail. Details 10c. Suproco, Ogema, Wisconsin.

MAKE Rubber stamps, metalize baby shoes, repair dolls, silver mirrors, make plaster novelties. Catalogue of "30 ideas" free! Universal, Box 1076-A, Peoria, Ill.

NATURAL Molding Latex. Extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

HALF Million articles wholesale. Directory 25c. Krueger, 3418 Wolcott, Chicago 13.

MAIL Order offers increased income, independence, unlimited possibilities; free literature. Manhattan House, 126 Lexington, New York 16.

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SELL Jewelry by mail. Everything furnished ready to go. Orders filled; small capital. Tremendous possibilities! Jomay, Box 1224-A, Toledo 3, Ohio.

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MAKE Money making new greaseless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

LIQUID Marble—Colorful, glossy! Molded, brushed, sprayed! Cast novelties, statuary, colored tiles. Flexible molds. Composition floors. Particulars free. Marbleizing Service, Edwardsville, Illinois.

LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

"SPECIALTY Manufacturing." Big money business. Start on small capital with dependable formulas. Send for free interesting booklet. Howard Robinson, Ph. G., 1300-A South Ohio Street, Sedalia, Mo.

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordan Publishers, Box 23, Pawtucket, R. I.

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PLASTERCRAFT Supplies. Rubber molds, natural liquid rubber, rayon and cellophane flock finishes, etc. Illustrated catalog and "Plastercraft" course free on request. Blue Rapids Supply, Blue Rapids, Kansas.

ENVELOPES Addressed accurately, reasonably. Fast service. We have capable addressers in your city. Glenway System, 5713-Y Euclid, Cleveland 3, Ohio.

HOME Business making statuettes, plaques, artificial marble, rubber molds. Metallizing baby shoes. Silvering mirrors. Formulas. Folder free. Creative, 236-I, Winnetka, Illinois.

MAKE Money spare or full time, casting metal toys and novelties. Latest scale model autos, original ashtrays, savings banks, water pistols, etc. Enormous wholesale and chain store demand keeps manufacturers busy. No experience or special place necessary. Write for details and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

VENDING Machines earn big money! An investment as low as \$10.50 will start you in this fascinating, profitable business that can lead you to the road of success and independence. Routes can be established and operated in either full or spare time with no experience needed. Write for full details and our free catalog illustrating our nut, candy, gum and stamp vendors; also pin ball machines, music boxes, etc. Write immediately to Parkway Machine Corporation, Dept. 7, 623 W. North Avenue, Baltimore 17, Maryland.

YOUR Own profitable home business. Preserve live flowers to last forever. New simple discovery. Enormous demand all year 'round. Tremendous profits! Light fascinating work. Send \$2.00 for working equipment, instructions, and valuable sales plans. Satisfaction guaranteed or money promptly refunded. Alfred Hermansen, 210 Fifth Ave., Suite 1102A, New York 10, N. Y.

NO Selling, operate vendors, amazing profits, details free. Silver-King, Suite B, 622 Diversey, Chicago 14, Ill.

MAKE Money addressing envelopes. Our instructions reveal how. Glen Glenway, 5713 Euclid, Cleveland 3, Ohio.

I MAKE Big money in the mail-order business. You can do the same at home with copyrighted system. Write me. I'll tell you how. F. Little, R.D. #1, Glenshaw, Penna.

POPCORN Equipment, potato chip outfits. Long Eakins Company, 4960 Hi Street, Springfield 9, Ohio.

OWN Mirror shop. Resilver mirrors. Glass sign making. Electroplating. Supply prices. John Sprinkle, V60, Marion, Indiana.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

A BUSINESS in your own home! Our chemicals, plus free water and cheap "grocery store" materials can bring you over \$500 monthly earnings. Plans and formulas free. Chemica Division, 1269 S. Norton, Los Angeles 6.

A FACTORY in your home garage! Mfg. and sales rights, mechanics' waterless hand cleaner. \$500-\$800 monthly. No special equipment necessary. Formula free. Western Aircraft Mfg., Dept. D, Los Angeles 6, Calif.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

START Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

137 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

COPUBLISH Leading m.o. paper. Latest copy Mail Sale Advertiser and proposition, dime. Vanroy W. Shirk, Lebanon, Penna.

250 ENTERPRISES. Local, mail order, foreign. Atlantis, Box 2085, Station V, Los Angeles 3, Calif.

START Plating business at home. Amazing profits. Make own outfit. Inexpensive. Illustrated instruction booklet 25c. Popular Mechanics Press, (C-43), 200 E. Ontario, Chicago.

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RESURFACE Butcher blocks with portable machine. Butchers pay well for this service. You can easily make \$50 to \$100 per week for part time work. Write for details, Hill Machine Co., Box 677, Rockford, Illinois.

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"**WESTERN Advertiser**" offers many worthwhile mail order opportunities. 6 months subscription, 10c. H. Edlund, 577 Kensington, Los Angeles 26, Calif.

UNPAINTED Bookends, plaques, statues, figurines. List. Haverty Products, 1219 8th Ave., Altoona, Penna.

MAIL Order success even for beginners. Join profitable opportunities club. Details free. Perrin Co., 428-D Pine St., Nevada City, Calif.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd Successful Enterprises" free! Work home. Expect something odd! Pacific, Oceanside, Calif.

NECKTIE Clean 'n' press form 50c postpaid. Get ready for business! Ryane's, 61 Freeman St., Buffalo 15-M, New York.

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DOLLARFUL Ideas for you every month in advance—"Voice of Mail Order." Leads the field in exclusive supply sources. Plans for mail order operation; new products, etc. Details free. Advance Publishing Company, Suite 350, 313 East 21st Street, New York 10.

HOW To design posters that sell! Other big pay projects. Folder free. Ryane's, 61 Freeman St., Buffalo 15, New York.

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POPCORN Poppers, vendors, peanut roasters, copper kettles, bottled gas, gasoline burners; new, used. Northside Sales, Indianola, Iowa.

"**EVERYBODY** Likes candy." Learn to make professionally. Our 39th year. Ragdale Candies, D4, East Orange, New Jersey.

DEPRESSION Insurance! Own profitable business. Information free. Pru-Ex, Kingsport, Tennessee.

15 MINUTES Masters advertising and sign lettering. \$1; free circular. Abenterprizes, Box 875-M, Peoria, Illinois.

UNUSUAL Back yard money-making opportunities! Fully outlined! Write: Pickett's, 62-A Sanders, Florence, Kentucky.

START Profitable home business in spare time. Make extra money raising Golden Hamsters. Small, clean, odorless. New. Unlimited market. Literature free. Golden Gate Hamstery, 631-H Richmond Street, El Cerrito, California.

ANALYZE Handwriting for profit! Complete outfit \$1.00. Graphologists, POB-971, Philadelphia.

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PROFIT With Larson Leathercraft. Belts, purses, 100 other ideas. Largest supply in U. S. Catalog 10c. Larson, Dept. C, 824 S. Tripp, Chicago 24.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

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10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

11,146 FORMULAS. Postal brings literature. Formulard, 1707 Maryfield, Ann Arbor, Michigan.

\$1.00 GETS You 21 money-making popcorn, candy apple formulas. We supply equipment. Concession Supply Company, Dept. A, Station B, Toledo, Ohio.

HOT Tamale. Making for profit. Particulars. Box 384, Altus, Okla.

FORMULAS For nearly everything. Catalog free. Write Creative, Winnetka, Ill.

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

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WHOLESALE Plastics supply catalog, 10c. Lucite, clear, colored. Metallic Acetate. Complete Castolite line. Phosphorescent, pearling pigments, dyes. Metal findings. Tools. Ideas and bargains galore. Fast delivery from stock. Gem-O'-Lite, Box 686E, North Hollywood, Calif.

FLEXIBLE Mold makers—"Instruction Manual" explains new type plastic mold materials. Cost: Only \$1.00 postpaid. Multi-Mold Prod., 265 W. 30 St., New York 1, N. Y.

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12x12) cost, 1/16" 95c; 1/8", \$1.25; 3/16" \$1.50; 1/4", \$1.80. Colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Avenue, New York 1, N. Y.

METALLIZING Service. Plastic articles, wood, plaster, etc., beautifully plated. Philip Stein, Oswego, Illinois.

AMAZING Liquid plastic. Sets in half hour. Beautiful results. Embed photographs, coins, keepsakes. Make solid objects. Clear, colors. Needs no expensive equipment. Machines as easily as wood. Complete kit \$3.25. Send for price list. Kristal Plastics, Box 29, Dept. P-8, Wilmette, Illinois.

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PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

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NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 15c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

NEW Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 23, Ill.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester, 7, N. Y.

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BOYS Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample. Write Dept. 50, National Engravers, 214 Summer, Boston, Mass.

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BIG Profits—Taking orders from friends, neighbors. 50 super value Christmas folders \$1.25, with name. America's leading \$1 box 21 French folders. Christmas Holly box—lined envelopes. Also: gift wrappings, plastics, religious, kiddies, napkins, stationery, etc. Samples on approval. No investment. Sunshine Art Studios, Dept. PM-7, 115 Pulton St., New York 8, N. Y.

EXTRA Cash! Sell plastic Christmas card—everyday assortments. New, different personalized money-makers. Profits to 100%. Free samples name imprinted 25 and 50 for \$1.00 Christmas cards, stationery, napkins, guest towels, matches, keepsake notes. Senrab Co., 129 N. Warren St., Syracuse, N. Y.

AT Last! Something new and sensational in Christmas cards. Show gorgeous satins, velours and plastics never before offered. Gets easy orders fast! Pays big profits. Free samples of Christmas cards with name 50 for \$1, imprinted stationery, floral charmettes, napkins. 50 other assortments 60c to \$1.25. Samples on approval. Write: Puro Co., 2801 Locust, Dept. 940-J, St. Louis, Mo.

YOUR Own business! Steady, permanent income. Amazing profits. America's fastest selling household and industrial article for 29 years. Tremendous market. Sells quickly. Constant repeats. Exclusive territory. Write now for special no-risk offer. Dominant Products, 359 Pearl Street, Dept. P-1, New York.

NEED Money? Get it easy! Sell friends glamorous plastic Christmas cards, other novel assortments. Profits to 100%. Bonus, 50 and 25 for \$1.00, 25 for \$1.95 name imprinted Christmas cards—free sample portfolios. Feature assortments on approval. Special offers. Write Pilgrim Greetings, 111 Summer, Dept. AN-2, Boston, Mass.

NEW Sensational money maker. "2-in-1" knife and scissors sharpener. Nothing like it before. Proven success, 100% profit. 30 second demonstration gets order. Special trial offer. Barberdier, 918 Eleventh, Sacramento, Calif.

CHRISTMAS Cards. Earn \$5.00 with every ten 21 card \$1.00 boxes you sell. Also new plastic cards, personalized cards and stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-7, Pitman, N. J.

BETTER Earnings possible with over 200 household products. You own the business. Send for free samples. Miles Household Products Corp., East Orange 4, New Jersey.

FRIENDLY Social visits bring you big Christmas card profits. Take easy orders wonderful new type plastic, metallic assortments. Send at once for free 48-page catalog. Feature samples on approval and free name imprinted Christmas card sample portfolios. Special offers. New England Art Publishers, North Abington 51, Mass.

HOTTEST Item today. Combination ball pen; cigarette lighter. All gold finish. Year around seller. Suitable men or women. Retail for only \$1.00. Fertig Products, Dept. N-7, Bronx 60, N. Y.

EARN Extra money easily, sell new Christmas cards and Gifts-'n-Things. 24 folder asst. sells for \$1.00, sent on approval; no investment. Get \$50 or more selling only 10¢ boxes. Amazing sample offers. Headquarters for new 3-dimension Christmas cards. Plastics, genuine engraved etchings. We send free samples of easy-to-sell personal Christmas cards and stationery. Pen 'n Brush Studios, Dept. PM, 139 Duane St., New York 13, N. Y.

EARN Big money plus sensational bonus. Be a one person department store. Sell men's, women's, children's apparel and accessories, etc. Free sales equipment. Corporate Merchandisers, Dept. PM-14, 54½ Broadway, New York City.

EXTRA Money! Sell friends Christmas cards—including fascinating plastics. 100% profit. Request free samples exclusive name-imprinted Christmas cards, stationery unobtainable elsewhere with Christmas and everyday assortments on approval. Regal Greetings, Dept. PM-7, Hazel Park, Mich.

4 BRAND New products. Needed by millions everywhere. Samples 50c. information free. Liebig Industries, Beaver Dam, Wisconsin.

HOTTEST 39c Item on the market. Write National Sales & Service, Greenville, Penna.

SHINE Shoes without "polish." New invention. Lighting seller. Shoes gleam like mirror. Samples sent on trial. Kristee 131, Akron, Ohio.

MAKE Extra money fast! Sell Christmas and everyday cards to friends, neighbors, club members, others. Amazing profits. 100 sell-on-sight items. 6 plastic assortments — "Little Stars," "Jack Frost," "Little Ones." Glamorous "Gleam 'n' Glo" metallic cards. "Mild Animals," "Smile Please," stationery, wrappings, juveniles, Christmas trees, gifts. Write today for feature box on approval. Hedenkamp, 343 Broadway, Dept. PM-2, New York.

A Dress yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. A-235, Cincinnati, Ohio.

ELECTRIC Lawn mower. Sample \$59.50 (delivered), or sales kit—Free. Satisfaction guaranteed. Smith Agency, S-2007, Excelsior Springs, Mo.

LOOK Here! Wanted—Men and women to start in business on credit. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. G-192-PPM, Freeport, Ill.

QUICK, Easy cash for you! Sell amazing variety new Christmas cards. Profits to 100%. Novel plastic, 3-dimension "Stage Set," metallic, Christmas carol cards. Gift wraps, animated books, table settings. 14 special offers. Bonus. Write for feature samples on approval and free samples 4 different name imprinted Christmas card lines, floral and personal stationery. Elmira Greeting Card Co., MA-109, Elmira, N. Y.

PLASTIC Tablecloth covers, curtains, drapes, baby pants, bowl covers and other plastic articles selling like wildfire! Make big money now! Free details. Write L & M Co., Dept. 58-G, 510 St. Charles, St. Louis, Mo.

AMAZING Offer—\$40 is yours for selling only 50 boxes Christmas cards. Also 50 and 25 for \$1.00 with or without name. Free samples. Other boxes on approval, including entirely new, different deluxe assortment with feature television card. Cute plastic assortments. Write today. It costs nothing to try. Cheerful Card Co., 774, White Plains, New York.

CALL On friends with sensational Christmas cards in handy assortments. Sell for \$1.00. Profit up to 50c. Also popular-priced personal Christmas cards, everyday assortments, stationery, imported napkins. Samples on approval. Wallace Brown, Dept. A-4, New York 10, N. Y.

SELL Big profit 5x6 1/2 inch stock signs. Write for jobbers introductory offer. Al Hawkins Sign Co., Sioux City 7, Iowa.

PROFITS. Big demand and repeat orders selling rubber mats for home or auto. Free sales plan. Mitchell, Dept. PM7, 2140 San Fernando Road, Los Angeles 41.

STOP The music. Original titles mystery melodies \$1.00 year. Mitchell, Box 175, Huntington, W. Va.

MOVIE Projector 16mm sound. Sell churches, schools, industry. Big profits. Write N. Jessen, 5 S. Wabash, Chicago 2, Illinois.

PAINTS - Enamels, roofing 65c gal. up. Your name on label. Certified Products, 812E 38th, Louisville, Ky.

GREETING Card bargains. Gift wrappings, stationery, notes, novelties, plastic cards. Personalized Paper Products, Raum, 4154g Fifth Street, Philadelphia 40.

BEAUTIFUL Bright red extinguisher. "Fire Doctor." Fifteen inches tall, hangs on wall. Dry chemical forms carbon dioxide gas. Fastest \$2.00 seller. Will send postpaid two "Fire Doctors" and literature anywhere U.S. only \$2.00. Agents averaging four sales per hour. Marvel Chemical Products Co., Cortland, New York.

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WAGE Earners records. Business cards. Samples free. Goerke, 524 E. Seventh, Long Beach, Calif.

FREE Samples. Big profits showing amazing Glow-in-the-Dark specialties. House numbers, pictures, plastic novelties, religious and nursery objects, etc. Large manufacturer. Madison Plastics, 303 Fourth Ave., New York 10, N. Y.

BUY Thousands of nationally advertised products direct from manufacturers and distributors. Write for "Buy Direct and Save." Service Publishing, 218-A Investment Bldg., Pittsburgh 22, Penna.

MUSIC Greeting cards. All occasions. Dorby Music Cards, P.O. Box 738, Morristown, New Jersey.

FREE! Big cash contest. Sensational offer. Make more money selling plastic Christmas cards. 50 and 25 for \$1.00, imprinted. Fast selling line. Bonus. Free contest entry and portfolios. Richar, 16A East 18th, New York 3.

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SENSATIONAL Non-electrical burglar alarm for doors or windows. Untouched market. Retails \$2.95. Millions of prospects. Earl Denton Co., 221 N. LaSalle, Chicago.

FIRE Extinguishers, pressurized liquid. Sells \$2.00. Costs \$1.00. Free details. Firecom, Southport, Connecticut.

SELL Printing in your spare time on commission basis. Send for free sample outfit and details. Baynas Press, 3752 N. Cicero Ave., Chicago 41, Ill.

NYLON Uniforms. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P7, 3936 Market, Philadelphia 4, Penna.

RIBBONS—Sell 10c hanks everyday and Xmas ribbons with your line greeting cards. Price 3c each gross lots. Samples 10c. Wotring Co., Catasauqua, Penna.

UP To \$100 daily selling "Quick De-Tarnishing Atomic Metal Plates." Instantly cleans silverware, jewelry, metals. Sensational demonstrator. Wholesale, retail, sideline, spare, full time. Mfgs., 508 New York Street, Aurora, Ill.

SCISSORS Sharpeners. Fast 25c seller. Mar. 74 Park, Webster, New York.

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BE First! Clean up selling brilliant new, metal Christmas cards featured in America's greatest box assortment line. Special metal, plastic, foil and novelty assortments. Five portfolios of personal cards. Fast imprint service. Free samples. Elmcraft Chicago, 5930 South Western, Chicago 36, Ill.

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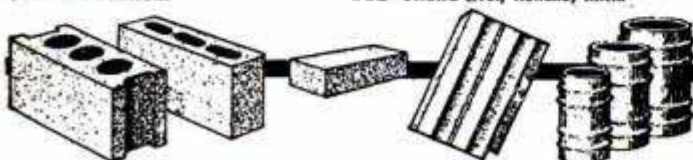
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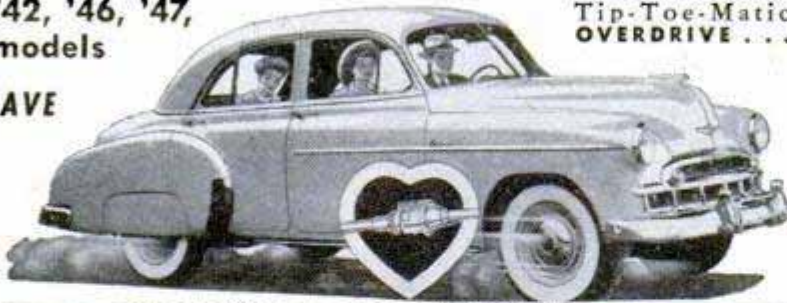
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22x21 1/2"	12 lb.	\$1.95
23 1/2x27"	15 lb.	\$2.45
22x29 1/2"	16 lb.	\$2.95
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HI-SPEED GRINDER (not pictured) has 2 step pulley driven thru rear or base
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1/4", 3/16", 1/4"	9/16" per ft.	4c
(your choice)	3/4", 1", (your choice) per ft.	6c
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 Our price.....

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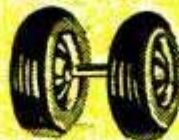
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Good for boats, scooters, wheelbarrows, etc. Stock #536

2.75 x 105/8" & 1/2" bore	\$ 4.50
4.00 x 85/8"	\$10.95
10 1/2" x 4, 6 ply 3/8"	\$ 8.95
14 1/2" x 5, 6 ply 1"	\$10.95

New airplane tires, tubes and wheels with high speed Timken Hyatt ball bearings.
 Stock #544. 800 x 5-6 ply 1"..... **\$14.50**
 1700 x 20" 12 ply TUBES. Stock #545. **\$44.50**
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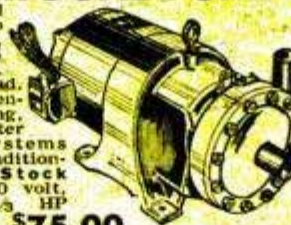


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3 phase motors. All models 1/2 HP to 1 1/2 HP. 220 volts. Motors totally enclosed—ball bearing. Stock #541. 40% off list price.



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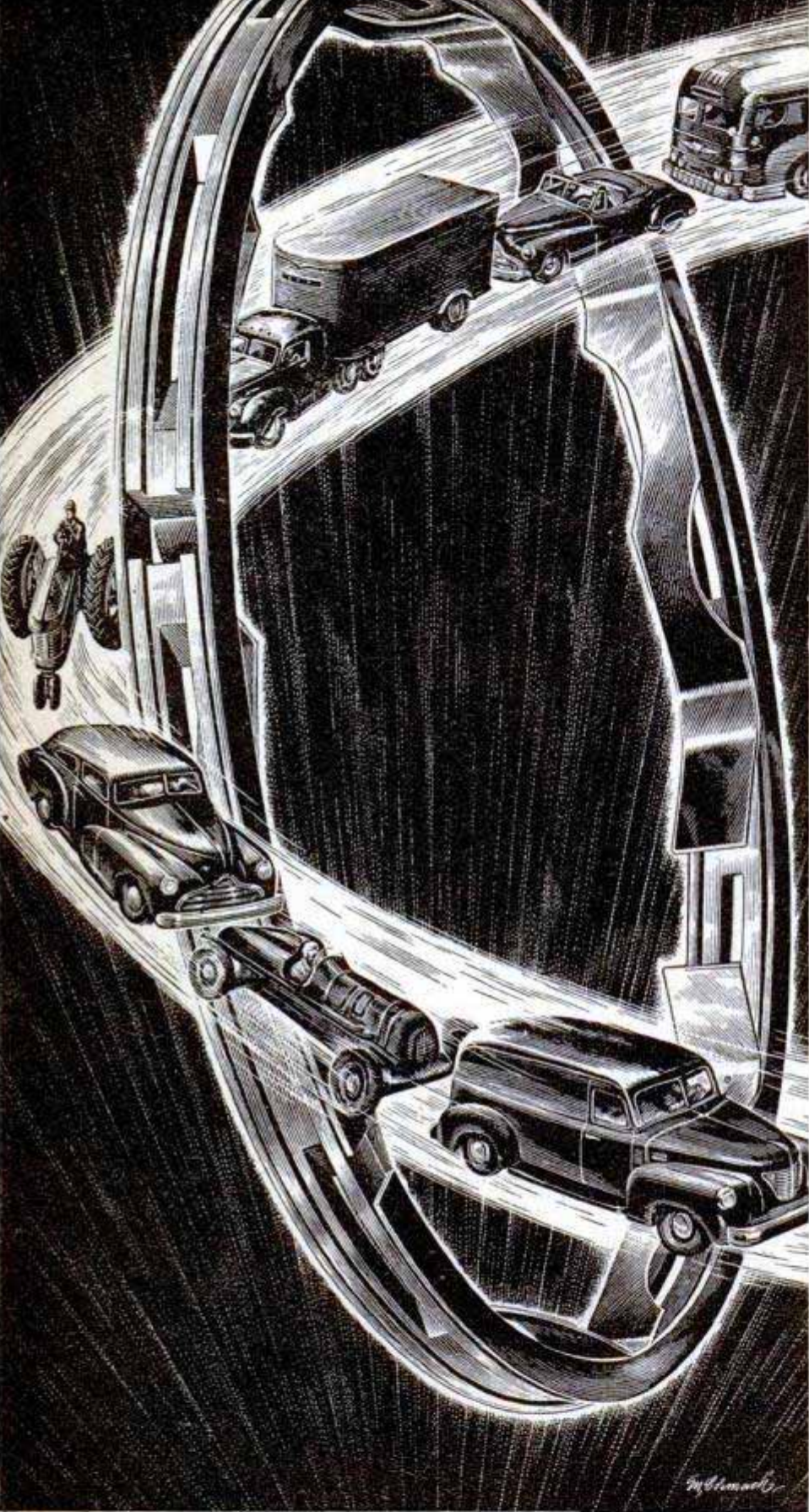
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JULY
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WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 92 NO. 1

Passenger Rocket

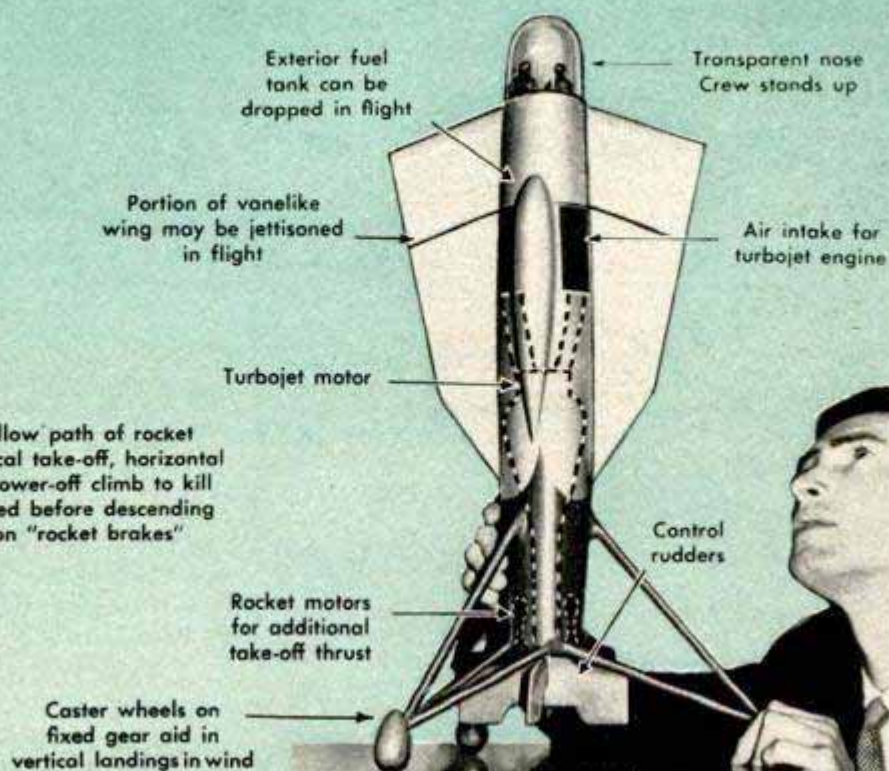
By Thomas E. Stimson, Jr.

A WINGED ROCKET that carries a crew of two in its transparent nose has passed its initial tests in model form and can be built at any time. That's the assertion of Stanley Hiller, Jr., West Coast helicopter manufacturer, after months of research in which the rocket and its control system were developed.

The man-carrying rocket would rise straight up from the ground, lie over on its side to fly and maneuver like an airplane at speeds up to 600 miles per hour, and would "back down" against its motor thrust to land gently on a three-point landing gear attached to its tail.

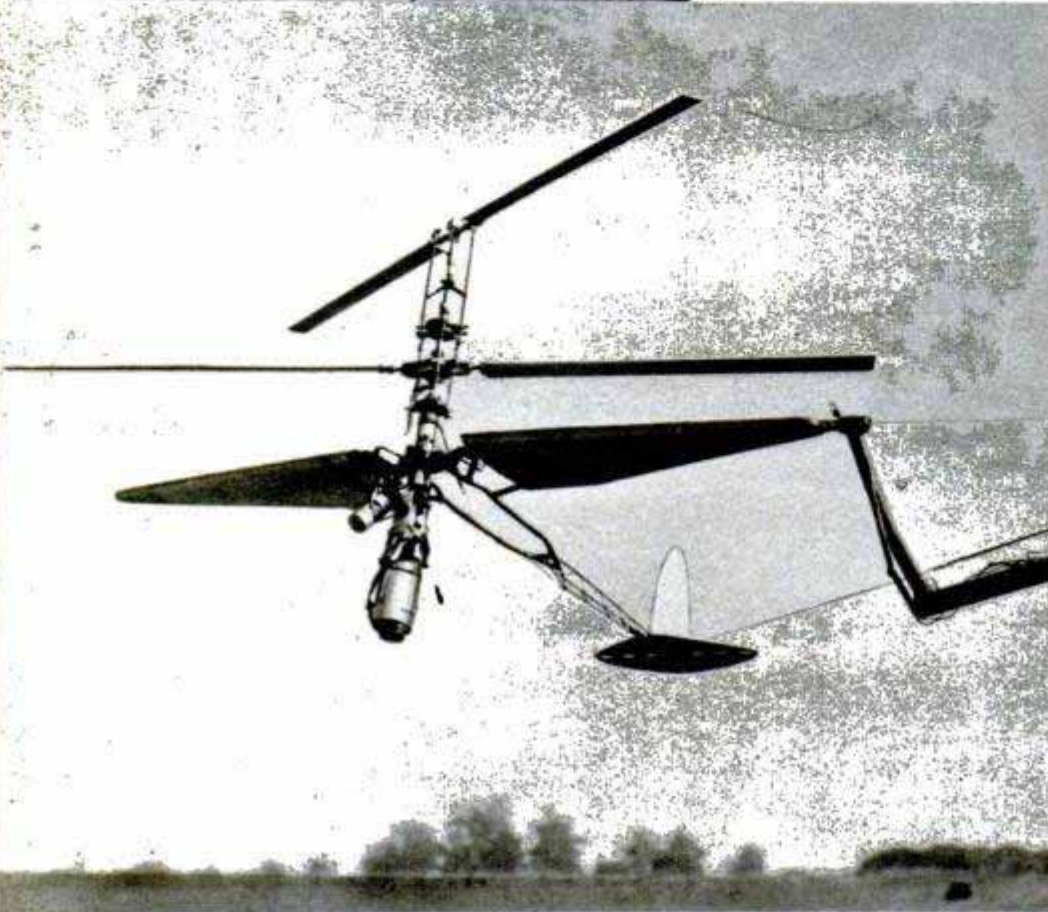
The proposed full-size vehicle would be 30 feet tall. It would resemble a V-2 rocket with a pair of small vanelike wings and a fixed landing gear attached. Two exterior streamlined drop tanks would carry sufficient fuel for one hour of flight and could be detached from the rocket in flight when emptied. Additional fuel would be carried inside the rocket's body.

The VJ-100 would be powered with a 6000-pound-thrust Rolls-Royce

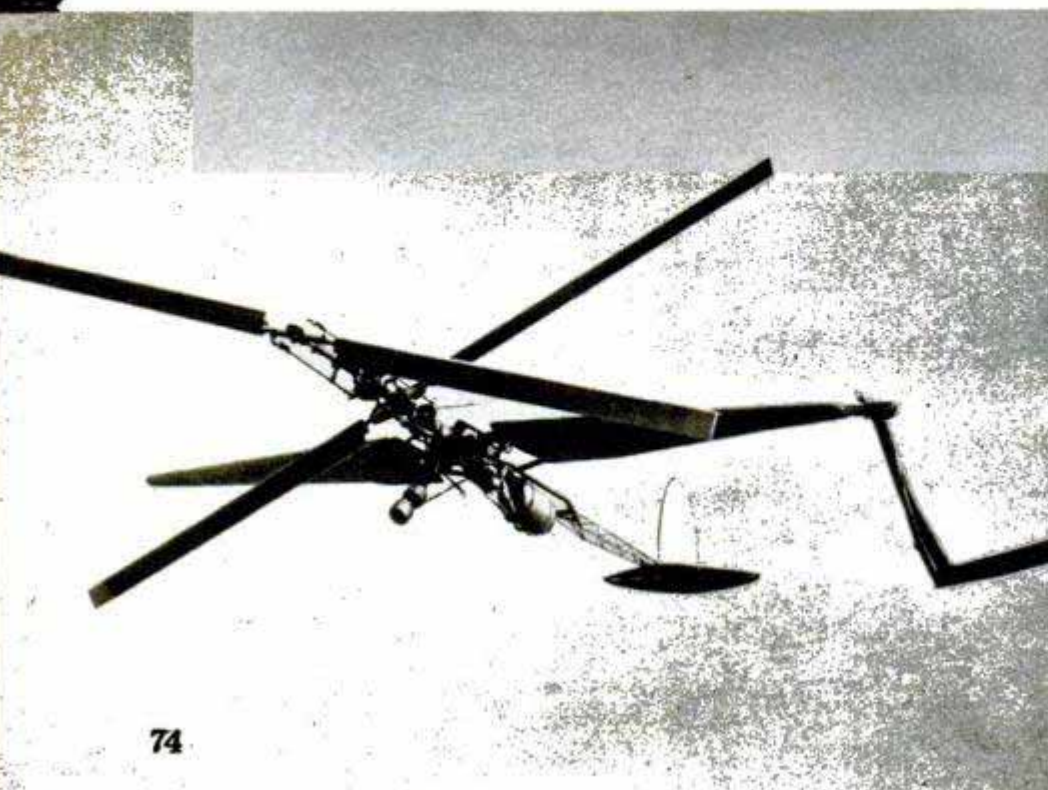


Arrows follow path of rocket through vertical take-off, horizontal flight and power-off climb to kill forward speed before descending to earth on "rocket brakes"

Stanley Hiller, Jr.



Hiller's man-carrying rocket stemmed from research with craft above. It resembled conventional plane but had overhead rotor blades for both upward and forward flight. Below, blades tilted for forward motion. Craft's motor was swung back into fuselage to maintain proper center of gravity



"Nene" turbojet engine and four liquid-fueled rocket motors. The latter, firing through the tail, would provide 5000 pounds of additional thrust for lifting the 11,000-pound craft vertically from the ground. The rocket could accelerate vertically at speeds up to 4.8 feet per second. Since air is required for operating its power plant, the craft would not be a space ship that could leave the earth's atmosphere.

After attaining altitude and speed, the booster rockets are shut off and the craft is laid over on its side for cruising on its turbojet. The vestigial wings have enough surface to provide full lift for horizontal flight at speeds above 200 miles per hour. They also serve as stabilizers when the craft is being backed down to a landing.

Both the pilot and passenger are strapped side by side in a standing position in the nose for the ascent, and lie prone when the craft is in level flight. Cockpit controls similar to those of a conventional helicopter are used for all maneuvering.

To prepare for a landing, the pilot reduces the power and points the rocket's nose upward in a climb that kills his forward speed. He then backs down to the ground at a controlled rate of descent, using blasts of the turbojet or the rocket motors to almost equalize the pull of gravity.

Tests have shown that there are no difficult control problems in holding the rocket balanced in a vertical position during the descent. Provision is made for jettisoning the cockpit capsule and the forward part of the wing during flight, after which the crew would descend by parachute. This emer-

gency measure is common to most aircraft in the 600-mile-per-hour speed range.

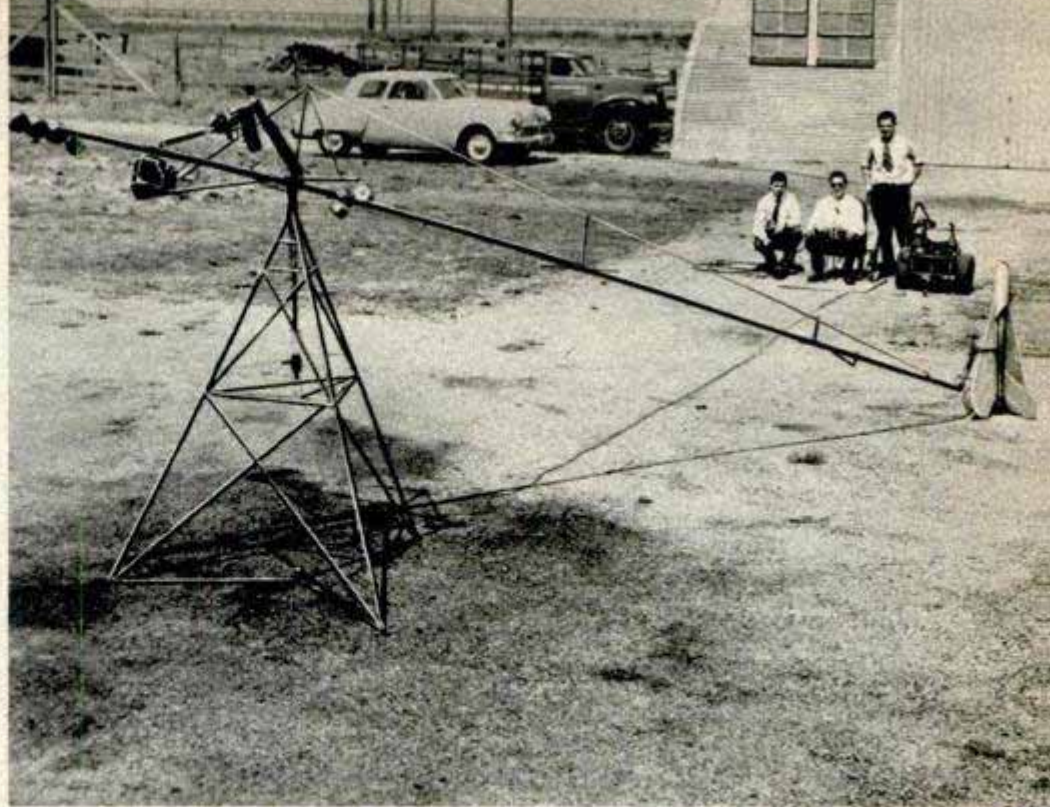
Design of the rocket is the outcome of research by Hiller's company, United Helicopters, Inc., of Palo Alto, Calif., to create an air vehicle that has an exceedingly high ratio between top speed and landing speed. This ratio is only five or six to one for the fastest conventional aircraft.

The first attempts to improve this ratio were embodied in a "convert-a-plane," a craft resembling a conventional airplane and equipped with a pair of overhead coaxial helicopter rotor blades. These blades would lift the craft up from the ground to a desired altitude and would then be tilted forward to operate like ordinary airplane propellers for producing forward flight.

Models of the convert-a-plane were put through exhaustive runs on dynamic test stands. Though the idea proved feasible, it was dropped because of several complications, including the mechanism required for changing from helicopter to fixed-wing operation.

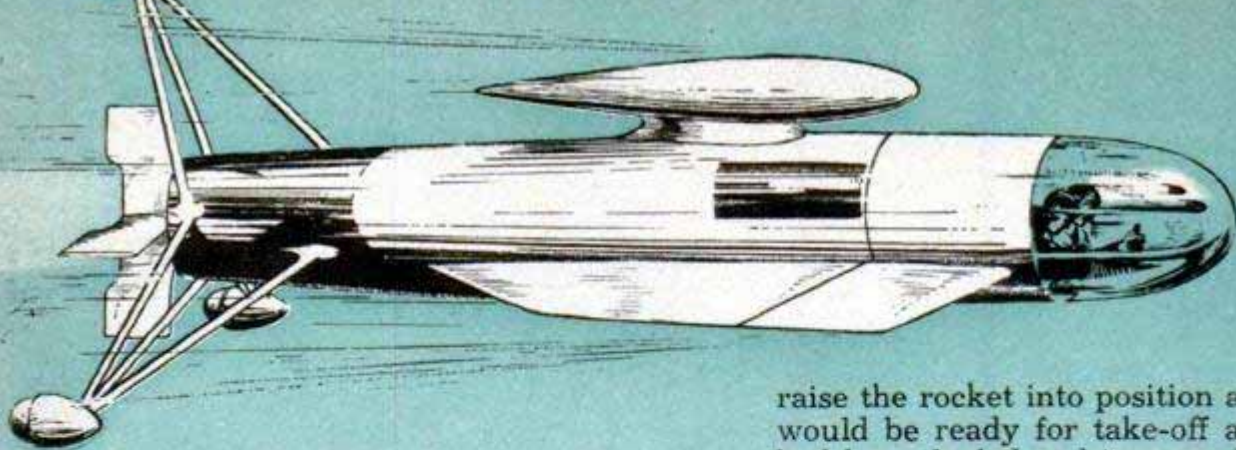
Jet propulsion seemed to be a simpler idea because the same jet can be used to provide vertical lifting force and the thrust required for forward flight. Jet-powered models were studied both on test stands and in free flight, with results indicating that the basic design of the rocket, its power plants and control system are practical.

Hiller foresees one potential use of the VJ-100 as a high-speed military photo-reconnaissance aircraft that could be towed on a trailer to any desired operating point. An elevator on the trailer would



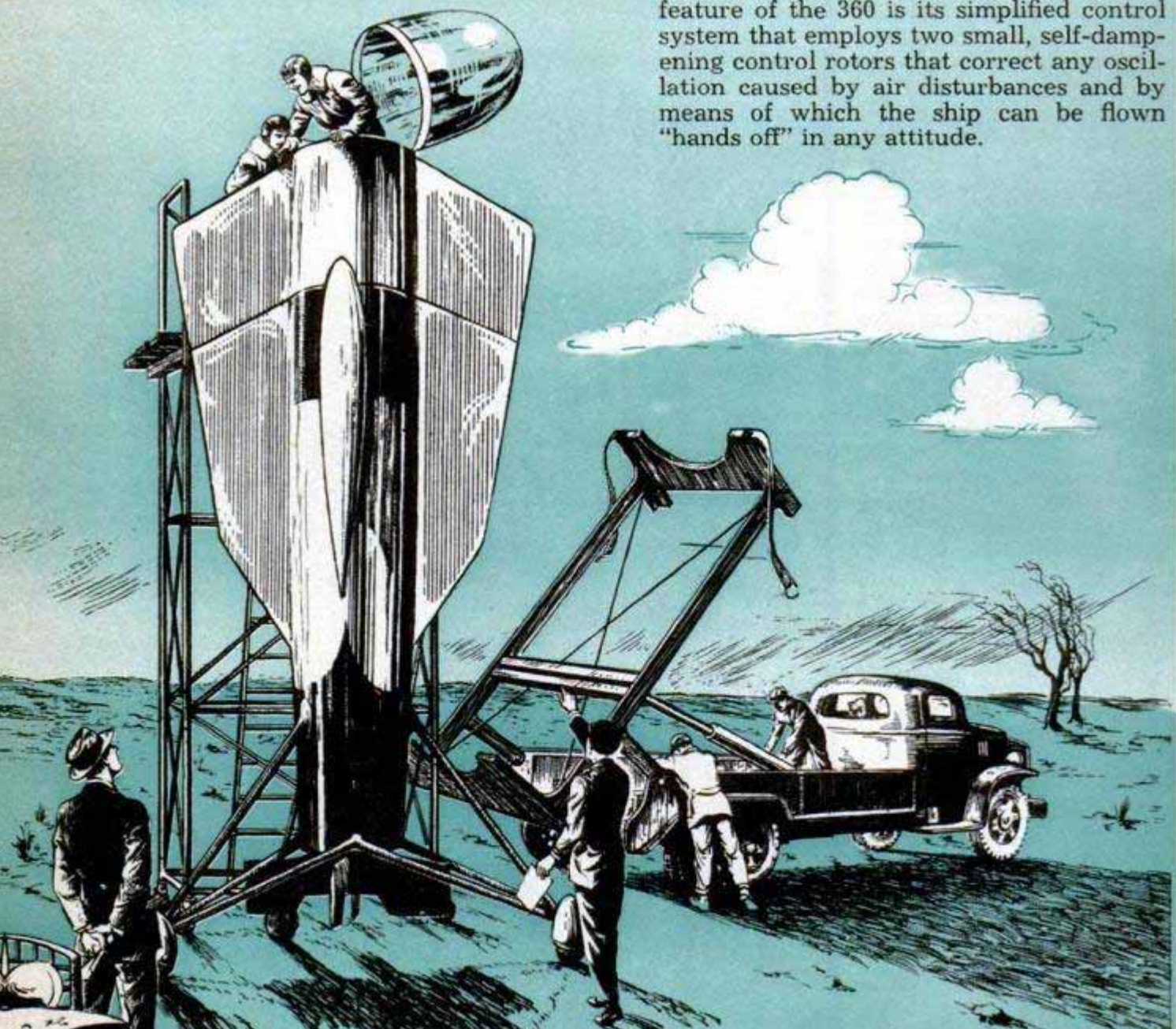
Operated by middle man in background, test stand forerunner of VJ-100 tilts over on its side and flies in circles. Experiments indicated ship had enough stability to back safely down to earth, at low speed, against the jet thrust. Below, the model whirling around stand in level flight





Above, after vertical take-off, with crew standing upright, craft is put over on its side for level flight on single turbojet engine. Landing gear would stay in fixed position

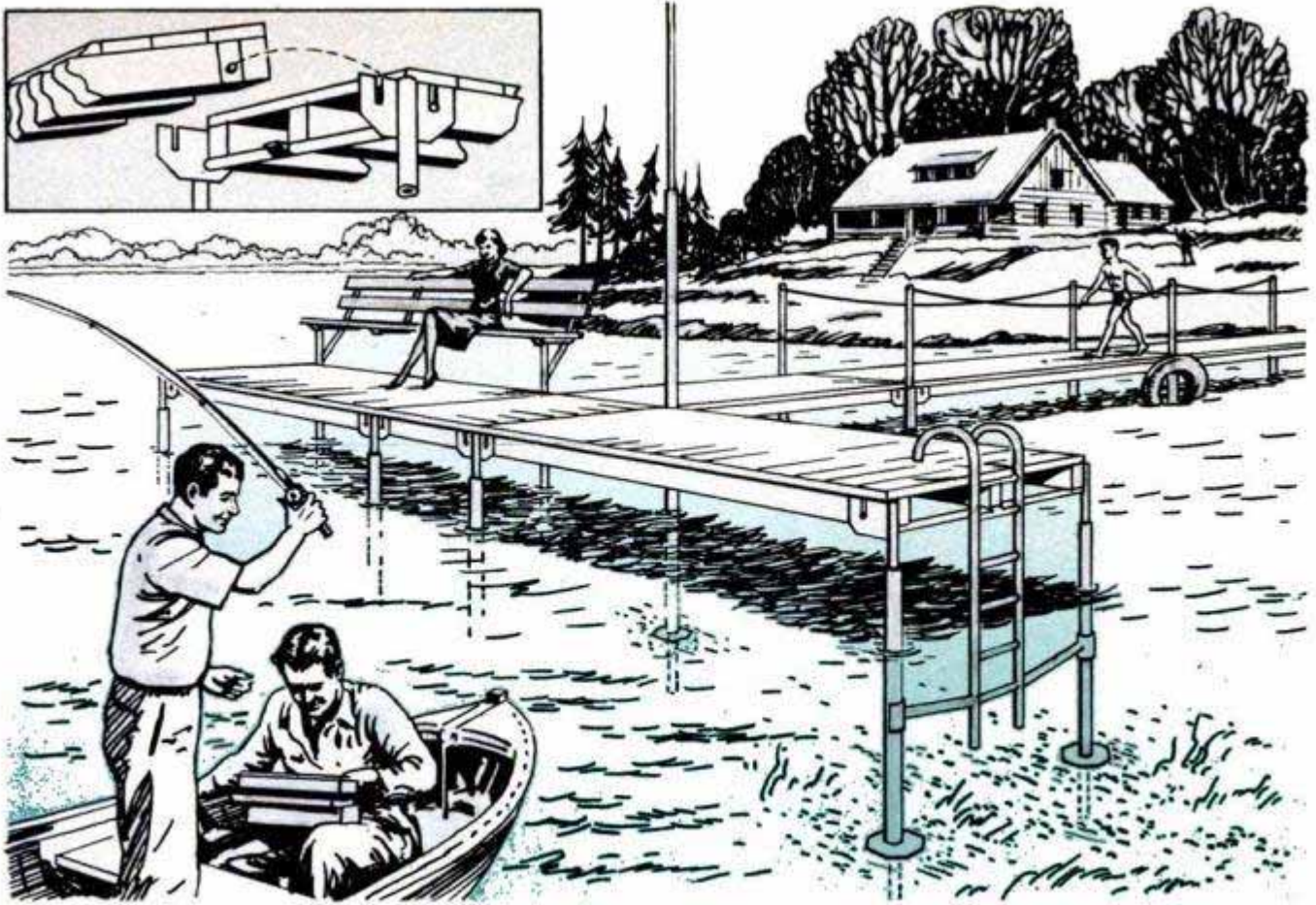
Below, man-carrying rocket could be unloaded in this fashion for photo-reconnaissance assignment. Any flat field with radius of 25 feet could be used as temporary operating base



raise the rocket into position and the craft would be ready for take-off as soon as it had been fueled and its crew had climbed on board. Any flat piece of ground with a radius of 25 feet would be suitable as a launching and landing platform.

In addition to conducting an intensive research program, United Helicopters is in production of the Hiller 360 helicopter at the rate of one ship every other day. Carrying 3 people, the 360 has a top cruising speed of 84 miles per hour, a ceiling of 9900 feet and can cruise for 2½ hours.

As a duster or other cargo-carrying vehicle the 360 can carry a pay load of 551 pounds in addition to the pilot plus sufficient fuel for an hour of flight. One unique feature of the 360 is its simplified control system that employs two small, self-dampening control rotors that correct any oscillation caused by air disturbances and by means of which the ship can be flown "hands off" in any attitude.



Prefabricated Dock Is Assembled Without Bolts

Portable and demountable, a prefabricated dock is made in sections which are assembled without bolts, producing a sturdy, self-aligning boat dock. A variety of designs can be worked out with the sections which come in 9 and 11-foot lengths. Supports for the dock are two-piece, galvanized-steel pipes that telescope for adjustment. A shiftproof base plate and pin hold the dock supports in position.

Also available is a variety of accessories such as flagpoles, benches and ladders for use when the dock is built as a lake-front swimming enclosure. The wood decking comes in completely assembled sections or, if you prefer, you can buy the metal framework and install the deck yourself. Dock designs ranging from a one-boat landing to a U-shaped boat well can be formed with the prefabricated sections.

POTATO HARVESTER made in England can be operated by one man. Potatoes are scooped into the machine and lifted into a rotating drum which knocks off most of the dirt. Machine will harvest four acres of potatoes in a day. Needed in a hurry to harvest a crop, it was finished five weeks after plans were received from Sweden

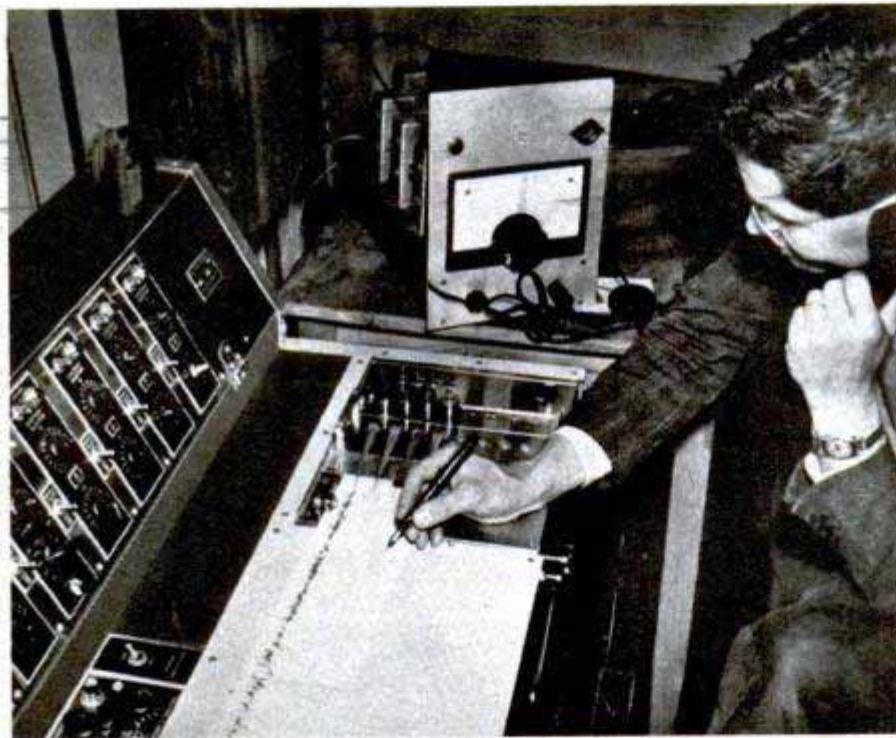
British Information Services photo





Dogs Go "On the Air" To Help Scientists

Dogs are on the radio at Bar Harbor, Me., but for science rather than for entertainment. At the Roscoe B. Jackson Memorial Laboratory, scientists are carrying out research in animal behavior with the help of battery-operated transmitters that broadcast the dogs' heart beats and respiratory rates while the animals run free. A shoulder "holster" is strapped on the dog to carry the portable transmitter. Broadcasts are picked up by a receiver and recorded on a paper tape. Formerly, the animals were held on a table while their reactions were studied. With the new recording system, the emotional responses of dogs are more natural.



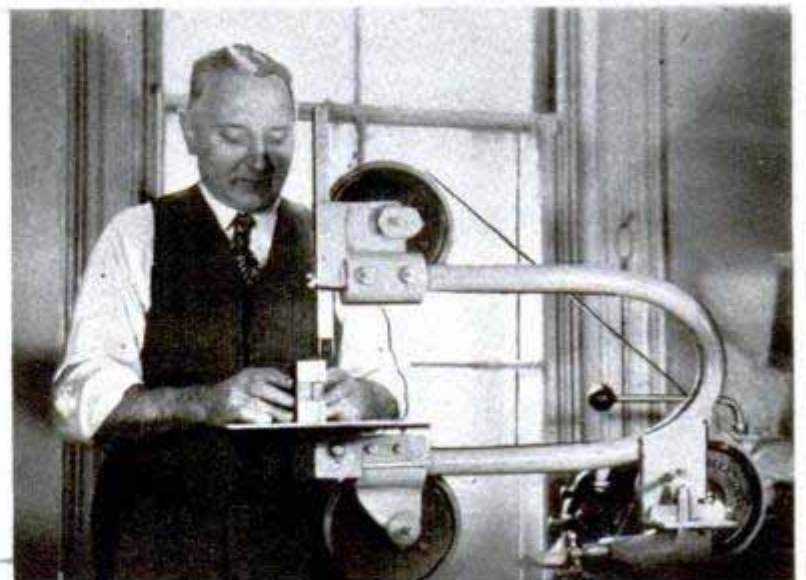
2,4-D on Vegetables Keeps Them Fresh

Cauliflower sprayed with 2,4-D, a growth-regulating hormone, retains its freshness in storage for a longer period, according to the Department of Agriculture. A preharvest treatment of cauliflower has reduced leaf dropping from 80 to 10 percent. The vegetables were stored for six weeks at 33 degrees Fahrenheit.

Three-Wheel Bandsaw Mounted on Lathe

Attached to the tool post of a lathe, a bandsaw takes advantage of the lathe's back-gear system to provide various speeds for cutting different materials. The saw will cut to the center of a 36-inch circle and will take stock up to six inches thick. One of the band wheels is chucked in the lathe and used as a driver. The lathe's cross-feed carriage tightens the blade.

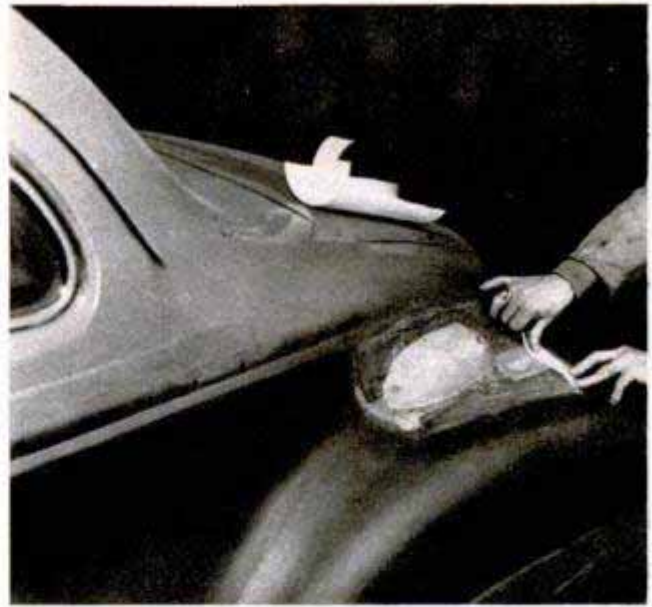
☐ Insects destroy over five percent of all cereal foods in storage.





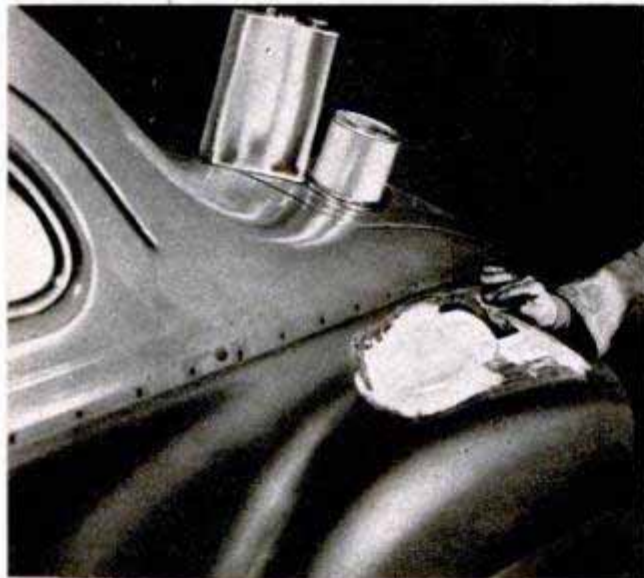
Rusted out and weakened area on top of a rear fender first is sanded to provide a clean surface for patch

Coating of cold solder is applied over the patch. When hard, it is sanded smooth by hand or machine



Patch fabric is dipped into a solvent, which softens it, and then smoothed neatly over area to be patched

Fender is painted with brush or spray enamel and shows no trace of the neat fabric and metal patch



Fabric-Metal Patch Repairs Rusted Car Bodies

Areas on car bodies that are rusted out can be filled in and repainted to look like new with a fabric and metal patch kit. The damaged section of the car is sanded smooth and clean. Then the patch material is dipped into a special solvent and applied over the hole, where it dries into a hard

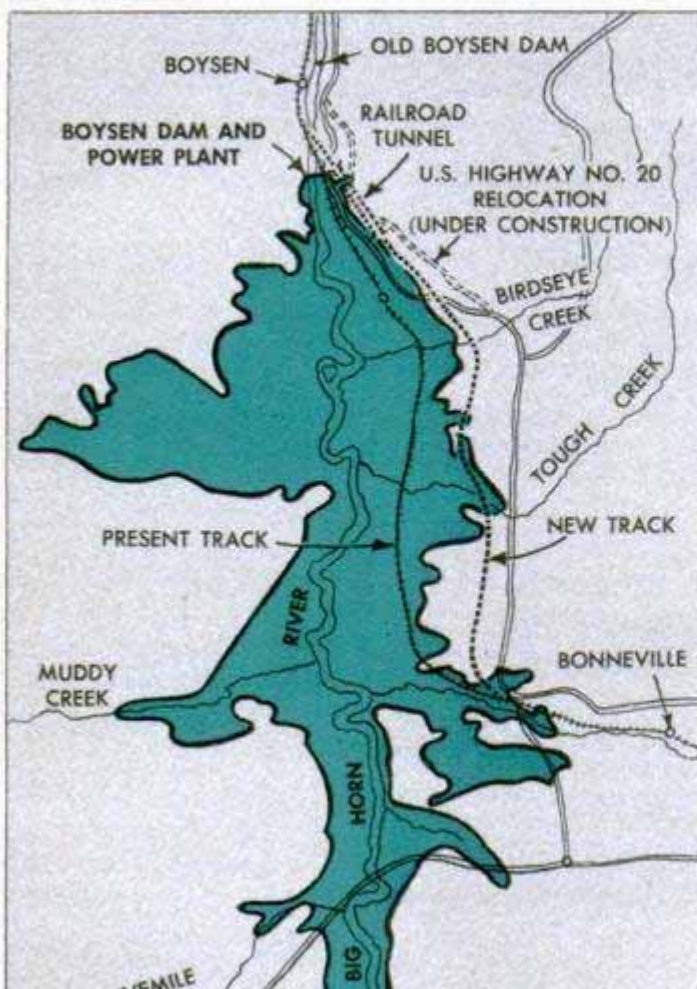
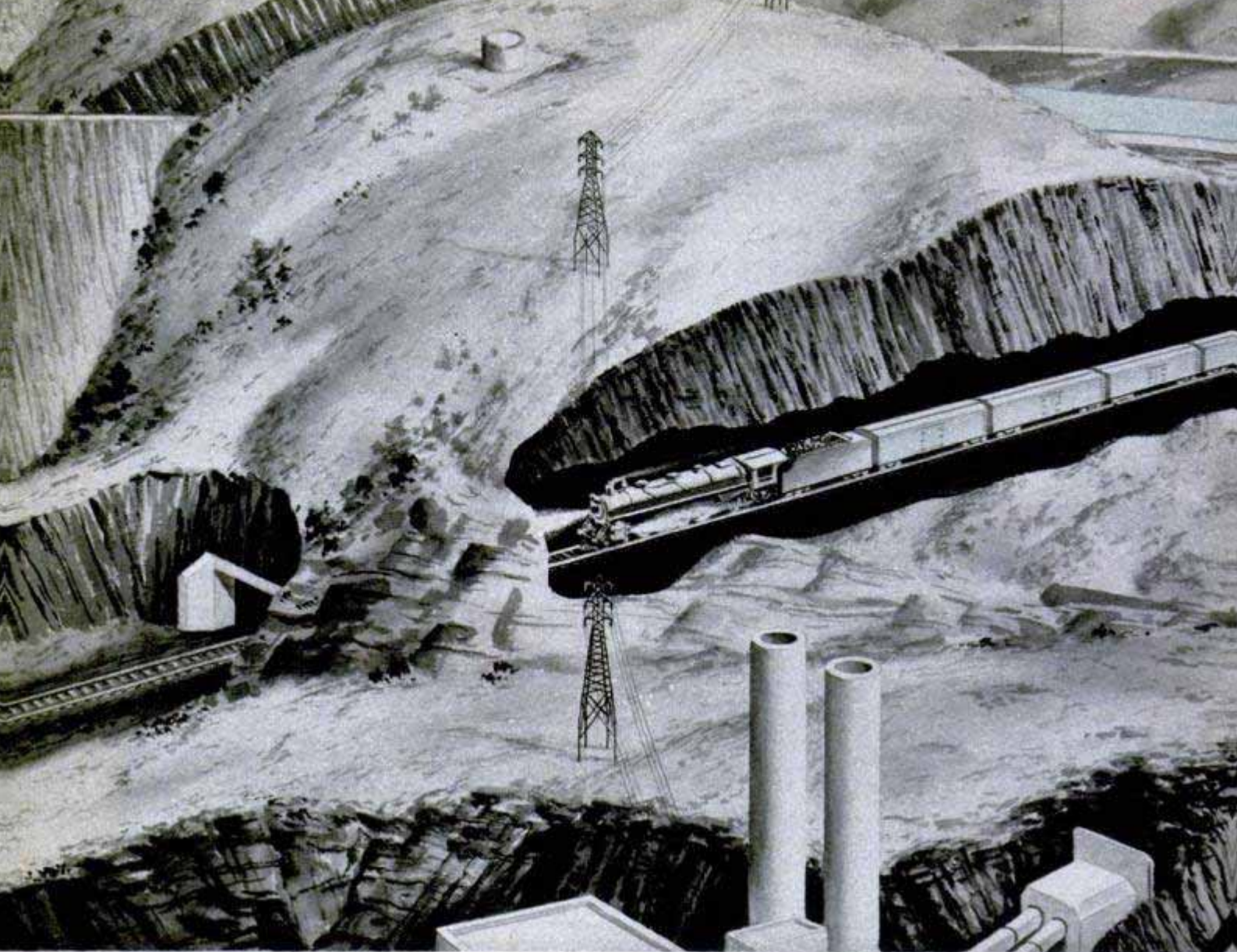
surface. A cold solder is spread across the patched area and allowed to harden. Then the patch is sanded smooth and painted. The patching kit also can be used to repair wood, plaster or concrete around the home, dented refrigerators, stoves and leaky water tanks.

Thin Concrete Forced Into Pavement Prevents Highway Damage

Pavement breakdowns that disfigure many miles of American highways are prevented by a new cement slurry developed at Purdue University. The principal cause of damage to highways is "pumping," a name given to the process where soil and fill are forced up through the pavement between cracks. The resulting void beneath the highway causes the pavement

slabs to break down. The new cement, a combination of portland cement and calcium aluminate cement, is mixed to a consistency almost as thin as water and forced through pavement holes. It hardens quickly, and is practically impervious to water.

☐ Your chances of being injured while in an elevator are less than one in 100 million.

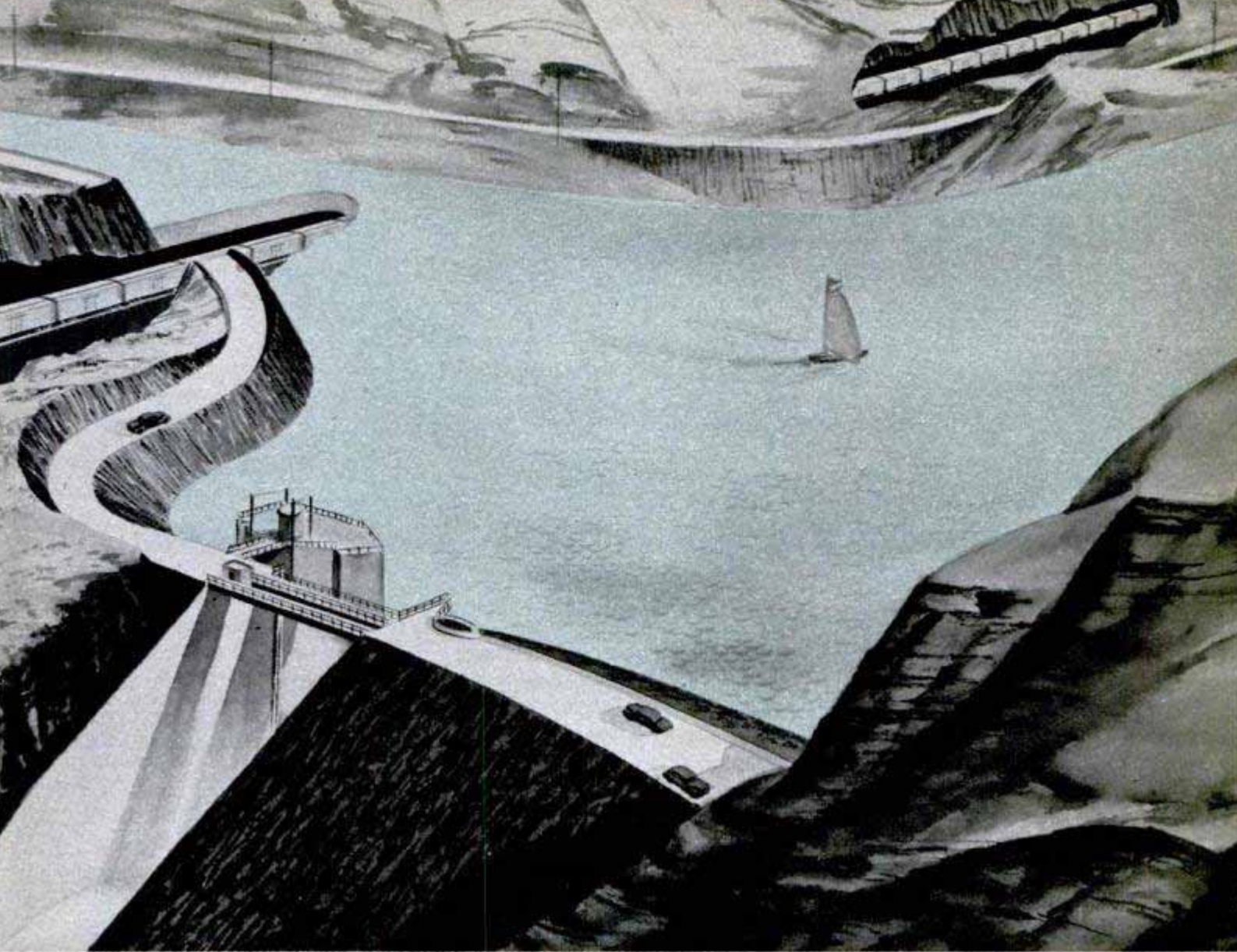


Railroad Under a Lake

TRAINS between Billings, Mont., and Casper, Wyo., soon will plunge through a tunnel $1\frac{1}{3}$ miles long, passing beneath the reservoir to be created by Boysen Dam.

The dam is being erected by the U. S. Bureau of Reclamation. The existing tracks of the Chicago, Burlington & Quincy Railroad must be relocated because the reservoir will inundate part of the present right-of-way. The new track will pass directly under one bay of the big reservoir.

Trains will duck into the tunnel where the Big Horn River enters Wind River Canyon and will emerge below the dam. The 12 miles of new track bed and the tunnel will cost an estimated \$1,000,000 per mile, with the total railroad relocation project costing about \$13,000,000. This is nearly half of the estimated \$28,000,000 cost of the entire project including the dam.



Puffing through the new tunnel, trains will pass beneath one arm of the lake created by the new Boysen Dam

Present plans call for the tunnel to be completed about the end of 1949, with trains using the new track early in 1950.

Engineers who are building the new tunnel have encountered difficulties they didn't anticipate. A quantity of "silt rock" lies directly in the tunnel path. This is an earth material that appears hard and flinty but flakes off when exposed to the air and turns into slime when soaked with water. The original plans for the tunnel called for eight-inch beams four feet apart to support the roof and sides, but now the engineers are placing the beams only a foot apart in the weaker sections.

Despite this precaution there are places where the rock formation has slipped down on the beams, twisting and bulging them. Reinforcements in the form of steel and concrete bars are being set in place to overcome these weak areas.

Boysen Dam will be a multiple-purpose structure 150 feet high. It will be an earth-and-rock-fill dam about 1000 feet long at the crest, containing 1,400,000 cubic yards of fill. The dam will build up a reservoir

covering 31,300 acres of land, most of which now is used for grazing.

Primarily, the dam will be used to generate power. Engineers are installing two generators with a combined capacity of 15,000 kilowatts. About 6500 kilowatts of this total will be "firm"—available the year round. The remainder will be available depending upon the water flow through the river, and will be used whenever there is sufficient water to turn both generators. Enough water will pass through the two turbines to keep up the normal river flow.

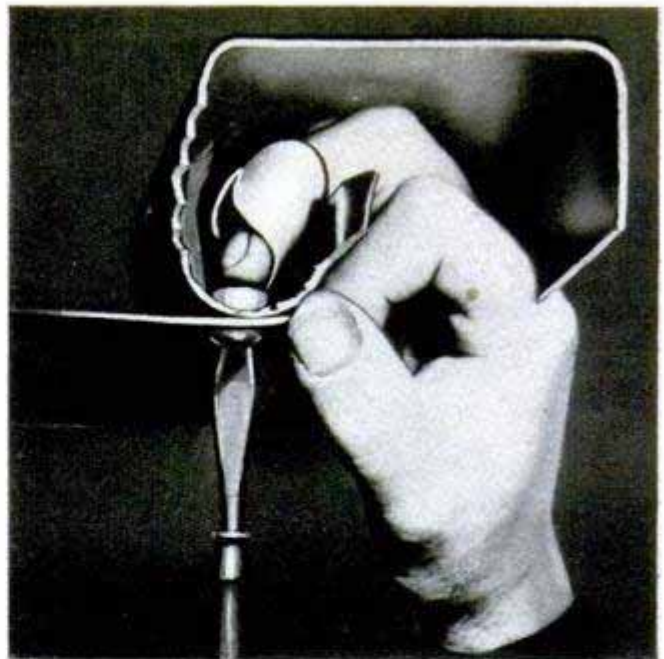
The capacity of the reservoir will be about 1,493,000 acre-feet of water. Reclamation officials say the regulation of the stream by the new dam will benefit irrigation projects both up and downstream. The top 27 feet of storage space in the reservoir will be set aside for flood control.

In one way, previous railroad facilities will aid in the new project. A tunnel bored years ago for the railroad will be used as the penstock or tunnel through which water will drop from the dam to the hydroelectric plant.



Bent-Stem Pipe Rests on Chin

There's no strain on your teeth or jaw when you use a bent-stem pipe that rests comfortably on your chin. A gentle curve in the stem fits against the chin, permitting the pipe to be held in the mouth with very little pressure.



Thimble Wrench for Tight Spots

Worn like a thimble, a finger tool solves the problem of getting at a nut in those hard-to-reach places found in ranges, automobile bodies and other sheet-metal products. The flanges fit snugly around the finger and the wrench-size opening at the tip of the tool grips the nut.



Musician tests tone of rosewood bar after cutting it on bandsaw. Right, finished bars are exactly in tune

Marimbas Tuned With a Bandsaw

Marimbas now are tuned with a bandsaw. The exacting process of tuning the rosewood bars was accomplished in the past by shaving away the underside until an arch was produced. Then the bar was cut and scraped until it resonated at the proper pitch. Recently, an enterprising Chicago manufacturer tried a bandsaw as a means of bringing the bars to pitch in the hope that this would speed manufacture. Now, an accomplished musician feeds

the bars into the bandsaw, following a jig template. At one pass the bar is arched. It then is struck with a hammer and the tone compared with a standard note. Two or three passes usually are necessary. With the bandsaw, a bar can be tuned in less than one minute, compared to seven minutes with the best previous process.

☐ Electronics experts have discovered that the mysterious radar reflections or "blips," which have baffled them for years, are caused by insects flying in the beam.

Folding Plane Seats Provide Cargo Space

Folding airplane seats have been introduced to accommodate varying loads on cargo-passenger runs to Alaska. They are collapsed by pushing the backs down and turning the armrests inward. Each two-seat unit is folded against the cabin wall. The steel framework of the seats forms posts for cargo lashing to supplement the tie-down rings inserted in the floor.

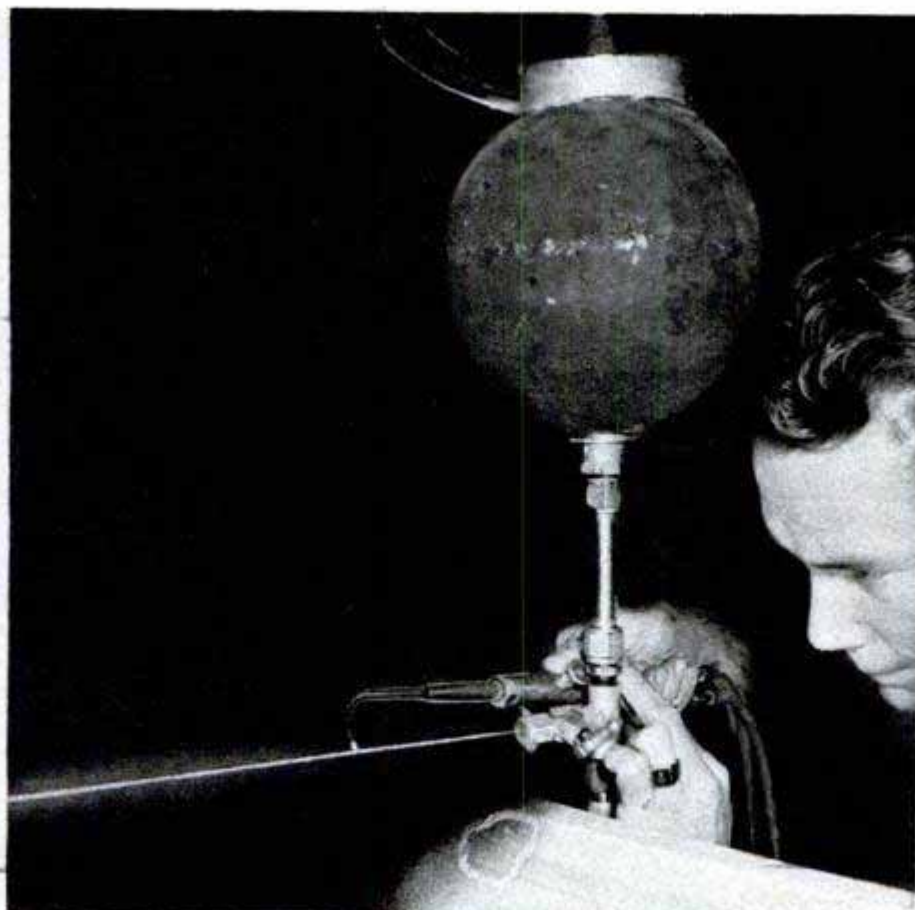
Supersensitive Vacuum Gauge

By means of the ionization gauge it is possible to measure a vacuum so high that all but about a trillionth of an atmosphere has been removed, General Electric researchers announce. During the war, when advances in electronics brought increased activity in the field of vacuum production, high-speed pumps were developed for use at the low pressure of one millionth of an atmosphere. In the



Northwest Airlines photo

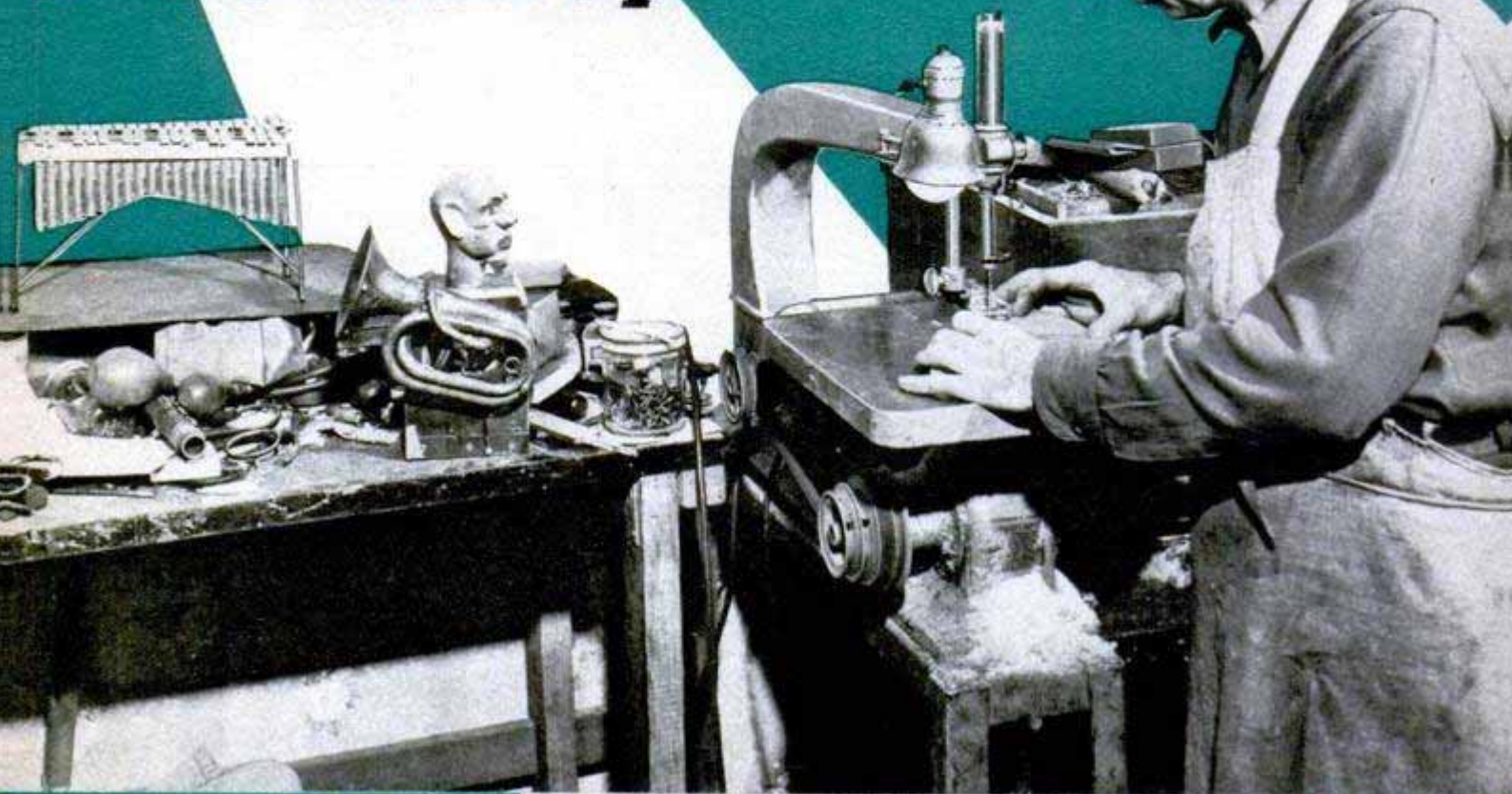
laboratory it is possible to produce vacuums that would have to be increased at least 10 trillion times to raise them to normal atmospheric pressure.



Hydraulic Fluid Is Fire-Resistant

Airplane hydraulic fluid, essential to modern planes, has been made fire-resistant, reducing fire hazard. Hydraulic fluid is used to operate such devices as retractable landing gear, brakes, wing flaps and even windshield wipers. In one test, a thin stream was passed through the flame of an oxyacetylene torch. It failed to ignite until the torch was held at some distance from the sprayer orifice and even then it flashed only momentarily. When introduced into an existing fire under the proper conditions, the fluid will burn, but it does not support combustion, going out when the existing fire is removed.

***the floor show
that grew in
a workshop***



Pete Evans develops a hilarious new gag in his workshop. Who knows what that small bald head will be? Probably not even the entertainer himself at this stage in the development. Below, left, Evans and his pals perform their gags on a crowded little stage. Some of their instruments are real, altered for their purposes, and some are homemade. Below, when Evans sits down, a stool built into his coat falls into place



Photos by
Grant and Marjorie Heilman

A FLOOR SHOW so zany that the patrons are flocking to a Pittsburgh night club was born and reared in a cluttered workshop.

Before the war, Pete Evans was just a happy night-club entertainer who happened to have an amateur interest in puttering around a workshop. But after he spent his war years as a welding instructor, a mechanical revolt took place in Evans' night-club act, for he suddenly discovered he could mix his hobby with his floor show. The result is a screwball act so funny that it tickles the patrons into tear-streaked laughter.

Evans turns out the absurd mechanical devices for his show in a crowded workshop above the night club. During his off hours you'll likely find him in the shop, tinkering with everyday items to convert them into new and still funnier gimmicks.

Most of the props used in the act are perfectly sane, respectable items which Evans has rebuilt into entirely unpredictable props. For example, all of the musical instruments play real music, but they also are likely to explode, spray water on the customers or even smoke cigarettes.

Evans and his three partners, Jack Peck, Tiny Miller and Walter Camarada crowd onto a stage only five feet square and put

Scroll of cello suddenly opens to reveal a mouth. Then it calmly puffs cigarette supplied by Evans



Comedians play Oriental music and a snake weaves wearily out of a kettle

these countless hilarious props through their paces to entertain the patrons.

Tiny Miller's eyeglasses seem innocent, but suddenly come alive to act out some of the songs. When Tiny sings "I Cried for You," the glasses spout tears. When he changes to "Smoke Gets in Your Eyes," a cloud of smoke pours from the frames.

The glasses have standard frames, but along the frames is a piece of copper tubing drilled with small holes. A rubber hose runs behind Tiny's ear and down beneath his coat to Pete Evans, who is armed with a glass of water and a cigarette to produce the spray of tears and cloud of smoke.

During the hilarious act Evans becomes the victim of his own cleverness. The bass horn he plays suddenly shoots a stinging spray of water into his face. The secret is an extra valve he has installed in the horn, a valve made from an old soda siphon. The valve is attached through tubing to a small tank partially filled with water and then pressurized with a tire pump. Press the valve and the water shoots out of the horn.

During one act, the performers play Oriental music on strange homemade instruments while clustered around a kettle. Suddenly a snake rears up out of the kettle and wearily dances to the tune. The audience, naturally, can't see the string that holds up the snake.

Jack Peck interrupts his violin playing when his violin suddenly breaks in half, revealing a row of white teeth and a red tongue that leaps out to try to snare a bug which is bothering Peck.

As the customers watch, some of the instruments actually seem to come to life. While Evans calmly plays his bass fiddle,



When orchestra plays "Smoke Gets in Your Eyes," a cloud of smoke pours from Miller's glasses

Below, "I Cried for You" sings Miller, and tears spray forth to prove the singer's words

Secret of gag is tube that runs behind the bulky singer to Evans who provides water and smoke



an eyelid built into the sound box slowly opens and a huge glass eye follows Evans' fingers as he plays. When the eyelid closes again, a cuckoo suddenly pops out of the other side of the instrument and shakes its head in pity.

When Evans gets tired of standing during the act he just sits down, apparently on thin air. In the tails of his coat is a built-in stool that automatically falls into place beneath him when he bends his knees.

Always good for a big laugh is Evans' cello, which springs to life as he plays it. Suddenly the cello opens up to reveal a set of white teeth. When the entertainer puts a cigarette into this comical mouth, the scroll of the cello immediately begins to puff smoke. Secret of the gag is a tiny hole drilled through the scroll and connected by tube to a rubber bulb that Evans holds in his hand. When the screwball entertainer squeezes the bulb, the scroll calmly inhales and exhales the smoke.

Evans also has built an extra valve into a tuba. When he presses the valve the horn sprays white powder over the customers—who laugh uproariously as they brush themselves off.

Probably the greatest miracle of the entire floor show is that all the props are stored either around the tiny stage or in the dressing room, which is just about the size of a small closet. Meanwhile Pete Evans is in his workshop above the stage, working out new gags for an act that constantly changes.



Above, bass horn suddenly spouts a geyser of water into the entertainer's face. He seems to bear the instrument's revolt patiently. The spray is controlled by an extra valve made from an old soda siphon

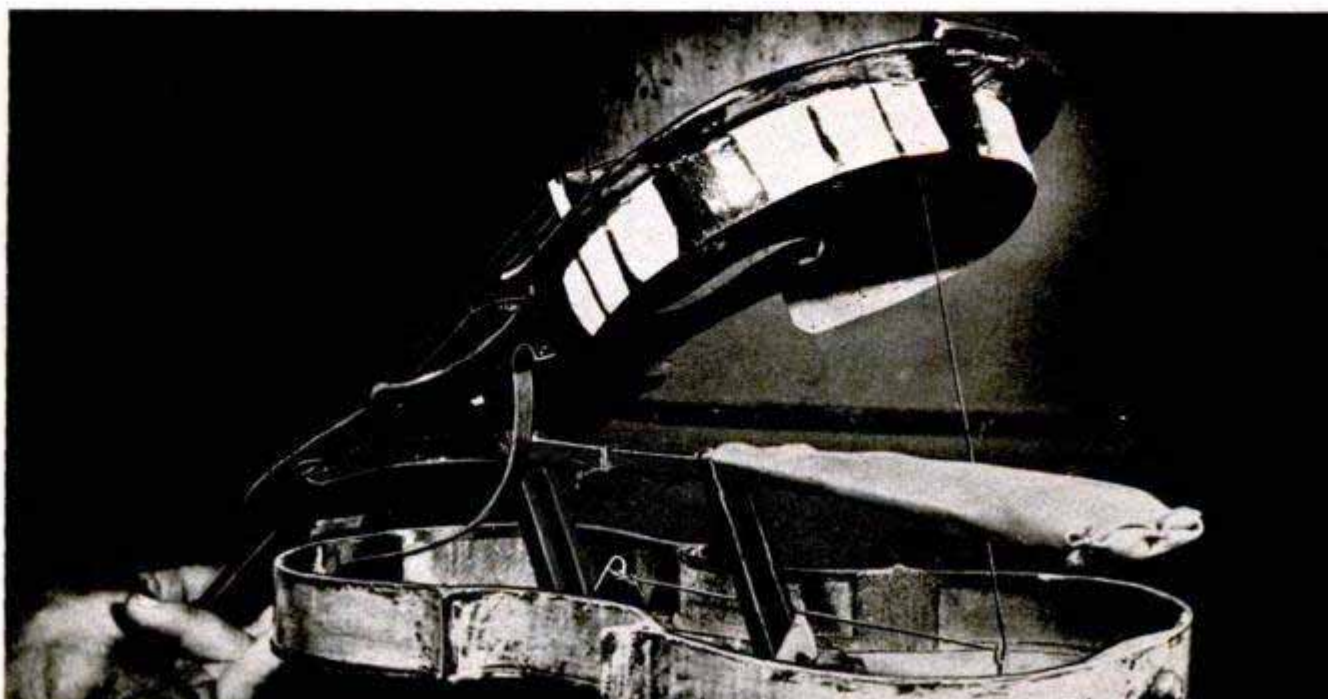


Above, right, the valve is attached through tubing with a small tank partially filled with water. The tank is pressurized with a tire pump. When the entertainer presses valve, water is forced out spout

Right, eyelid on bass fiddle suddenly opens to reveal a glass eye which follows Evans' hands as he plays. Later a cuckoo pops out of the instrument, listens for a moment, then shakes its head



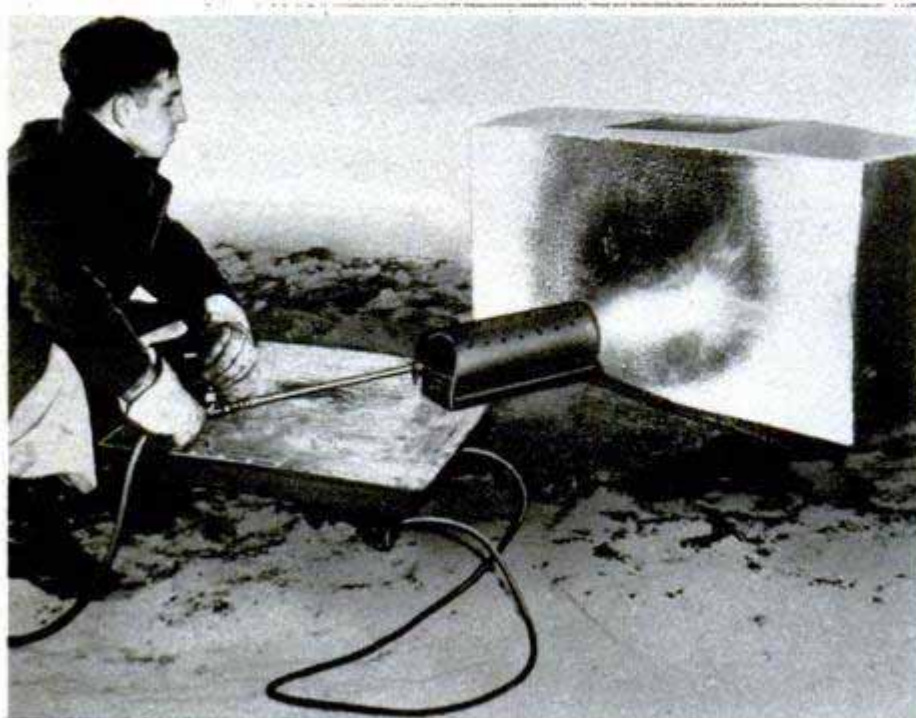
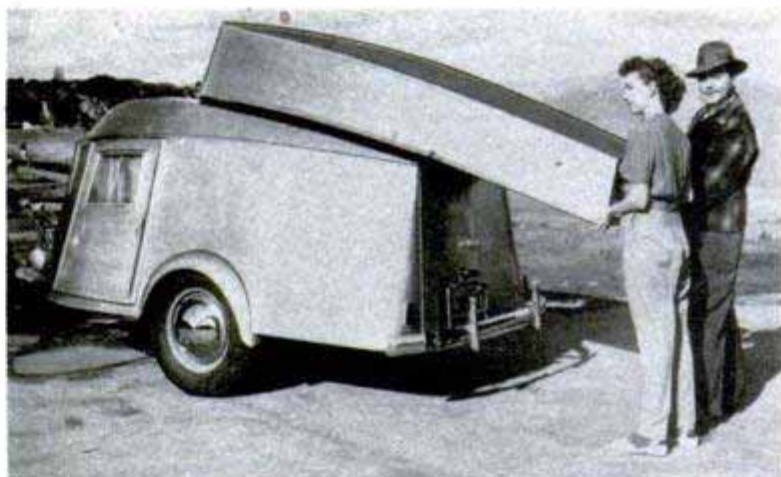
Below, Jack Peck's violin breaks open suddenly to become a huge mouth. Tongue pops out to snare an insect which has been bothering the entertainer. Spring-and-cord mechanism operates the instrument





Boat Serves as Extra Roof on Sportsman's Trailer

Three persons can sleep in a sportsman's trailer built by a San Pedro, Calif., draftsman and his wife. A 90-pound boat, secured from inside the trailer by pins, forms a double top. A roller on the boat's bow simplifies unloading. Fishing rods, guns and other items are carried in the double floor of the trailer. The outfit includes a cooking stove and 50-pound ice-box. The hinged rear bumper comes down to serve as a brace for keeping the floor level when the trailer is parked.



Aircraft Gas Tank Withstands Flame

Capable of withstanding fire and temperatures of 2000 degrees, a lightweight fuel tank has an outer coating of rubber and other materials that increases the safety factor when it is installed in airplanes. Designed by Goodrich for the Navy, the tank was not damaged by prolonged exposure to a blowtorch flame which disintegrated an ordinary aluminum tank in less than 60 seconds. The tank, also bullet-sealing, is the first of its kind to withstand direct flame.



When grain elevators overflow, the golden wheat is stored on the ground. There are 75,000 bushels in this pile

Golden Harvest *Feeds the World*

By Thomas E. Stimson, Jr.

JUST AT THE TIME when a hungry world direly needs any surplus we can spare, American farmers are producing the greatest wheat crops in history. The United States grows a fifth of all the wheat that is produced by the world and ships more of it abroad than do all the other wheat-producing nations combined.

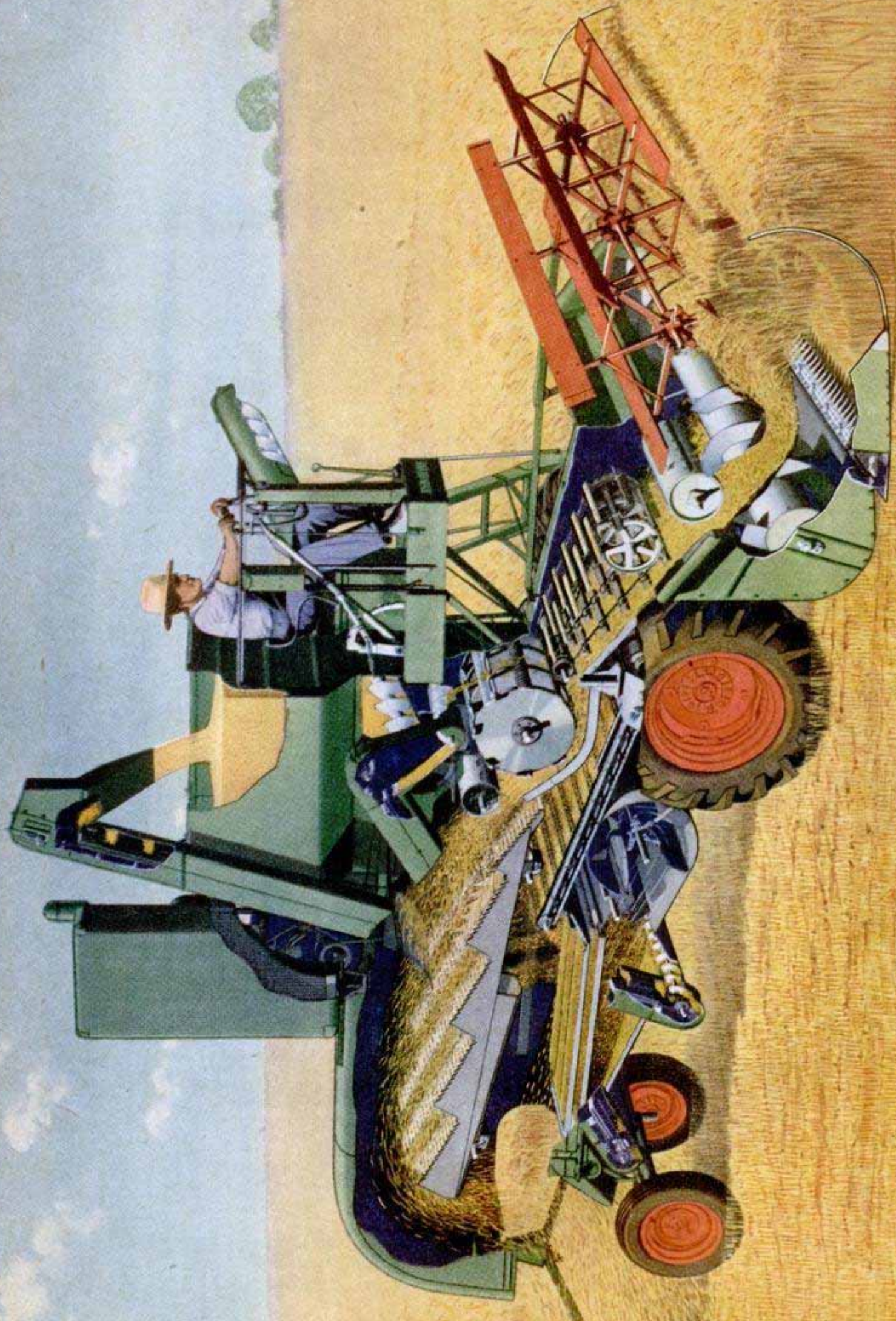
Last year's bumper crop in the United States amounted to some 1¼ billion bushels, which is equal in volume to 18 dams the size of Hoover Dam or enough to hide all of New York City under a golden blanket two inches deep. The crop could provide the flour to bake 72 billion standard one-pound loaves of bread.

This immense production has been possible because of favorable weather, strong prices that provided an incentive to the growers and because vastly improved strains of wheat and better mechanical farm equipment were developed just as the

need for more wheat became imperative.

Growing wheat and handling it is a special major industry all across the country from New England to the Northwest and down into the deep South. Two thirds of the total output, however, is produced on the Great Plains between the Mississippi and the Rockies. Harvesting begins in central Texas in May just as the hard winter wheat that was planted the previous autumn becomes mature. Up in the Dakotas and Montana, at about the same time, spring wheats that will mature in the late summer are being planted.

The harvest crews, who start the season in Texas, slowly move north as the summer advances, reaping the grain from millions of acres and reaching the states on the Canadian border just as these northern fields are ready for harvesting. Some 3000 custom combines make the trip from Texas to the northern border every year and this



traveling equipment is augmented by thousands of other units that operate within small local areas. Twenty bushels of wheat, on the average, are taken from every acre. Some rich fields produce 40 or 50 bushels per acre or more.

Wheat is an entirely mechanized crop these days. Seeding is done by tractor-drawn drill-type seeders, some of which also fertilize the ground at the same time. Harvesting is performed by combines, the combination reaping and threshing machines that cut the heads from the wheat stalks, shake out the grains of wheat and discharge the chaff and straw back onto the fields. Most of the combines in use are tractor-drawn and require a two-man crew, but this equipment is being replaced by the new self-propelled combine machines that can be handled by a single operator.

One man on a self-propelled combine and one man in a truck to pick up the wheat and haul it to storage comprise a harvest crew that handles as many acres today as 12 to 15 men could handle in the '20s. Two or three man-hours of labor per acre of wheat, from tillage to market, are all that are required today and the result is that one farmer often can handle his own fields, amounting to 500 or more acres, all by himself. Operators who farm two or three times that acreage require only small amounts of help.

Harvest time is the final critical period in making a crop and each grainland owner wants to see his wheat safely under cover the moment it is ripe enough to thresh. The Great Plains in particular have a tricky climate and a few days of delay may bring on a high wind or a rain or hailstorm that shatters the heads and lays the stalks down on the ground, decimating the crop.

Because of this danger, harvesting is always a rush operation and the crews work all day long and far into the night, every day of the season. The emergency isn't over until the last acres along the northern border have been reaped.

Meanwhile the storage elevators

← Cutaway drawing of the John Deere self-propelled combine. With its one-man crew, this machine reaps and threshes grain



Above, research worker cuts down one row of experimental wheat at a time with this small reaper to avoid mixing the variety with adjacent growths. Below, another miniature machine for test stations is this thresher being used here on a pea crop



JULY 1949
Ag. Exper. Station



Tractor-drawn combine harvesting wheat in Washington. Pipe projecting at right unloads grain into trucks

and the railroads fight their annual battles to get the precious grain under a roof or on its way to the big central storage houses and the mills. New concrete elevators have been built every 10 miles or so alongside the railroads that cross the wheat country

and even their capacities are taxed by bumper crops. Some farmers have had to store their wheat temporarily on the ground. At some of the elevators, huge wooden cribs have been built alongside the bins to take care of the overflow.

Flour sample is placed in an electric furnace to test its mineral content



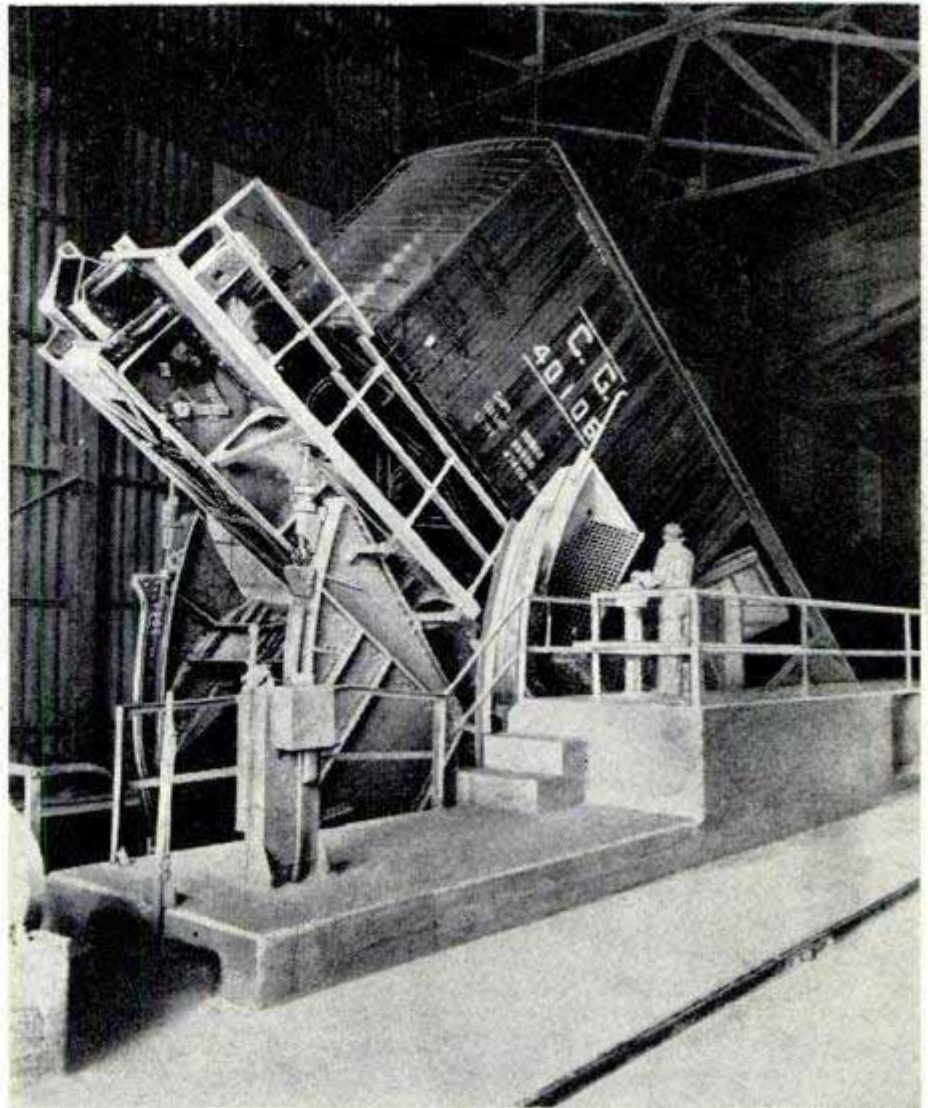
The railroads are in a similar fix at harvest time. There are never enough cars to meet the demand even though plans are started six months ahead of time to divert every available boxcar to the prairies. Extra locomotives are brought in from as far away as the West Coast. Additional crews of engineers, firemen, conductors, brakemen and switchmen are recruited from other divisions. The freight departments of the Santa Fe, Southern Pacific, Union Pacific and the other lines in the wheat territory

reschedule many of their operations to give priority to the wheat specials.

Most of the grain that moves by rail goes to the huge terminal elevators, some of which have capacities of more than 10 million bushels, located at Kansas City, Chicago, Wichita and other points. Suction hoses sweep the cars clean of their loads and the cars are then made up into long strings of empties to go back for another load. Several of the largest elevators have automatic car dumps that can pick up an entire boxcar and tilt it so that all of its grain spills out into a receiving hopper in seven minutes.

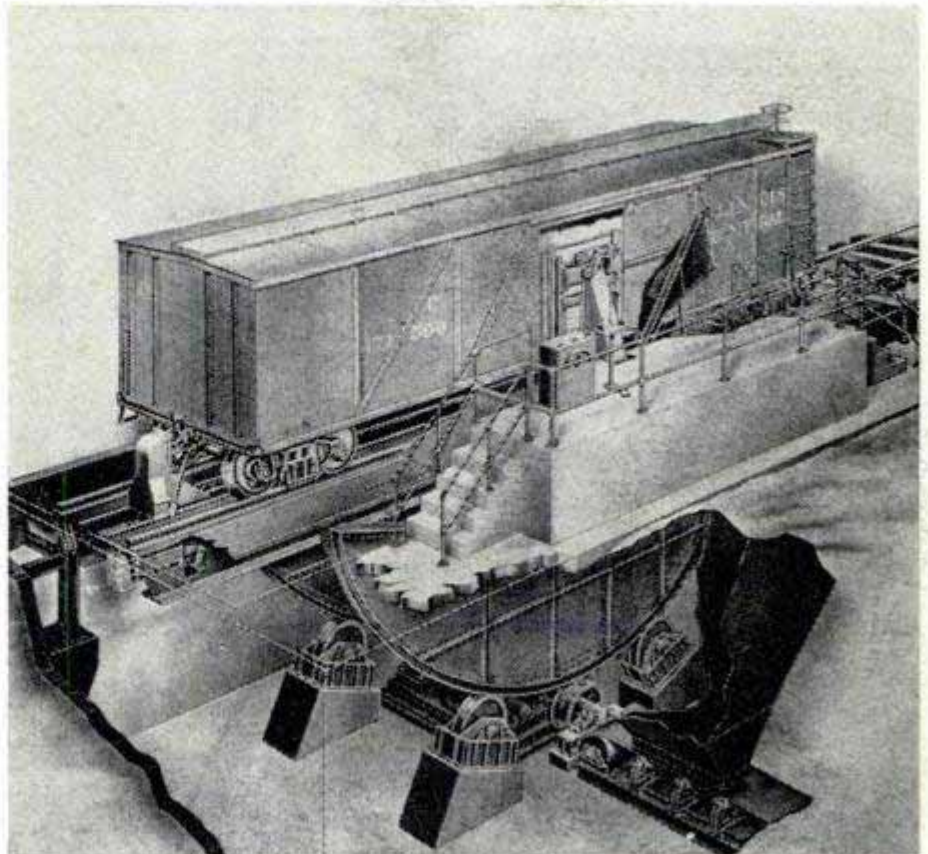
Wheat used to be a scrawny plant subject to many ills. Sudden frosts would kill it, prolonged droughts would dry it up, smuts or rots or such insects as the Hessian fly would destroy whole crops. These calamities still threaten but modern improved wheats have much more resistance to disease and weather than the older varieties.

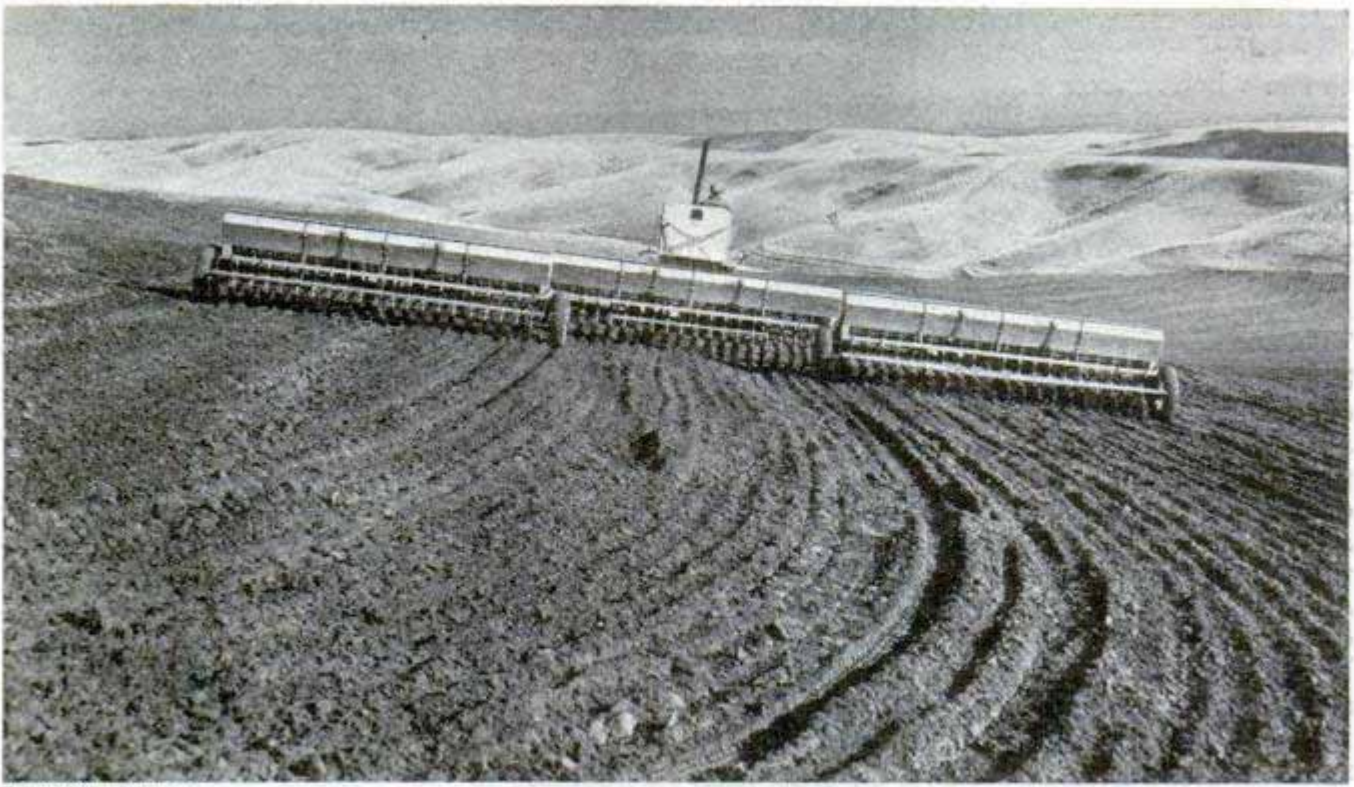
Along with the other improvements in the "re-modeled" wheats have come tremendous increases in yield, up to 50 percent in some cases over the best varieties that were available in the past. Kansas harvests 30 million bushels more from the same acreage simply because of the success of the prolonged plant-breeding program. Over a period of 40 years the original hard red Turkey pioneer wheat of the Plains has been given built-in disease and insect resistance, higher yield and has even been redesigned for machine handling. The newest Pawnee strain bears little resemblance to its Turkey ancestor and almost guarantees a good crop in



Link-Belt Co. photo

Freight cars loaded with grain are picked up and dumped by this unloader that will handle as many as 10 cars an hour. A large steel hopper below the tracks catches the grain as it spills through the door. Below, four steel rollers support the cradle on which the car is placed for dumping





Deere & Co. photo

This gang drill, drawn by a tractor, plants a 30-foot strip with seed wheat at a speed of six miles an hour

the particular region to which it is adapted.

In all, more than 200 distinct varieties of wheat are grown in the United States because a type that is ideal in one region often is not a good producer elsewhere. The plant-breeding program is intended to create an ideal variety for each region. Agronomists and geneticists of the United

States Department of Agriculture, the various state colleges and private plant breeders are all cooperating in the program. The work is exacting and complicated because the geneticist must constantly keep in mind that he is seeking a variety that, among other things, has a high yield and a high weight per bushel, a short

Not all wheat is grown on the plains, and in hilly land like this a double-jointed hillside combine is used

International Harvester photo

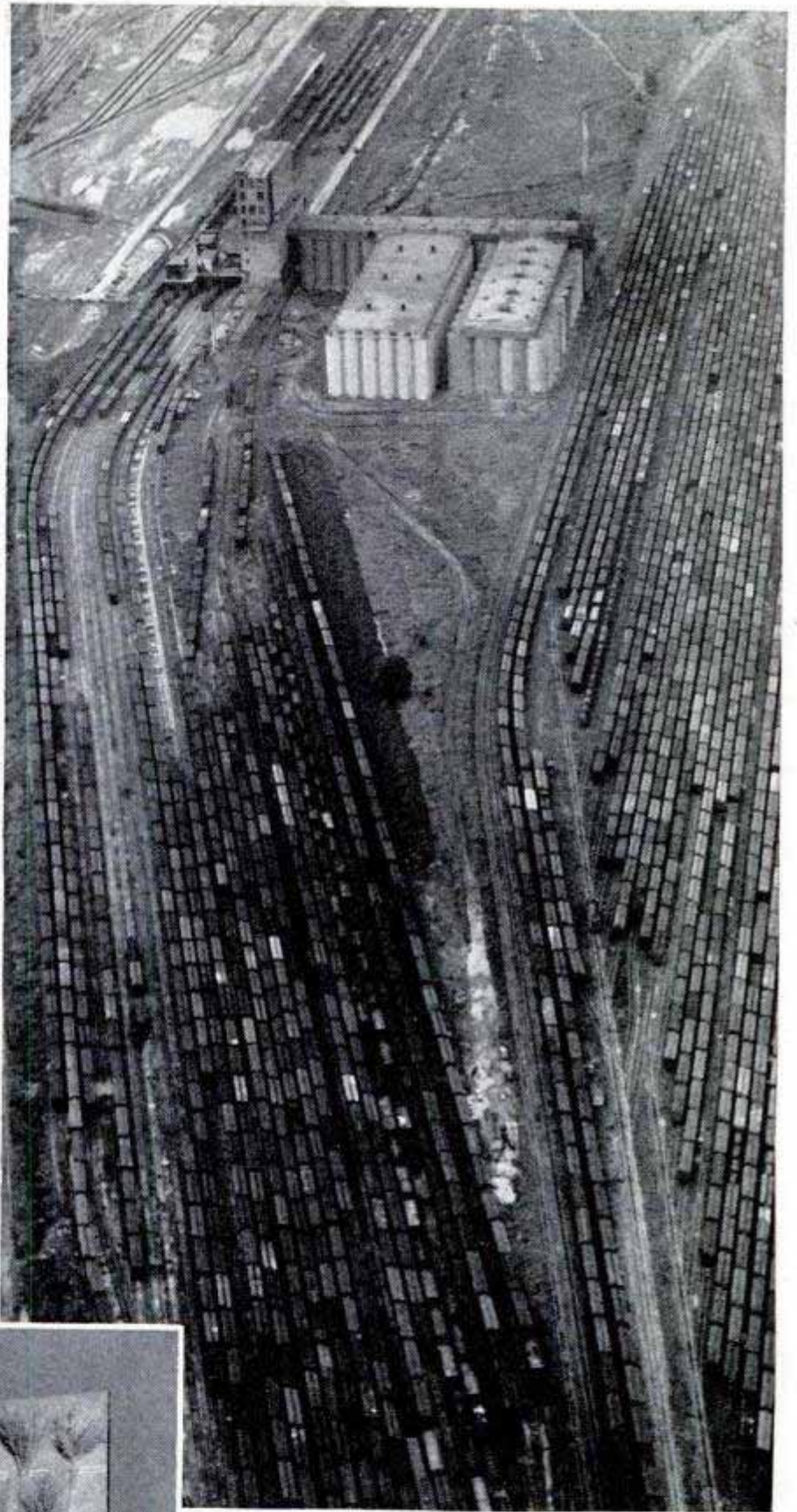


stiff straw and resistance to winter-kill as well as to drought. The same wheat must also resist insects and diseases and must resist shattering in the field.

Even when a cross is produced that fulfills all these specifications, the plant breeder moves cautiously. The grain must pass several other tests before a seed crop can be grown and released for use. The breeder remembers one instance in the past when an extremely good new wheat was created and 350,000 acres were sown with it at once. Farmers got a bumper crop and then they learned that the mills couldn't handle it. The new wheat produced a fluffy meal that floated in the air and just wouldn't pass through the mill.

Today, the geneticists use small specially built mills that duplicate in miniature all the grinding and sifting processes through which wheat must pass in a huge commercial mill. Each of the big regional laboratories, too, has its own baking department. A wheat that looks good in the experimental growing fields is taken into the lab and, if it passes all the tests for milling qualities, it takes a final examination on its baking qualities. Its flour

(Continued to page 230)



Hundreds of wheat-laden freight cars fill sidings at the 10-million-bushel Santa Fe elevator in Kansas City as the golden harvest rolls to the market



Left, there are about 200 different varieties of wheat raised in the United States. Samples shown here are types that have proved best in Northwest

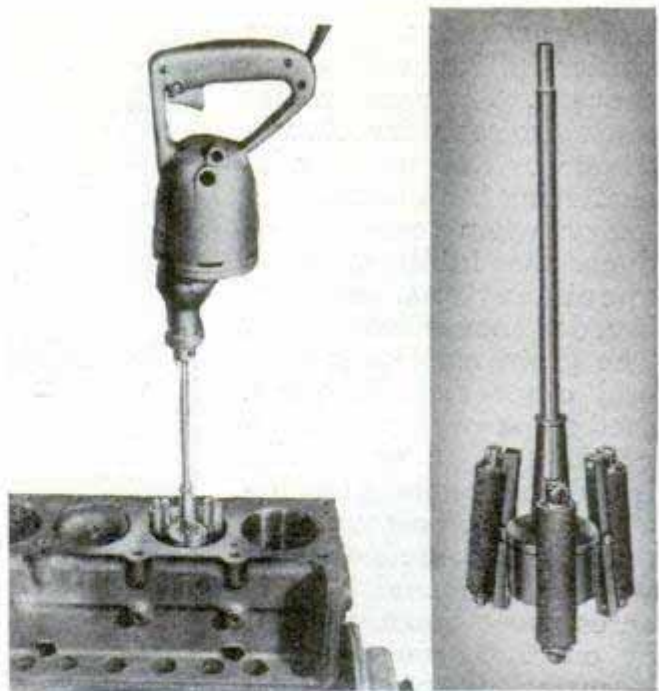


Power Pack Built Into Reflector Of Electronic Photoflash Unit

Eliminating the separate power pack and bothersome connecting cables, a new electronic photoflash unit has its power supply built into the reflector. The unit uses a hollow-type flash tube that fits over a built-in modeling lamp. The flash is the equivalent of a No. 5 bulb. A photoelectric cell on the reflector sets off the flash when it is used as a slave light.

Lever Tool Eases Wheel on Car

Almost every phase of tire changing is made easier by a handy lever tool. First it pries off the hub cap; then, acting as a lever, it lowers the wheel off the car; finally, it provides leverage to ease the spare tire onto the hub. In addition, the aluminum tool can be used to remove the casing from the wheel.

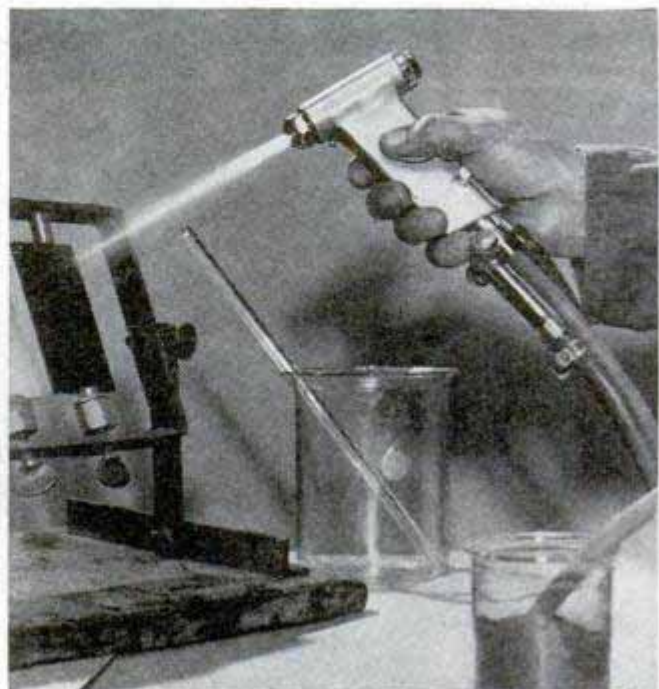


Power Tool Deglazes Cylinders

Cylinder walls are deglazed safely and quickly by a self-adjusting tool that has no springs or gears to wear out. It will not grab or bind and it adjusts itself to the bore automatically. Cloth abrasive material is used on the blades. The deglazer can be used with any clockwise electric drill.

Hand Gun Sprays Metal Powders

Metallic or plastic powders are heated to a liquidizing temperature and sprayed in a continuous film by a laboratory-size spray pistol. A controlled flame provides the necessary heat. When it has cooled, the film adheres tightly to the surface. Nonporous films of plastic can be sprayed with the pistol to prevent corrosion. It can also be used to heat, solder or braze.





Sower Spreads Grass Seed Evenly

Squeezing the handle of a new lawn seeder sprays grass seed across the ground in a uniform pattern. The hopper of the tool holds about a pound of seed. The user holds the tool in front of him and squeezes the handle as each foot touches the ground. Seed passes through a hole in the bottom of the hopper and is ejected by small whirling rods. The tool leaves a swath of seed about three feet wide.

Plug Repairs Worn Sockets →

Anyone can repair a worn electric socket without tampering with the wires by pushing a new plug-type connector into place. The device locks permanently inside the socket and provides a tight fit for all standard electric plugs. It then replaces the worn outlet and eliminates the bothersome loose connection.

Single Rinse Cleans Paintbrush

Cleaning brushes after you finish painting is a quick operation with a new liquid cleaner that is so effective you can switch from black to white paint without streaking. You merely immerse the brush in the liquid, agitate it for a few seconds and wipe off the excess. The brush is completely clean and ready for new paint or to be put away. Safe for use with brushes having either hair or nylon bristles, the cleaner keeps the bristles soft and pliant.

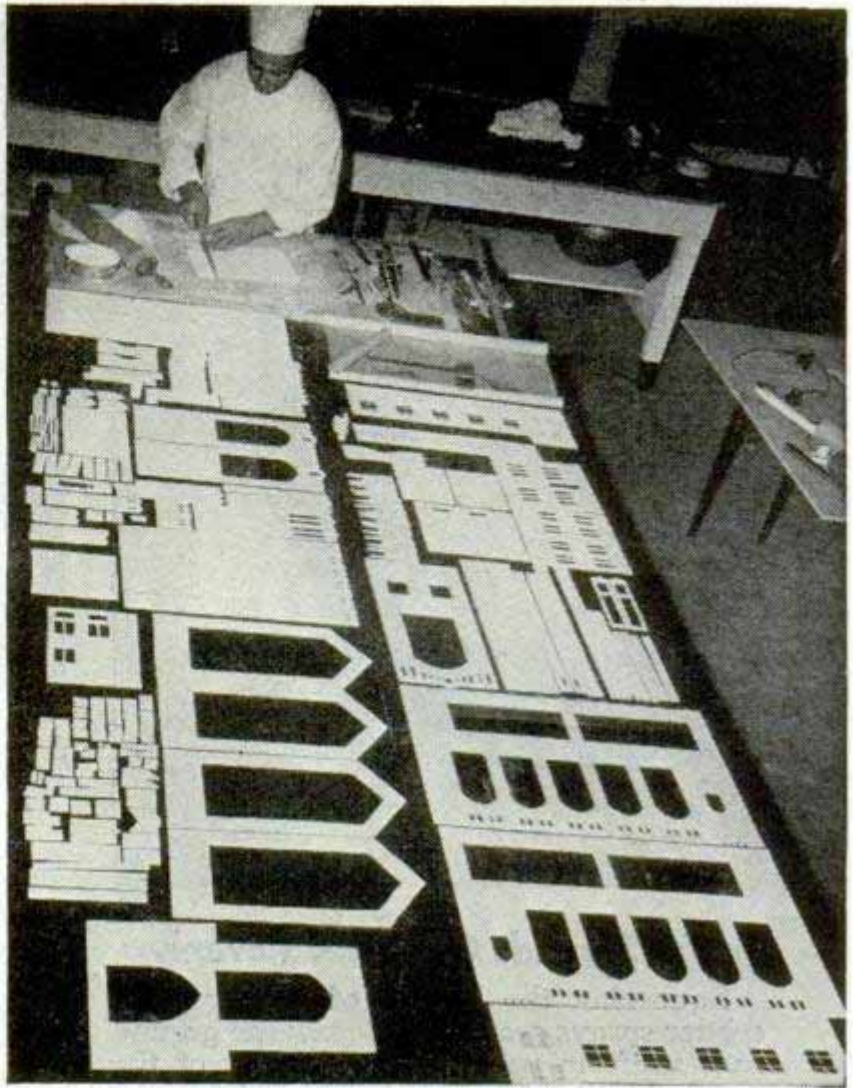
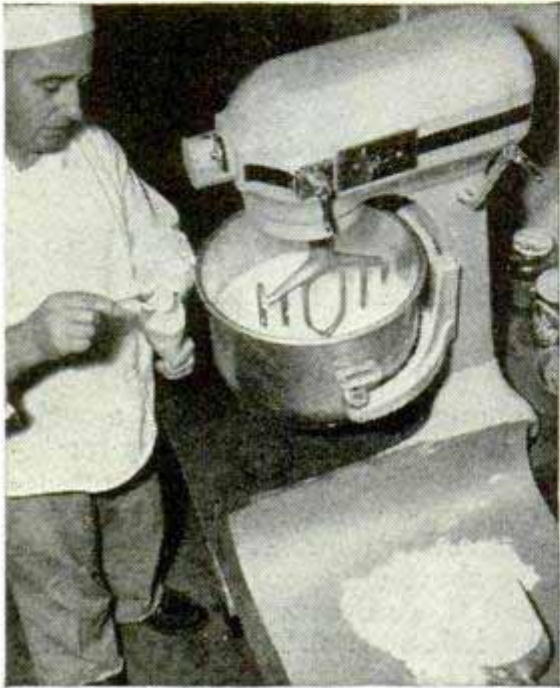


Wrist Camera Is Quick-Loading

Small enough to be worn like a wrist watch, a new miniature camera is magazine-loaded to enable you to switch quickly from black and white to color film in the middle of a roll without wasting a picture. The rotary shutter has only one speed, $\frac{1}{50}$ second, and there are three aperture settings, f: 6.3, f: 8 and f: 16. The 16-mm. film is bought in a 14-exposure magazine and the purchase price includes the cost of factory processing for either black and white or color film. The camera has an eye-level view finder fitted with a ground lens.



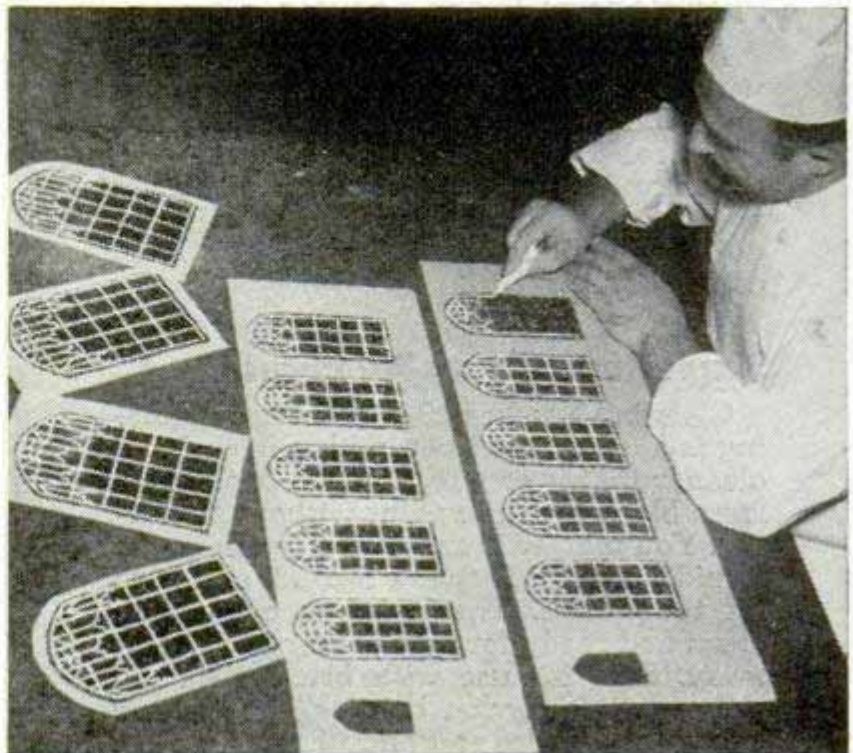
Architect in Sugar

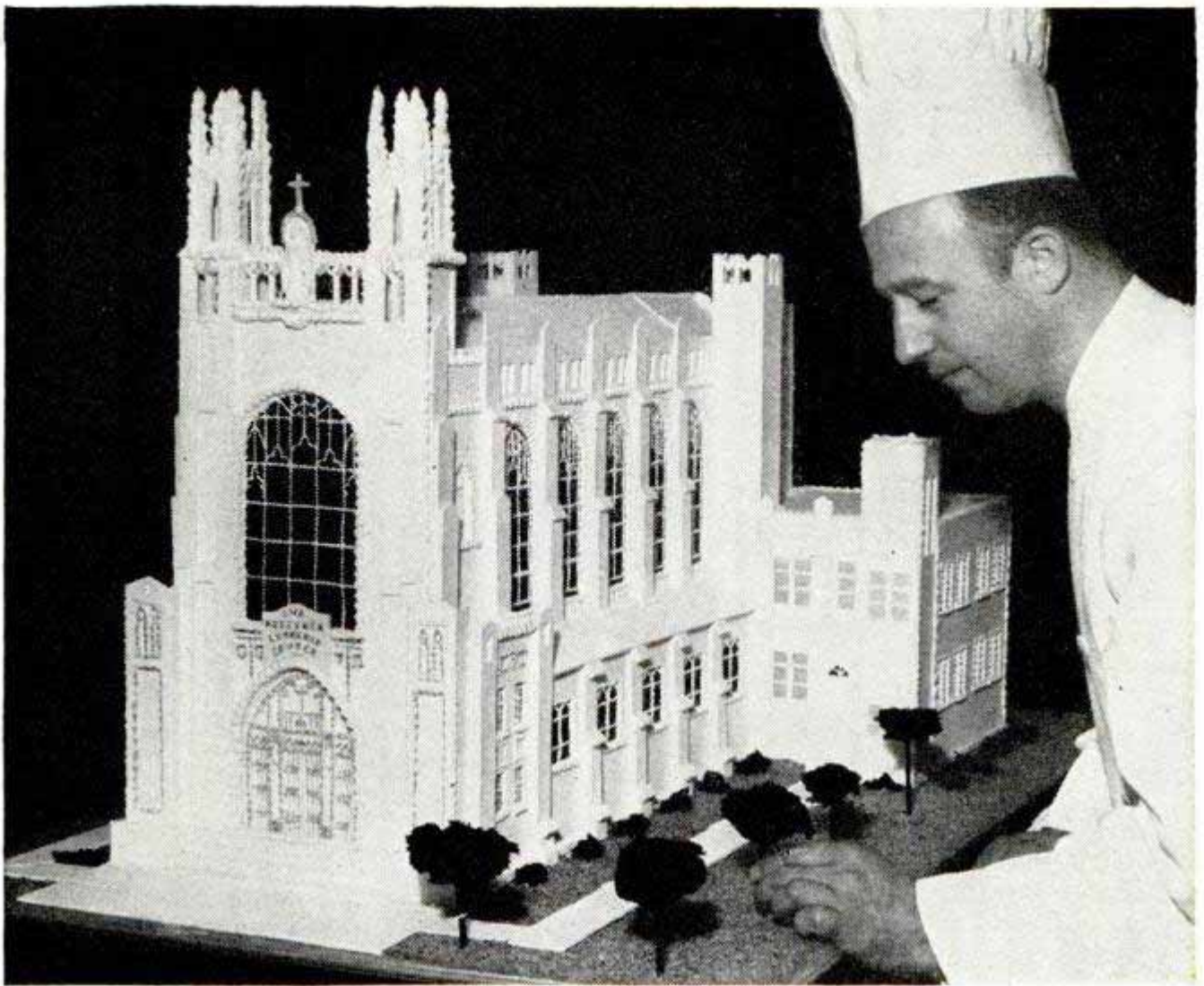


SUGAR and egg whites are the building materials used by a Chicago baker who specializes in scale models you can eat if you wish. He recently "built" a four-foot model of a Chicago church, complete with "stained glass" windows. More than 300 pieces were used in the construction, a task that took 184 hours. The model is self-supporting, there being no internal braces or frames. Four electric lights within the church illuminate the interior and bring out the colors of the many translucent windows. For amateur builders who are tempted to try their skill, here's the recipe: 25 egg whites, 10 pounds of sugar, the juice of two lemons and peppermint flavoring. Five times this amount was needed for the church. John J. Zenker, who teaches cake decorating in his own school, was the "contractor" in charge of design and construction. The church is only one of many sugar models Zenker has produced. Others include the Eiffel Tower, the Lin Yutang Fountain and a model of Chicago's State Street, complete from department stores to lampposts.

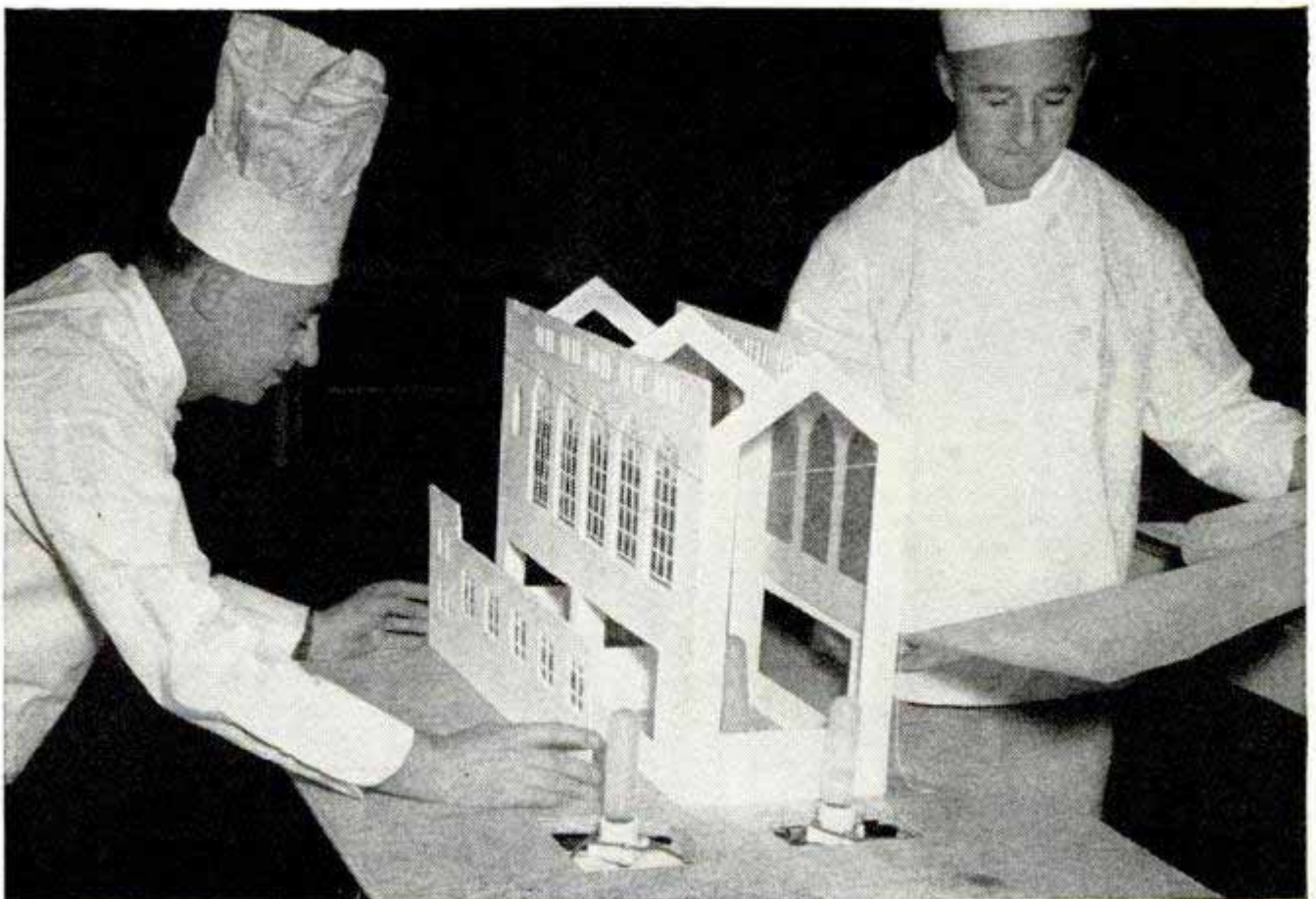
Left, mixing the recipe would be a tiring job by hand, but this power mixer does it thoroughly and quickly. Mixture is then kneaded, rolled flat and cut to shape. Right, the 324 separate pieces for the church are laid out on table to dry

Below, the model windows, stained with vegetable coloring, are decorated by hand to resemble those in the real church





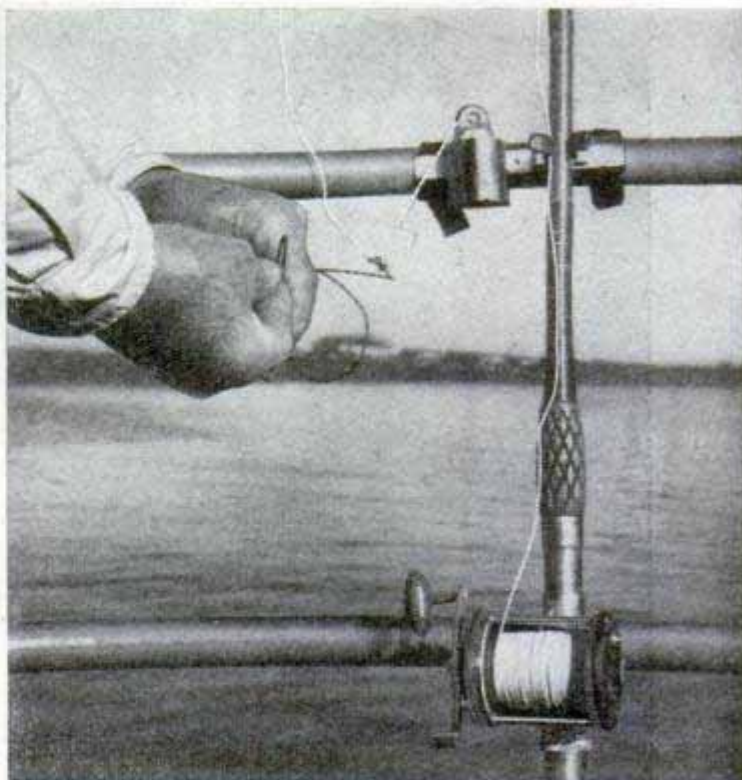
Zenker places the artificial shrubbery in place around the completed sugar church. Below, a wall section is moved into place. Royal icing is used as the glue. String around top of model is removed when icing hardens





Seat "Toppers" of Rubber

For more comfortable riding, a foam-rubber cushion now can be installed on the car seat by the motorist himself. The seat "toppers" are one inch thick and are available in two sizes, 20 by 52 inches and 20 by 56 inches, to fit seats of any car model from 1915 to 1949. They are installed quickly by removing the outer seat cover, placing the foam cushion on the seat and then replacing the cover.



Clamp Holds Fish Rod for Baiting

Fishing rods are held securely in an upright position by a clamp that fastens to the gunwale or rail of a boat. The holder is designed to keep rods out from underfoot while they are not in use or while the line is being baited. It consists of a spring clip to grip the rod and a cup which holds the sinker, preventing the line from being tangled. The holder, made of stainless steel, is available in two models, one with a spring clip for fastening it to a gunwale and the other with straps which hold it on a rail.

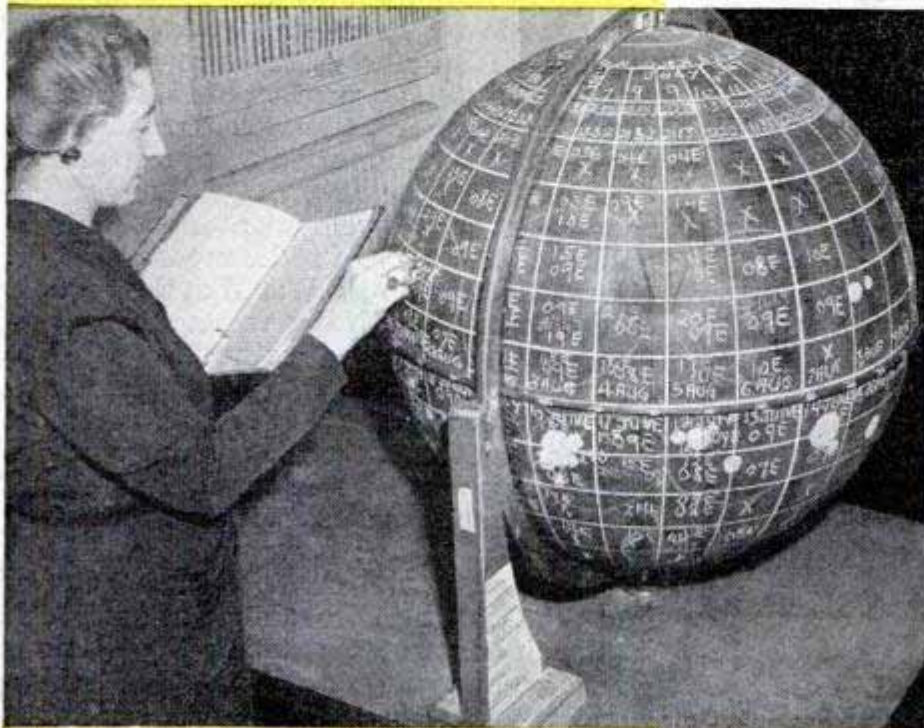


Shoe-Repair Bar

Customers needing minor shoe repairs now can wait for on-the-spot work while seated at a bar similar to a lunch counter. Openings in the base of the bar permit the repairman to remove the customer's shoes and replace them after new heels have been installed or minor repairs made. The shoe-repair work is done on a compact machine unit at the rear of the bar.

Popular Mechanics provides two sources of further information concerning the articles published in each issue: the WHERE-TO-BUY-IT INDEX, starting on page 10, and the WHERE-TO-FIND-IT INDEX, which may be obtained without charge by writing Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, 11

Forecasters for the air waves



National Bureau of Standards photos

Code marks, plotted on this globe, permit forecasters to see the pattern of radio reception everywhere in world three months in advance. Below, ionospheric stations can be found from the Harvard campus to Pacific atolls. This one is on the island of Maui in the Hawaiians

THE ANNOUNCER

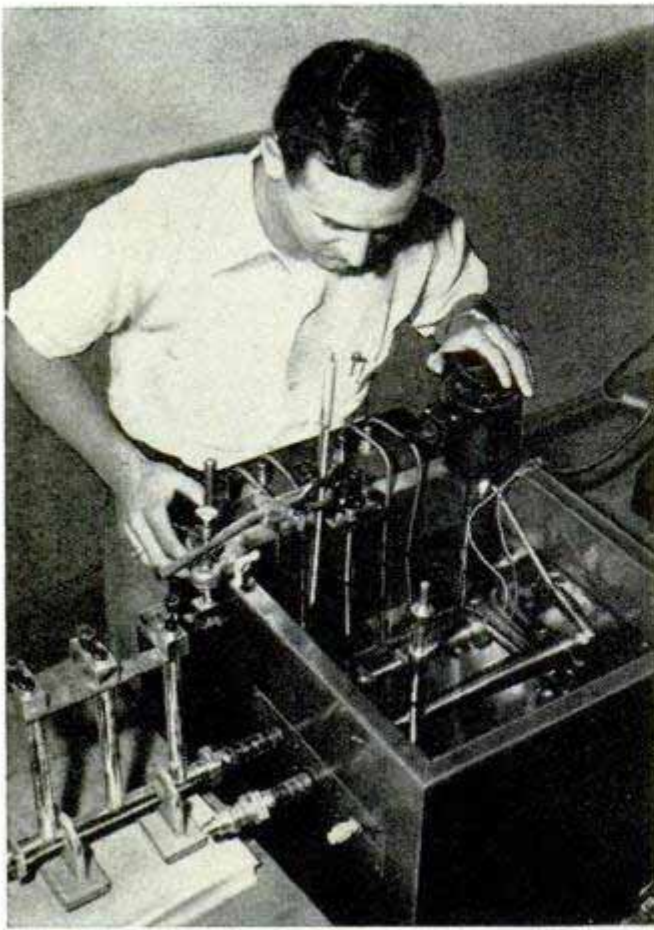
on the radio program beamed at Russia said: "This is the 'Voice of America,' speaking to you from New York and bringing you a news program. Meanwhile, may we remind you that this station is on the 11-13-16-meter band. Our next regular program to your area will be on the 19-21-23-meter band. . . ."

Why the change in frequency? Why require the farmers around Stalingrad or the factory workers in Moscow, tuned to the American news program, to change the setting of their radio dials? Wouldn't some of the listeners be lost in the process? Wouldn't this be a blow to our efforts to bring the truth to the Russian people?

Well—better to lose a few listeners than to have no listeners at all.

And therein lies the story of the Radio Propagation Laboratory, maintained by the National Bureau of Standards in





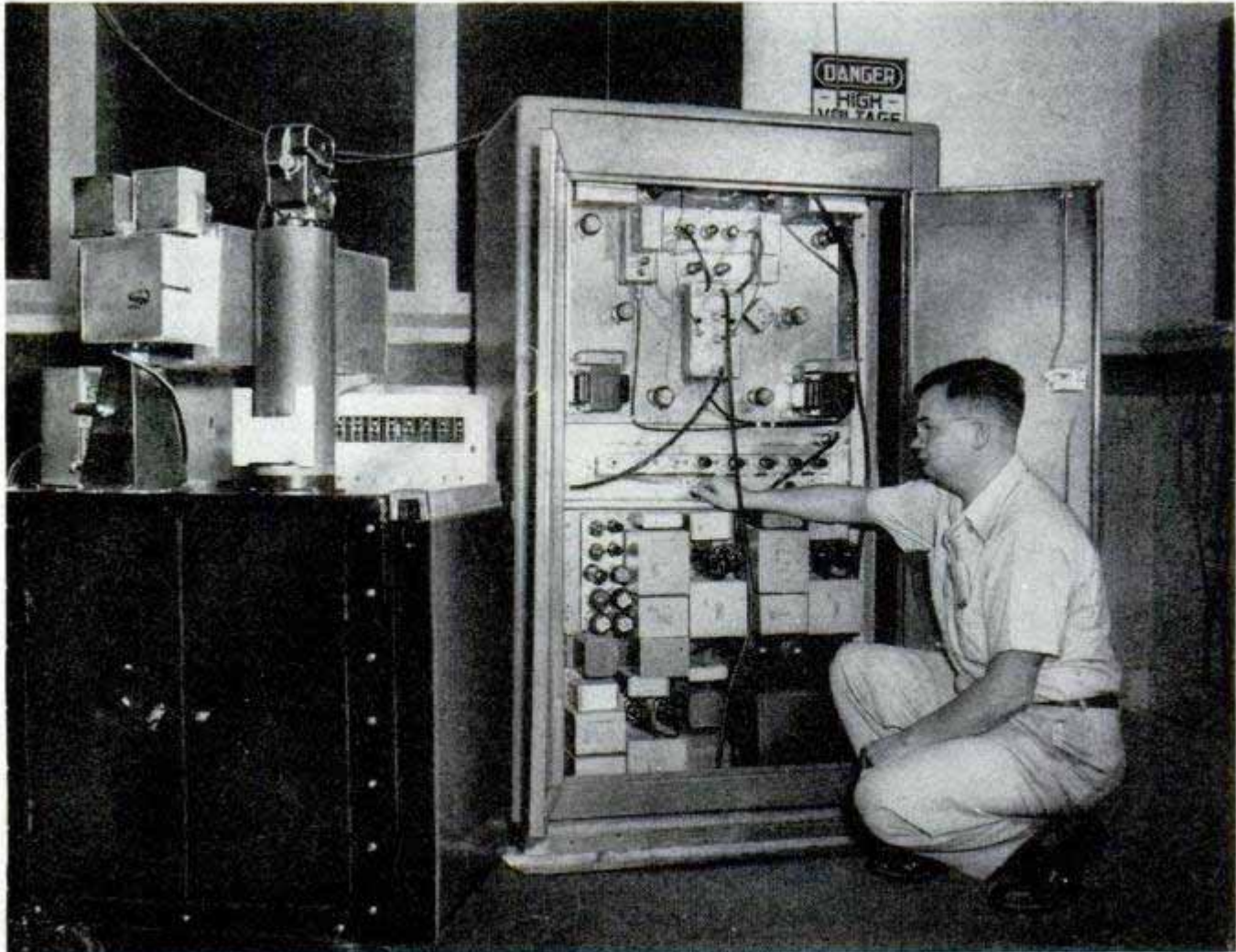
Instrument for measuring microwave frequencies is kept in constant-temperature oil bath. Below, ionospheric recorder notes radio-wave characteristics

Washington, D. C., which is making possible better short-wave radio communication with all parts of the world.

This unusual laboratory can predict three months in advance what the short-wave radio communications over any 2500-mile path anywhere in the world will be like any hour of the day. Its 300-man staff on the Bureau of Standard's campuslike setting at the nation's capital also does much basic research—theoretical and experimental studies of maximum usable frequencies, the absorption of radio signals in the atmosphere, the variations of radio propagation characteristics, the effects of the sun, weather and magnetism of the earth and the development and maintenance of standards of radio measurements.

Organized in World War II at the request of the Army and Navy when radio communication had to be maintained all over the globe, the Radio Propagation Laboratory now is making its services available to such peacetime agencies as the Weather Bureau, the State Department, the Federal Communications Commission, the Civil Aeronautics Administration, the Forest Service Radio Laboratory, the Coast Guard and the Coast and Geodetic Survey.

Also, it has proven valuable to such non-government groups as airlines, steamship companies, television and radio schools,



college and university research laboratories, radio and telegraph companies, navigation-instrument manufacturers and geographical exploration outfits.

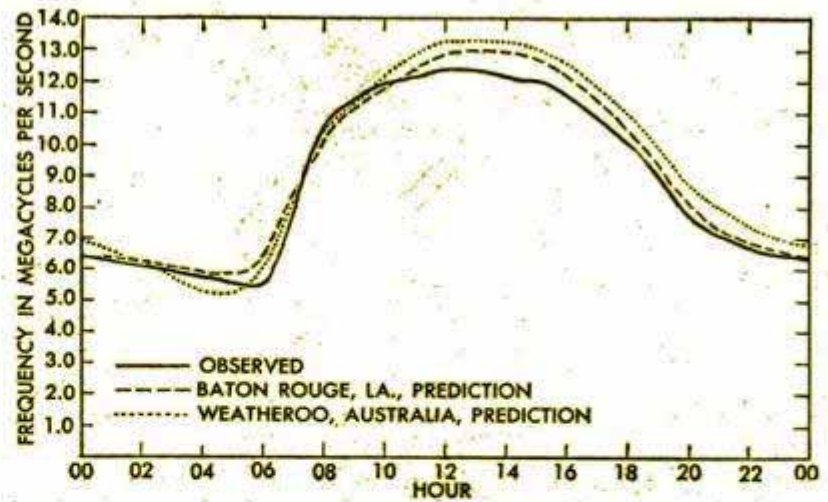
And last, but not least, the Radio Propagation Laboratory is enabling a number of the more enthusiastic radio "hams" to increase their distribution of "CQ" cards.

As far back as 1902, scientists began to realize that long-distance radio transmission is made possible by the ionosphere. This consists of a series of layers in the atmosphere 50 to 250 miles above the earth. Radio waves are reflected from these layers back to earth again like light flashing between a series of mirrors or a rubber ball bouncing back and forth between the floor and ceiling of a long, low tunnel. The ionosphere is electrically conducting because its gas molecules have been "ionized" (given an electric charge) by ultra-violet light from the sun.

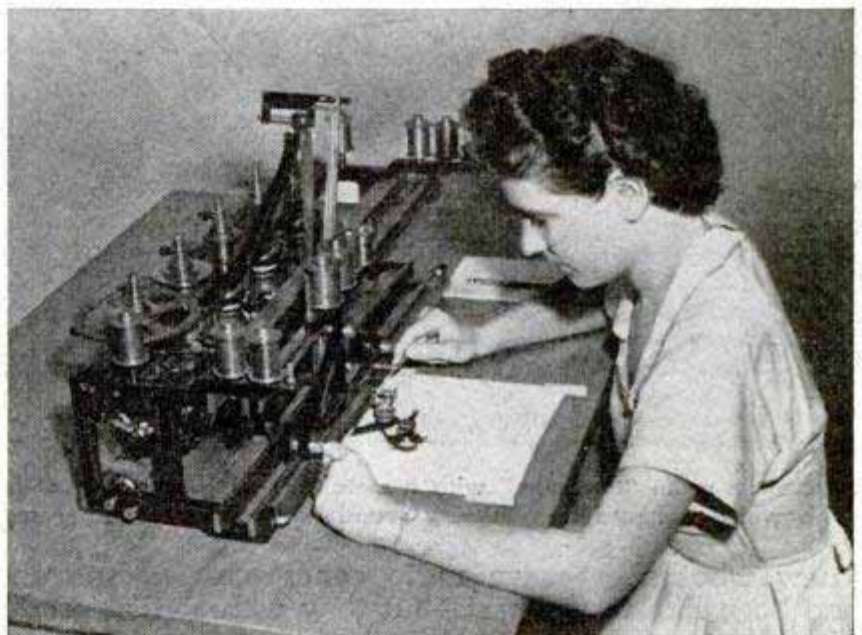
The more they studied the ionosphere, the more scientists found it to be a complicated phenomenon. During daylight hours, for example, it is separated into three layers. These are the E layer, the F1 layer and the F2 layer—existing at heights of 60, 120 and 180 miles above the earth. Below the E layer is a D layer which absorbs low-frequency radio waves. At night the picture isn't quite so involved. The entire ionosphere merges into a single F1 layer.

Furthermore, the ionosphere is about as unstable as the weather. Its characteristics change with geographical location. They are affected by seasons of the year. They are altered when sunspots flare up. Sometimes changes occur suddenly and mysteriously for no apparent reason.

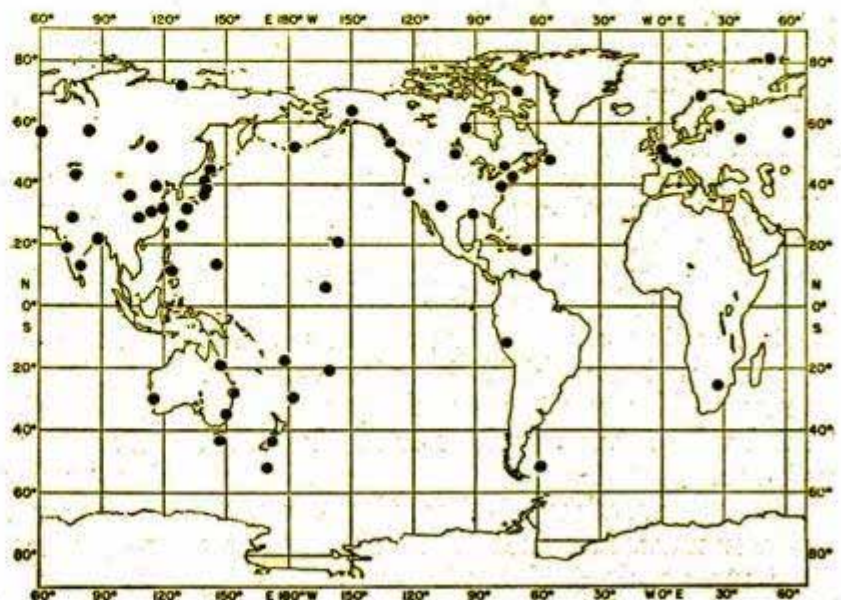
Although some preliminary work was done in the 1930s, scientists didn't really buckle down and apply this ionospheric knowledge to practical short-wave radio problems until World War II. They

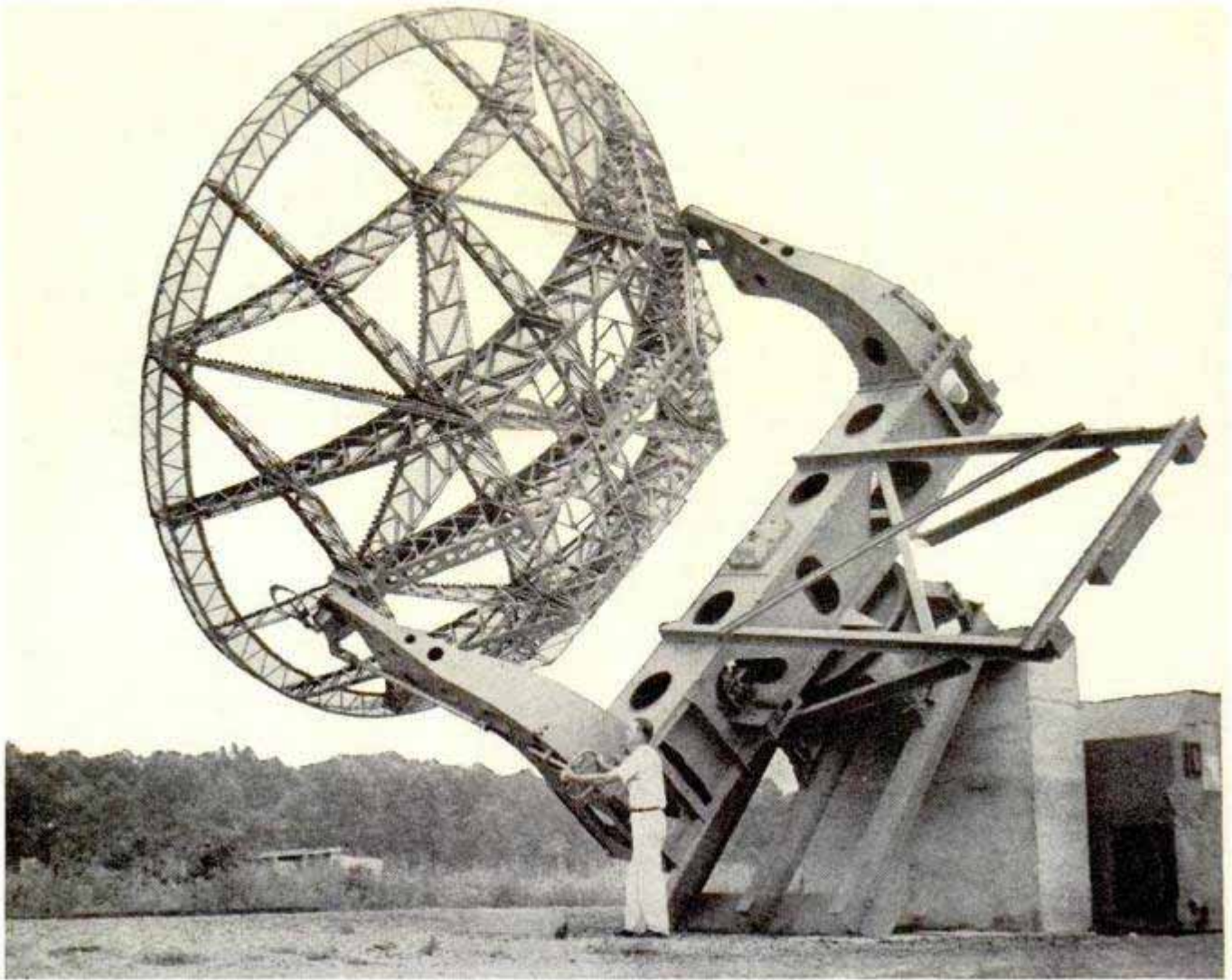


Graph shows curious fact that radio waves behave about the same at Weatheroo, Australia, and Baton Rouge, La. Note how close the predictions were to observed behavior of waves on this particular day



Instrument plots in curves the seasonal and daily variations in the reflection of radio waves from the ionosphere. Such information shows radio engineers how well their broadcasts will be received. Below, here are the locations of the ionospheric stations around the world





Twelve-ton radio "telescope" with a metal-mesh reflector 25 feet in diameter intercepts and records solar noise which is heard as a hissing sound and interferes with reception. This reflector is at Sterling, Va.

knew what short-wave radio conditions had been like in the past—but they were woefully weak in their ability to forecast the future.

Today, the Radio Propagation Laboratory in Washington, D. C., is the center of a worldwide network of 60 ionospheric stations which feed in valuable information each day. Sixteen domestic and overseas stations are operated directly or under contract with the Bureau of Standards. The others are maintained by foreign governments, universities or private concerns.

What is an ionospheric station?

Well, it's something like a weather station. It may be located on a coral beach at Palmyra Island in the South Pacific, it may be buried under snowdrifts at Fairbanks, Alaska, or it may be situated on a quiet part of the Harvard University campus. It's manned by two to six technicians, with a chief who is usually a trained electrical engineer.

Unlike a weather station, there are no thermometers, barometers, rain gauges or other meteorological equipment. Instead, the principal equipment is a high-powered

radio transmitter and a radarlike receiver that produces a "pip" on the screen of an oscilloscope.

The transmitter is a "pulse" machine that automatically sends a series of high-frequency radio signals into the air. They travel upward until they reach the ionosphere layers and then are reflected downward to be recorded by the receiving part of the equipment. This can be done visually by the operator or recorded by 35-mm. motion-picture cameras. The two critical factors to be measured are the time of the bounce-back, which determines height, and the frequency of the waves which are reflected. If the frequency is too high, they will go right on through like minnows escaping a tuna net.

It's a curious fact, but somewhat similar results have been found for areas on opposite sides of the world. Two stations, Weatheroo, Australia, and Baton Rouge, La., for example, will show almost identical communications conditions for corresponding seasons of the year. This proves helpful in filling in some of the "blind spots" of the

(Continued to page 248)



Plymouth Combination Station Wagon and Utility Vehicle

With a sort of resigned defeat, suburbanites for years have made the family buggy double as a combination limousine, pickup truck, station wagon and traveling nursery. The resultant tears, gouges and stains from garden tools, oilcans and grocery baskets haven't helped make the "doubling in brass" too successful. Now Plymouth has brought out its Suburban to help solve the forgotten Main Streeter's car problem. The sporty looking utility vehicle of all-metal construction is a slick five-passenger family car on a 111-inch wheelbase—designed to get by at the swankiest country club. But when it's time to go marketing, the rear seat pivots into a foot well in the floor. Folded forward, the seat forms a bulkhead at the head of a huge cargo-carrying space about 5½ feet deep. The back of the seat becomes part of

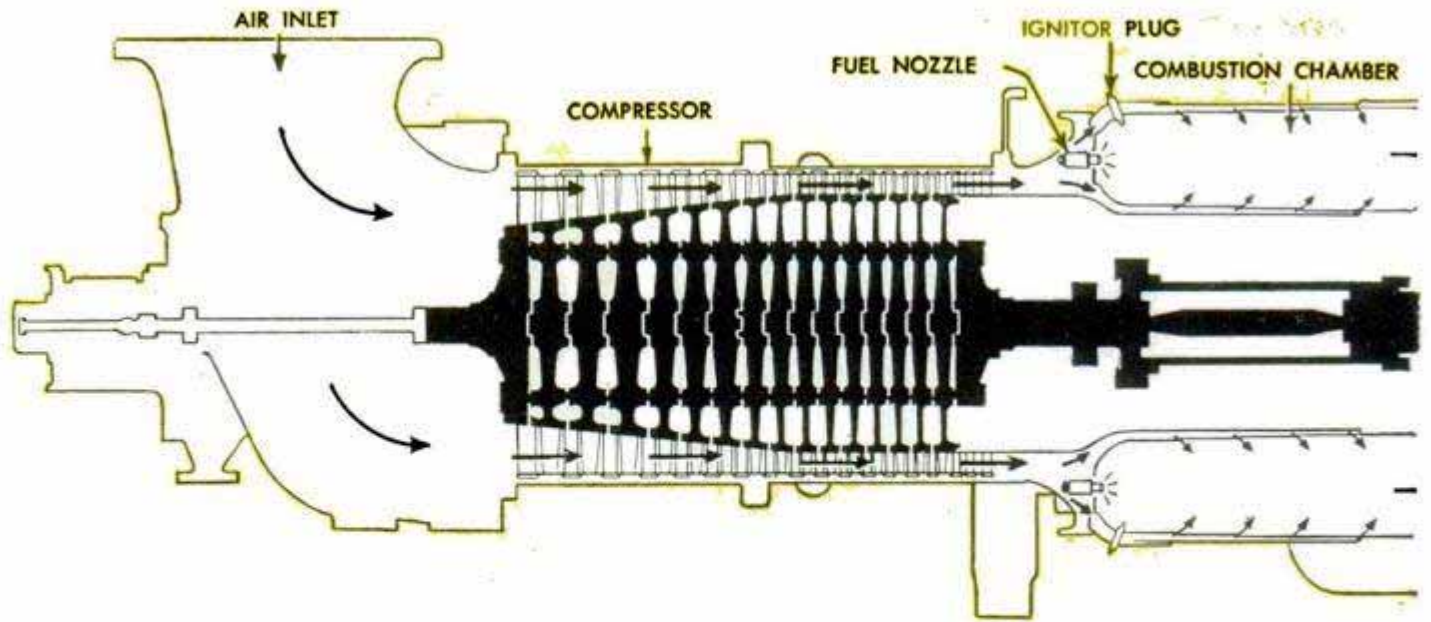
the floor. By opening the tailgate, the area is increased to seven feet, five inches. Seat and upholstery face away from the compartment, and thus are protected from gouging or chafing. The ever-annoying spare tire is out of the way in a floor well, so stowage space is clear. The Suburban features rear side pockets for small parcels, strong, washable vinyl fabric for upholstery, 18-inch wheels (optional) for greater clearance in backwoods driving. It has the same 97-horsepower engine featured in the deluxe line. Plymouth expects a long, eager look from salesmen with cartons of samples to lug around; surveyors, construction workers and photographers laden with gear; hunters, fishermen and skiers; not to mention the long overwhelmed commuters with their multiple problems.

Dodge Roadster Has Canvas Hand-Operated Top

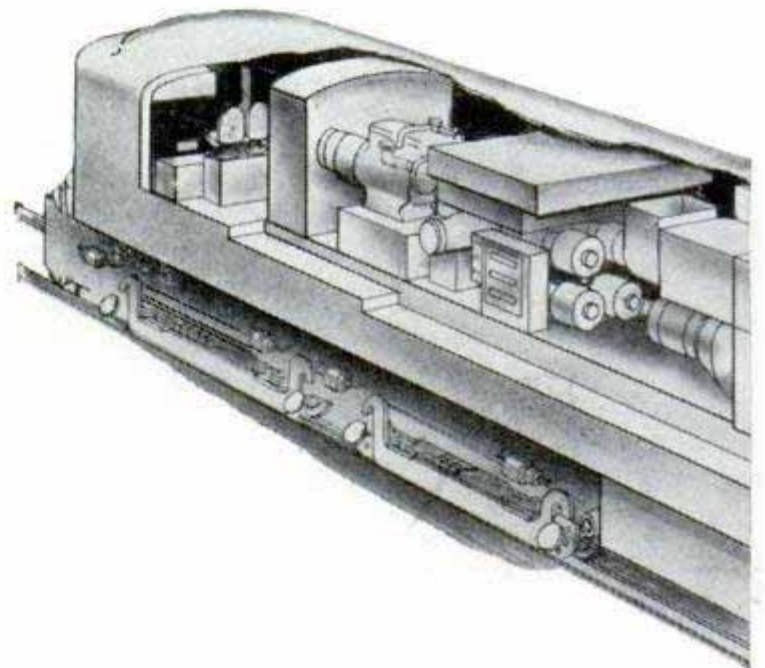
Dodge's new "economy" roadster has a canvas top which is put up by hand and plastic side windows framed in aluminum which are stored behind the seat when not in use. The top can be put up by the driver

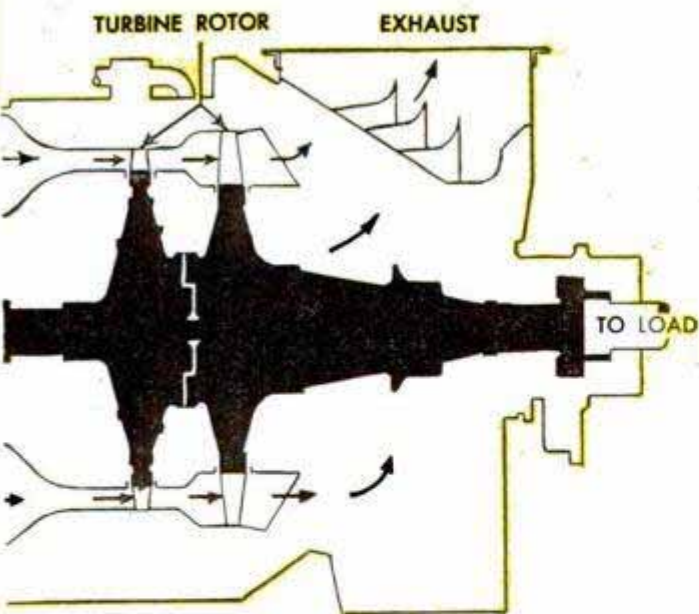
without leaving his seat; all he has to do is reach back with one hand and pull the top into position. The roadster is powered by the same engine used in other models and has Fluid Drive and Super-Cushion tires. This three-passenger open car recalls the many roadsters built in the 1920s. Roadster production dropped from 322,502 in 1920 to 1134 in 1937. Dodge built its last roadster in 1932. The Wayfarer roadster is designed as a car for young people or as a second car in two-car families. Width of the single seat is 58 inches. The special axle gear ratio is 3.73 to 1.





AFTER years of research and months of road tests, a 4500-horsepower gas turbine-electric locomotive is making its bow this month on a freight run. The locomotive, developed by the American Locomotive Company and General Electric, is being put into service by the Union Pacific Railroad. The locomotive gas turbine differs from the aircraft jet engine in that the gases it produces are harnessed within the power plant and the resultant power is transmitted electrically to drive the wheels. The aircraft engine provides forward thrust from the exhaust stream. The new locomotive's compressor, combustion chamber and turbine are of in-line construction. Air is drawn through a compressor into several combustion chambers. Fuel is injected and the mixture burns, raising the temperature of the compressed air. The gases expand and move at great velocity against the turbine blades, turning the shaft. The shaft drives both the power-plant compressor and the generator. Power from the genera-



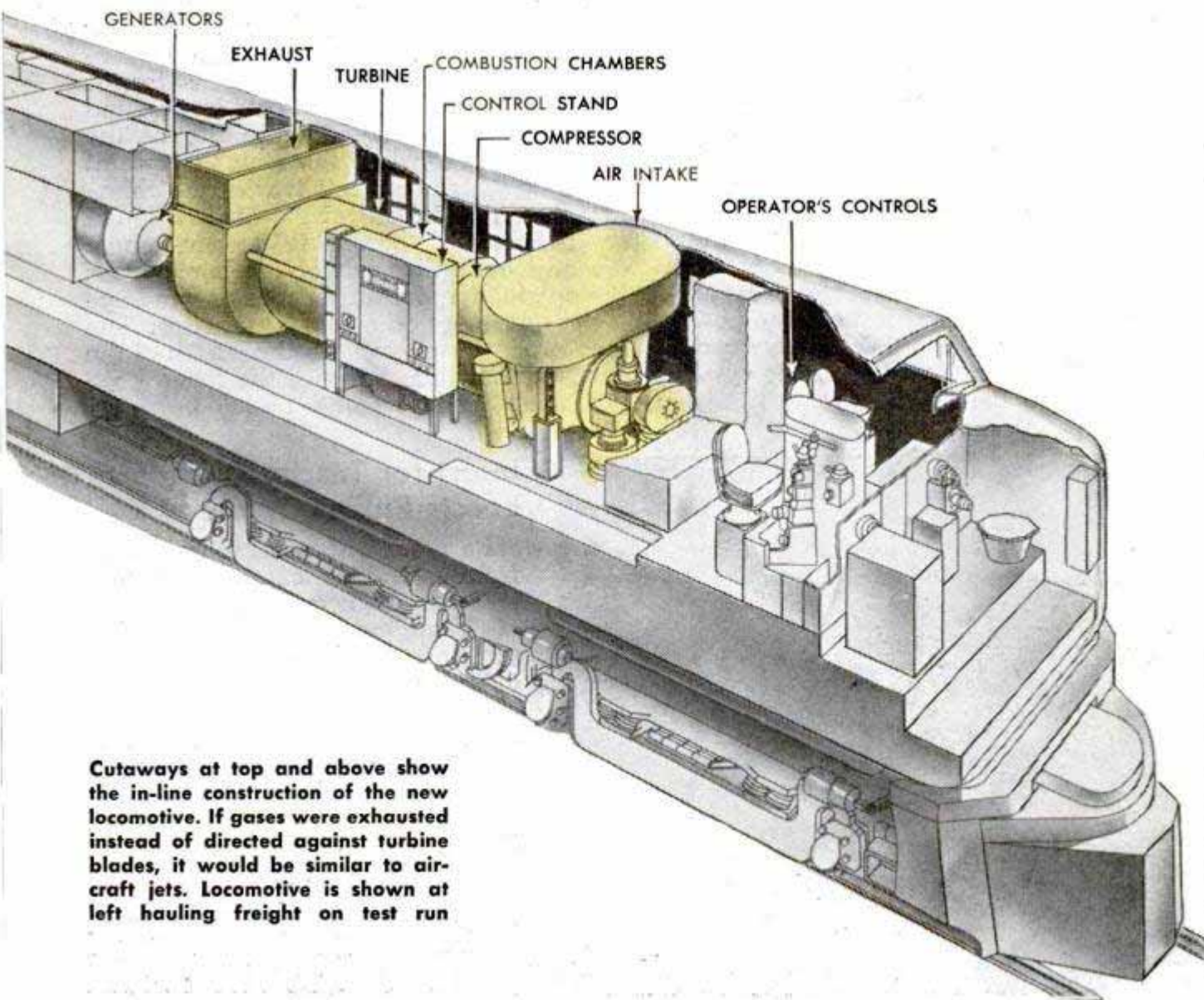


GAS-TURBINE LOCOMOTIVE

**A new trail in railroading
is being blazed by Union
Pacific's revolutionary
4500-hp. 'gas' locomotive**

tor is supplied to eight traction motors, each of which drives an axle. The locomotive is of single-cab construction with an operating station at each end. It develops 53 horsepower per foot of length, weighs 500,000 pounds and is 83 feet 7½ inches

long, 14 feet 3½ inches high and 10 feet 7 inches wide. Geared for 79 miles per hour, the locomotive carries enough fuel for 12 hours. It is fired with oil. Research is continuing on the possibility of burning coal in an engine of this type.

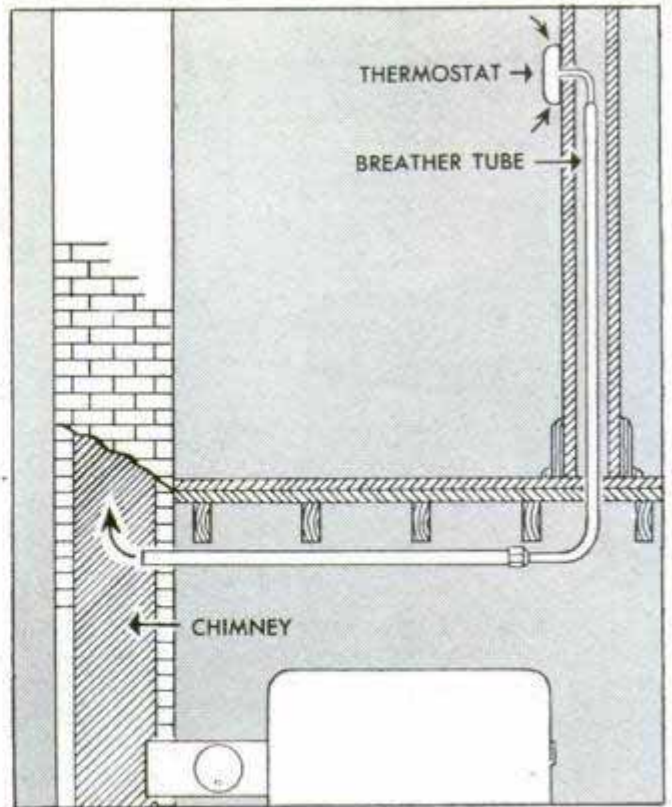


Cutaways at top and above show the in-line construction of the new locomotive. If gases were exhausted instead of directed against turbine blades, it would be similar to aircraft jets. Locomotive is shown at left hauling freight on test run



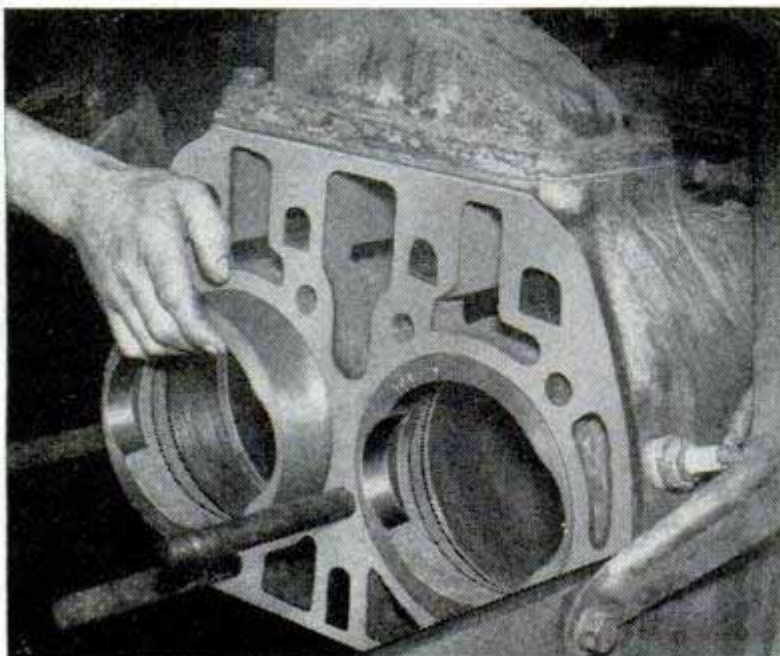
Fort Worth Policemen Speak in a Loud Voice

Motorcycle policemen in Fort Worth, Tex., don't have to shout to make themselves heard over the noise of traffic. Instead, they talk into a hand microphone and a 15-watt public-address system, operated from the motorcycle's battery, booms their words out clearly. The amplifier, a two-tube circuit, uses the power supply of the motorcycle's two-way radio. The directional loudspeaker of the system is mounted on the handlebars.



Thermostat "Breathes" Air Sample Through Draft in Chimney

Greater fuel economy for oil, stoker or gas furnaces is promised with a new thermostat that automatically compensates for warm, cold or windy weather. Fewer and larger fuel runs add to the life of the burner. The heart of the new thermostat is a tube which connects it with the chimney flue. The tube draws a draft through the thermostat, "breathing" an air sample directly over the control mechanism. As the outside temperature drops or wind velocity increases, the draft increases. The amount of draft regulates the length of the "on" period, thus keeping the firing proportionate to the weather demand.



Insert for Tractor Cylinders Boosts Pulling Power

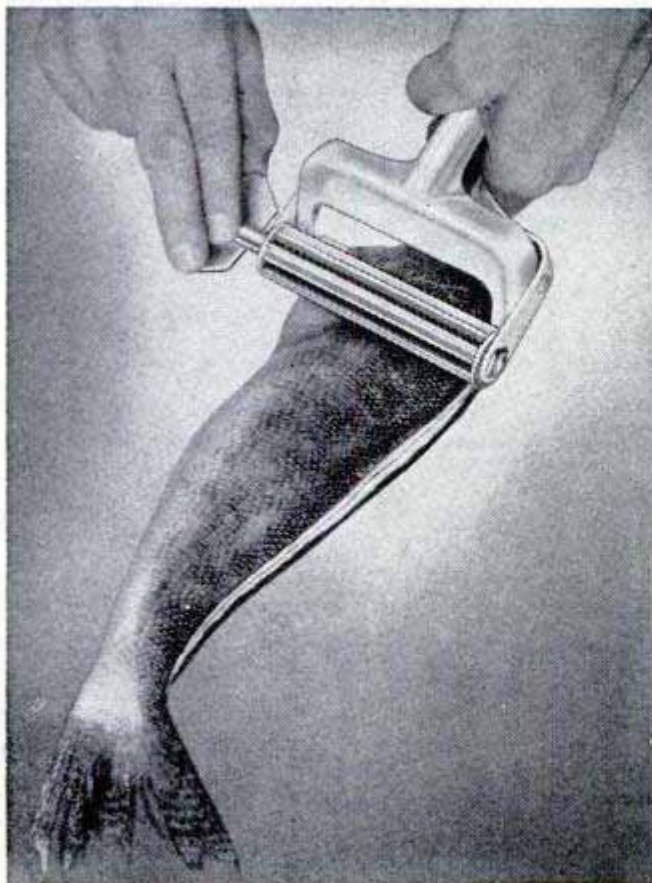
Farmers who want more power from a tractor can convert the motor to high compression without changing any of the parts. Inserts are placed in the top of the cylinder, cutting down the space in the combustion chamber to produce the higher compression. The inserts increase the pulling power of the tractor about a gear. They are available for several models of John Deere, Allis Chalmers and Farmall tractors.

☐ In 1948, a record-breaking 15½-billion dollars' worth of minerals was mined in the United States.

This Clothesline Works Every Day

Your clothesline will become a beautiful addition to your back-yard pleasure if you install a combination sunshade-clothes drier that is useful seven days a week. On wash days, you have 200 feet of plastic-coated line to hold the laundry. The rest of the week, the line supports a canvas awning that provides 125 square feet of shade for outdoor eating and lounging. The end supports can be raised, lowered and tilted to give maximum shade or, if desired, can be turned vertically to support a badminton or volley-ball net. Hanging clothes is a no-stretch operation because you can crank the line down to a convenient height and then raise it to a height of seven feet for fast drying.

Top, six days a week you relax beneath this huge awning which, come Monday, right, slips back to uncover a roomy clothesline



Fish Skinner

By simply turning the handle of a new kitchen aid the fisherman can skin his catch, peeling off the scales at the same time. The device is patterned after commercial meat skinners. It operates without throwing scales or tearing the flesh. The fisherman prepares the fish by cutting the skin down the belly and the back and removing the fins and head. Then the edge of the skin is pinched into the skinner. Turning the handle separates the skin from the flesh and feeds it back through an opening with the scales still attached.

Drug Protects African Cattle Against Fly-Carried Disease

Use of a new drug that cures and protects cattle against all forms of a tsetse-fly-carried disease is expected to open 4,500,000 square miles of tropical Africa to stock raising. Named Antrycide by its British discoverers, the white crystalline powder will cure the two worst forms of the disease in one treatment.

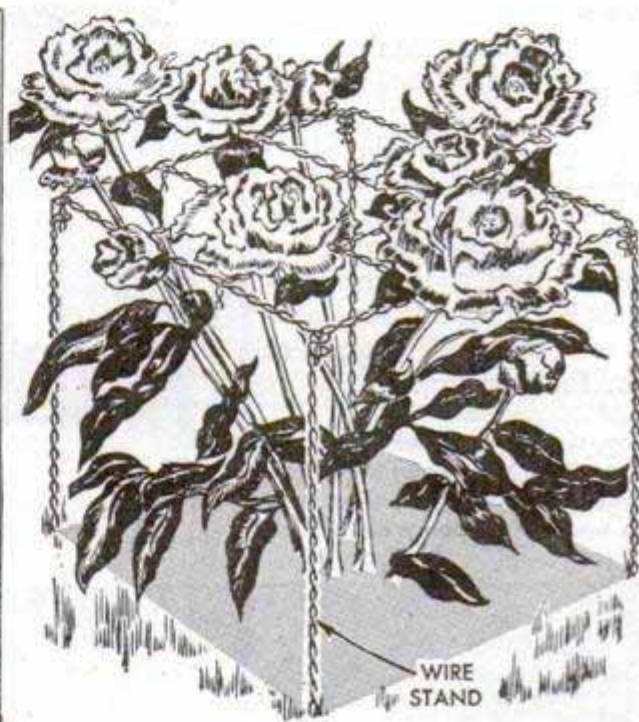
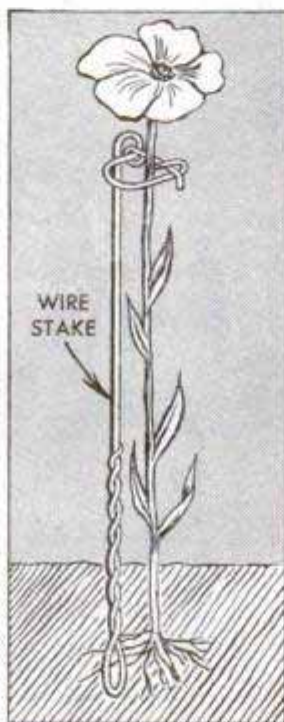


Dual Wheels on Tractor Aid Traction in Wet Soil

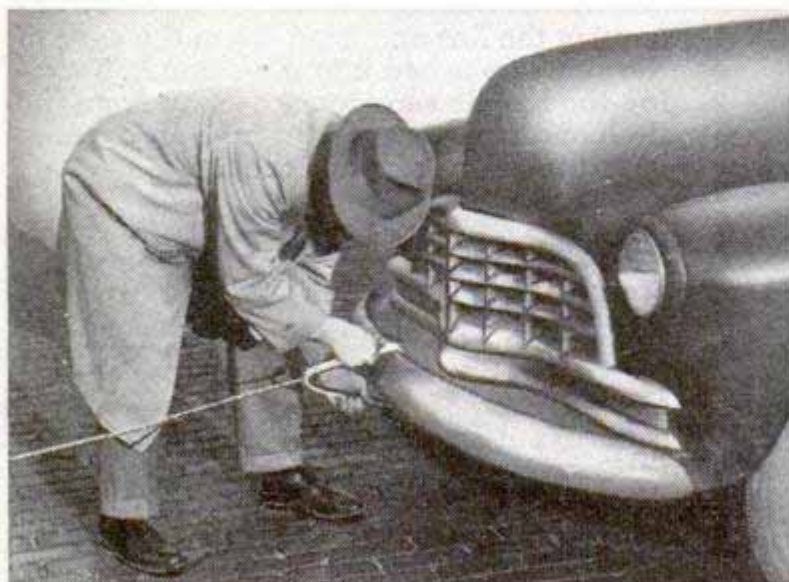
Tractors often bog down in the soggy, rice-growing land in Texas, but one farmer, near Port Arthur, solved the problem by mounting a pair of steel-lug wheels on the outside of his tractor's regular wheels. The rubber tires keep the tractor from sinking into the soft soil and the long lugs of the steel wheels provide traction even when rolling through water. To remove the oversize steel wheels, the farmer drives his tractor next to the edge of a furrow in the field before loosening the four bolts that hold the wheels in place.

Flower Stakes Of Heavy Wire

Flower gardeners can improve the appearance of their plots and also protect the slender stems of large blossoms with an inconspicuous plant stake that holds the flower upright, yet allows it to turn with the sun. One model has a telescoping feature which adjusts to the height of the growing plant. Made of heavy woven wire, the stakes are flexible enough to sway gently with the wind. The wire loop that is pushed into the earth does not interfere with root growth. A support for peony plants has four stakes which hold a horizontal wire grille. All models of the stakes have an ingenious wire lock that can



be removed at any time without damaging the plant. For use with house plants, there is a model only one foot long.



Snap-On Tow Cable

You won't have to crawl under the car to hook on a heavy chain when you need a tow if you have a spring-clamp-equipped cable with you. Steel clamps on the ends of the flexible steel cable snap over the bumpers quickly and securely. The complete assembly can be rolled into a small coil and carried conveniently in a corner of the luggage compartment.

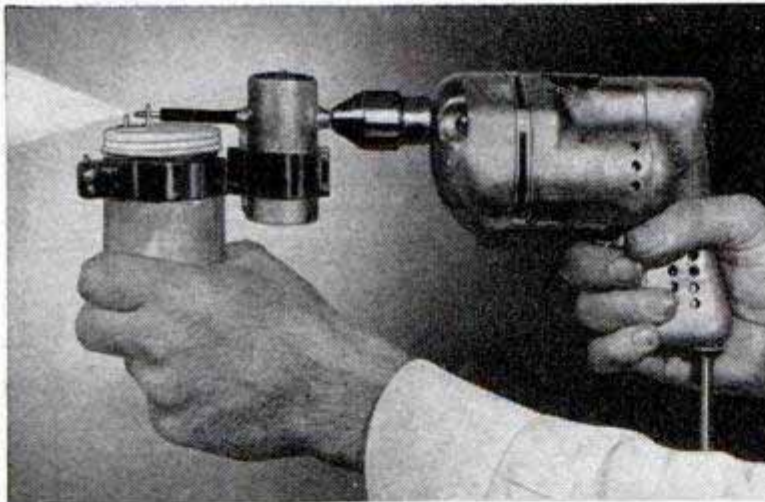
☐ Crop experiments in Oklahoma show that burning off a pasture reduces its yield about 50 percent by killing soil organisms.



Pontoon Houseboat

Built with an Army bridge pontoon for a hull, a houseboat constructed by a Daventry, Iowa, grocer accommodates 10 persons. The builder, Richard Buergel, fitted a cabin to the aluminum pontoon, equipped it with a marine engine and operates his

unusual craft on the Mississippi River. The work was done almost entirely by hand, an electric drill being the only power tool used. The houseboat is 32 feet 11 inches long, has a beam of 8 feet 8 inches and draws only 6 inches of water. One feature is a top-deck steering apparatus. This was Buergel's first boatbuilding project.



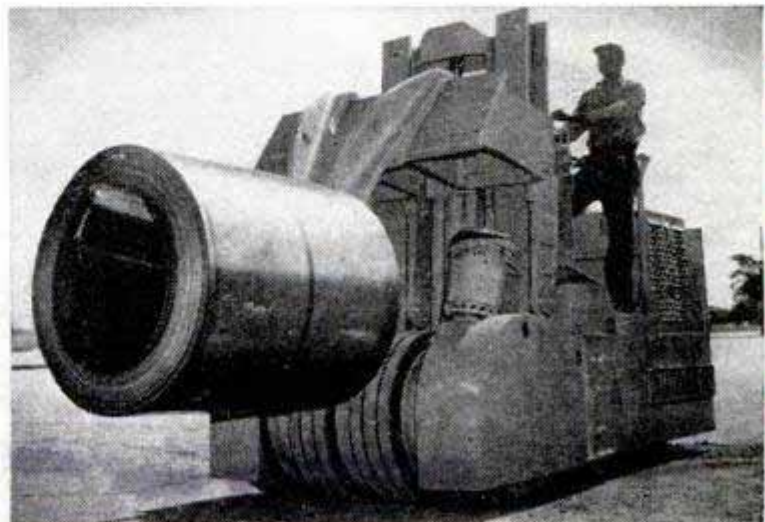
Compressor Converts Drill Into Paint Spray Gun

Any 1/4-inch electric hand drill can be converted into a spray gun with an attachment that includes a miniature air compressor. The attachment provides a small sprayer for touch-up paint jobs around the shop and for hobby use. Weighing only eight ounces, the unit is made of an aluminum-alloy casting fitted with bronze bearings. The container-gun is held in place by a chrome strap.

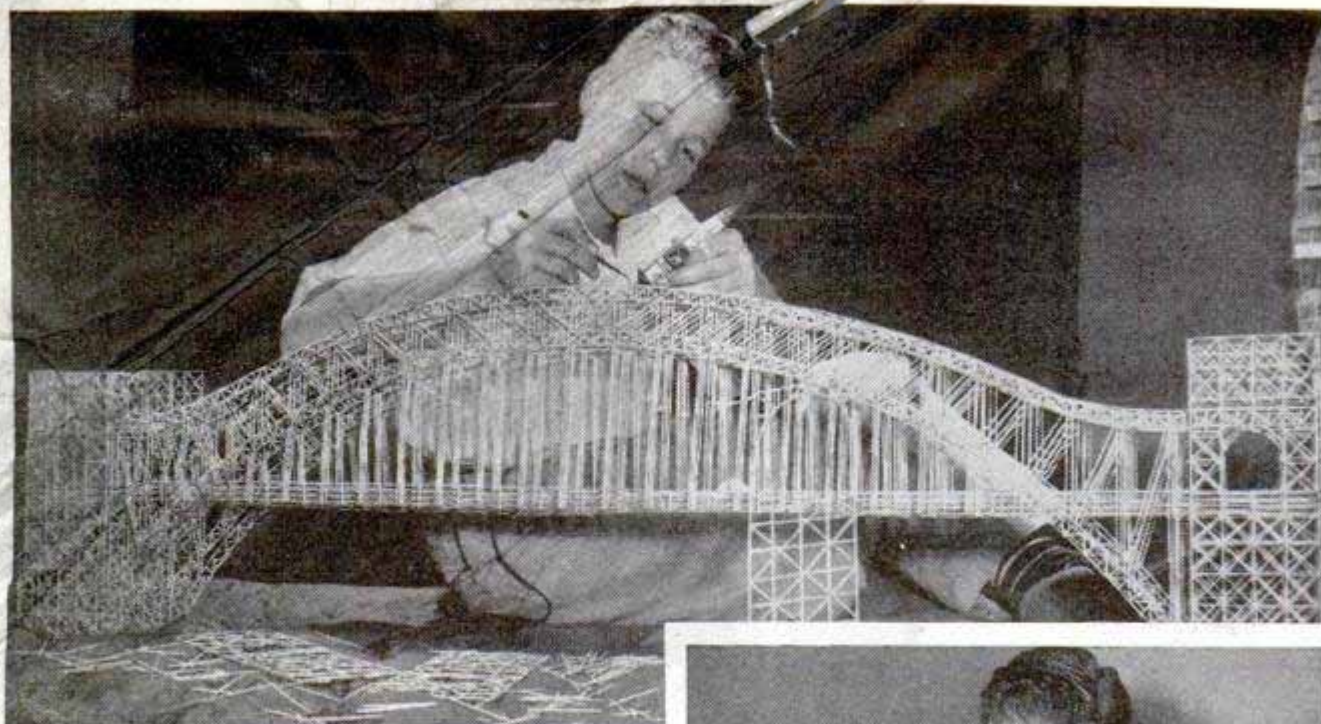
Mail returned. No longer listed in phone book.

Mobile Lifts for Steel Handle 20,000-Pound Rolls

Steel rolls weighing 20,000 pounds are handled with ease by mobile lifts at the Ford Motor Company's River Rouge plant. They have taken over work formerly done by cranes.



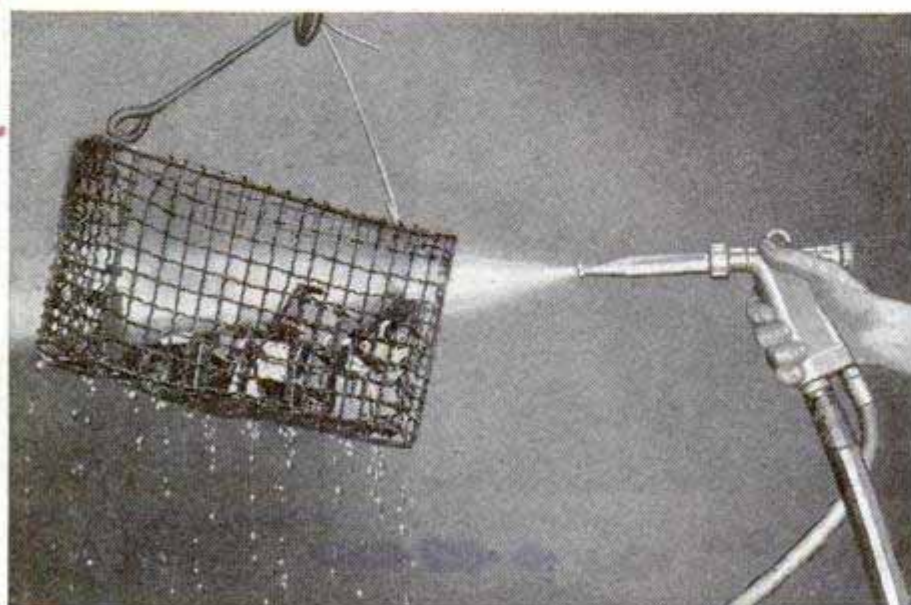
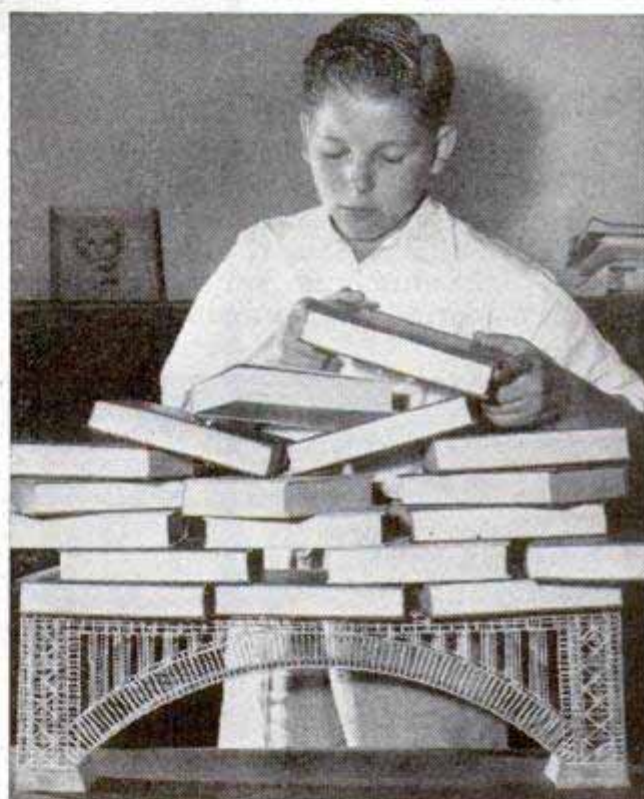
Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX which is available without charge from our Bureau of Information, 200 East Ontario Street, Chicago 11



Bridge Made of Toothpicks Supports 10-Pound Load

Toothpicks are the building blocks of youthful Barry Pariser of New York, whose hobby is constructing bridges. The youth built one arch bridge of 2500 toothpicks which weighs only a few ounces, yet it will support more than 10 pounds. His next project was a 4½-foot railway bridge that required 35,000 toothpicks. The young engineer figures it takes about five months' work to complete such a project. Construction tools include liquid cement, tweezers to handle the toothpicks, nippers to cut them—and a great deal of patience.

Top, one of the young engineer's projects is this 4½-foot railway arch bridge requiring about 35,000 toothpicks. Right, smaller bridge easily holds 10 pounds of books. Cement holds the toothpicks together



"Cold Steam" Spray Cleans Metal Parts

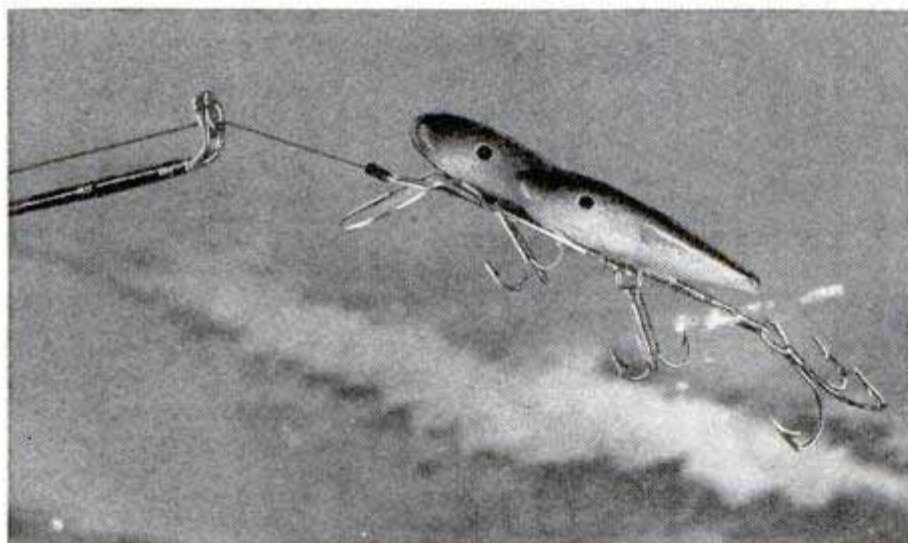
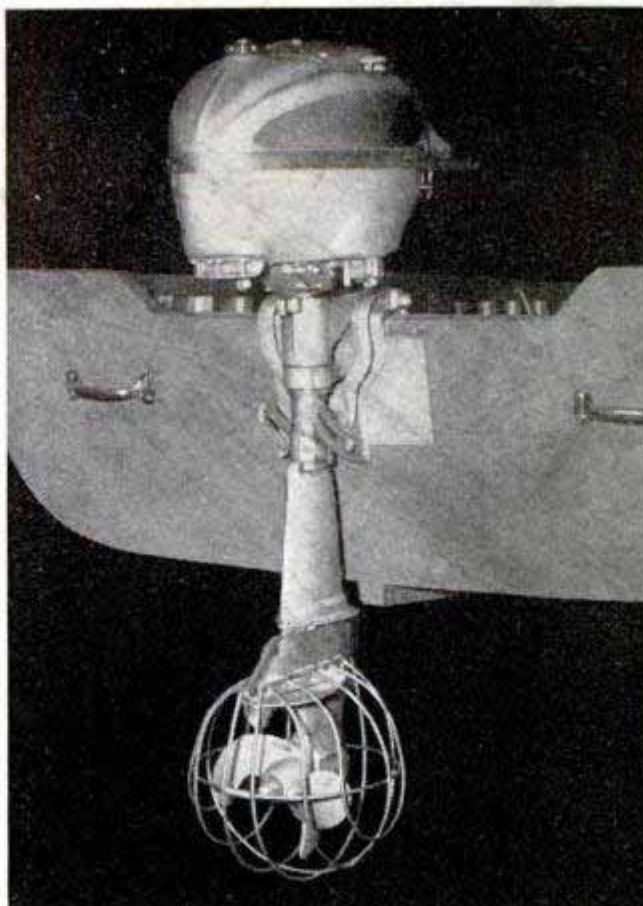
Pressure rinsing with "cold steam" from a hand gun that combines water and air into a high-pressure stream of tiny droplets blasts heavy dirt and grease from machines and small parts. There is no back splash and the spray won't harm the finest finish. The material to be cleaned is dipped or sprayed with a pre-soaking solution before the pressure rinsing operation is started.

Cage Protects Outboard Propellers

Outboard motors are protected by a new guard cage made of stainless steel. The guard is spherical and completely encloses the propeller, eliminating damage to the blades and shear pin. Being stainless steel, the guard will not corrode in salt water. A trolling plate fits the contour of the cage for fast motor operation at low speed.

Dash-Controlled Shock Absorbers

Because shock absorbers can be made adjustable by the use of a fluid having a magnetic-controlled viscosity, the motorist of tomorrow may be able to adjust the smoothness of the ride from the dashboard. Recommended at a meeting of the Society of Automotive Engineers, the dash-controlled shock absorbers would use fluid consisting of finely powdered iron dispersed in a liquid. When a magnetic field passes through the fluid, the iron particles tend to flux and thus viscosity is increased. This would enable the driver to adjust the riding comfort of his car or truck to road and load conditions.

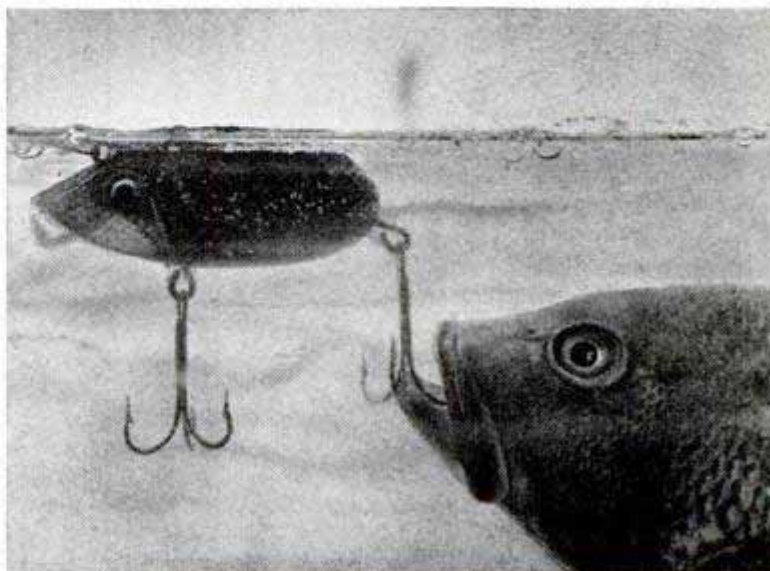


Twin-Minnow Lure

Combined in a single angling lure are two artificial minnows, simulating the action of small fish that travel in schools. The minnows are mounted on a metal chassis, one staggered to the rear of the other. Three sets of hooks project well away from the chassis, making it difficult for the fish to strike the twin lure without first coming in contact with one of the hooks.

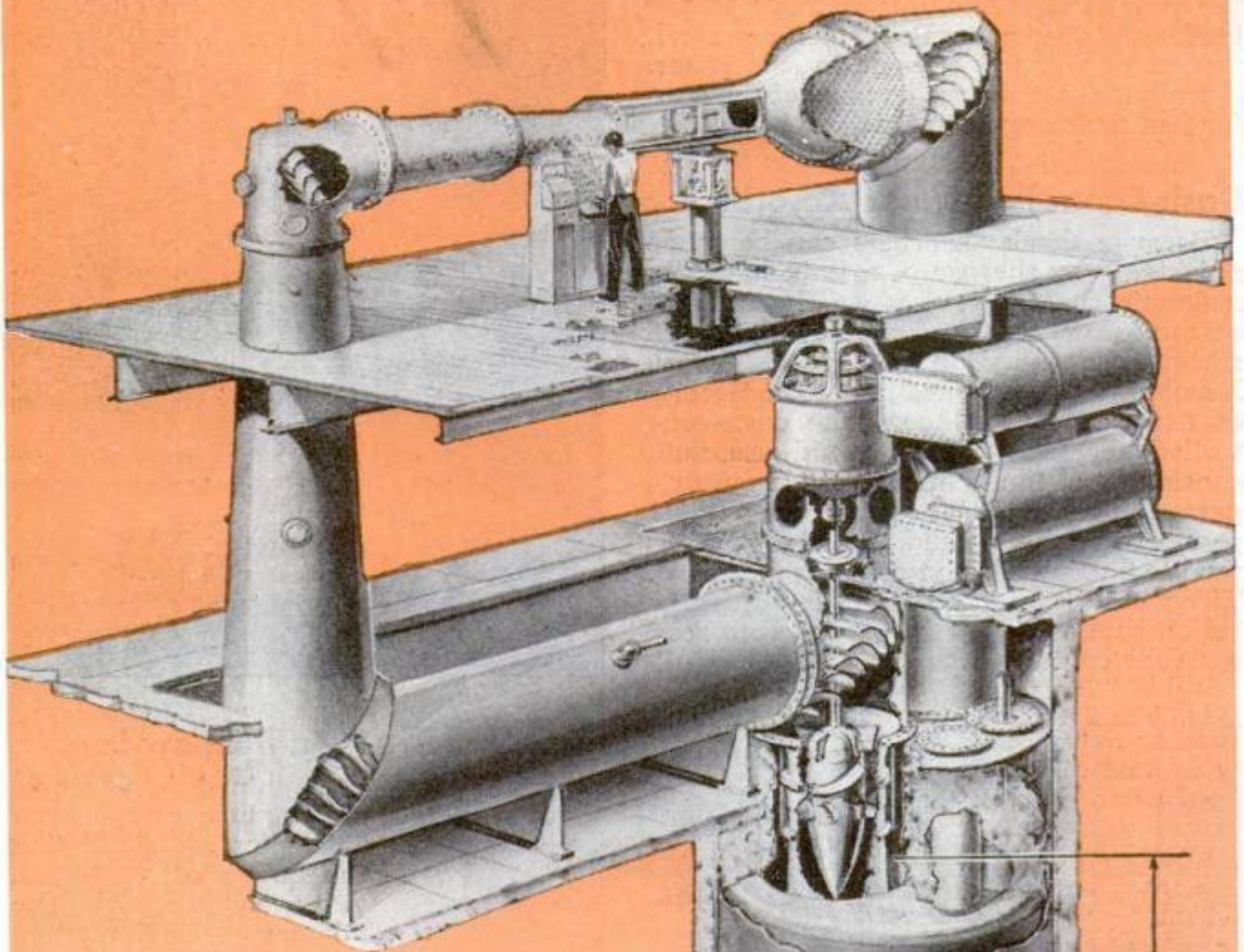
Bubbling Bait

Bobbing and weaving like a real fish, a new lure made of Celanese plastic emits bubbles to coax the big ones to the surface. A special pill is clipped beneath the lure's snout to give off the bubbles which provide the lifelike action. No rod-tip manipulation is required with the lively lure, which also can be used without the pill as an underwater bait.

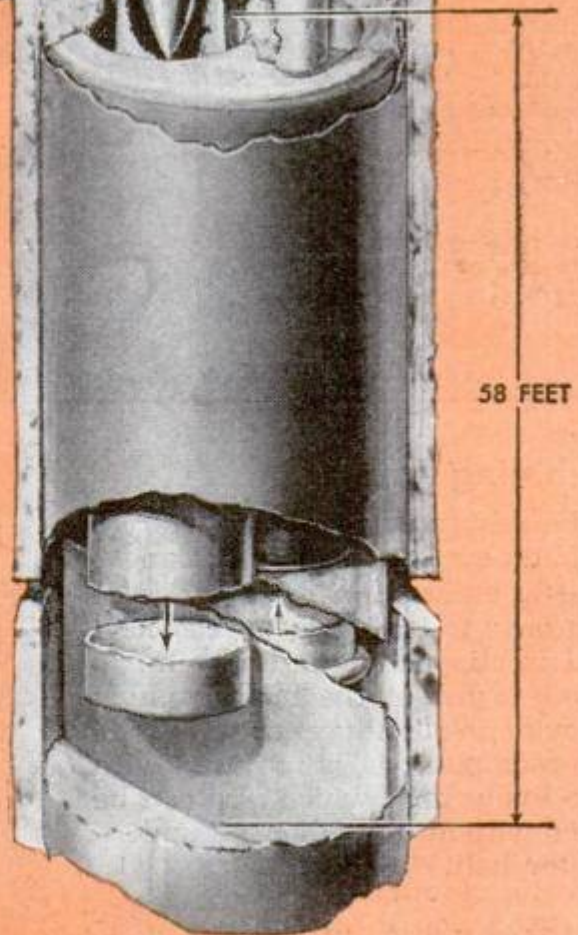


☐ Antarctica, with an average height of 6000 feet above sea level, is the highest continent.

Underwater Speedway



Water flows at speed of 100 feet per second past the test section (to right of observer in drawing) of huge research water tunnel. Below, torpedo model is attached to balance mechanism prior to test



58 FEET

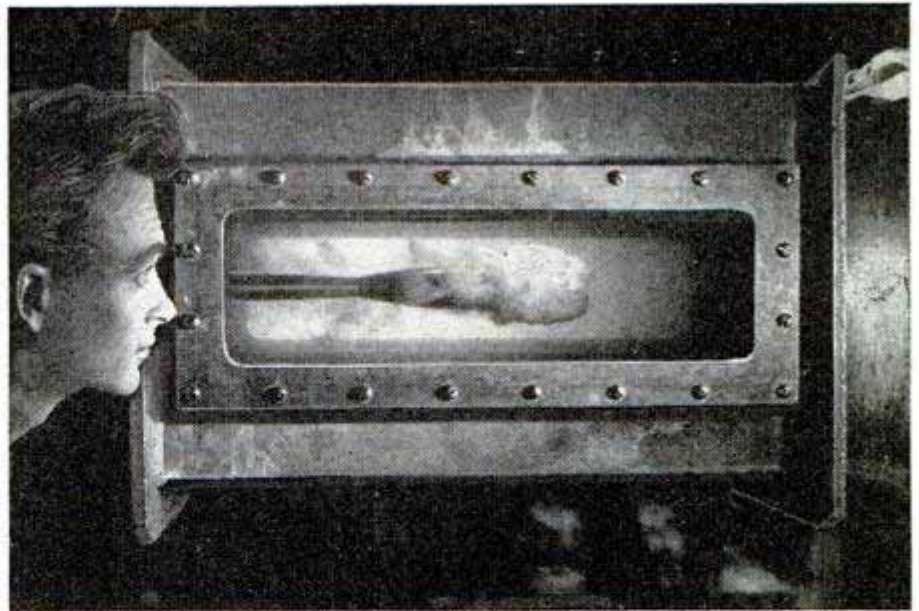
WHEN AN OBJECT moves underwater at high speed a mysterious force is brought into play that has baffled scientists for years. The speeding object may be one of the new underwater missiles propelled by the furious action that occurs when sodium or some other substance is allowed to unite with water. Or, it may be a speedboat, a torpedo, or a pump for a dam like Grand Coulee.

The mysterious force which acts as a brake on any speeding underwater object is known as cavitation. This bugaboo of hydrodynamics is something like the drag that limits the efficiency of airfoils in the atmosphere. A swiftly moving body creates a cavity in the water in the form of a blanket of low-pressure bubbles that appear, grow and collapse. The hammering of the water as the bubbles collapse creates vibrations, limits speeds and actually erodes metal. Fast ocean liners must sometimes go into dry dock for repairs to propellers that have been eaten away by cavitation.

Engineers know what causes cavitation and they know its harmful effects but they don't know for certain how it works. To find out, the hydrodynamics laboratory of the California Institute of Technology is making studies in water tunnels that are comparable to the wind tunnels used in aerodynamics.

Among those keenly interested in this research are the many designers in remote fields who are plagued by the vagaries of cavitation. Naval architects who design fast sailing cutters find that each boat has an arbitrary "hull speed" beyond which it hardly can be driven. The boat shakes and trembles when the hull speed is attained. The underwater disturbance creates a rumble that one racing skipper compares to the sound of sailing the boat across a gravel bar.

Cavitation is also a costly factor in the design of

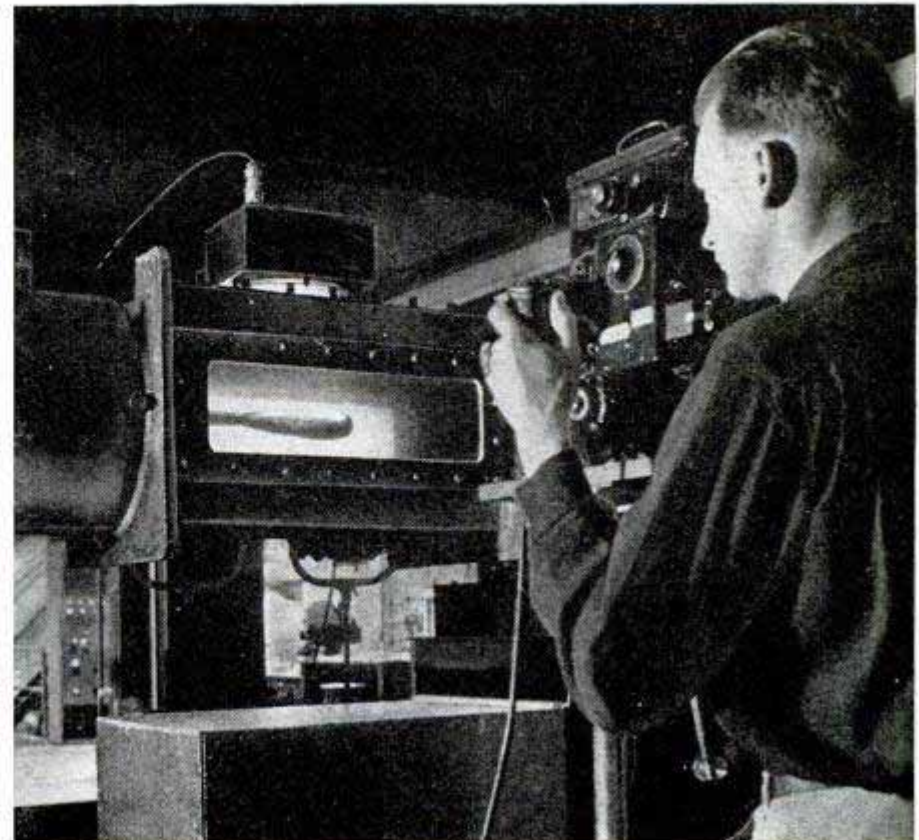


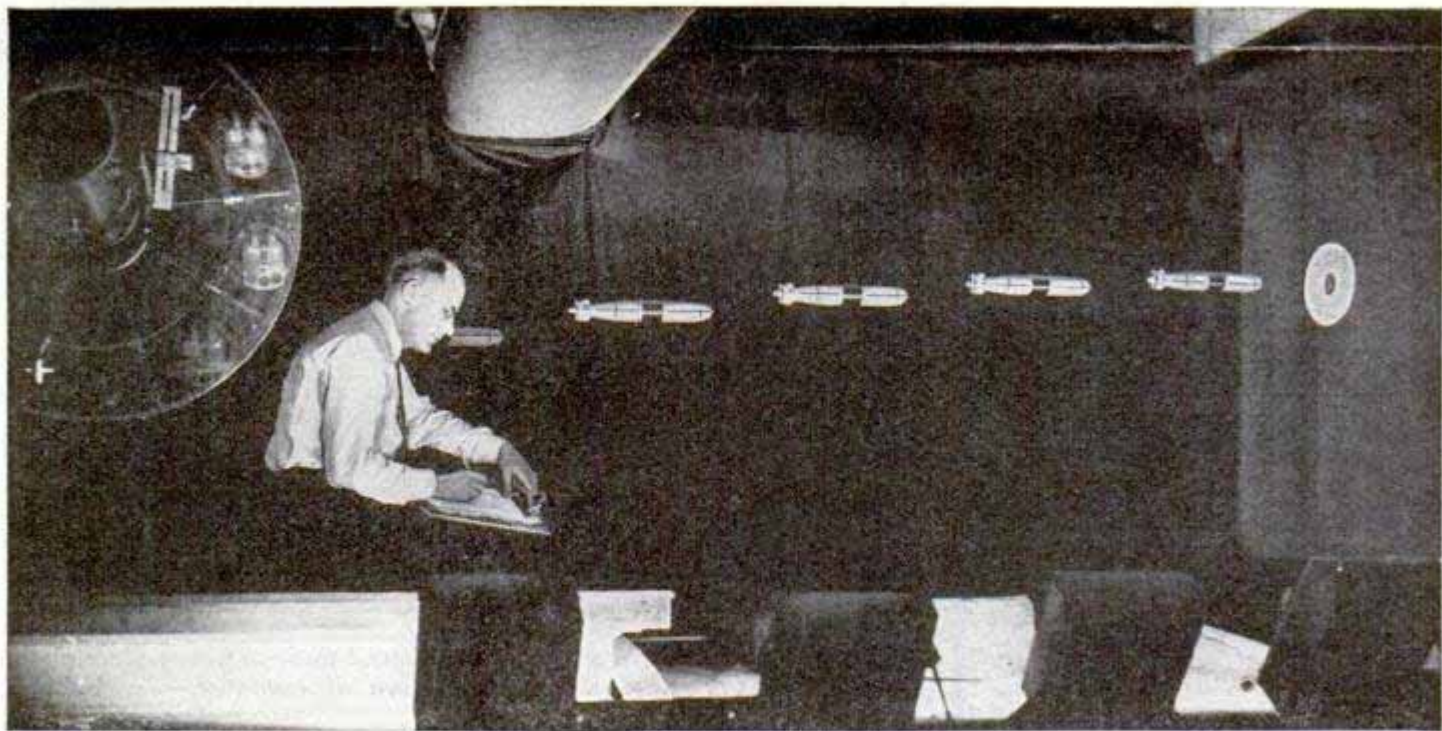
Models in high-speed water tunnel are viewed through heavy glass plate. Cloudy area over nose of model is result of cavitation—tiny bubbles

the pumps that will lift part of the Columbia River up the side of a 300-foot cliff at Grand Coulee Dam for irrigation purposes. This job will be done by 12 giant pumps. Each has an impeller wheel 14 feet in diameter and a shaft that weighs 30 tons. Each will be driven by a 65,000-horsepower electric motor. Smaller, faster pumps could do the job at less cost if it were not for cavitation.

The mystery of cavitation may be solved in C.I.T.'s water tunnels. Streams of water are made to flow past models at speeds up to 100 feet per second. A balance system

Laboratory equipment includes camera that takes 20,000 pictures in one second. Photographer trips button that operates camera and flash lamps



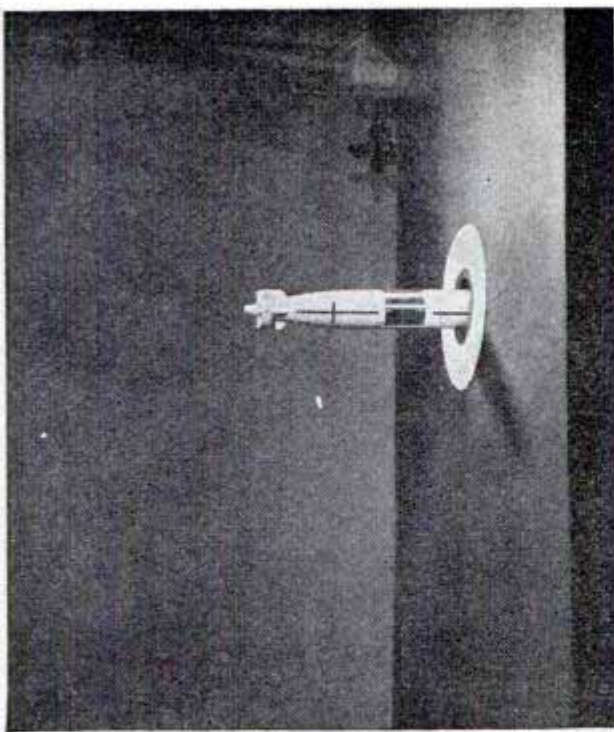


Torpedo launcher is tested by firing at target 12 feet away. Opening in curtain is $\frac{1}{2}$ inch in diameter larger than torpedo. Left, close-up of torpedo on wheel-launching device. Below, magazines of five high-speed underwater cameras in the launching tank

that is attached to the model is used to control its attitude in the water and to measure the hydrodynamic forces that act on it. High-speed cameras take pictures of the cavitation that the model induces.

Looking through the thick glass wall of the water tunnel, no evidence of cavitation can be seen while the water moves at low speed past the model. But when the velocity is increased, the water behind the model becomes disturbed and finally begins to





froth. At top water speed, the whole model may be coated with minute white bubbles.

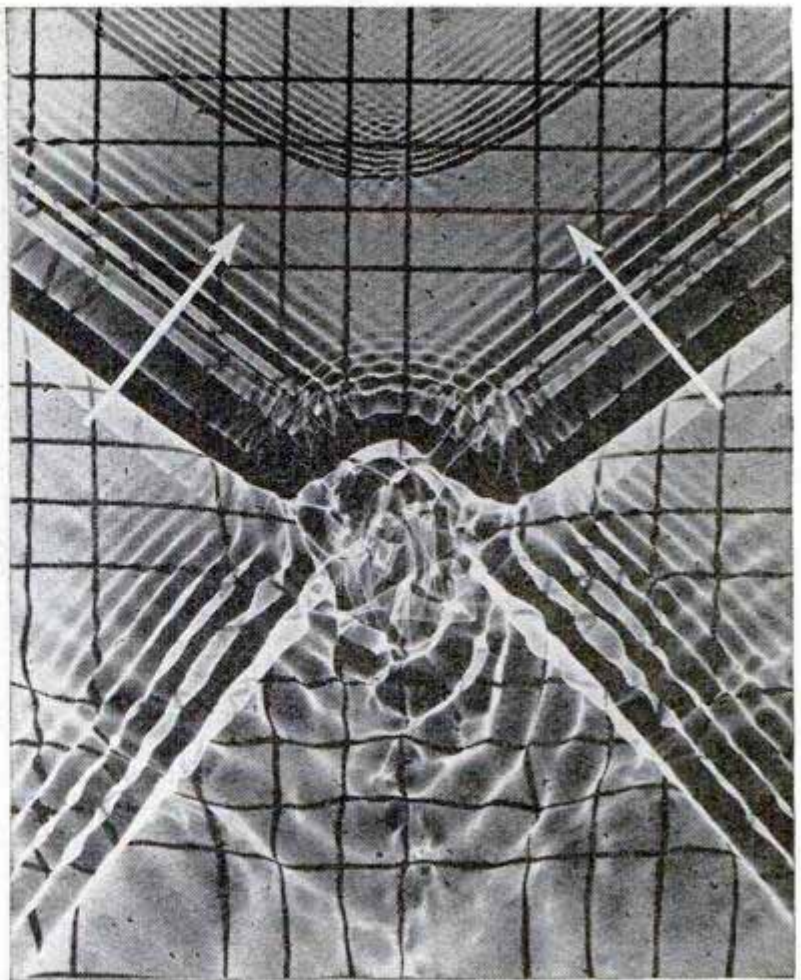
This is evidence that the shape of the model is forcing the water away from it, leaving a partial vacuum in which gases and water vapor bubble and boil.

"Cavitation limits the speed of underwater bodies and creates problems in controlling them," says Dr. Robert T. Knapp, director of the laboratory. "It limits the size and speeds of turbines and causes loss of efficiency in pumps. It is a limiting factor to all types of hydraulic machinery.

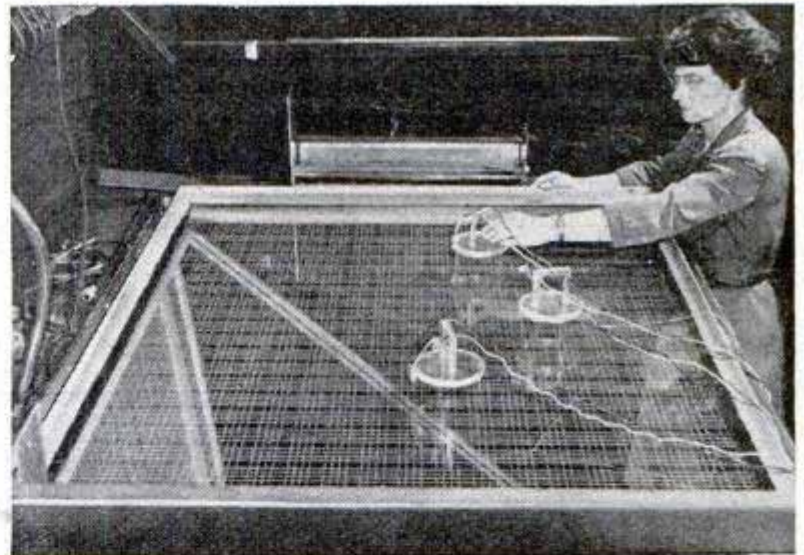
"The research that is being done with water tunnels may ultimately improve every type of machine that moves in a fluid, for when we understand how cavitation works it may be that we can control or reduce it."

The high-speed water tunnel is one of the chief tools for cavitation studies. Water is forced through the tunnel circuit by a 350-horsepower electric pump, is cooled by refrigeration to remove the heat that is created by the pumping action, and is forced down and up an 85-foot-deep steel well twice to cause it to reabsorb any bubbles that it may contain. Entering the working section of the tunnel, the water is forced through the small end of a huge nozzle that helps build the water speed up to a maximum of about 70 miles per hour.

Most cavitation phenomena are studied by means of high-speed photography. Special cameras are used to magnify time, to

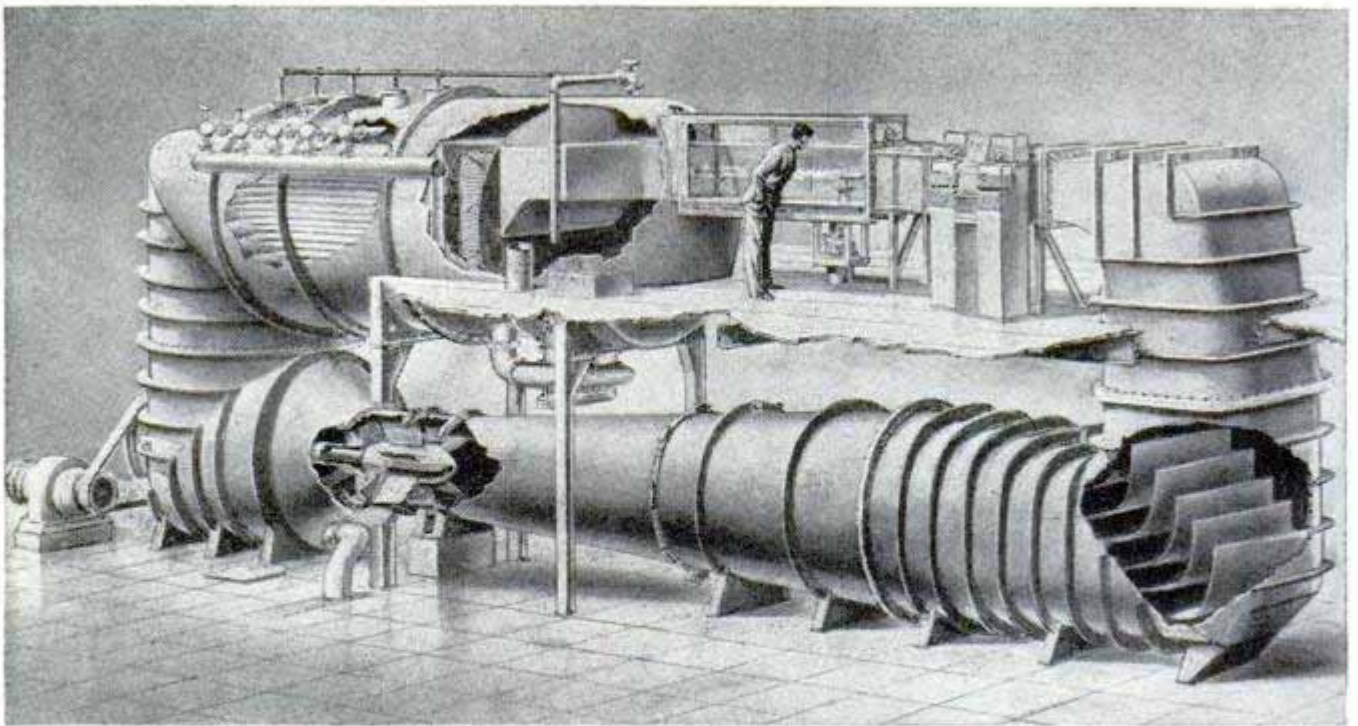


Ripple pattern is produced when two shock waves collide in a shallow water tank. Below, transparent table top is used to study ripples and wave motions. Plastic instruments being placed on the table measure heights and lows of waves



stretch one second into as long a period of time as 20 minutes. This allows examination, step by step, of the mechanics of the formation and collapse of cavitation bubbles that live and die in tiny fractions of seconds. Cameras are used as precision measuring instruments.

One 16-mm. camera used with the high-speed water tunnel exposes a 100-foot roll of film in one second. Instead of the ordinary camera aperture, a special slit $\frac{1}{16}$ inch wide is used, permitting 20,000 individual



Caltech's "free surface" water tunnel is used in laboratory study of submerged bodies close to the surface

pictures to be made on a single roll of film.

Hydrodynamicists have no expectation that they will double or triple the efficiency of water machinery. Many pumps are 90 percent efficient already and ships' propellers are 70 or 80 percent efficient. These figures apply to the "designed speed" at which the blades will be operated most of the time. What the scientists do hope for is to learn how to design smaller blades that will perform the same amount of work by operating at higher speeds, without harmful cavitation, and that will be more efficient over wide speed ranges.

During the war Caltech's hydrodynamics laboratory specialized in studying the behavior of underwater rockets, depth bombs and torpedoes.

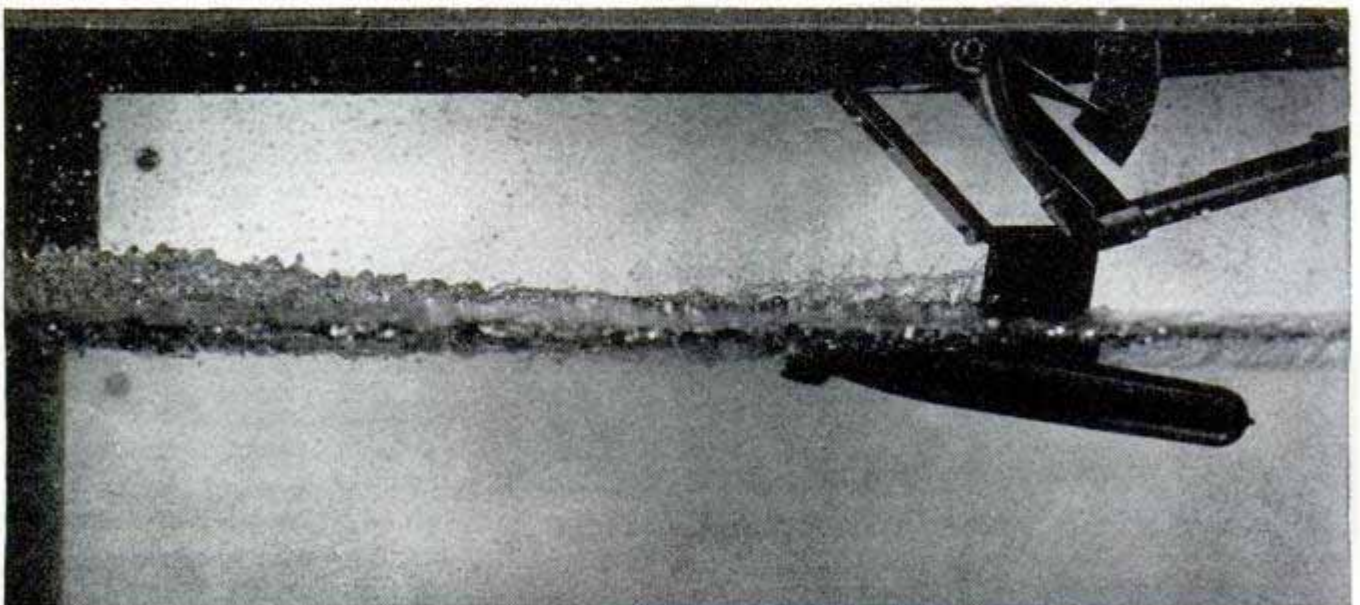
To learn what happens to torpedoes that

are released from aircraft, the laboratory built an enormous launching tank in the form of a closed cylinder 29 feet long and 13 feet in diameter. Thirty thousand gallons of distilled water, necessary for good underwater photography, partly fill the tank. The air in the space above the water can be pressurized to the extent of 40 pounds per square inch.

Built into the roof of the tank is a hinged hatch that supports a heavy flywheel on its lower side. Attached to the flywheel is a mechanical hand that holds a model of a torpedo and releases the torpedo at some predetermined angle after the flywheel has been brought up to speed. The path of the torpedo through the atmosphere and into the water is then recorded

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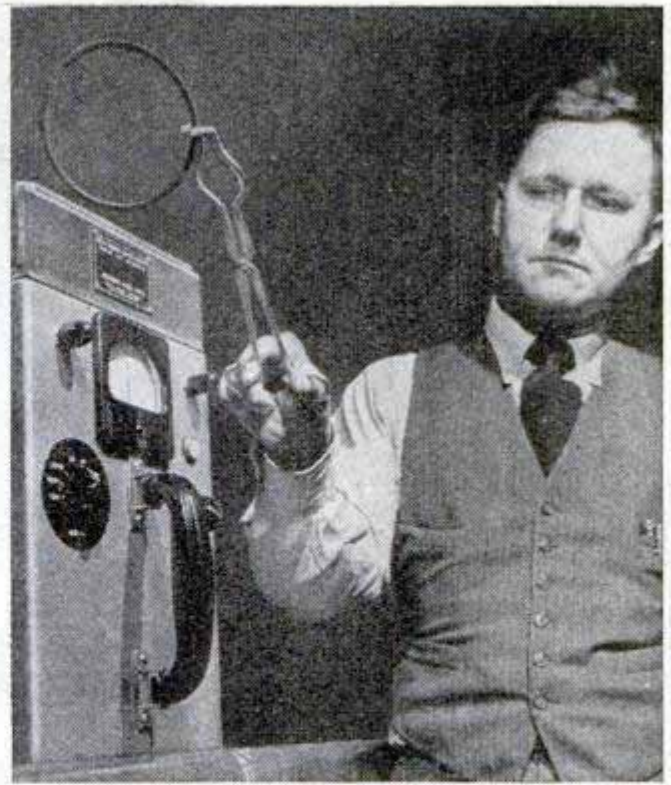
This photo was made in test section of tunnel above. It shows a torpedo just after it has entered the water





"Blackboard" Sign

Advertising messages can be wiped off a new glowing sign and other words written on the surface. The sign, which glows like a neon tube, is edge-lighted with a 15-watt fluorescent tube. The message is written on the surface with special crayons or painted on with water colors. The writing captures the light from the tube.

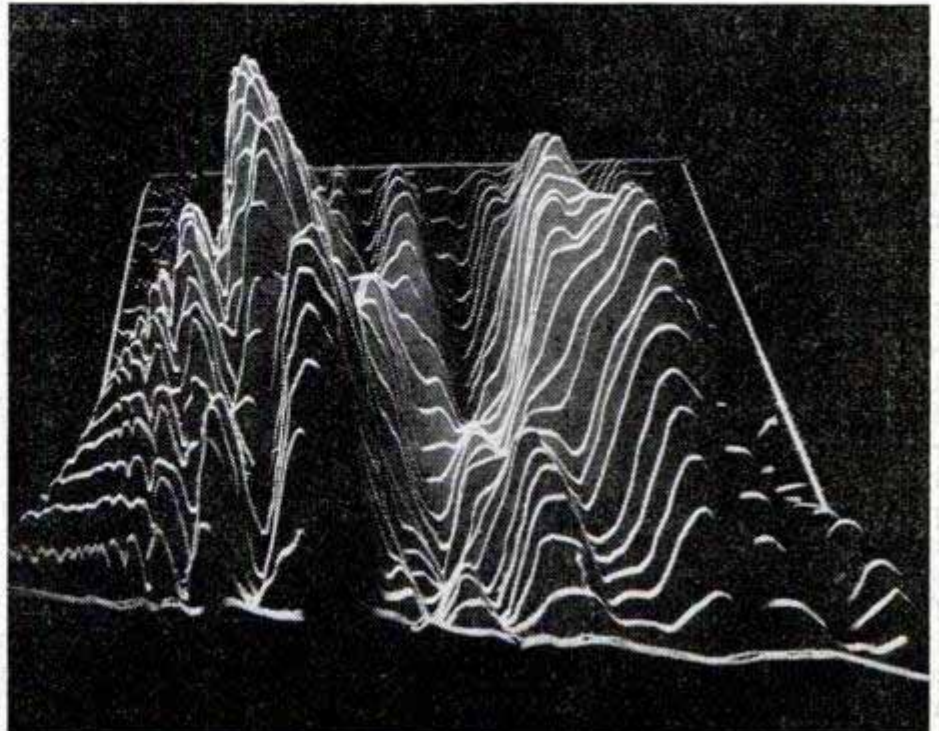


Atom Test for Engine Wear

Atomic energy has been put to work to improve fuels and lubricants for your car. The California Research Corporation is conducting tests with radioactive piston rings. A ring is exposed to an atomic pile and then placed in a test engine. After three or four hours of operation, technicians remove a sample of oil from the engine's crankcase and expose it to a Geiger counter. The instrument measures radioactivity in the oil and thus indicates the amount of metal worn from the ring.

Cutout Model Shows Action of Electrical Charge

Nobody knows what electricity looks like, but a cutout fiberboard model produced at General Electric shows graphically how electrical peaks are built up as a simulated lightning stroke, lasting 250 millionths of a second, travels through a coil. Patterned from photographs of oscillograph readings, the model shows voltage peaks and valleys that resulted from the current. Height of the model indicates voltage variations, width represents time and the length traces the location of the impulse in the winding.





Trouble Shooter on the Scent

By Alfred Eris

AT LEAST one nose in America can appreciate the more full-bodied odors like those made by a skunk or a civet cat, yet is sufficiently delicate to lead its owner to create exotic perfumes for America's most discriminating women.

That most sensitive nose belongs to Albert J. Dillinger, whose job is to concoct scents for U. S. nasal organs. To industrialists, Dillinger is a "trouble shooter" for their smell problems. Take the candy manufacturer who recently called for help because sales were dropping and complaints were pouring in. One customer after another was irate because the firm's candy smelled like cardboard. The trail Dillinger followed led to the paper mill where he introduced a "neutralizer" so that the old and odorous papers and rags used in the manufacture of cardboard would not per-

Up to the sensitive nose goes a prepared scent. After sniffing a few times, Dillinger will pronounce judgment on the odor

meate the products sold therein.

The requests Dillinger gets are as varied as human imagination can create. Some screwball ideas he must, regretfully, turn down. Others, seemingly impossible, he fills quite easily. For an insurance firm he produced an ink that smelled like a fire-gutted house. Used on a direct-mail pamphlet, it startled many prospects into signing on the dotted line. He has been asked to make plastic bones smell like beef (for dogs), sponge rubber to smell like cheese (for mouse-traps) — and a thousand and one items for humans, too. One of his current problems is impregnating waxed paper, in which bread is wrapped, with a "bread smell."

Dillinger makes artificial leather smell like the real thing; he makes the letterheads of mountain resorts smell of fresh pine woods; he gives greeting cards a distinctive odor; he permeates the paper in which bacon is wrapped with a "baconish" odor and he has even filled a request for starch to smell

"extra clean—like fresh sunlight."

Sitting in his aromatic hideaway among hundreds of bottles, his task is one which demands extreme concentration. All day long, strips of blotting paper soaked in some aromatic chemical compound are waved in front of one of America's most sensitive noses. The incorporation of odors with commercial products started some 12 years ago with simple assignments like perfuming printers' inks, insecticides, stationery or impregnating artificial flowers with a "real" odor.

Today, there's no limit to Dillinger's field—cheese, stockings or ink, it's all in the day's grind. From a prodigious memory he will quickly make a mental analysis of a formula which is close, if not fully accurate. From hundreds of bottles at his fingertips, he will select a few, draw a drop

from this, a touch from that and—presto!—beef, leather or whatever scent the manufacturer wants is produced.

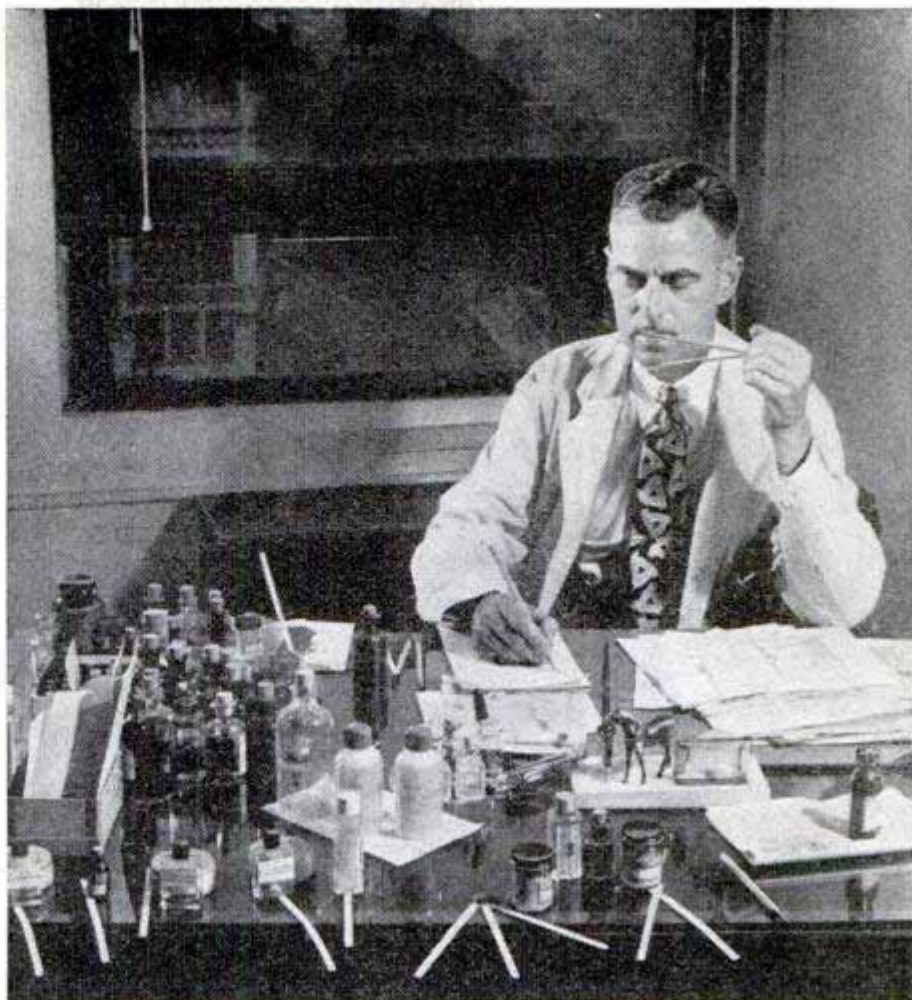
There's far more to concocting scents than the average perfume-user realizes. Apart from the fact that basic ingredients such as oils, balms and resins must come from burning wastes, a mountain of Tibet or the depths of the Atlantic, a skilled aromatic chemist must know his anatomy if he is to be efficient.

Dillinger's highly respected and specialized ability is such that he is sometimes called upon to confirm—they hope—the expectations of landlubbers or seafaring men who think they have ambergris. This valuable (\$8.00 an ounce) product of the sperm whale is often confused with other animal products generally considered useless. Ambergris is formed by the digestive fluids of the whale and the squid meat it has swallowed.

Not very long ago Dillinger had to break the bad news to a sea captain who had already put a ton of his "ambergris" into drums, piled the drums on a pier and sat in his cabin making mental computations of how he'd spend his loot. Instead of the cheery news he expected, it was the distressing duty of Dillinger to advise the seafaring gent that the stuff was completely useless.

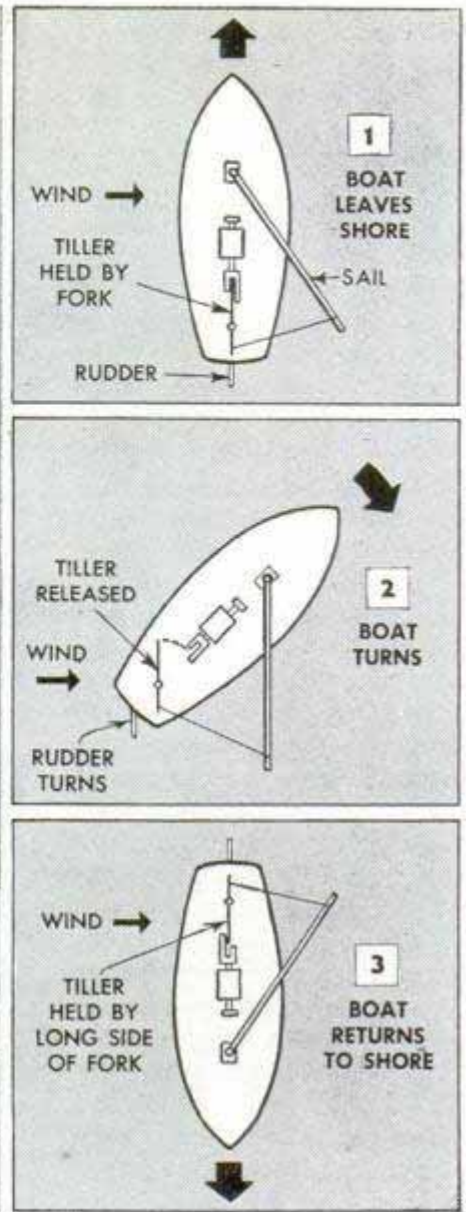
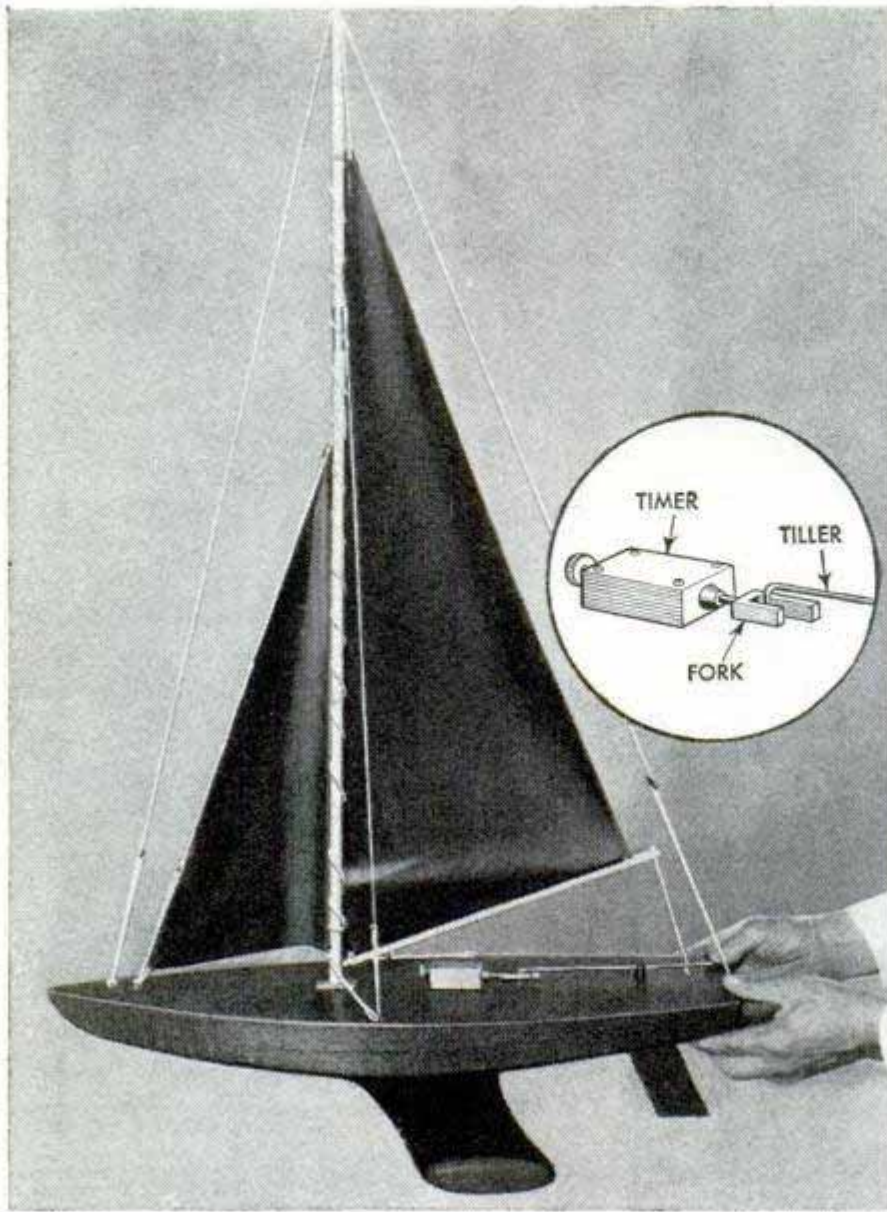
Dillinger also keeps tabs on the Chinese equivalent of Western horse thieves. The Tibetan thieves have acquired the dodge of buying musk pods from hunters and adulterating them with such sundries as powdered broiled liver, roasted powdered beans, dried blood and iron rust, and

(Continued to page 240)



Through his prodigious memory the sniff sleuth can smell a new mixture and list up to 30 ingredients used in making the odor. Below, his aromatic laboratory is lined with hundreds of bottles containing essences

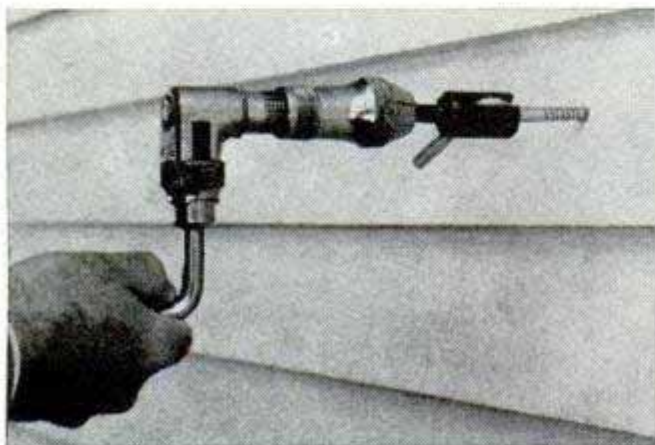




Pneumatic "Crew" Brings Model Boat Back to Port

Model sailboats are brought back to port by a "crew" that swings the rudder over after a definite length of time. The crew is a pneumatic timer with a slotted shaft protruding from the after end. At the start of the cruise, the forward end of the tiller, a long rod pivoted on the rudder post, is held securely in the fork and the main sheet is tied to the after end of the tiller. As the time expires, the timer shaft moves into

the case. Since the leeward side of the fork is shorter than the other side, the boom pulls the tiller hard over as soon as it can clear the short arm of the fork, swinging the boat around. When the boat has come about, wind pressure on the opposite side of the sail forces the tiller against the still-protruding long arm of the fork and the rudder is held on a straight course for the homeward leg.



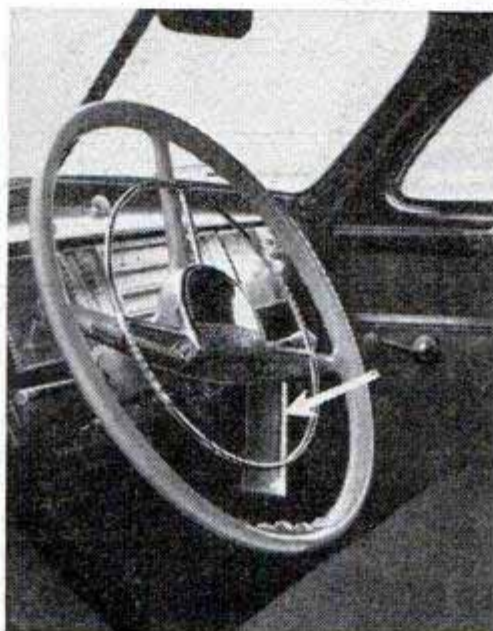
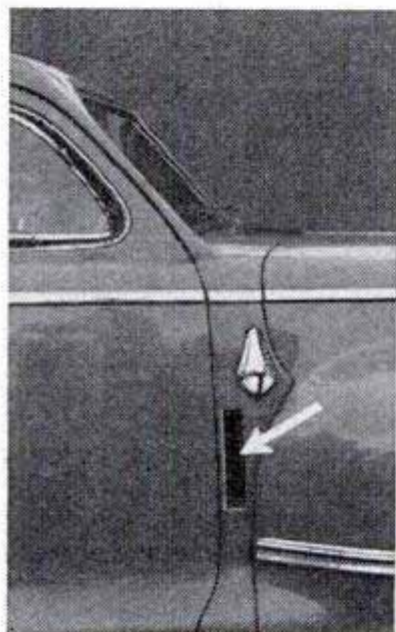
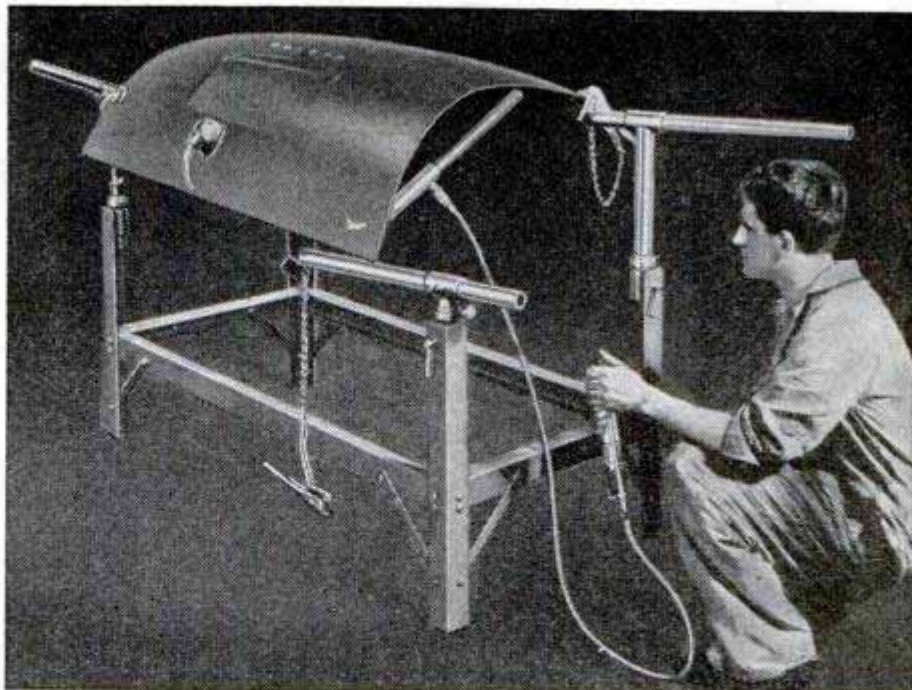
Tool Drives Angle Screws Without Damaging Threads

Angle screws used in wiring installation are driven into wood without preboring by a special screwdriver that fits into the chuck of a brace. The angle screw is inserted in a hole in the tool which holds it firmly. A few quick turns of the brace drives the screw into the wood without damaging the threads.

☛ Car trouble forced the average U. S. motorist to call a garageman 1.2 times in 1948.

Garage Repair Rack Holds Any Auto Part

Any part of an automobile, regardless of shape or size, can be clamped in a rack where it is held securely for repairs. The rack's four vertical arms can be adjusted to a convenient height. Horizontal arms slide in and out, providing an infinite variety of holds. Within 90 seconds any job can be set up on the rack. Weighing 150 pounds, the rack is adjustable in height from about 31 to 42 inches. The brackets are lined with fabric.



Curb Light

One automobile driver solved a parking problem with a side light and plastic-window combination. This enables him to see the curb by day or night when parking. The driver, K. A. Staley of Madison, Ohio, cut a slot two inches wide and eight inches high in the side of his car, about 28 inches above the ground. The inner opening is flared to five inches in width and is 11 inches high. For illumination he used a small parking light.

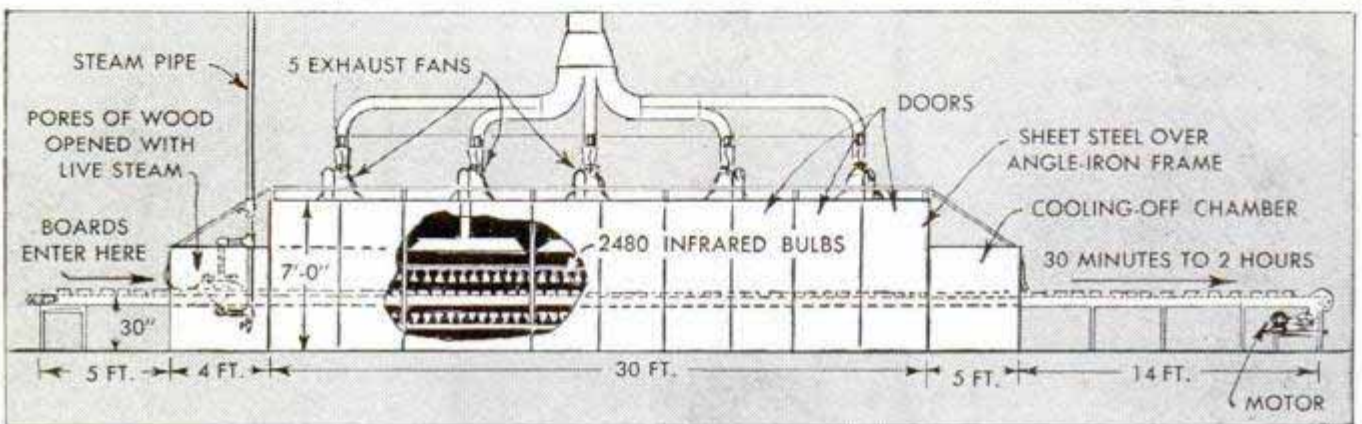
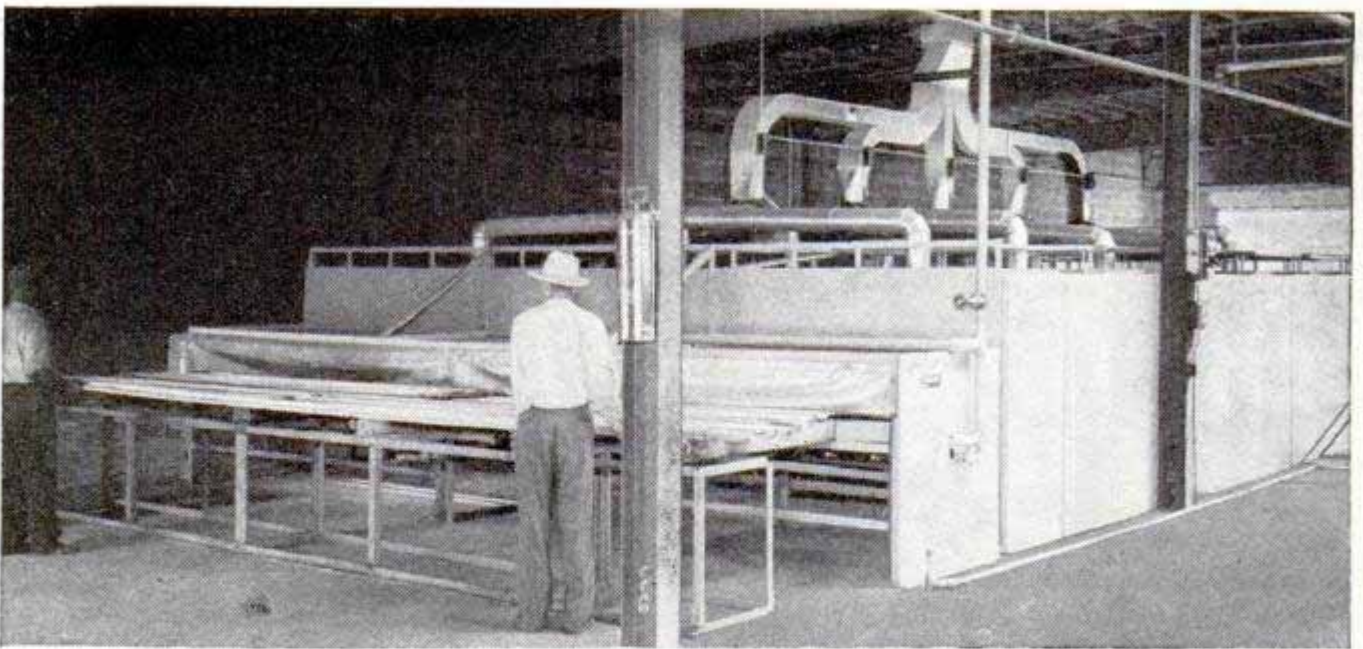
Shotgun Cleaner Protects Barrel

Cleaning and oiling your favorite shotgun is a one-minute operation when you use a combination device that can't damage the barrel. Consisting of a 34-inch wood rod covered with two inches of lamb's wool, the cleaner is pushed into the barrel from the chamber end. The wool is compressed tightly as it is forced into the barrel and it scrapes grime loose and pushes it out the muzzle.

An oil-soaked bob, also made of wool, is then hooked to the projecting end of the rod and drawn back through the barrel,



leaving a thin film of oil. A carrying case is furnished with the kit. The cleaner is available for the standard shotgun gauges.



Infrared "Oven" Dries Wood

Lumber is thoroughly dried in 45 minutes—instead of 14 days and nights—in an infrared light kiln perfected by the Chicago Streamlite Corporation. Conveyors take

boards through a live-steam bath before exposing them to temperatures of approximately 250 degrees Fahrenheit from 2480 infrared bulbs. It lowers the moisture content of the wood from approximately 28 percent to 9 percent.



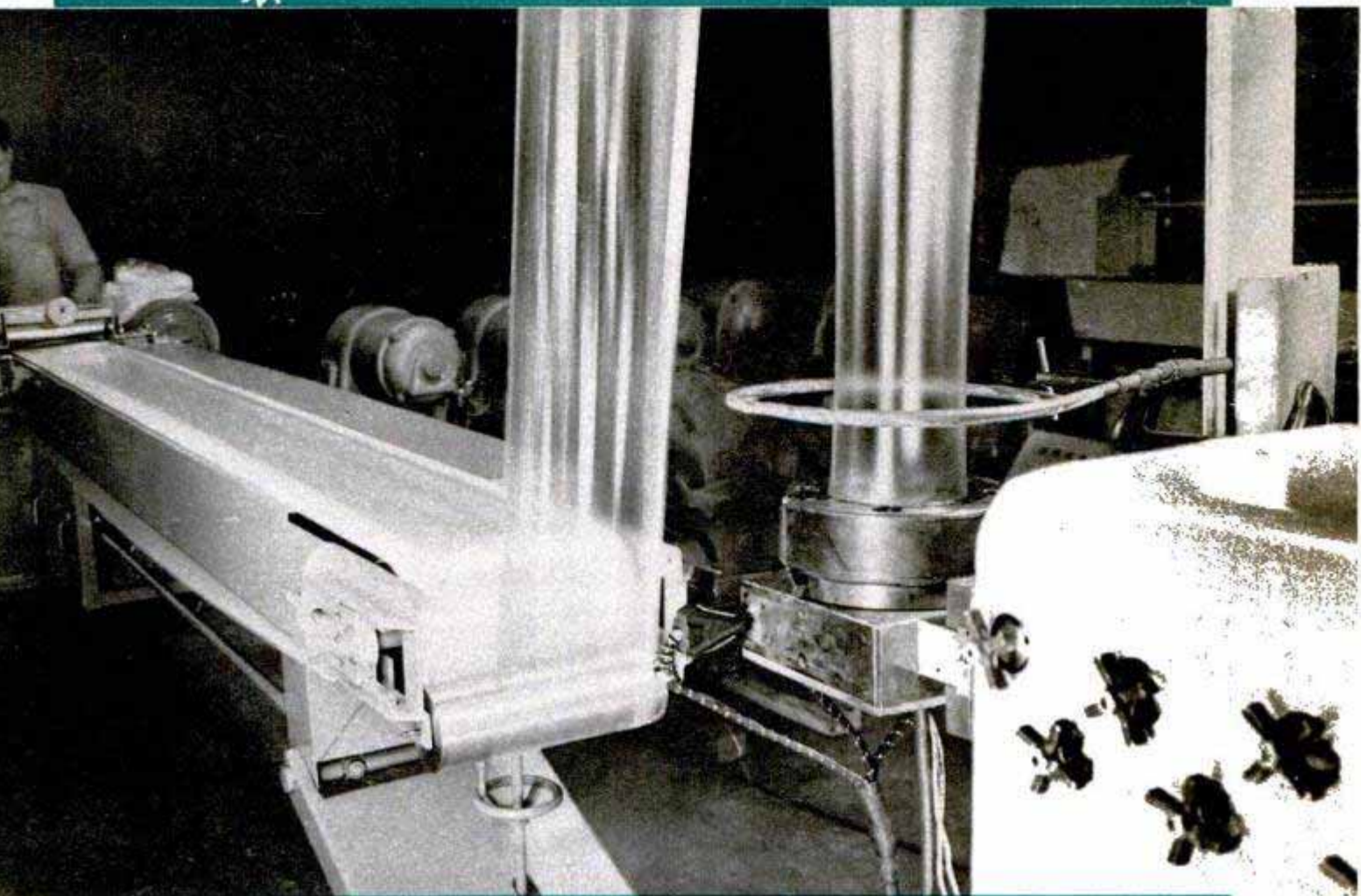
Consolidated-Vultee Aircraft photo

B-36 Adds Four Jet Engines

Adding pairs of jets in a "pod" beneath each outer wing panel of the B-36 gives the world's largest bomber a record total of 40,000 horsepower. They supplement six

3500-horsepower piston engines for added power on take-off and extra speed over the target area. Using them the giant plane has taken off at a gross weight of 280,000 pounds in 3500 feet of runway and reached a 40,000-foot altitude.

The All-Star Plastic



Modern Plastics Machinery Co. photo

This machine extrudes polyethylene vertically in the form of lay-flat tubing, widely used in packaging

By Bill Reiche

HIGH ON THE all-too-short list of postwar "dream products" must be placed a versatile young member of the plastics family, polyethylene, a material which has been aptly called "the precocious plastic."

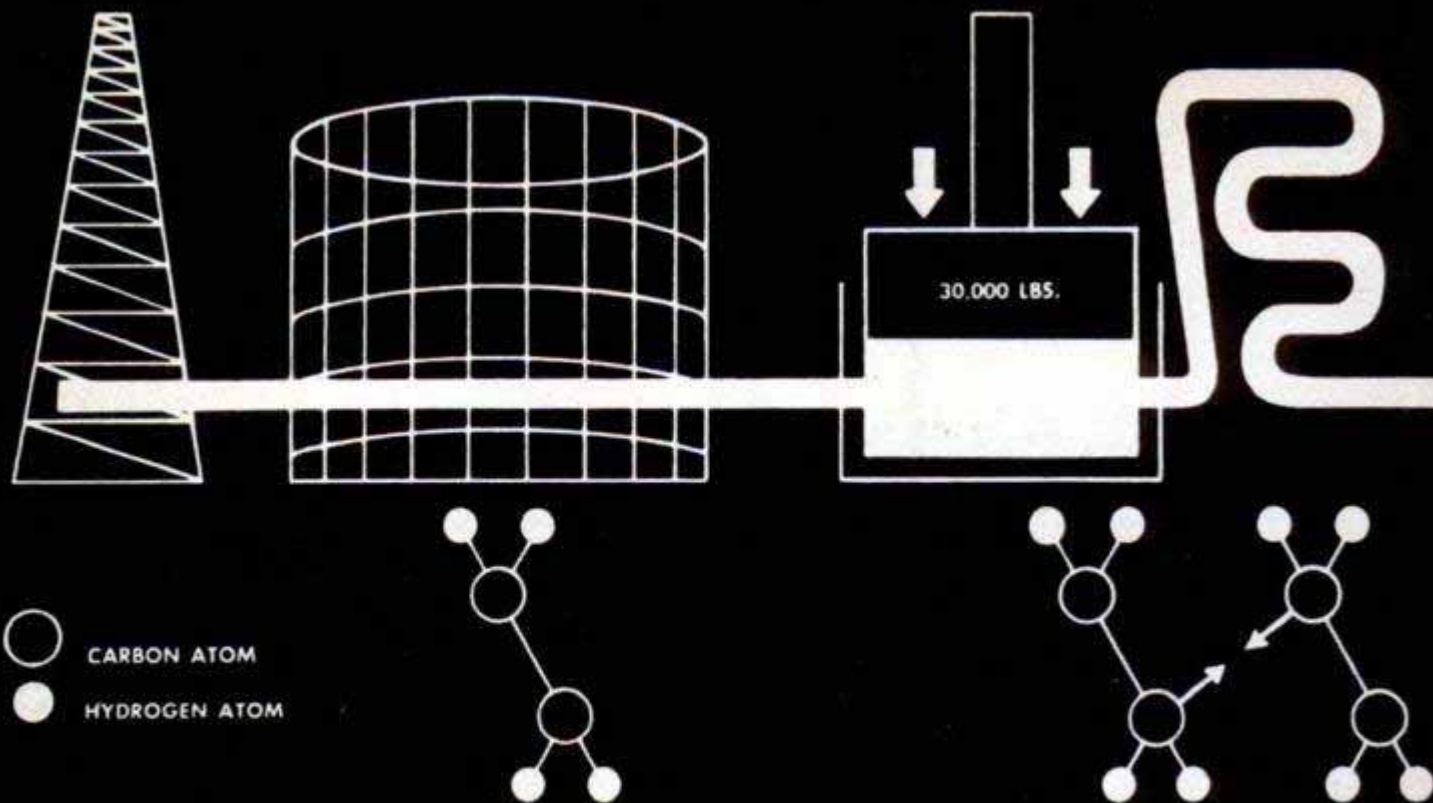
Considerably less than 10 years old as a commercial product, this plastic—known as polythene to one of its major producers—is challenging Cellophane as a packaging material; is replacing lead in a major application of that not-too-abundant metal; has proved extremely valuable as a structural material in surgery; and has a list of other current and potential applications as long as your arm.

Polyethylene has so many good qualities that it is hard to know where to begin enumerating them. It is one of the lightest plastics known to man and a pound of it,

costing about 44 cents, goes a long way. Having low-loss electrical properties, it makes excellent insulation and in this application its characteristics of toughness, flexibility, low water-vapor transmission and ability to withstand a wide range of temperatures prove most valuable. The material has high shock-resistance, can withstand acids and other chemicals better than glass, can be made either opaque or almost clear and takes color beautifully.

Like many other scientific developments, polyethylene goes back almost half a century and, at the same time, is just about as new as radar.

Around the turn of the century a polymerized ethylene was achieved, using diazomethane, but because of its low molecular weight it varied in consistency between a light oil and a waxy solid and had no



Schematic diagram of the life story of polyethylene from its natural-gas origin to a completed product. Lower section shows the resultant molecular changes

plastic properties. In the '30s research chemists of Imperial Chemical Industries Ltd., in England, turned to the problem and found that ethylene gas could be polymerized into a crystalline solid that was flexible and tough and composed of straight chain molecules.

However, this process was performed under pressures up to 1500 atmospheres, or 22,500 pounds to the square inch, and at temperatures up to 480 degrees Fahrenheit.

Large-scale production was delayed, therefore, until equipment was devised which would safely withstand the pressure and dissipate the heat.

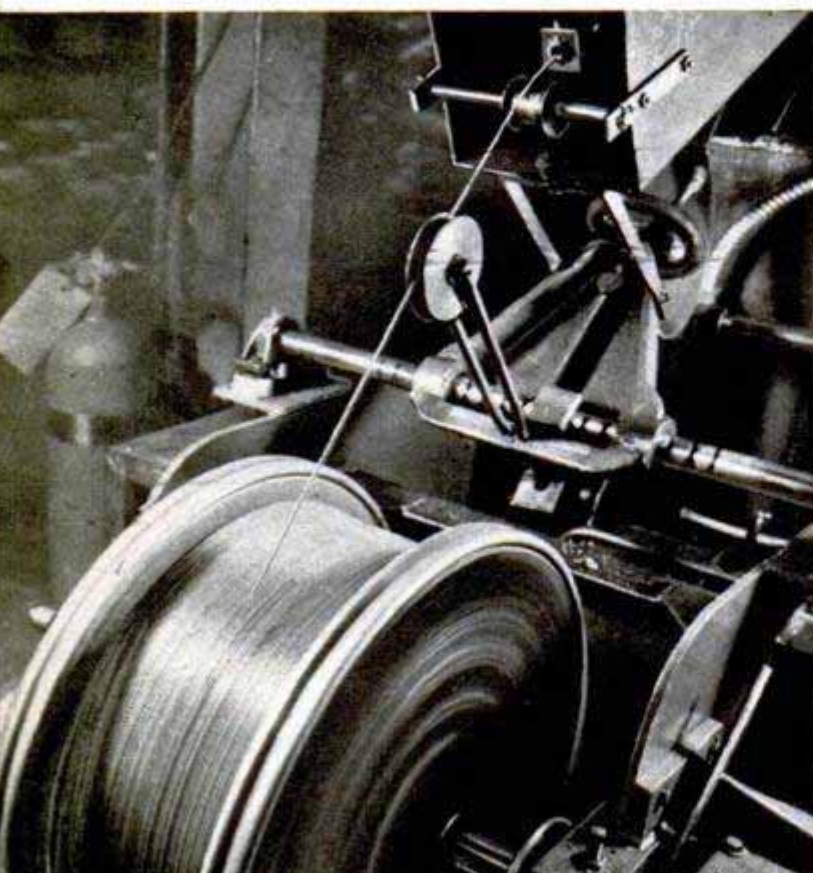
World War II prevented what might have been a glamorous commercial debut for polyethylene; instead, under a cloak of military security, it sneaked out the back way and joined the armed forces as insulation for wire and cable in radar sets. All types of radar devices use vast quantities of wire and cable, which had been traditionally insulated with lead, a relatively scarce material in wartime. The new plastic stepped into the breach and did an outstanding job.

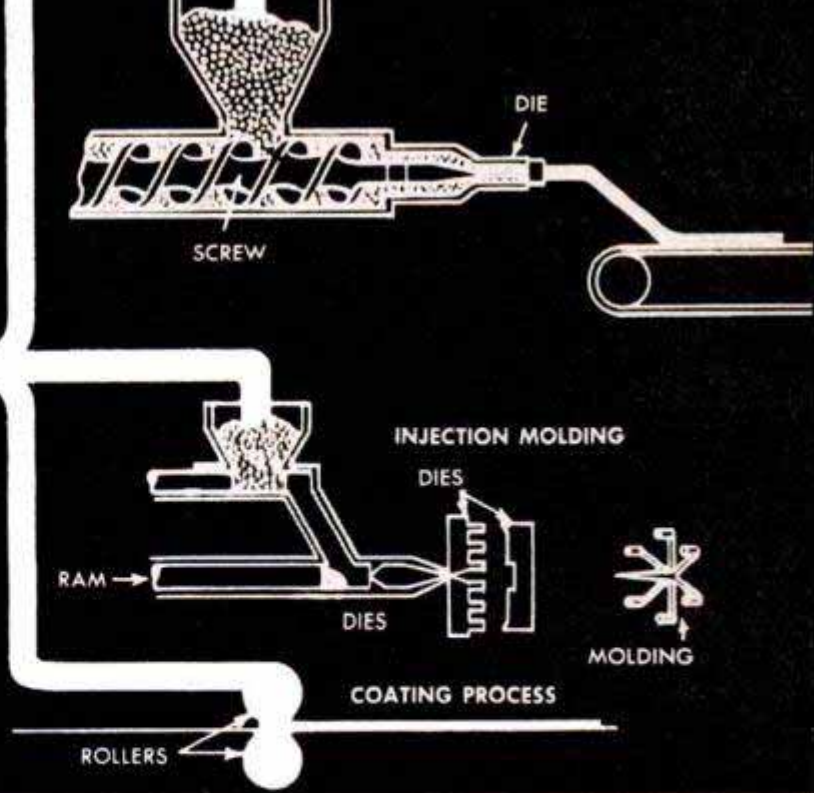
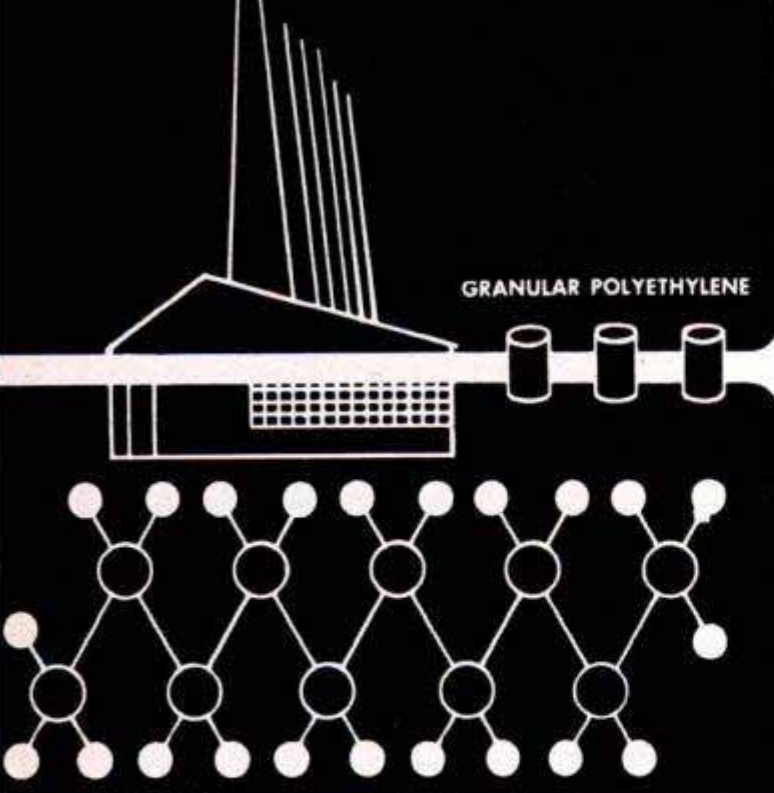
During the war, research was conducted into other uses for the new material and in 1944 the Bakelite Corporation and Du Pont went into commercial production under licensing agreements with Imperial Chemical Industries.

Last year the two companies produced about 15 million pounds of the plastic; this year all indications point to an output of about 50 million pounds and it is believed that this production will not be enough to keep ahead of demand. Both organizations have big new plants to produce the material: Du Pont (which calls it polythene) at Sabine River, Tex., and Bakelite at South Charleston, W. Va.

As diverse as the uses of polyethylene have become, the first application—for sheathing wire and cable—still leads the way in quantity consumed. It was estimated recently that 80 percent of the total

Television cable insulated with polyethylene comes through the extrusion head and is wound on the reel





output went into such uses and the forecast is that the wire-and-cable industry will double its consumption by next year and treble it by 1953.

The spring after the war ended the Bell Telephone System estimated that it would have to have 60 billion feet of cable to meet the pent-up demand for new telephone service and for replacement—enough to carry 24 pairs of wires from the earth to the moon and double the amount produced in 1929, the prewar peak year.

Lead in sufficient quantity for sheathing was out of the question. A substitute existed but it had never been field-laboratory tested or used in a service installation, although it had been subjected to accelerated aging. This sheathing is called Alpeh, from the key letters of its components' names, ALuminum and PolyETHylene. From the center out, an Alpeh-coated cable consists of the pulp-wrapped telephone wires, a paper wrapping, a corrugated aluminum covering and, finally, a sheath of polyethylene compounded with carbon black and an antioxidant to protect it from exposure to sunlight and atmosphere. Western Electric produced 60 billion conductor feet of this cable in a year. Compared with lead-coated cable, the new type carries three times as many pairs of wires, pound for pound; it is cheaper to make, to ship and to string in aerial installations; it is smoother, therefore longer lengths can be pulled through conduits, reducing splices; and it is not susceptible to corrosion.

Polyethylene is serving in the East-Mid-

west coaxial television cable. In each of the coaxial lines the plastic serves as spacers between the center and outer conductors, as many as 506,000 spacers per mile, replacing the hard rubber formerly used. Not only is there less high-frequency loss with the plastic disks, but a saving in cost.

A Brooklyn schoolboy who lost an ear now mingles with his playmates, freed of the childhood curse of being "different." Plastic surgeons at Kings County Hospital, New York, gave him a polyethylene ear which is not only natural in appearance but extremely efficient in function.

Polyethylene is widely used for insulating cables, such as the one being pulled through a conduit here



The material has been found by surgeons to have unique qualities which make it particularly adaptable to reconstruction work on the human body, both internally and externally.

It has been described in a report carried by *The Journal of Plastics and Reconstructive Surgery* as "the most satisfactory substitute" for human cartilage and bone in plastic surgery. Describing chemically pure polyethylene, the report states that it is "chemically inert and resistant to most common solvents. It has no adverse effect on body tissues, nor is it in turn affected by them or by normal temperature ranges. Its natural flexibility and pliability remain unchanged, yet it forms a secure scaffolding on which surgeons can build the final shapes needed to repair accidental and natural deformities."

Perhaps its most dramatic application in surgery was to provide "blowout patches" on the aorta, the main artery carrying blood from the heart to the entire body. Six persons, the *American Heart Journal* reports, whose aortas bulged—as a weakened inner tube might—as the result of disease, had them either patched or completely wrapped with polythene. After more than two years all had survived this delicate operation, whereas a "blowout" of the artery would have been instantly fatal.

Ethylene gas, the source of this material, is found in natural gas and petroleum and exists in great, if undetermined, quantities. It is polymerized, a process which combines small molecules to make large ones, and the resulting molding powder is waxy-looking and translucent. By strict control of manufacturing, particle size can be varied, thus changing such characteristics as tensile strength, elongation at break, brittleness temperature, tear resistance and plasticity.

Television images and control circuits are carried from cameras to control rooms and transmitters over polyethylene-insulated cable. Larger coaxials, for network telecasts, also use this versatile plastic

Smooth, odorless, tasteless, nontoxic and nonabsorbent, polyethylene is a natural as a packaging material and this is expected to be the field of greatest consumption, with the possible exception of electrical insulation and sheathing. The obvious question is, "How does it stack up as compared to Cellophane?"

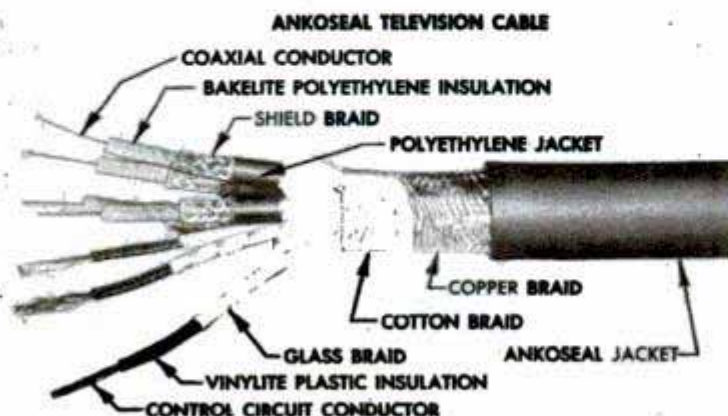
Some persons in the plastic industry believe it will outstrip that glistening material, claiming that it is tougher and that its low water-vapor transmission gives it a decided edge in packaging frozen foods. Goods wrapped in Cellophane, which passes moisture more readily, sometimes are "scorched" and become discolored at the time of freezing. Polyethylene is not subject to this undesirable reaction. But, on the other hand, it cannot be made as transparent as Cellophane, which means that it lacks the sparkle and "showcase" characteristics of the older material. Du Pont people see no slackening in the demand for Cellophane ahead, feeling that there is room for both in the field.

Applications of the plastic in consumer goods are almost without number and new ones seem to appear daily. The same material which imprisons highly corrosive hydrofluoric acid, which chemists call a "glass eater," makes an excellent, pre-sterilized, nursing "bottle" that cuts down baby's burping. Tubular sections are cut off, fitted with a plastic top, filled with formula and closed with the nipple. The tube collapses as it is emptied, cannot feed the baby air and give him indigestion. The disposable bottles cost a cent apiece.

It makes fish lures so much like eel skins and pieces of squid that the canny striped bass is fooled. It will keep a head of lettuce fresh at room temperature for a week because the thin plastic sheet "breathes." Toilet preparations can be squeezed from a flexible polyethylene container and ice cubes pop out of a polyethylene freezing tray with a twist of the wrist.

"Poly" keeps food odors sealed in when used to cover leftovers in your refrigerator. It is not brittle and won't crack, yet it wipes clean with a damp cloth. You can make attractive covers for appliances with it in any color you choose. In rubber production, carbon black is packed in polyethylene bags which are tossed into the mix without being opened, the plastic having been included in the formula.

Made into tubing, it handles sulphuric acid or fresh milk. Polyethylene bags hold peat humus without rotting, a tremendous advantage over paper and cardboard, which are soon decomposed by the organic material. The precocious plastic is useful, decorative and inexpensive. It has earned a place on the all-star plastic team.

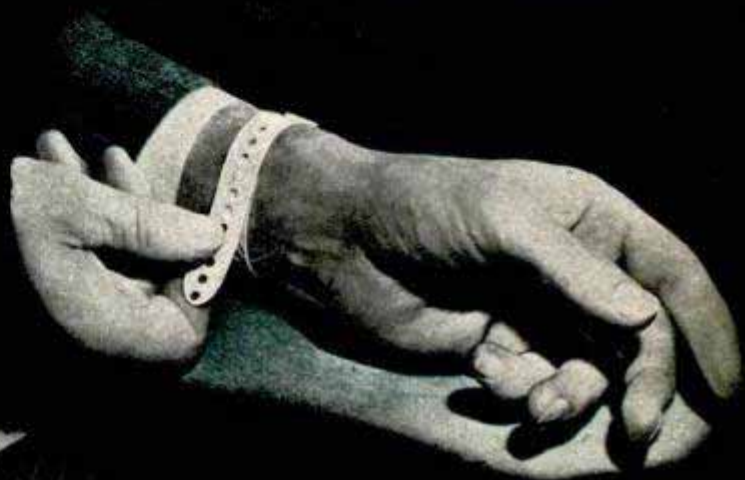




Ice cubes pop out of this polyethylene tray with a twist of the wrist. It's virtually unbreakable, too



Polyethylene, the all-star plastic, forms the neat shield that protects the twin lenses of this camera



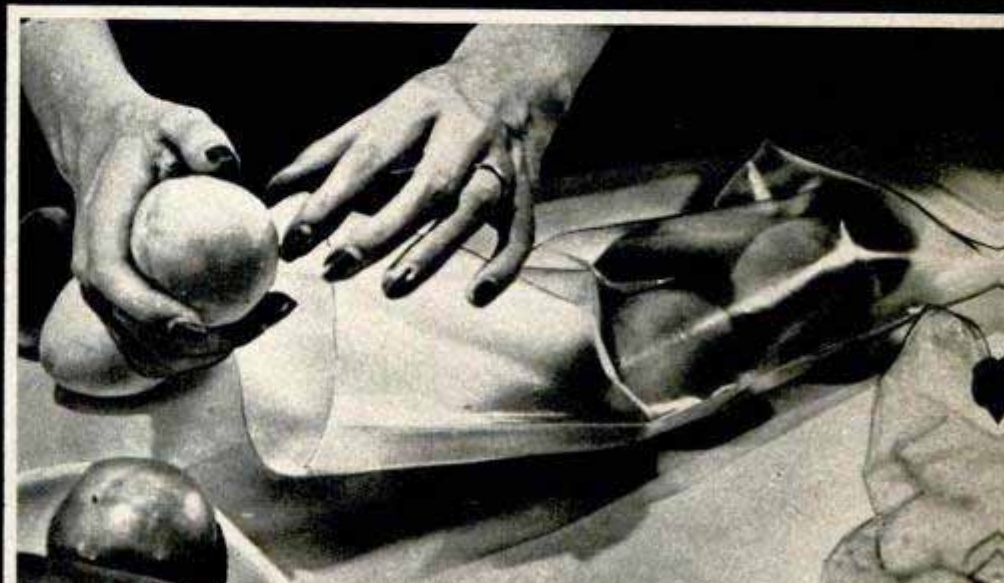
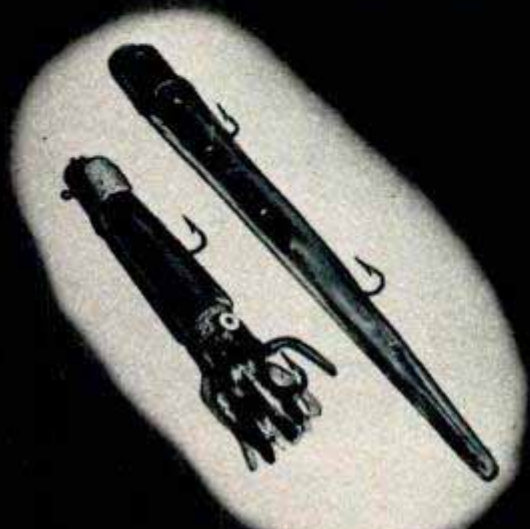
This watch band is also a "poly" product. Button-like snaps keep it tight



Humus bags are made of "poly" because it won't decompose as paper does

Food stored in plastic bags, below, retains original flavor much longer

Fishermen use the all-star plastic, too, as these lures, below, testify

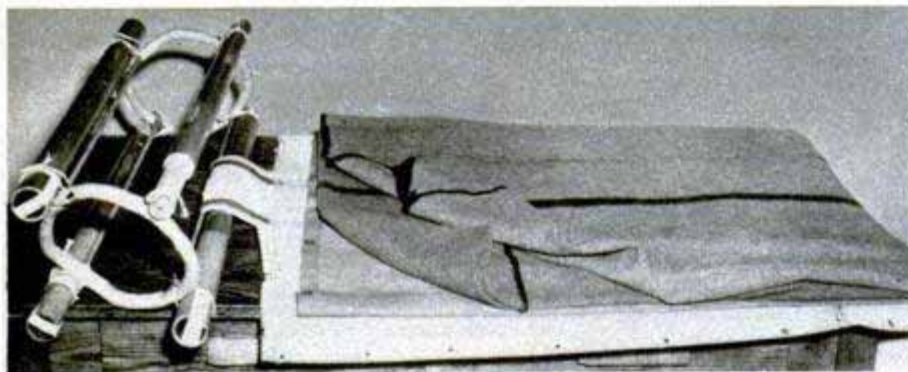
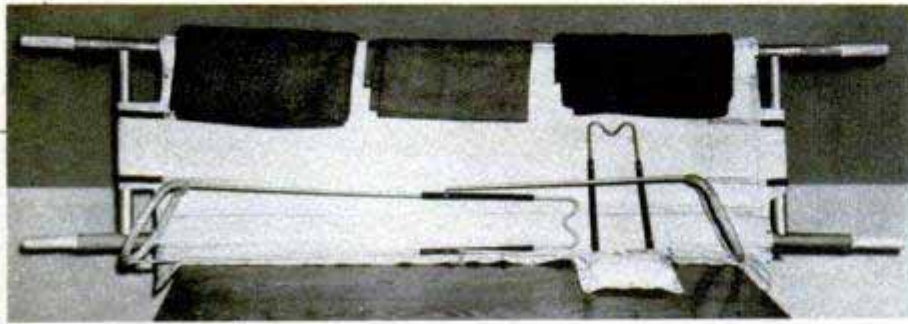


Parachute Aid Kit Supplies 10 Victims

Fragile medical supplies parachute to earth safely in a new droppable kit adopted by the Royal Canadian Air Force. Containing supplies sufficient for 10 persons, it will be standard equipment for "mercy flights" over the Arctic and the bush country. Each item will be individually packaged to withstand the landing shock. The kit was developed by the Institute of Aviation Medicine of Toronto. In addition to medicine, instruments, plasma and splints, it will include hollow poles that can be used with the kit's covering to make a stretcher. Tubes of drugs and lubricating jelly will be placed inside the poles and the top of the kit will be packed with hot-water bottles, folded in half, and tourniquets.

Crown Copyright photos.

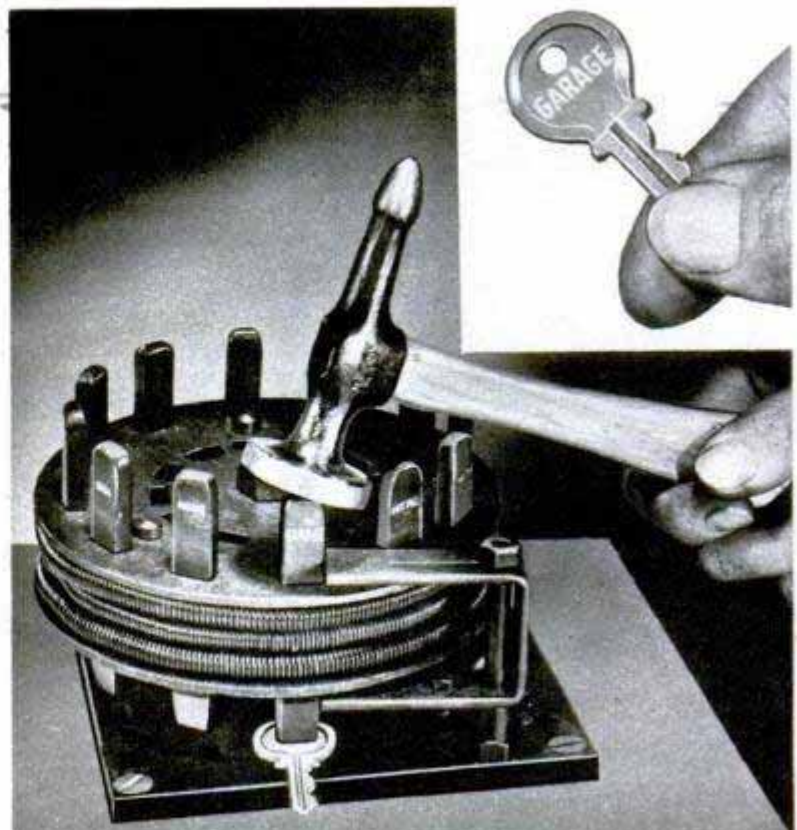
Top, all medical supplies shown can be parachuted in a single shockproof kit. Center, canvas kit covering and poles form a stretcher. Left, the sectioned poles are also used in splints



Turntable Unit Marks Keys With Identifying Names

You'll always be able to find the right keys when you have them marked with an identification name on the key head. This is done with a turntable die unit and a wide variety of dies is available for the machine, designed for use in factories, warehouses and key shops. The key head is placed beneath the die tip and one sharp blow with a hammer makes the impression. To make the letters more legible, paint is rubbed into the impression.

☐ Now in its 20th year without a fatality or serious injury to passenger or crew member, Colonial Airlines has flown over 250,000,000 passenger miles while establishing a world's safety record for scheduled airline operation.

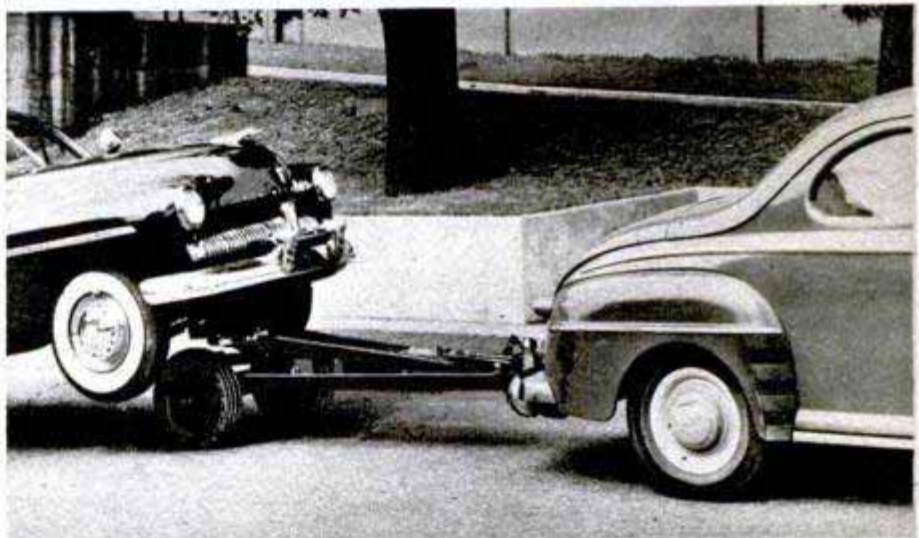


Car's Lift-Trailer Serves as Wrecker

Any car can be converted into a wrecker with a trailer that lifts and supports a damaged auto while it is towed to the garage. It connects to any car or light truck with an ordinary trailer hitch. Adjustable jaws are extended from the two-wheel trailer and slipped under either end of the damaged car. A hydraulic jack lifts the car off the ground. When the tow car is backed up, the trailer frame telescopes until the load is directly over the two trailer wheels.

Fine-Grain Developer In One-Use Packages

Photo hobbyists who develop small quantities of film only occasionally can now get fine-grain developer packaged in aluminum-foil packets, which contain chemicals for eight ounces of solution. Since the developer is discarded after one use, there is no liquid storage problem. By mixing the chemicals each time film is to be developed, the hobbyist always has a fresh batch of developer and that means better negatives.



Miniature Paddle-Wheeler Made of Inner Tubes

Four can ride without danger of tipping or sinking in a craft made of inner tubes and canvas. Howard Karst of Los Angeles, builder of the Gazook, believes it is just the thing for families living near a lake or pool. It is hand-powered by metal paddle wheels.

☞Horses will become extinct in perhaps 15 or 20 million years according to Professor Laurence L. Sloss, Northwestern University geologist, who bases his prediction on the known history of horses and horselike animals.



The Fox is acting out the fable, *The Fox and the Grapes*, for the movie camera. Actually, he's jumping after a piece of beef liver behind the grapes

Below, right, in a scene from the familiar fable, the plodding Tortoise passes the Hare, who is so sure of winning the race that he stops for a little nap

Below, as Chace looks over the script, the playful Raccoon sneaks up behind him and bites at his hair. This is a part of the getting-acquainted procedure



ANIMALS ENACT AESOP'S FABLES

Photographed by Lynwood M. Chace for
Encyclopedia Britannica Films

HOLLYWOOD directors who think their movie stars are difficult to handle should be thankful they don't have Lynwood M. Chace's assignment. The stars in his films are more temperamental than the flightiest prima donna. They are all animals and the script they follow is Aesop's Fables. Included in the cast are such well-known Aesop characters as the Hare, Tortoise, Fox, Stork, Owl and Raccoon.

Before filming starts, Chace turns each new animal loose in the brightly lighted studio and lets it romp around, getting accustomed to the lights and equipment. He sits quietly in a corner taking notes on the animal's behavior, noting which actions can be worked into the script. He experiments with various foods to discover those with the most appeal to the animal. Later, he uses these foods to tempt the animal into following the script.

The movies are filmed for Encyclopedia Britannica Films, Inc., and, when completed, consist of 400 feet of 16-mm. sound film for use in teaching the fables to school children. Standard movie equipment is used and Chace usually takes about 1200 feet of film for each movie. By careful editing and splicing, he gets a movie short that is filled with 400 feet of action.

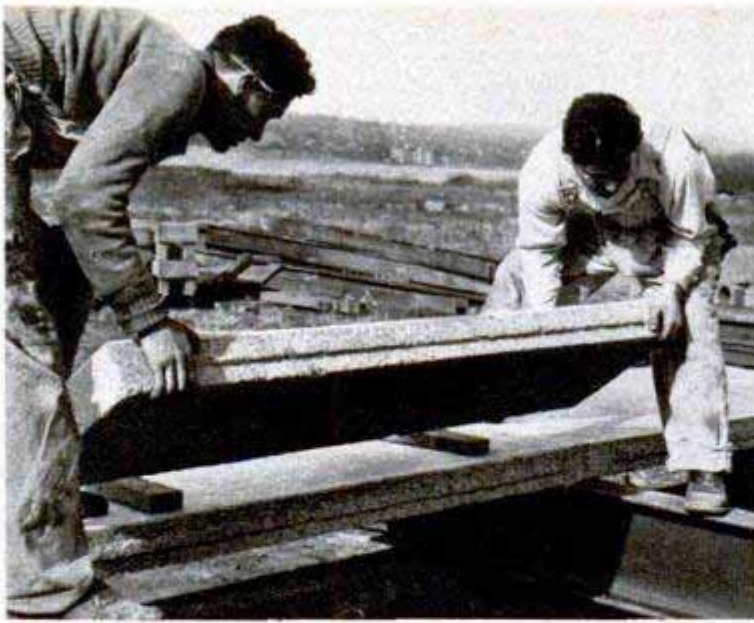


The Great Horned Owl, who plays the role of judge in the race between the Hare and the Tortoise, is completely at ease as he poses for a close-up shot

Right, in Aesop's fable of the Hare and the Tortoise, the Hare, bragging about how fast he can run, tells how he outraced a dog, as shown in this movie scene

Below, the Fox, a sly creature, invites the Stork to dine with him and serves soup in a shallow dish so the bird can't get any. But the Stork is no fool and he returns the invitation, placing the food in a long-necked jar, center, much to the disgust of the Fox who goes hungry as the Stork eats at right





Left, two men can handle a roof plank of wood-aggregate concrete. Right, an aluminum batten seals wall joint

Cement and Wood Shavings Form Building Slabs

Fireproof and soundproof, a lightweight building material is made of chemically treated wood shavings mixed with cement and molded under pressure into planks, slabs and blocks. The material has a high insulating value and resists attacks by insects and vermin. Reinforced planks, eight

feet long, are used for roof decks and are light enough to be handled by two men. For exterior walls, aluminum battens seal the joints between the slabs. The material is used as a plaster base for interior walls where its soundproofing quality deadens bothersome noises in the home.

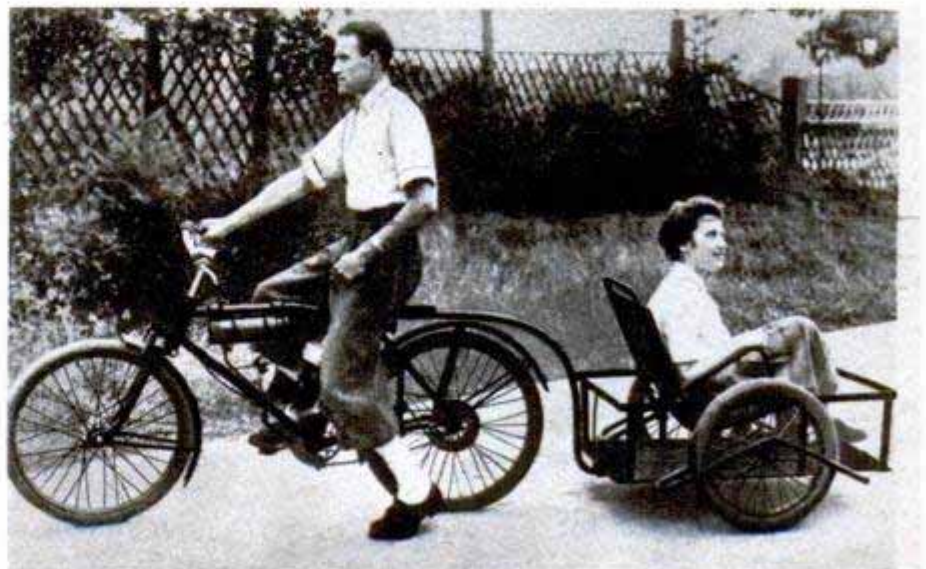


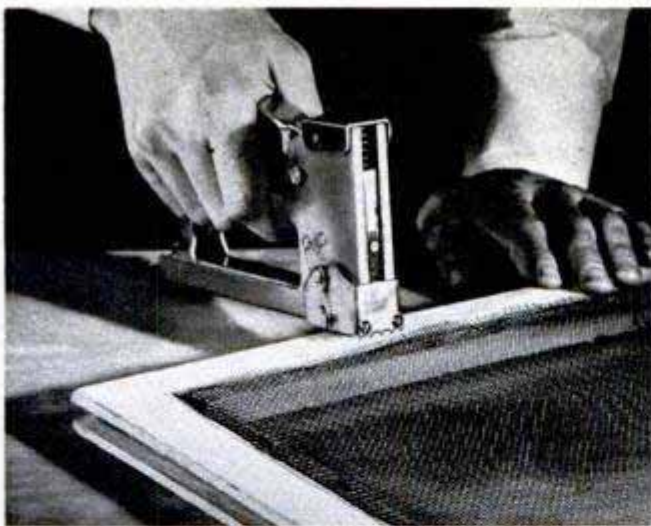
"Waste" Coffee Made Into Soap

"Waste" coffee, about one third of the world's production that is unsuited for beverage and was formerly dumped or burned, is being made into soap products. The soaps remove dirt, grease, stains, ink and paint. A new process separates the natural oils from roasted coffee beans after they are ground. The oils are treated with alkali to produce soap. The caffeine extracted is used for medicinal purposes. Odorless, "coffee soap" eliminates foreign smells and has proved nonallergic in hospital tests.

Travels 400 Miles On 2½ Gallons

Two can travel almost as cheaply as one and when they go by motorbike-trailer combination that's real economy. A German couple recently traveled over 400 miles on 2½ gallons of gasoline on a lightweight motorbike and homemade trailer. A padded chair on the pneumatic-tired trailer provided a comfortable ride for the passenger.



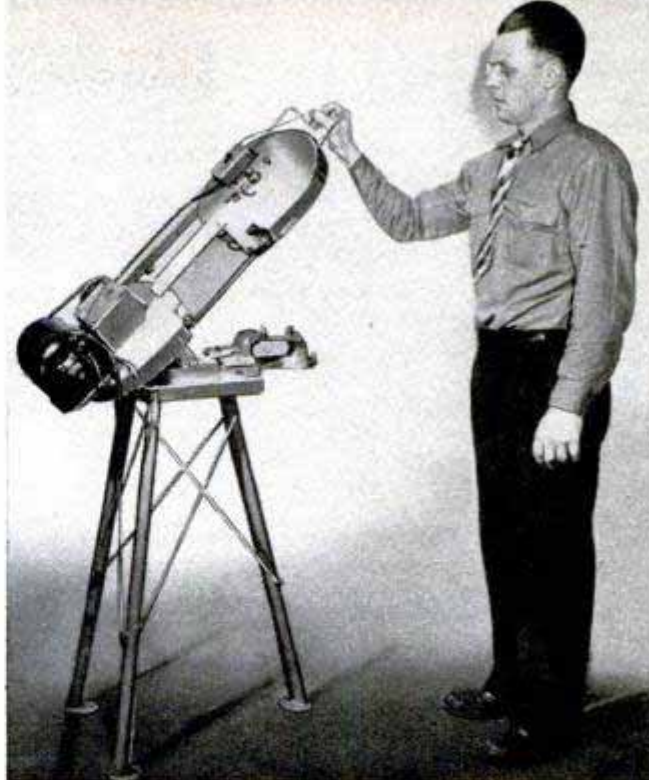


Gun Stapler Has Toothed Claw For Stretching Wire Screen

Wire screen is stretched and tacked in one quick operation by a gun-type stapler that has a toothed claw attached to its front end. The teeth are hooked into the screen to pull back on the wire and make it taut. Then the trigger is squeezed and the gun fires a staple between the wire strands, tacking the screen in place. When not needed, the claw is reversed so that the teeth face upward.

Fish Stringer Serves as Carrier

Fishermen can hold their catch in the water with a new stringer that also serves as a carrier. The lock on the stringer holds 100 pounds securely and can be opened with one hand. The leader chain has an eye on the end for fastening the catch to a boat or pier. The stringer is made of rustproof, tempered steel.

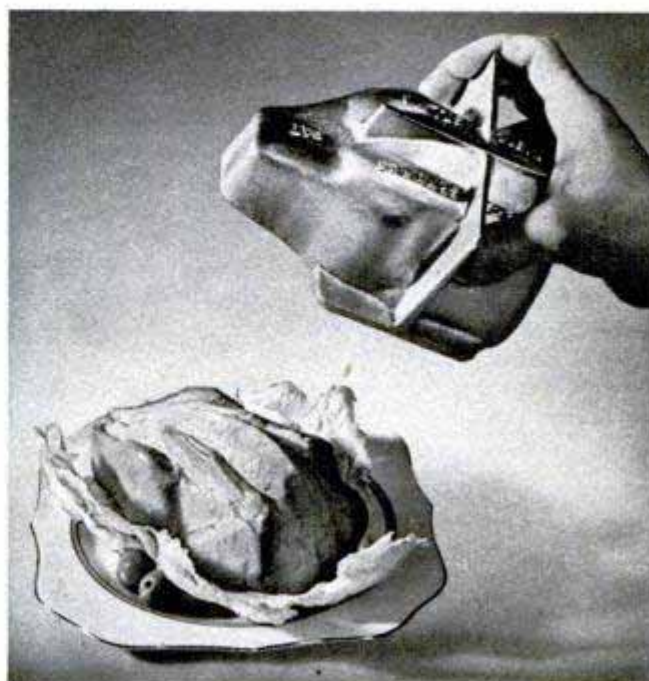


Metal Bandsaw Pivots at Base

Small metal parts can be held in a vise while they are cut by a bandsaw that pivots down against the work. The saw also is designed to handle pieces too unwieldy to move during the cutting operation. It is hinged at the base and can be swung down to bring the blade in line with the desired cut. The capacity is 3½ by 3½ inches.

Chicken-Pie Mold

Chicken pie is shaped to resemble a baked chicken when prepared in a new cast-aluminum mold. Weighing one pound, the mold can be used in baking other meats and fish, or for forming Jello or ice cream.



Pack Into the Wilderness

By Andrew Hamilton

When you head into the rugged forests of the West with rod or rifle, you'll find no modern substitute for those old-fashioned beasts of burden, the pack horses





These pack horses haul supplies in Montana's Flathead National Forest for sportsmen who will ride in later

WANT TO BAG a spread of horns to grace your den? Want to stuff a creel with fish big enough to boast about for months? If you do, then you'd better plan to go on a pack trip.

The pack trip is an institution as Western as the lariat, the cayuse or the sombrero. In Maine or Canada you paddle a canoe to get "where the big ones are." In Florida you charter a power launch. But in the Far West you hire a packer.

A pack trip is an expedition on horseback into some part of America's 30,000 square miles of wilderness—the "happy hunting ground" of hunters and fishermen.

Every summer and autumn, scores of pack trips are organized and conducted into remote corners of national parks and national forests in Idaho, Montana, Wyoming, Colorado, Utah, Washington, Oregon, California, Arizona and New Mexico. Much of the remaining wilderness area is almost as primitive as when Lewis and Clark or Kit Carson tramped through it. Deer, bear, moose, bighorn sheep, mountain goat and elk prowl up its canyons. Ducks, geese, dove and pheasant whirr across its marshes and meadows. Trout and salmon riffle its lakes and streams.

A pack trip requires time, effort and money. But it's worth it. As one old-time guide says, "You can't sit in your automobile, and expect to shoot an eight-point buck or hook a 30-pound salmon."

In the Western states a number of packers make a profession out of taking hunting and fishing parties into wilderness areas. Three requisites of a good packer are: (1) a string of dependable horses, (2) first-rate equipment, and (3) a palm-of-the-

hand knowledge of the area to be covered.

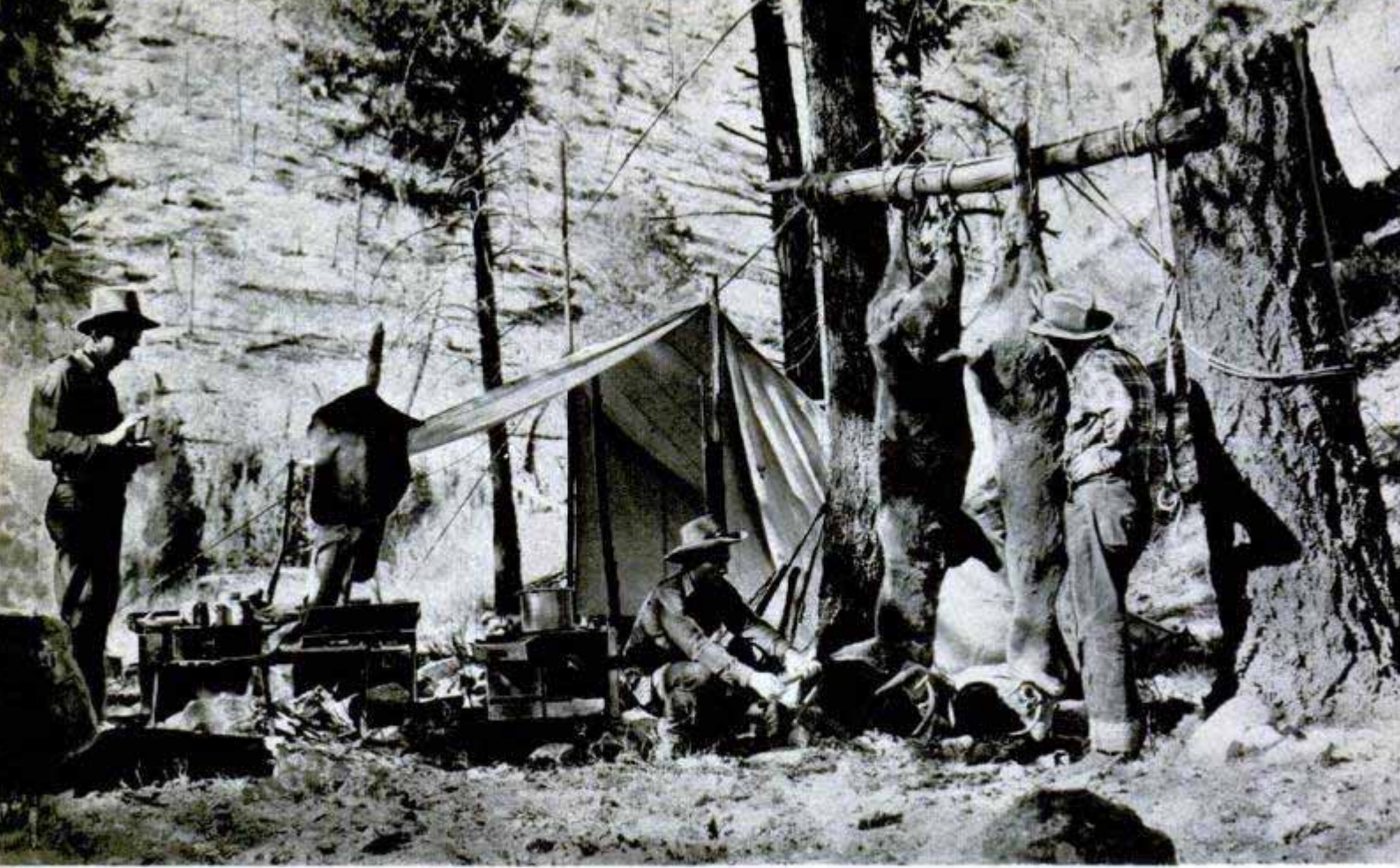
Some states license their packers; others are currently planning to do so. This is an effort to eliminate the "tin horns"—fly-by-night fellows with poor equipment and little experience. Not only is the reputation of established packers damaged, but a miserable time and little or no game result for the sportsman.

A pack trip may be made by a single individual—or by as many as 10 or 12 persons. The ideal number, packers say, is three. Rates vary from place to place and according to the equipment required. The price of a big-game hunting trip may run as high as \$50 per day per person. An overnight fishing trip with a group of 8 or 10 may cost as little as \$5 per person.

Women sometimes go on hunting and fishing pack trips. But the rigors and uncivilized character of a pack trip should always be carefully explained to any woman who fancies herself a 20th-century Diana. A pack trip is a lot more primitive than a Sunday picnic.

Most pack trips into fishing areas are made during the months of June, July, August and September. Pack trips to hunting areas are made during September, October and November.

Horses used for pack trips are regular Western cow ponies—smaller than some other breeds of American horses, but sure-footed and possessed of tough endurance. Those that carry hunters or fishermen are saddled with the familiar Western saddle; those that tote provisions and equipment carry the sawbuck pack saddle. The traditional diamond hitch is used for lashing gear on any animal. Each packer usually



There is double proof here of the good hunting you'll get by packing into the wilderness around Sun Valley

develops his own variation, however, of this famous rope hitch.

More and more persons are packing into wilderness areas not to fish or hunt, but simply to enjoy the rugged grandeur of the mountains. One of these groups is the Trail Riders of the Wilderness, a nonprofit organization. Begun in 1933 by the American Forestry Association, Trail Riders has conducted over 65 expeditions into 10 Western states over trails totaling 8000 miles.

Last summer for example, the Trail Riders sponsored nine expeditions into wilderness areas in Idaho, Colorado, Montana, California and Washington. They range in

length from 7 to 16 days, and in price from \$129 to \$228. The size of each party varies from 20 to 30 riders.

Does a pack trip interest you? If so, put on a flannel shirt and blue jeans and we'll take a trip into the Middle Fork of the Salmon River in central Idaho.

We've made headquarters at Sun Valley, Idaho. The famous winter ski resort becomes "home base" for hunters and fishermen during summer and fall. A tall, wiry chap by the name of Joe Burgy is our guide. A graduate of Georgetown University, Joe studied for the foreign service and for seven years was secretary to Senator Borah. Because he loved the blue skies and towering peaks of Idaho, he returned to his native state. Now he is director of outdoor activities for Sun Valley.

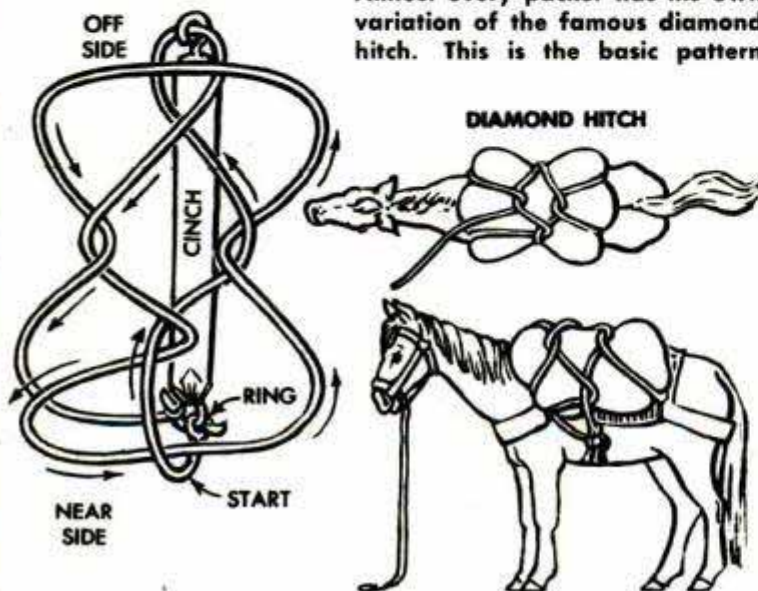
This is to be a big-game trip, so Joe suggests that we go over to the shooting range to sight-in our guns. Good advice for any kind of a hunting trip.

"Guns get knocked about and the sights become crooked," he says. "On a hunting trip you may get only one good shot. If your gun is firing three feet high, you'll miss your one chance."

Joe also advises us on the subject of equipment (weight should not exceed 50 pounds) and helps select the food we'll need.

Drawings on these two pages are from the book, *Wildwood Wisdom* by Ellsworth Jaeger, copyright 1945 by The Macmillan Company and used with their permission.

Almost every packer has his own variation of the famous diamond hitch. This is the basic pattern





Packing into the wilderness is not exclusively stag. A man and wife try their luck in Lolo National Forest

The matter of equipment is important. Waterproof sleeping bags and air mattresses are recommended. A slicker or raincoat comes in handy to ward off quick summer thundershowers. Trousers should be loose at the knees. Most experienced guides recommend blue jeans or khaki pants. A broad-brimmed felt hat will keep off the sun's rays, which burn deep and quickly at high altitudes. Toilet articles should be compact. Cameras, binoculars, a sharp jackknife and a small folding drinking cup are found useful.

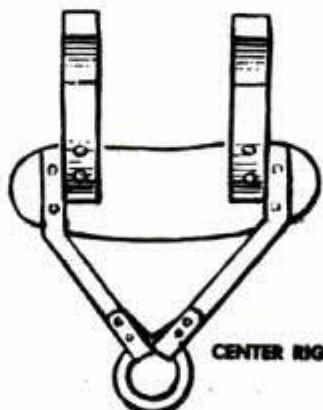
Preparations completed, we climb into a station wagon and drive 100 miles north of Sun Valley to the tiny outpost of Challis. Here "Andy" Anderson, a veteran packer, maintains a string of horses and equipment.

"Howdy," Anderson says, "I'm all set to go—soon as you gentlemen say the word."

The pack animals are waiting. One saddle horse for each sportsman, guide and packer. Three pack horses to carry the tents, cooking equipment and food. Since we are going hunting, there are additional animals to carry the mountain goat, deer or elk that we might shoot. One horse can carry a 250-pound deer. It takes two horses to haul back larger game.

As important as the packers who take you into hunting and fishing areas are guides like Joe Burgy, Taylor Williams, Dutch Gunderson, Jim Saviers and others in the Sun Valley country. They're essential because as a stranger in the primitive Middle Fork area, you could easily become lost, and you've got to have someone along who knows the habits of big game and fish, where they are found and how the weather affects them.

That's why most guides are older men—or men who have lived in the area since childhood. It requires a lifetime study to outwit a fish like a salmon that has sneaked

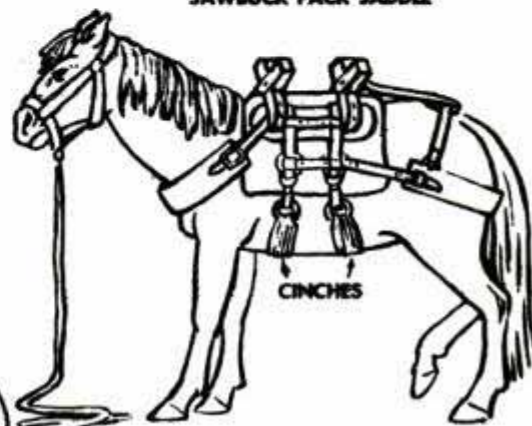


CENTER RIG

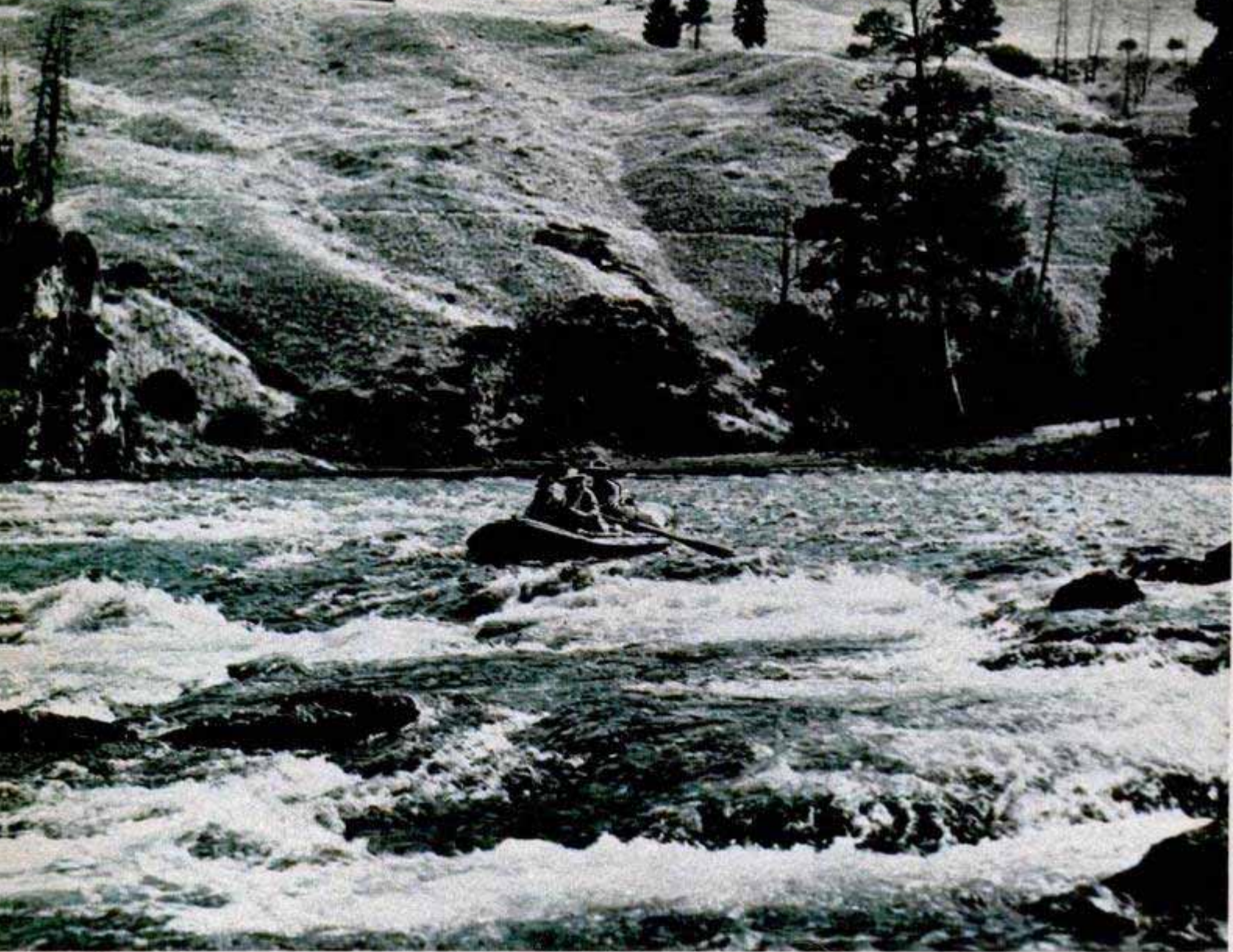


Two types of sawbuck pack saddles, the center rig and the double rig, that are standard for pack horses

SAWBUCK PACK SADDLE



DOUBLE RIG



It's a rough ride down the rapids of Salmon River which drops 1700 feet in 60 miles, but it takes more than white water to stop the enthusiast

Deflated, this double-bottom rubber boat is hauled in by pack horse. Pumped full of air, it is sturdy enough to shoot the turbulent rapids



past the rapids and nets of the Columbia River—or a bull elk that has escaped the natural and man-made perils of the forest for a score of years.

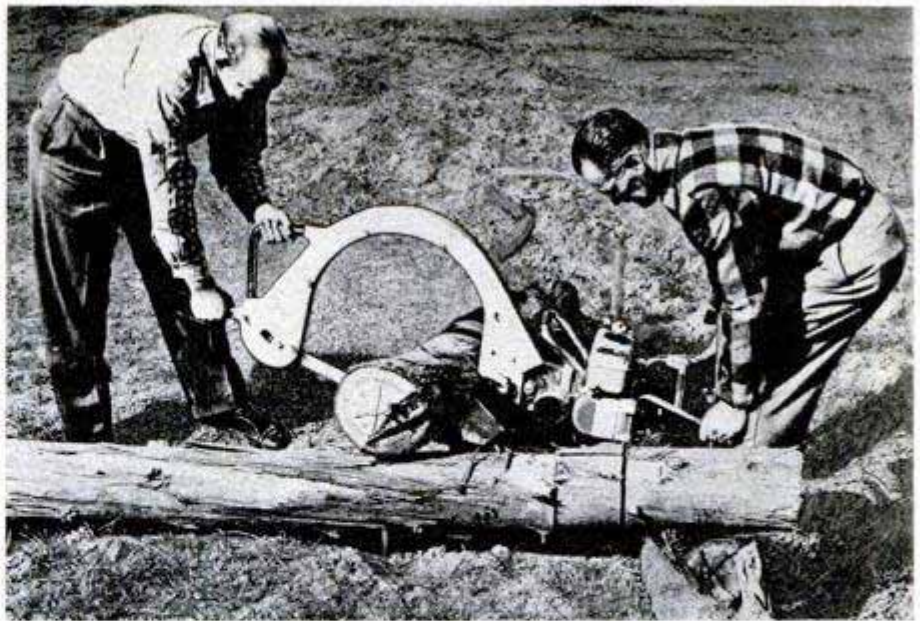
The first day's journey on a pack trip may be an easy 8 to 10 miles. The following days will be more rugged—15 or 20 miles.

Man-made improvements in this part of Idaho's wilderness area—and in all national forests—are maintained by the U. S. Forest Service. Its green-uniformed Rangers supervise the maintenance of trails, inspect camp sites and protect the areas from fires. At the same time they strive to maintain the primitive environment of the wilderness that is so

(Continued to page 236)

Bow Saw Cuts Logs Without Binding

Timber can be cut in any position without pinching by a powered bow saw that has a 20-inch curved blade. Driven by a five-horsepower gasoline motor, the saw cuts rapidly through any type of wood, whether it is on the ground, propped at one or both ends or swinging. The curved blade allows cuts to be made without difficulty all the way through a log that is flat on the ground.



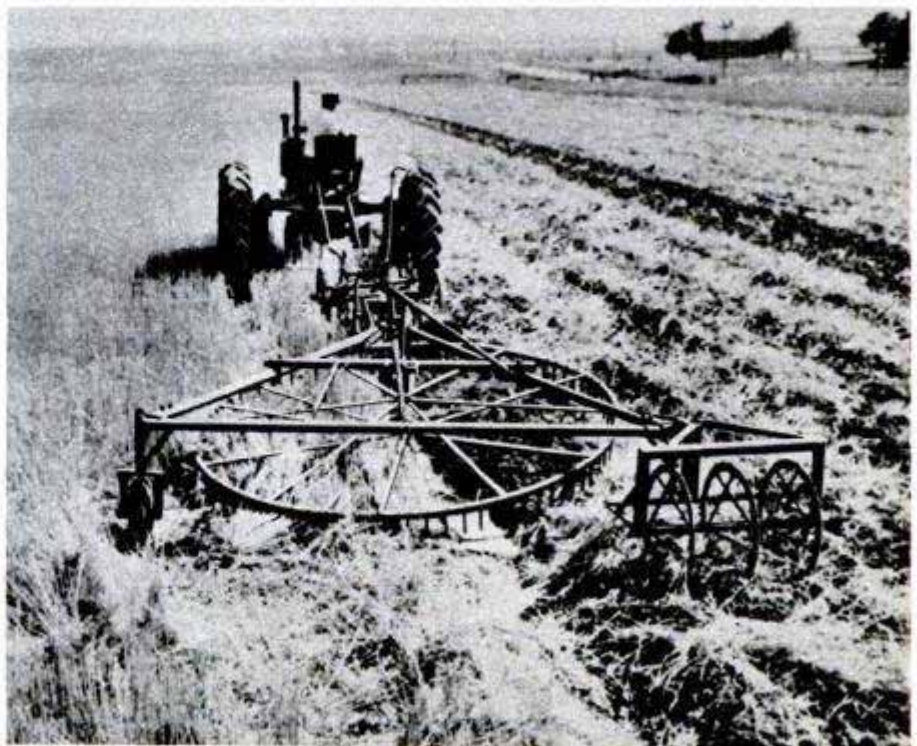
Midget Tractor Pulls Big Loads

Weighing only 525 pounds, a small tractor is powered by an air-cooled engine that drives it up to 30 miles an hour and goes 60 miles on a gallon of gasoline. Capable of pulling a 12-inch-bottom plow, 6 inches deep, at 4 miles an hour, the tractor is also useful for delivery work and odd jobs around town. It has a standard transmission and differential with three forward speeds and one reverse. Maintenance costs are low because of its simple construction. Attachments include a mower, rake, seeder, snowplow, cultivator and bulldozer.



Huge Rotary Rake Spreads Mulch

Loose straw and stubble are spread over plowed fields by a big rotary rake, preventing erosion and providing a mulch. The rake can be pulled behind almost any kind of a plow. It revolves to spread loose stubble from unplowed land across freshly plowed land. The mulcher rides on rubber tires and is adjustable in height for all kinds of straw, stubble, sweet clover and other vegetation. The teeth are made of high-carbon steel and can be replaced if they wear out.





Creole Petroleum Corporation photo

Venezuela's Magnetic Mountain

By Harry Chapin Plummer

WHEN THE CONQUISTADORES of old Spain explored the jungle country of eastern Venezuela four centuries ago, the native Indians told them tales of a strange mountain which attracted lightning. Later the Spaniards saw for themselves this magic mound which, when struck by a lightning bolt, gave forth a spray of flashes. The Spaniards dubbed the mountain "El Florero"—the Flower Pot—because the lightning flashes looked like flowers growing from the peak.

Today that mound has been found to hold one of the world's richest iron-ore deposits.

Credit for that discovery goes to an alert Venezuelan mining inspector, Eduardo Boccardo. In 1926 he determined to penetrate beyond the superstitions of the natives and to find out why the mountain was one of the spots most frequently struck by lightning on the South American continent. What he discovered was a fabulously rich lode of iron ore which, by magnetic at-

traction, drew lightning to the mountain. The Spaniards, intent upon their quest for gold and silver, had passed up a deposit so valuable that even now its riches can be only estimated.

traction, drew lightning to the mountain. The Spaniards, intent upon their quest for gold and silver, had passed up a deposit so valuable that even now its riches can be only estimated.

Surveys of that part of the mountain granted to Boccardo show that about 35,000,000 tons of mineral rich in iron underlay his concession. Assays have proved that this ore actually is 55 to 68 percent iron. Absolutely pure iron ore is made up of 72 percent iron and 28 percent oxygen. The iron content of Minnesota's famous Mesabi range is about 57 to 63 percent. On this basis, the Flower Pot represents one of the most important discoveries of the century in the field of metallurgy.

Naturally, it didn't take industry long to jump into this whopping mountain of ore. Today the Iron Mines Company of Venezuela, organized as a subsidiary of the Bethlehem Steel Company of the United States, already has a small army of employees in the jungles near the Orinoco. Their task is to form a modern mining industry in the heart of the forests. They are at work between El Pao, the ore site, and Palua, the loading point on the Orinoco.

The task of these workers is staggering. They must build the mines and the port, highway and railway—even their own homes in the wilderness. Already they have



Workers are carving modern road and railroad out of this jungle. That's a labor camp on side of mountain

completed a highway more than 14 miles long which eventually will serve as the right-of-way for a standard-gauge railway, the vital artery from the mines to the river. This railroad will have a steep grade from sea level to the mines.

When the harbor and dock installations, the roads and railways finally are completed, the ore will move by truck and train from the mines to the ships on the Orinoco. It then will travel aboard a fleet of ore carriers, especially built for the purpose, to the blast furnaces at Baltimore, Md.

It is estimated that production will rise to 3,000,000 tons of ore annually from ore reserves that will last a quarter of a century.

Already rolling along the uncompleted rail line is a 1500-horsepower diesel locomotive. When the track is completed, the railroad will have four locomotives, 100 ore cars with a capacity of 70 tons each, eight boxcars, four tank cars and a crane.

Before the end of this year the ore will begin to flow from the mines atop the magnetic mountain. There crews especially trained for the job will perforate and excavate the rock and earth, which will be picked up by four gigantic electric shovels each capable of taking a huge bite out of the ground. The shovels will load the ore into trailer-trucks hauled by tractors. From

there it will be taken to big ore crushers—one of them said to be the largest in the world. The fragments of crushed ore will be carried by an aerial cable arrangement to the waiting ore cars on the railway.

It is estimated that about 10,000 tons of the rich earth will be hauled down the mountainside every working day.

When the ore reaches the harbor, it will be dumped into a huge storage area. An ingenious series of chutes at the base of the area will drop each load into an underground conveyor installed in a tunnel. After passing through the earth, it will climb up a huge loading bridge which extends



Map shows location of the iron-mining area. Ore will be shipped down Orinoco from a point near San Felix



Diesel locomotive pulls ore cars along the top of the dumping structure. Chutes at the base drop ore into a conveyor tunnel

As efficient as a section of the New York subway, the underground conveyor system carries ore to the river loading bridge



like a pointing finger over the waters of the Orinoco. The load will slide by toboggan into 4000-ton lighters. Tugs then will pick up six of the lighters, form them into a train and haul them downriver to the Gulf of Paria. From there the new 24,000-ton ore carriers will take the ore by ocean to Baltimore.

This modern industrial system in the heart of the jungle is within the orbit of Ciudad Bolivar, the principal river port of the Orinoco and the administrative and financial center of the region watered by the river.

Almost due south of Ciudad Bolivar the United States Steel Corporation has been conducting explorations of another area that appears to have huge ore deposits. It seems likely that the same vein which crops out atop the magnetic mountain also appears in this new area.

Reports state that the mineral deposits found in this second area are of a high quality, satisfactory for smelting in open-hearth furnaces.

These two ore strikes are the second great boon to Venezuelan national economy within the past half-century. The first was the discovery of petroleum around Lake Maracaibo. Huge investments in drilling and pumping equipment, pipe lines, railways, bridges, community settlements, hospitals and schools have been made by the participating oil companies.

Venezuela has enacted a law which requires the oil companies, both foreign and national, to refine within the country a percentage of the crude oil that is recovered. The purpose, of course, is to have a supply of domestic oil. It is anticipated that similar legislation will apply to recoveries of iron ore, and that eventually there will be smelting operations within Venezuela.

Such a development would place Venezuela in the forefront of South American nations which at the turn of the century were dependent upon agriculture—cattle, coffee, sugar, cacao, tobacco and rubber growing. Thus the magic mountain that attracts lightning may revolutionize the economy of a nation.

Glass Orchestra

Imagination coupled with craftsmanship has produced a tiny orchestra with the instruments and figurines made entirely of glass. Harry G. Nunamaker, who fashions glass research equipment for the University of Iowa, made the figurines by bending and spinning $\frac{3}{8}$ -inch glass tubing in an oxygen and acetylene blast burner. With the glass at its softening point, Nunamaker gives his imagination complete freedom in guiding his hands. Dabs of softened glass are added here and there to complete the figurines.

Drug for Allergies Cures Seasickness

Seasickness may be eliminated by a synthetic chemical originally made to relieve hayfever, hives, and other allergies. The ability of the drug to prevent and cure all types of motion sickness was discovered by a fortunate accident. It was given to a woman to cure her hives, but unexpectedly relieved the car sickness which she had suffered all her life. Subsequent tests by the Army in the rough waters of the Atlantic showed that less than

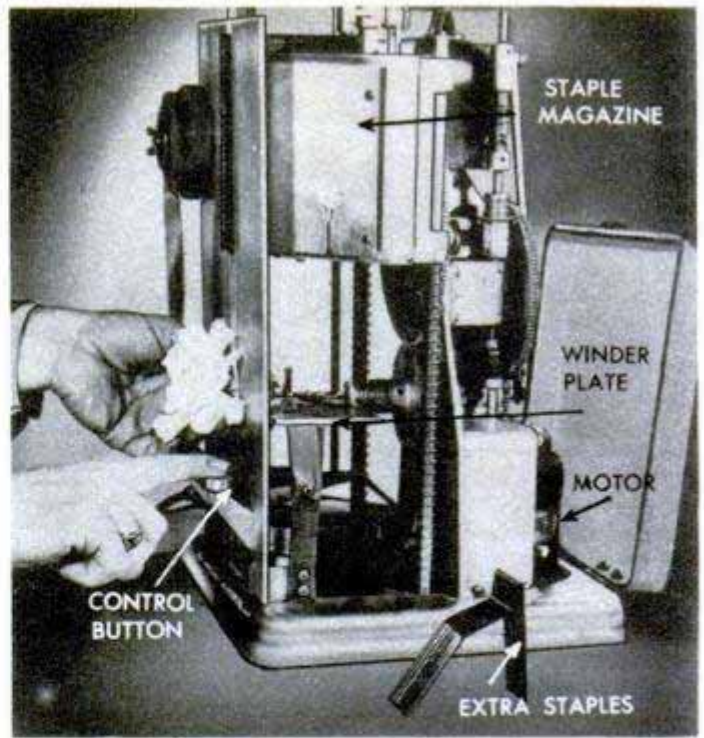
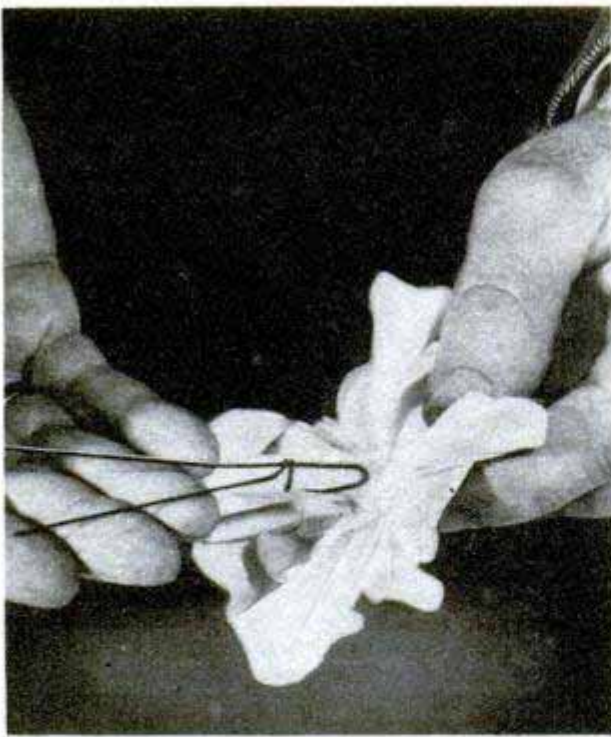


two percent of several hundred men who took the drug became seasick. The drug, called Dramamine, also gives complete relief from airsickness, according to Johns Hopkins scientists who first discovered its new use.



Welder Thaws Pipes With Electricity

During extremely cold weather in Portland, Ore., last winter, W. C. Peters came to the rescue of the city by thawing frozen water mains with electricity. Rapid thawing of the mains was essential to provide water for fighting fires. Peters showed city fathers how to warm the pipes with a heavy-duty electric welder. He attached the positive and negative cables of the welder to accessible sections of the pipe on opposite ends of the part to be thawed, eliminating the need to dig ditches.



Florist's "Robot" Wraps Wire Around Flower Stem

Stemming — wrapping wire around the stems of cut flowers for wreaths and corsages—is done automatically by a machine invented by a California florist. Previously, stemming has been a tedious hand operation. The labor-saving machine handles the blossoms so delicately that it can stem

Gladiolus blooms, ferns and greens without damage, something that hand-stemming has never done successfully. The stem of the flower is placed in an opening in the face of the machine and, when the control button is pressed, a winder plate wraps the wire around the stem.

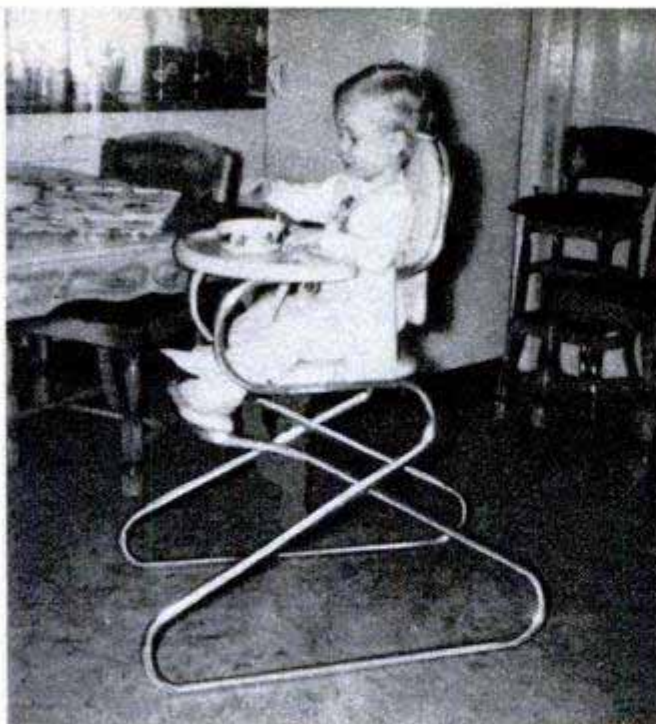


Track-Laying Hand Truck Rolls Up or Down Stairs

Refrigerators and other heavy items roll up and down stairs smoothly on a track-laying hand truck that makes the moving operation a one-man job. For rolling along the level, the carriage is swung up against the refrigerator allowing the truck to roll on the two front wheels, thus increasing its maneuverability. The truck is equipped with brakes.

"Cat Test" at Customs Fights Spread of Disease

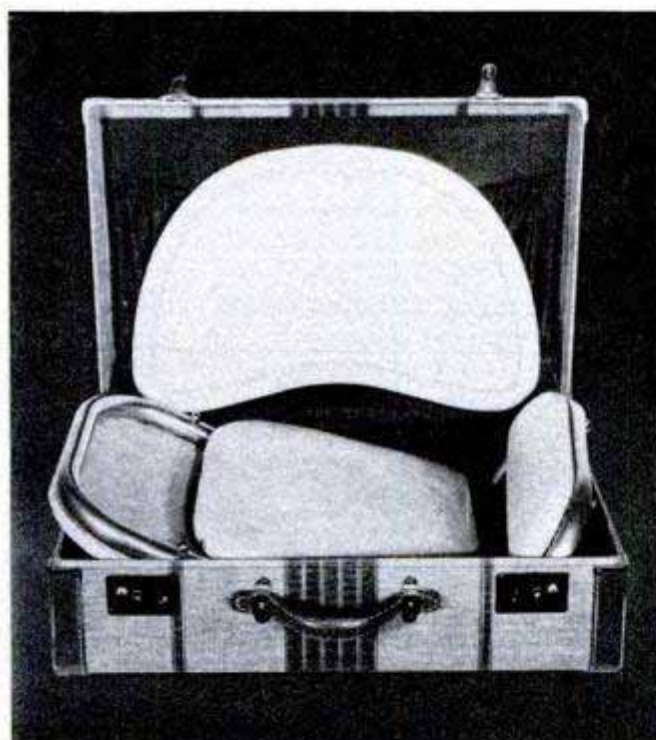
Tourists entering the United States from Mexico at Zapata, Tex., undergo a "cat test" as customs inspectors try to prevent the northward spread of foot-and-mouth disease. Fresh meat and rare game are frequent carriers of the disease and tourists who try to smuggle these items into this country are caught by a cat named Solomon which picks up the scent when allowed to explore vehicles.



Tubular Furniture for Children Fits Into Suitcase

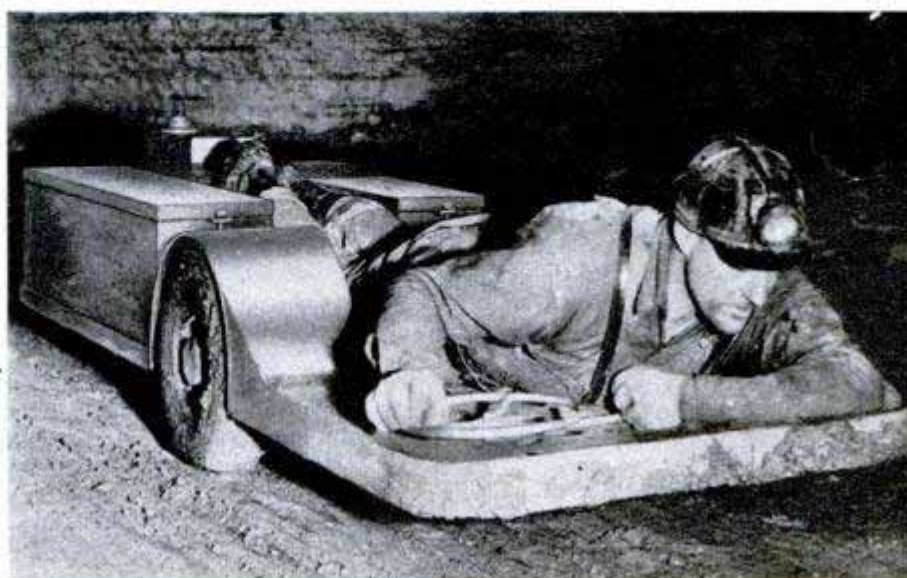
Supported by a frame of aluminum-alloy tubing, a lightweight baby's high chair weighs only 10 pounds. The bent tubing forms a broad, stable base that makes the chair nontippable even for active babies. The easily cleaned tray is made of plastic. Both the seat and footrest are upholstered in washable plastic. The chair is quickly disassembled for travel and all parts except the tubular frame fit neatly into a small suitcase. Of similar construction is a desk-and-chair set suitable for home and school use. This set also comes apart and the seat and back can be packed into the boxlike desk top.

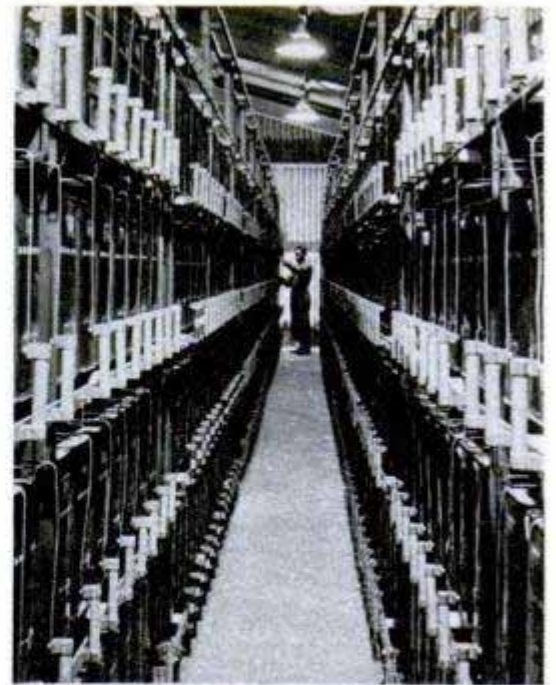
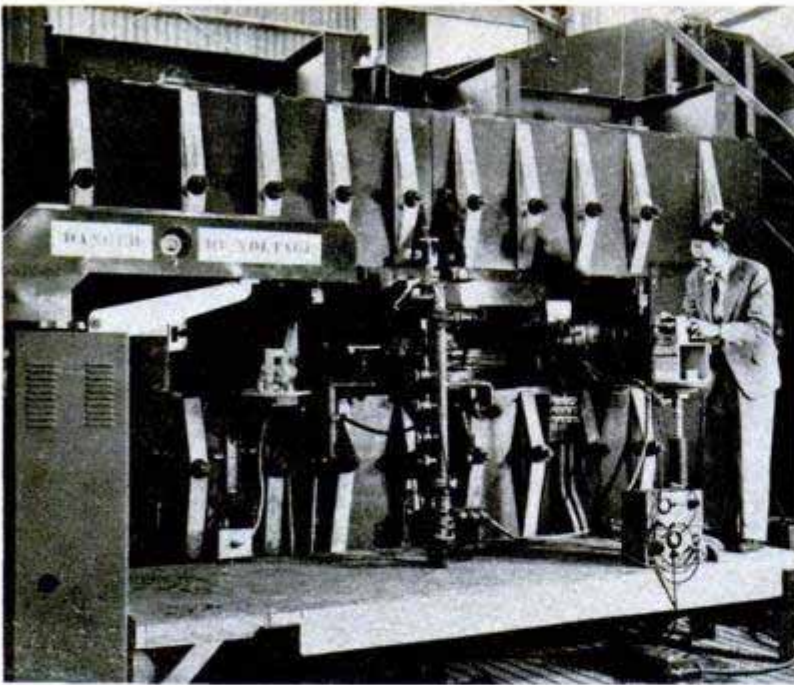
Top, right, chair-and-desk set of tubular aluminum. Top, left, lightweight high chair has a broad base that makes it virtually nontippable. At left, the seat and tray fit into a small suitcase for travel



Coal-Mine Car Hugs Ground

Riding prone, a supervisor or engineer in a coal mine can drive safely in tunnels no more than two feet in height on an underslung three-wheel vehicle. The flat car is only 22 inches high with driver. Powered by a 20-volt battery, the car maneuvers easily and moves at five miles an hour. The single rear wheel steers the car which can turn around in a nine-foot circle.





Left, Dr. Edwin McMillan adjusts target in preparation for X-ray bombardment. Right, part of condenser bank

Giant Synchrotron Joins Attack on the Atom

Three times as powerful as the largest betatron, the new synchrotron at the University of California fires a stream of electrons which, upon impact with a heavy metal target, liberates X-rays of 300 million electron volts. The fine, highly penetrating X-ray beam, the most powerful in the world, is used for bombarding atoms. Power for the 135-ton synchrotron magnet is stored in the largest condenser bank in the world. A total of 3328 condensers is

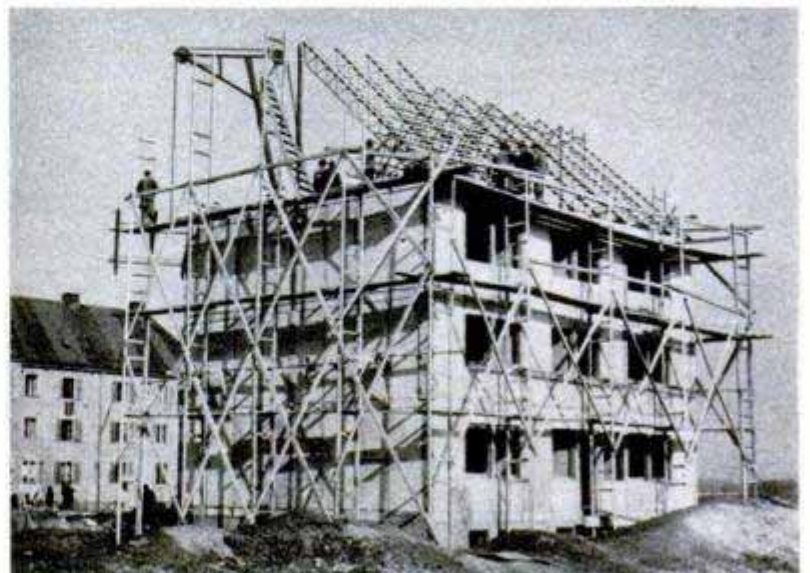
used in the bank which serves as a storage tank for electric power. During the $\frac{1}{50}$ second periods in which the synchrotron actually operates, this tremendous power is thrown into the magnet and back into storage again. In operation, the synchrotron sounds something like a high-powered diesel engine. It begins with a low thumping when the magnet is turned on, then builds up to a loud, regularly spaced hammering when it is working at full power.

"Foam Concrete" Houses Built by Messerschmitt

One of Germany's greatest wartime airplane manufacturers, Willi Messerschmitt, is now producing prefabricated houses of steel and concrete slabs in Munich. All supporting parts are of corrosionproof

steel. The concrete slabs are made in one standard size and are formed of "foam concrete" made with carbon dioxide gas to decrease weight. Pipes for gas, water and electricity are enclosed in the slabs.

Left, wheeling a concrete slab into place. Right, welded-steel rafters support roof of three-story house



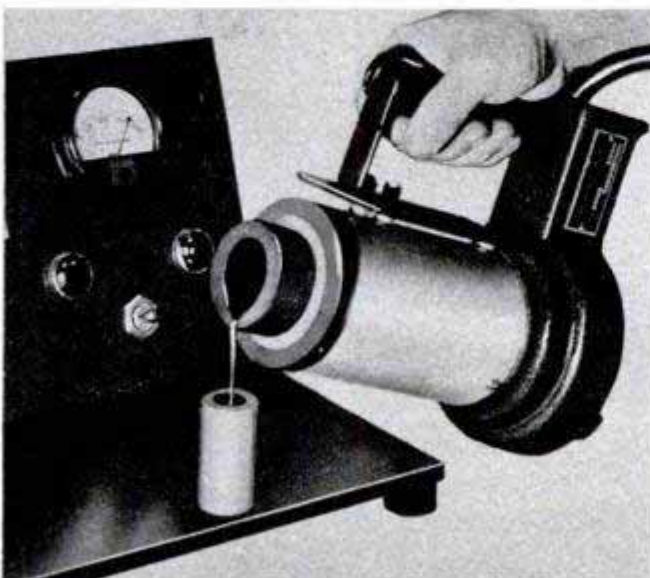


"Pistol" Dispenses Tape

Speedier application of cellulose tape is possible with a pistol-type dispenser. Pulling the trigger ejects the tape and setting a thumb button cuts it at any length up to 1½ inches. When set at a noncut position, as much tape as needed can be unreeled. Only one hand is used to operate the unit, leaving the other free to hold the material being taped.

"Coffee Pot" Melting Furnace

Nonferrous metals are melted quickly in an electric furnace that weighs only five pounds and has an insulated pouring handle like a coffee pot. A pyrometer indicates metal temperatures, assuring consistent results in successive melts. The furnace has a temperature range to 2000 degrees Fahrenheit and operates on 110 volts either a.c. or d.c. It will melt 15 ounces of silver in 10 minutes.

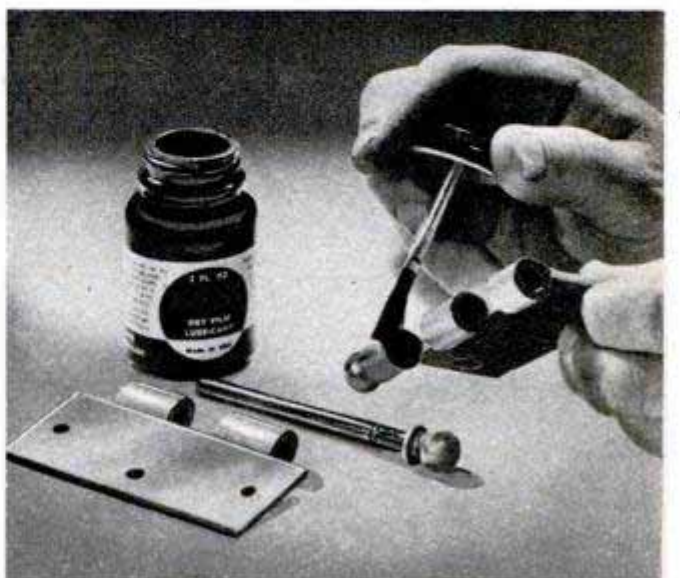


Miniature Scaffold for All Ladders

Any ladder can be quickly converted into a miniature scaffold by adding a stage. Measuring 24 by 26 inches, the stage provides safe footing from which a repairman or painter can work. Made of aluminum alloy with wooden footboards, the portable unit weighs only nine pounds. The footboards are slotted and can be adjusted for width.

Dry Lubricant Applied as Paint

Applied by brush or dipping, a new lubricant produces a dry graphite surface that won't come off. The liquid is composed of graphite particles suspended in alcohol. Painted on any surface, it dries rapidly to a lustrous lubricating film. The lubricant can be used on guns and ammunition, drawers and windows that stick, bicycle chains, door locks, model-railroad cars and knife-switch contacts.





Magnified 24 times, the microtext is as easy to read as the original. Right, inserting a card in the reader

CARD-SIZE LIBRARY BOOKS

Libraries of the future may have their book shelves replaced by neat filing cabinets containing small microcards on which are reproduced in microtext as many as 200 book pages per card. The cards, of standard card-catalogue size, are made of

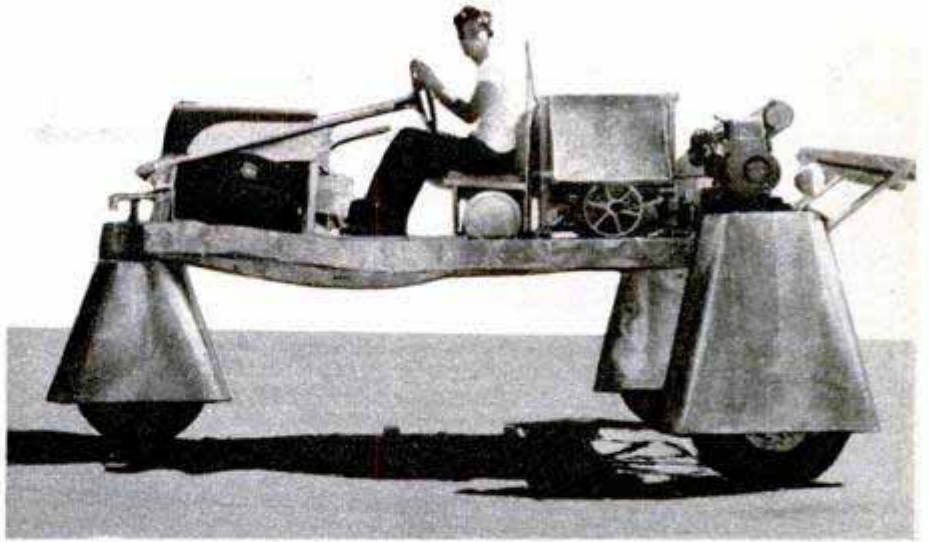
special fine-grain photographic paper and are placed in a projection reader that magnifies the text 24 times, making it easily legible on a translucent screen. A convenient control knob "turns" the pages. At the top of the cards are printed in regular size type the usual catalogue entries, eliminating need for separate catalogue cards.

Type and page size determine number of pages a card can carry. Below, in actual size, is a 64-page card

<p>0 2 5 Microcards</p> <p>Rider, Fremont, 1885-</p> <p>The scholar and the future of the research library, a problem and its solution . . . New York city, Hadham press, 1944. (xiii p., 1 l. 236 p. 2 facsim., diagr. 24 cm.) Proposes microcards as the solution for research library growth.</p>	<p style="text-align: right;">Z 6 6 5</p> <p style="text-align: right;">(Card 1—p. i-xiii, p. 1-64)</p>	

Cotton Duster

Riding high on "stilt wheels," a homemade machine dusts cotton plants without damaging them. The vehicle, built by two veterans near Fresno, Calif., can cover 25 to 35 acres an hour, dusting 15 to 20 rows at a time. Equipped with lights, the machine can be used after dark to take advantage of the moisture on the cotton plants. It is powered by a V-8 engine which operates the rear wheels by chain drive. The gear ratio produces a road speed of 35 miles an hour. A single wheel supports the front end and all three wheels are housed in streamlined guards.

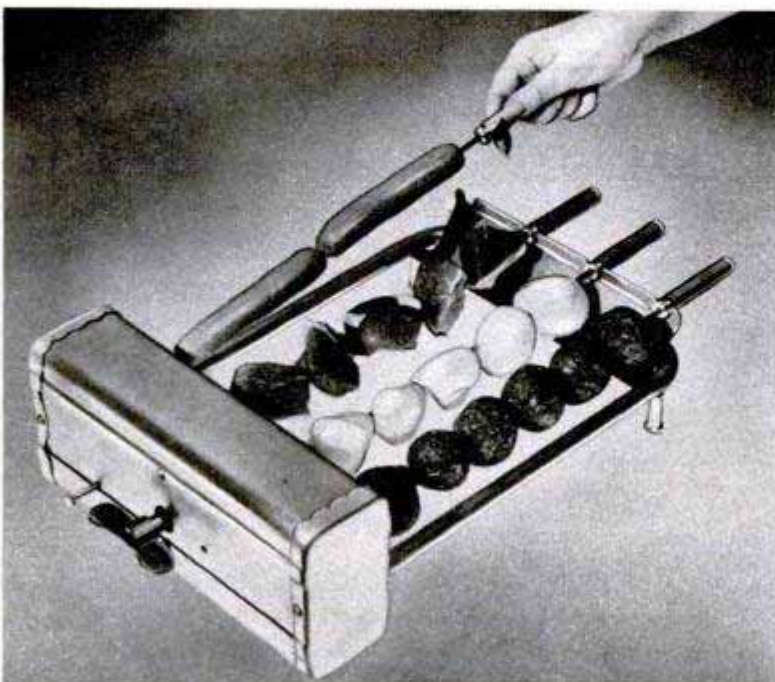


Paper-Pulp Process Uses Wheat Straw

New uses for straw promise to turn into an economic asset the 40 million tons of wheat straw burned or wasted annually on U. S. farms. Experiments at the Department of Agriculture have resulted in processes which permit the use of wheat straw in the production of paper pulp and building board. The paper-pulp process not only makes fine paper from straw, but also improves the present process used in making strawboard for boxes so



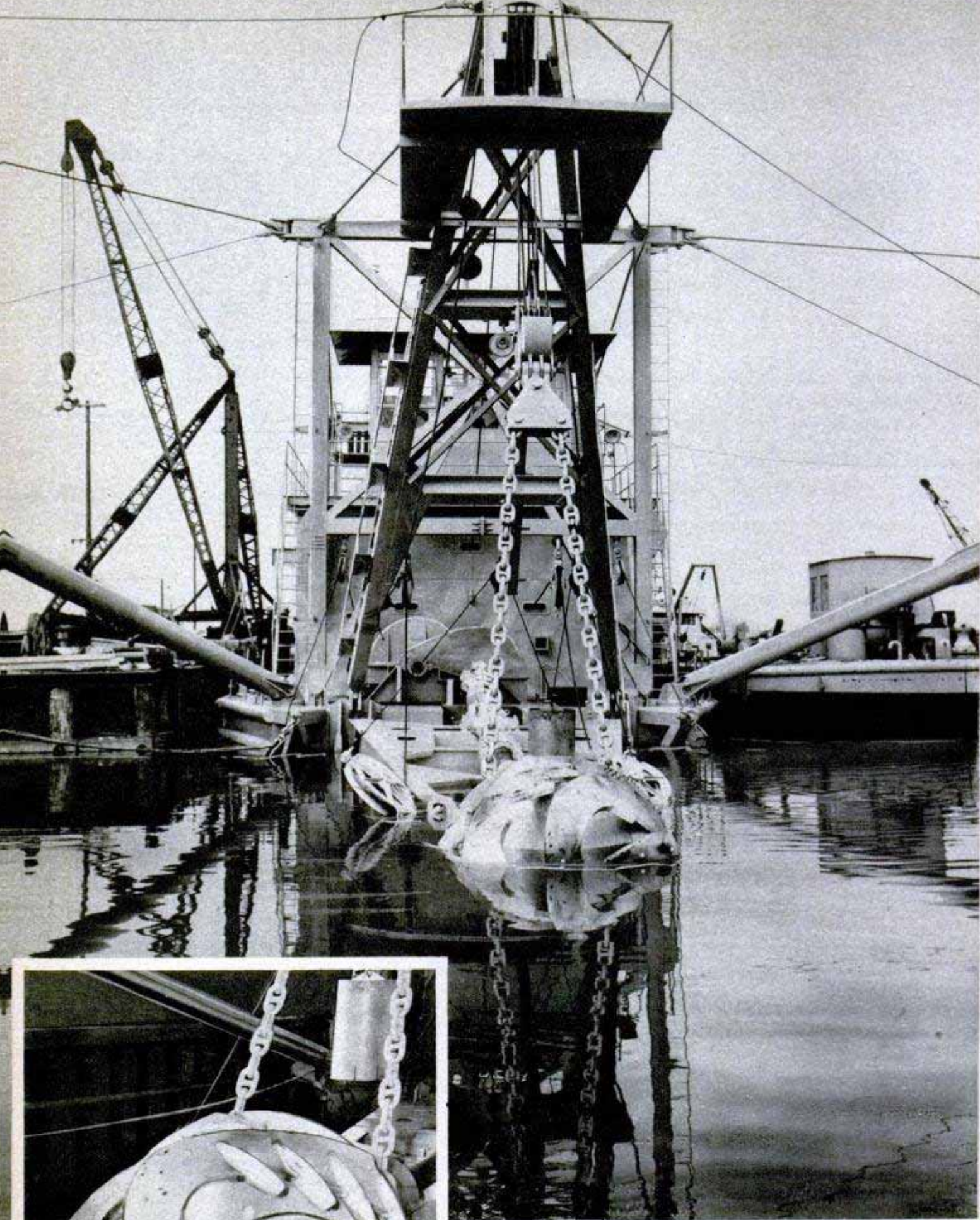
that a better product is created at lower cost. The new building board is a blend of ordinary straw pulp, such as used in strawboard, a new pulp that is cheaper to produce and which adds strength to the finished product.



Wind-Up Barbecue

Foods skewered on a new barbecue grill are turned slowly and automatically over the flames by a spring-driven motor. The grill can be used over a fireplace, a gas or electric range or inside an oven. One winding of the motor will turn the four skewers for 20 minutes, sufficient time to cook most foods that are cut into small pieces. An asbestos shield prevents damage to the motor.

Many of the products described in this issue are already commercially available. For the names and addresses of manufacturers, turn to the WHERE-TO-BUY-IT INDEX, starting on page 10

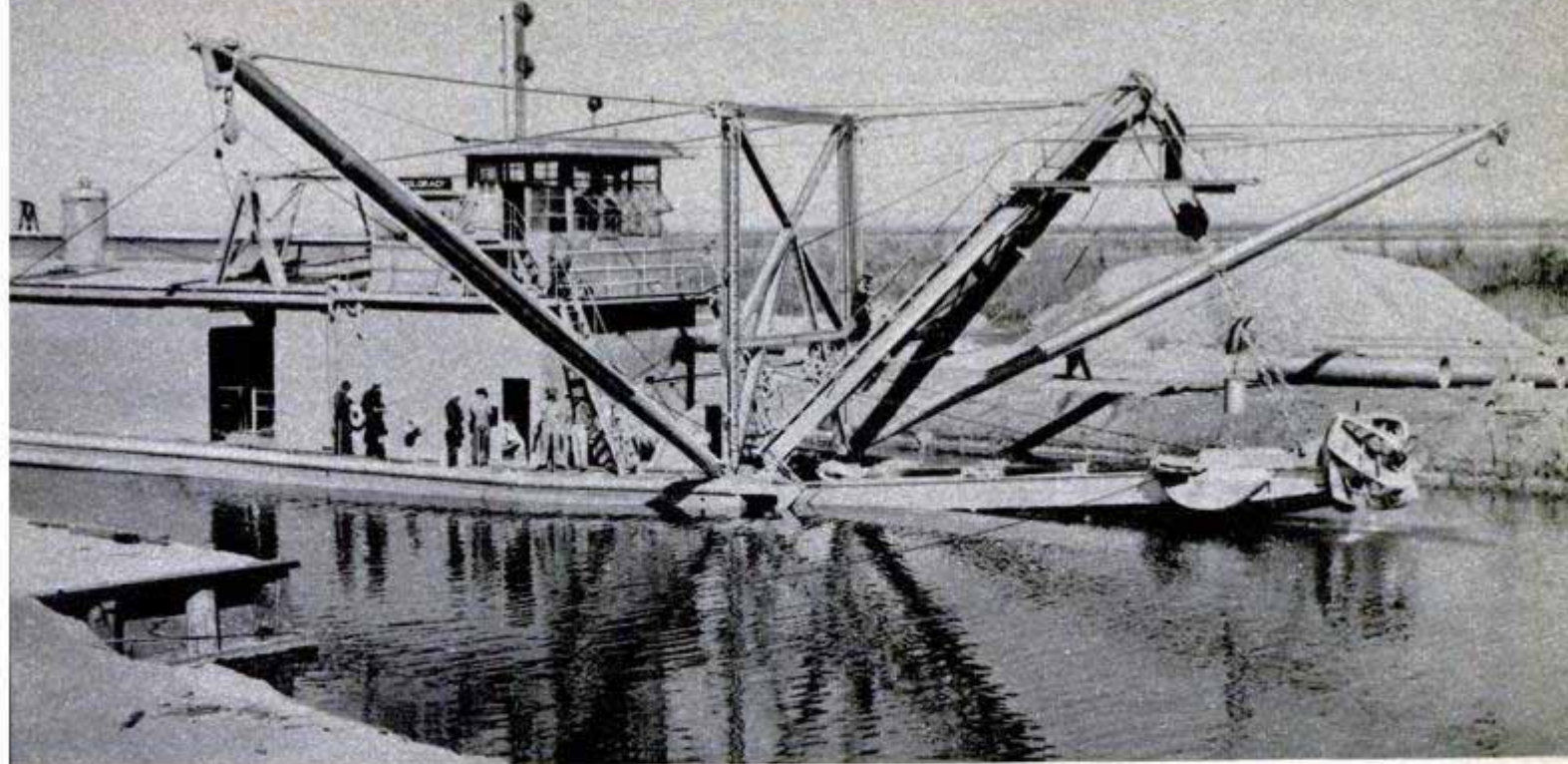


Bureau of Reclamation photos

Giant dredge now is slashing its way through roots and rocks to open a new channel for the mighty Colorado in man's unceasing battle to control the turbulent river

Dredge's 20-inch cutterhead has teeth that bite into the earth. Material is sucked into a pipe and carried away

POPULAR MECHANICS



Demountable dredge, assembled in a man-made basin, now must cut its own way out to site of the new channel

Putting a River in Its Place

By Laura Bell

THE BUREAU OF RECLAMATION is winning another round in the endless struggle to keep the mighty Colorado River in its place.

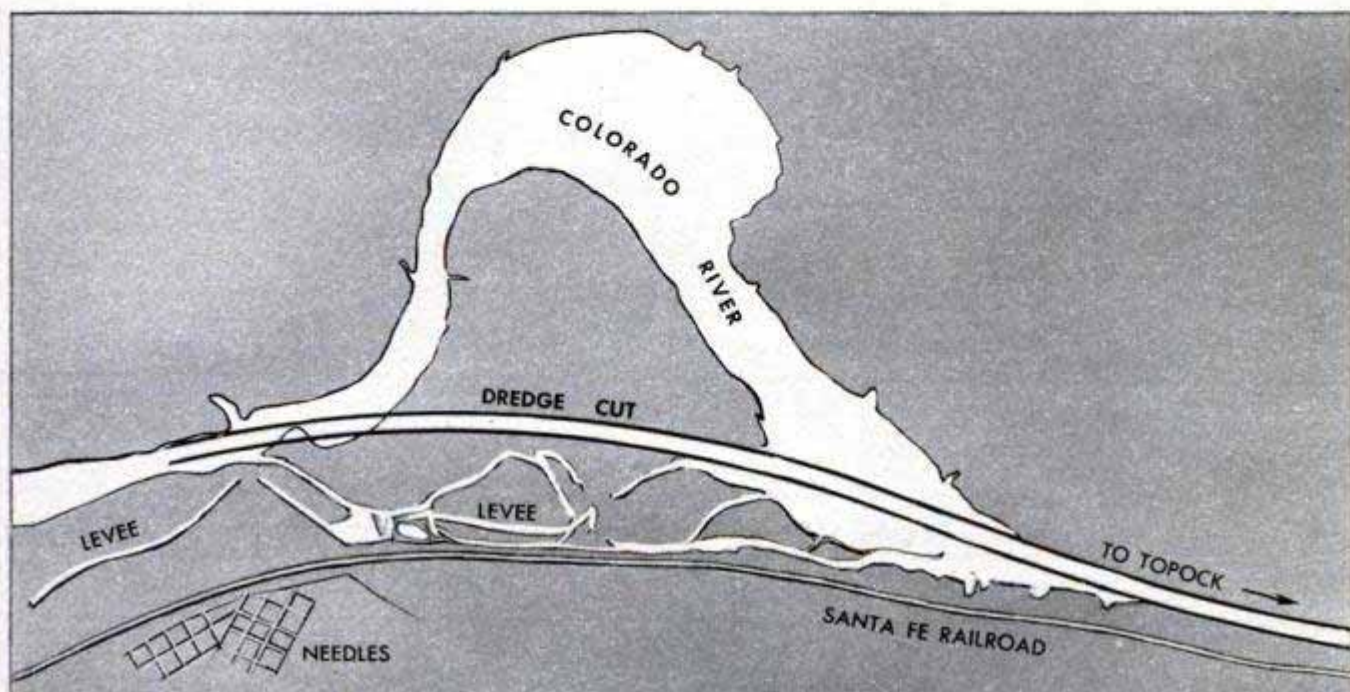
The successful weapon this time is not a dam but a newly designed dredge—largest of its type ever constructed—which was built at Alameda, Calif., and transported in sections by rail to Needles, Calif., where it was assembled and put to work this year.

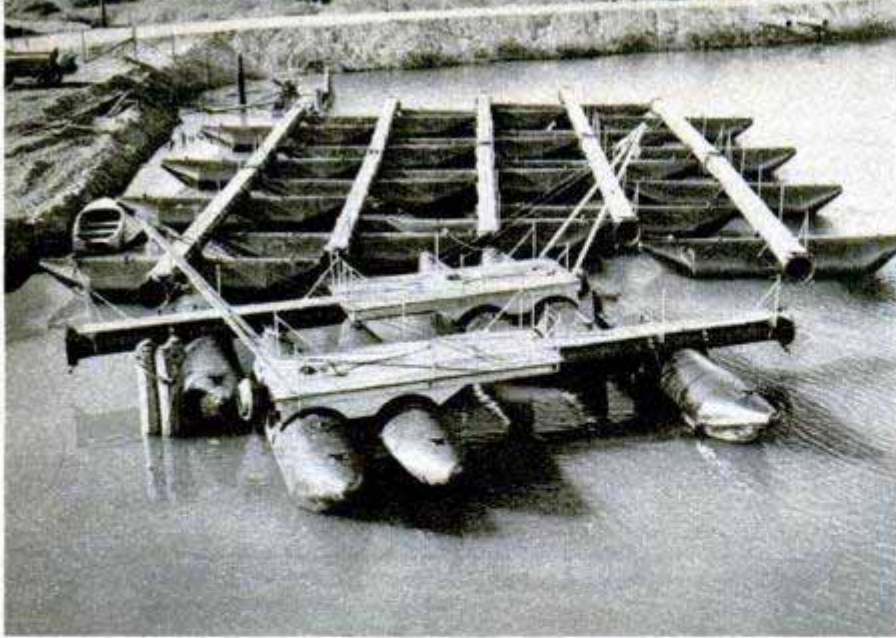
Its job there is to carve a new river 300 feet wide and 15 to 17 feet deep through

dense tules, willows and silt, to Topock, 12 miles downstream. There are other jobs in view when this one is completed after about 1½ years of work.

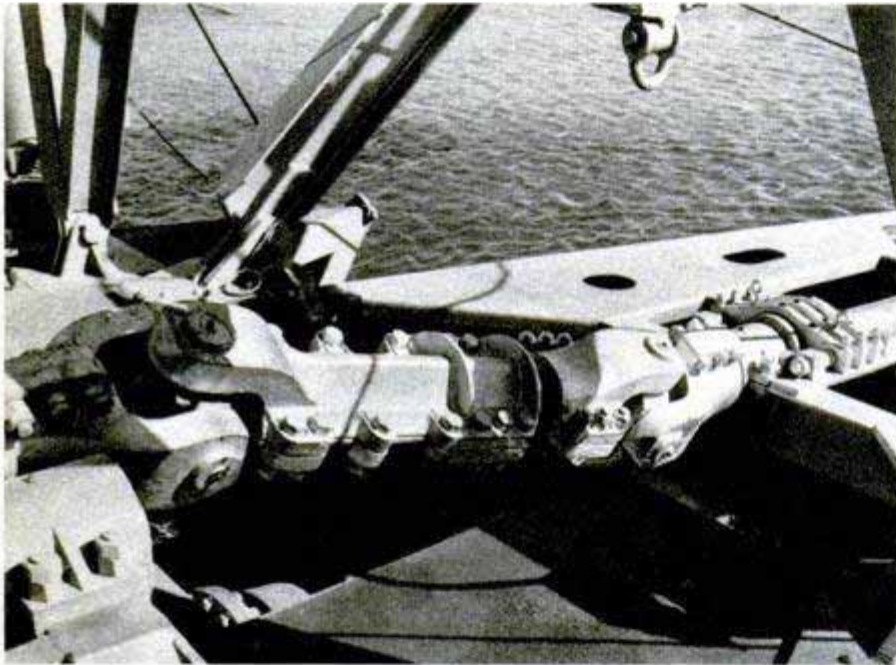
The machine, designed by Bureau of Reclamation engineers to take on this mammoth task, is a 20-inch pipe-line cutterhead dredge, 130 feet long, 30 feet wide, 500 tons in weight and with a draft, loaded, of about 5 feet. Because dams on the river preclude navigation, the dredge is built in sections weighing not more than 35 tons each so that

Map shows location of the dredge cut in vicinity of Needles, Calif. Channel will extend 12 miles to Topock

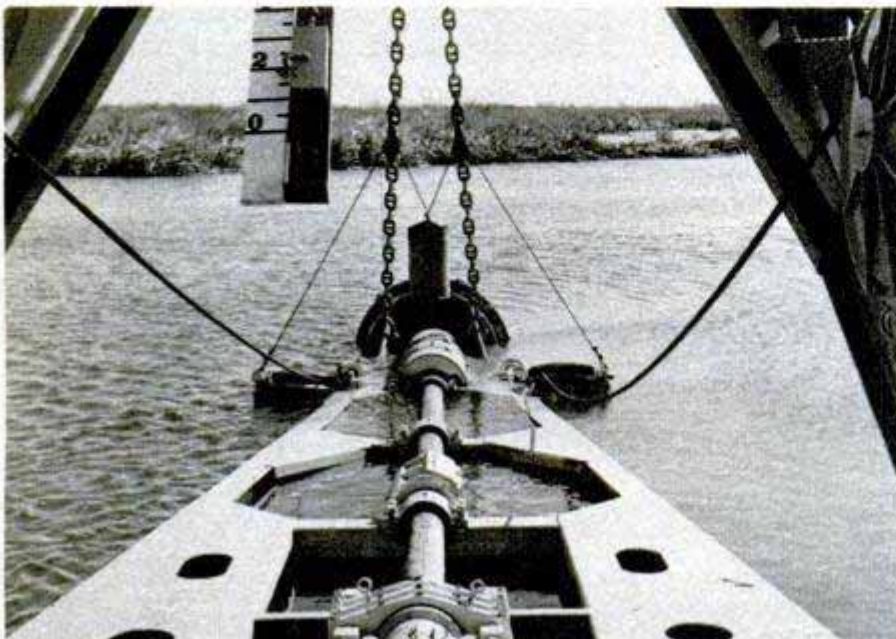




Cutter ladder, shown while it was being assembled, extends far in front of the dredge to support the big cutterhead. The machine was built in transportable sections, then assembled on site



Universal joint on the drive shaft transmits power from the diesel engines to the cutterhead. Below, floating pipe line carries earth and root material away for discharge. Small derricks help the crew in coupling sections of the pipe together



it can be dismantled and transported on railroad cars. It is made up of nine pontoons fastened together with 880 steel bolts. It is not self-propelling, but is moved by two stiltlike spuds and swing lines, or is pushed by the accompanying powerboat.

Two diesel engines of 525 and 1350 horsepower supply power for the dredge which moves 500 to 1800 yards of channel silt and roots an hour, depending on the type of material and length of the pipe line. It is capable of digging out gravel, clay, willow roots and swamp material to a depth of 25 feet below water level. It passes the material through a pipe line 1900 feet long and discharges it 10 feet above water level at the rate of not less than 500 cubic yards of solid material each hour, when the solid material constitutes 10 percent by volume of the discharge.

The mighty Colorado was not tamed when the gates of Hoover Dam closed on it in Black Canyon 14 years ago. The river only changed its strategy, using silt instead of seasonal floods to undo the works of man. After the tallest dam in the world began controlling the flow of the once turbulent and muddy river, the gradient changed and silt plugs raised the river bed several feet at various points below the dam. At Needles this caused the water to spread over a wide area to form swamps and endanger the low-lying portions of the city as well as the Santa Fe Railroad tracks. The railroad crosses the river at Topock and runs parallel with the west bank up to Needles.

Although an investigation was made in 1941, little was done until 1944 when the water surface reached the railroad tracks. The Santa Fe was hauling war materials, and Uncle Sam soon made available emergency funds to throw up a levee and pump the water out.

C. P. Vetter, who has worked with the Bureau of Reclamation for many years, was called back from an engineering job in Cuba to work out methods of controlling the recalcitrant Colorado. In August 1944, the Office of River Control was established with Vetter as its chief. Congress has

Rear view shows the stiltlike spuds, one in a raised position. They act as anchors and also as pivots as the digger lurches forward with the help of a boom-operated anchor on front. A powerboat also is used to push the mighty dredge as it opens the new channel



since been appropriating a million dollars a year for its use.

When Vetter recommended in the early report that levees be thrown up at Needles, he also urged that the river channel be dredged.

"It was obvious," he says, "that we could not keep on raising the levees and pumping the seepage water higher and higher."

In August 1947 the contract was awarded to the Pacific Coast Engineering Company of Alameda on a low bid of \$871,700. The contract called not only for furnishing and assembling the dredge, but also for providing its attendant fuel barge, work barge, pipe barge and power plant. A year later the construction was completed in the Alameda yard.

After completing the job between Needles and Topock, the dredge will be dismantled and shipped 100 miles down the Colorado to the Cibola Valley above Blythe, where the perverse "Old Lady," as Vetter calls the river, keeps building up the water table and

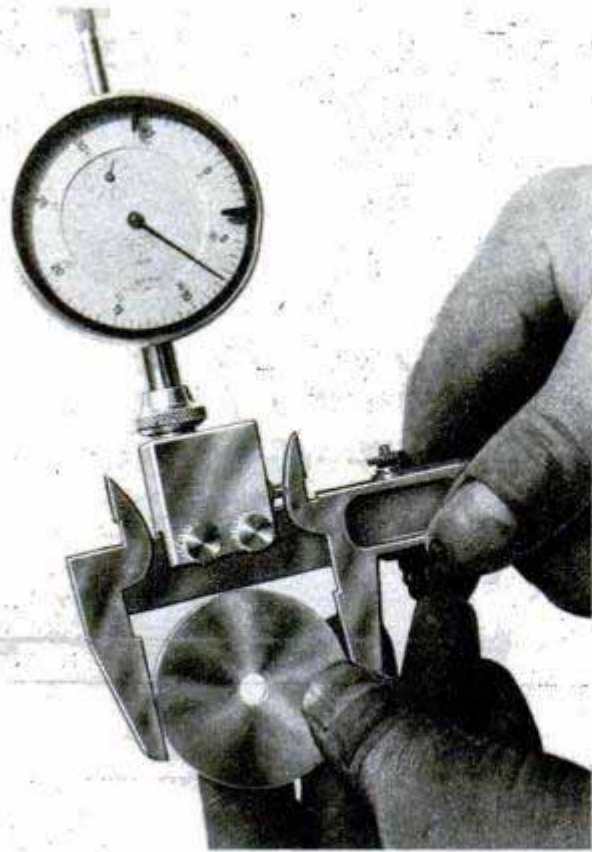
drowning out more and more of the rich agricultural land along her banks. Two years or more will be spent in correcting the course of the river in that area, according to estimates; then the dredge will be brought back to Needles to work up the river toward Davis Dam, which will be completed some time next year.

When that stretch of river channel is straightened and deepened, the Old Lady undoubtedly will have thought up some other mischief which will have to be undone by this new weapon in the nip-and-tuck battle of river control.

The new million-dollar dredge is only one spearhead in the carefully planned long-range campaign to keep the great Southwest's only source of water and power from dissipating her forces in riotous living.

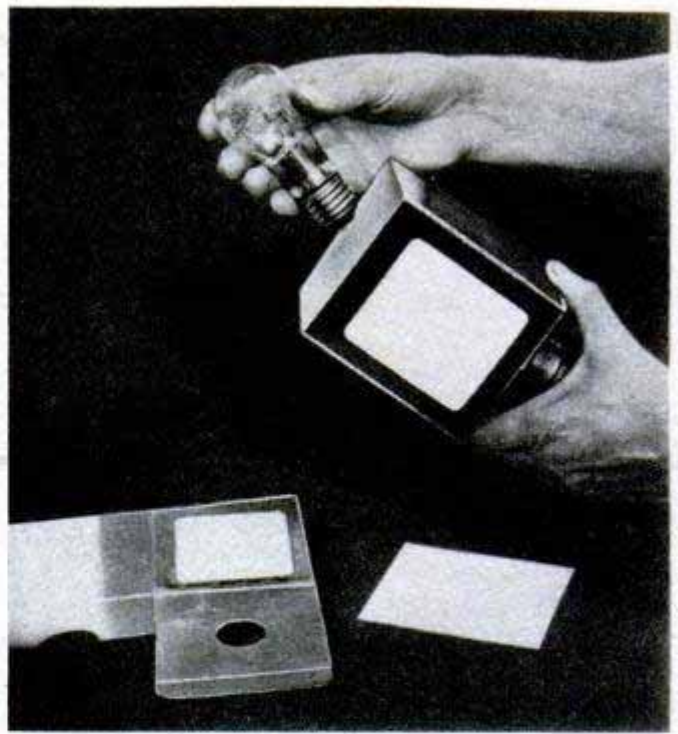
Another attack on the silt problem is the sedimentation survey on Lake Mead behind Hoover Dam and the river above as

(Continued to page 242)



Adapter Transfers Motion Around 90-Degree Turn

Motion is transferred at right angles to operate a dial-indicator shaft by a small clamp-on adapter that has only two moving parts. Used with a dial indicator, the adapter converts a slide caliper for measuring motion at right angles to the indicator shaft, whereas normally motion has to be parallel with the shaft for measurement. Accurate to within .0025 inch, the adapter will make a crude measuring tool micro-matic in accuracy.



Photoflash Reflector Softens Shadows

Harsh, black shadows that characterize photographs taken with a single flash bulb are eliminated by a cardboard reflector shaped like a box with an open top. The front side of the box consists of a translucent window which passes enough light to produce faint shadows. When shadows are to be reduced even more, a piece of translucent paper is placed over the window. The open top permits light to escape and be reflected from the ceiling, filling in shadows around the subject. The reflector reduces the effective output of the flash bulb, making it necessary to use larger lens apertures and slower shutter speeds.

Newsreel Cameraman Gets His Pictures Three at a Time

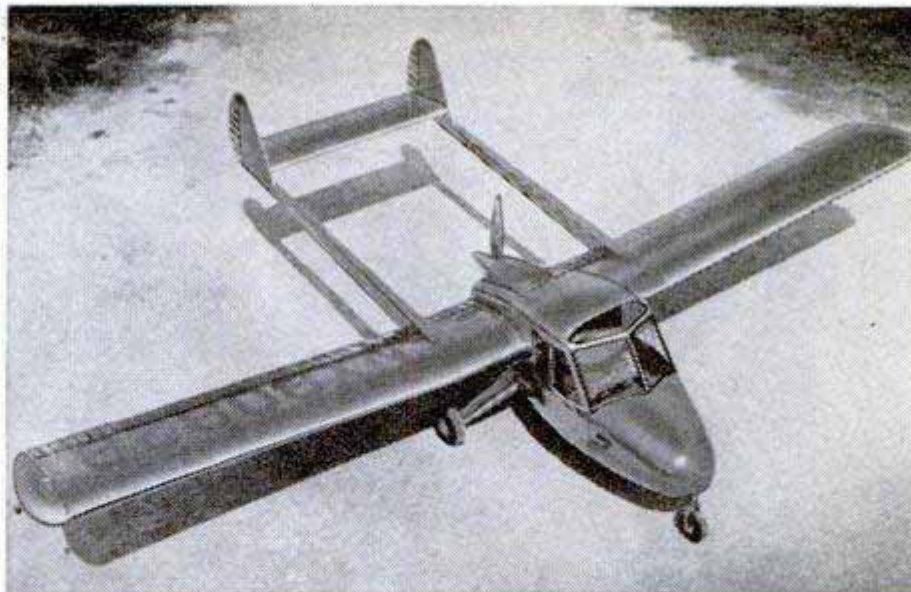


Three at a time is the way Parris Emery, newsreel cameraman, gets pictures of exciting news events. He mounts two movie cameras, one 35 mm. and the other 16 mm., and a press camera on a long bracket that attaches to the tripod head. As he follows the scene in the 35-mm. viewfinder, the other cameras automatically cover the same action. With the two movie cameras he films the action for newsreel release and home-movie release simultaneously, and with the press camera he shoots spot news photos for newspapers when the action reaches a climax.

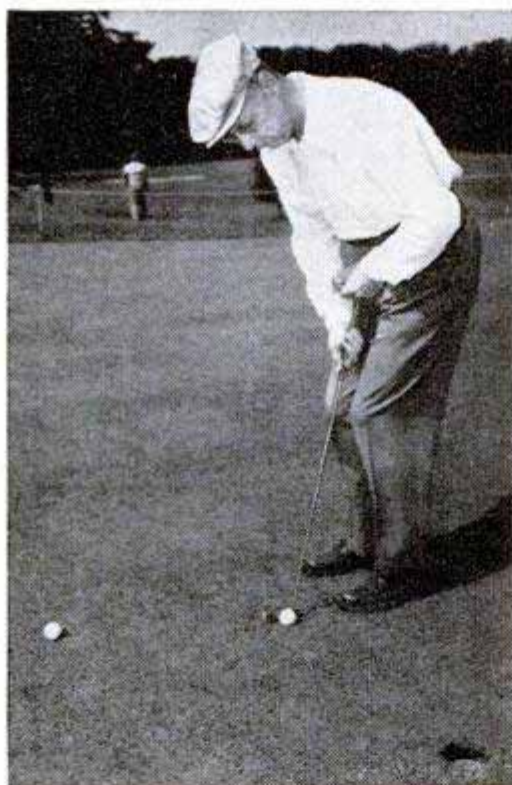
☞ There are about 1500 drive-in theaters in the United States, enough to handle 300,000 cars.

Twin-Boom Plane Seats Two

Twin booms connect the tail with the wing section of a new personal plane, permitting the use of a shorter body with resulting reduction in drag. The engine is located behind the two-place seat and is connected directly with a pusher propeller. The tricycle-type landing gear permits the plane to be steered like an automobile. Baggage is carried in a compartment aft of the seat, with fuel carried in the leading edge of the wing. With this weight near the center of gravity, load has little effect on the flying trim. Passengers



have unrestricted vision and the cabin of the plane remains free of engine oil and exhaust vapors.



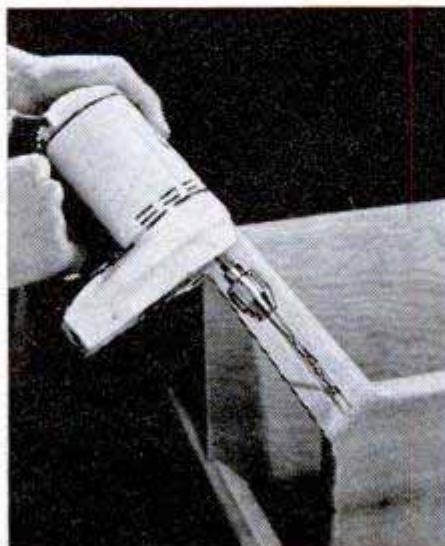
Pendulum Golf Putter

Golfers who have trouble on the green may find that a pendulum-type putter will bring down their scores. The putter has a crossbar handle at the top, parallel with the head. The player's left hand grips the handle rigidly, simulating the pivot point of a pendulum. The right hand, placed near the top of the shaft, swings the club down and into the ball. According to the inventor, Jules Sternberg of Reading, Pa., the club's action minimizes pushing or pulling off line and produces a natural follow through. A pair of runners at the base of the club head reduces grass friction.

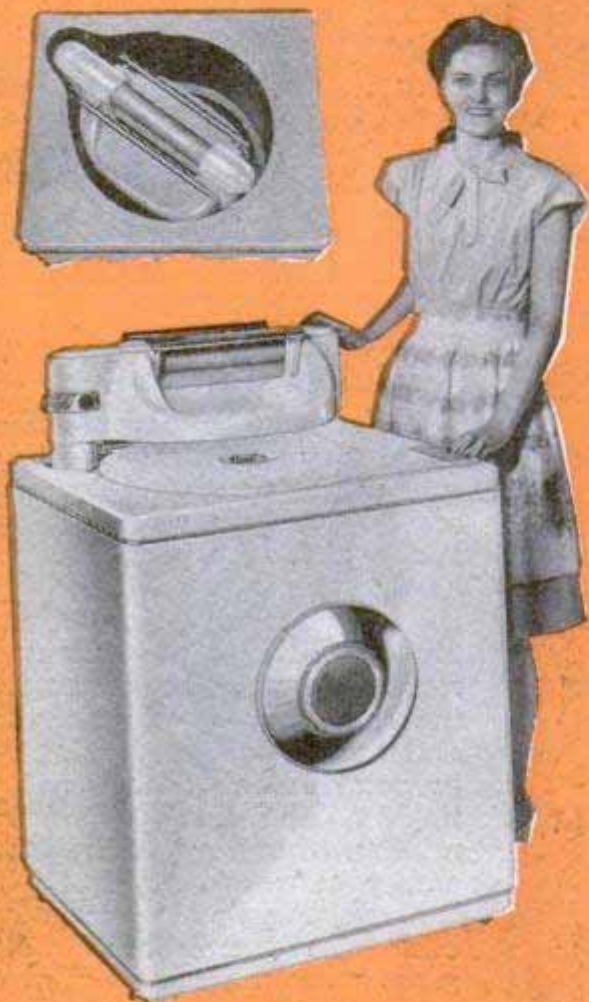
☐ Minnesota law now requires that all new cars sold in the state be equipped with turn signals.

Electric-Mixer Motor Becomes Power Tool

That electric mixer your wife has in the kitchen becomes a handy, light-duty power tool for polishing, drilling, sanding and buffing when you install a simple adapter kit. The mixer beater is replaced by a conversion shaft mounting a 1/4-inch chuck. Grinding stones and other accessories are attached to the shaft.



WHAT'S NEW *For Your Home*

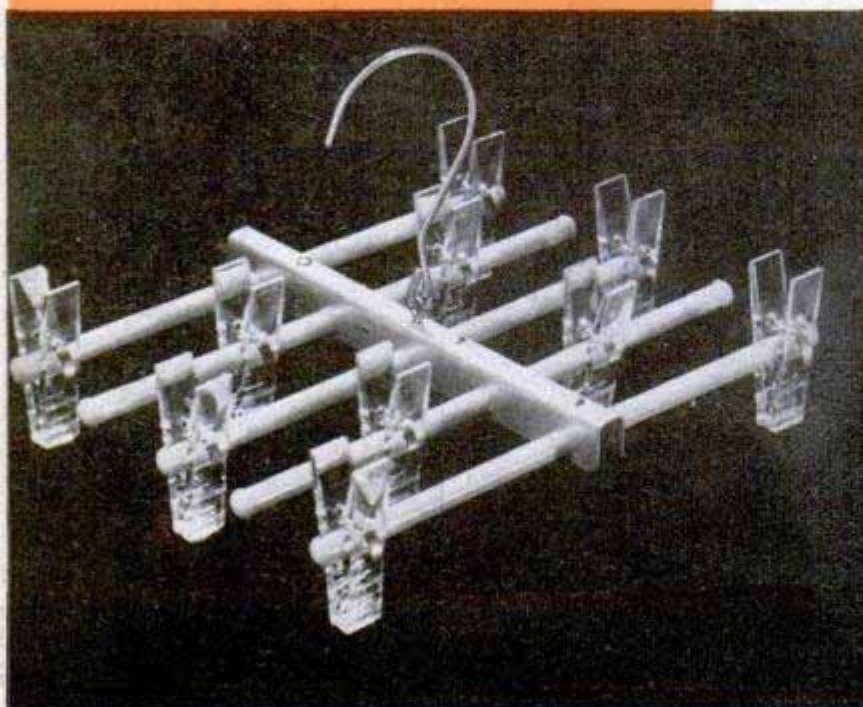


CRANK-UP BROILER can be raised or lowered with the door closed. A crank handle at the base of the broiler door operates the lift mechanism

DISAPPEARING WRINGER on washing machine, left, slips down inside cabinet when not in use, giving the washer a flat top at counter height.

HANGING RACK, below left, is handy to use and attractive to look at. Crystal plastic clips can be adjusted to any position on aluminum rods

POT WRAPPER, below, makes plant care easier. You pour water into the Vinylite-plastic wrapper and the roots keep moist by gradual absorption





SPACE-SAVING DINETTE has shelves concealed when closed. At mealtime, the front swings down to form a comfortable dining set for six persons



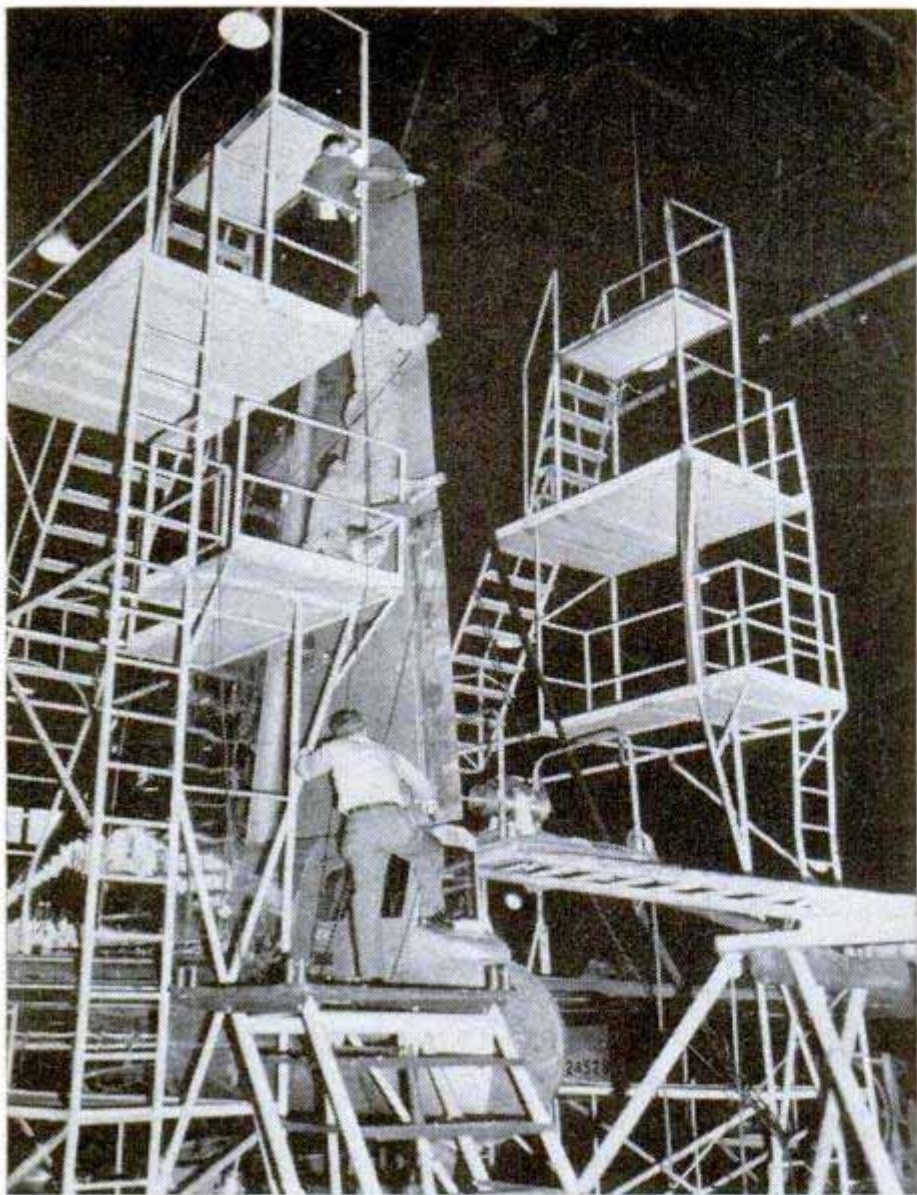
PORTABLE BREEZES go right along with you when you travel in the hot weather if you pack this light electric fan in your traveling bag

CREAM REMOVER, below left, for paper milk carton works like a spile in a maple tree. You push it into the carton and the cream pours out

FOOD ODORS in refrigerator are eliminated by a deodorizer, below center, enclosed in a plastic case that clips to the underside of shelf

FAT DRAINER built into frying pan, below right, makes tipping the skillet unnecessary. You press the lever and the grease drains off





Electronic Shakers Find "Flutter" Bugs

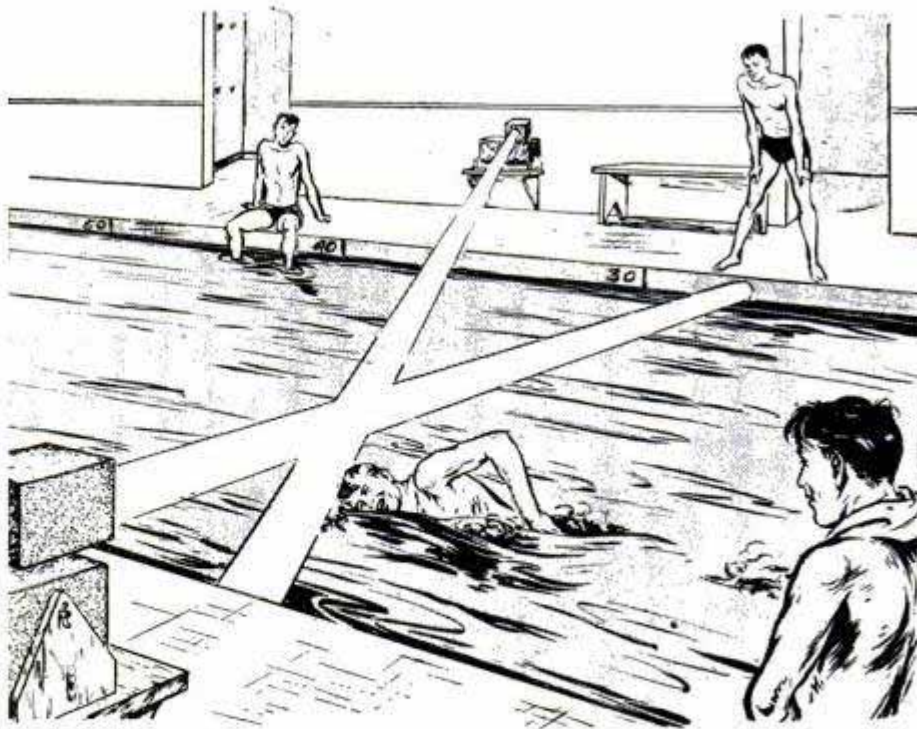
Electronically run exciters now make sure the "flutter" bugs are out of planes before the craft ever flies. They're doing the job so well that not a drop of water spills from a full glass placed on a Boeing Stratocruiser armrest in flight. Along with dangers created for the plane's structure, steady vibrations of as little as .002 inch have been found to annoy passengers. The new exciters, driven by electrical currents, can duplicate movement precisely over a wide range of frequencies. In addition to hand-held deflection indicators, small magnet-and-coil pickups, sometimes distributed over as many as 100 places on the plane, help register the amount of vibrations.

←Boeing Aircraft photo

Working on four-story perch, engineers at different levels use deflection indicators as vibrator at right shakes the rudder of Boeing B-50 bomber

Moving Light Beams Pace Swimmers

Swimmers can time themselves during practice with a light beam that moves along the gutter of the pool at any preset speed. The pacing machine is designed to develop swimming teams. In some pools, two of the lights are used to cast a moving spot on each gutter. The beams travel in unison at a constant speed so that the swimmer can see one of the lights no matter which direction he is moving. The instrument enables a swimmer to set his pace for a certain distance and know at all times just how hard he must swim in order to make his goal. The speed of the lights may be varied from 13 to 26 seconds per length of a 25-yard pool, so that each



day the swimmer can increase the speed of the lights by a few tenths of a second. In one test, a swimmer cut 16 seconds from his time for 440 yards.

Gallstone "Detector"

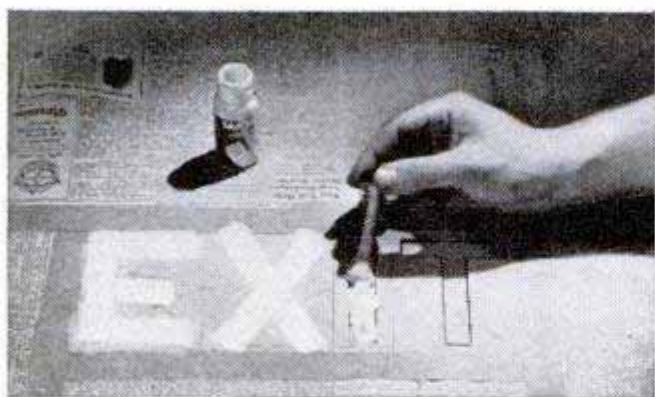
Pennsylvania surgeons and engineers cooperated in the development of a gallstone "detector," an electro-acoustical instrument that transmits a metallic sound whenever a crystal on its probing wire touches a stone in the human body during a surgical operation. The detector was first used successfully at the University of Pennsylvania Medical School Hospital in Philadelphia. It was said to make known the presence of tiny stones which might otherwise go undetected by the surgeon.

Enamels for Aluminum

Enamels have been developed for two alloys of aluminum to make them more durable and widen their decorative use. Enameled aluminum, used on storefront panels and in many other ways, is fired on strips at a temperature several hundred degrees below that required in enameling steel. Other uses for



the Du Pont Company discovery may include washing machine tubs and agitators, architectural tile and outdoor furniture.



Adhesive Stencils Stick to Surface While Paint Is Applied

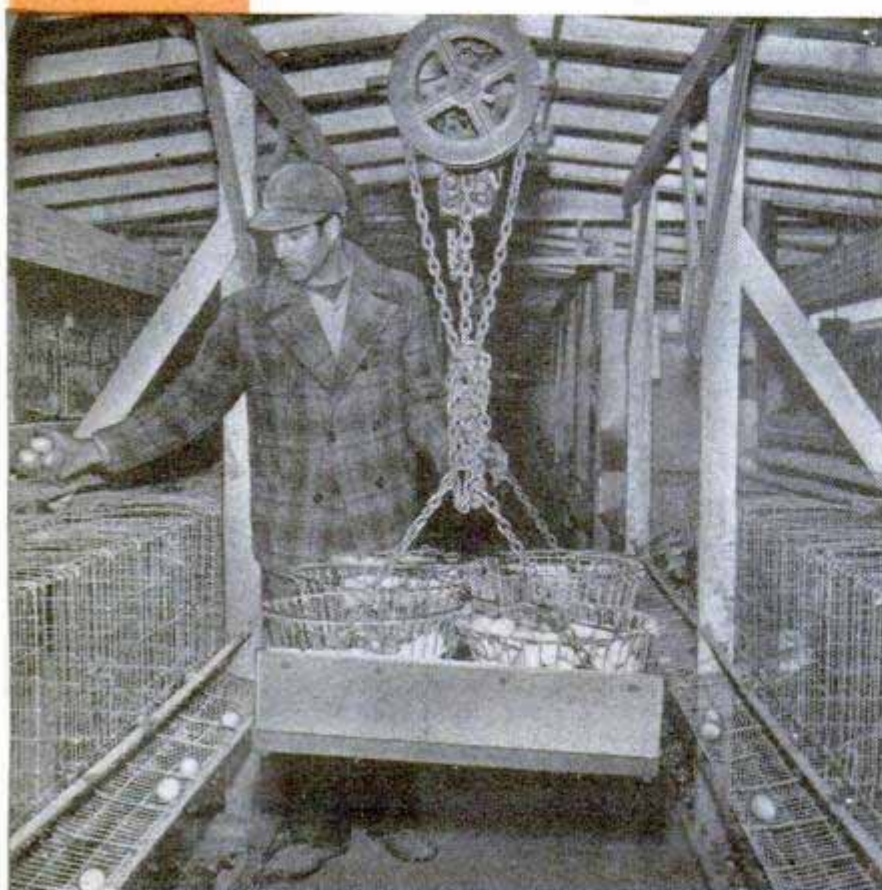
Amateurs can paint signs that have a professional appearance with the aid of stencils that stick to the surface to be lettered. The sign painter draws a center line across the surface which serves as a guide for corresponding lines on the stencils. A backing is peeled off each letter or figure chosen, exposing an adhesive coating which sticks to the surface. After the stencils have been fastened in place, paint is applied with a brush or a spray gun. If a "pin stripe" is desired around each letter, certain parts of the stencil are replaced and a contrasting paint applied. The stencil cards themselves can be used as temporary signs. A quick-drying or luminous paint is recommended for use with the cards. The stencils originally were designed for marking insignia and other information on aircraft.

There Are Air Tides, Too

Tides are not limited to water, according to a Norwegian meteorologist who states that every day two tide crests sweep through the ocean of air at the bottom of which we live. One tide is a response to the moon's pull, the other to the sun's, with the solar air tide being much higher. At sea level, the crests come at 10 a.m. and 10 p.m., Dr. J. Berknes told a recent meeting of the National Academy of Sciences.

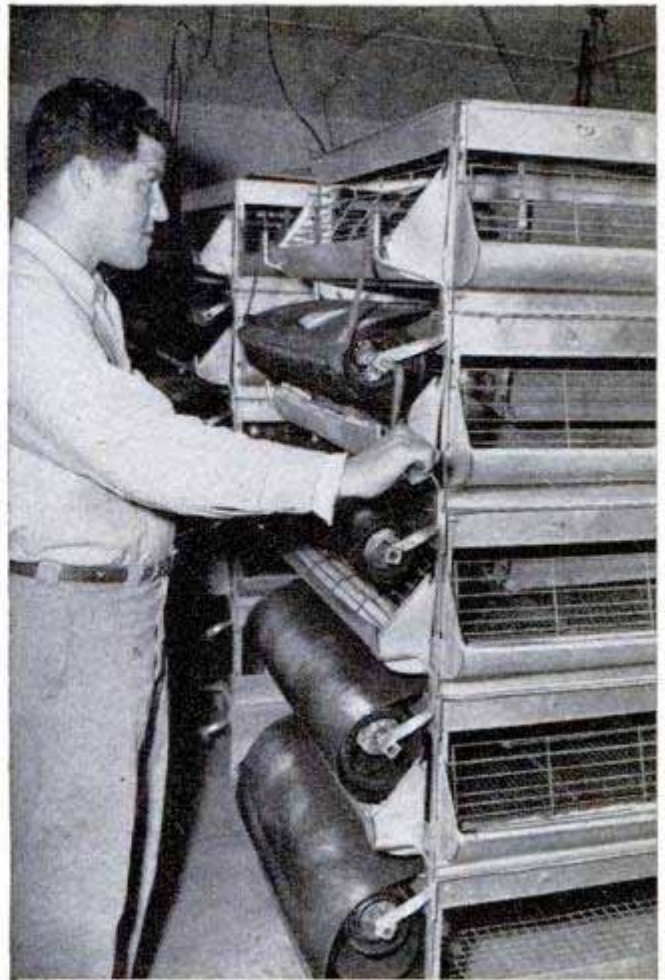


Eggs on the production



THE 7000 laying hens on a California egg ranch eat their meals in reverse-cafeteria style. Instead of moving past rows of food as people do in cafeterias, the hens merely stand in their individual cages and eat their meals as the food moves past them on endless belts. Once a full-time job for three men, feeding can now be done by one man. He dumps dry mash into hoppers from which it is picked up in chain-driven buckets and dropped on the moving belts. The cages are arranged in two tiers and the food, after passing in front of the top hens, is dropped to a lower belt which carries it past the lower tier of hens and then

Eggs are collected from troughs into which they roll as soon as laid



Left, resistance wire around water pipes prevents freeze-ups. Above, the paper floors of brooders are scraped clean when they are cranked around rollers

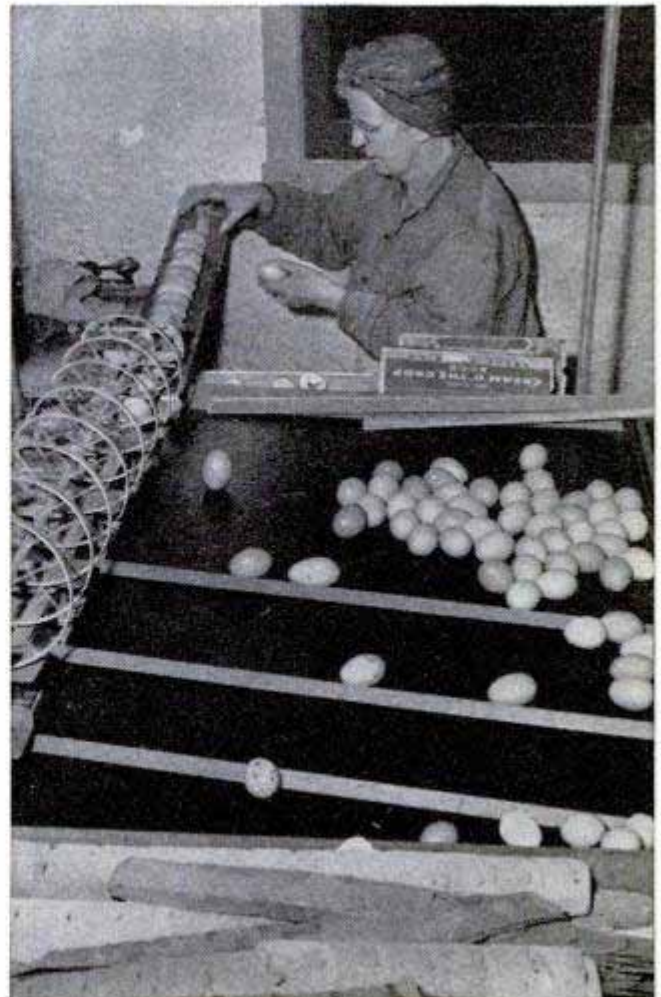
line

returns the uneaten food to the hopper.

Built by two California egg raisers, the production-line egg farm has 12,000 chickens, including baby chicks and young hens being raised to maturity. The weekly grocery bill is pretty big. The hens eat 3000 pounds of feed every day.

Everything on the ranch is as mechanical as possible. An overhead monorail trolley carries feed to the hoppers. The same trolley rail is used to move baskets along the tiered cages during egg collection. The floors of the wire cages slant and when an egg is laid, it rolls toward the aisle where it is easy to collect. Production charts above each cage show how each hen is doing. The cages have individual drinking cups, filled automatically. The hens are housed in open-sided sheds that are cooled in summer by a water-spray system on the roofs. Eggs are sorted according to their weight by a mechanical sorter that weighs the eggs and segregates them in the standard weight ranges.

Eggs are graded automatically by this machine that rolls them into compartments according to weights





↑ Student grips steering wheel with one of the attachments for his artificial arm. Above, right, aluminum wrench fits socket for changing a tire. Right, here are some of fittings that make 15 different tools

Aids for Amputees

Fifteen different tools fit into the socket of an artificial forearm, making it possible for an amputee to write, shave, drive an automobile and make car repairs. The arm was designed by Waldo Rook of Berlin, who lost a hand in World War II. It operates on the principle of a socket wrench to hold the aluminum tools. One tool slips into the socket to aid in changing a tire. Another connects with a car's steering wheel. Aluminum for the fittings is donated from scrap in the American and British sectors of Germany. Rook operates a school sponsored by the city. About 400 students have already learned to use the artificial arm and attachments in a class that lasts four weeks. The city gives an arm and fittings free to any student who enrolls in the school and completes the course.



Radio-Radar Domes

Shifting radio and radar equipment to experimental wing-tip domes has increased cargo space in the Fairchild Packet. The plastic "radomes" resemble the droppable fuel tanks used on fighter aircraft. About 200 pounds of radar, formerly in the hold, are now at the left wing tip. A like amount of radio equipment has been moved to the right wing tip to balance the ship aerodynamically.



The CRAFTSMAN

★ Why just dream about having an outdoor fireplace when it's so easy to build one yourself? The full-color story starting on page 174 gives all the pointers one should know before starting to build—how to lay bricks, how to mix mortar, importance of location, etc.

★ Shooting transparencies is a fascinating hobby, but filing the slides in order—that's work, unless you have a cabinet similar to the one on page 201. It holds 2000 slides.

★ A damaged sail can lay up your boat over several week ends unless you know how to mend sail. Beginning on page 196, professional sailmakers tell the tricks of the trade.

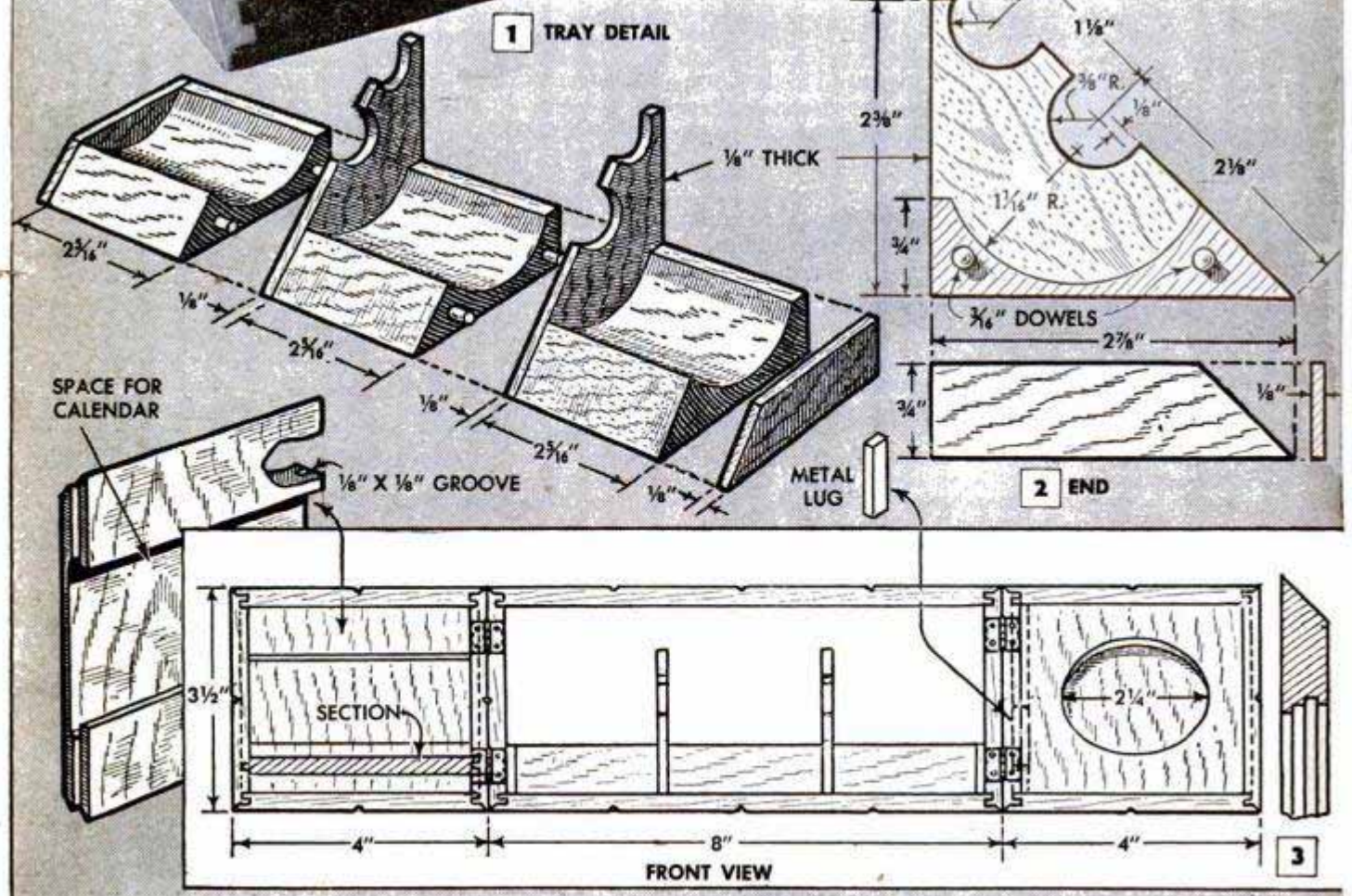
★ A shop story on sawing compound angles, page 210, contains invaluable data for your reference file.

COLOR-SLIDE
FILE CABINET



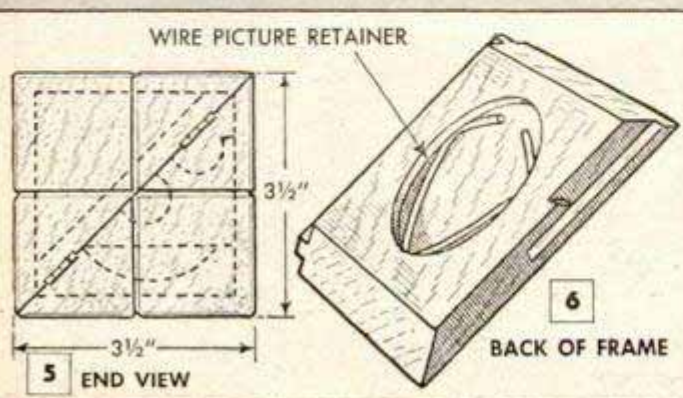
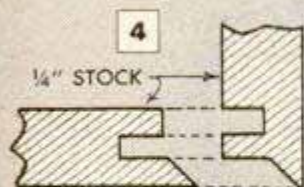
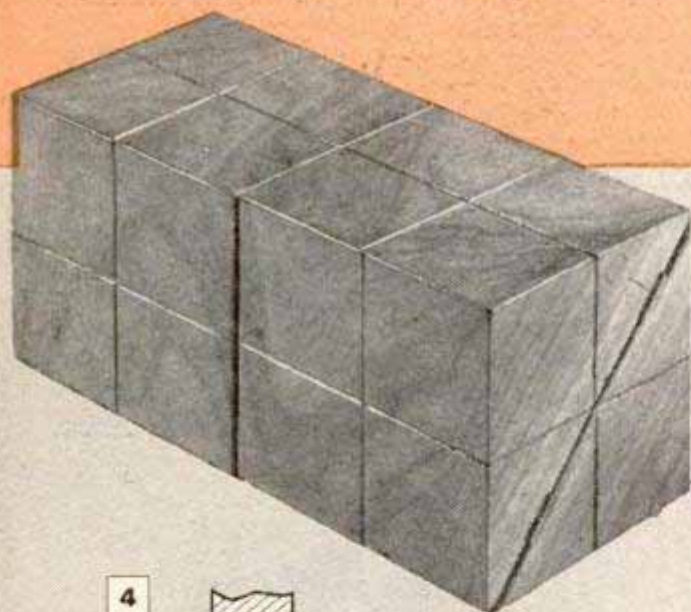
DESK ACCESSORY

has secret compartments





By Benj. Nielsen



HOW DOES it open? That's what your puzzled friends will ask when they examine this intriguing desk accessory. The tendency is to try to raise the lid like any box, but that's when it fools you. For, instead of opening from the front, the box opens outward from the center and becomes a triangular-shaped unit, containing a calendar, photo frame and a removable tray for pencils, stamps, paper clips, etc. In addition to these features, the spaces behind the photo and calendar can be used to hide small items of value. To the casual observer it appears that the covers to the compartments are fixed, but actually they are removable—that is, if you know the trick. A small metal lug, concealed in a blind groove run in the edge of each cover, serves as a lock which is released by turning the box upside down and tapping it. This causes the lug to slide down to the open end of the groove, thereby unlocking the cover. By taping the valued item to the inside of the compartment so it will not rattle, it will be safe from the unsuspecting petty thief.

While appearing to be assembled in a single unit and then sawed apart diagonally, the box is made in three separate sections. Except for the parts of the tray, Figs. 1 and 2, $\frac{1}{4}$ -in.-thick solid stock is used throughout. Fig. 3 shows a direct front view of the box, opened, while Fig. 5, an end view, shows it closed. Mitered tongue-and-grooved joints, detailed in Fig. 4, are used at all corners. The triangular-shaped ends of the hinged sections must be grooved on the inside before assembling to take the covers and the locking lugs. Fig. 6 shows the combination rabbet and groove for the lug and how a tongue is formed on the opposite edge. The section through the calendar cover, Fig. 3, shows this clearly. The grooving is the same on both covers, except that one is made left hand and the other right hand. The hole for the photo is lathe-turned and rabbeted for a wire ring as detailed in the sectional drawing above Fig. 3. All surfaces of the box are scored lightly in a squared pattern so that the grooving aligns when the hinged sections are closed. Tiny brass hinges mortised flush are used to hinge the sections. Meeting edges of the folding sections may have to be trimmed slightly to permit closing.

Paper Is Perforated Quickly If Scored on Hardboard

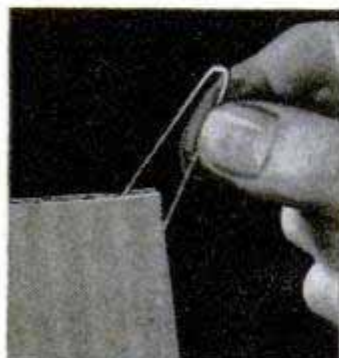


Placing a sheet of paper on the back side of a piece of tempered hardboard and scoring it with a single stroke of a sharp knife results in perforations that permit easy tearing of the paper. The rough surface of the hardboard allows cutting through the paper at the high spots, but the material is soft enough so it will not dull the knife blade. A single sheet of gummed paper can be perforated to form labels by typing it prior to tearing along the perforations.—Michael Ligocki, Gary, Ind.

Shellac Prevents Stain Bleeding

Before applying a light-colored paint to varnished woodwork or furniture, first sand the surface and paint a small test spot in an unnoticeable place to see if the stain will bleed through. Wait a few days and inspect the spot for discoloration. If present, the entire surface should be sealed with two coats of shellac before the painting is continued.

Reinforcing Corners of Backing Protects Photos for Mailing



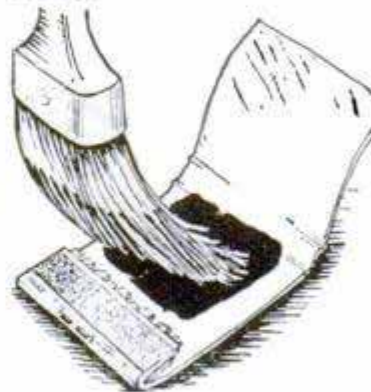
Even though photographs are protected by corrugated-cardboard inserts when mailing, the corners frequently are bent and the appearance spoiled. To reduce this possibility, re-

inforce the inserts by pressing a hairpin diagonally through the corrugations at each corner. This will add strength and rigidity without materially increasing the weight.

William Swallow, Brooklyn, N. Y.

Paint Sample Carried Safely In Empty Match Book

Recently when decorating my kitchen, I found that I was not going to have quite enough paint to finish the job. I had mixed the paint myself and, not wishing to re-mix the small additional amount required, I decid-



ed to try to match it with ready-mixed paint. The problem of how to carry a fresh sample of the color safely to a store was solved by using an empty match book. I daubed a bit of the paint on the inside of the cover and closed the flap over it. Thus I was able to carry it in my pocket.

George Henry, Argyle, Wis.

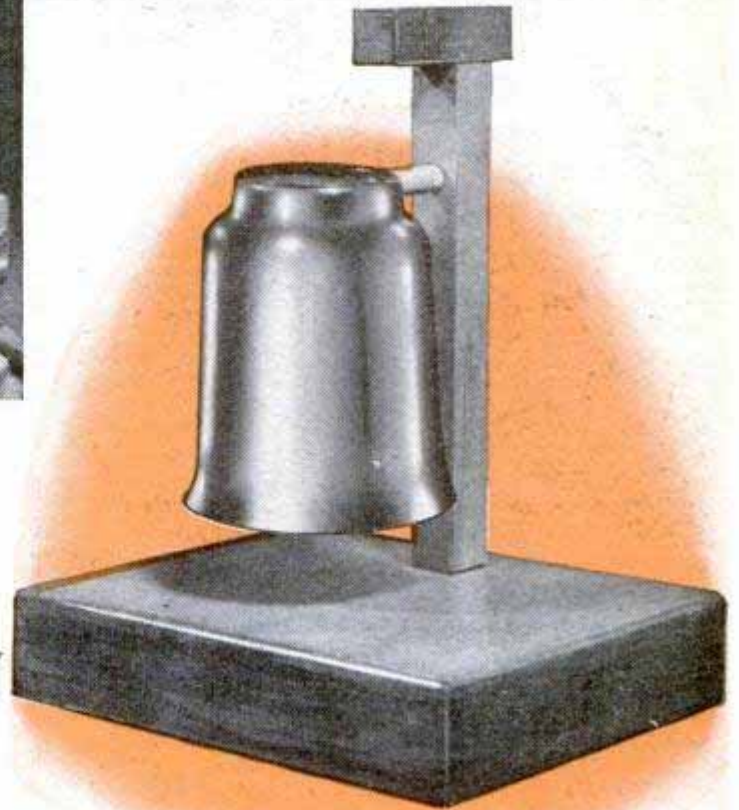
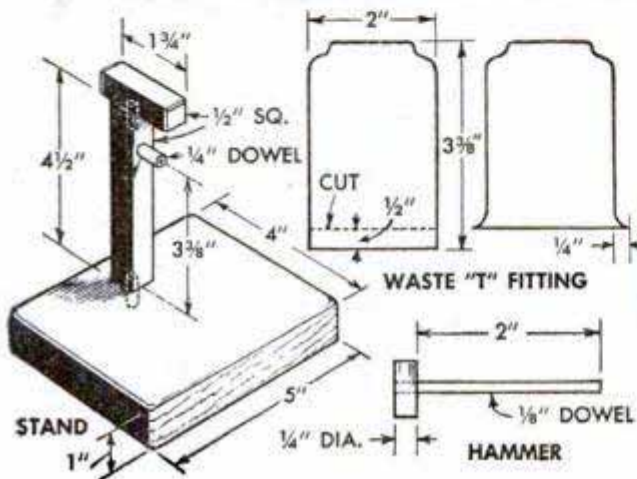
Sunglasses Kept From Dropping By Ribbon Tied to Frames

To make sure that your sunglasses do not fall and break during summer sports, tie a ribbon to the frame so it will hold the glasses around your neck. This is also a convenient way to carry the glasses when they are not needed.

Arthur Trauffer, Council Bluffs, Iowa.



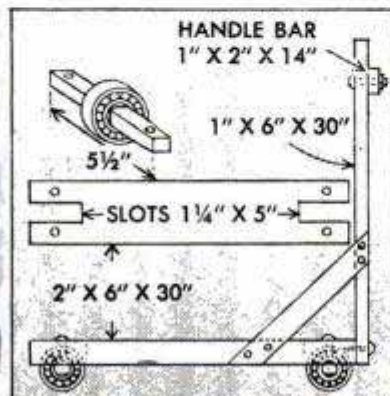
Say "Come and Get It" With This Tiny Dinner Bell



At dinnertime the soft tone of this tiny bell calls all hands at a single stroke. The bell is obtained ready-made from your plumber for it's simply a chrome-plated escutcheon, or cover, used in conjunction with a pop-up waste "T" fitting of a built-in drain plug on a lavatory. The straight end of the fitting is drawn and flared about $\frac{1}{4}$ in. by hammering it on a stake, which, in this case, is simply a 6-in. length of $1\frac{1}{2}$ -in., round cold-rolled steel. Use a soft hammer to avoid denting the metal. The stand is a good one-evening project. Use a cab-

inet wood that matches the dining table or sideboard for the base and upright. The bell is mounted by inserting a wood screw through the setscrew hole already in one side of the bell at the top and driving the screw into a hole drilled in the end of a short length of $\frac{1}{4}$ -in. dowel, as indicated in the left-hand detail. The head of the striking hammer is made from $\frac{1}{4}$ -in. steel rod and fitted with a wooden handle turned from the same wood as that used in the stand. Finish the stand with varnish or wax.—R. J. DeCristoforo, New York City.

Smooth-Running Scooter Wheels Provided by Auto-Axle Bearings



Worn rear-axle bearings from an automobile provide smooth-running wheels for a comparatively silent scooter which can be made in a short time. The base of the scooter is cut out, as shown, for the wheels which rotate on hardwood axles. The latter are simply lengths of square stock tapered at one end and driven through the center hole of the bearing. The ends of the axles are drilled and screwed to the underside of the scooter base.

C. E. Wilkinson, Golden, Ohio.

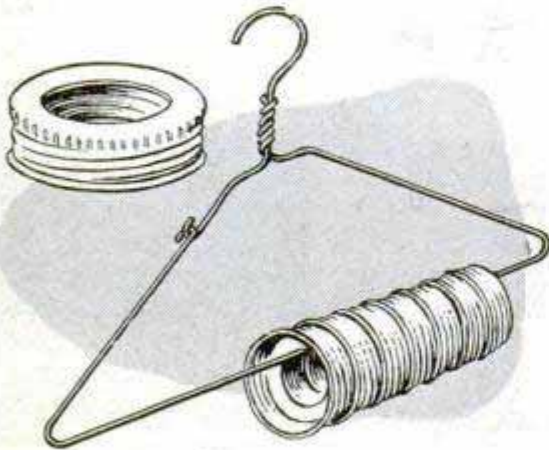
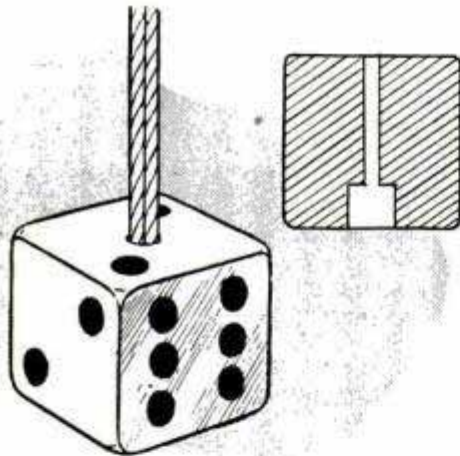
☐ Fish that have been out of the water for some time will scale more easily if they are dipped in boiling water for a minute.

Solving HOME PROBLEMS

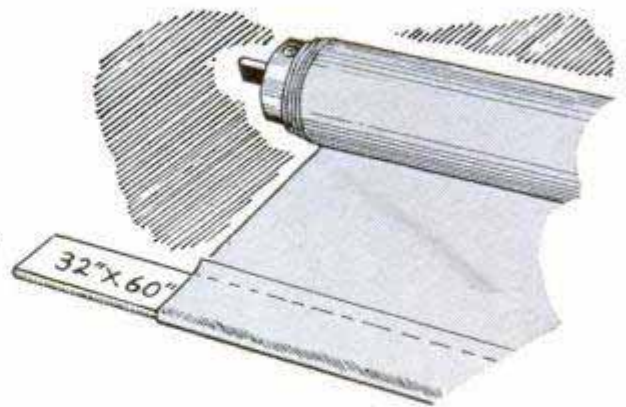


It isn't necessary to keep your eye on a double boiler to see that it doesn't boil dry. Just place a fruit-jar lid in the bottom vessel and when the water gets low the jar lid will rattle loud enough to give warning that it's time to add more water

Novel shade pulls, especially appropriate for a game room or den, can be made from large-size colored dice. To attach them to the shade, drill a hole through the center and counterbore the bottom as indicated to take knotted end of the cord

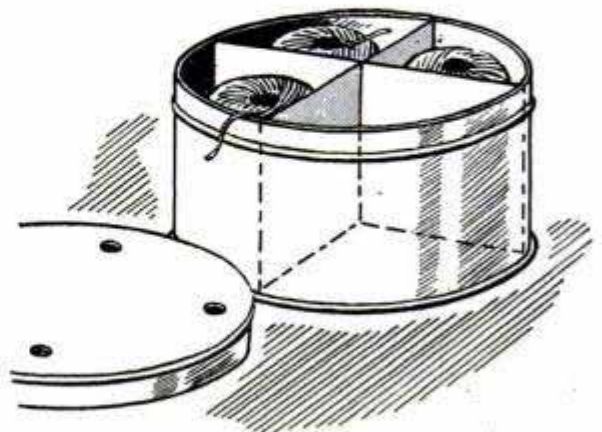
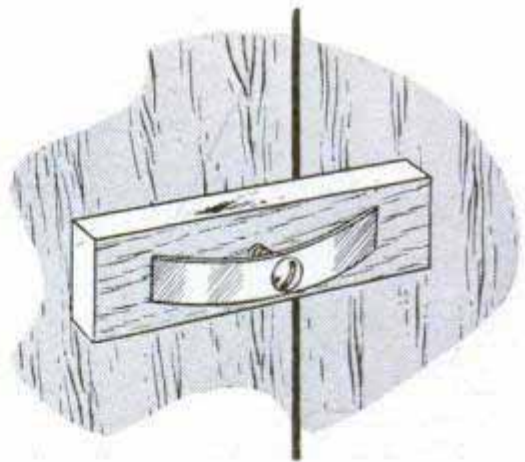


Keeping track of fruit-jar covers from one canning season to the next is no problem if a practice is made of threading them on a coat hanger when they are removed. The hanger is cut near the twisted end and severed ends are bent into hooks

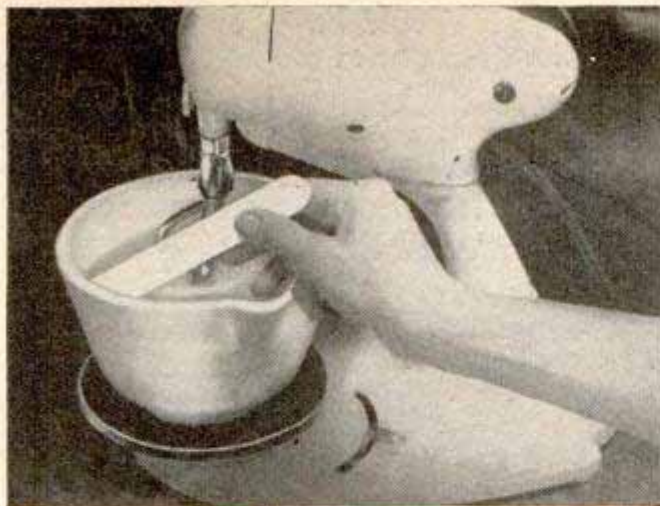


When shades are fitted to windows of a new home, future replacement of them is simplified if the length and width are marked on the shade. A good place to write this is on the end of the wooden slat. Thus the note is handy for quick reference

If the screw hole in a wooden turn button becomes so enlarged that the screw will no longer hold it in a set position, a section of clock spring, placed under the screwhead, will provide enough pressure to keep the turn button in a horizontal position



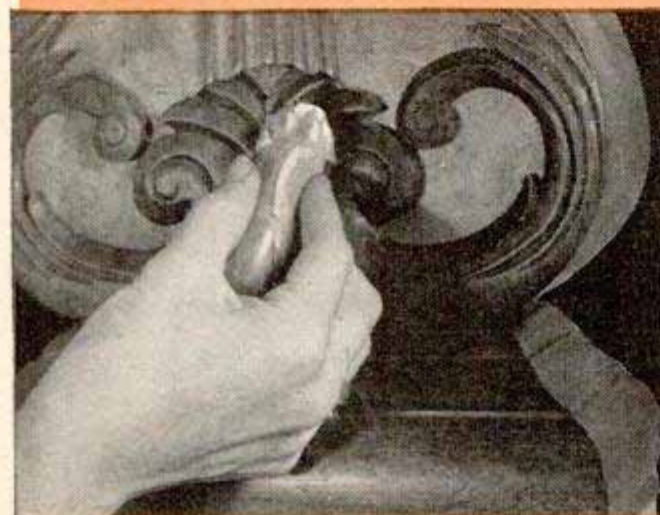
A large canister or metal candy box fitted with compartments makes an excellent dispenser for balls of string or yarn. Two pieces of cardboard, slit and half-lapped, divide the box into four compartments. Holes are drilled or punched in the lid



Possible damage to the beaters of a food mixer is prevented by using wooden tongue depressors instead of a spoon to scrape mixture from sides of the bowl. Thus, if the depressors accidentally catch in the beaters, they will not damage the latter.



The job of breaking ice cubes into small pieces to fill a Thermos bottle is avoided if "icicles" are used. These are frozen in a mold formed by folding a strip of wax paper in pleats. The mold is placed in a freezer tray and covered with water.



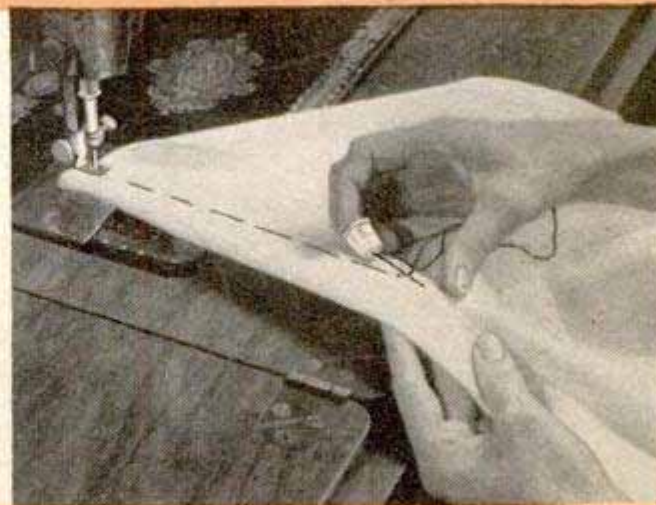
Wallpaper cleaner is put to new use in removing the film which collects on fancy carved furniture. Being pliable, the cleaner can be shaped to get into tiny crevices and other hard-to-reach places encountered in cleaning intricate overlay carvings.



Nothing is more annoying than pricking the fingers when applying curtains to a stretcher. Next time, try placing a common thimble on each thumb. Used in manner shown, thimbles serve as guards to bring the edge of the curtain over the barbs.

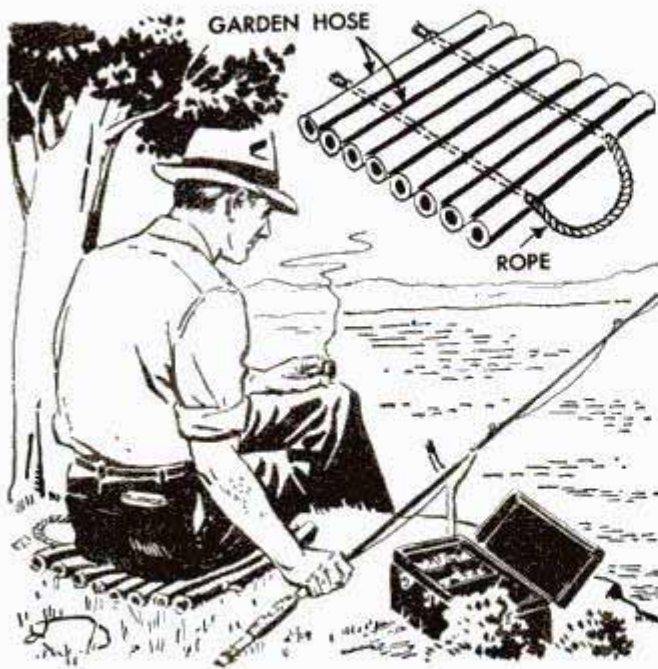


Eggs will fit nicely in round bun sandwiches if they are fried inside a tin can placed in the skillet. Top and bottom of the can are removed and resulting band serves as a cup to retain the egg as it is fried. Select a shallow can for the purpose.



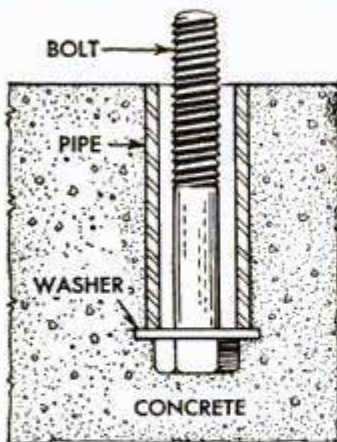
Basting hems is considerably less tedious when the presser foot of a sewing machine is used as a hold-down. With both hands free, the material can be held taut as it is being basted which not only speeds work but produces a straight running hem.

Portable Seat for Fisherman Utilizes Old Garden Hose



Several sections of discarded garden hose strung on a length of clothesline provide a portable seat which is just the thing when fishing from the bank of a river or lake. Such a seat is quickly made and, if there is a sufficient amount of old garden hose available, a number of them also will come in handy for picnics. They will be welcome in the early part of the day when the ground is still damp. To make the seats, cut the hose sections to size and drill two holes through each of them. Then, string the clothesline through the holes and knot the ends to form a handle for the seat.

Floating Foundation Bolts Permit Slight Error



To allow for small errors in center-to-center distances when drilling holes in the plates of a frame house, one home builder embeds "floating" bolts in the concrete foundation walls. This is done by placing a washer and a short length of pipe over

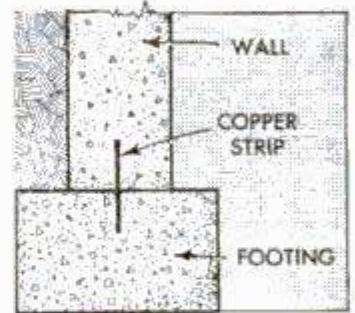
the bolt and then setting the assembly in the wet concrete so the top of the pipe is flush with the surface. The pipe keeps the concrete away from the shank of the bolt, permitting the threaded end to be moved slightly in either direction to pass through the hole in the plate. The inside diameter

of the pipe should be $\frac{1}{4}$ to $\frac{3}{8}$ in. larger than the diameter of the bolt to provide a maximum amount of float.

Roger Isetts, Kenosha, Wis.

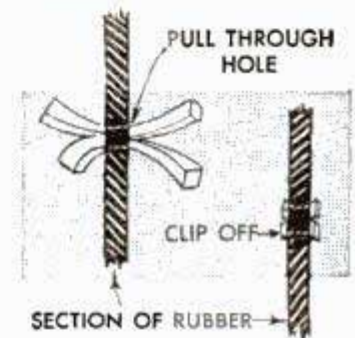
W.T.M. Concrete Copper Strip Prevents Seepage Between Wall and Footing

When pouring the foundation for his new home, one man sealed the joint between the footing and wall with a copper strip, 4 in. wide, to prevent seepage into the basement. About half the width of the strip was embedded in the wet concrete of the footing all the way around the house. After the wall was poured, this formed a watertight joint.



Sealing Leaks in Rubber Boots

Small leaks in rubber boots or waders can be sealed without using unsightly patches by cementing pieces of rubber band in the holes. First, locate the leak by shining a flashlight inside the boot.



Then, work some rubber cement into the hole with a needle or toothpick, and pull one or more short lengths of rubber band through the hole so it is filled completely. Set the boot aside until the cement has dried thoroughly and clip off the ends of the rubber bands flush with the sides of the boot. The resulting mend will be long lasting and practically invisible.

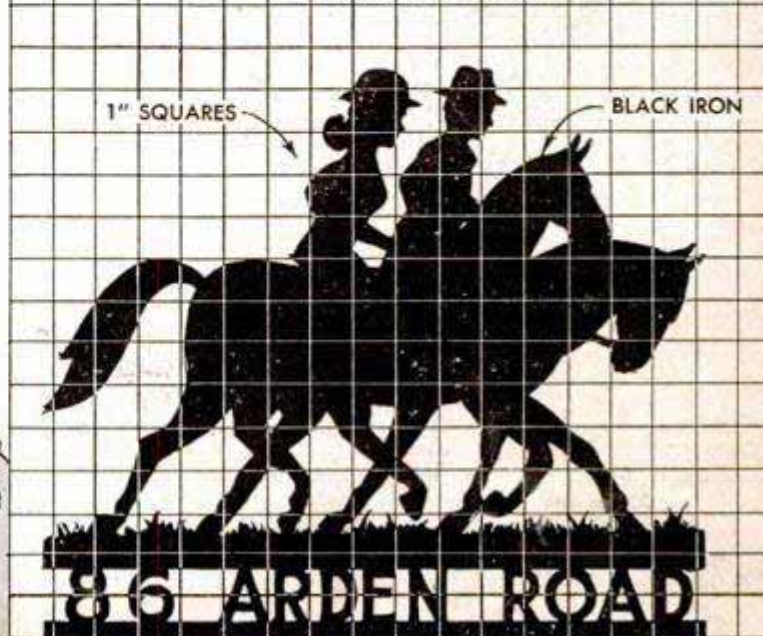
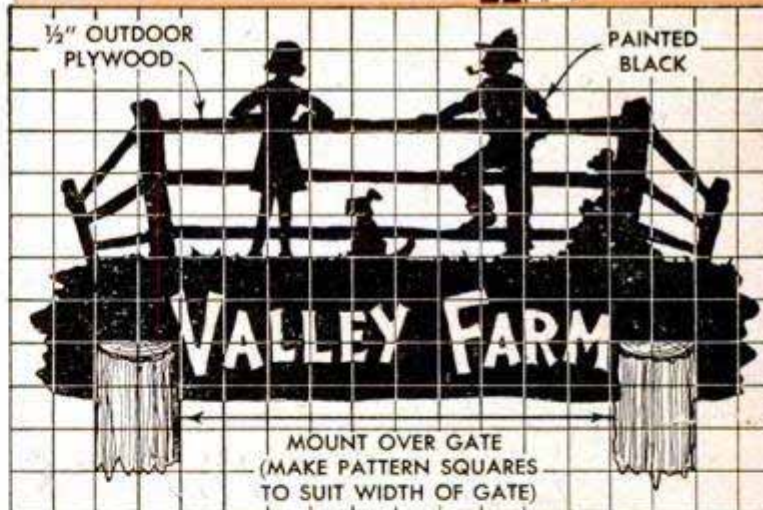
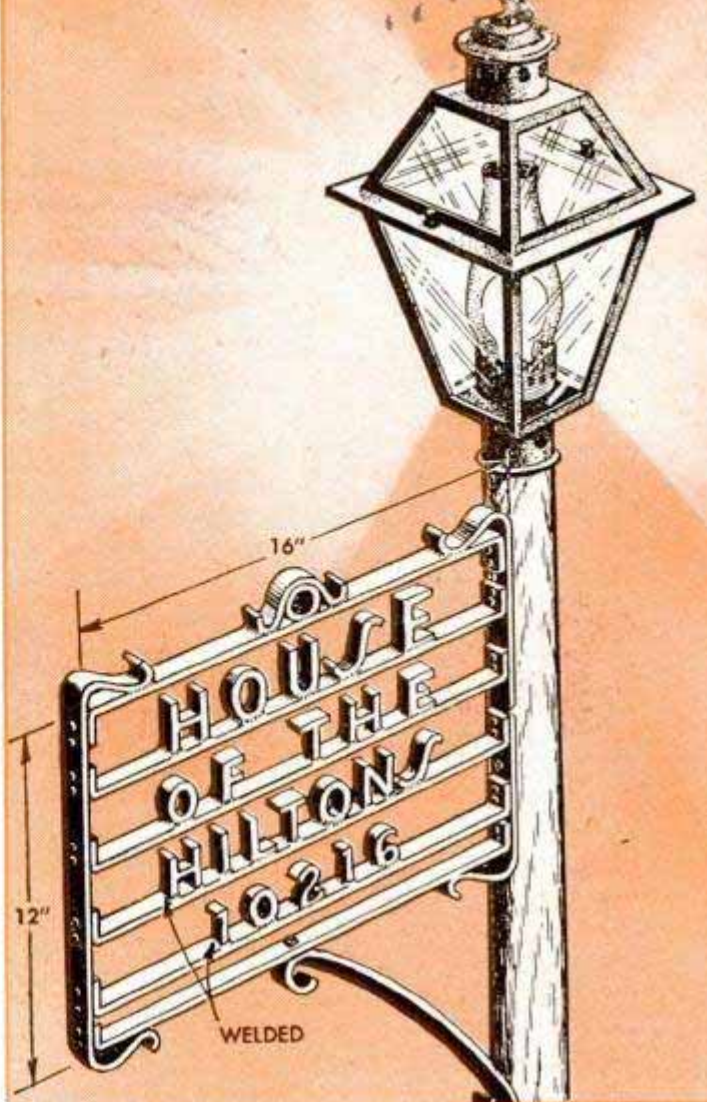
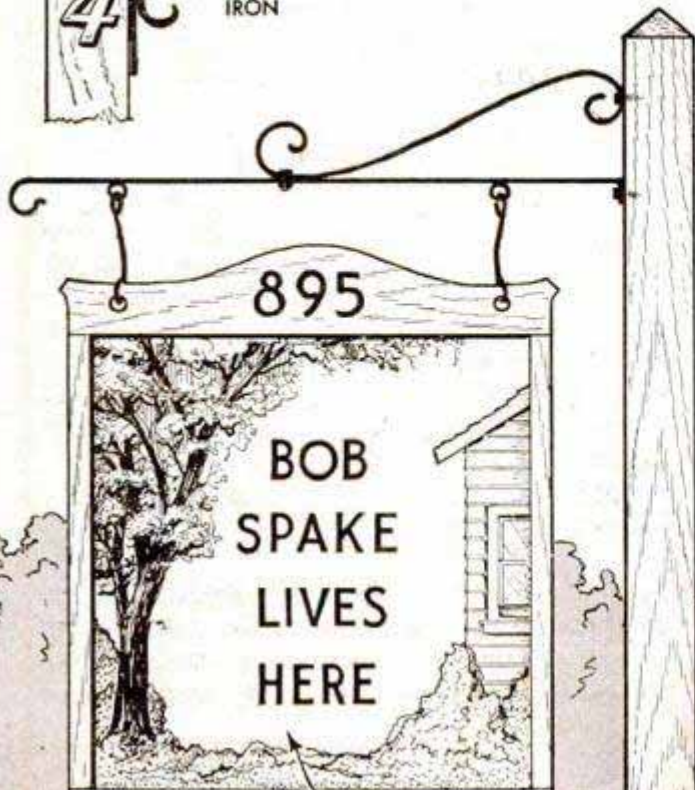
Effective Insect Repellent

Applied to the socks, shoes and trouser legs every two or three hours, this chigger repellent will see you safely through badly infested brush and grass. The repellent consists of a mixture of oil of spearmint, 1 oz., and oil of pennyroyal, $\frac{1}{2}$ oz. For a mosquito repellent, add $\frac{1}{2}$ oz. glycerin to the above formula and apply to the hat, shirt and socks. In addition to being effective, the repellent is long lasting and has a pleasant odor.

☐ A simple and inexpensive clothes sprinkler is made by punching holes in the metal cap of a catchup bottle or one similar to it. The cap should be of the screw-on type.

IDENTIFY YOUR HOME

Friends who are unfamiliar with the location of your home will appreciate an attractive plaque or sign listing your name and house number where it is easily seen day or night from the street. If the sign is illuminated by a post lantern, it can be located so it lights the way to your door. The designs sketched below show what can be done with such materials as outdoor plywood, sheet metal and bent iron. The ironwork should be finished in flat-black lacquer and the wood painted





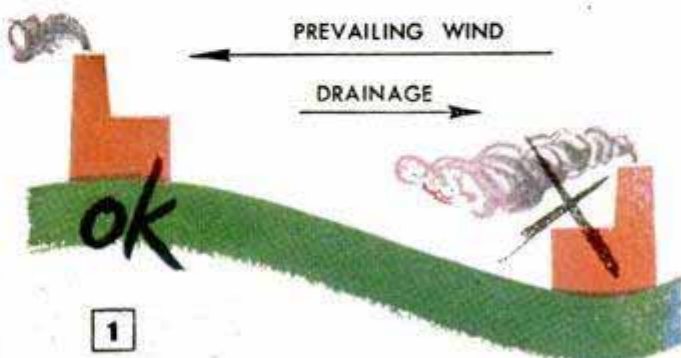
By E. R. Haan

HAVE YOU been anticipating the pleasures of an outdoor fireplace but have not done anything about it, either because the cost of having the work done is prohibitive, or because it seems that the job is too forbidding to tackle yourself? Building one isn't so difficult if you arm yourself with guiding facts on just how to proceed—information such as is contained in this article.

What type of fireplace do you want? You may prefer a fireplace of the simplest type like the one shown in Fig. 2, which is low and consists of bricks laid without mortar. This type is serviceable if used only occasionally. In the more permanent structure shown in Fig. 3, a concrete foundation slab supports three sides and

Planning and Building Outdoor Fireplaces

X285
Also X253



Pointers on location and arrangement—importance of good design—how to mix and use mortar — how to lay brick, etc.

a chimney. Grates can be formed by setting iron bars in the masonry, but greater cooking efficiency is possible by using a steel firebox and ashpit around which the fireplace is built as in Fig. 4. Then, there are more elaborate fireplaces. One combining a cooking grill and Dutch oven with an open hearth that gives warmth on cool evenings is shown in Fig. 5. Storage space for cooking utensils and fuel can be included. You also can incorporate a trash burner or a garbage incinerator, concealed from the cooking end of the fireplace and operating independently.

Important facts about location: After deciding just which type of fireplace you want, determine its location. Select a dry spot having good drainage, where water does not collect and where heaving frost will do the least amount of damage to units that do not have deep foundation walls. Prevailing wind direction can make your fireplace either a pleasure or a tribulation. The fireplace should face prevailing winds, Fig. 1, so that full advantage is taken of the draft and so the smoke will blow away from the crowd. Also, in order

2

Simplest fireplace setup consists of brick laid without mortar to form three sides for the grate. The chimney is omitted



3

For permanence, fireplace is built on concrete slab with brick laid in mortar. Chimney is low for better draft





Photo courtesy Mangel Florist, Chicago

to avoid interference with the draft, a fireplace should not be located under a tree, Fig. 6, or under a high wall. Other important considerations when selecting the location are appearance and utility. The fireplace should enhance your yard or garden, and it must not be too large in proportion to the lot. It should neither block the view from house windows nor be close to a doorway. Equally important, it should not be situated where the wind tends to carry the smoke into the house. The appearance also can be improved by using a type and color of brick or stone for the fireplace which harmonize with the house.

A firm foundation: The fireplace must have adequate support to prevent it from settling unevenly in soft earth, or from being damaged by frost. Where frost is negligible, a concrete slab 6 or 8 in. thick and reinforced with iron rods and pipes, Fig. 7, will be adequate. The top of the slab should extend a couple of inches above the ground level so that water will not collect in the ashpit. For the same reason, the floor of an ashpit should always slope to drain out water. If the soil does not have good drainage, the slab should be poured over an 8-in. layer of crushed stone or cinders, which has been well tamped.

In northern climate, a small, lightweight structure may be built on a slab foundation as described above, but a heavy structure requires a concrete foundation wall extending below the frost line and having a footing as in Fig. 8. For concrete foundations in sandy or loose earth, a double form should be used as in Fig. 9. To avoid buying lumber for making forms, you may be able to rent or borrow ready-made forms from a cement contractor. On large jobs, it is often advisable to have the concrete work done by a contractor. It is possible to pour the footing and wall at one time by nailing 1-in. wooden strips to the lower edges of the forms and bracing them with stakes, Fig. 9. In heavy soil, such as clay, the soil itself often will serve as one side of the form, Fig. 10, or it may be possible to dispense with wooden forms entirely, Fig. 11. It is best to pour all the concrete for the foundation at one time. After the forms are removed, the floor of the fireplace can be poured. Concrete foundation walls consist of ingredients in the proportion as given in the table, Fig. 12. To determine quickly the quantity of ingredients required for your fireplace, figure its volume in cubic feet. If, for example, the volume is 54 cu. ft., or twice as much as 27 cu. ft.

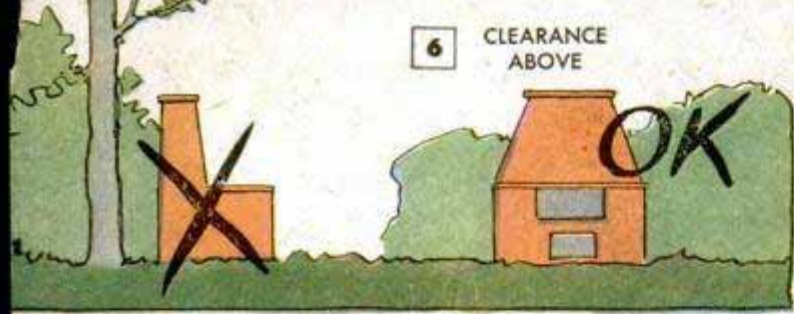
By using a steel firebox and ashpit, greater cooking efficiency is possible because of advantage of the better draft control



Warmth and cheer of an open fireplace on cool evenings is an added advantage of a more elaborate one



6 CLEARANCE ABOVE ABOVE

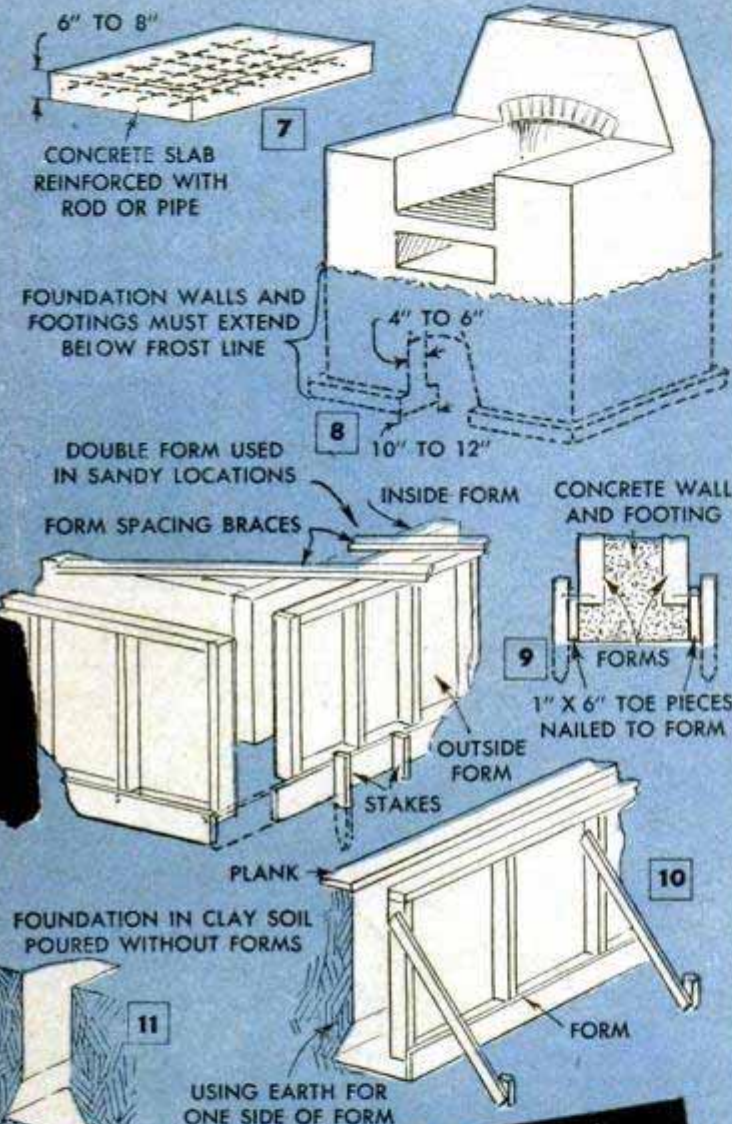


on which the quantities in Fig. 12 are based, you will need just twice as much of each ingredient. Or, if you require only 9 cu. ft., you will need only one third of the quantities given in the table. Only enough water is added to form a mushy, but not a soupy, mixture. The ingredients are first mixed thoroughly while dry, on a level platform or in a shallow box. When mixed, the pile is shoveled outward to build up the edge and form a depression into which water is poured, Fig. 14. Then the material is pushed from the edges into the water slowly.

Facts about good design: Outdoor fireplaces frequently are made too large and massive, even though small ones are less expensive and easier to build. For the sake of convenience, the area of a grate should not be less than 2½ sq. ft. Cast-iron grates are available in many sizes from manufacturers of fireplace equipment. These or homemade grates shown in Fig. 17, can be held in place with pins or bars set in the mortar. Dimensions of grates to be purchased should be known prior to building so that the fire-chamber dimensions can be determined. A built-in grate, consisting of iron rods or lengths of pipe, can be installed in the masonry as in Fig. 18. The rods should extend 2 or 3 in. into the wall, and they should be spaced not to exceed 1¼ in. A little extra care taken to make the grate surface perfectly level will be appreciated when the fireplace is being used. Do not permit the ends of the rods to butt tightly against any part of the masonry but provide a little space to compensate for expansion of the metal when hot. In some cases where this precaution was neglected, fireplaces have been wrecked by expanding metal.

Best results are obtained in building a fire if the fuel rests on a grate through which air passes to the fire. This type of bottom grate is located over an ashpit and is heavier than the top grate on which cooking is done. For greatest efficiency, the distance between the two grates should not exceed 8 in. Other recommended dimensions for efficient fire chambers are given in Fig. 13. There also is a definite

Photo courtesy Portland Cement Assn.



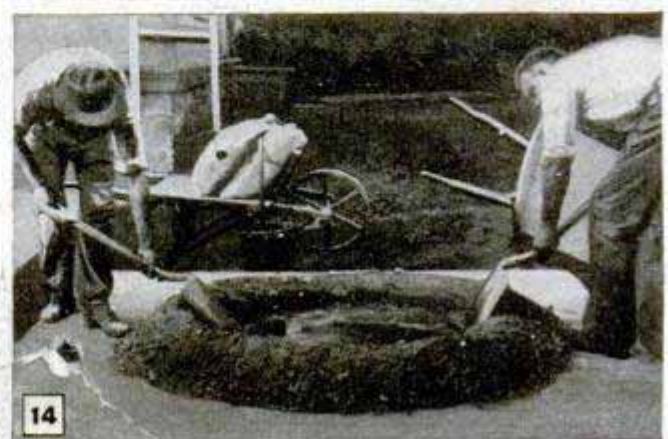
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ONE CU. YD. (27 CU. FT.) OF CONCRETE FOR OUTDOOR FIREPLACE FOUNDATIONS CONTAINS

3 parts	Cement (1 bag=1 cu. ft.)	4.3 cu. ft.
3.75 parts	Sand	16.1 cu. ft.
5 parts	Crushed stone or gravel	21.5 cu. ft.
Minimum amount until "mushy"	Water	27.6 gals.

RECOMMENDED SIZES FOR FIRE CHAMBERS

- A—DEPTH—6 TO 8"
- B—WIDTH—12 TO 18"
- C—LENGTH—16 TO 30"
- GRATE AREA NOT LESS THAN 2½ SQ. FT.



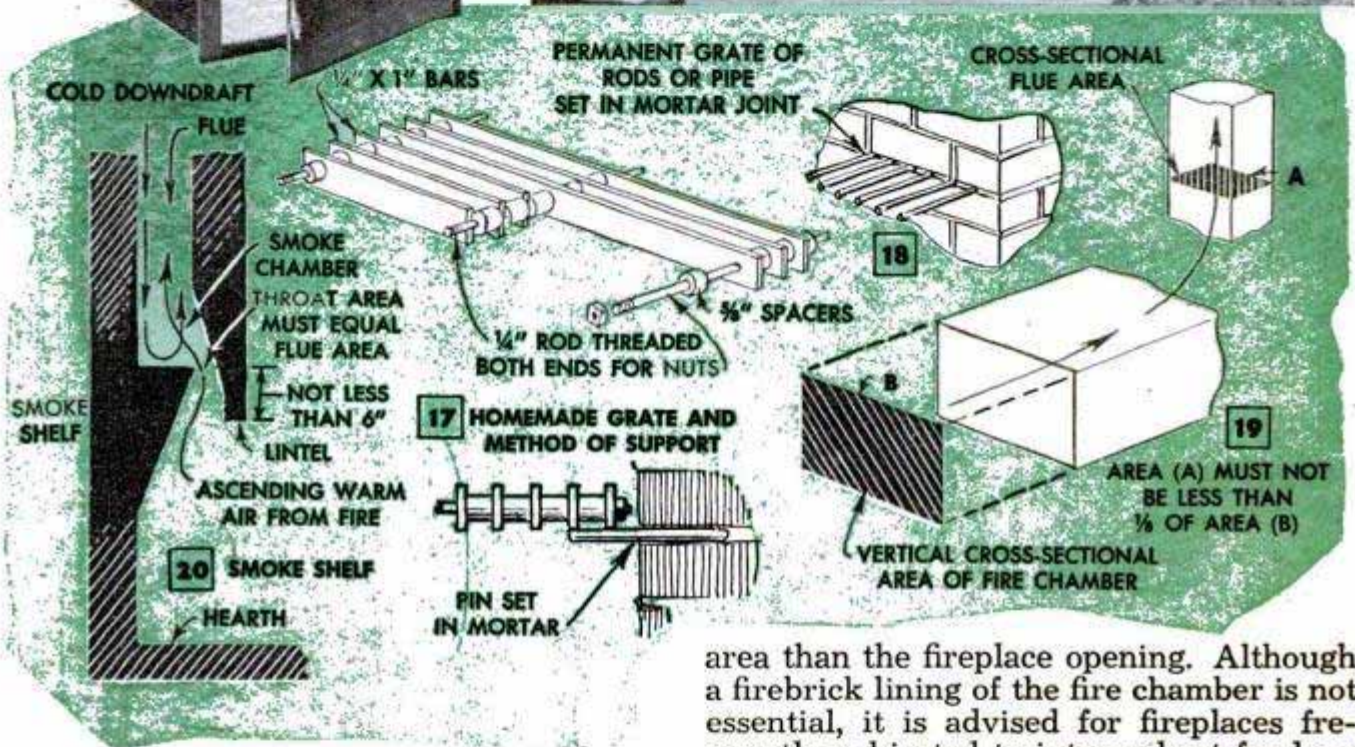
Photos courtesy
Donley Brothers Co.
Cleveland, Ohio



15



16



relationship in size between the fire chamber and the chimney flue. The cross-sectional area of the chimney flue should not be less than one eighth of the vertical cross-sectional area of the fire chamber, Fig. 19. Many builders of outdoor fireplaces use ready-made fire chambers as shown in Figs. 15 and 16.

A smoke shelf is an important feature to prevent descending cold air in the chimney from interfering with the upward movement of smoke. The shelf turns the descending cold air into the ascending column of hot, smoke-filled air with which it mixes and returns up the chimney, as in Fig. 20. The width of the smoke shelf is about equal to that of the chimney flue. The smoke chamber flares out at an angle of approximately 30 deg. past the front of the smoke shelf which is supported by brickwork built out at an angle from the rear wall of the fireplace. The space from lintel to smoke shelf must not be less than 6 in., and the opening or "throat" located just in front of the smoke shelf should not be less in

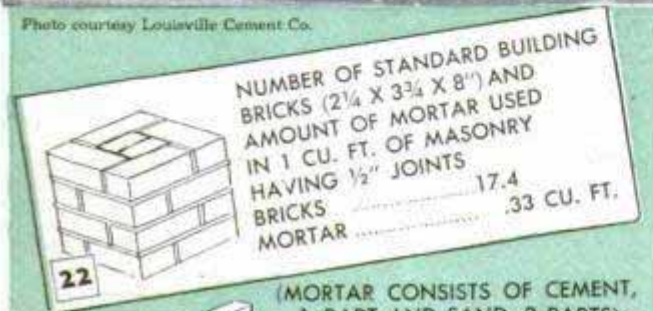
area than the fireplace opening. Although a firebrick lining of the fire chamber is not essential, it is advised for fireplaces frequently subjected to intense heat for long periods, especially when the brick or stone used is porous like sandstone, which absorbs water readily and chips when exposed to high temperatures.

Brick and stonework: Like determining the amount of concrete needed, it is easy to figure the quantity of bricks required, Fig. 22. Fireplace walls should not be less than 8 in. thick. Standard building bricks are 8 in. long, 3¾ in. wide and 2¼ in. thick. Standard firebricks are 9 in. long, 4½ in. wide and 2½ in. thick. A strong mortar consists of portland cement, 1 part, and sand, 3 parts. If a more "buttery" mortar is desired, replace from 10 to 15 percent of the portland cement of the above mix with hydrated lime. About ⅓ cu. ft. of mortar is used for each cubic foot of brickwork having ½-in. joints. Firebricks are laid in fire clay. To start with the brickwork, lay the entire outside row of bricks in place as shown in Fig. 23, allowing about ½-in. space between the bricks. Generally the spacing can be increased or decreased uniformly so that the course of bricks will



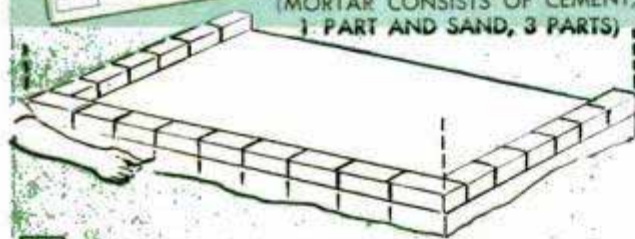
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Photo courtesy Louisville Cement Co.



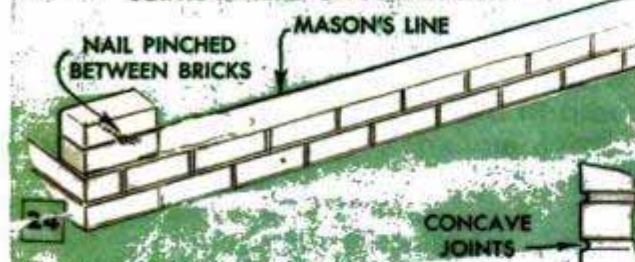
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(MORTAR CONSISTS OF CEMENT, 1 PART AND SAND, 3 PARTS)

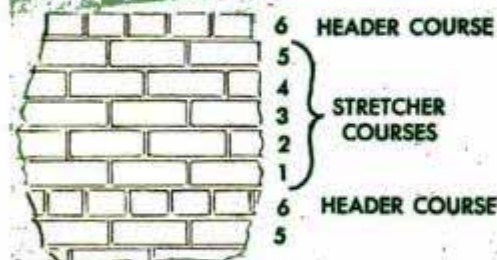


23 SPACING BRICKS TO FIT FOUNDATION

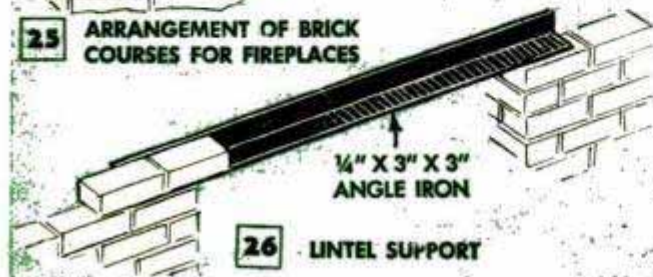
FIRST COURSE LAID TEMPORARILY WITHOUT MORTAR AND THEN POSITION OF JOINTS MARKED ON FOUNDATION



24



25 ARRANGEMENT OF BRICK COURSES FOR FIREPLACES



26 LINTEL SUPPORT

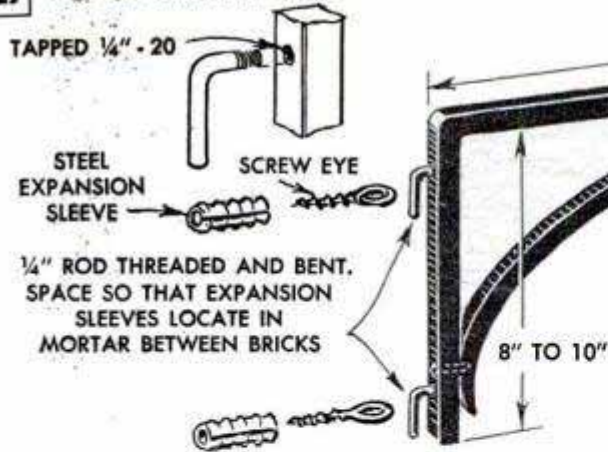
fit exactly from corner to corner on the slab. If not, a half brick is set between the last two bricks, or the last brick is laid at right angles, starting the course on the adjacent side. The position of each joint is marked carefully on the foundation. Then the bricks are removed, and mortar is applied so that when the bricks are pressed down firmly they will be raised about 1/2 in. Bricks to be laid must be kept thoroughly soaked so that moisture will not be absorbed from the mortar. A straight line of bricks is assured by using a mason's line stretched taut from two nails pinched between bricks, Fig. 24.

Corners of the brickwork must be kept plumb, which can be checked with a level. The inner

bricks of an 8-in. wall are staggered half-way between outer bricks, like those in successive courses. You can use the "common" bond consisting of five courses laid lengthwise and a sixth course laid crosswise to bind inner and outer layers together, Fig. 25. After placing the mortar, the brick is pressed down and also against the mortar on the end of the last brick laid. Simultaneous with these two movements is a third, forcing the brick outward to align its upper edge with the line—not touching it, however. This movement squeezes some mortar out beyond the face of the brick as in Fig. 21. The trowel is used to remove this surplus mortar and to wipe it on the end of the brick just laid. After a course is laid, the mortar joint is raked to a concave shape with the aid of a raking tool or metal rod. This type of joint, shown in Fig. 25, is best for brickwork exposed to weather.

When working with bricks, remember that they are slightly wedge shaped. The top is wider than the bottom, which has a depression or is marked with a trade name, and one face of common brick is square but the opposite face has a slight bevel. Bricks are laid so the face having the depression or trade name is at the bottom and the true face is exposed on the outside of the wall. The first course of brick or stone over a fireplace lintel is given adequate support with a length of 1/4 x 3 x 3-in. angle iron as in Fig. 26. When using stone for outdoor fireplaces, keep it wet when laying it in mortar, as is done with brick. Limestone, which is relatively soft, is a favorite material, but harder and denser stone will last longer under all kinds of weathering conditions and intense fire heat. Select only pieces of stone that are solid and have no cracks. A stone wall, like one built of bricks, must have bonding stones here and there to keep the separate layers together.

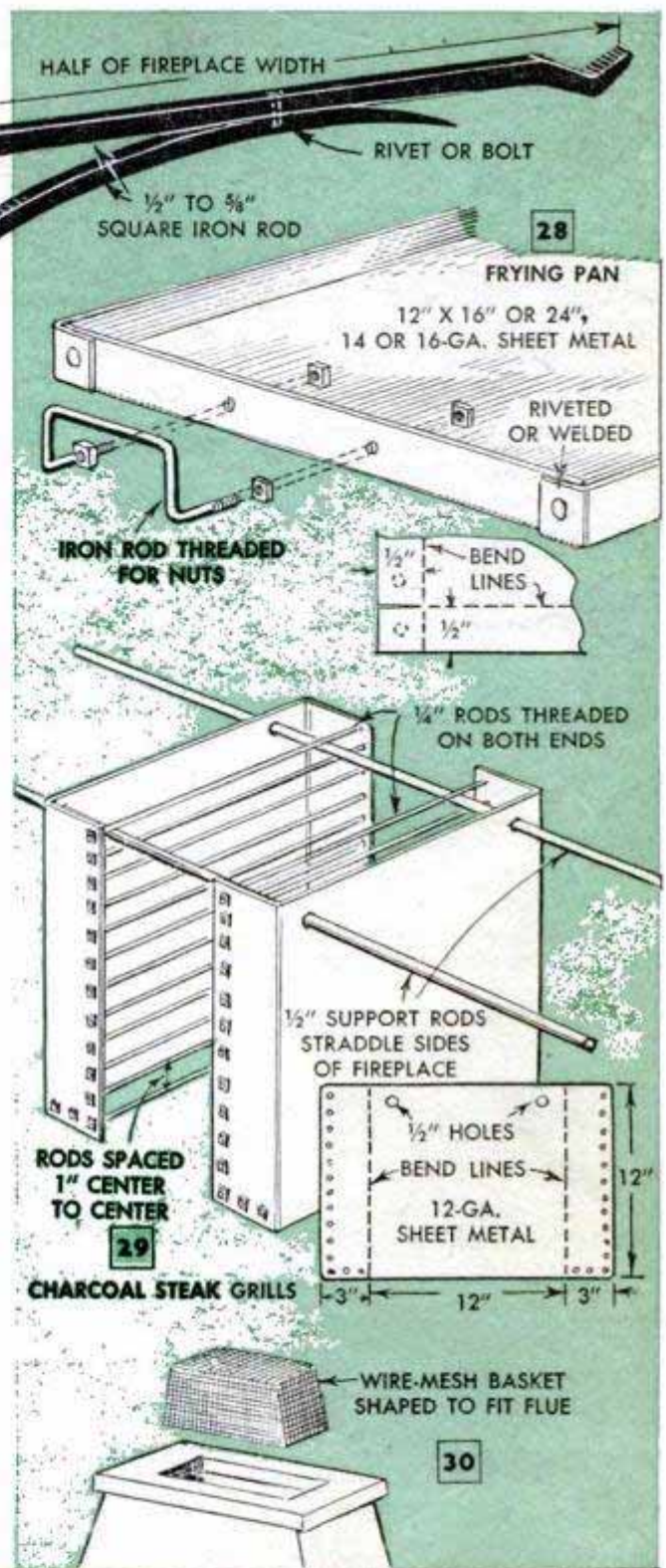
27 PIVOTED FIREPLACE CRANE



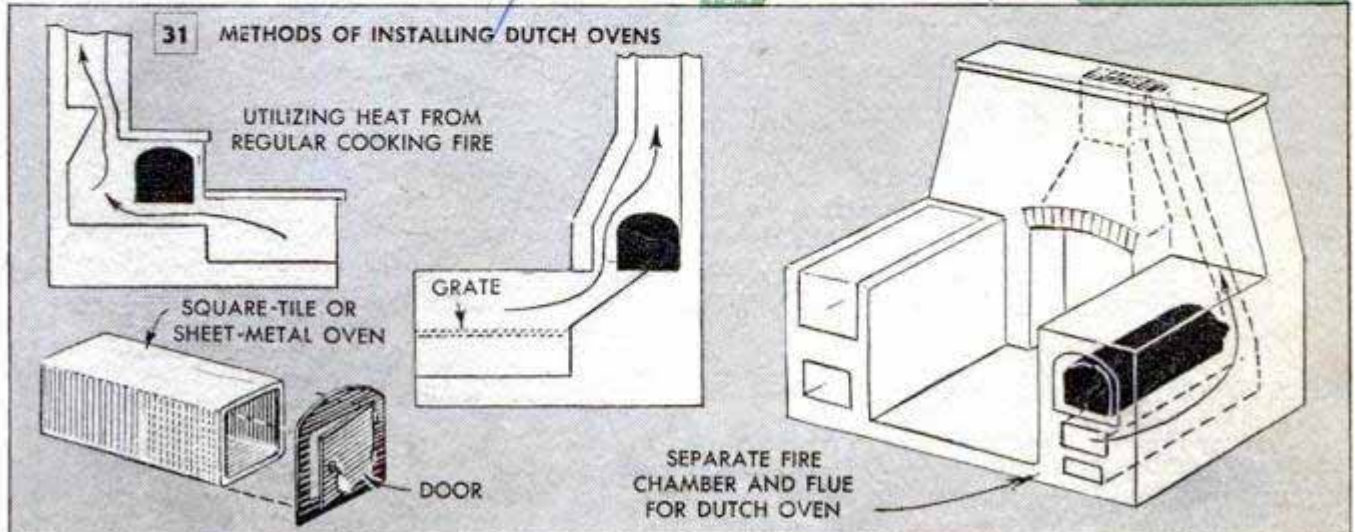
Stones can be chipped to shape and size by using a cold chisel and sledge hammer.

Added conveniences: A solid plate over the grate is often desired to avoid getting utensils coated with soot and getting fly ash in the food. Such a plate should be 1/4 in. thick. It may be loose or hinged to swing back against the chimney. Food can be prepared in an iron kettle hung on a crane, Fig. 27, and another convenience is a shallow frying pan, Fig. 28. Two charcoal baskets, hanging vertically in a fireplace from two 1/2-in. iron rods resting on the fireplace sides, are ideal for broiling steaks. You can purchase these or improvise a pair as shown in Fig. 29.

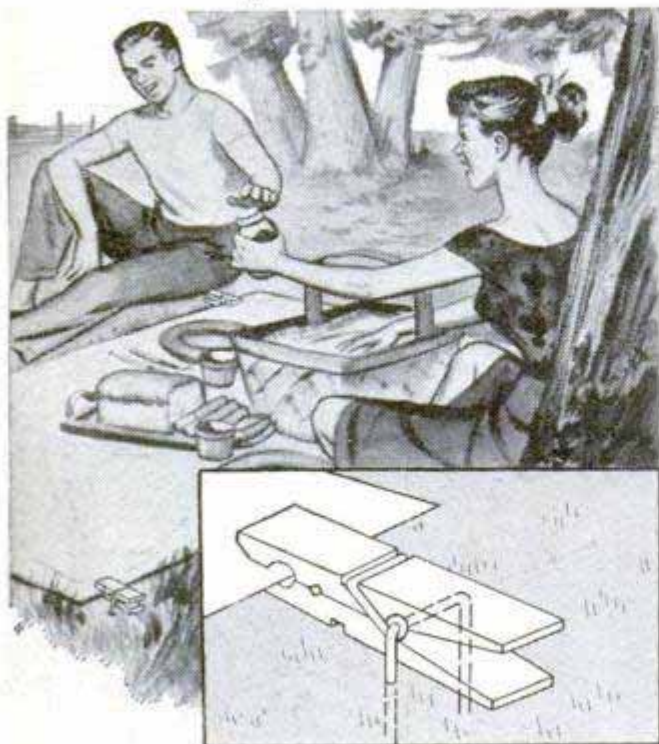
Three methods of installing a Dutch oven are shown in Fig. 31. To avoid starting a fire on your neighbor's shingle roof or in a patch of dry grass, install a wire-mesh guard on top of the chimney flue as shown in Fig. 30. It's a good idea to provide space for fuel so that it can be kept dry and always ready for use. Such space can be had by incorporating a fuel compartment in the fireplace when designing it. Dishes and utensils can be kept in a Dutch oven although separate storage space can be provided if desired. Scrupulous cleanliness is of utmost importance because scraps of food attract insects and rodents.



31 METHODS OF INSTALLING DUTCH OVENS

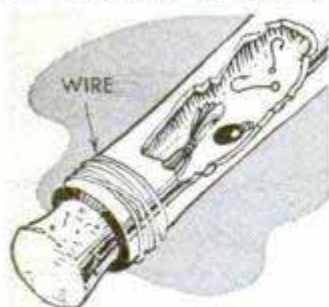


Picnic Cloth Held to Ground With Clothespin Anchors



Spring-type clothespins fitted with long wire staples provide excellent anchors for holding the corners of a picnic cloth securely to the ground. A piece of stiff wire is pushed through the spring of each clothespin and the ends are bent downward. In use, the staple is pressed into the ground and the corner of the cloth is gripped by the jaws of the clothespin.

Spare Fishing Tackle Carried In Hollow End of Cane Pole



One of the advantages of cane-pole fishing is not being burdened with a large amount of tackle, but it's a good idea to carry a few extra hooks, leaders and sinkers and a spare line, just in case. Even these can be carried compactly inside the hollow pole. Simply cut off the handle end of the pole above the first joint, insert the tackle in the hollow and cap the opening with a tight-fitting cork. To keep the pole from splitting, wrap tape or wire around the end.

Harold Rolseth, Pewaukee, Wis.

Recipe for Modeling Clay

Most children enjoy playing with modeling clay, and some can be made in a jiffy by mixing the following ingredients with enough water to bind them together: flour,

1 cup, salt, $\frac{1}{2}$ cup, and alum vegetable coloring, 3 teaspoonfuls. To keep the clay moist, store it in a can or jar or roll it into a ball and cover with a damp cloth.

Saw Doubles as Disk Sander

Having only occasional need for a disk sander, I temporarily convert my circular saw into a sander and find it does the job satisfactorily. I merely slip a heavy abrasive disk over the saw shaft and tighten it against the blade. The blade provides a solid backing for the disk. As the guard must be removed, be exceptionally careful when sanding.

Robert B. Leslie, Kansas City, Mo.



Reflecting Letters on Car Door Warn Approaching Drivers

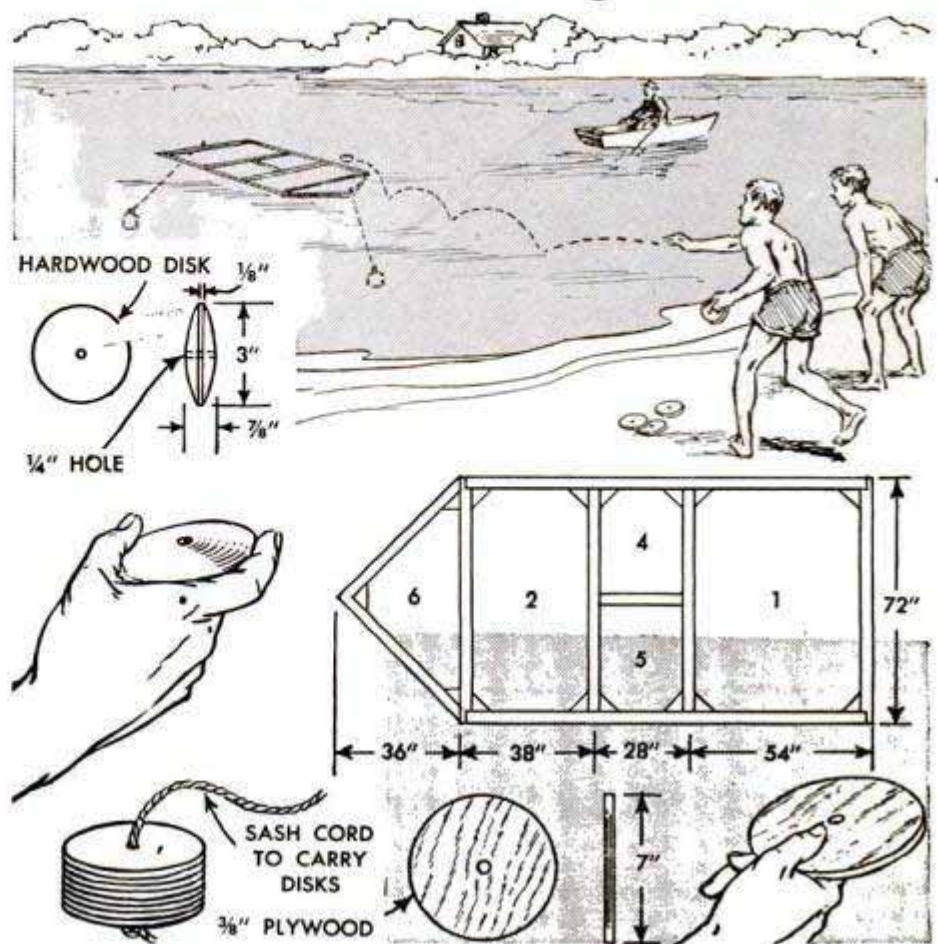
As it is necessary for one driver to make a left turn off a dark, heavily traveled highway in order to reach his home, he cemented reflecting sign material to the frame of the car door to form the word "left." Now, when he slows down for the turn, he opens the door, and the warning, gleaming in the bright lights of cars approaching from the rear, cautions drivers who otherwise would attempt to pass him on the left. The thick door frames of the newer cars provide plenty of space to cement large, clearly visible letters.

F. Edward Litty, Denver, Colo.



Requiring only a floating court and two sets of wooden disks, all of which can be made in a few hours, "skip scotch" is an action-packed game that provides real fun at the beach. After the court has been anchored in the water 60 ft. from the shore line, each player attempts to skip four disks into the highest-scoring section of the court. The first player to score 18 points is the winner of the game. The court sections are numbered as shown in the detail, the front, or triangular, section having the highest number of points. One point is subtracted from the player's score for each disk that misses the court, and disks that come to rest on the framework are not counted. These rules, of course, are merely suggested ones and they can be altered as desired. The wooden framework

"Skip Scotch"—Played With Wooden Disks Provides an Entertaining Beach Pastime

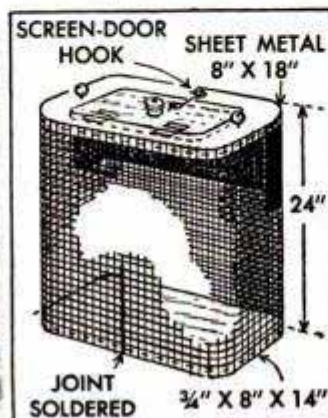


is made as shown and, after the top has been painted white so it can be seen easily, the entire court is given a coat of spar varnish. Small, convex disks can be made of hardwood, or larger, flat disks of waterproof plywood can be used. One set of disks is painted yellow and the other set red, all of them being given a final coat of spar varnish. Before painting, the centers of the disks are drilled so they can be strung on a length of sash cord or clothesline for

carrying. Anchors attached to the front and rear of the court hold it in position, and their lines should be as short as possible to keep the court from swinging. Cans filled with concrete will provide anchors. If the game is to be carried in a car, the court can be hinged to fold compactly or made in two or more separate sections which can be quickly hooked or screwed together at the beach and later taken apart in a few minutes for carrying.—Hi Sibley, Nuevo, Calif.

Inexpensive Live Box Made From Hardware Cloth Hangs Over Side of Boat

Made of 1/2-in. hardware cloth stapled to top and bottom pieces of solid stock, this inexpensive live box is just the thing to hold a day's catch. A door, sawed in the



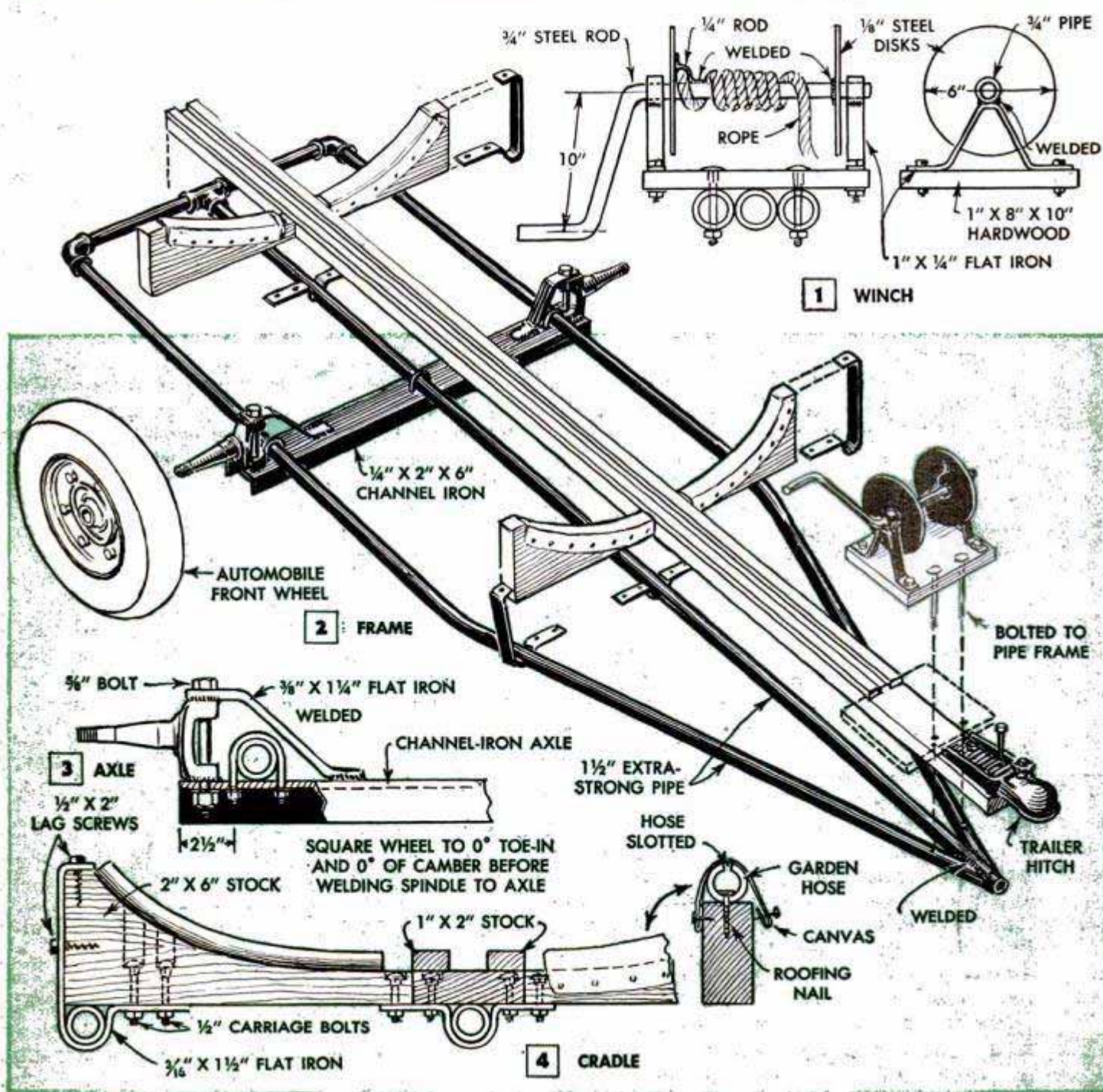
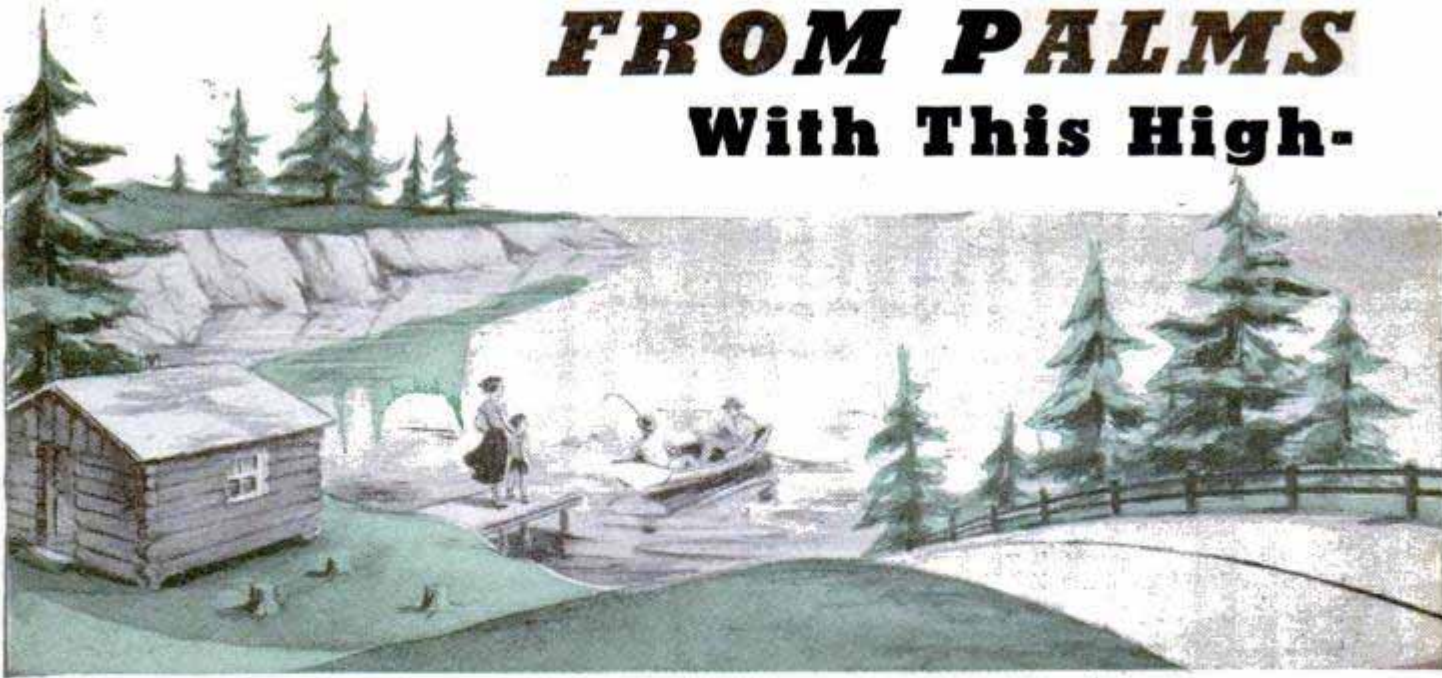
toppiece, is hinged to open away from the boat. This makes it easier to transfer the fish from the boat to the box. A small knob is fastened to the upper side of the door, which is held closed with a screen-door hook. A cleat can be nailed to the underside of the toppiece to form a rabbet in which the edge of the door rests. The box is secured to the boat with a length of rope tied to two screw eyes turned into the toppiece. Note that the joint of the hardware cloth is soldered and that a sheet-metal bumper protects the mesh from being damaged against the side of the boat.

M. B. Birge, Hinsdale, Ill.

☐ A coat of white shoe polish will make white Venetian blind tapes look like new.

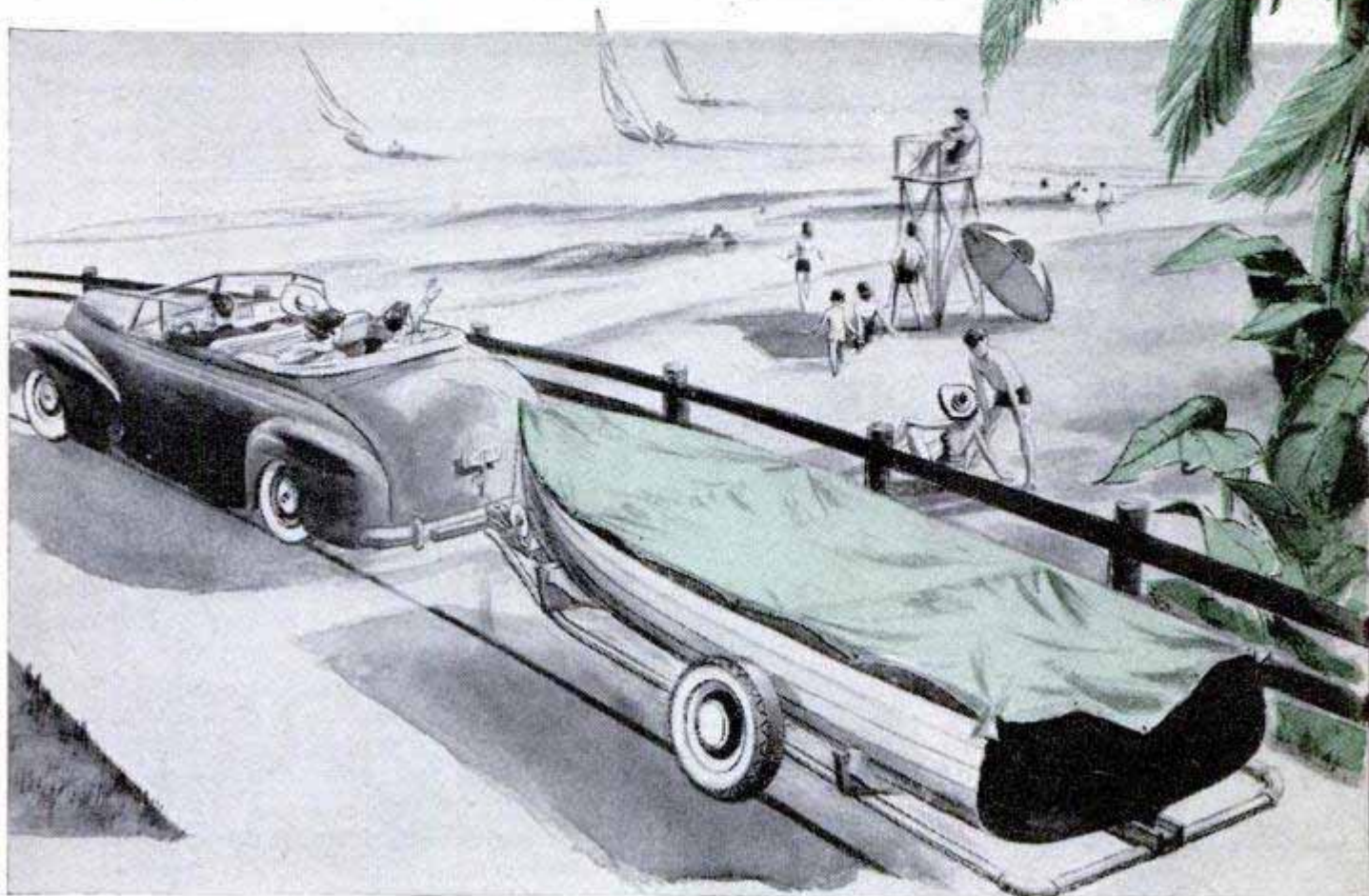
FROM PALMS

With This High-



TO PINES

Speed Boat Trailer



WITH THIS trailer you're all set to take your boat anywhere a car will go. Although it's built especially for fast highway cruising speeds, the trailer also has the built-in strength and stamina to take the rough going on those back trails that usually lead to the best fishing waters. As you will see from the details in Figs. 1 and 2, the trailer frame is designed for both lightness and rigidity and is fitted with padded cradles which support the boat at two points, a powerful loading winch and a full-length hardwood keel track. For boats up to 16 ft. in length, use 1½-in. "extra strong" pipe for the side frames and the center member. For a longer hull or a heavier inboard-motor job, use 1½-in. pipe of the grade called "double extra strong."

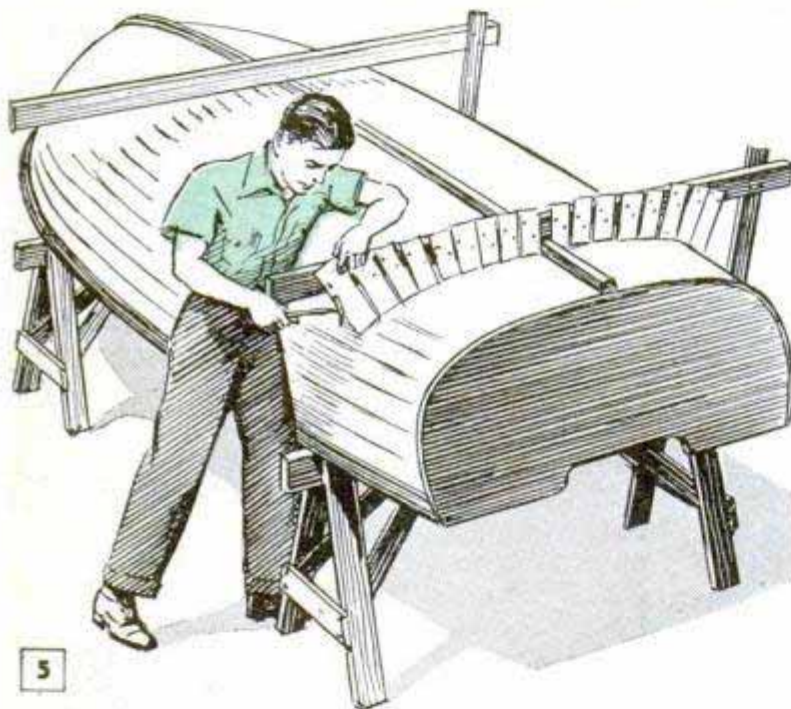
Full dimensions are not given as it is necessary to build the trailer frame to suit your boat. The essential measurements are easily determined directly from the boat itself. As a fair rule, the frame should be from 8 to 12 in. longer than the boat when assembled. This means that the side members will have to be at least 18 ft. long to allow for the bend when the trailer is designed for a 16-ft. boat. Assemble the frame by first screwing the T-fitting on the

threaded end of the center frame member. Screw the long nipples into the T-fitting and turn the 90-deg. elbows on the ends of the nipples. Then bend the side members at approximately the points indicated in Fig. 2. Check the accuracy of the bends by laying the members in position. Then mark and saw the forward ends at an angle to fit against the center member. Finish up with a half-round file to get a good fit before welding. Support the frame on leveled sawhorses while welding the side members to the center member. Both rigidity and strength of the frame depend to a large extent on the care with which this joint is fitted and welded. The weld should be continuous, not intermittent.

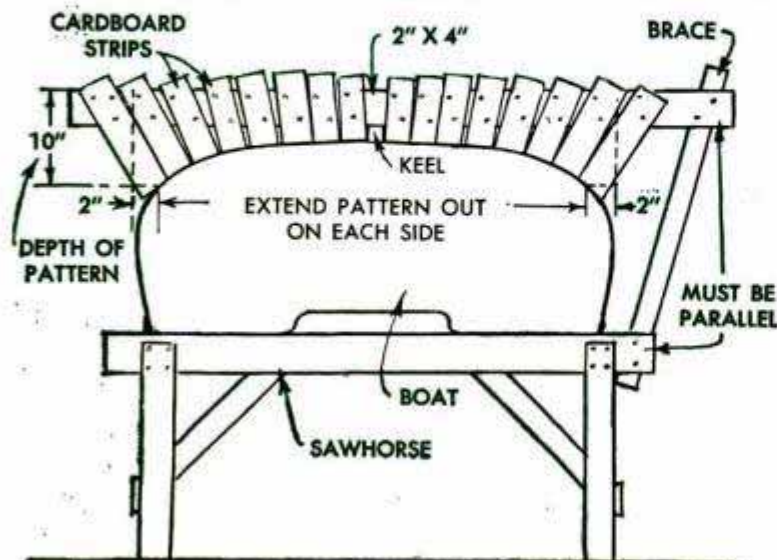
Construction of the axle will be clearly understood from Figs. 2 and 3. First obtain two second-hand auto front wheels with 6.00 x 16 tires and spindles. Check to see that the bearings and spindles are in perfect condition. Remove the spindles and bolt them to a length of channel. When wheels and axle are assembled, the tread should be 60 in. so it is necessary to locate the spindles and true them carefully before welding to the channel. After the spindles are bolted to the channel, replace the



Boat loaded, battened down and all ready for a long, fast trip



5



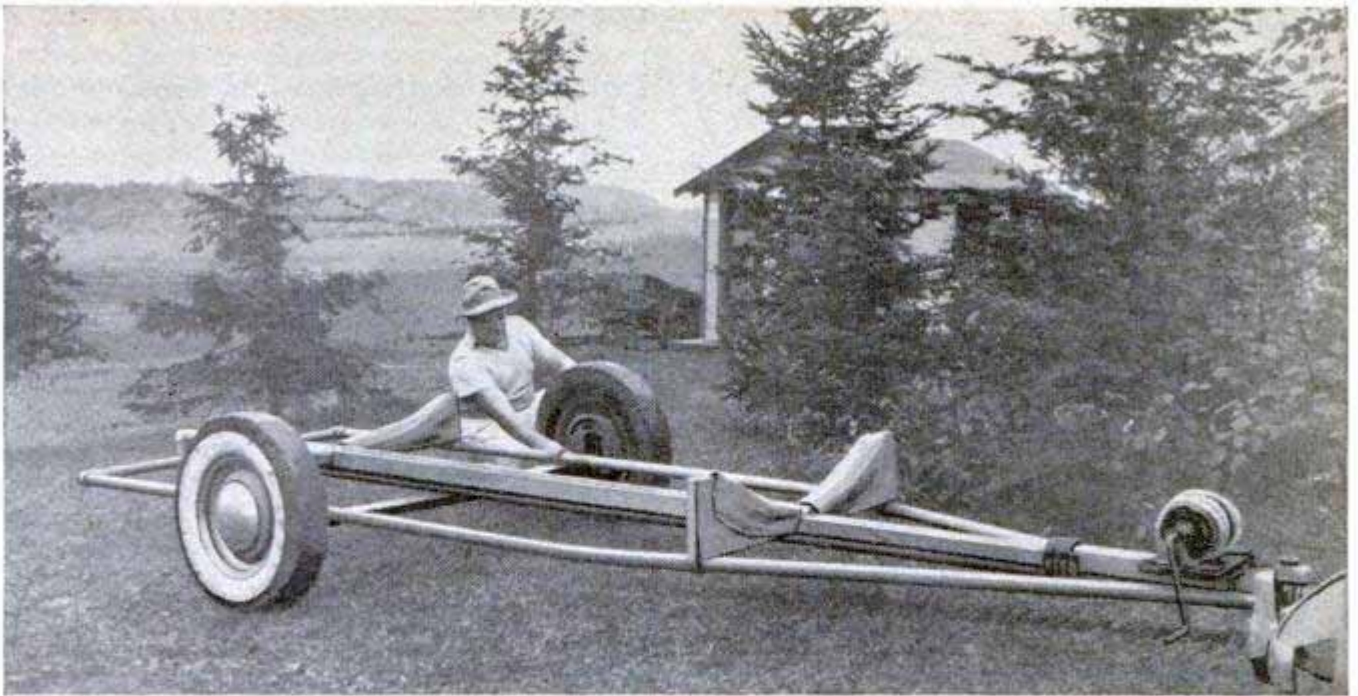
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METHOD OF MAKING PATTERN FOR BOAT CRADLE

wheels and true each one to 0-deg. toe-in and 0-deg. camber before welding the spindles in place. Do not weld on the spindle brace, Fig. 3, at this time. Position the axle temporarily on the frame and drill the channel for the U-bolts. A straight-grained 2 x 6-in. piece of oak or yellow pine makes the keel track. Two 1 x 2-in. strips nailed to the top face serve as guides for the keel. The trailer hitch is bolted to the forward end of the track as in Fig. 2.

Figs. 5 and 6 detail a method of quickly finding the curve of the hull at two points along the length. Use the templates thus improvised to lay out the curve of each cradle member. On a 15-ft. boat, for example, the rear cradle should be located about 40 in. from the transom and the front cradle approximately 60 in. from the bow. These measurements are, of course, only for boats of conventional round-bottom construction. Now, saw out the curved cradle members and pad the curved edges with lengths of garden hose and canvas as detailed in Fig. 4. The flat-iron brackets used to fasten the keel track and cradles in place can be made by a local blacksmith shop or ornamental-iron works at a very nominal cost. It is difficult to bend these parts cold to the 90-deg. angles and short-radius bends required. Drill these members and then bolt and lag-screw the parts in position on the frame.

Make the winch detailed in Fig. 1, bolt it to a hardwood base and then bolt the unit to the keel track as in Fig. 2. Bolt the axle in an approximate position on the frame and load the boat with the winch. Now you have everything in place and it's an easy matter to balance the trailer just as you like it. Ordinarily, it should balance with about 25 to 35 lbs. weight on the hitch when the trailer is in the running position. Some drivers will want more weight on the hitch, perhaps as much as 75 lbs. That's a matter of choice. Jack up the loaded trailer and shift the axle until you get just the degree of weight on the hitch that you want. When this has been determined, bolt the axle permanently in place on the frame. Then unload the boat and



Here's what you have when the job is finished, ready for use. Note underslung frame, low center of gravity

weld on the axle braces as shown in Fig. 3.

Use lock washers on all bolts to prevent the nuts from working loose. Sand all the wooden parts and finish with two coats of spar varnish or with two coats of outdoor enamel in the desired color. Go over the metal parts with fine emery cloth to remove rust and other loose material. Then apply an undercoater specially mixed for use on metal. Follow with two coats of chassis enamel or an auto enamel of the color desired. In use, the trailer may be backed

into the water to launch the boat. For this reason it's a good idea to use plumber's pipe compound in all the threaded joints of the frame when it is being assembled. This will prevent water from entering the frame through the threaded joints. Weld a cap over the open end of the center member of the frame. Be sure to clean and lubricate the wheel bearings before putting the trailer in service. Provide safety chains in addition to the hitch. Check the hitch at times to guard against excessive wear.

Caster Extensions Adapt Washing Machine for Use at Kitchen Sink

When a standard washing machine must be used at the kitchen sink of an apartment or small house, it often is necessary to raise the machine to permit the wringer to pass over the rim of the sink. This can be done by fitting each leg of the machine with an extension made from a pipe nipple and coupling. A wooden plug which is drilled to take a caster socket is driven in the coupling as shown in the detail. The length of the pipe coupling determines the distance the washer is raised.

W. Mack Angas, Brooklyn, N. Y.

Notations in Photograph Album Made With White Shoe Polish

Liquid white shoe polish provides an excellent substitute for white ink when printing identifying labels or commentaries on the black pages of a photo album. The polish is applied with a pen or small brush.

Glue a strip of emery cloth inside your hatband or coat and you'll always have a dry place to scratch a match.



Garden Hose Covers Slide Rails To Protect Children's Hands



Children's hands will be protected from splinters if the wooden rails of a playground slide are covered with lengths of garden hose. Split the hose lengthwise with a sharp knife, press it over the top edges of the rails and carefully tack in place. The hose also will prevent clothing from becoming snagged on the rails.

R. M. Woodbury, Haverhill, Mass.

Memo Pad Hung From Kitchen Wall Is Ideal for Shopping Lists

There will be no more hunting through the house for a scrap of paper to make up a shopping list or jot down a recipe, when this memo pad hangs from a convenient spot on the kitchen wall. A roll of adding-machine tape supplies enough paper for



hundreds of memos and, if the holder is made carefully and painted or stained to harmonize with the kitchen appointments, it is as attractive as it is useful. The wooden base and brackets are cut from $\frac{1}{2}$ -in. stock, the brackets being fastened with flat-headed screws driven from the underside of the base. The paper roll revolves on a dowel axle which rests in slots cut in the brackets. The bottoms of the slots must be at least 2 in. above the base to allow for the thickness of the roll. Two strips of copper, one mounted under the roll and the other at the lower end of the base, guide the paper, the lower strip also serving as a straightedge for tearing the paper. The brackets are notched to provide clearance for the upper strip and both strips should be shimmed with washers or pieces of copper to permit the paper to pass under them. Note that the lower ends of the brackets are shaped to form a pencil rest and the top of the base is drilled for a screw.

Ken Sellers, Columbia, Mo.

White Fishing Floats Retouched With Golf-Ball Lacquer

The white portions of fishing floats and bobbers will remain clearly visible if they are retouched occasionally with golf-ball lacquer. As this lacquer is quick-drying and applied like nail polish, a bottle of it can be carried in the tackle box and used to renew the finish of the floats while on a fishing trip.

H. Leeper, Canton, Ohio.



Loss of Outboard Motor Prevented By Safety Block on Transom

Fastened to the transom of a rowboat just above the locking screws of an outboard motor, a safety block prevents loss of the motor if the screws work loose. The block, which is 1 in. square and about 8 in. long, keeps the ends of the locking screws from slipping upward and allowing the motor to drop off the transom.

Sol Tepfer, Brooklyn, N. Y.



Breakfast Set Folds into Wall

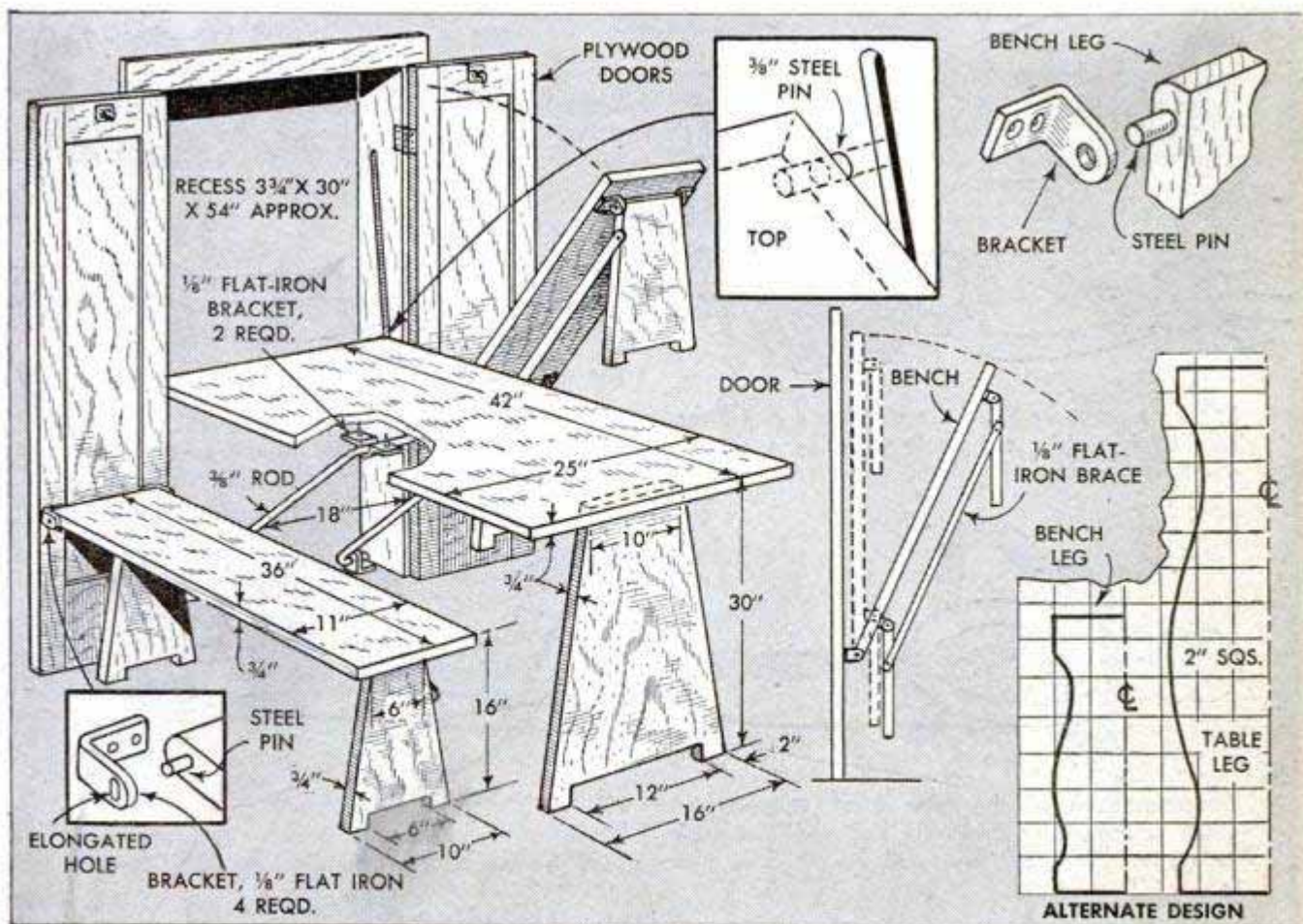
By William H. Freeman

THIS FOLD-AWAY breakfast set has been designed especially to solve the problem of space in small kitchens. It seats four persons comfortably and when not in use the whole unit folds into the wall behind doors that close flush, leaving the wall and floor space clear. Note in the details below that the width of the table is given as 25 in. and the width of the wall recess as 30 in. The latter dimension is the approximate width of the wall opening before installing the header, false studs and jambs. Locating the breakfast set on an outside wall provides maximum depth for the opening and, if the unit must be installed in exceptionally limited space, some changes in dimensions may be necessary. Finish the wall opening and hang the doors first, then make the table and benches from $\frac{3}{4}$ -in. plywood. Assemble the hinged parts with the special hinge fittings shown in the details. In the original design, the rear end of the table is guided by steel pins sliding in stopped grooves cut at an angle in the jambs. This construction can be simplified by using two hardwood strips nailed to each jamb and spaced to allow the pins to slide freely. Provide stop blocks at the lower ends of the guides.

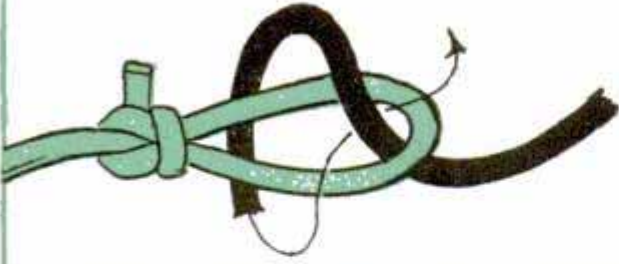


When not in use, benches and table fold into wall behind doors that close flush, leaving wall space clear

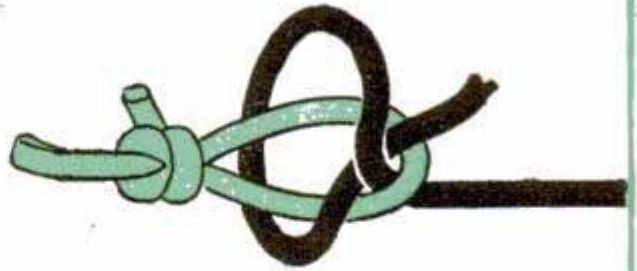
Furniture you can build yourself



TYING LINES TO LEADERS



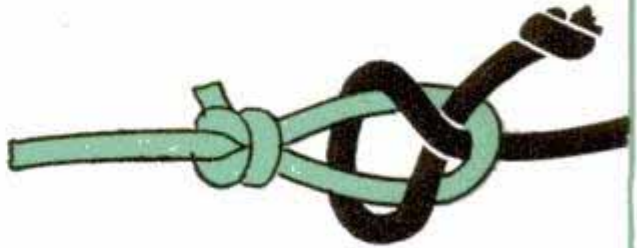
This knot is known quite generally to fishermen as the single tie or single sheet bend. Detail above shows a common way of starting the tie



Here's the same tie with the formation of the knot completed by passing the line under the standing part before drawing the knot tight



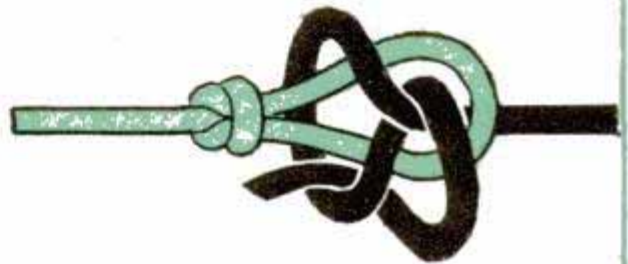
Drawn up, the single tie looks something like this. It cinches up tightly under a moderate strain and is easy to untie after slacking off



Here again is the single sheet bend with an overhand knot on the end of the line. In drawing up, overhand knot is worked down to the bend



Somewhat simpler than the sheet bend, the reef knot cinches tightly and holds fast but when tension is released the loop can be slacked off



The popular figure-of-eight knot can be used to attach the fly to the leader or the leader to the line. A simple, reliable fly-fisherman's tie



The first stage in tying the overhand jam knot. Here it is simply a slipknot with the overhand knot tied around the standing part of the line



The slipknot becomes a sheet bend when worked down over the end of the leader loop and tightened. Many fly fishermen prefer this neat tie



Sometimes called the tiller knot, the slipped hitch is especially desirable because it is easy to untie. Slack off and pull on the free end



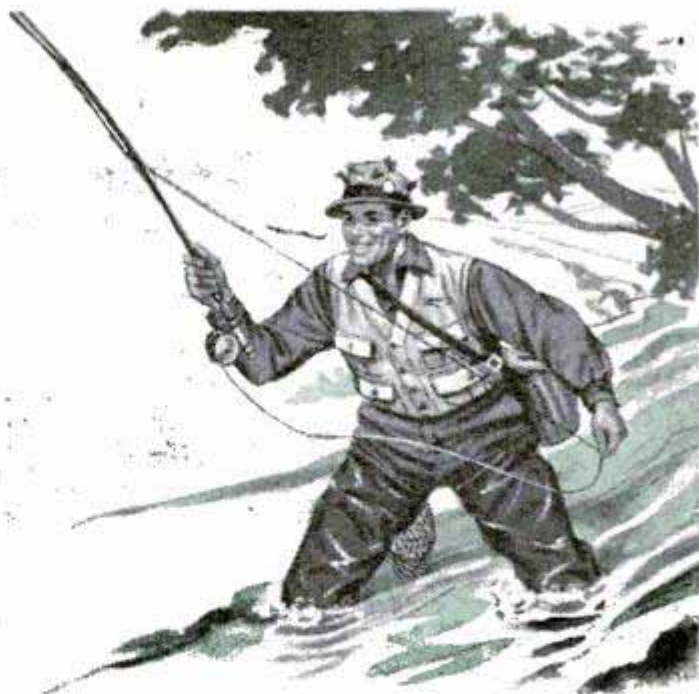
The reef knot again, but with the end of the line seized to the standing part. Smoother even than the jam knot as there are no dangling ends

KNOTS and TIES

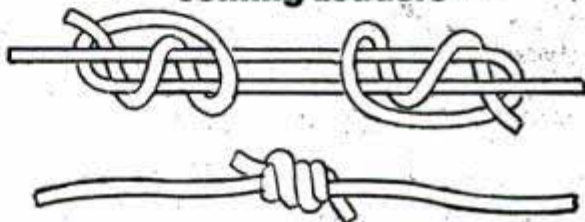
By W. Clyde Lamme

LIGHT-TACKLE fishermen who wet lines in sweet water from the time of the first hatch of flies in early spring to the close of the season need to have almost as good a working knowledge of knot tying as did the old-time sailors. Although history of the development of knot tying is in many instances not definitely known, it is fairly certain that many of the knots now used by fly fishermen were developed in an early day by good marlinespike seamen and also by fishing sailormen.

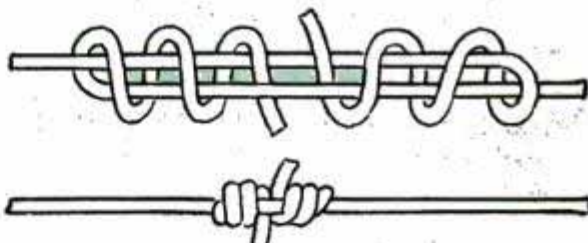
Experienced fresh-water fishermen usually choose only types of knots which seem best suited to their purpose and use these regularly for everyday fishing needs. Anyone can learn to tie any knot from the simplest to the most complicated, but some knots require much more practice than others before the process of tying them can be clearly established in mind. As a rule, fishermen do not use involved knots as these usually are bulky even when cinched up tightly. Such knots offer considerable resistance to movement through the water, leave a trail of bubbles underwater and form a wake when on the surface. These features are objectionable to most fishermen. Among the knots approved by nearly all fly fishermen for joining lines to leaders are the single sheet bend, the reef and figure-of-eight knots, the overhand jam knot, and the tiller or slipped hitch. All these knots are detailed on the opposite page. Some anglers do not approve the overhand jam knot (the fourth knot from the top in the left-hand column), but it will be noted that when the tie is properly finished it makes a neat, reliable knot which is no larger than the leader loop. It can be whipped through a quiet pool with practically no disturbance of the water. The



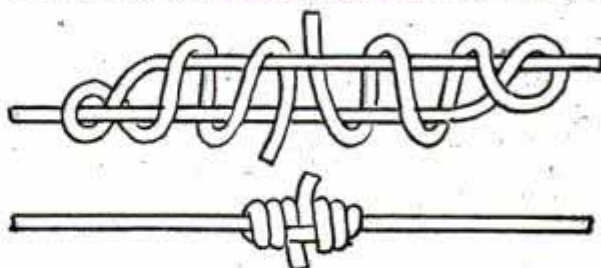
Joining Leaders



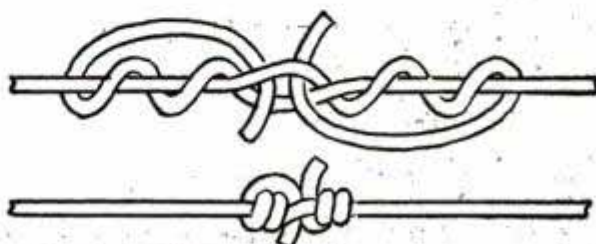
For joining the ends of leaders, the fishermen's bend is perhaps the simplest of barrel-knot ties



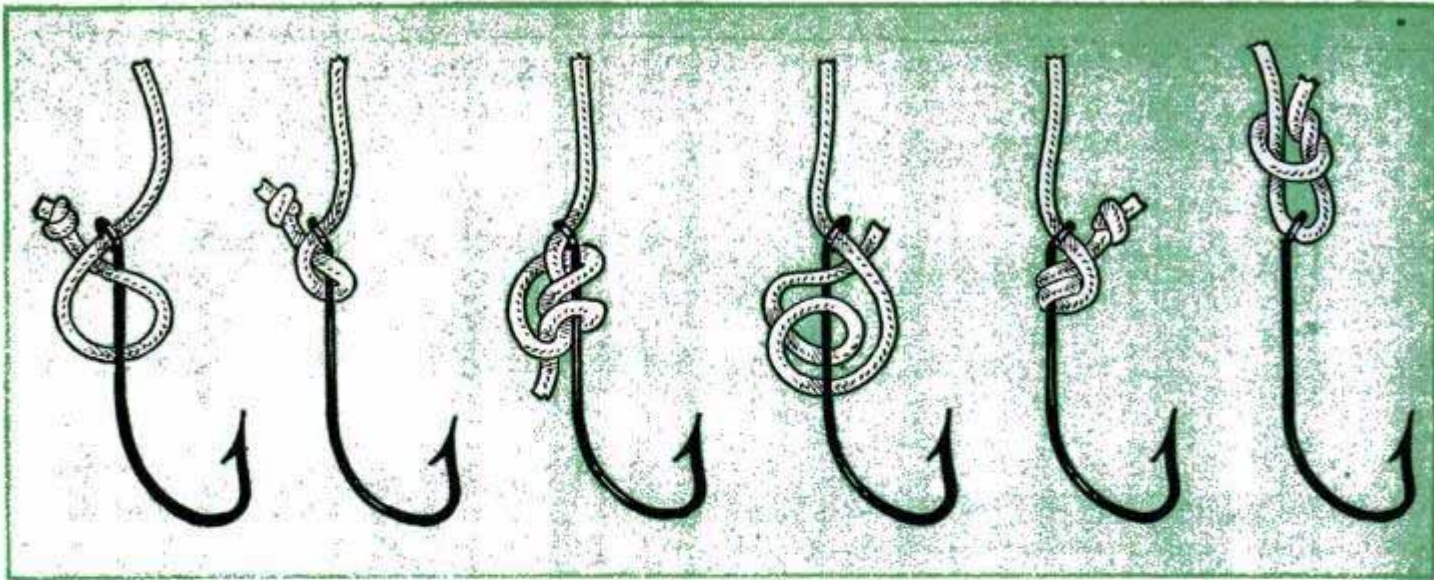
Another variation of the fishermen's bend which is preferred by some anglers for artificial leaders



A third variation with turns made in the opposite direction. Work out the slack gradually



The Blood-knot bend builds up a neat, smooth tie



Of the four fishhook ties left to right above, the first two are the familiar single sheet bend with an overhand knot in the end of the line. The next is the round-turn fishhook tie before drawing up. Following this comes the double sheet bend shown loose and drawn up, and finally an application of the overhand knot

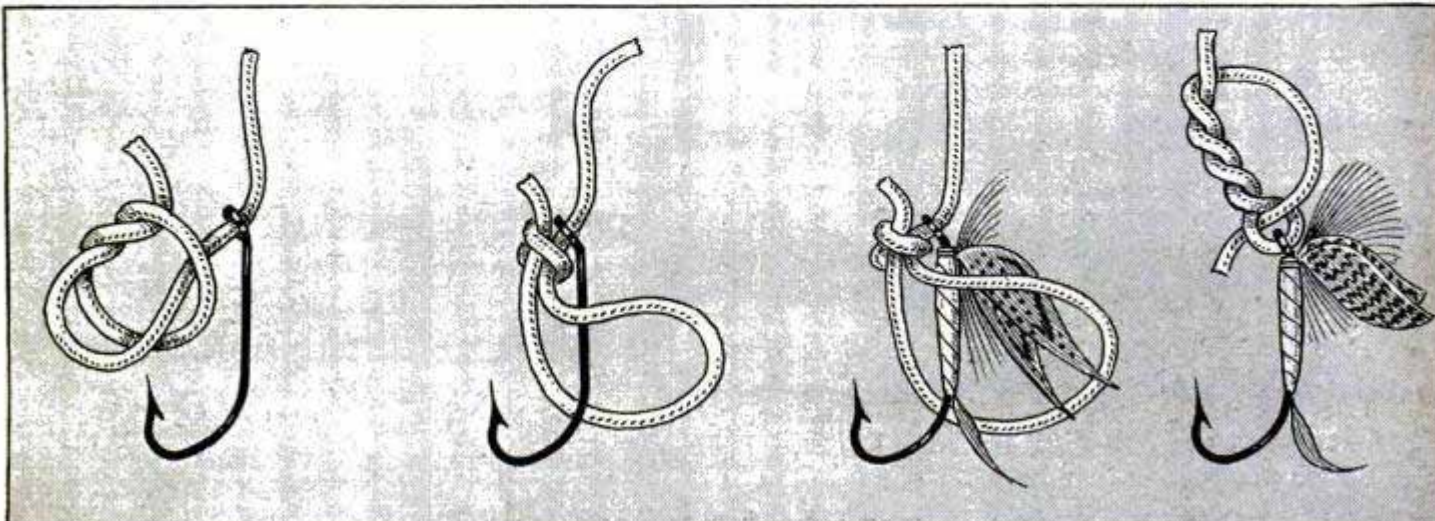
simplest and quickest, perhaps, of all these knots to tie and untie is the single sheet bend and, of course, the neatest and smoothest one of all is the reef knot with the free end seized to the standing part.

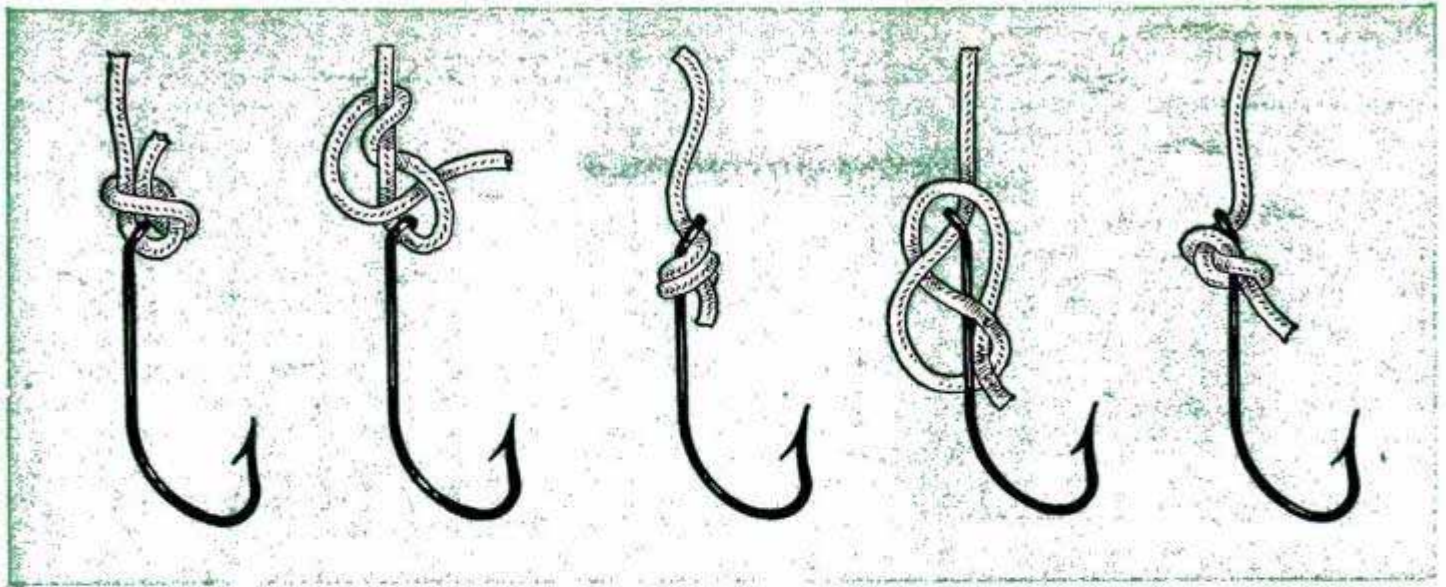
For joining the ends of leaders when building up a long, single leader, the details at the right on the preceding page show several variations of the barrel-knot bend, or double fisherman's bend, as it is often called. The knot in the lower detail is perhaps more properly called the Blood-knot bend. The trick in tying these bends is not in the formation of the knot, which is comparatively simple, but in working out the slack and drawing up the turns to make a smooth tie. This is especially true of the fishhook ties shown above and on the following page. All of these are either detailed loose or partly drawn up. None are shown cinched up tight as they would be when in use. One of the most popular knots for attaching lines to hooks is the familiar single

sheet bend. An overhand knot tied in the end of the line prevents slipping or pulling out. Some fishermen prefer the double-sheet bend for attaching fine lines to small hooks. Other knots in the series shown are used extensively by fishermen when building up heavy tackle. Although not shown in all details above, many fishermen tie an overhand knot in the end of the line as a regular practice when tying either lines or leaders to hooks. It should be noted, of course, that most of the fishhook ties are used by fishermen for tying both lines and leaders to hooks or eyed flies.

The turtle knot, shown in the first three details below, is considered by many anglers to be the best ever developed for tying either lines or leaders to hooks and also leaders to flies. As you can see by study of the knot formation, it is simply a sliding overhand knot, the overhand knot being tied on the standing part after the line has been passed through the eye of

Left to right below, the first two details show how the turtle-knot tie is used to attach the line to the hook. Third detail shows application of this knot when joining eyed flies to line or leader. Fourth detail is a twisted tie which is especially suitable for attaching eyed flies to artificial leaders. Work the turns tight





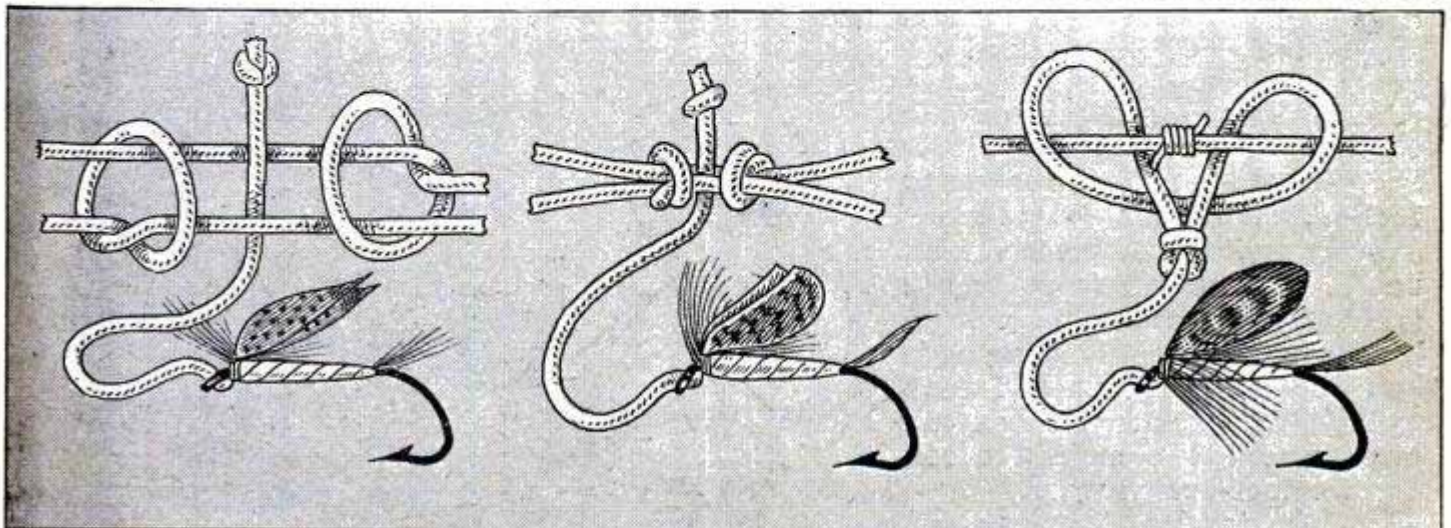
Left to right, the first detail shows the sliding overhand knot pulled up to eye of hook. Next two details show the wedge tie loose and drawn up, the knot being slipped over the turned-down eye of hook. Last two details show a figure-of-eight knot, in common use among fishermen. Note that knot is drawn up below the eye

the hook. The loop is then passed over the hook or fly and snugged up against the eye. Hold the overhand knot tightly between the thumb and forefinger when pulling up the loop. Simplicity is the feature of the twisted tie shown in the fourth, or right-hand, detail below on the preceding page. It is quite similar to the timber hitch and holds securely when the turns are carefully worked down to the eye of the hook or fly. The three details at the bottom of this page show two methods of attaching a dropper fly. Two overhand knots are tied side by side. Then the knotted end of the dropper is inserted between the standing parts as shown. The overhand knots are then worked up against the dropper and drawn tight. In the center detail below, the knots are not shown fully drawn up. In the right-hand detail below, a barrel knot is tied on the line to prevent slipping and the dropper is attached by means of an angler's loop. In certain applications, the name of

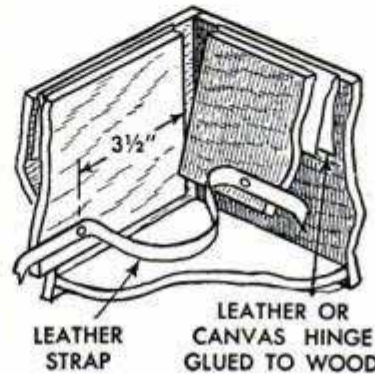
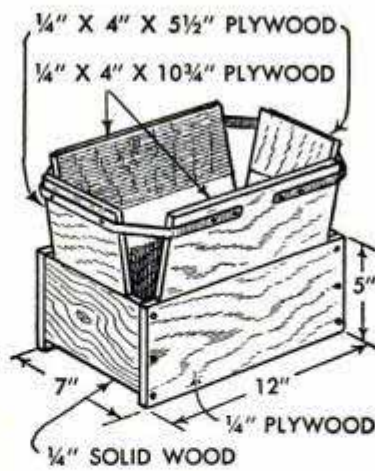
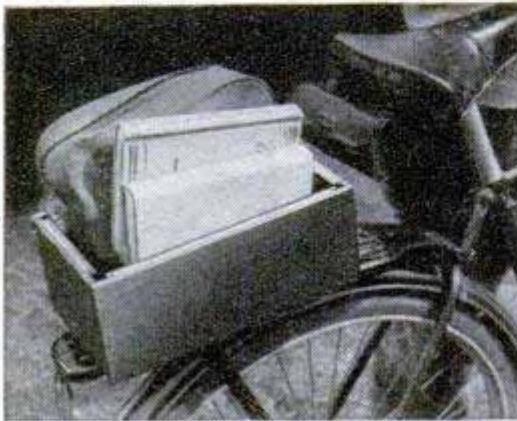
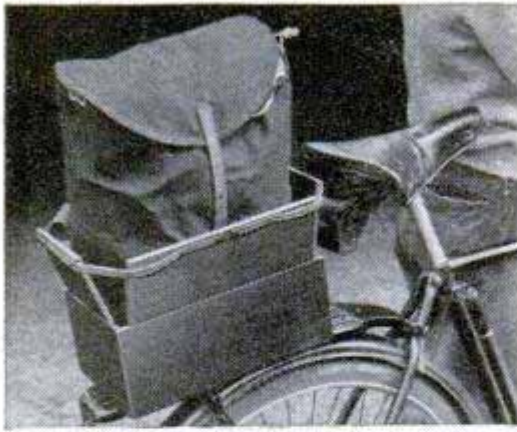


the knot is determined to some extent by variations in common use. An example is the ordinary slipknot. It is also referred to as the jam knot and the sliding overhand knot but, of course, it consists of essentially the same formation. The same is true of certain other knots in various applications.

Left to right below are two methods of attaching a dropper fly. In the first detail, overhand knots are tied side by side, or back to back, as shown. Then the knots are drawn up over the knotted end of the dropper as in the center detail. Right-hand illustration shows barrel knot combined with angler's loop



Box on Bicycle Luggage Carrier Handles Parcels



This adjustable wooden box fastened to the luggage carrier of a bicycle is just the thing for carrying books, lunches and parcels. To handle more bulky items and replace saddle bags, the hinged sides of the box can be opened to almost double its depth. The bottom of the box is of $\frac{3}{4}$ -in. solid stock and is bolted to the luggage carrier. Plywood sides are screwed to solid endpieces and folding sides and endpieces are hinged to them with leather or canvas. The hinges, which should be the full length of the joints, are glued to the wood. Leather straps, riveted to the folding members, support them in the opened position.

Nonslip Grip for Shampoo Bottle Made From Wrist of Rubber Glove

Cut the wrist portion from an old rubber glove and place it over a bottle of shampoo. This will keep the bottle from slipping out of wet hands and possibly breaking. If a

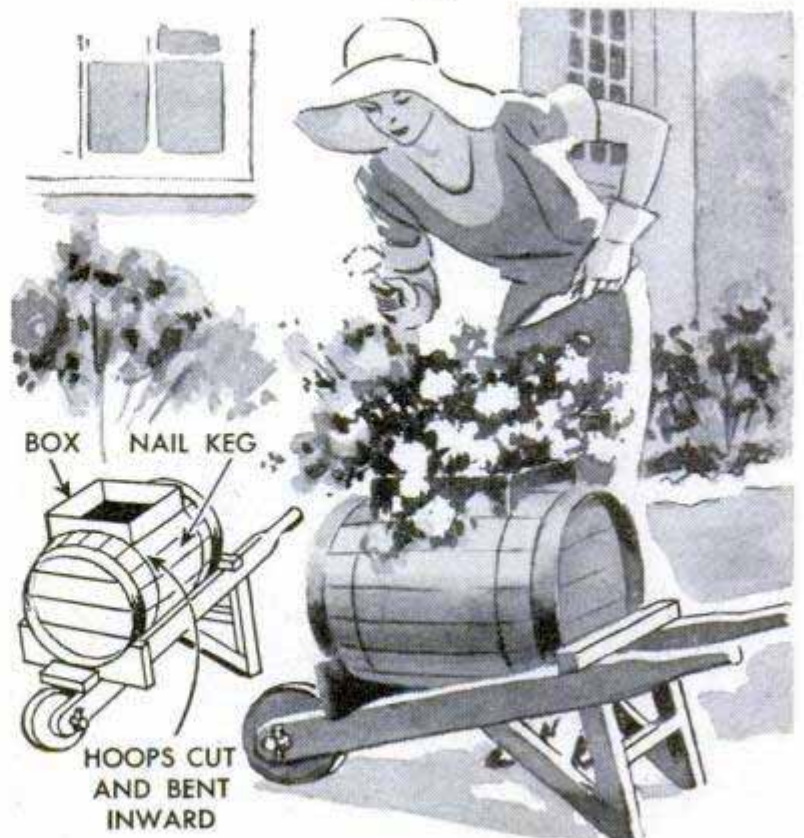
rubber glove is not available, several rubber bands slipped around the bottle will serve the same purpose.

Mrs. Burnice Bourquin, Palo Alto, Calif.

Rustic Wheelbarrow Flower Box Utilizes Old Nail Keg and Fence Pickets

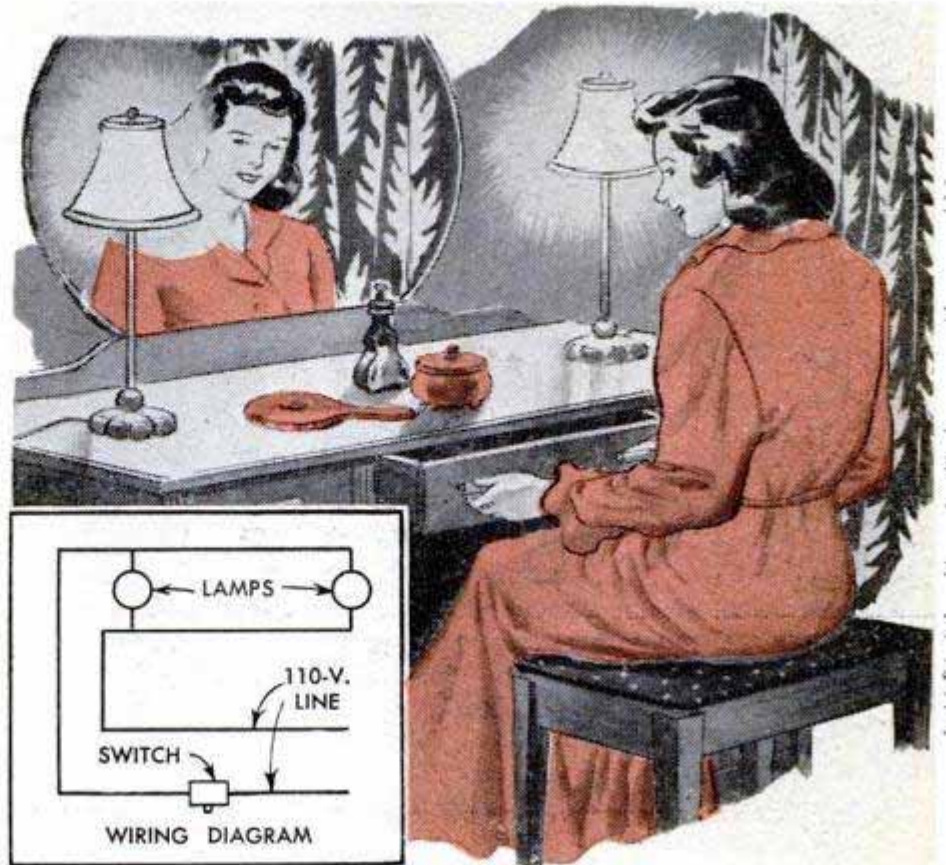
Made by mounting a discarded nail keg on a wheelbarrow-type framework, this unusual flower box adds a pleasing rustic touch to the back yard or terrace. On the original flower box, fence pickets were used to provide arms for the wheelbarrow frame, but any boards of suitable length can be employed. One end of each arm is shaped to form a handle, and the two arms are fastened together with cleats, the front one being curved to fit the round side of the keg. The legs and braces can be of 1 x 2-in. stock and the wheel band-sawed to suit from a piece of 1-in. board. The upper side of the keg is cut away and the wire hoops are bent inward. Then the opening is boxed-in by nailing strips of wood to its edges. The flower box can be painted white or stained to look like weather-beaten wood.

Eda Johnston, Los Angeles, Calif.

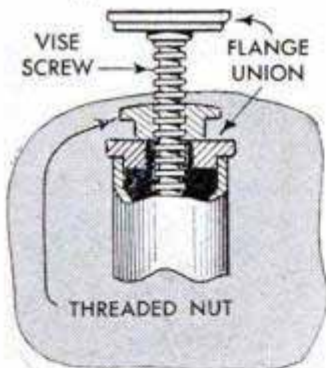


Controlled by a sensitive switch, a set of vanity lamps can be wired to turn on automatically when the center drawer of the vanity is pulled open. A sensitive switch or a switch of the type used on refrigerator and car doors is installed at the back of the drawer, so that opening the drawer releases pressure on the button and closes the circuit. The type of switch and its location depends, of course, on the amount of space available in back of the drawer. The lamps are wired in parallel and the switch is wired into the circuit as shown in the diagram. When wiring the switch, be sure that the wires are placed so the insulation will not be worn.—John R. Handley, Cuyahoga Falls, Ohio.

Vanity Lamps Turn on Automatically When Center Drawer Is Pulled Open



Inexpensive Floor Jack Assembled From Length of Pipe and Scrap Parts



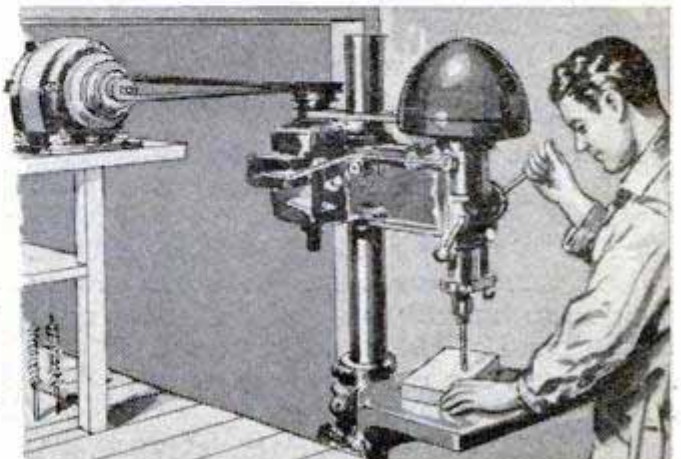
Assembled from scrap parts, this sturdy floor jack will do the job at a minimum cost. The post is a length of pipe, preferably 3 in. in diameter. Two flange unions are used, one to provide a cap for the post and the other a cap for the jackscrew. The latter can be a vise screw, and a hub plate from an old-fashioned wooden car wheel. A floor

flange will serve as an excellent base. To assemble the jack, the base is welded to the post. Then, one of the flanges is turned down so it rests on the top end of the post, its lower portion fitting inside the pipe. The hole in the flange is enlarged to permit the jackscrew to slide through it. The other flange is pressed onto the unthreaded portion of the screw, and a threaded nut, which also can be taken from a vise, is turned on the screw so it rests on top of the post cap. With the jack in position under a beam, the nut is turned with a wrench to raise the screw and tighten the jack.

D. C. Marshall, Manhattan, Kans.

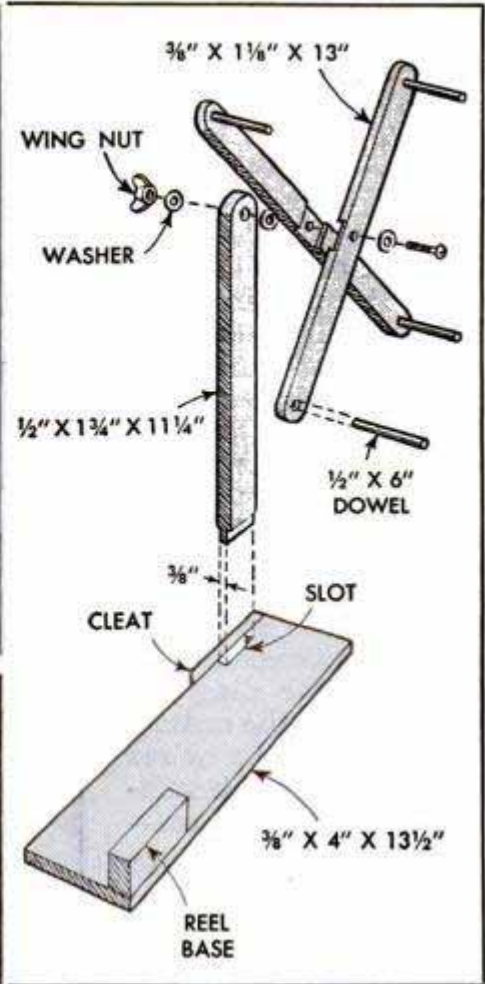
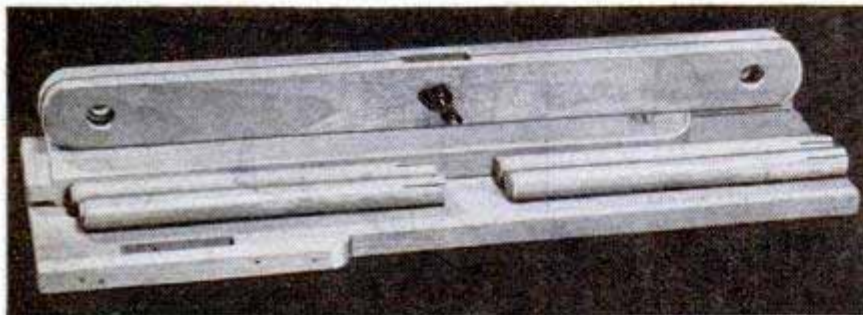
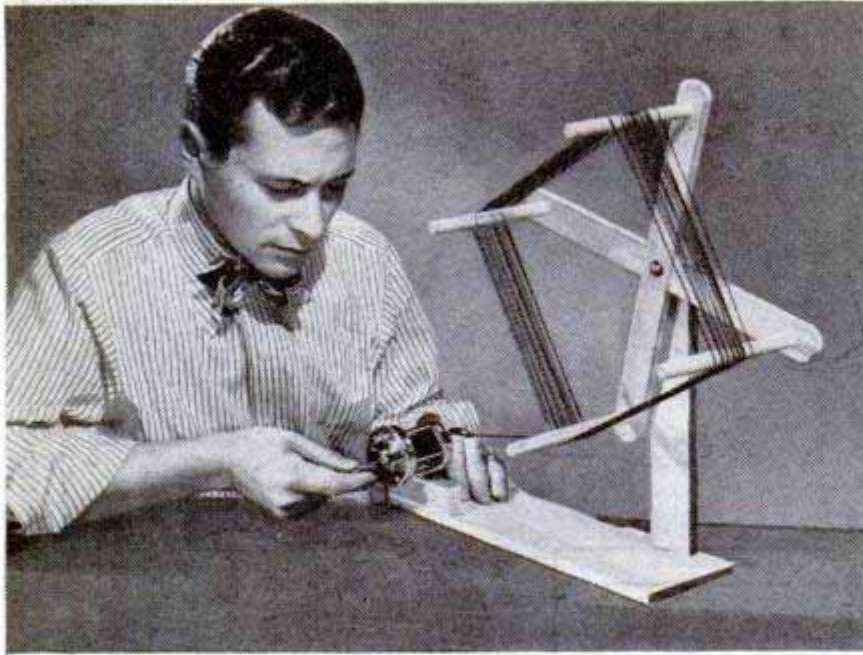
Auxiliary Motor Replaces Countershaft to Permit Low Drill-Press Speeds

One craftsman who uses his drill press for low-speed work finds that he can make speed changes more quickly with an auxiliary motor than with a countershaft. He mounted the motor to one side of the drill press and, when a low speed is desired, he uses the auxiliary motor to drive the drill-press motor, which serves as a jackshaft. This takes advantage of the speed reduction afforded by the extra set of pulleys. Wm. F. Macomber, Palo Alto, Calif.



☞ When dusting, use a cloth in each hand and you will save considerable time.

Take-Apart Fishline Drier Stored in Small Space



To fishermen who take special pride in having tackle always in perfect condition, a line drier is a "must" item of equipment. This one is made entirely of hardwood and the take-apart design permits it to be stored in a small space when not in use. It can be set up in a jiffy. The reel spider turns on a simple bearing on which tension is adjustable by means of a wing nut, permitting just the right drag on the line when rewinding to the reel. Reel arms can be lengthened to 8 in. if desired. Finish the parts with spar varnish.

Reflectors Soldered to Wheels Make Scooter Visible at Night

If scooters, coaster wagons or tricycles are likely to be used after dark, ruby reflectors soldered to the wheels will make crossing streets with them considerably safer. The reflectors should be soldered near the rims of the wheels so they will look like pin wheels in the dark, thus attracting the attention of approaching motorists.—Opie Read, Jr., Chicago.



Bicycle Identification Tag Hidden Inside Handle Bar

Hidden within the handle bar of a bicycle, an aluminum name plate is a sure means of proving ownership of a stolen bicycle. Just stamp your name on a 2 x 3-in. piece of sheet aluminum, roll it to fit snugly inside the handle bar, and push it almost to the bend of the bar. When needed, the name plate can be pulled out with a piece of wire bent to form a hook.

Donald Kolesar, Terrace, Pa.

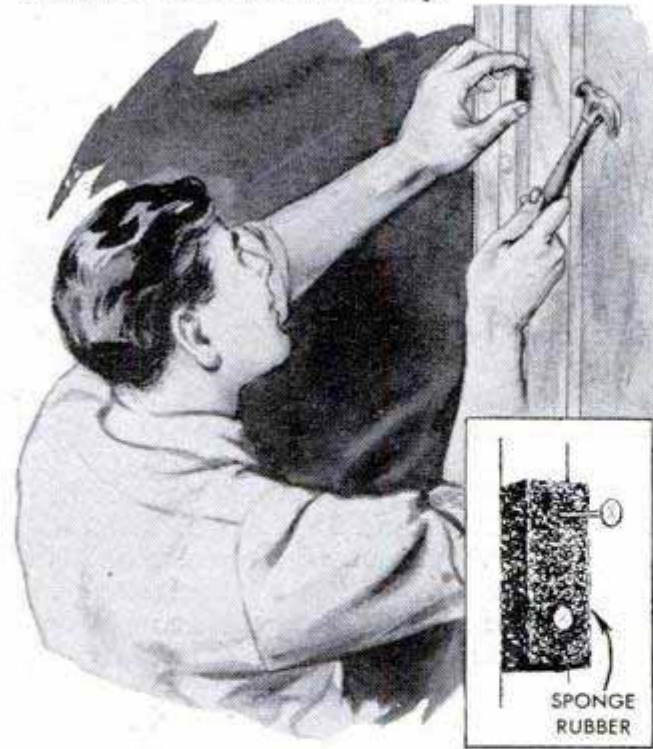
Rope Provides Convenient Grip For Wiping Top of Car

Owners of older cars know what a trying job it is to wipe the top of the car while standing on the running board. There's just nothing to grasp to maintain balance. A simple solution to the problem is had by using a short length of clothesline for a handhold, hooking it over the door handle on the opposite side of the car, as shown in the photo. Use a piece of cotton rope so that it will not scratch the finish.

Paint Can Carried Up Ladder Should Not Be Full

Whether painting a ceiling from the top of a stepladder or the outside of a house from an extension ladder, it is a good idea to keep only a small amount of paint in the can. The partially filled paint can is considerably easier to handle than a full one and, if it is dropped, less paint is spilled. In addition, if the brush must be put aside for a moment, it may be stood in the can of paint. Especially helpful when it is difficult to look downward, the brush can be dipped in the paint until it touches the bottom of the can.

Sponge Rubber Cushions Door When Fastened to Stop



Rattling of loose-fitting doors can be prevented and the doors cushioned against slamming by fastening pieces of sponge rubber to the doorstop. One piece of rubber tacked or glued near the top of the door and another piece similarly attached near the bottom will serve the purpose.



Nail Polish Colors Spectacle Frame

If the color of your plastic spectacle frame is no longer desirable, you can change it to any one of a wide variety of colors by applying a coat of nail polish. The polish dries smoothly and makes the frame look like new. If you do not wish to change the color permanently, be sure that the frame is not made of a plastic that will be affected by the nail-polish remover.

Ellis Roberts, Decatur, Ill.



Labels Typed on Cloth Tape Are Handled Easily

Gummed labels that stay in place but can be removed simply by pulling them loose are had by typing the information on gummed-cloth binding tape. This is the kind of tape used for bookbinding and should not be confused with ordinary adhesive tape.

Mount the tape directly on the typewriter platen and merely pull it off when finished. As the gummed surface does not dry out, the label is easily removed from its position at any time.

☞ Wine stains may be removed by holding the stained portion of cloth in boiling milk.





Photo courtesy Los Angeles County Chamber of Commerce

HOW TO MEND TORN SAILS

EXPERIENCED sailors avoid the risk of being caught with a torn sail aloft by keeping sailcloth always in good repair. A short tear takes the drive out of a sail and a bad tear, which usually starts with a small rip in the canvas, may leave your boat wild a long way from help or the home port. Mending sail will come easy to the amateur yachtsman after he learns the tricks of handling a sailmaker's needle and how and where to use the flat and herringbone stitches employed by the professional sailmaker. Inventory of a sailmaker's "ditty bag" will show that it contains one or more sailmaker's needles, a "palm thimble" or palm, as it is called, a sharp knife, a ball of twine (it is never called thread) and a lump of sailmaker's wax. In the sailmaker's loft, the wax is referred to as "composition." All these items are available from marine-supply dealers at a nominal cost. The palm is made from soft leather and fits in the palm of the right hand as in Fig. 1.

An indented metal plate sewed into the leather palm serves as a "thimble" for forcing the heavy needle through the cloth. The procedure pictured in Figs. 1, 2 and 3 shows how to apply a patch to a straight-line tear, using the flat stitch, also called the round stitch. Note the position of the left hand in Fig. 1. The cloth is grasped between the thumb and the left fore and middle fingers. As the needle passes through the cloth in making the stitch, it touches the middle finger and simultaneously the thumb presses the cloth down, causing the point of the needle to emerge or "break." This finger action produces stitches of a uniform length and, although the procedure requires considerable skill, it can be mastered with practice. Fig. 2 shows a patch sewed over a short straight-line tear like that shown at the left in the photo. First, the patch is sewed to the sail with the edges tucked under, Fig. 2. Then the sail is sewed to the patch, Fig. 3. Diagonal

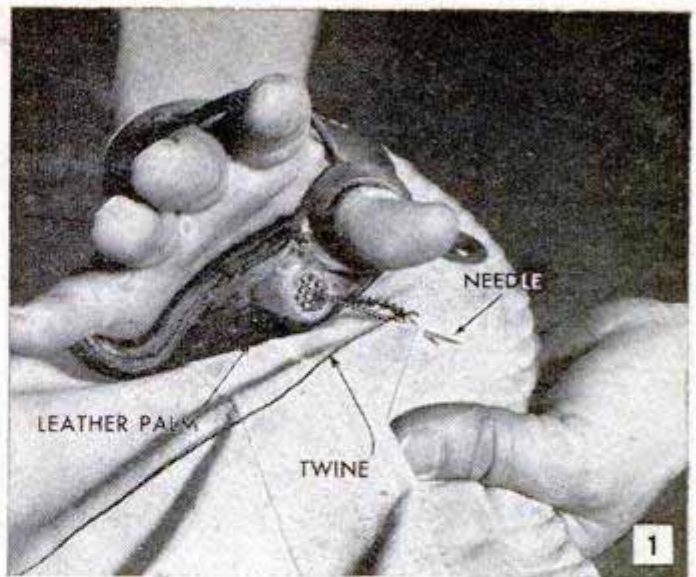


By Ed Lundburg

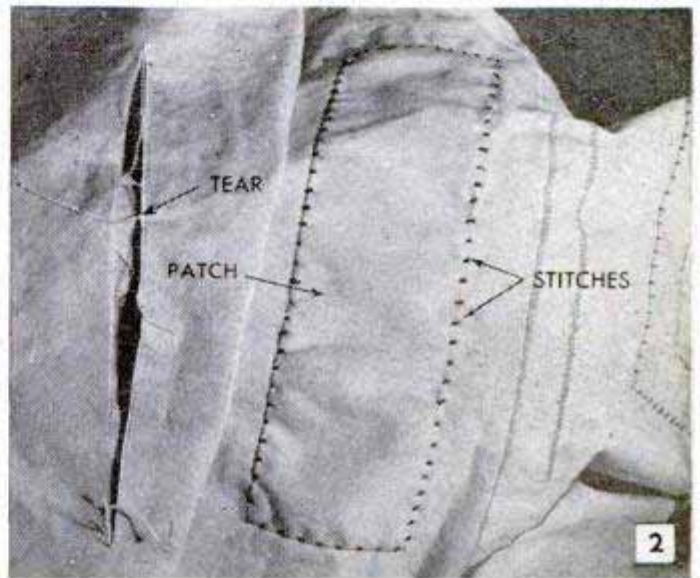
A torn sail can spoil your week-end yachting trip — unless you know how to mend it. Here, professional sailmakers tell you how

cuts are made at each end of the tear and the edges of the sailcloth are tucked under as the sewing proceeds. A straight-line tear may extend the full span of the sail and yet it can be mended with a patch applied as shown.

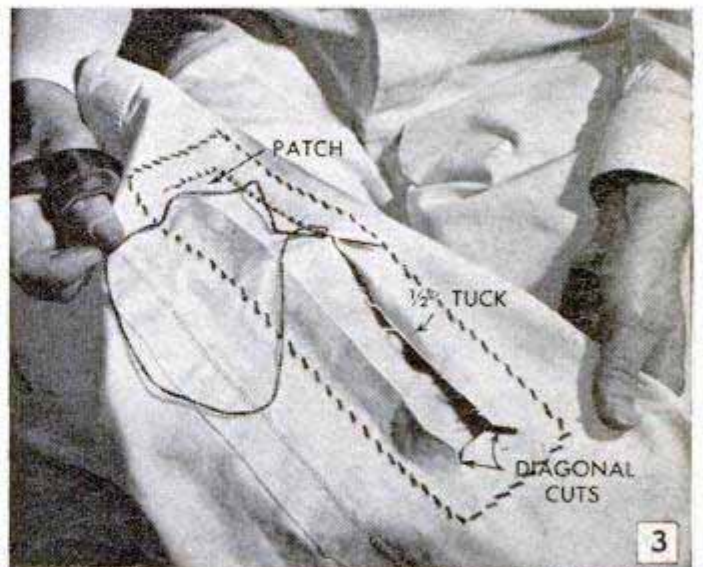
In all photos showing the stitches, black twine was used for purposes of clarity. In actual practice white twine is used almost exclusively. Figs. 1, 2 and 3 do not show all the movements in completing a stitch, nor do they show the natural position of the hands in actual practice. As an example, the fingers of the right hand, Fig. 1, are shown much higher than they would be in normal procedure. This has been done in order to show clearly the position of the needle. After the needle has been pushed through by the palm, it is grasped firmly by the thumb and forefinger of the right hand and pulled through to tighten the twine. In mending sail, the twine is never tugged at the completion of the series of stitches. It is merely pulled taut and to a light tension. The twine is never knotted, at either the beginning or finish ends. In all patching, the edges of the patch, as well as the torn edges of the sail covered



Leather palm with metal thimble protects sailmaker's hand as needle is driven through sail and patch. Pressure with left thumb "breaks" needle into the clear



How a patch is sewed over a straight-line tear similar to one at left. Sewing the patch to the canvas is the first step in making the repair. Edges are tucked under



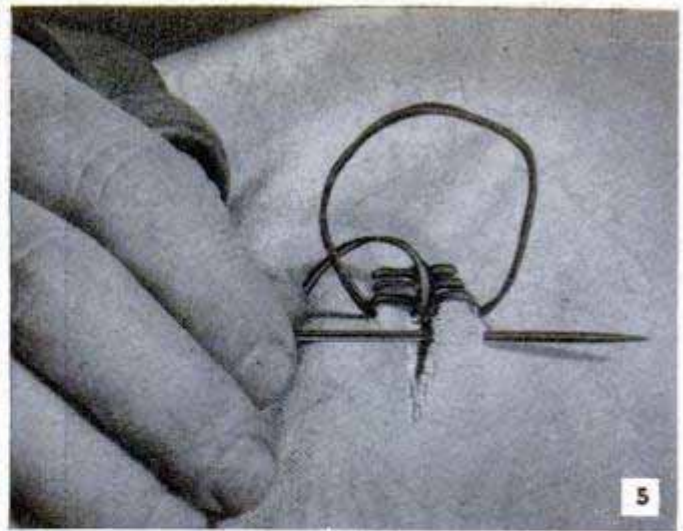
Photos by Jasper Nutter

With the patch in place, the canvas is reversed and the sail is sewed to the patch. At ends of the tear, cloth is cut diagonally and tucked under to prevent fraying



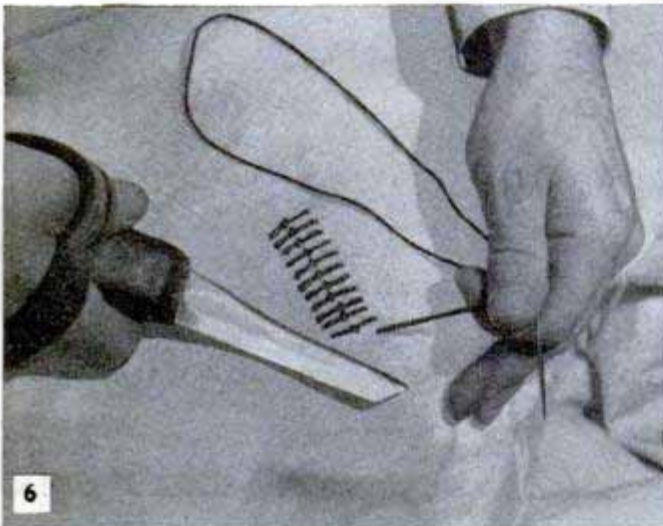
4 Patch at the right repairs an L-shaped rip similar to one shown at the left. Procedure is the same as that employed in repairing the straight-line tear

The completed herringbone stitch with the finish end about to be cut off. Some sailmakers return the twine through several loops before cutting the end



5 Minor tears, both straight and L-shaped, are mended with herringbone stitch like that shown above. No patch is used. Herringbone stitch is self-locking

The herringbone stitch also is used to repair tears around grommets. In making the repair, one loop of each stitch passes around the grommet ring as shown



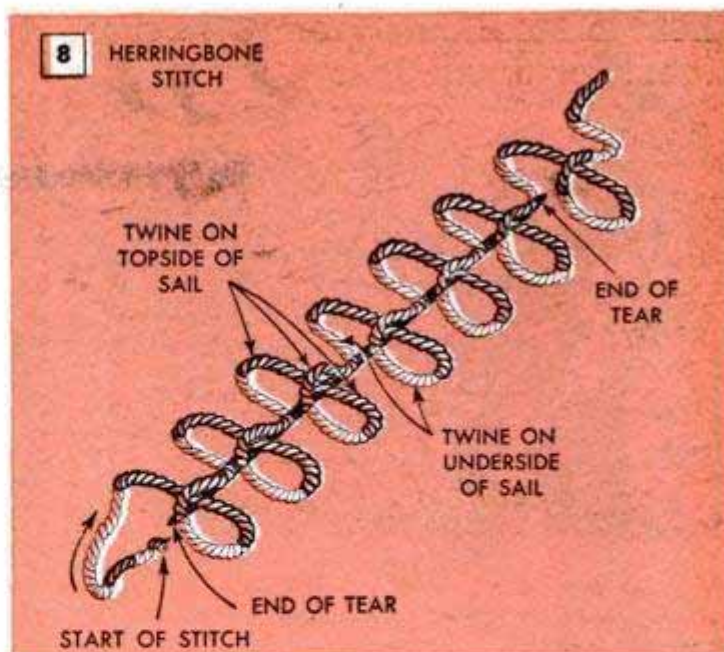
by the canvas patch, are tucked under to prevent fraying of the cloth. Ordinarily, the patch is cut from material of the same weight as that of the sail and it is cut to a width that will extend it at least 3 in. on each side of the tear before tucking. Sailmakers use several methods of locating the patch correctly over the tear. A short tear offers little difficulty but a long rent or one that is L-shaped requires more care, Fig. 4. It's important to make sure that the patch extends an equal distance beyond the limits of the tear at both ends. About 3 to 4 in. is a good average. Long patches can be tacked temporarily to the sail with several stitches at intervals along the length. Old sailmakers frowned on this practice, however, as they found there is a possibility of a patch applied in this way causing unequal tensions in a large sail. Perhaps the best practice in applying fairly large patches is to spread the sail on a flat surface, smooth all the wrinkles out of



the canvas, then mark the location of the patch on the cloth. The marks on the sail make it easy to locate the patch as the sewing proceeds. Sailmakers usually start the first stitch about halfway along the length of the patch. The initial stitch goes down through the sail and patch and back up and the twine is pulled through until only about 3 or 4 in. of the end remain. This free end is then folded under the tuck where it is locked in place by subsequent stitches. At the finish end of the stitch, the twine is carried back under several loops and cut off.

The herringbone stitch, Figs. 5 to 8 inclusive, is used in repairing snags, small rips and tears both straight-line and L-shaped, and also for mending the tears that develop around grommets, Fig. 7. It is self-locking and exceptionally flat and, when carefully made by a skilled workman, it results in a neat and permanent repair. Figs. 5 and 6 show the start and end of the

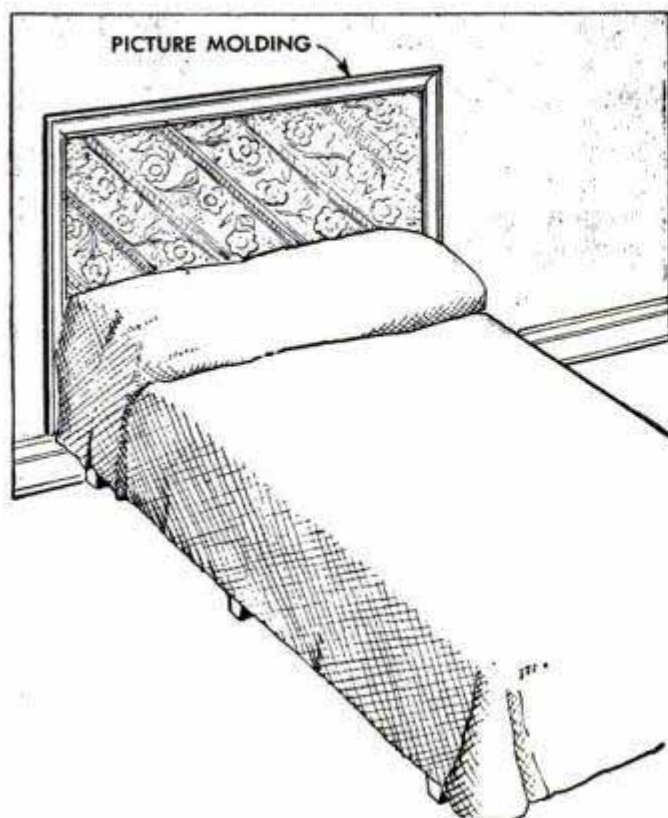
stitch and Fig. 8 details the procedure quite clearly. Note in Fig. 8 that the dark-shaded portions of the twine are on top of the cloth while the lighter portions are underneath. With this in mind, it is easy to follow the course of the needle and twine above and below the cloth. The stitch is started as in Fig. 8 by forcing the needle through the cloth, then back up and through to the underside again. Next, the twine is carried to a point just about opposite the end of the tear and about $\frac{3}{8}$ in. to one side of it. Then the twine is brought up through and across to an equal distance on the opposite side of the tear where it is passed again through the cloth and brought up through the tear. From here it is taken over the first loop and down through the tear. This completes the first individual stitch. The trick in making a smooth, neat repair without bulges or wrinkles is simply to maintain an even tension on the twine as the individual stitches are made. A common method of ending the stitch is to cut the twine as in Fig. 6 about $\frac{1}{2}$ in. above the cloth. Another acceptable method is to pass the needle through several loops and then cut the twine just back of the last loop. In repair-



ing the cloth around grommets, one loop of the stitch passes around the grommet ring, Fig. 7. This type of grommet repair cannot be considered permanent, although it will last throughout a full season unless the sail is old and the cloth weakened by age and weathering. In making any repair, experienced sailmakers usually hold the sail on the lap as this position permits free movement of the left hand.

Picture Molding Frames Wallpaper to Form Novel Bed Headboard

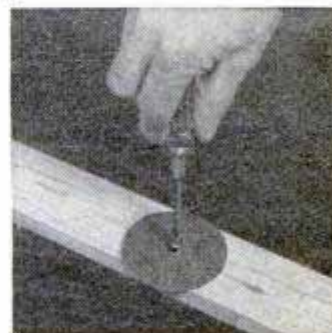
An attractive and inexpensive headboard for a Hollywood-type bed is had by applying wallpaper to the wall in back of the bed and framing it with picture molding. Against solid-colored walls, paper having



a prominent design or a contrasting color looks well. On papered walls which have a colored design, solid-colored paper or water-soluble paint makes a neat appearing headboard. The picture molding is attached to the wall with finishing nails, the heads of which are set and then puttied over. The molding can be painted to match the woodwork or finished to resemble the bedroom furniture.—A. E. Fenn, Chicago.

Rubber Guard Protects Surface If Screwdriver Slips

Where it is particularly important to avoid marring the work by having a screwdriver slip from the head of a screw, a large rubber disk cut from a piece of inner tube will protect the surface. The screw is driven into the work through a hole punched in the center of the disk. It's an easy matter to remove the disk by lifting it up over the head of the screw just before driving it home.



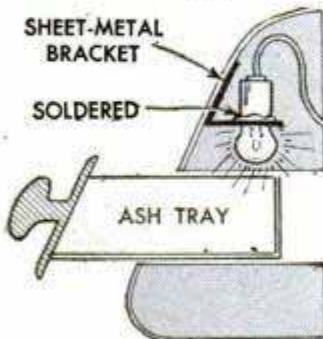
Mortar Box Made From Oil Drum Ideal for Small Jobs



Made from half an oil drum, this steel mortar box is more durable than the wooden type, cannot leak or splinter and is just the thing for small jobs. In addition, its rounded bottom facilitates mixing the mortar and shoveling it from the box. The drum is cut in half, lengthwise, with a torch, and should be steam-cleaned before cutting to remove any fumes which might cause an explosion. Flat-iron legs are welded to the drum to keep it from tipping.

Victor H. Lamoy, Upper Jay, N. Y.

Illuminating Dashboard Ash Tray



Cigarette ashes frequently are dropped on the car floor when driving at night because the dashboard ash tray cannot be seen plainly. This can be avoided by illuminating the inside of the ash tray with a small light

installed behind the dashboard. The bulb is located directly above the ash tray and is not visible when the latter is closed. This method, of course, is effective only on ash trays which pull straight out from the dashboard. The bulb is inserted in a standard socket which is mounted on a sheet-metal bracket soldered to the inside of the dash-

board. The lead from the bulb is wired into the circuit of the instrument-panel lights and the bracket serves as a ground.

W. M. Dierks, Chicago.

Modeling Clay Holds Fishhooks On Inside of Tackle-Box Lid

To eliminate searching through the tackle box and thus to save time when changing hooks or flies, one fisherman selects in advance those lures that will be needed and presses them into a wad of modeling clay.

MODELING CLAY

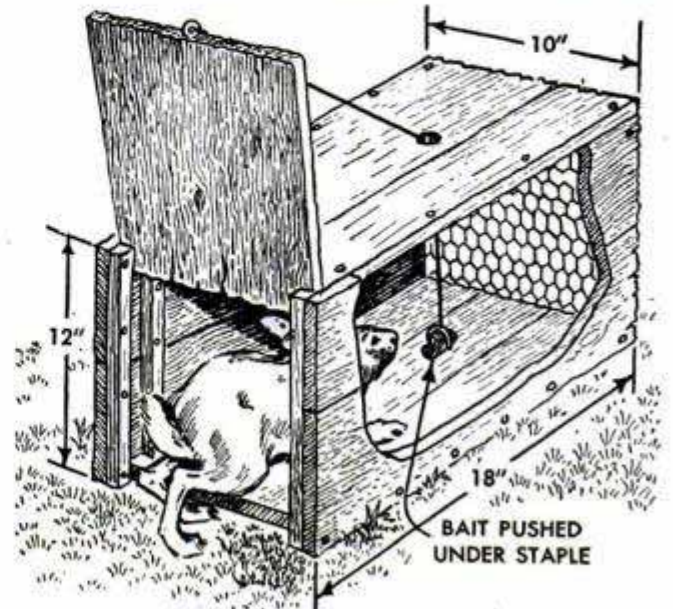


Then he sticks the clay to the inside of the tackle-box lid so the hooks are handy when needed.—G. E. Hendrickson, Argyle, Wis.

Small Animals Caught Easily With Rough Wooden Trap

Properly baited, this live trap will easily catch rabbits, skunks and other small animals. As most animals are suspicious of new lumber, the trap should be built from old, weathered boards. A loose-fitting door slides vertically in channels made by nailing two cleats to each side, and is held open with a length of picture wire run through a hole in the roof. The free end of the wire is baited and the bait pushed under a staple driven into the floor of the trap directly beneath the hole. When an animal pulls the bait from under the staple, the trap door is released and drops. Timid animals will enter the trap more readily if the back is covered with chicken wire or hardware cloth instead of boards.

R. A. Jenkins, St. Louis, Mo.



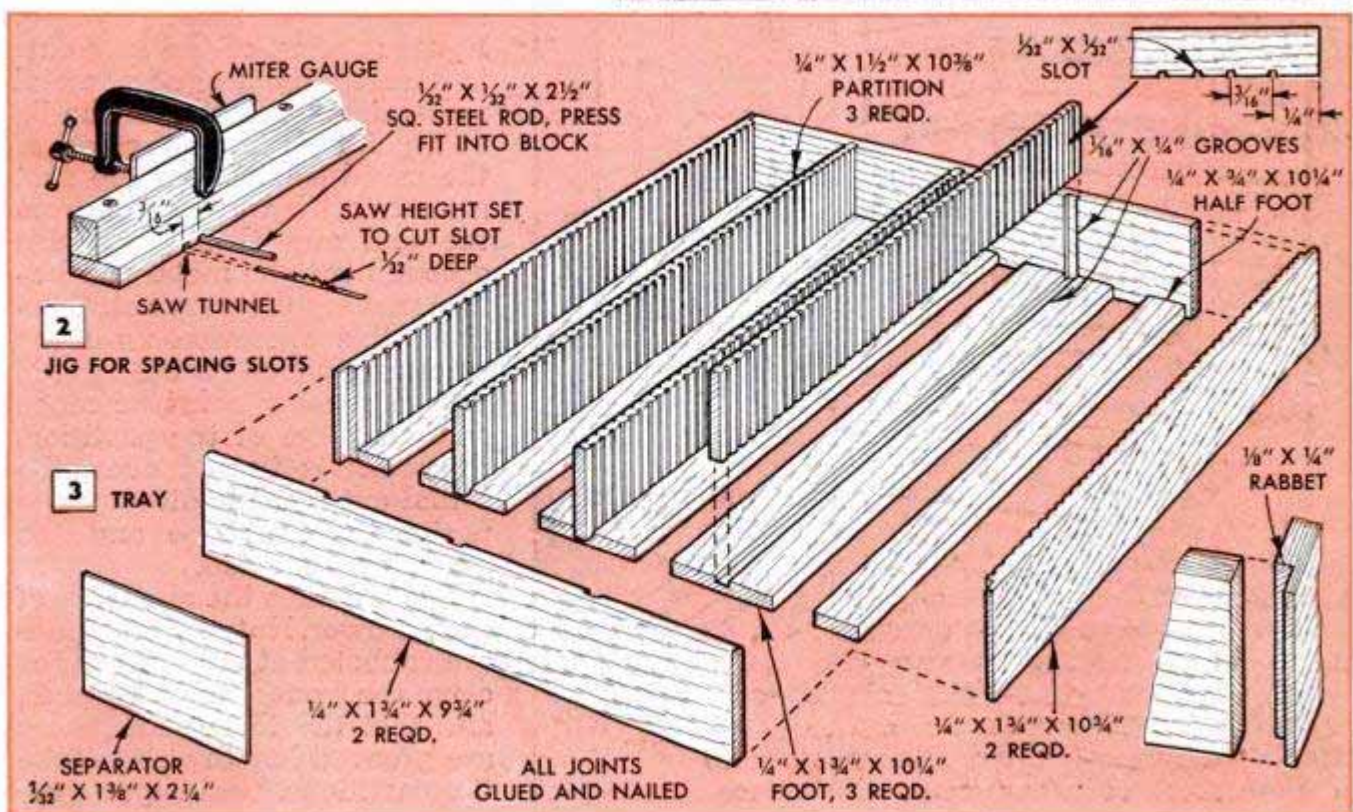
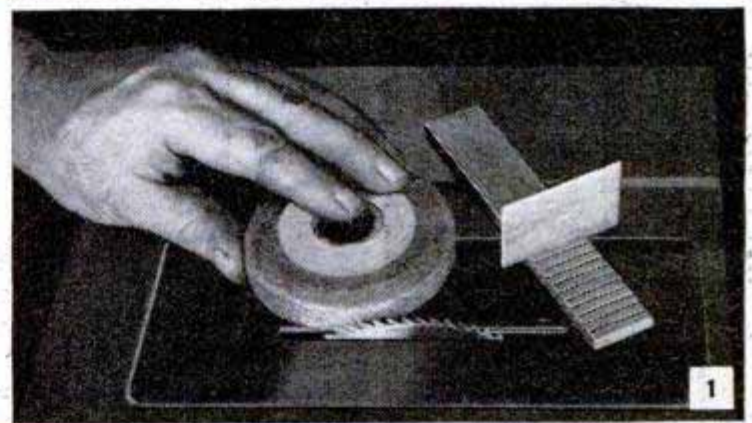
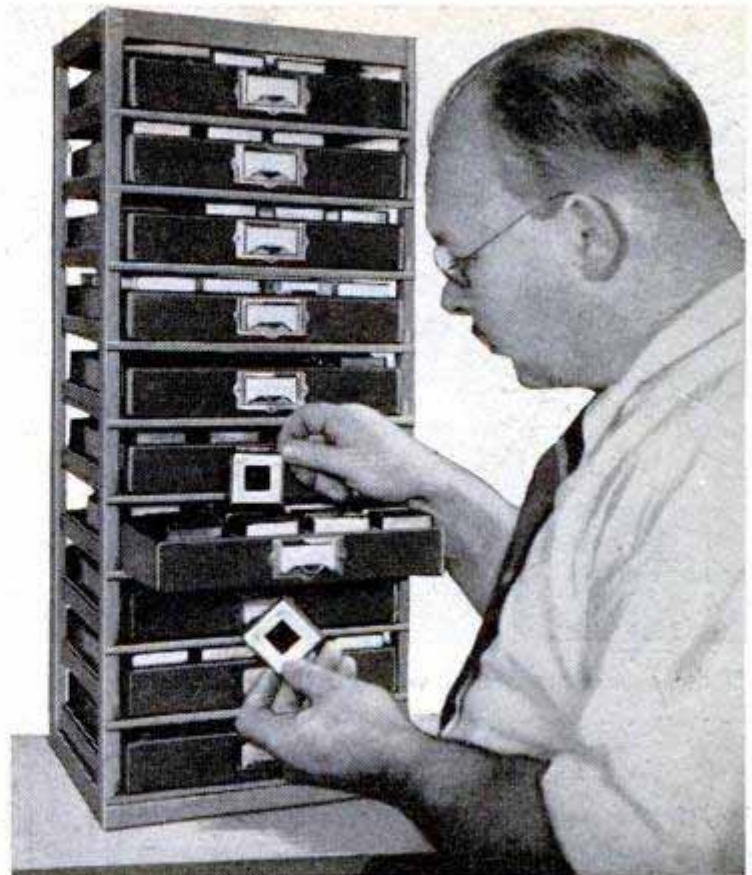
FILE CABINET

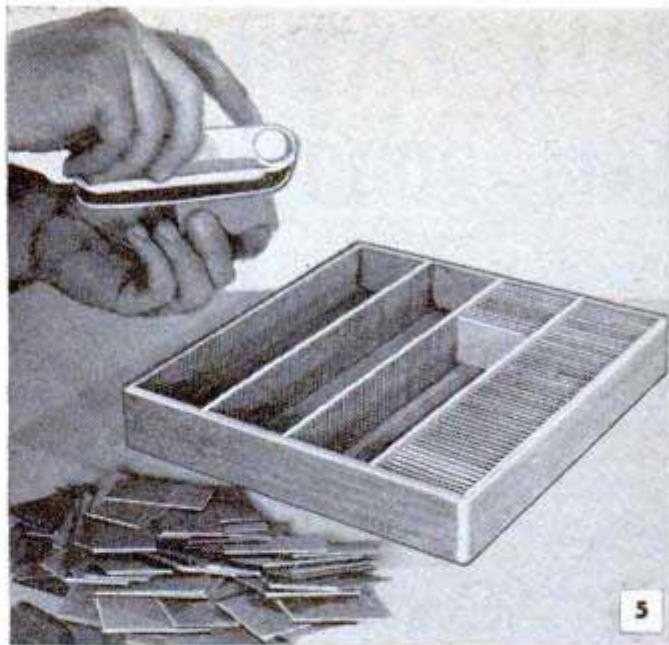
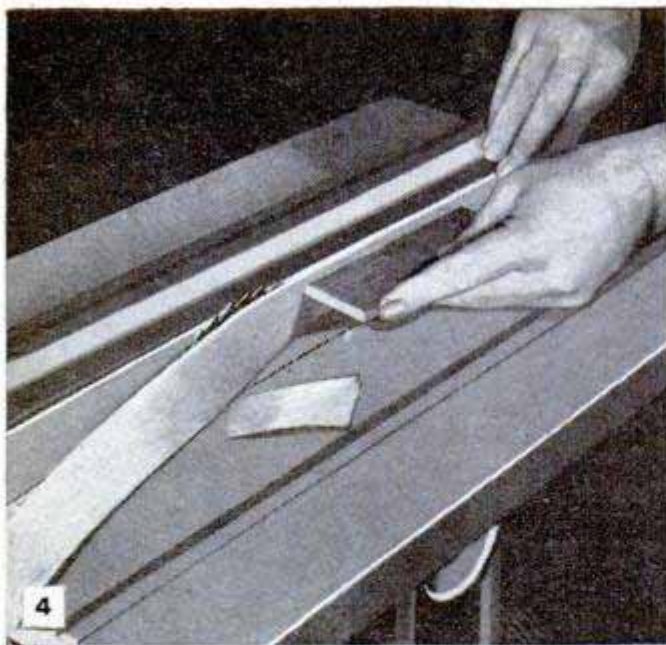
holds 2000 slides

By Alexander Maxwell

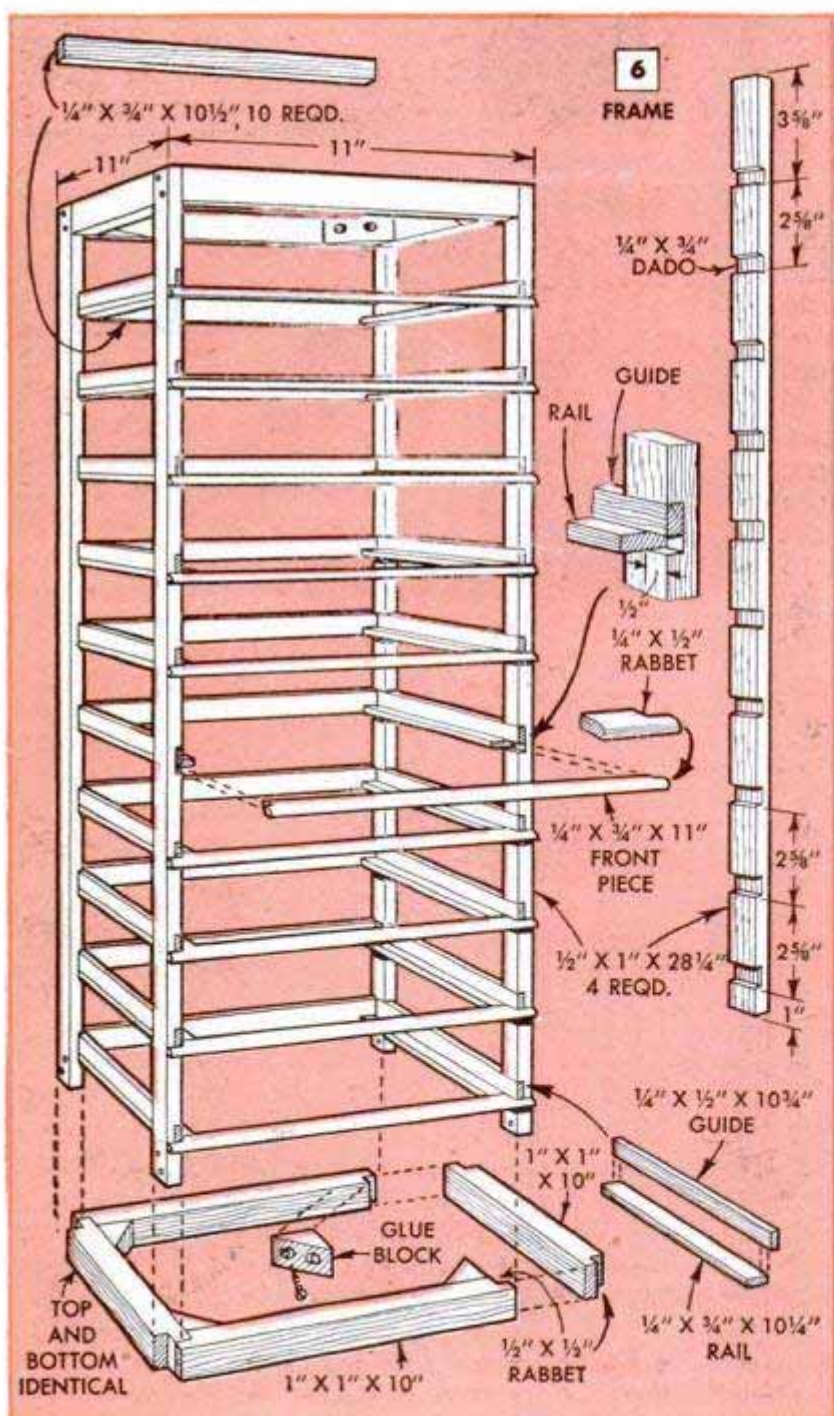
SHOOTING transparencies soon becomes such a fascinating hobby that the job of cataloguing and filing the many slides quickly outgrows the capacity of the small, individual file box generally used. That was my problem, and rather than bother with a number of file boxes, I designed and built this 10-drawer cabinet. Holding up to 2000 slides, it will fill the needs of the most avid color enthusiast.

You'll notice that the drawers or trays of the original cabinet are housed in an open framework. This was done purposely to reduce its weight but, if desired, the cabinet can be enclosed and even fitted with a door to protect the slides from dust. Except for the four corner posts and the top and bottom assemblies, the drawers and their frames are all made from 1/4-in. material. As the parts of all drawers are alike, duplicate pieces can be mass-produced by using stop blocks and special setups to assure identical units. An example is given in Fig. 2, which shows how a simple wooden jig attached to the crosscut guide (miter gauge) can be used to





If the separators are of wood, a thin shaving cut is taken from 1 $\frac{3}{8}$ -in. stock, cut into pieces and sanded

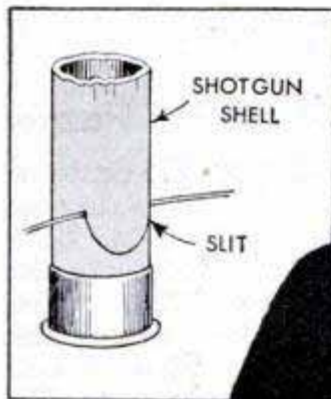
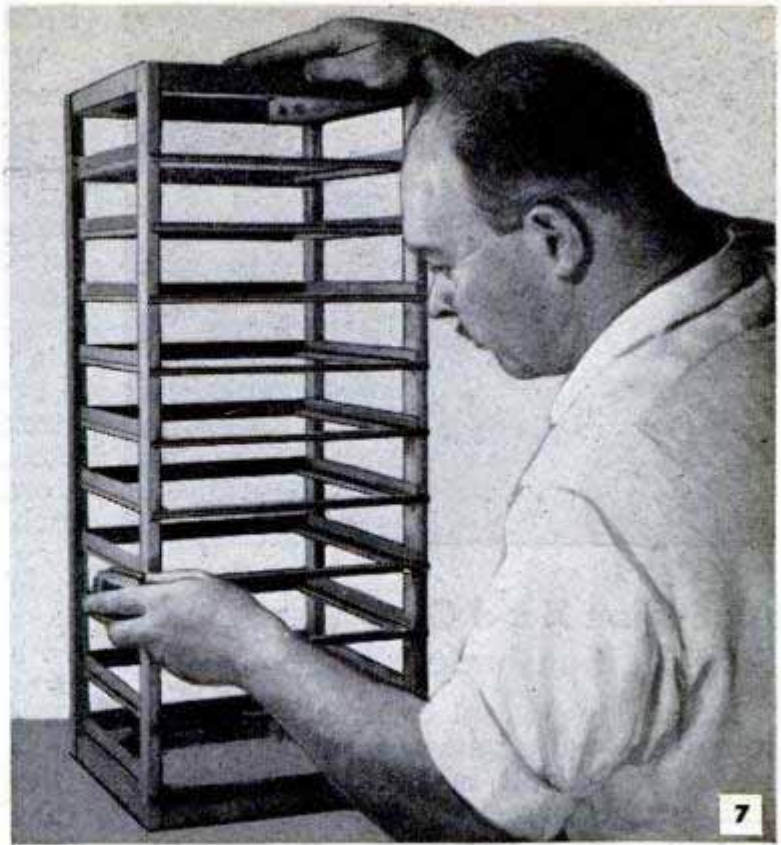


produce identically spaced saw cuts in the partition members of the drawers. The grooves are for thin separators which can be cut from plastic, metal or wood. I made them of wood, slicing them to paper-thinness as shown in Fig. 4. As the average saw blade produces a saw cut much too wide to provide a close fit for the separators, I took an old blade and dressed it down to the required thickness, using a grinding wheel as in Fig. 1. The blade is resharpened afterwards and is used without set. The latter is not necessary when making such shallow cuts as those required. Equal spacing of the saw cuts is assured by a square metal rod which is inserted in the jig at a point $\frac{3}{16}$ in. to the left of the saw blade. Make the first groove in the work $\frac{1}{4}$ in. from the end and then place this groove over the metal rod before making the next cut. Continue this operation until the piece is grooved its full length. Where grooves must be made on both sides of the partition, the work is turned over, the initial cut is made directly opposite the first one and the process is repeated.

Fig. 3 details the assembly of each drawer. Note that the sides are rabbeted at the ends to receive the front and back pieces, and that the three foot pieces are grooved lengthwise to take the partitions. Resin-type glue

and small brads are used in assembling the pieces. The top edge of each separator is rounded slightly with a sanding block, Fig. 5, before inserting it in place. No glue is required in holding the separators in the grooves. A coating of clear varnish or lacquer sprayed on the finished drawer will seal the separators in the grooves.

Fig. 6 details the assembly of the framework of the cabinet, which can also be mass-produced as it consists of many duplicate parts. Dadoes are equally spaced in the four corner posts of the framework to receive the guide and rail members. These are installed after the top and bottom assemblies are attached to the posts. Final sanding completes construction, Fig. 7, which is followed by varnishing or painting all parts except the drawer guides. Each drawer is fitted with a standard label-holder pull.



Tallow-Filled Shotgun Shell Dries and Waxes Fishline

To wipe a fishline dry and wax it in a single operation, one fisherman uses a fired shotgun shell filled with melted tallow. A slit is cut through the side of the shell and into the wax, as shown, and the line is inserted in the slit. Then, as the line is reeled in, the water is squeezed out and wax applied at the same time. The wax should be warmed occasionally to close the slit for efficient operation.

Paper Around Steampipes Prevents Cracks in Plaster

When steam or hot-water lines pass through a plastered wall, the plaster around the pipes frequently cracks because of the expansion of the pipes. This can be prevented by wrapping several thicknesses of wrapping paper around each pipe before plastering. Then, after the plaster dries, the paper is removed, leaving clearance between the pipes and the plaster to allow for expansion.—Arthur N. Nelson, Kansas City, Mo.

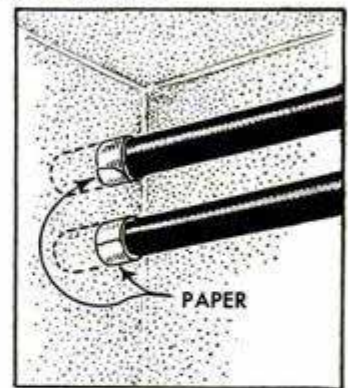
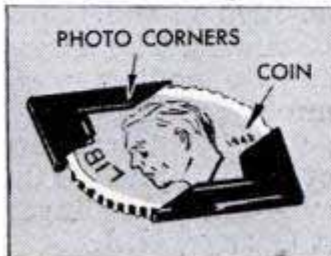
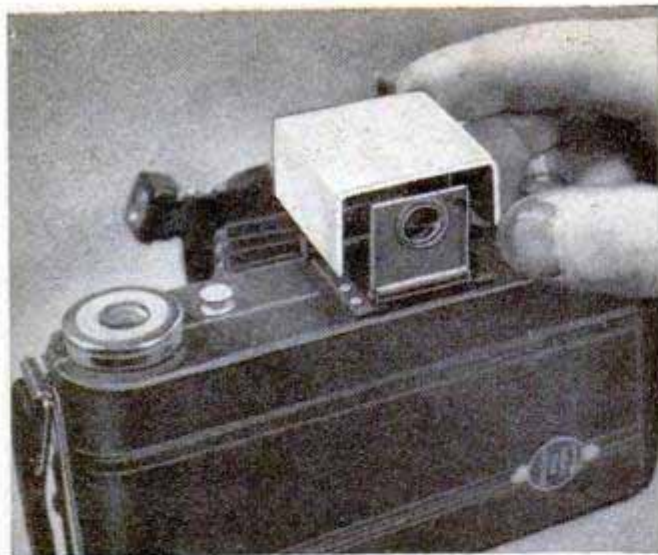


Photo Corners Hold Coins For Mailing With Letter

Coins enclosed with a letter or order blank will not slide around in the envelope if they are fastened to the sheet of paper with gummed photo corners. Just slip two corners over the edge of the coin, one opposite the other, moisten the backs and stick them to the paper. —P. Criton, Kayville, Sask., Can.



☞ For a better job, warm furniture polish thoroughly in hot water before applying.

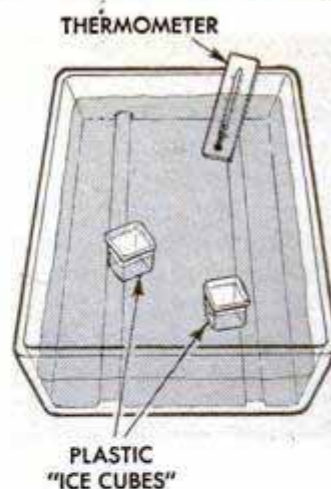


Aluminum Hood Over View Finder Provides Sunshade

In using the two-piece direct view finder found on many cameras, sunlight often makes it difficult to obtain clear vision. This can be corrected by fitting an aluminum sunshade over the finder. Cut the metal to size and bend it to clip over the front and rear parts of the finder like a hood.

Plastic "Ice Cubes" Cool Developer

When warm weather makes it a problem to maintain photo solutions at the proper temperature in a small darkroom, here's a way you can cool the liquid without diluting its strength. Simply place a couple of frozen plastic "ice cubes" in each tray until the tem-



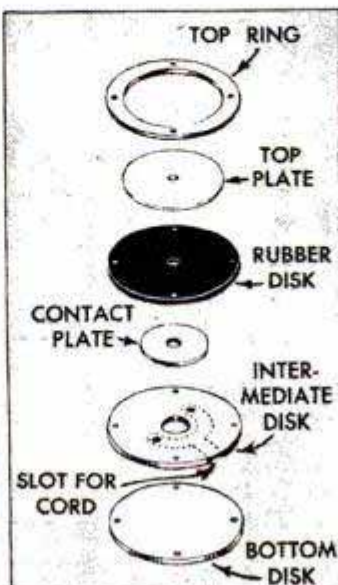
perature of the solution is lowered the required amount. Designed to cool drinks without diluting, the cubes are of transparent plastic and have water sealed inside which is retained upon melting. The cubes can be used over and over again by simply refreezing. As some cubes are identified by color, it is easy to prevent contaminating a solution by accidentally placing a cube in hypo that has been in developer.—Will Stoll, Elmhurst, Ill.

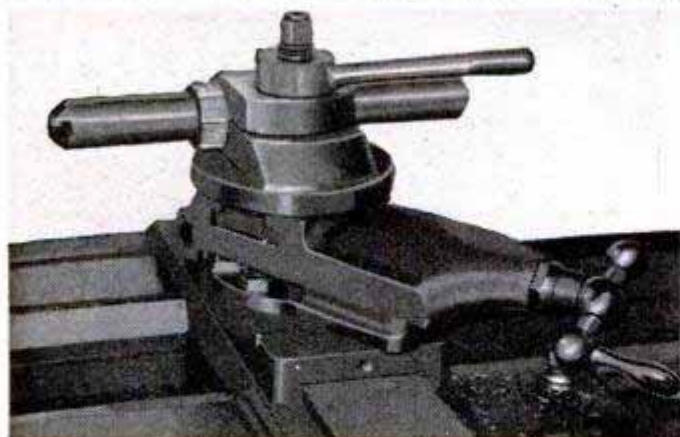
Wafer-Thin Foot Switch for Photo Enlarger Eliminates Stumbling Hazard

If the foot switch on your enlarger is a bulky affair or if you do not have a foot switch, make this compact, wafer-thin switch. It is easily assembled in layers of fiber, rubber, copper and brass. First, cut the bottom and intermediate disks from $\frac{1}{4}$ -in. fiber, making them 4 in. in diameter. Then drill a $\frac{3}{4}$ -in. hole in the center of the intermediate disk and rout a slot in the underside of the disk for the wires which run to the terminals. The latter are brass screws located on each side of the center hole. After this, cut a disk of sheet rubber and a disk of brass to the same diame-

ter as the fiber disks. Cut out the center of the brass disk to form both the top ring and the top plate. Then drill $\frac{1}{8}$ -in. holes through the centers of the top plate and rubber disk. Now, cut a disk from sheet copper to form the contact plate. This should be large enough to fit over both terminals, and a $\frac{1}{4}$ -in. hole is drilled through its center. Next, drill four registering holes through the edges of the ring and disks to permit fastening the assembly together with machine screws. Bolt the top plate, rubber disk and contact plate together, using a fiber insulating washer

between the contact plate and the bolt and a larger fiber washer between the plate and the nut to keep the current from flowing through to the brass top plate. Then, attach the wires to the contact terminals and assemble the switch, inserting a stiff compression spring in the $\frac{3}{4}$ -in. hole in the intermediate disk. The spring holds the contact-plate assembly off the terminals when foot pressure is not being applied to the switch.—Jack Mellinger, West Orange, N. J.





heavy-duty BORING BAR

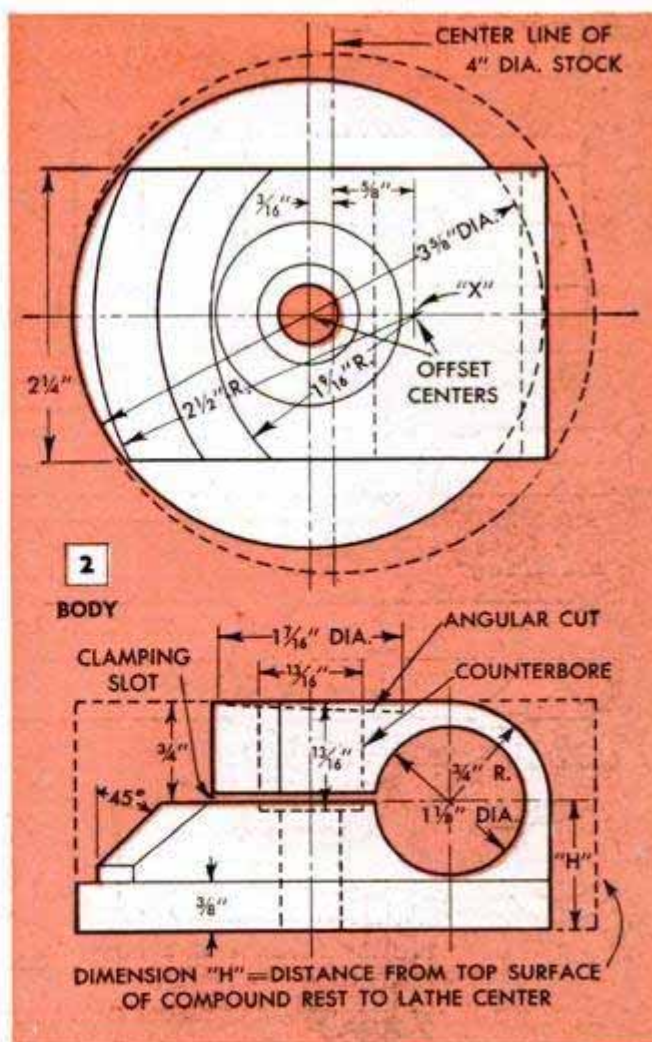
By Everett W. Holt

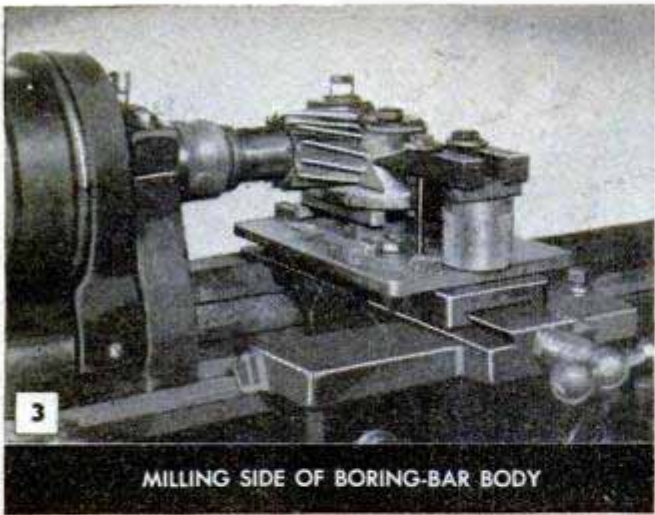
THIS VERSATILE boring bar is especially designed to provide maximum rigidity for turning and boring operations on diameters up to the full capacity of the average lathe, Fig. 1. A novel eccentric bushing permits accurate adjustment of the cutter height and top rake in relation to the axis of the work. Made to the dimensions given, the unit is suitable for use on lathes having up to 13-in. swing.

Begin work on the body, Fig. 2. Dimension "H" should be carefully determined before facing and finishing the stock. Start with a 4-in. disk of cold-rolled steel having a thickness slightly greater than dimension H plus $\frac{3}{4}$ in. The excess over the sum of these two dimensions is the allowance for facing both sides. After facing to the correct dimension, scribe intersecting center lines and prick-punch the true center of the disk. Then scribe offset center lines, one $\frac{3}{16}$ in. and the other $\frac{5}{8}$ in. Prick-punch the centers and mark the $\frac{5}{8}$ -in. offset "X" as in Fig. 2. Then set up the work in the four-jaw chuck and adjust to bring the $\frac{3}{16}$ -in. offset true with the tail center. Drill $\frac{15}{32}$ in., ream $\frac{1}{2}$ in. and counterbore $\frac{13}{16}$ in. Next, insert a $\frac{1}{8}$ -in. spacer between the back of the work and the chuck jaw at the center point, X, and finish an angular cut to clean up at exactly $\frac{17}{16}$ -in. diameter. The angularity of this cut assures that the hub of the clamping lever will bear on the outer portion of the lug when the lever is tightened. Re-chuck and true the $\frac{5}{8}$ -in. offset center with the tail center, using spacers, if necessary, to limit the depth of the work

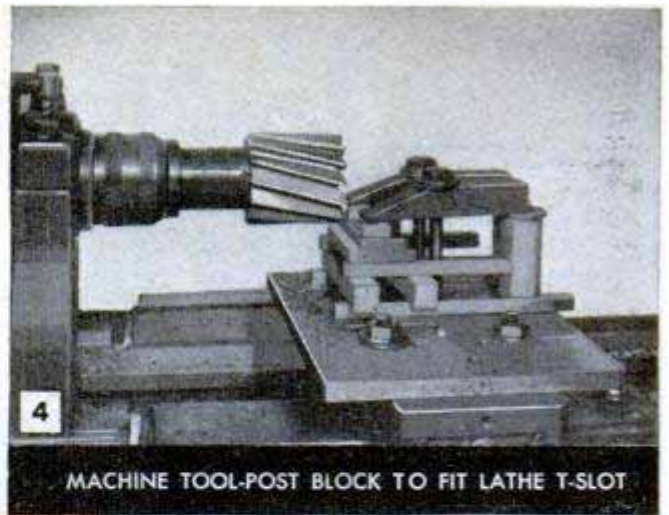


This tool will handle either inside or outside work

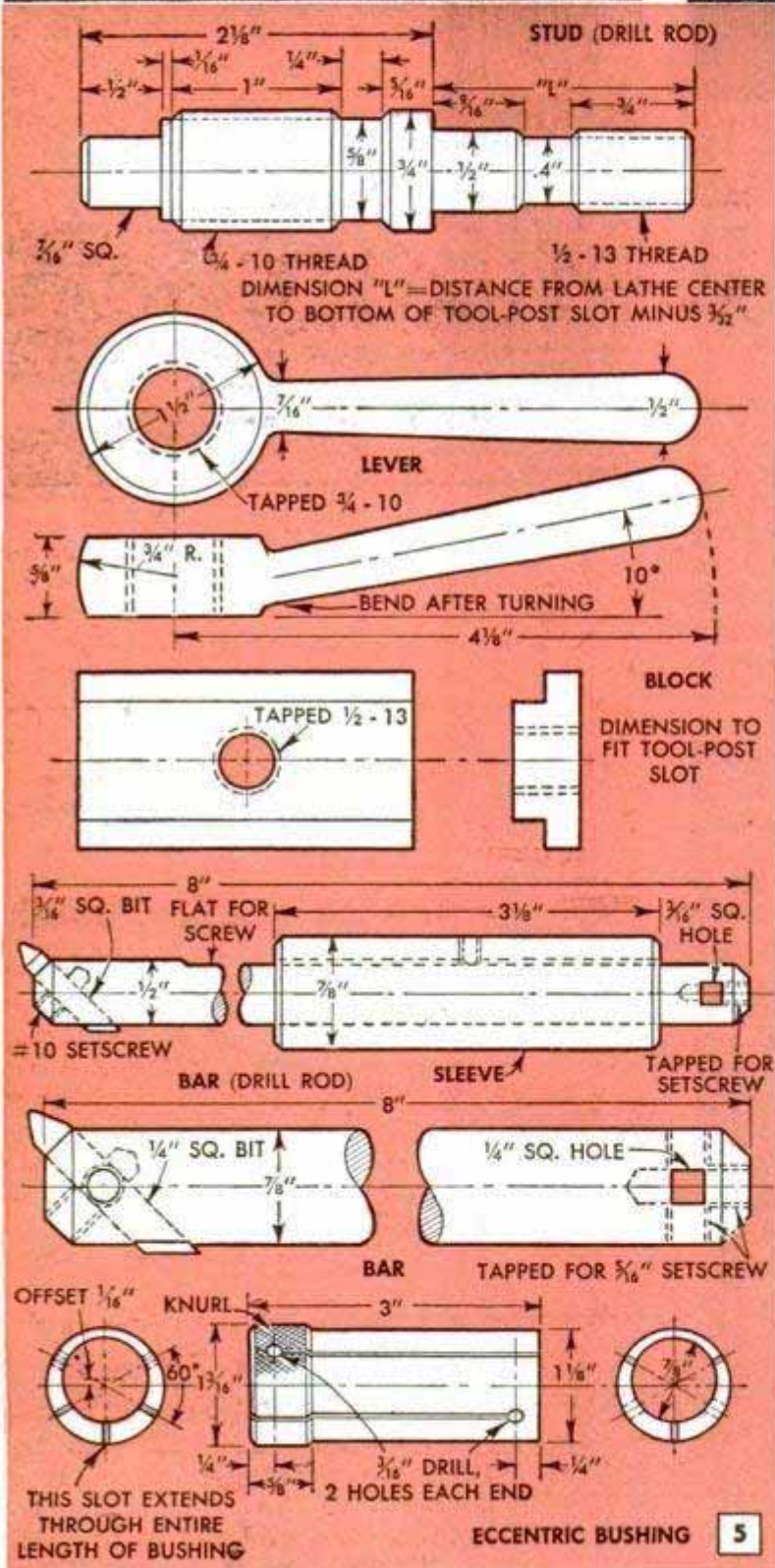




MILLING SIDE OF BORING-BAR BODY



MACHINE TOOL-POST BLOCK TO FIT LATHE T-SLOT



in the chuck jaws to $\frac{3}{8}$ in. Turn the $2\frac{1}{2}$ -in. radius, Fig. 2, back to the chuck jaws, then turn the $1\frac{1}{16}$ -in. radius to $\frac{3}{4}$ -in. length and finish the 45-deg. chamfer.

Mount the stock for the stud, Fig. 5, between centers, then finish and thread that portion of it which is $\frac{1}{2}$ in. in diameter. Clamp the partly finished body block to this improvised mandrel with a $\frac{1}{2}$ -in. nut and turn the $3\frac{5}{8}$ -in. diameter on the body, Fig. 2. Take a light cut on the bottom of the body up to the nut if runout is noticeable.

The sides and front of the body block are milled as in Fig. 3. Drill and tap a $5 \times 7\frac{1}{2}$ -in. steel plate for hold-down bolts. Then bolt the plate to the cross slide. Mount the work on the plate and clamp it securely in place with hold-down bolts. Use a right-hand shell mill mounted on a stub arbor. Next, shoulders are milled on the special tool-post clamping block as in Fig. 4. No dimensions are given on this part in Fig. 5 as it must be dimensioned to fit the tool-post T-slot on your lathe. The setup for milling flats on the locking stud is shown in Fig. 6. After milling one flat, the next cut is indexed by bringing the finished flat square with the base plate. In finishing the stud, break all corners where indicated.

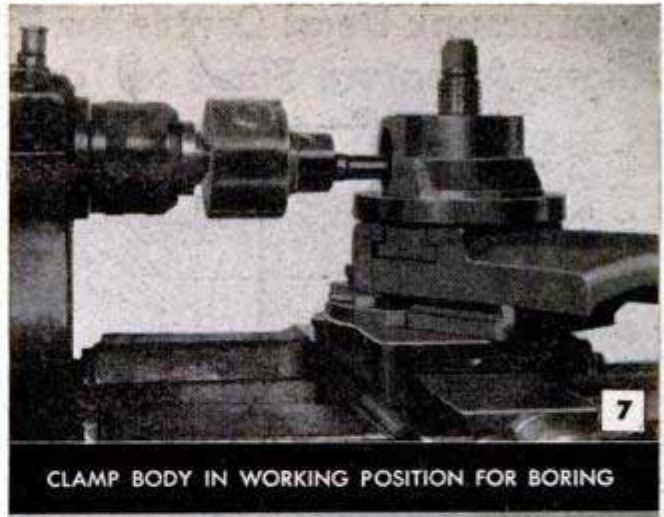
Now the body block can be mounted in working position on the cross slide and bored for the eccentric bushing as in Fig. 7. Use either an offset boring head, as shown, or a boring bar with fly cutter. The eccentric bushing, Fig. 5, is machined and ground to a slip fit in the hole bored in the block. Then bore the bushing off-



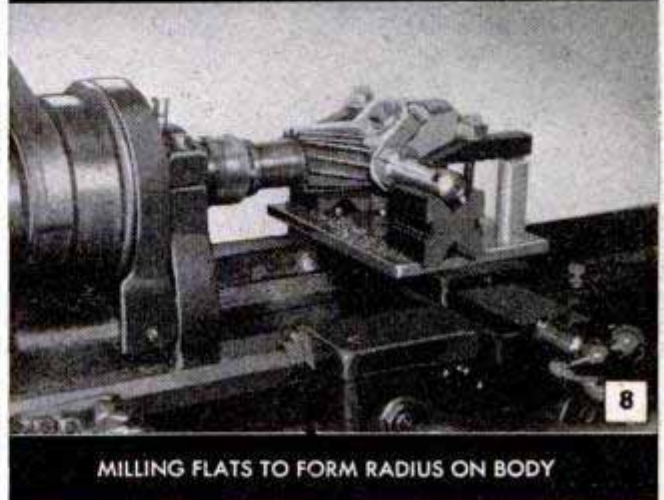
SETUP FOR MILLING FLATS ON STUD

center and ream or grind to a slip fit over the bar sleeve, Fig. 5. Knurl the bushing and drill stop holes $\frac{1}{4}$ in. from each end. Then saw the slot through the heavy side, using either the slitting saw on the milling machine or a hacksaw blade stoned to remove some of the set so that you get a smooth cut. Saw or mill slots from each end of the bushing to the stop holes and remove burrs on the inside and outside. Now the body can be finished by milling or sawing the clamping slot, Fig. 2. If you must use a hacksaw, two blades used side by side will give a slot of the correct width.

Squared holes at the ends of the boring bars are readily formed by first drilling $\frac{3}{16}$ -in. holes in the smaller bar and $\frac{1}{4}$ -in. holes in the larger bar. The holes are then cornered with a square file to very nearly the finished size, and are broached by driving through $\frac{1}{4}$ and $\frac{3}{16}$ -in. cutter bits, the ends of which have been ground square across. The clamping lever, Fig. 5, is made from $\frac{5}{8}$ x $1\frac{1}{2}$ -in. stock. The handle is turned between centers and the work is



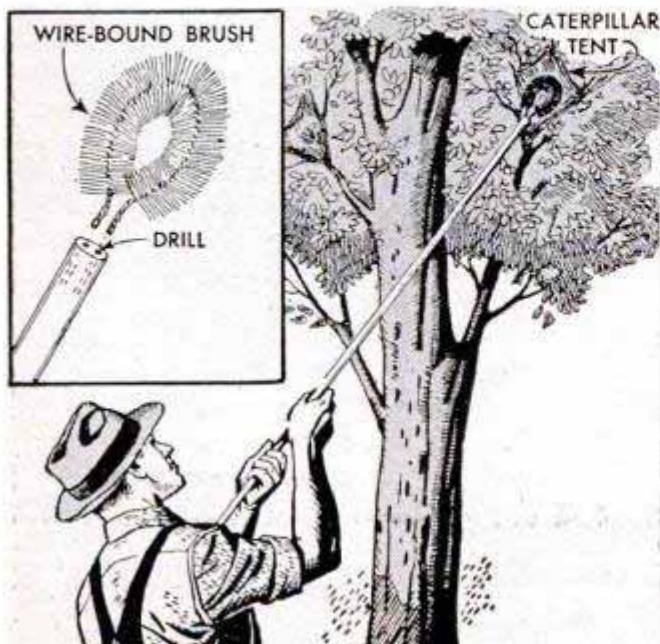
CLAMP BODY IN WORKING POSITION FOR BORING



MILLING FLATS TO FORM RADIUS ON BODY

chucked for facing, boring and threading the hub. This done, the hub is formed by sawing away the waste and filing to a smooth contour. As the final operation, the handle is heated and bent to a 10-deg. angle. Now the body can be finished by milling a series of flats, Fig. 8, across the front to rough in the $\frac{3}{4}$ -in. radius shown in Fig. 2. After milling, the surface is finished to a smooth curve by filing.

Caterpillar Tent on Fruit Tree Removed With Long-Handled Brush



Instead of endangering fruit or shade trees by burning caterpillar tents with a torch, just pull them off with a long-handled brush and drop them into a can filled with kerosene. A wire-bound brush having fairly stiff bristles is suitable for this purpose. The prongs of the brush can be pressed into holes drilled in the end of a broom or rake handle.

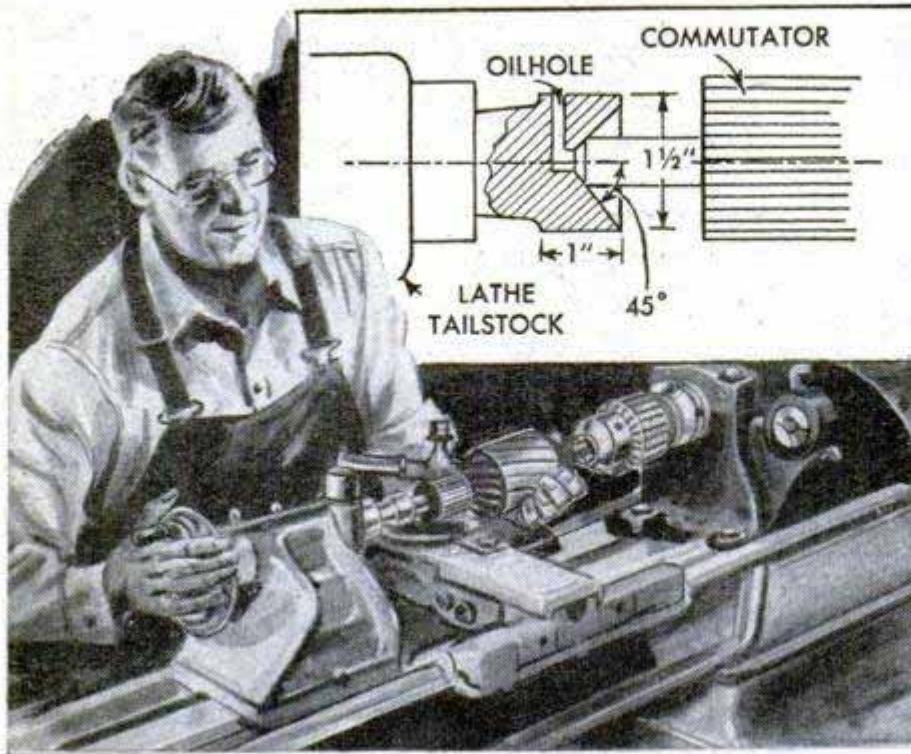
J. Modroch, Danbury, Conn.

Vibration of Power-Take-Off Shields Silenced by Inner-Tube Patches

The noisy vibration of power-take-off shields at certain tractor speeds can be muffled with inner-tube patches. Simply vulcanize a patch to one of the shields wherever another one vibrates against it.

P. R. Wilson, Brooklin, Ont., Can.

Countersunk Dead Center for Lathe Tailstock Aligns Armature Shaft to Turn Commutator



When turning the commutator on an armature shaft which does not have a center hole, one machinist uses a countersunk tailstock center to mount the work in the lathe. The center is countersunk as shown in the detail, and the shank of the center is turned to a standard taper to fit the tailstock spindle. The edges of the armature shaft are beveled by touching lightly with a file. Then, the work is chucked in the lathe, the tailstock center is brought in contact with the end of the shaft, and the sloping sides automatically center the work. Note that an oilhole for lubricating the bearing surface is drilled through the shoulder of the center.

Copper Pipe and Steel Flange Joined With Novel Silver-Soldering Method

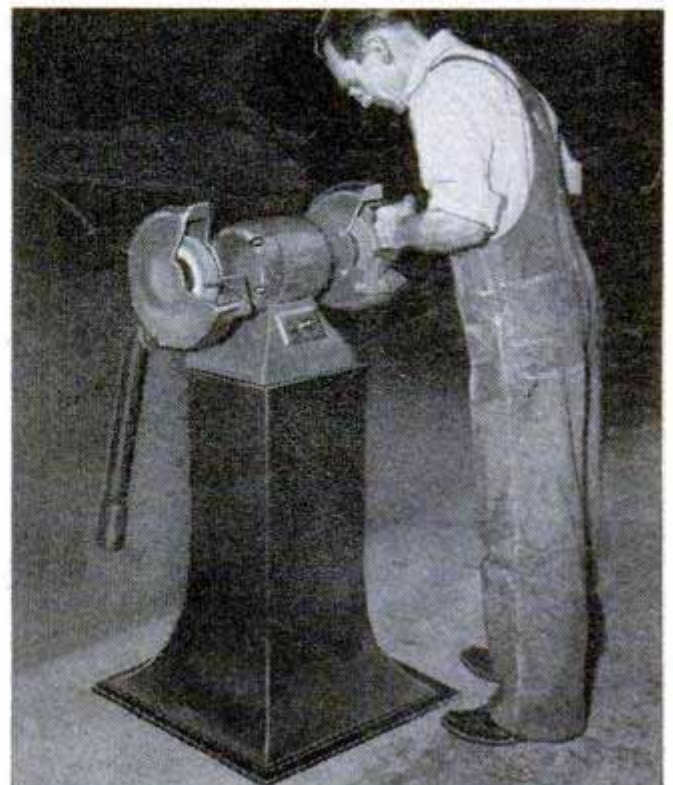
Having to weld a copper pipe to a steel flange, I first tried to do the job with the conventional technique for silver-soldering, using a rod having a high copper content and a melting point of about 1190 deg. F. This rod was selected because it produces a strong joint at a low temperature. As copper is a better heat conductor than

steel, it was extremely difficult to heat both of the materials to a uniform temperature. However, I found a solution to this problem simply by tinning the surface of the steel flange with silver solder and then silver-soldering the copper pipe to the tinned surface of the steel flange.

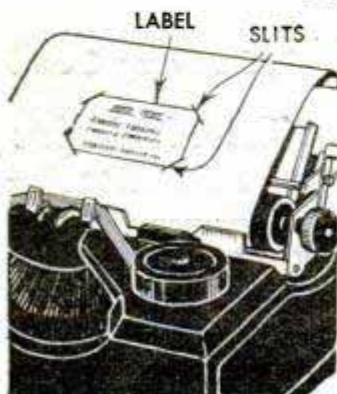
Cleon A. Wing, Mechanic Falls, Me.

Moving of Hollow Grinder Base Facilitated by Dumping Out Sand Ballast

Extremely free from vibration, this hollow grinder base is made of welded steel and weighted with sand. A steel bottom is welded inside the base slightly above the floor level, so that all weight rests on the edges of the base. The unit is then filled with sand which is dumped out when the base is to be moved any appreciable distance.—L. H. Houck, Jefferson City, Mo.



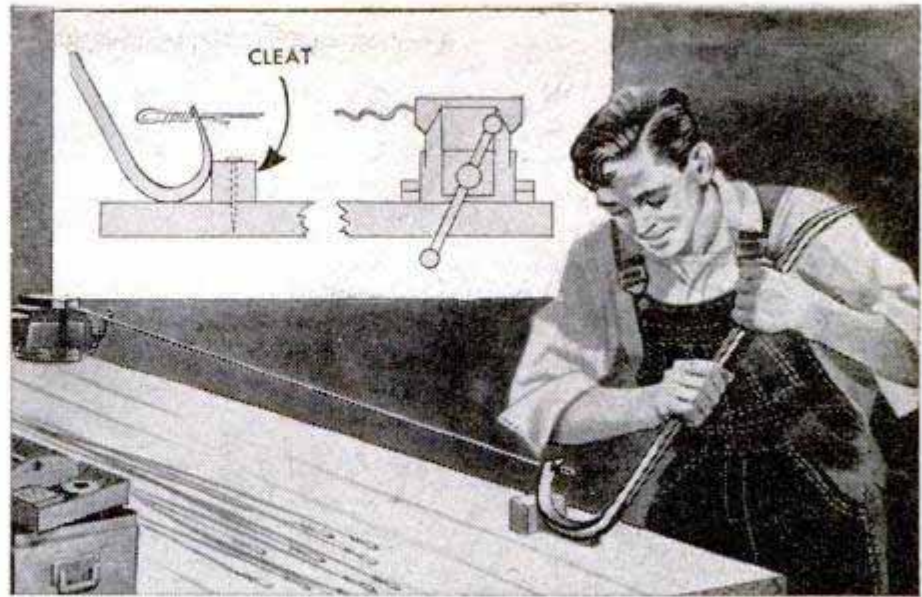
Labels Held in Typewriter



Labels won't slip in the typewriter platen if their corners are inserted in four diagonal slits cut in a sheet of paper. This will hold the labels securely and allow typing along their bottom edges without slipping.

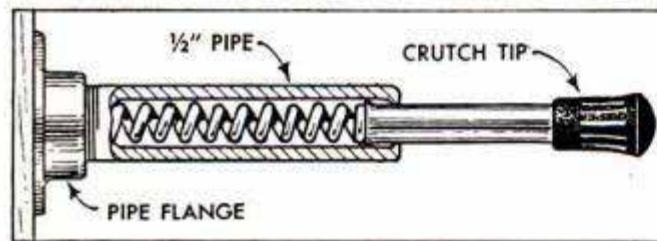
When salvaging baling wire for reuse, one farmer straightens the lengths quickly with the aid of a bench vise and wrecking bar. First, a wooden cleat is nailed to the bench top, being positioned so that its distance from the vise is slightly less than the length of the baling wire. Then, the looped end of a length of wire is slipped over the claw of the bar and the other end is clamped tightly in the vise jaws. With the cleat serving as a fulcrum, the wire is drawn taut simply by applying pressure with the wrecking bar.

Kinks Quickly Removed From Baling Wire By Using Bench Vise and Wrecking Bar



Spring-Loaded Bumper Compresses to Cushion Impact of Heavy Shop Door

In addition to being rubber tipped, this heavy-duty door bumper compresses to absorb and cushion the impact of a heavy door. It consists of five parts—a floor flange,



a pipe nipple, a light compression spring, a crutch tip and a short length of iron rod. One end of both the pipe and the rod is peened over slightly to form a lip. The peening must allow the rod to slide freely inside the pipe, and yet keep it from coming out. The opposite end of the pipe nipple is threaded for a floor flange and the outer end of the rod is capped with a crutch tip. The length of the spring should be sufficient to exert a slight pressure on the rod when the bumper is mounted.

W.T.M. Concrete

Eaves-Trough Sections Provide Molds for Pouring Concrete Fence Posts

Sections of discarded eaves trough supply inexpensive molds for pouring reinforced-concrete fence posts. The eaves trough is cut into 6-ft. lengths and the ends are blocked with pieces of wood shaped to fit, the blocks being fastened with nails driven through the sides of the trough. After the molds are oiled to keep the concrete from sticking, the concrete is poured and the reinforcing rods added. The posts should be allowed to cure for several days before they are used.

Charles E. Mason, California, Mo.

Making Cloth Gloves Last Longer

My work as a sheet-metal mechanic requires using soft cloth gloves which usually wear out within a few days. However, I make them last three times as long by dipping the thumbs and first two fingers in waterproof glue and rubbing sawdust in the glue. The glue must be thoroughly dry before the gloves can be used.

A. P. Washlake, Detroit, Mich.

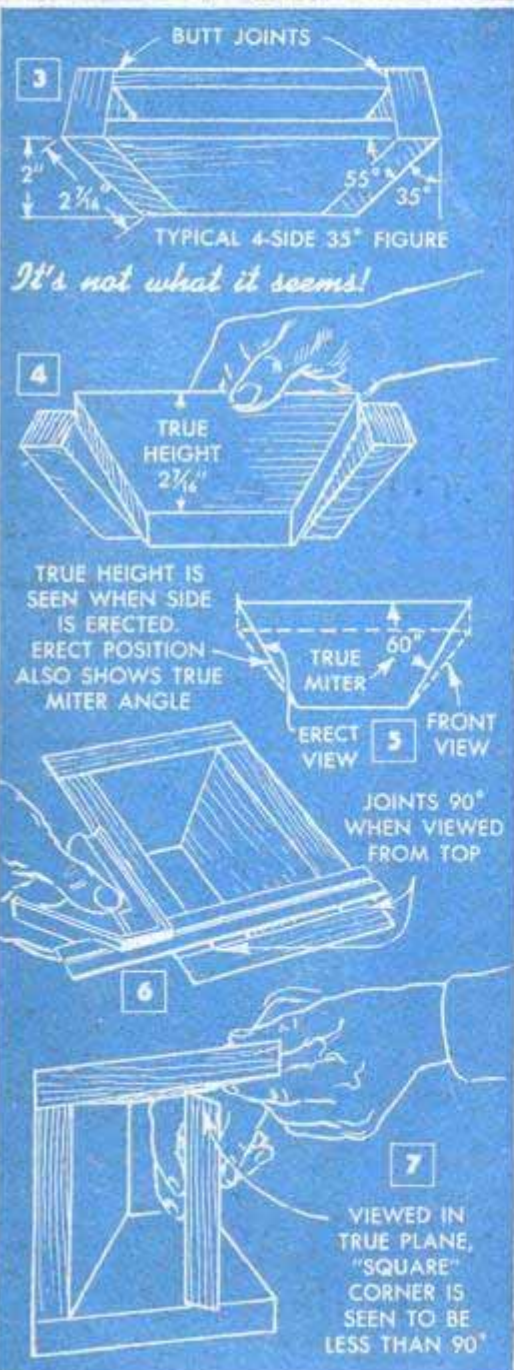




1 PICTURE FRAME IS 4-SIDE MITER AT 45°



2 TRAY TABLE TOP LEANS OUTWARD AT 25° ANGLE



COMPOUND CUTS

By Sam Brown

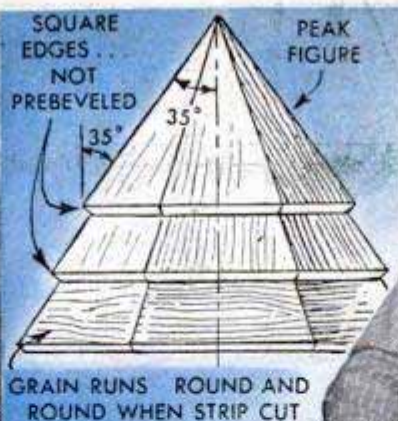
IN MAKING a compound cut with a circular saw, a miter and a bevel are cut in the same operation. The compound-angle cut is required when sawing the parts of any box or open framework having sloping sides. Typical examples of this type of joinery are shown in Figs. 1, 2 and 8. The angles do not show on an ordinary plan drawing and, even when you examine a finished job, the angles are not what they seem.

Laying out: As viewed from the front, the simple box in Fig. 3 is 2 in. high and the sides seem to be 35 deg. from vertical. Joints appear to be cut at a 90-deg. angle, but a study of Figs. 4 to 7 will show that you could not cut a compound corner joint, or "hopper" joint as it is sometimes called, by following these measurements. The true height of the box sides is 2 7/16 in. and not 2 in. The miter angle is 60 deg. instead of 55 deg. What appears to be a square butt joint is cut at 70 1/2 deg. instead of 90 deg. These angles are determined simply by consulting a table, Fig. 23, which gives the required tilt of the saw table and the swing of the miter gauge in degrees for sawing a number of common compound angles. The example, Fig. 3, is a butt-joint job with the sides slanting at 35 deg. The table, Fig. 23, shows that the saw table must be tilted 19 1/2 deg. and the miter gauge set to 60 1/4 deg. to produce the joint.

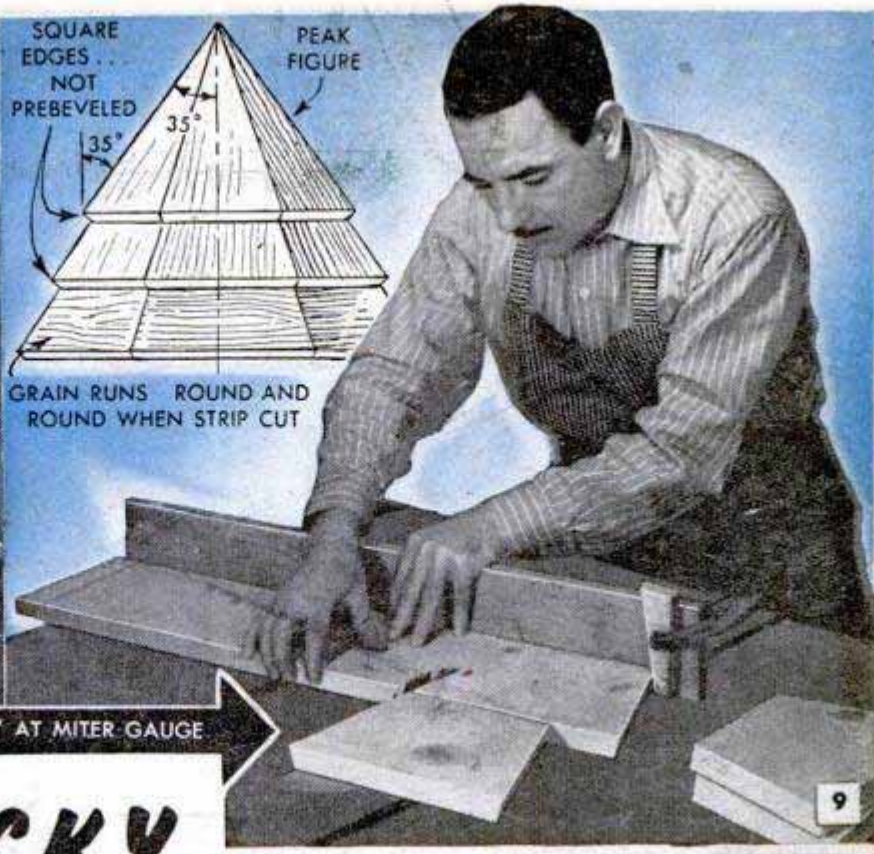
Sawing the parts: The parts for a box or frame can be cut from several individual pieces or continuously from one board. Strip cutting is nearly always preferred as it is simple and saves material. Fig. 9 shows the lower course of a birdhouse roof being cut from a single strip, the board being simply turned over for alternate cuts. All parts of such a structure as the birdhouse roof, Fig. 10, must be cut



8



GRAIN RUNS ROUND AND ROUND WHEN STRIP CUT



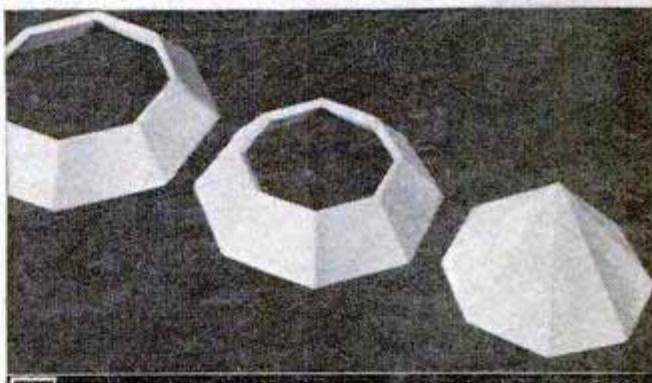
9

8-SIDES, 35° MITER TAKES 18 1/4° TILT AND 76 1/2° AT MITER GAUGE

ARE TRICKY

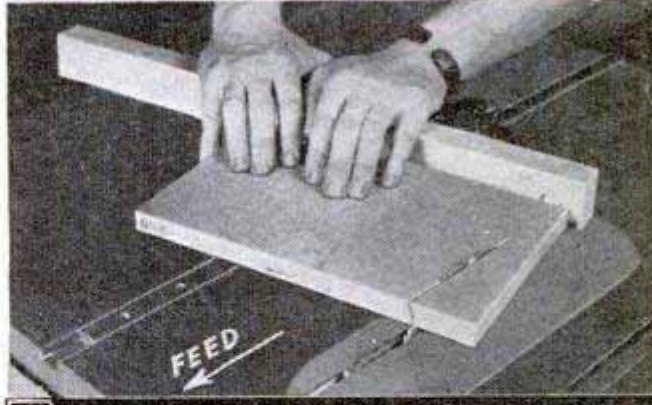
at the same setting. Figs. 11 and 12 show how the miter gauge is used when the pieces are individually cut. Note that the gauge remains at the same setting but is reversed, that is, turned around and used backwards, for the second cut in order to support the wide side of the work against the miter-gauge facing. In this case, the saw is a tilting-arbor type, the blade tilting to the right. To clarify this alternate use of the miter gauge, two sets of details are given in Fig. 13.

Miter-gauge positions: The right-hand details in Fig. 13 are for a tilting-arbor saw with the blade tilting to the right. The left-hand diagrams are for tilting-table saws or tilting-arbor saws on which the blade tilts to the left. Although the details are identical, they are lettered differently to correspond to instructions in the notes. The four standard positions are common to all miter cuts and the two sets of positions, A and B, and C and D, are pairs worked by shifting the miter gauge from one table groove to the other. Use any of the four positions shown for strip work or large individual pieces. In some instances, it will be necessary to use definite miter-gauge positions instead of using any of the four regular positions at will. A common limitation of this kind is caused by the use of pre-beveled boards. The boards are beveled, of course, to make the bottom and top edges of the box flat. As an example, the box sides shown in Fig. 3 are beveled at 35 deg., which is the same as that specified for the inclination of the sides. The details in Fig.



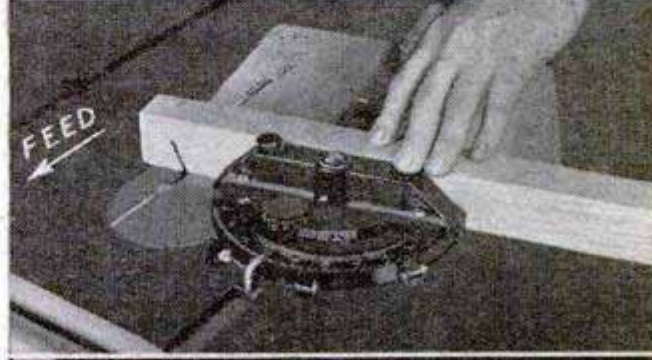
10

ALL PARTS ARE CUT AT SAME SETTING



11

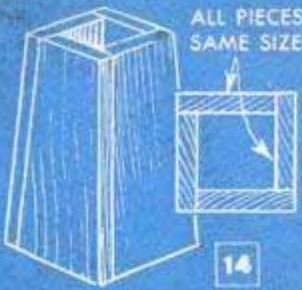
FIRST POSITION FOR PEAK OR SHORT BASE WORK



12

SECOND POSITION—WIDE END IS SUPPORTED

13 MITER-GAUGE POSITIONS FOR COMPOUND CUTS



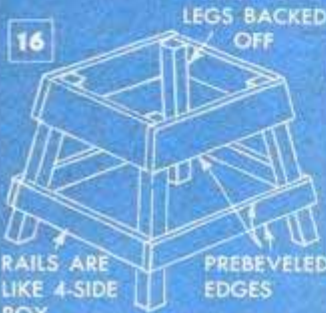
14

OVERLAPPING ASSEMBLY OF BUTT JOINTS MAKES A SQUARE FIGURE WITH SAME SIZE PIECES



15

FENCE-POST TOPS COME TO A PERFECT PEAK IF JOINTS ARE MITERED. ANGLE IS 35° OR 40°

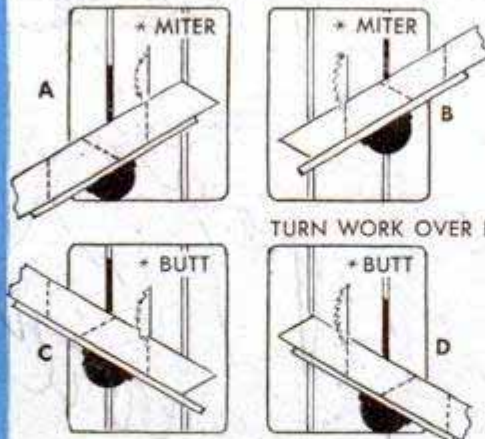


16

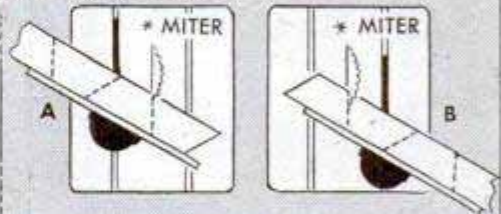
PEDESTAL STANDS AND SAWHORSES INVOLVE SAME ANGLES AS A 4-SIDE BOX

POSITIONS FOR TILTING TABLE SAWS OR LEFT-TILTING ARBOR

POSITIONS FOR TILTING-ARBOR SAW WITH RIGHT-HAND TILT

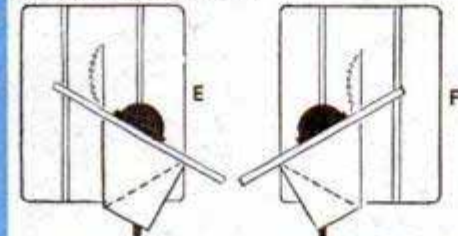


TURN WORK OVER FOR ALTERNATE CUTS

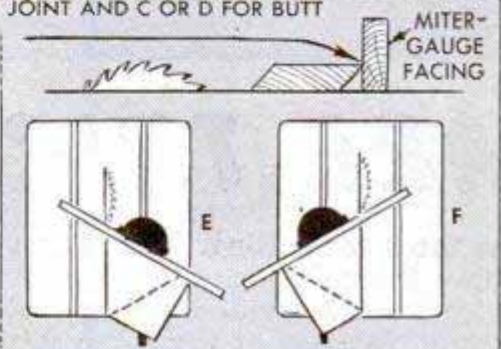


Four Standard Positions... USE ANY POSITION FOR STRIP WORK OR LARGE INDIVIDUAL PIECES NOT PREBEVELED. IF EDGES ARE PREBEVELED, USE POSITION A OR B FOR MITER JOINT AND C OR D FOR BUTT JOINT ... THIS KEEPS BEVELED EDGE UP

MAKE SECOND CUT WITH C POSITION



(COMBINE WITH C) (COMBINE WITH B)



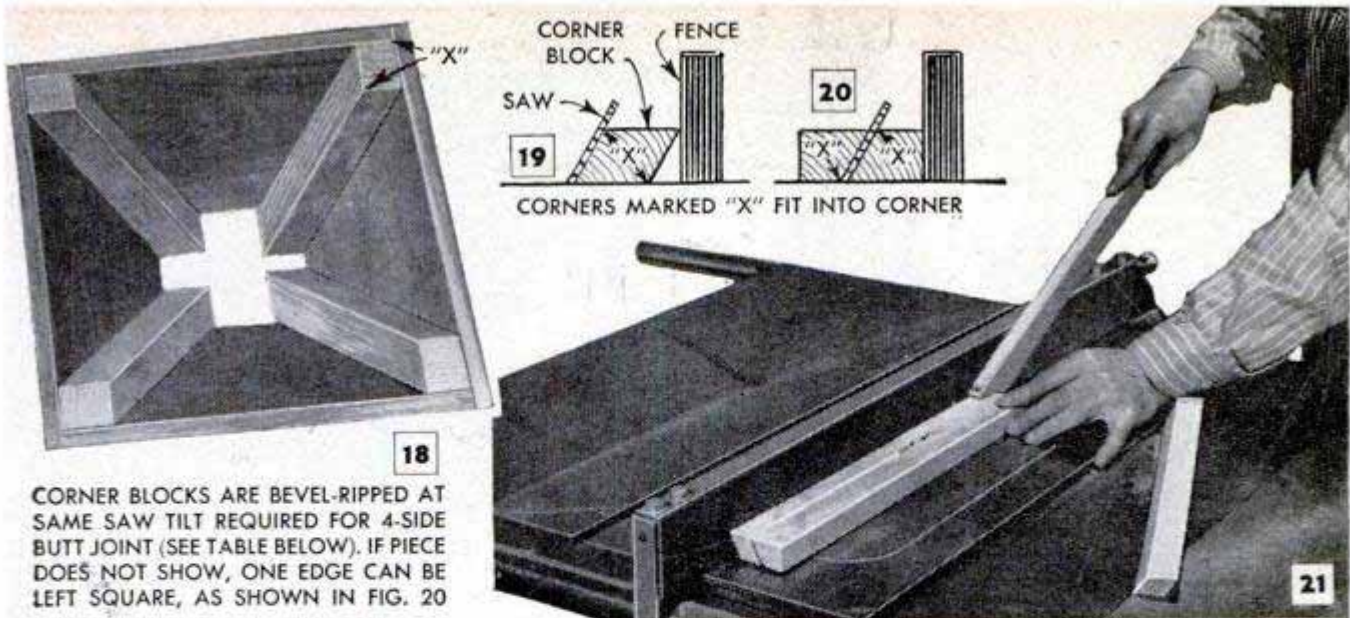
(COMBINE WITH A) (COMBINE WITH D)

Two Special Positions... ARE USED FOR PEAK OR SHORT BASE WORK. EITHER OF THESE POSITIONS WILL KEEP WIDE SIDE OF WORK AGAINST MITER GAUGE. IF WORK IS PREBEVELED, THE BEVEL WILL BE UP FOR ONE CUT BUT DOWN FOR THE OTHER



17 TILTED TABLE LEGS UP TO 10° ANGLE ARE USUALLY WORKED "IN THE SQUARE" AND WITH TOPS AND BOTTOMS CUT AT TILT AND MITER GAUGE SETTINGS EQUAL TO SAME ANGLE AS WORK. JOBS REQUIRING OVER 10° TILT SHOULD BE BACKED OFF AND OTHERWISE TREATED THE SAME AS A CORNER BLOCK. (SEE OPPOSITE PAGE)

13 show that only two of the four positions can be used for prebeveled work, that is, if the corner of the bevel is to bear against the miter gauge with the sharp corner up. Another limitation will turn up when cutting parts from individual boards to form a peak. In this instance, the work has only one base and this must be held against the miter-gauge facing for both cuts. In this case, either the E or F position, Fig. 13, may be used. When a peak is to be cut from individual prebeveled boards, the long side of the work must be held against the miter-gauge facing for both cuts, and the bevel must be up for both cuts. On a tilting-table saw, use positions B and E, Fig. 13, if the joints are mitered, or C and F if the joints are butted. On a right-hand tilting-arbor saw the positions are A and F for a miter joint and D and E for a butt joint. These combinations permit the gauge to be used on the same table groove but require a swing of the gauge from one side to the other as the alternate cuts are made. Although the instructions may seem complicated, they actually are quite simple if you just forget those which do not apply to your type of saw and refer only to the six positions in Fig. 13 which apply to your particular type of machine.



18

CORNER BLOCKS ARE BEVEL-RIPPED AT SAME SAW TILT REQUIRED FOR 4-SIDE BUTT JOINT (SEE TABLE BELOW). IF PIECE DOES NOT SHOW, ONE EDGE CAN BE LEFT SQUARE, AS SHOWN IN FIG. 20

CORNER BLOCK FENCE SAW 19 CORNERS MARKED "X" FIT INTO CORNER 20

21

Corner blocks: Corner blocks are often required to stiffen the joints of a box such as that shown in Figs. 14 and 18. Simply bevel-rip the material with the blade tilted to the same angle as that required for a four-sided butt-joined box, Fig. 23. Fig. 21 shows the operation. The second bevel cut is run as in Fig. 19. If the blocks do not show in the finished work, a single ripping cut will make two corner blocks, Fig. 20. Top and bottom ends of the blocks are cut as in Fig. 22. The miter-gauge setting is taken from the table but the tilt of the saw table remains the same as when making the ripping cuts.



22

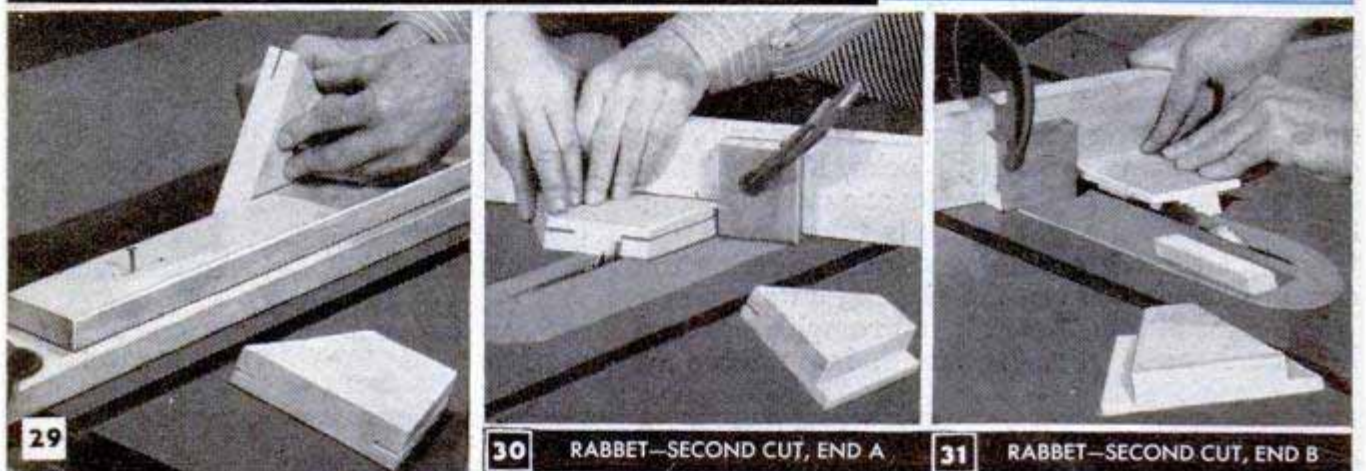
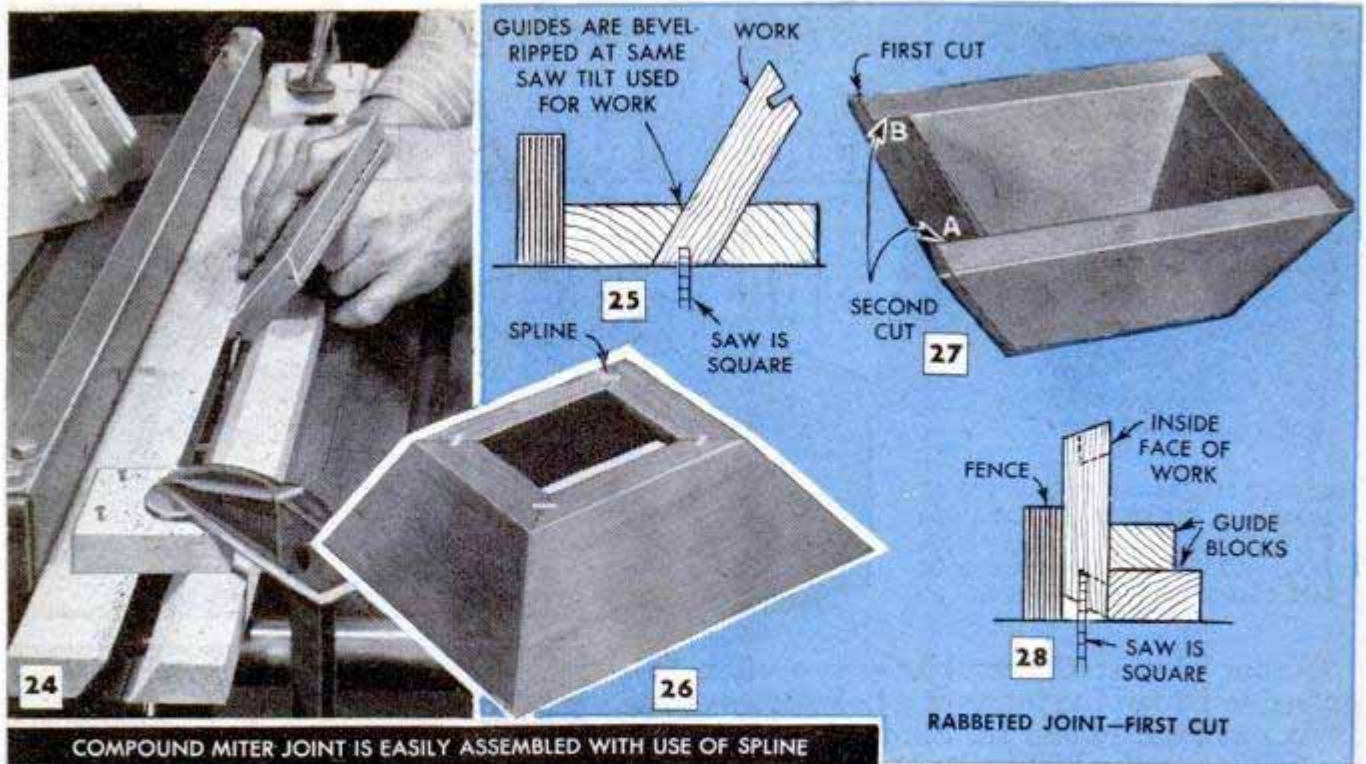
Pedestal stand: Any structure with splayed legs such as a pedestal stand, lamp table or

TOPS AND BOTTOMS OF CORNER BLOCKS ARE CUT WITH MITER-GAUGE SETTING FROM TABLE. SAW TILT IS SAME AS WORK ANGLE. (NOT TAKEN FROM TABLE)

23 TILT AND MITER-GAUGE SETTINGS FOR COMPOUND ANGLES

Work Angle	4 Sides Butt Joint		4 Sides Miter Joint		6 Sides Miter Joint		8 Sides Miter Joint	
	Tilt Table	Miter Gauge	Tilt Table	Miter Gauge	Tilt Table	Miter Gauge	Tilt Table	Miter Gauge
5°	½	85	44¾	85	29¾	87½	22¼	88
10°	1½	80¼	44¾	80¼	29½	84½	22	86
15°	3¼	75½	43¾	75½	29	81¾	21½	84
20°	6¼	71	42	71	28¼	79	21	82
25°	10	67	40	67	27¼	76½	20¼	80
30°	14½	63½	37¾	63½	26	74	19¼	78¼
35°	19½	60¼	35¾	60¼	24½	71¾	18¼	76¾
40°	24½	57¼	32¾	57¼	22¾	69¾	17	75
45°	30	54¾	30	54¾	21	67¾	15¾	73¾
50°	36	52½	27	52½	19	66¼	14¼	72½
55°	42	50¾	24	50¾	16¾	64¾	12¾	71¼
60°	48	49	21	49	14½	63½	11	70¼

FIGURES ARE IN DEGREES AND ARE FOR DIRECT SETTING TO TILT SCALE AND MITER GAUGE. SCALE PROVIDING TILT STARTS AT 0° AND MITER GAUGE AT 90° IN NORMAL POSITION.



sawhorse, is worked out at the same angles as a box figure of the same general dimensions. Figs. 16 and 17 are typical examples of this type of work. A common procedure in making a pedestal like that in Fig. 16 is to make the rails first and assemble them. Then back off the legs on two opposite sides and make the angle cuts at the top and bottom ends of the legs. On the simple pedestal shown in Fig. 16, an average slope of the legs would be 15 deg. Taking this as the basic angle, you will see by referring to Fig. 23 and to the work itself that the rails are prebeveled 15 deg. The compound setting for the rails would be made by tilting the saw table $3\frac{3}{4}$ deg. and the miter gauge $75\frac{1}{2}$ deg. The legs would be backed-off $3\frac{3}{4}$ deg., and the top and bottom ends cut with a $75\frac{1}{2}$ -deg. miter-gauge setting and a 15-deg. saw-table tilt.

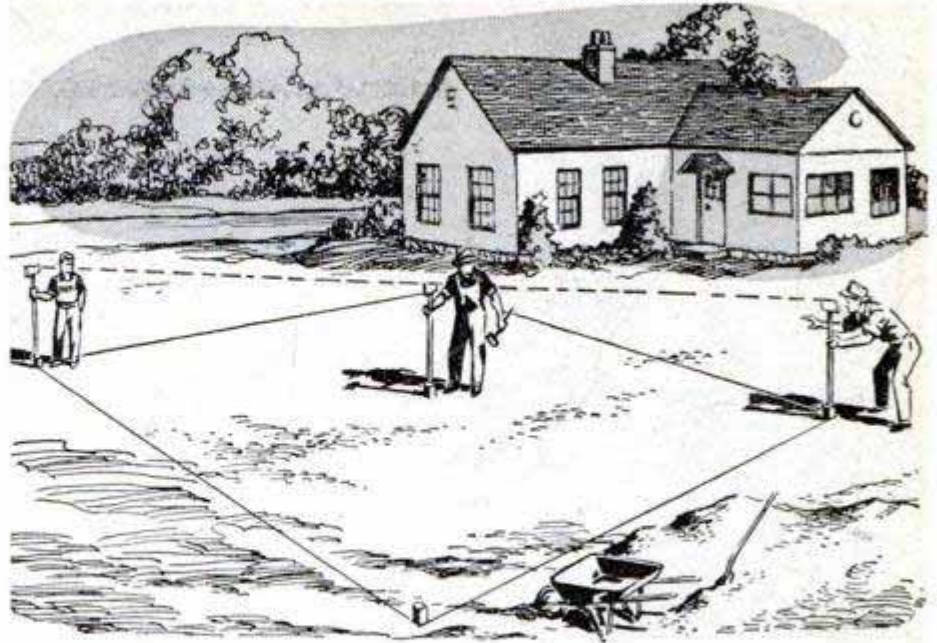
Types of joints: Rough work assembled with compound joints usually is simply butted and nailed. Screws and glue can be used where greater strength is required, but the finer work, such as the picture frame in Fig. 1, the birdhouse roof in Fig. 8,

and jobs like those in Figs. 15 and 26, require a plain mitered joint or a mitered joint fitted with a spline. Run the spline grooves as in Figs. 24 and 25, using the simple fixture in the manner pictured. Rabbeted joints are cut in two passes, the first cut being from the end of the work as in Figs. 28 and 29. The second cut parallels the end surface and is made at the same tilt and miter-gauge settings as were used in cutting the joint. Limitations are that the inside surface of the work must be down and the wide end of the work must bear against the miter-gauge facing. If the piece is small, the gauge must be swung to the opposite side and it must be used backward when making one of the cuts. Fig. 30 shows the end A, Fig. 27, being cut in the conventional position. Fig. 31 shows the same cut on end B being made with the gauge reversed. Always use a sharp saw blade with a medium set for all bevel cuts.

Ⓞ Instead of scrubbing hearth tiles, rub them with furniture polish. They will look much cleaner and take on a splendid polish.

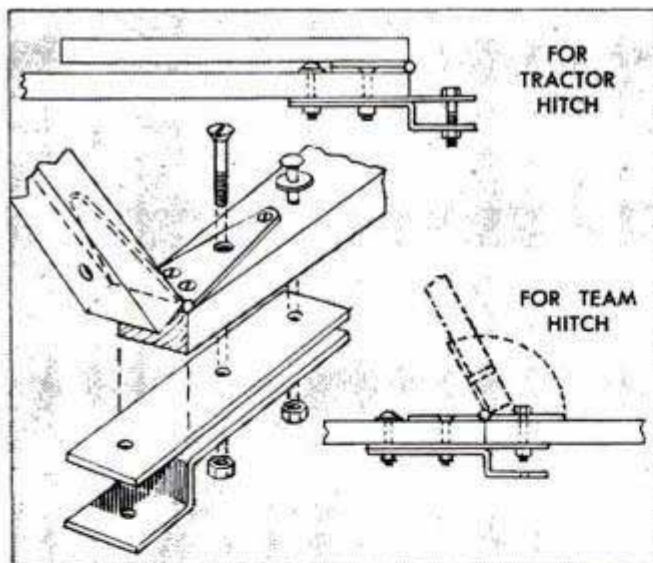
Wooden Tees Facilitate Grading Small Lot Evenly

Having to fill in my back yard for a lawn and garden, I obtained an evenly graded lot in a comparatively short time by using three wooden tees to level the tops of stakes driven into the ground. The tees were made by nailing 8-in. crosspieces to boards 4 ft. long, special care being taken to make all three of them exactly the same length. First, I drove a stake at each corner of the area to be filled and left the stakes extending above ground a distance equal to the desired depth of fill. With two friends helping me, I set a tee upright on one corner stake and another tee on the stake at the opposite corner. Next, we drove a stake at the center of the area and stood a tee on it. By sighting over one of the corner tees and across the top of the center tee to the tee at the opposite corner, we drove in the



center stake until the top of the center tee was exactly level with the tops of the other tees. The tops of the stakes, in turn, were also level. Proceeding in the same way, we drove stakes about 6 ft. apart throughout the area. Then it was simply a matter of filling in with dirt to the tops of the stakes.

Harry Ingole, Kingsford Heights, Ind.



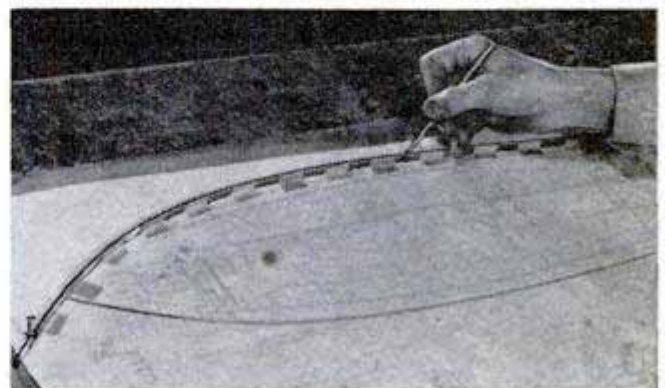
Tongue for Tractor or Team Hitch Is Hinged and Fitted With Clevis

Hinged and fitted with a flat-iron clevis, this dual-purpose wagon tongue is quickly adapted for use with either a tractor or team. To expose the clevis for hitching to a tractor, a bolt, which secures the front section of the tongue to the upper member of the clevis, is removed and the tongue is folded back. The same bolt serves as a pin for the hitch. The strap hinge is fastened with flat-headed screws and the bolt, which is flat-headed also, passes through the hinge leaf to attach the clevis to the underside of the tongue. This allows the front section of the tongue to fold back flatly.

Plastic Strip Secured by Masking Tape Provides Naval-Architect's Spline

When fairing lines on a boat drawing, an inexpensive substitute for a naval-architect's spline and ducks can be improvised from a strip of plastic which is held in place on the drawing with tabs of masking tape. The plastic strip should be approximately $\frac{1}{16} \times \frac{3}{8} \times 30$ in. and the tabs are spaced 2 in. apart along the full length of the strip as shown in the photo. A pin pressed into the drawing board at each end of the strip helps hold the shape of the curve.

Eldon Schiel, Chicago.



Posts of Electric Fence Anchored With Mower Sections



Inexpensive posts for an electric fence are made by welding discarded mower sections to 4 or 5-ft. lengths of angle iron. One section is welded near the lower end of each post to anchor it in the ground and another section is welded to the upper part of the post for each run of fence wire. Porcelain insulators are attached by bolting them through the rivet holes in the mower sections.—Asa F. Miller, Sabetha, Kans.

Carrying Case From Lunch Box Holds Electric Drill

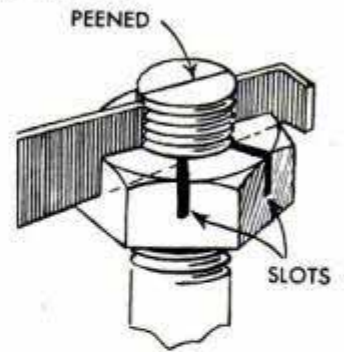
A metal lunch box forms a compact carrying case for a portable electric drill and its accessories, or, if the drill is kept in the shop, the box provides a handy storage



container. The Thermos bottle in the cover of the box is replaced with a tennis-ball container to hold drill bits and accessories.

Wedge Locks Nut on Bolt

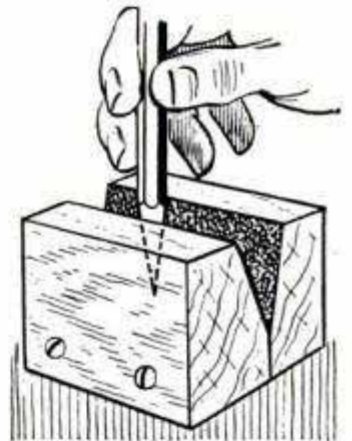
Here is a simple way to lock a nut permanently on a bolt when a lock washer is not available. First cut a deep slot across the end of the bolt and three shallow slots across the top of the nut, forming six castellations.



The slot in the bolt should be closed by peening over the edges. With the nut tightened, drive a tapered sheet-metal wedge in one of the slots in the nut and through the slot in the bolt. Then bend over the narrow end of the wedge to keep it from slipping out of the slots.

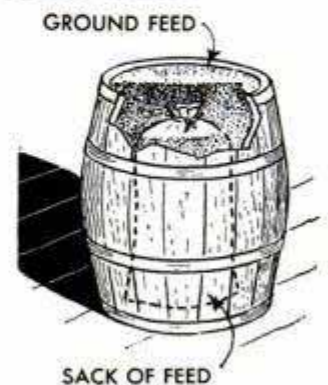
V-Sander Collects Pencil Dust

To sharpen pencils without getting dust on fingers and drawing board, one artist uses this novel V-sander. It consists of two wooden blocks screwed together. The adjoining faces of the blocks are beveled to suit the taper of the pencil and covered with sandpaper glued in place. To sharpen the pencil, the point is inserted in the vee and the pencil rotated with the fingers.



Dry Storage for Grass Seed

If grass seed is stored for any length of time, it must be protected from the moisture in the air to prevent spoiling. This is done by placing the sack of seed in a barrel and filling the barrel with ground feed. A layer of feed should be poured over the bottom of the barrel before the sack is inserted and the top of the sack should be completely covered.



SQUEEZING-IN THAT NEW CAR

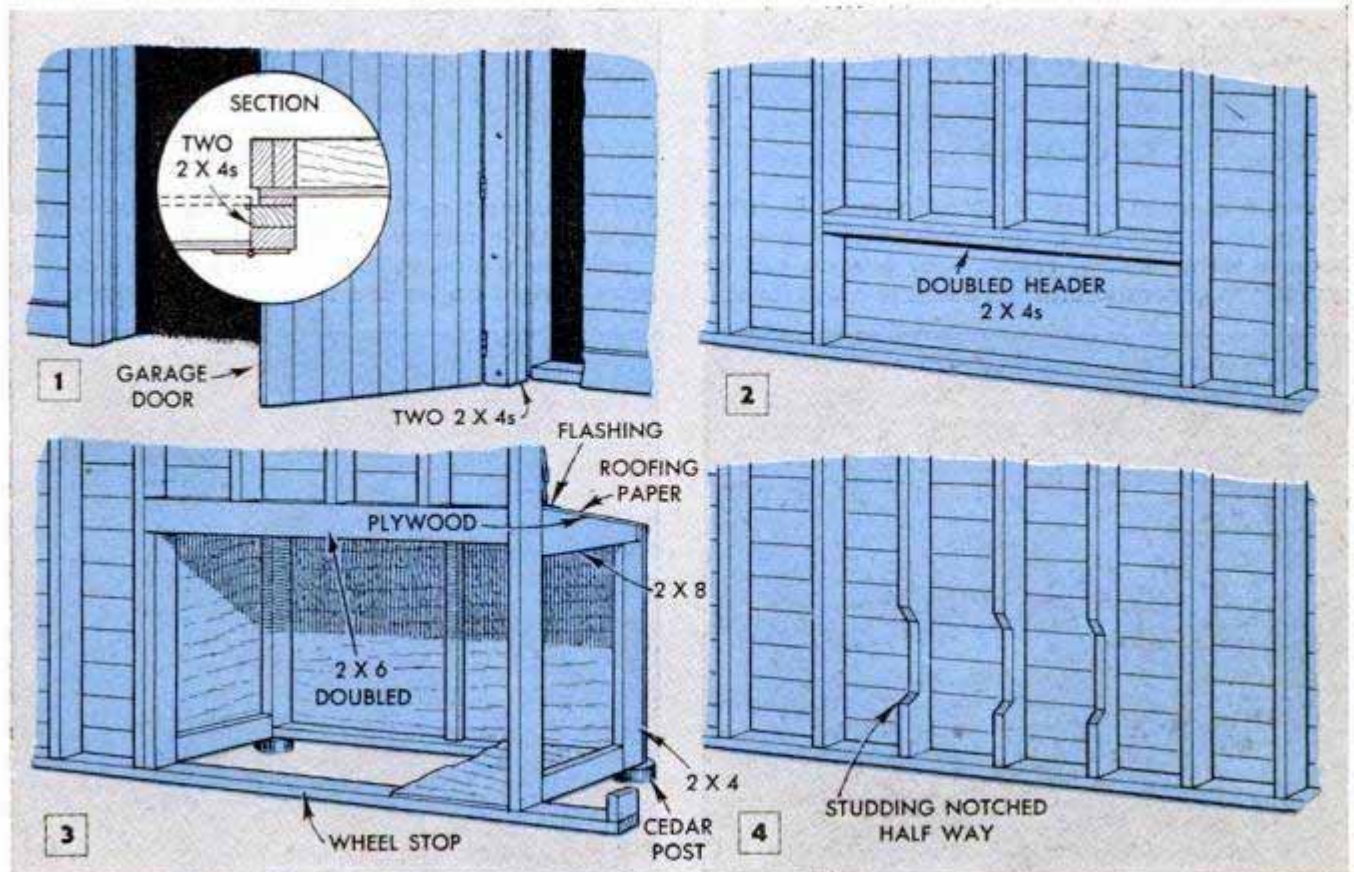
By Richard Hanscom

NEW CARS and old garages just don't go together. Whether the rear bumper extends an inch or a foot beyond the wall line, the problem is essentially the same—how to gain the extra space needed to close the doors. In some cases, the doors will close but the short length of the building leaves no room for walking around the car to the side door. Easing into such a restricted space without knocking out the rear wall of the building is an added inconvenience, especially when the car is used every day.

There are several ways of stretching an old garage so that new car will fit in it with room to spare. The method used will depend on the construction of the building, the type of doors used, and the amount of room needed. If, for example, the doors swing outward and it happens that the car bumper extends only 3 or 4 in., building out the door jambs, as in Fig. 1, will give the required space. To do this, the doors are removed and two 2 x 4s are spiked or bolted to the sides and across the top of the doorframe directly over the trim boards, as shown in the detail. This arrangement gives the maximum space. Provide a wide sheet-metal drip cap across the top to prevent leakage. Then paint all the new woodwork and rehang the doors. It may be necessary or desirable to build out the ramp

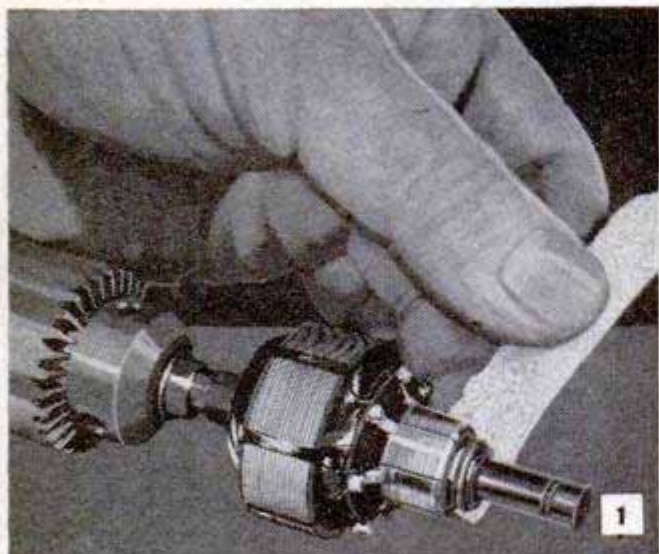


to close an open space under the doors. When an overhead door has been installed or where the doors are of the folding type that rolls on an overhead track along the inside of one wall, about the same amount of space can be gained at the rear wall of the building by using the methods shown in Figs. 2 and 4. Where still more room is required, the lean-to structure detailed in Fig. 3 is the most practical solution. This is built high enough to clear the car hood. Use of waterproof plywood sheathing and flooring simplifies and speeds up this job.

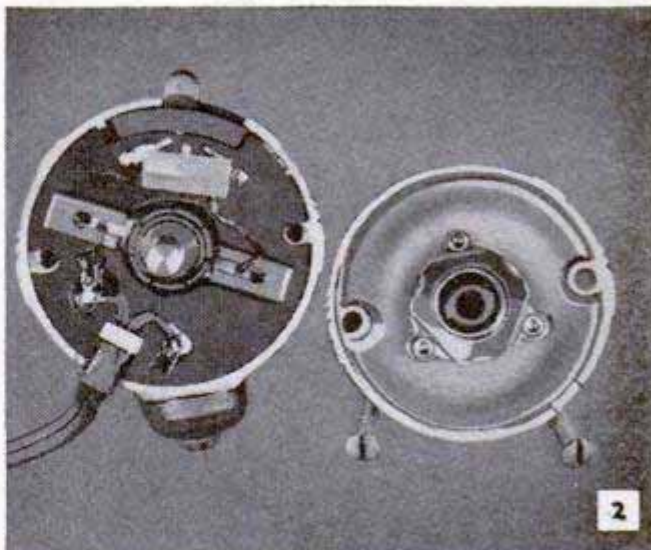




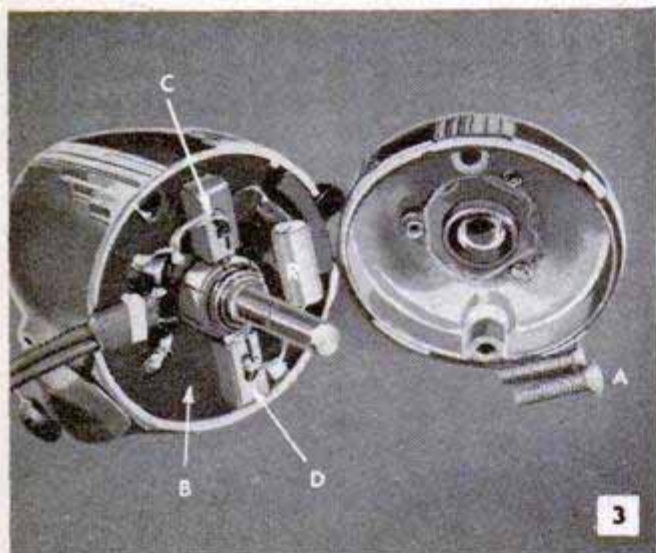
Electric-Fan



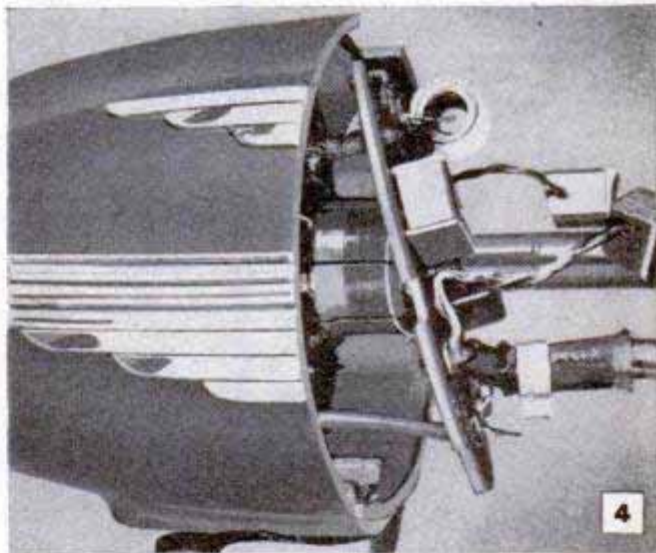
If the brush track on the commutator is badly carboned, it can be cleaned with ordinary fine sandpaper. Do not use any other abrasive for this work



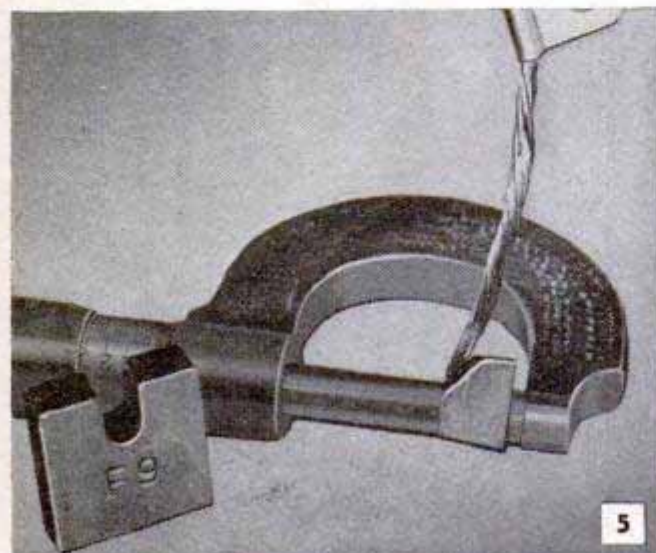
This is what you'll find inside a typical electric-fan motor when the end shield is removed. On some motors, wires are unsoldered to free the brush plate



Above, a common cause of motor failure is jamming of the brush pigtails in the holders when brushes become worn. Below, replacement brushes can be made from generator brushes. Measure brush for size



Above, in most small fan motors, the brush-holder plate must be removed to free the armature. Below, attach the pigtail to replacement brush by drilling holes at right angles and then anchoring with solder



Trouble Shooting

By C. E. Packer

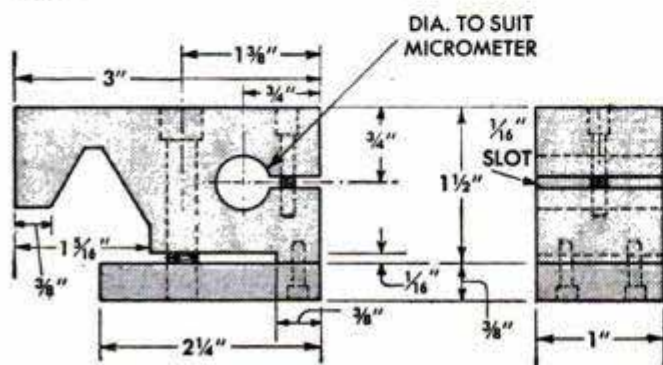
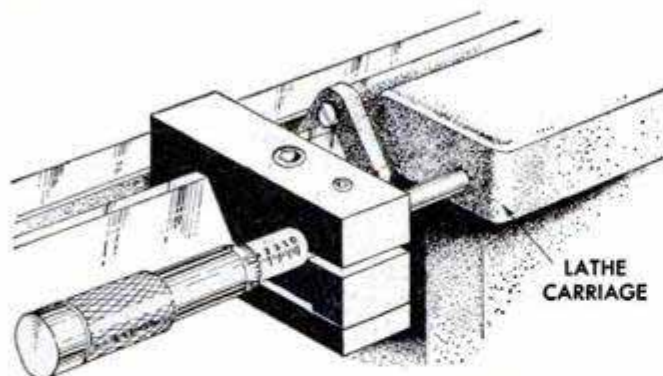
FAILURE of small electric-fan motors usually is due to four common causes—lubricant hardened or dried, bearings clogged with dust, brushes worn short and a loose connection. Any one of these can put the motor temporarily out of service. Most small fan motors can be dismantled quite easily by first removing the wire guard, the fan unit and the motor end shield. On some fan motors, it will be necessary to unsolder wire leads before the brush-holder plate can be removed. On others, this is not necessary. Fig. 2 shows a common arrangement of parts on the brush-holder plate. After removing the two screws, A in Fig. 3, work carefully in removing the end shield or damage may result. Removing the end shield generally exposes the brush-holder plate, B, the brush holders, C and D, and the resistance unit, R. Excessive wear of the brushes frequently causes the brush pigtails to jam in the holders, thus interfering with proper brush contact on the commutator. If the brushes are so badly worn that the pigtails jam or the follower springs no longer bear on the top ends, then they should be replaced. If new brushes are not readily available, replacements can be made from



common generator brushes. Make the old brush as in Fig. 5 to get the exact size. Then cut the generator brush to these dimensions and drill for the pigtail as in Fig. 6. Drill another hole at right angles through the first one and anchor the pigtail with solder. If the commutator brush track is badly carboned, it must be cleaned. Remove the holder plate, Fig. 4, and also the armature. Then mount the armature in a drill chuck, and clean and true the commutator with a piece of fine sandpaper as in Fig. 1. Clean the armature bearings with a solvent, such as kerosene, and apply new lubricant before reassembling the motor.

Micrometer Stop for Lathe Carriage Facilitates Precision Machining

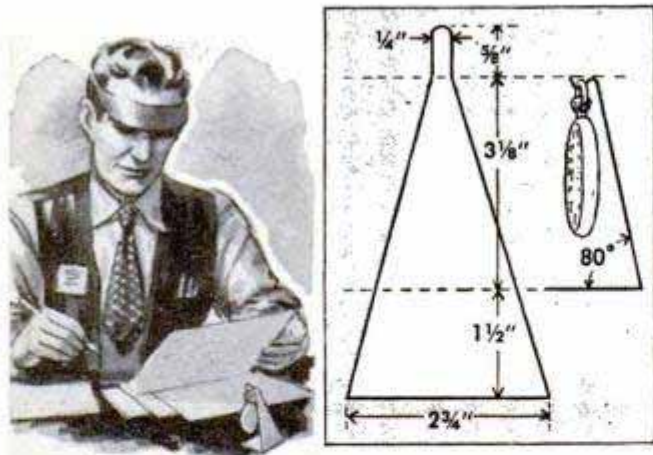
When doing precision facing, depth boring and duplicate shouldering in the metal lathe, a micrometer carriage stop is essen-



tial. It's easy to make one by using a micrometer-caliper head, a head with a ram travel of 0 to 1 in. being sufficiently large for average use. The mike head is supported in a clamp-type holder made from tool steel. One end of the holder is profiled to fit over the outer V-way of the lathe bed. It is held in place by a clamp lug which is drawn against the bottom of the V-way by a socket-headed binding screw inserted from the top through a counterbored clearance hole drilled in the holder body. The screw turns into a tapped hole in the lug. A 1/16-in. offset milled, or filed, across the bottom of the holder permits sufficient movement of the lug. Next, a hole is drilled transversely through the body of the holder to take the graduated barrel of the mike head. The holder body is then slotted through the center line of this hole and a socket-headed binding screw is provided for locking the mike in place. For a neat job, the body of the holder is finished over its entire surface and all screw-holes are counterbored.

Edward S. Barrows. Philadelphia, Pa.

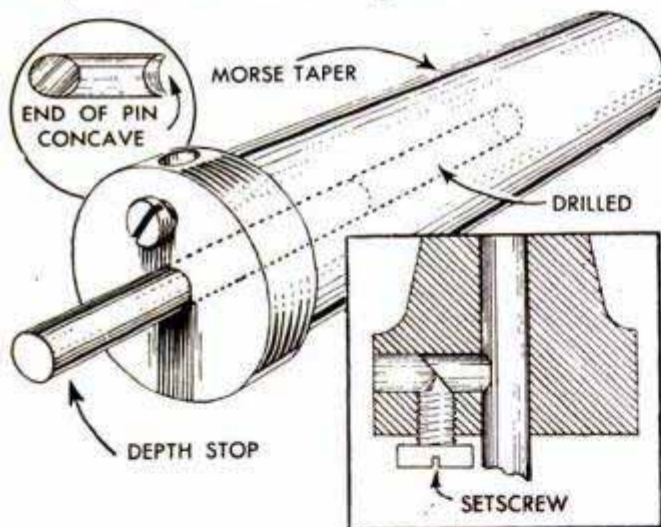
Metal Stand Holds Pocket Watch In Convenient Position on Desk



Particularly useful for transportation dispatchers, this little desk stand holds a pocket watch so that the time can be checked frequently without glancing up at a wall clock. The stand is made in a few minutes by cutting it from a tin can or sheet aluminum and bending as shown in the detail, forming a hook at the top.

Robert V. Dee, Chillicothe, Ohio.

Depth Stop for Lathe Chuck Adjusted While in Spindle



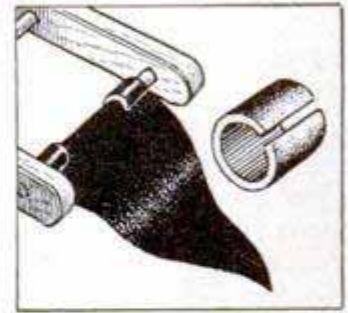
This depth stop for an engine lathe does not have to be removed from the spindle for adjustment. A setscrew on the face of the taper is loosened, the stop is pushed in or pulled out of the taper as required and the setscrew is tightened to clamp the stop in place. The stop itself is simply a length of rod which is a sliding fit in a hole drilled in a Morse taper. A pin inserted in a transverse hole drilled through the edge of the taper flange locks the stop. One end of the pin is ground concave to provide maximum gripping surface on the side of the rod, and the other end is ground at an angle of approximately 45 deg. A setscrew having a pointed tip enters from the face of the taper and exerts pressure on the angular end of

the pin. This, in turn, forces the concave end of the pin against the depth stop.

Borge Hansen, Copenhagen, Denmark.

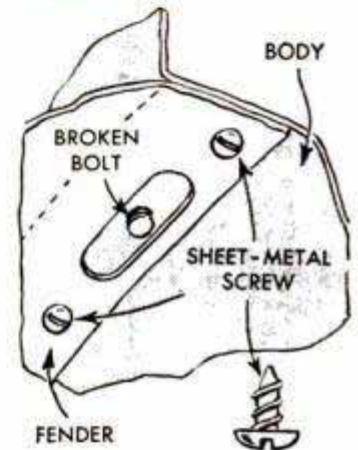
Warning Flag Attached to Ladder With Rubber-Hose Sections

When carrying a ladder on a truck or trailer, a red warning flag can be quickly attached to the end rung of the ladder and just as easily removed if two rubber-hose sections are used to hold it in place. One or two turns of the flag are first wrapped around the rung, and then short hose sections, slit lengthwise, are forced over the flag and rung.



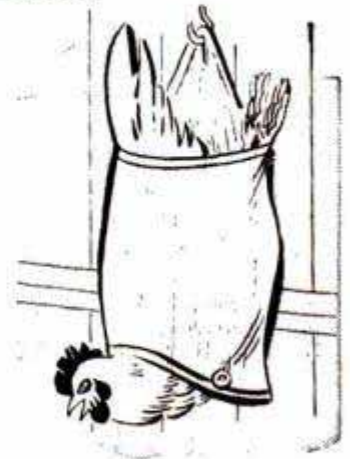
Screws Replace Fender Bolt

Where it is impractical to drill out and replace a broken fender bolt, a quick and efficient repair can be made by driving two sheet-metal screws through the fender and body, one on each side of the bolt as shown. These screws, which are self-tapping, should be driven about 1 or 1 1/2 in. from the broken bolt. Short, heavy screws are recommended for this job.—Ed Packer, Chicago.



Poultry Held for Weighing By Trouser-Leg Funnel

One poultryman improvised an emergency weighing funnel from one leg of a discarded pair of trousers. He cut a section from the leg and fitted one end with a button and buttonhole to keep the fowl from slipping through. Then he made a hole in the other end for the scale hook. The fowl is held securely by the sides of the trouser leg and is released by unfastening the button.



Newspapers Through the Air

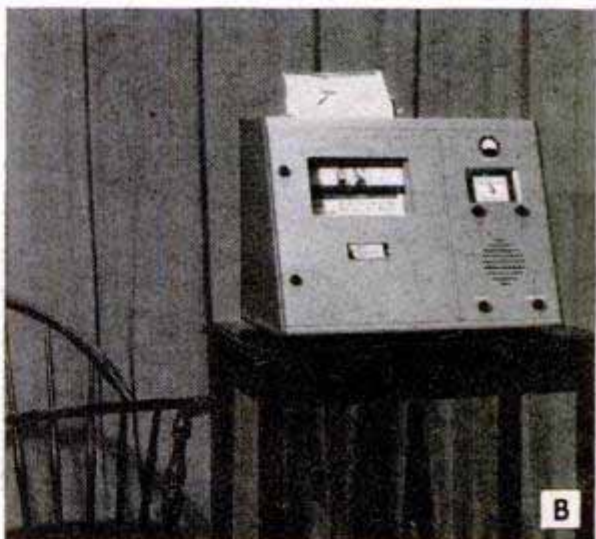
FACSIMILE, the electronic newspaper that is delivered through the air by means of transmitted words and pictures on FM radio waves, prints these items on paper coming from receivers installed in your home or office. Although still in the experimental stage, this service may be available in your area soon.

Original, experimental facsimile transmissions were made just before the late war by broadcasting stations located in Chicago, Newark, N. J., Cincinnati, Ohio and other cities. New activity in this field is now evidenced by the equipment shown in photo A, which was recently installed by General Electric at the Miami Florida Herald. This facsimile-transmitter console is used for programming experiments which include broadcasting stock-market reports, news and other items of importance to business firms and executives. It is claimed that other newspapers and broadcasting stations in this country and Canada will soon install similar equipment.

Collaborating with General Electric in the design and production of facsimile equipment, Radio Inventions Inc., of New York City shows the table-model, display receiver-recorder combination illustrated in photo B. The home-console facsimile-receiver combination shown in photo C is made by General Electric.

The initial showing of the new Stewart-Warner "display" facsimile receiver, for use in

(Continued to page 226)

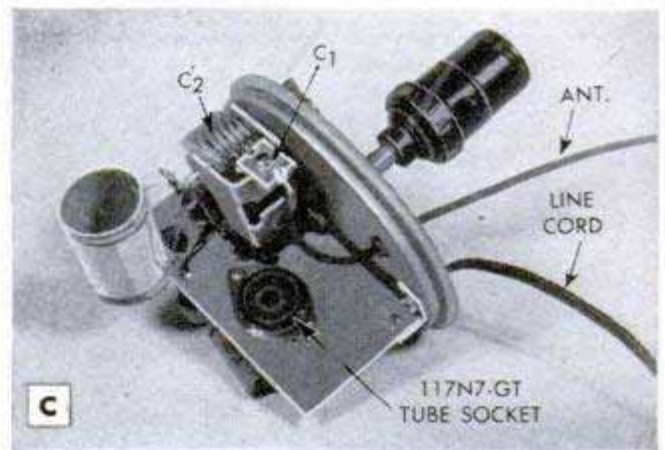
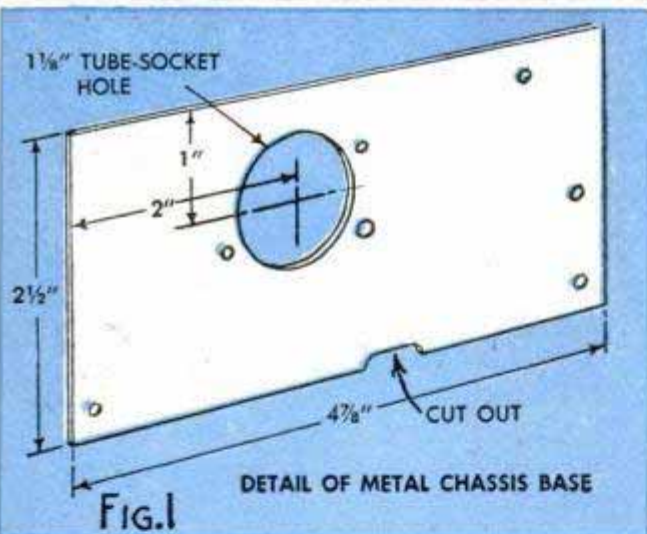
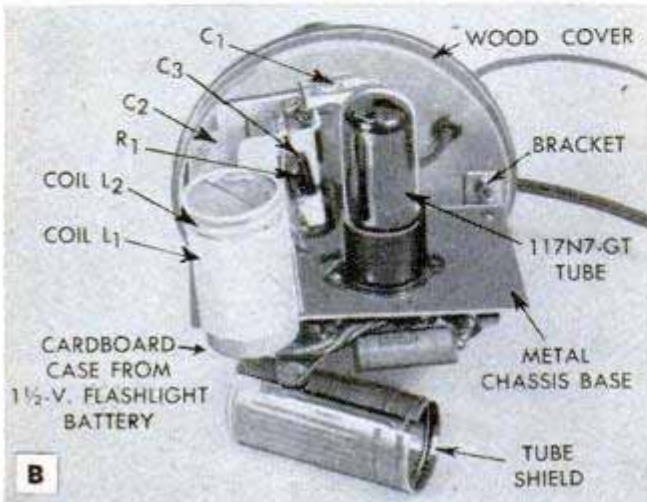
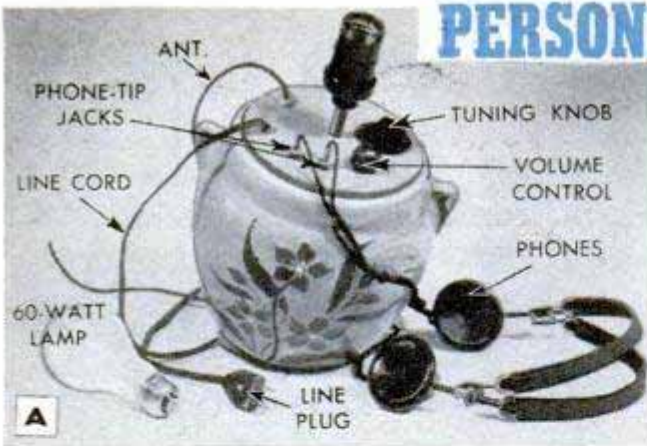


PERSONAL HEADPHONE RECEIVER

By S. A. Johnson

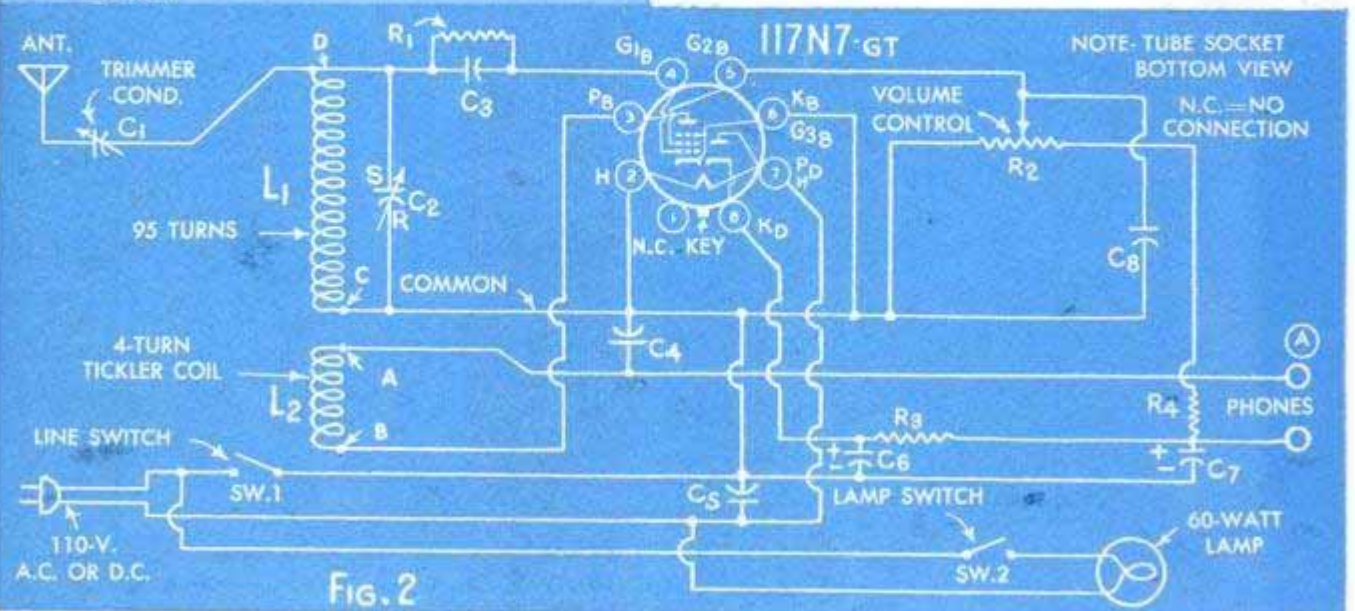
HERE IS an easy-to-build radio for that member of the family who frequently wants to listen to radio programs which are not particularly popular with the rest of the group. Since it uses headphones, it is completely "personal." Furthermore, it is built into a useful 60-watt homemade reading lamp in which a cookie jar does double duty in providing the lamp base and also the housing for the receiver.

Despite its simplicity, this compact set will pull in all of the "local" stations with only a short length of wire tossed on the floor to serve as an antenna. With a good outside antenna, this highly efficient little "one-tuber" really brings in distant stations with surprising volume and clarity. The cookie jar and lamp shade cost one dollar each at a "ten-to-a-dollar" store. These two units, plus a short length of hollow curtain rod, or piece of brass tubing, and a



RESISTORS

- R1 2-megohm, 1/2-watt carbon
- R2 0-10,000-ohm, audio-taper volume control with s.p.s.t. switch
- R3 4,000-ohm, 1-watt carbon
- R4 25,000-ohm, 1-watt carbon



AND READING LAMP

standard socket with a built-in switch, are all the parts needed for the lamp with the exception of a wooden top. The brass tubing supporting the socket is force-fitted in a hole in the lid. This lid was made up of two layers of $\frac{1}{4}$ -in. plywood cut to form a snug-fitting lid for the jar. All of the component parts for the receiver are assembled on the underside of this lid. The jar used in the model is $6\frac{1}{4}$ in. deep, and the top opening is $5\frac{1}{4}$ in. in diameter.

The simple metal chassis base is detailed in Fig. 1; this is mounted on the underside of the wooden lid by means of two, $\frac{1}{2}$ x $\frac{1}{2}$ -in. angle brackets, as will be noted in photos B, C and F. Use plastic-top screws for mounting this metal chassis (or countersink the screwheads and plug the holes with wood putty) to prevent possible shock. The coil is hand-wound on a cardboard case removed from an old standard-size flashlight battery cell. This coil consists of two windings wound clockwise as detailed in Fig. 3, and is mounted on the rear of the metal chassis in an upright position by means of a small angle bracket. The schematic circuit diagram is given in Fig. 2; a pictorial wiring diagram showing all

(Continued to page 226)

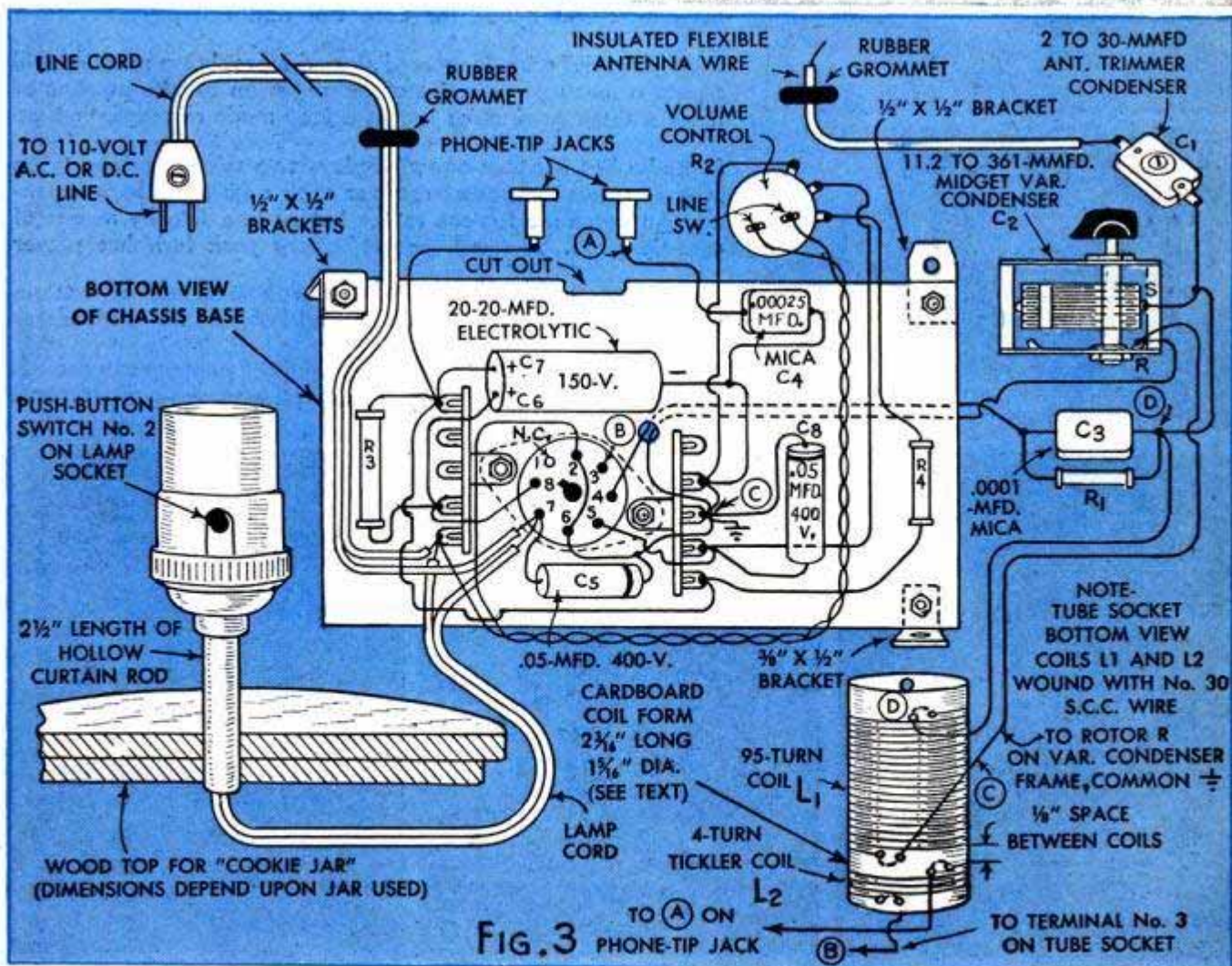
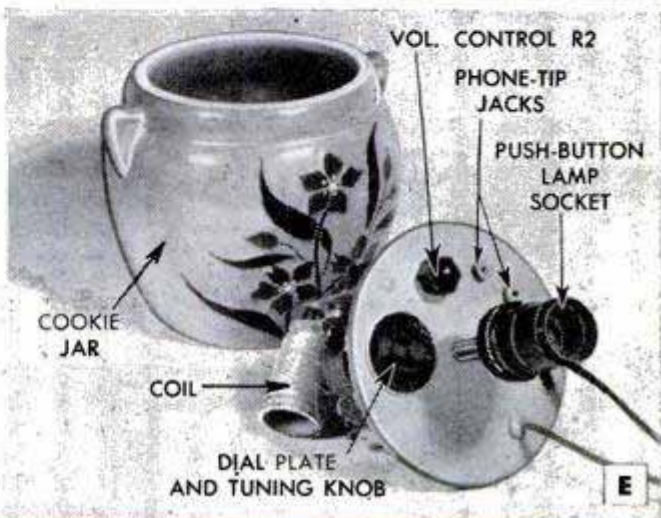


FIG. 3

Radio and Electronic Hints for Today



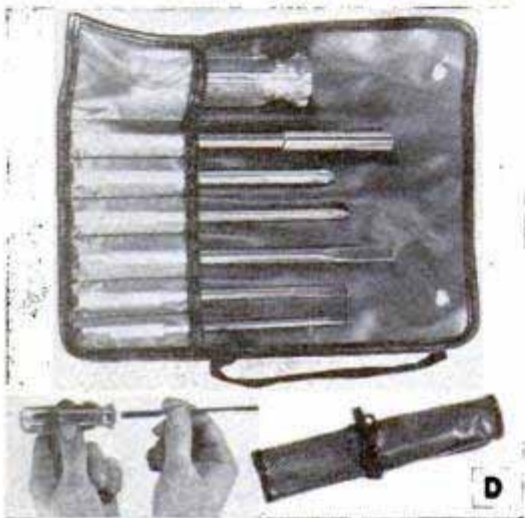
A



B



C



D



E

A—Console-model toy record player employs two-tube amplifier and a 5-in. permanent-magnet speaker which is protected by a multiweave metal grille. Plays regular 10 and 12-in. records

B—Hearing-aid B-battery is made up of small plastic cells which interlock to make all internal electrical connections

C—Tiny microphone weighing less than ¼ ounce is small enough to be carried in a walnut shell as indicated in the photo. It has a miniature diaphragm no larger than the human eardrum

D—Screwdriver kit includes a handle and five different interchangeable shanks, thus enabling the user to service most of his screwdriver needs for both slot and Phillips-type screws

E—"Electronic" narrator recording and reproducing machine will repeat a message or series of messages an infinite number of times without rewinding; it uses a loop made of magnetic tape

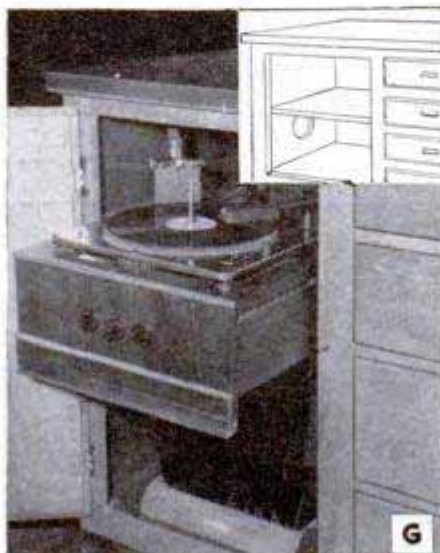
F—Radio hat for teen-agers employs two miniature-type tubes in a complete broadcast receiver with adjustable loop antenna. An earphone fastens to the hat on one side by means of cord-tip jacks. A small, pocket-battery-pack furnishes power

G—Phono-radio combination housed in kitchen cabinet. Shelves were removed in the end section and hole cut for loudspeaker

H—All the four present sizes and speeds of phonograph records can be played automatically in this phonograph-radio console



F



G



H

Meet the NEW Kodak Duaflex Camera with Kodak f/8 Lens



Here's the De Luxe Model of the popular Kodak Duaflex Camera. Lens sets in a jiffy to $f/8$, $f/11$, or $f/16$. You don't have to wait for the sun to shine before taking pictures. Open the lens wide to $f/8$...turn the focusing lens mount to correct distance setting...look through the brilliant reflex finder, and shoot. The two other settings "get the picture" in varying degrees of daylight. Lens can be focused from $3\frac{1}{2}$ feet to infinity.

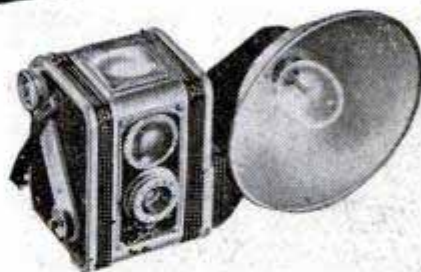
Automatic Shutter-Lock prevents double exposures. Ingenious new control

"remembers" for you—makes sure you can't spoil a good picture by tripping the shutter twice on the same negative. After each shot, the shutter-release locks until you advance film. You get 12 negatives, $2\frac{1}{4} \times 2\frac{1}{4}$, on black-and-white Kodak 620 Film, or 9 full-color pictures on Kodacolor Film.

Prices include Federal Tax
(Prices subject to change without notice)

\$19.85
including
neck strap and
lens shield

See it at your Kodak dealer's. Also ask to see the Kodak Duaflex Camera with Kodak lens...everything's adjusted at the factory; all you have to do is aim and press the trigger. \$13.50.



Flashholder for both
Duaflex models—\$3.33

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There is no name more famous for flavor than Beech-Nut...



There is no chewing gum more dependable for fine flavor and uniform high quality than...

Beech-Nut GUM

It's "Always Refreshing"

Beech-Nut **BEECHIES**, the Candy Coated Chewing Gum in three varieties:

PEPPERMINT, PEPSIN and SPEARMINT

Newspapers Through the Air

(Continued from page 221)

banks, department stores, hotel lobbies and other public places, was made in the equipment exhibition at the recent convention of the National Association of Broadcasters. This large, upright instrument is illustrated in photo D. It is claimed to include all of the features required for programming news features and advertising. The unit is to be sold or leased by the facsimile-transmitting station or publisher. Receiving sound and facsimile programs simultaneously, it provides completely unattended service, and all components are housed in a tamperproof cabinet. It will operate approximately three weeks (with four 15-minute 4-page "editions" every day) on one "loading" of facsimile paper. Actual facsimile "printing" starts whenever an edition transmittal begins, and stops when a broadcast is terminated by the station.

Personal Headphone Receiver

(Continued from page 223)

circuit connections appears in Fig. 3. The midget, variable-tuning condenser C2 is mounted directly on the underside of the wooden lid just above the metal chassis base by means of a countersunk, flat-head, 6-32 machine screw. A hex nut is used as a spacing bushing. The dial plate on top of the lid is a 0-1 midget type, and a pointer-knob is used. The volume control R2 (actually a regeneration control) is also mounted directly on the underside of the wooden lid.

A single, 117N7-GT tube is used in the a.c.-d.c.-type circuit; this dual-purpose tube was chosen because it combines a rectifier section, which supplies the required B-voltage, and a pentode section which acts as a regenerative detector.

When winding the coil, leave sufficient wire at the beginning and end of each winding for making the circuit connections. Anchor the start and finish ends in holes punched as indicated in the sketch. Both coils are close-wound with No. 30, single-cotton-covered magnet wire, and they are spaced $\frac{1}{8}$ in. apart.

When mounting the coil on the chassis base, make sure that it will clear the jar when the set is installed. To test the set, first recheck the wiring, then insert the tube in its socket and assemble the set. Now plug in the line cord and a pair of 2000-ohm headphones; turn the volume control so that the switch snaps to the "on" position. Advance the volume control

(Continued to page 228)

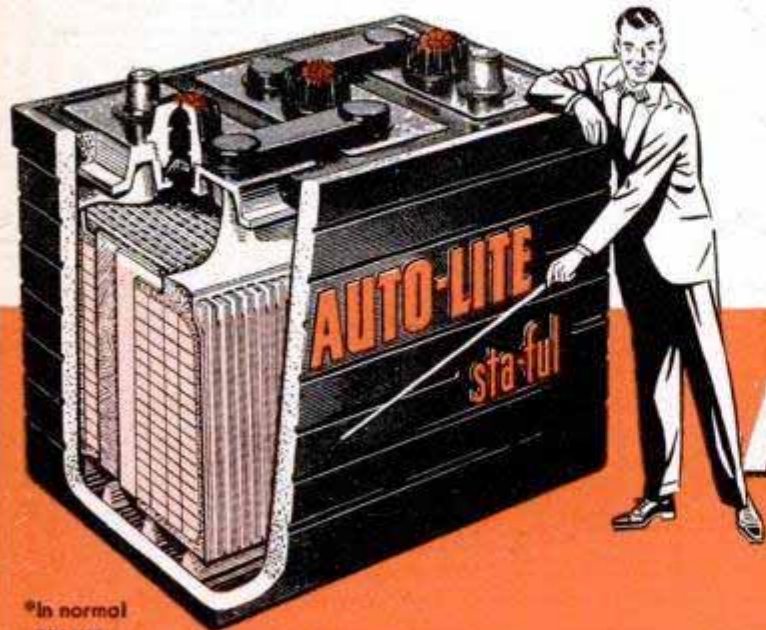
What's **NEW**
in Batteries?

AUTO-LITE **Sta-ful** BATTERY...needs water only 3 times a year*

A revolutionary new development, the Auto-Lite "Sta-ful" Battery, protects you against a major cause of battery failure . . . damage to plates due to liquid loss. This new "Sta-ful" Battery design permits a liquid reservoir with 3 times the capacity of ordinary batteries . . . keeps plates fully covered and active months longer in normal car use.

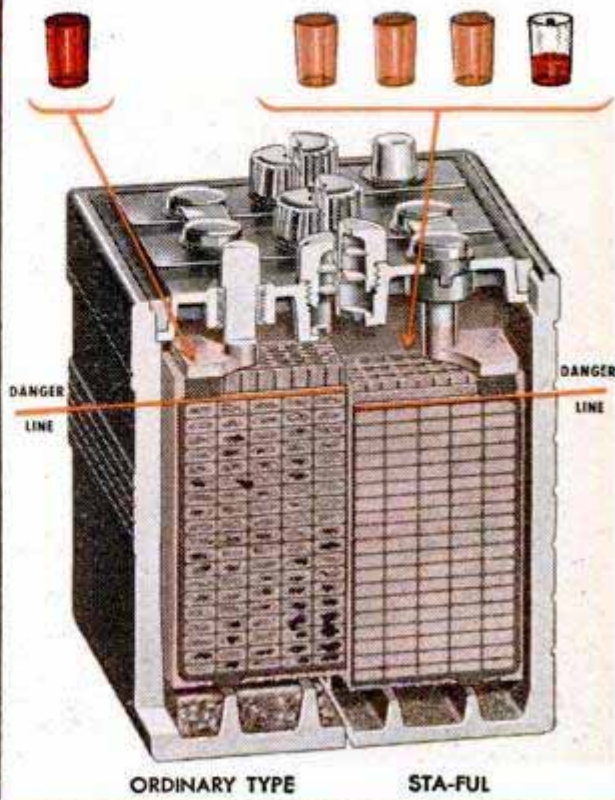
In addition, "Sta-ful" has extra plates for greater electrical capacity . . . Fibre-glass mats to hold the power-producing material in those plates for longer battery life. To get more for your battery dollars, replace with an Auto-Lite "Sta-ful". Money cannot buy a better battery.

AUTO-LITE BATTERY CORPORATION
Toledo 1 Ohio

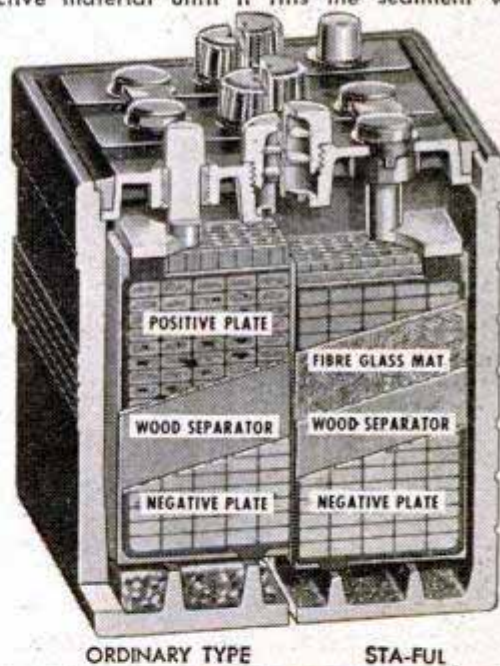


*In normal car use

Because of a unique construction, the new Auto-Lite "Sta-ful" Battery holds more than 3 times the liquid reserve of ordinary batteries.



Note how the protective Fibre-glass mat retains the power-producing material in the positive plate while ordinary battery plates shed the active material until it fills the sediment well.



AUTO-LITE Sta-ful BATTERIES

EXTRA COMFORT

EXTRA WEAR

2-PLY GLOVES



Riegel's 50-50

2-ply palm, thumb and index finger.

Knit wrist or gauntlet

Twin plies of soft but sturdy fabric make Riegel's 50-50 Work Gloves a big value in comfort, safety and long wear.

OTHER STYLES FOR EVERY NEED

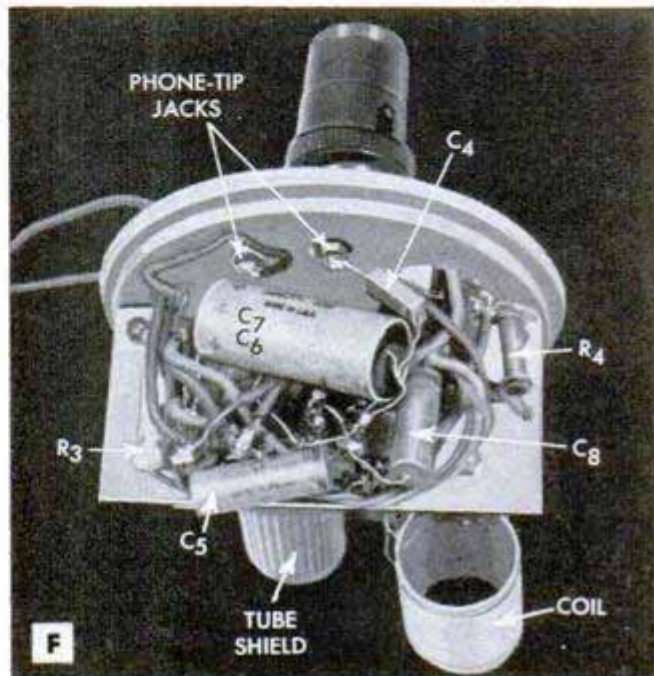
Canvas, jersey, leather . . . knit wrist, band top, gauntlet . . . double palm, reversible, quilted. Ask for the Riegel brand wherever work gloves are sold. Free catalog if requested on business letterhead.

Riegel Textile Corp.
342 Madison Avenue
New York 17, N. Y.



THIS TRADE MARK IS YOUR GUARANTEE OF VALUE

slowly and tune in a station with the tuning condenser. The presence of a station will be indicated by hearing a whistle in the headphones. Now back off the volume control until the program becomes clear. Finally, tip up the lid carefully and adjust the antenna trimmer condenser C1 with a small screwdriver for maximum volume. This does not have to be done again unless you change the length of your antenna.

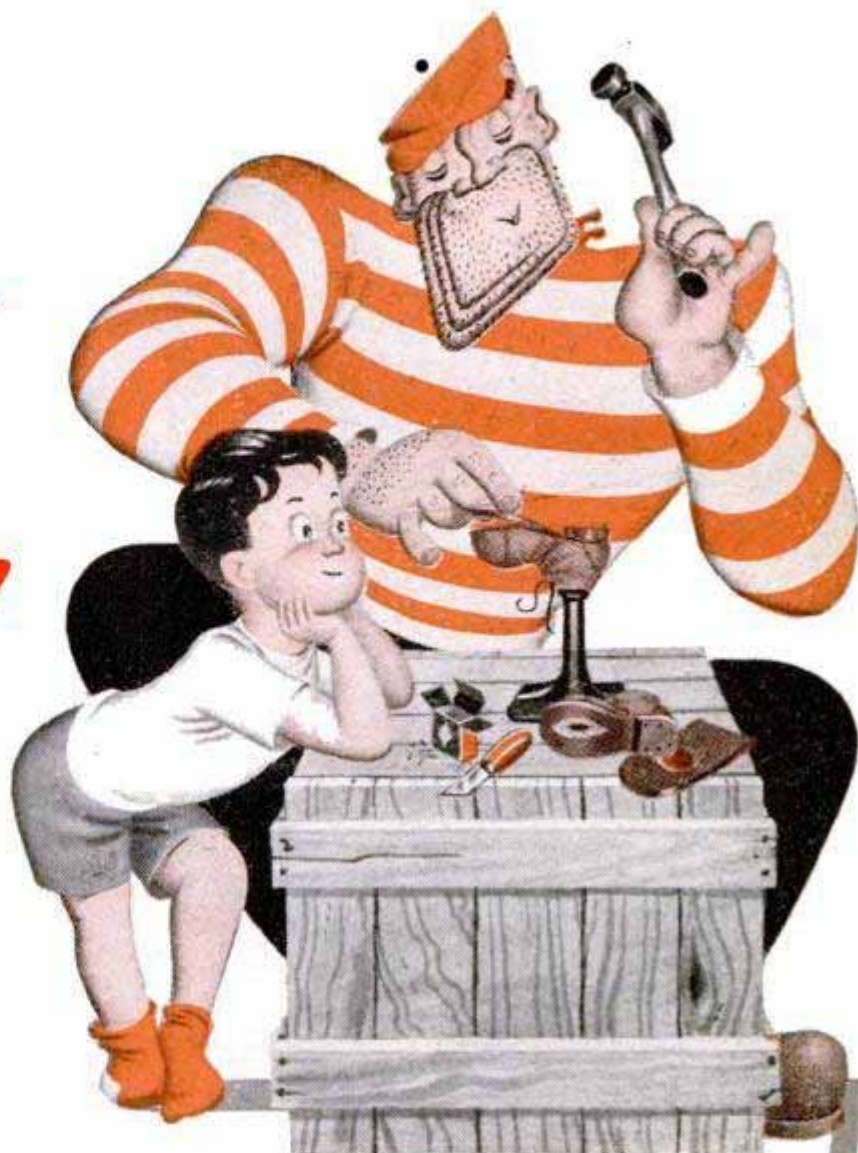


Since tubes differ slightly, in extreme cases it may be necessary to add a turn or two to tickler coil L2 to make the set "oscillate." However, before doing this, try reversing the A and B leads on the tickler coil, Fig. 3. Detailed student material list R-379 is available from Popular Mechanics Radio and Electronics department without charge upon receipt of ordinary letter postage.

Handbook for Uranium Prospectors

A pocket-size handbook entitled "Prospecting for Uranium" has been published jointly by the U. S. Atomic Energy Commission and the U. S. Geological Survey. This 123-page handbook is designed to answer 5000 inquiries which have been received by government agencies as a result of the Atomic Energy Commission's domestic uranium program announced in 1948. Under the program, the AEC established guaranteed minimum prices for various types and grades of uranium ore, and offered a \$10,000 bonus for the discovery of a high-grade deposit and the production of 20 short tons of ore or concentrates. The handbook is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., for 30 cents. An article on the progress of the AEC program, and a detailed construction article on how to build a Geiger-Mueller uranium survey meter, appeared in the February 1949 issue of Popular Mechanics Magazine

*Piston Rings
need
replacing, too!*

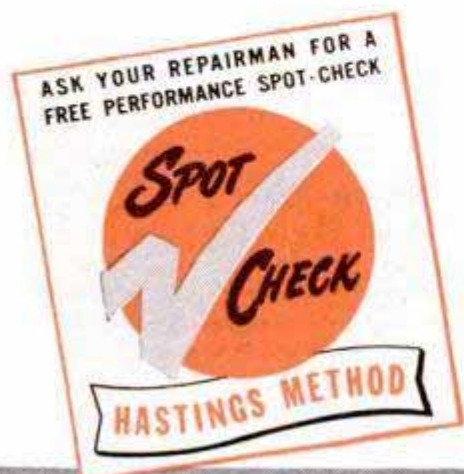


WHEN OIL-PUMPING flashes its warning that your piston rings are worn out, don't delay. The sooner you replace worn-out piston rings the longer your engine will last.

Fortunately, rings are *easily replaced*. And when you replace

with Hastings piston rings, you *stop* oil-pumping, *check* cylinder wear and *restore* performance. It's the best money you can spend on your car.

HASTINGS MANUFACTURING COMPANY
HASTINGS, MICHIGAN
Hastings Ltd., Toronto



HASTINGS
Steel-Vent Piston Rings

"TOUGH... BUT OH SO GENTLE"

TOUGH on oil-pumping — GENTLE on cylinder walls

"I'll take the **WHITE** one every time!"



WYTEFACE Steel Tapes, with their jet black markings on a white background, are easier to read in any light. They are rust-resisting, hard to kink and easy to clean.

Protected by U. S. Patent 2,089,209

WYTEFACE

TRADE MARK

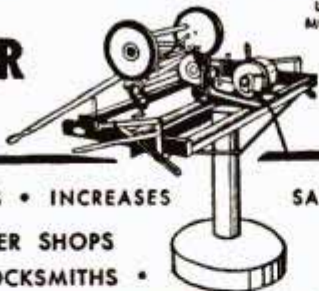
STEEL TAPES

KEUFFEL & ESSER CO.

PROFITS AND SPEED

**THE MODERN
LAWN MOWER
SHARPENER**

PRICE
\$241⁵⁰
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INCREASES PROFITS • INCREASES SALES!
FOR LAWN MOWER SHOPS
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Golden Harvest Feeds the World

(Continued from page 95)

is kneaded into bread dough or into biscuits and cakes and it goes into the oven. It must produce a good breadstuff of fine texture and good taste, among other qualities, before it is ready for release.

Up in the Northwest there is one good soft wheat that might be grown on millions of acres except for one objectionable characteristic. Ideal in almost all other respects, its chaff works into the skins of the harvest crews and produces an extremely irritating itch. The harvesters don't like to handle it and the result is that not much of it is grown. When the plant breeders eliminate this one objection, they will have a good, popular variety.

It takes moisture to get a crop and the Great Plains in particular have been enjoying several years of above-average rainfall. When the weather cycle swings around to the dry side again, it may be that the Dust Bowl troubles of 15 years ago will return, but some soil-conservation experts think not. They point out that most grain growers have learned the value of stubble-mulch farming in which straw and stubble are broken up and left on the surface to keep the soil from blowing and washing away and at the same time to reduce rain runoff and evaporation. Strip-cropping is also widely practiced. Legume crops are grown between strips of wheat lined up across the direction of the prevailing wind and summer fallow has come into its own. That is, when a farmer decides that the ground holds too little moisture to produce a good crop he lets the land lie fallow for a year, storing up two years' moisture to produce one good crop instead of taking a chance of losing two crops in a row. All these practices conserve the soil and if they work as well as expected the dust storms of the early '30s will never return.

The world is always hungry for wheat and it is such a precious commodity that it figures in many political treaties and international contracts. As much as they can, American farmers are doing their part to provide bread for the world.

Corncocks Form Abrasive In Mechanics' Hand Soap

Waste agricultural products, such as corncocks and nutshells, can be used instead of corn meal in abrasive hand soaps. The current world food shortages led Department of Agriculture chemists to substituting waste products for corn meal in the mixture. The cobs are ground and sieved before being mixed with the soap.

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1/4-in. ELECTRIC DRILL
SEARS REGULAR PRICE ~~\$14.50~~
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CRAFTSMAN 10-pc. high speed steel drill set for CRAFTSMAN 1/4-in. Electric Drill. For use in wood or metal. 1/16 to 1/4-in. sizes in handy drill stand. Price now only **\$3.50**



CRAFTSMAN fine quality, light-duty electric drill . . . NOW at an amazing saving during this special 30-day offer! Strong, compact! Ideal for light, intermittent use in home or workshop. Powerful 110-120-volt, 25-60 cycle, A.C. or D.C. universal motor; sturdy die-cast aluminum frame, balanced for fast, easy, accurate drilling! No-load chuck speed, 1500 R.P.M. 1/4-in. capacity Jacobs "Handtite" chuck; finest bronze bearings. 12-in. long. 6-ft. rubber-covered cord, unbreakable plug. Underwriters' Labs. approved.

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A sensational work saver . . . NOW bargain-priced! Ideal for polishing, sanding, buffing . . . for autos, boats, furniture, floors, wood or metal. Easy to use! Light (only 6 lbs.), yet sturdily built! Heavy duty 110-120-volt, 25-60 cycle, A.C. or D.C., G.E. universal motor; Formex-insulated. Non-locking trigger switch; precision ball bearings; helical spur gears. No-load speed, 1600 R.P.M. 10-ft., 3-wire rubber-covered cord, unbreakable plug. 7-in. high. Underwriters' Labs. approved. With 6-in. flexible rubber sanding disc, 7-in. lamb's wool buff, 6 assorted sanding discs and wrench, in steel case.

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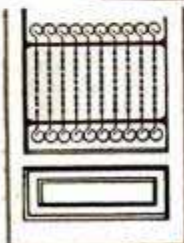
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Watering Lawn

Q—What is the correct way to water a lawn—how does one tell when to water, how much water to apply, etc?

M.W.—Madison, Wis.

A—A well-established lawn does not need watering except during prolonged dry weather and then only at fairly long intervals. When the lawn is watered it should be given a thorough soaking. Sprinkling is not approved, especially during a dry season. Light sprinkling may actually do more harm than good at such a time. One practical way of watering is to remove the nozzle from the hose and lay a board about 2 ft. long under the open end of the hose to spread the stream. Then turn the water on at about half pressure and let it run until an area of 20 to 30 sq. ft. is thoroughly soaked, that is, until water stands on the surface. Then move the hose a few feet and repeat the process in the same way until the whole lawn has been gone over. This procedure takes a lot of water but it is the only practical way of assuring a thorough job. Some homeowners prefer to use a canvas waterer. The device consists of a canvas tube about twice the diameter of the hose and 6 to 10 ft. long. It is closed at one end, the other end being fitted with a coupling for attaching to the hose. When the water is turned on, it fills the canvas tube and seeps slowly through the fabric.

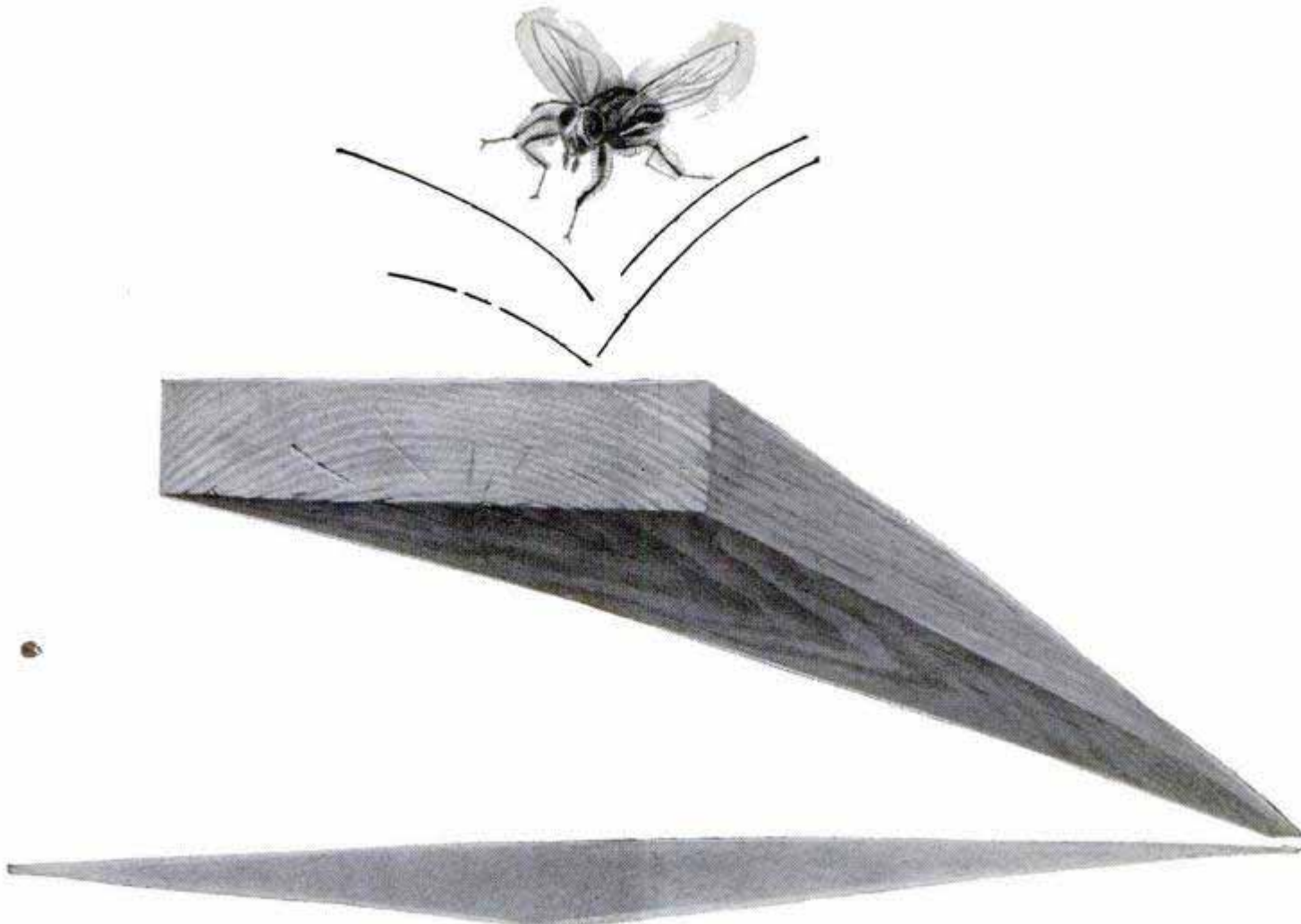
Finishing Knotty Pine

Q—How can I finish knotty pine in the natural color? The boards are in random widths with one beaded edge. Some of the knots are light-colored and many are checked or cracked. I would like to have knots all of a fairly uniform dark color.
G.M.—Spokane, Wash.



A—The first step is to sand the wood smooth, paying special attention to areas about the knots where the angle of the grain may have been the cause of slight chipping at the time the boards were planed. After the first sanding, fill the cracks in the knots with stick shellac of a color to match the knots as closely as possible. Stick shellac can be melted and worked into the cracks with a clean, hot soldering iron. Allow the shellac to set, then sand again to smooth it flush with the surface. Darken light-colored knots with a penetrating stain (not oil stain) of a color approximating that of the darker knots. Apply the stain with a small, round brush. Sand the stained knots lightly to

(Continued to page 234)



Supersensitive electron tube, developed by RCA, makes possible more accurate measurement of minute vibrations.

Can a housefly make a board bounce?

Surprising though it seems, a fly—when it lands on a board—causes distinct vibrations. They can actually be detected by a remarkable, and supersensitive, new RCA electron tube.

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Scientists predict many practical uses for this *electronic transducer*. Airplane designers can hitch it to engines or whirling propellers and locate vibrations which might lead to trouble. Oil men can use it to measure the sound waves from explosions with which they scout for oil.

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restore natural appearance at the edges. After the stain is dry, reduce orange shellac about 30 percent with alcohol or prepared thinner and apply to the boards with a clean varnish brush. Two or more light coats may be necessary. Smooth the surface lightly between coats with fine steel wool. Orange shellac brings out the characteristic grain of the wood and darkens it only slightly. The finished wood will darken with age. After the shellac is thoroughly dry, apply paste wax and polish to whatever degree of gloss is desired.

Cleaning Tile Floor

Q—How can I clean a tiled bathroom floor to restore the original white? None of the tile seems to be loose, nor is the floor uneven, but some of the tile are discolored. No washing-powder solution I have tried will remove the embedded grime or the discolorations. C.G. — Rochester, N. Y.



A—It is doubtful if you can restore the original color of the tile, especially if the surface is pretty well worn. A strong solution of trisodium phosphate should remove the embedded grime and dirt in both the tile and the joints, but it probably would not affect the discoloration. A medium solution of oxalic acid would be more likely to bleach out the discolorations so that they at least would be less noticeable. We would not recommend a strong solution as it might damage the tile, particularly on the worn spots. If the acid solution is used, apply it to the floor with a cloth swab and immediately wash or mop the floor with clear water to remove all traces of the acid. (Caution: In a closed room, provide a fan or other means of ventilation to carry away fumes from the acid solution. Do not place your hands in the solution or handle any cloth or swab soaked in it. Wear rubber gloves.)

Home-Shop Layout

Q—I have only a small space in one corner of my basement for a workshop. I have planned to install several power tools—jointer, circular saw, bandsaw, drill press and lathe. How do I figure the minimum working space required around each machine in such limited floor space? B.A. —Akron, Ohio.



A—One simple method of arriving at a fairly accurate and convenient placement of small machines in limited space is to sketch a rough floor plan of the shop on a scale of $\frac{1}{2}$ in. equals 1 ft. Then determine the approximate floor space required for each machine and locate these areas on the floor plan in the position you want the machines. Sketch the locations as squares or rectangles and be sure to allow wall clearance for motors and other projections. Then from the approximate center of the work area of such machines as the bandsaw and drill press, strike a semicircular arc about the front of the machine on a 30-in. radius. On the plan, these arcs must clear other similar arcs around the working areas of machines nearby. In the case of a bandsaw, drill press and jointer, the 30-in. radius will give you a place to stand and also clearance to work anywhere along the length of a piece of stock 30 in. long. The lathe may require a little more working space than will be enclosed by the semicircle. The circular saw should have about the same space at the rear as is allowed at the front so that stock will clear when ripping. These measurements represent just about the minimum working-space requirements for small machines. A working radius of 36 to 48 in. will allow much more efficient use of the machines, of course.

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Pack Into the Wilderness

(Continued from page 140)

appealing to a dyed-in-the-wool sportsman.

Settling down for the night is a major undertaking. A suitable camp site that will provide water, wood and feed for the horses must be found. The animals are unpacked and watered. Firewood is gathered. Provisions are broken out and supper is started. Everyone pitches in and does his share. On a pack trip such as this, democracy in its purest form is the accepted custom. A millionaire sportsman may find he can be most helpful by peeling the spuds.

If the area is one where water and grass are plentiful, the pack horses will feed themselves. If not, they are fed from the sack of oats brought along for the purpose. Horses are hobbled to prevent their straying or heading back toward the stables.

"Many is the time—especially early in the season—when I've chased horses a couple of miles down a canyon," says Joe Burgy. "Some of them can hop like grasshoppers, even when hobbled."

The Middle Fork of the Salmon River begins where it is joined by Beaver Creek and Marsh Creek. Here is the "big hole," a fishing mecca which has produced trout ranging from one to five pounds, salmon from 10 to 40 pounds.

Beyond the "big hole," the Middle Fork begins a rough, rocky descent. Riding down the trail that hugs the river, you are constantly aware of the mountains rising on either side. The descent narrows until it forms the 1500-foot-wide "Impassable Canyon." Along some parts of the river no trail exists. A collapsible boat is taken off one of the horses and you shoot the rapids.

The Salmon River is nicknamed the "River of No Return." Legend has it that gold was found in this wild canyon many years ago. The prospectors hired a crew of Chinese to mine it on the theory that, being unable to speak English, they would not reveal the mine's presence. But gold does things to men and one day the crew took \$300,000 in nuggets and dust, stole a boat and attempted to shoot the rapids of Impassable Canyon. They were never seen nor heard from again. Somewhere in the canyon must lie the waterlogged bones and a fortune in gold.

This is wilderness country where Gary Cooper and Ernest Hemingway come to hunt. The country is so rugged that few hunters venture in so far. But it's a sporting proposition. Any hunter who gets a chance to draw a bead on an elk after riding a rough trail, shooting the rapids and clam-

(Continued to page 238)



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Fastest reloading bolt action repeater you ever handled! Actual reloading time tests prove that the H & R PLAINSMAN with positive magazine ejector is faster than any comparable bolt action repeater model on the market. Fire 5 shots . . . press magazine ejector . . . magazine is pushed out . . . slap in another . . . fire away! Check and compare! See this new PLAINSMAN at your dealer's. It's a sensation at...

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bering up the rocky sides of the canyon fully deserves his trophy.

After a day of hunting you head back toward camp. As the afternoon shadows lengthen and the higher peaks begin to turn gold and scarlet, blue wood smoke drifts up among the trees. And as you get closer you smell the golden odor of frying trout, sheepherder's spuds and coffee. It's enough to make a man believe in heaven on earth.

In the evening, you sit around a glowing campfire and sing songs or spin yarns. One of the wranglers tells how a railroad vice-president was taught how to cast a fly.

"He kept flinging his elbow out until Dutch Gunderson asked him for his wallet. Dutch placed it under his arm and told him to go ahead and cast. He looked at the stream below and then at the fat wallet under his elbow. He didn't give Dutch any more trouble from then on."

The days go by with startling swiftness and almost before you know it you're back at Sun Valley. You begin to think about icing up some of the elk you've shot and expressing it home, giving the rest to the folks at Ketchum. You also begin to wonder about a good taxidermist to mount the head and horns.

The pack trip is over, but you'll remember it for a long time to come. Perhaps you'll think of it in the words of one of the veteran packers:

"I've seen a lot of men pack into these mountains—some of them rich, some of them famous. They think they're coming in to hunt and fish. But it's more than that. Perhaps it's a chance to get close to the mountains and trees and stars. Whatever it is, they keep coming back for more."

Liquid-Oxygen Converter For High-Altitude Planes

Development of a new converter system may make liquid oxygen feasible for high-flying U. S. Air Force planes. Lack of a satisfactory method of storing and handling the liquid in planes has previously prevented its use. Fully charged, gaseous-type oxygen tanks for a B-17 weigh 400 pounds, while the liquid weighs 130 pounds and takes 80 percent less space. The converter consists of a vacuum-walled metal container, a vaporizing coil and safety and operating valves. On vaporization, the oxygen is forced through the distribution system by pressure formed by the change from liquid to gas. A mobile plant that can be parked beside runways produces 80 pounds of liquid oxygen an hour. For use at remote bases, 1700-gallon storage tanks have been designed for transport in C-74s.

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BODY ACHES?



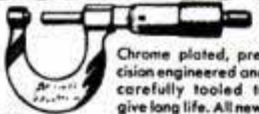
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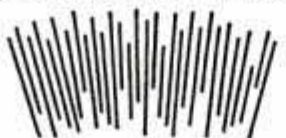
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"Locksmith Trade Books": . . . 6.75
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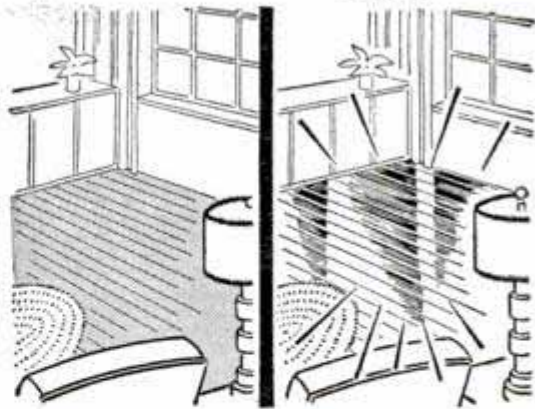


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LIN-X CLEAR-GLOSS VARNISH

Yes, and what a difference! That clear, tough, long-lasting coat of Lin-x Clear-Gloss Varnish protects and beautifies floors, woodwork, furniture, printed linoleum, boats, countless other surfaces—resists boiling water, sizzling cooking greases, alcoholic beverages. And so EASY to use—just brush it on!



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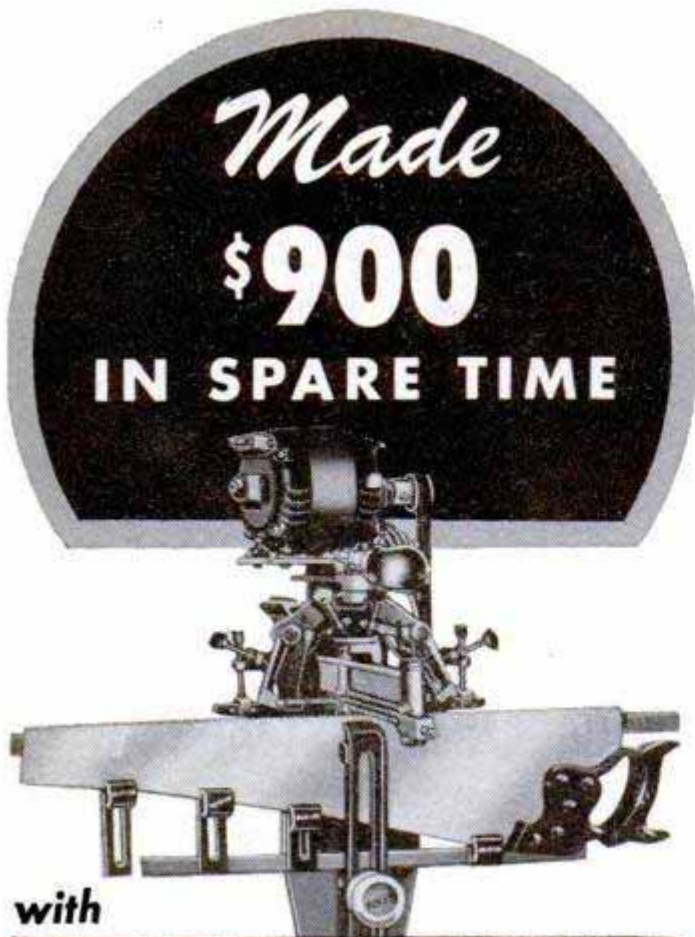


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WORLD'S LOWEST PRICED CAR



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IN SPARE TIME

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"I did very well last year with my Foley equipment, about 950 saws and 240 lawn mowers, in my spare time. About \$900 for me." Leo H. Mix. Len Crego says: "I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."

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Send Coupon for FREE BOOK

FOLEY MFG. CO., 716-9 Foley Bldg., Minneapolis 18, Minn.
Send FREE BOOK—"Independence After 40."

Name _____

Address _____

Trouble Shooter on the Scent

(Continued from page 121)

then reselling them as genuine pure musk. Musk is, of course, a very highly rated scent, held in esteem by perfumers and considered by many to have definite medicinal value.

Dillinger has no elaborate regulations to keep his nose in perfect operating condition other than trying to avoid colds. A cold has never put him out of condition, Dillinger says, "but it's bothered me at times and slowed me down."

Dillinger's facility for tracking down elusive odors can be bothersome, even to himself. If he detects a strange whiff in his own home, he is apt to follow the odor to its source and neglect other matters until the irksome problem is solved. The sight of him trailing an odor in the best Sherlock Holmes fashion is a familiar spectacle to his family.

A civet cat has an intolerable stench to most people, but to an aromatic chemist like Dillinger the odor is "intriguing." "By an intriguing odor," he explains, "I mean a rich, full-bodied one—to be studied, of course."

Whereas the average person can distinguish some two dozen or so odors, Dillinger stocks about one thousand in his mind. His favorite scent is that of lilac, and he grows this flower in his own garden. Then, in the laboratory, he duplicates its odor, a process requiring some 30 ingredients. To do this scientifically, a knowledge of the make-up of a flower is essential including the scent of each component such as petals and stamen. Since the blend of each of these scents provides the ultimate lilac smell, he follows the same course in his lab.

The use of odors for a variety of purposes has been long recognized, Dillinger points out. Lavender has the same effect as catnip on lions and tigers, wild birds can be tamed by rubbing oil of bergamot on their nostrils, mosquitoes will shun anything that smells like citronella and Japanese beetles will travel miles to be near geraniol.

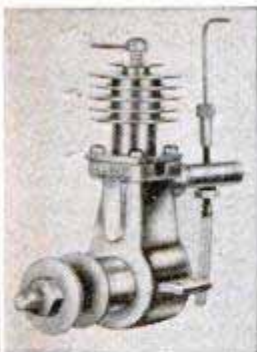
Recently Dillinger introduced the use of perfume for crippled children in a Texas hospital. Such scents as magnolia have been used for stimulating the appetites of child patients, and pine is good for sinus trouble. Cape jasmine and lilac, on the other hand, tend to soothe the nerves.

Dillinger's sensitive sniffer may someday explore the field of medical treatment.

☐ In 1948 American air carriers flew over eight billion passenger miles with a passenger fatality rate of only 1.3 per 100 million passenger miles flown.

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\$2.95



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Please send me by parcel post _____ rolls of
"SCOTCH" No. 33 Electrical Tape.

I enclose \$1.50 for each roll.

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Address _____

City _____ Zone _____ State _____

Putting a River in Its Place

(Continued from page 155)

far as Bridge Canyon. The U. S. Navy was put to work in the middle of the desert on this problem, and lake-bottom surveys were made from a special barge by men in diving suits. The actual survey has been completed and reports will be out in a few months, Vetter says.

The bureau's long-range vision for the future includes several other projects which eventually will metamorphose the once tumultuous, destructive river into a series of reservoirs for the storage of irrigation water and the generation of power to fill the increasing needs of the Southwest area.

Hoover Dam won't even continue to hold its proud title of highest dam in the world when the proposed Bridge Canyon project is completed. This barrier will rise 740 feet from bedrock, thus overtopping Hoover Dam by 13 feet. River barriers are envisioned also for Glen Canyon and Cocolino, among others.

Bureau of Reclamation engineers are unimpressed by pessimists who theorize that reclamation projects are doomed by the inevitable action of natural forces. They believe that man can cope with the Old Lady on her own terms.

Underwater Speedway

(Continued from page 118)

by high-speed photographic equipment.

To test the accuracy of the device, the hatch is raised and the model is released in the open air. A curtain 15 feet away, with a hole in it that is slightly larger than the diameter of the model torpedo, serves as the target. If the controls have been properly set, the model is released by the spinning wheel and flies straight through the air, passing through the target hole without disturbing the curtain.

The big launching tank has three camera ports placed above water surface for recording the air trajectory of the models, and five ports below water level for the cameras that record the underwater runs of the models. Each of the underwater ports is an optically ground spherical window that serves as an auxiliary wide-angle lens for its camera. Each camera magazine contains 32 feet of 35-mm. film spliced to form a continuous loop. The film loop is rotated at high speed when exposures are made.

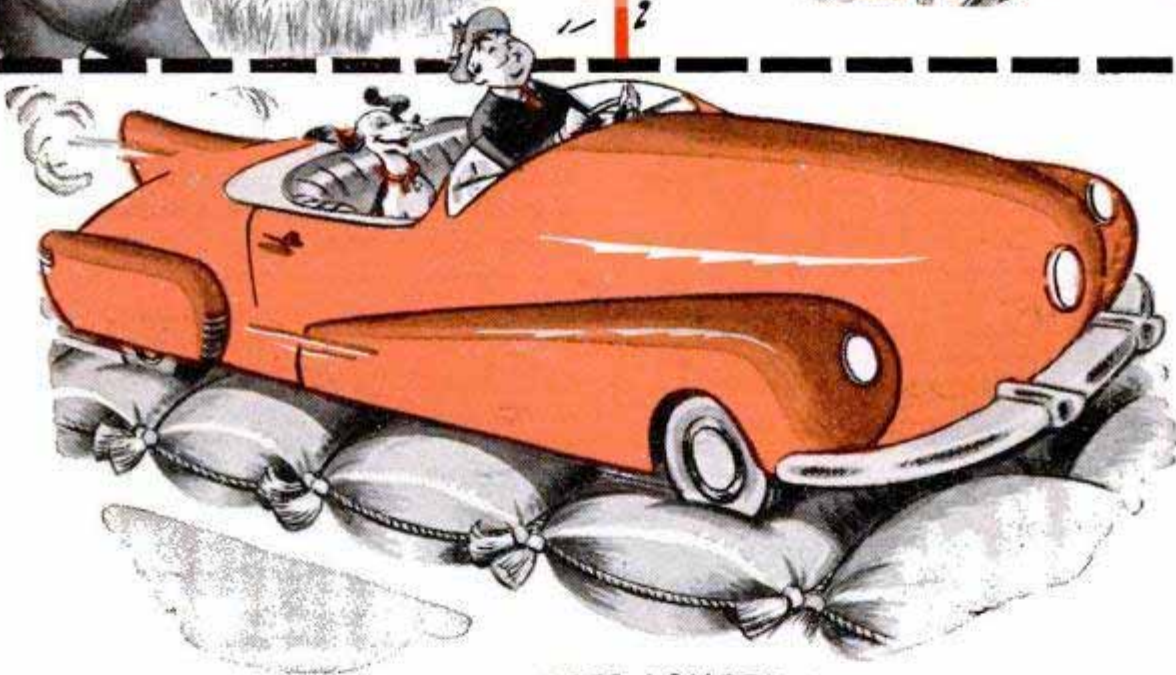
The interior of the tank is illuminated, for pictures, by 30 high-speed flash lamps, some inside of aluminized Lucite reflectors.

(Continued to page 244)

IF YOUR ARCHERY TURNS
OUT LIKE THIS...IT'S TIME
FOR NEW ARROWS...

and

IF YOUR CAR FEELS LIKE THIS
IT'S TIME FOR MARFAK
CHASSIS LUBRICATION



THAT CUSHIONY FEELING LASTS LONGER WITH MARFAK!

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2. Glass Blocks fit into framing, using prefabricated wood strips.



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MAIL COUPON NOW

All the lamps are flashed simultaneously at up to 3000 flashes per second, about 1/10,000 of the exposure time normally used in motion-picture photography.

No human operator could synchronize all this equipment manually. After the launcher and the eight strips of film in the cameras have come up to speed, the operator holds down a launching button. A series of interlocks waits until the film splices have passed through the camera, then immediately trips the model and launches it, and turns on the high-speed lamps. Three thousand separate exposures are made during the one second that the model is in motion.

Later the pictures are analyzed by projecting two frames at a time, from overlapping cameras, onto a movable "exploring" screen to which is attached a half-model of the torpedo. When the two film images of the model coincide with the half-model projecting from the screen, the research technicians know exactly the position that the projectile occupied in the tank at that particular stage of its run.

Other equipment in the laboratory includes a polarized-light flume that uses a dilute suspension of bentonite, with double refractive powers, as a fluid. When a body is placed in the flowing material and is illuminated by polarized light, the flow pattern around and past it becomes visible.

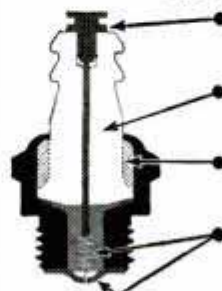
To study surface waves on enclosed bodies of water and, by inference, supersonic shock waves in the atmosphere, the laboratory uses a shallow glass-bottom tank. Small wave machines produce ripples in the water surface. The heights and frequencies of these ripples are then recorded by electric pickups.

Recently the laboratory installed a "free surface" water tunnel for studying the forces that act on a body that is at or near the surface of the water. The working section of the tunnel has transparent Lucite

(Continued to page 246)

CHAMPION V-GLOW PLUGS

for model engines only



• **CHAMPION TERMINAL**—assures better center electrode seal and provides sturdier electrical connection.

• **CHAMPION-CERAMIC INSULATORS**—proved dependable in millions of Champion Spark Plugs.

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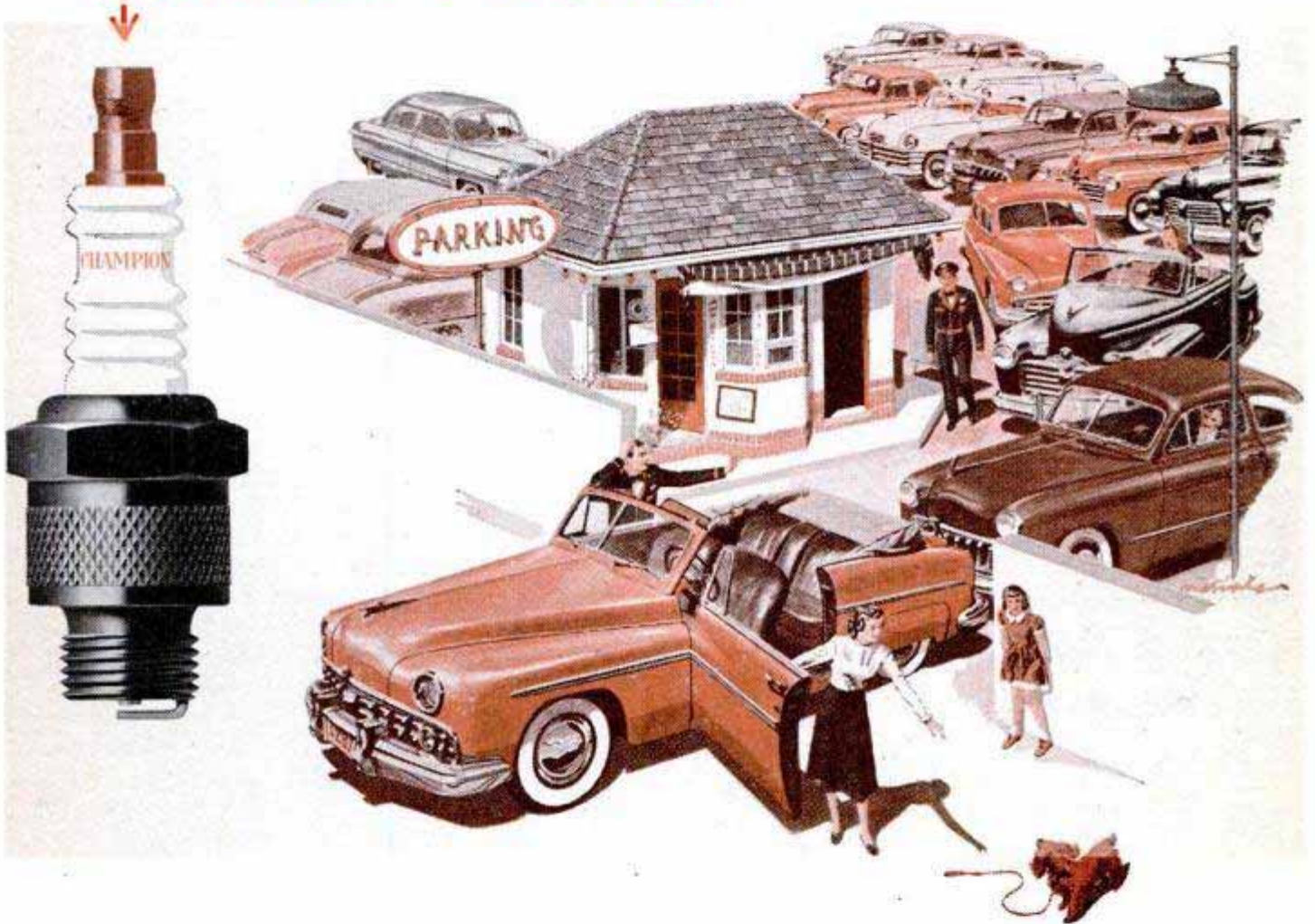
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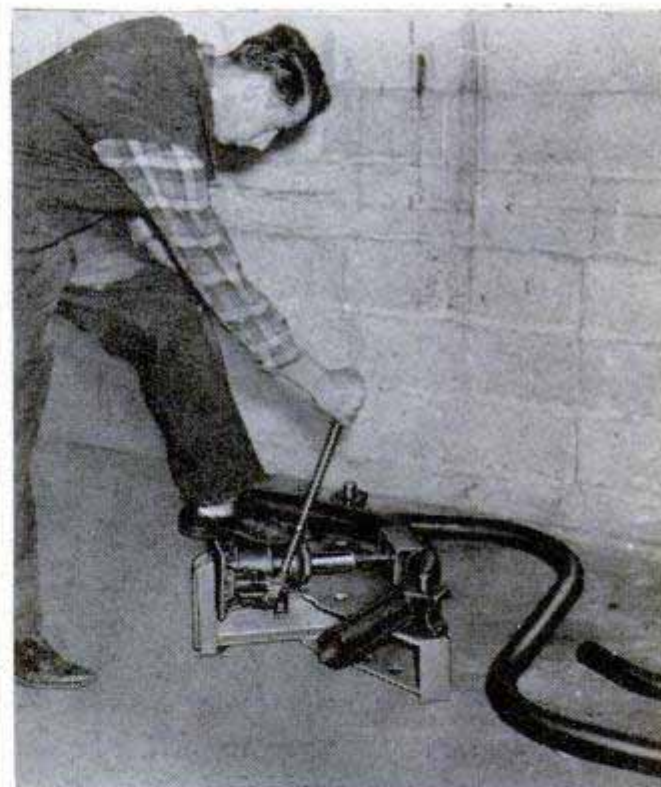
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sides and an open top that allows free wave action. The water travels past a stationary model at speeds up to 20 miles per hour and, since this is above the velocity of surface waves, the tunnel has many points of similarity with supersonic wind tunnels. The air pressure above the water in the working section can be reduced to about one point per square inch, permitting cavitation effects to be exaggerated and thus making it possible to determine the effects that cavitation has on the forces that act on a model.

Working in a new field, the laboratory has had to invent its own unique apparatus and techniques. Most of the studies are made to develop basic information rather than solving particular problems but, as Dr. Knapp points out, the information that is acquired in the water tunnels can be used in many applications, including better fluid drives for automobiles and even the prevention of hammering and vibration in water pipes.

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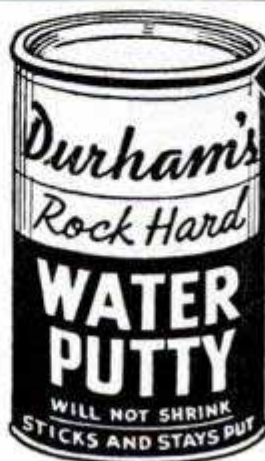
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Forecasters for the Air Waves

(Continued from page 104)

globe (such as South Africa and the southern part of South America) where ionospheric stations are spread rather thin.

Once the Radio Propagation Laboratory has gathered data, facts and figures from all parts of the world, it subjects them to statistical analysis. And from such analysis it prepares a monthly publication called "Basic Radio Propagation Predictions." This publication is printed by the U. S. Government Printing Office and mailed three months in advance to anyone who wants it. The price: 10 cents per copy or \$1 per year.

The laboratory has also prepared a manual called "Ionospheric Radio Propagation," selling for \$1, which explains in somewhat more detail the mystery of the ionosphere and how it affects short-wave radio communication.

It's easy enough, for example, to be the engineer of a powerful radio station where all you have to do to increase the strength of your signal is to turn on more power. But this is not always economical and it plays hob with other stations on the same frequency.

But, suppose you are a Navy communications officer aboard a ship operating in Arctic waters. You have to get an important message back to the Navy Department in Washington, D. C. There isn't enough power to blast a message through. What do you do?

First you consult your copy of "Basic Radio Predictions" and choose a frequency and time best suited to short-wave transmission. The frequency must be low enough so that it will be reflected from the upper layers of the ionosphere to its ultimate destination. If the frequency is too high, it will penetrate the ionosphere; if too low it will be subject to great absorption in the lower part of the ionosphere. Under certain conditions, the selection of the correct frequency is easily done. Under others, no communication whatsoever can be established.

Scientists at the Radio Propagation Laboratory say that enough data has been collected already so that predictions as far ahead as 1955 or 1956 could be made with a fair degree of accuracy. But like weathermen, the closer they are to a critical date, the better their forecasting.

It is the somewhat unexpected factors that plague the ionospheric forecasters—such as atmospheric radio noise, cosmic noise and solar noise.

(Continued to page 250)



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You've probably heard some of these disturbing factors on your own radio or television set. Atmospheric noise is commonly called "static" and is generated by electrical discharges from thunderstorms. Cosmic noise seems to come strongest from the vicinity of the constellation Sagittarius in the Milky Way and is heard as a slow, steady hiss. Solar noise is also a hissing sound, interrupted by "puffs" and "swishes" which are the result of sunspot activity.

With the use of higher and higher frequencies in communication and radar equipment, both solar and cosmic noise have come to be recognized as increasingly important. Recent advances in the design of very-high and ultra-high frequency receivers, which practically eliminate internal set noise, indicate that the limiting factor in the use of such equipment will be the "out of this world" noises from the sun and stars.

Radio Propagation Laboratory scientists, therefore, are much concerned with the study of solar and cosmic noises—and their effect on short-wave, long-range transmission. The researchers want to know the range of frequencies broadcast by the sun, received intensities and the correlation of the various kinds of noise in the atmosphere.

Two giant radar mirrors set up by the Radio Propagation Laboratory at Sterling, Va. (one built, the other under construction) will intercept and record solar noises reaching the earth. These devices are particularly suitable for this type of research because of their size. Their 25-foot reflectors will be aimed at the sun all day to pick up, initially, signals in the 480 to 500-megacycle band. Other ranges will be investigated later.

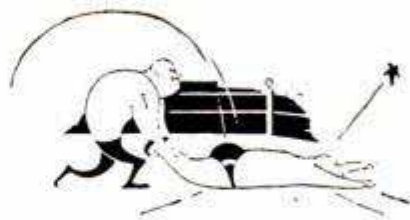
In addition to sending out printed material, the Radio Propagation Laboratory also broadcasts a vast amount of information over its radio station WWV. Located in Washington, D. C., WWV broadcasts on eight frequencies (2.5, 5, 10, 15, 20, 25, 30 and 35 megacycles). Seven or more transmitters are on the air at all times, day and night. This insures blanket coverage of the U. S. and much of the rest of the world.

Here is the information made available:

1. *Standard radio frequency*—The accuracy of any one of the radio carrier frequencies transmitted by the Bureau of Standards is one part in 50,000,000. Such gnat's eyelash measurements are of value to radio, electronic and acoustic research. Any desired radio frequency, including microwave, may be measured in terms of standard frequencies.

(Continued to page 252)

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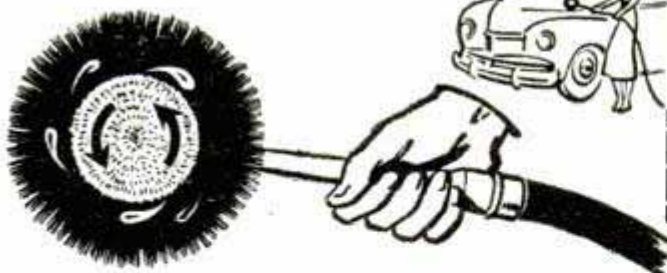
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6. *Radio propagation disturbance warning notice*—In spite of carefully drawn, scientific broadcasts, sudden ionospheric disturbances arise now and then. The Radio Propagation Laboratory provides a warning in code at 20 and 50 minutes past each hour. A series of "Ws" signifies that disturbed conditions are to be expected within 12 hours; a series of "Ns" means that none are expected.

Taking the guess out of radio "bounce" is important now that domestic broadcasting is moving into the higher-frequency ranges and FM and television are coming to the foreground. It means better communications with the whole world and higher standards of accuracy for researchers and manufacturers.

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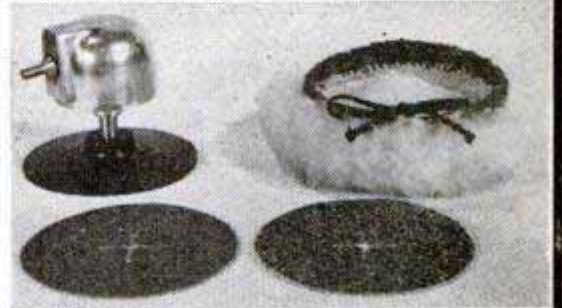


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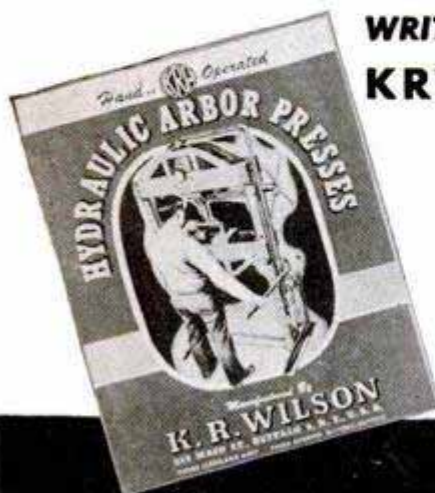
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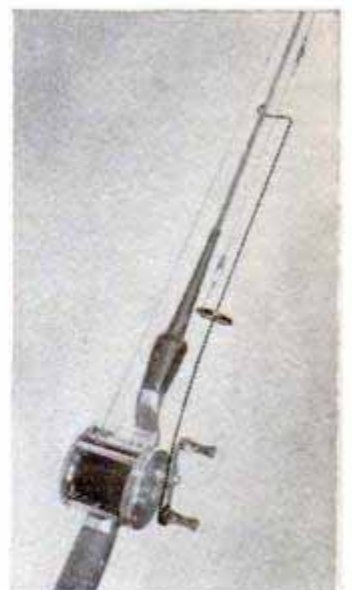


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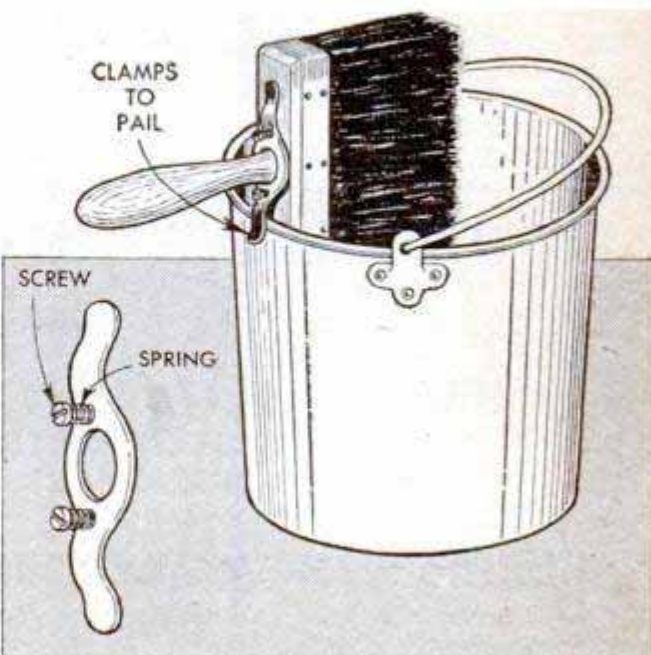


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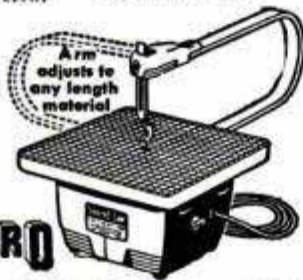
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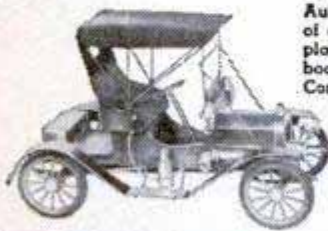
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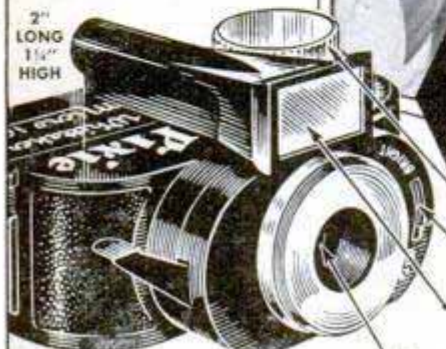
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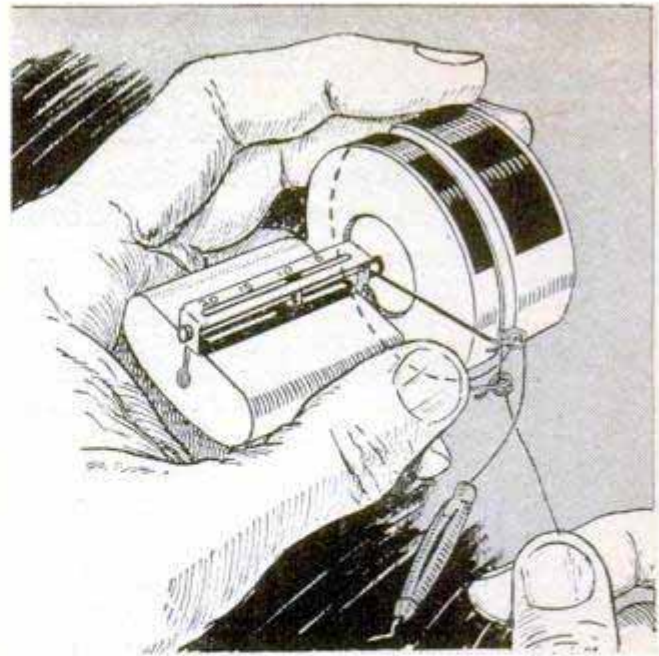
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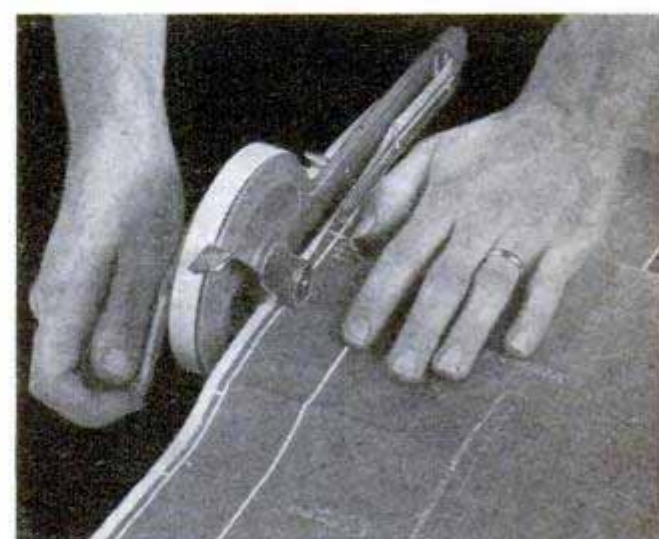


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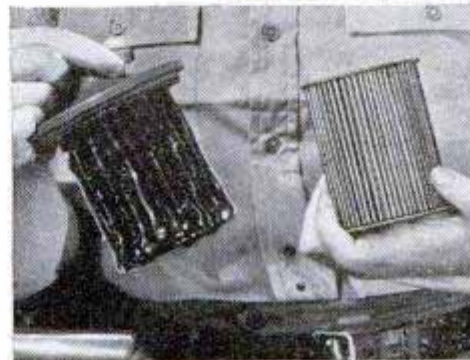
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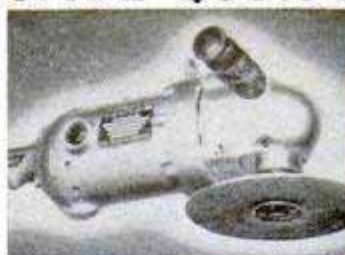
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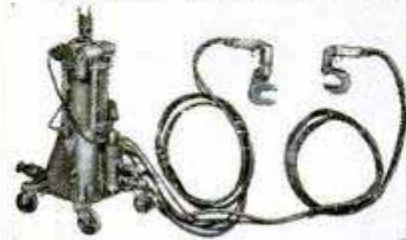
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PRICE CORRECTION!

Price for Speedy Sprayer Outfit in last month's issue of this magazine should have read **\$29.95**, less motor.

W. R. BROWN CORP., 5718 Armitage Ave. • Chicago 39, Ill.

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COMPLETE WITH A POLISHER-SANDER UNIT

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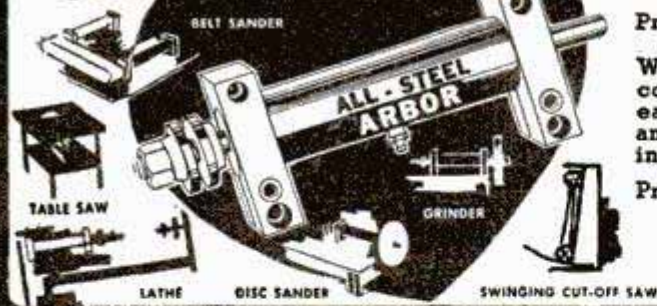
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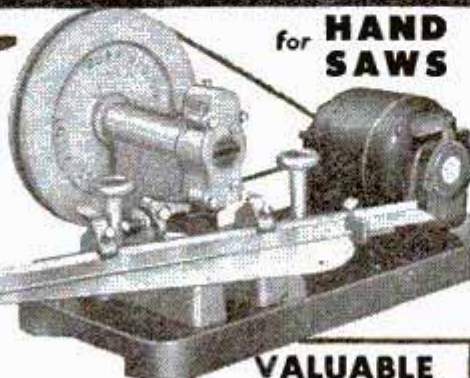
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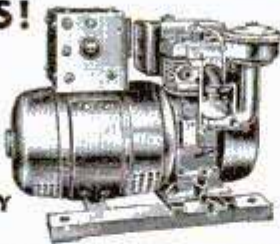
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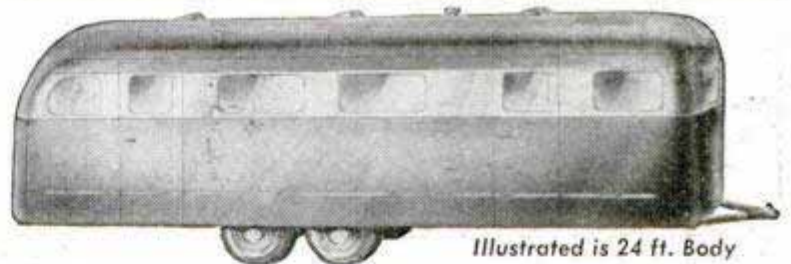
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Fits Any Window or Transom. Quiet Operation. 12 Inch Blades. Moves 1500 CFM. Beautiful Cream Streamlined Design. Puts comfort in your home at the finger touch . . . Reversible to draw out odors or draw in fresh air. Any Window 24 to 34 inches. Height 16". Wgt. 27 lbs. CW-1-110 V.-60 cy. AC-1ph. **\$29.75** ONLY. Fob.

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WITH 20 FT. AIR HOSE
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DETACHABLE TIRE CHUCK **\$22.95**

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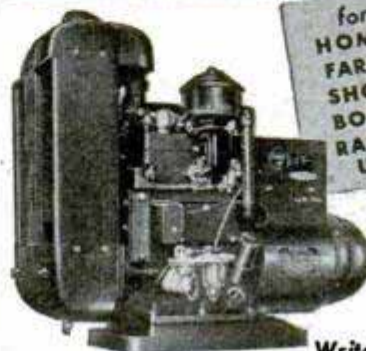


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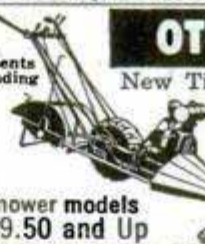
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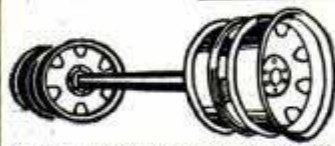
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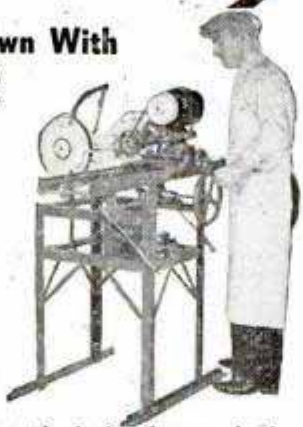
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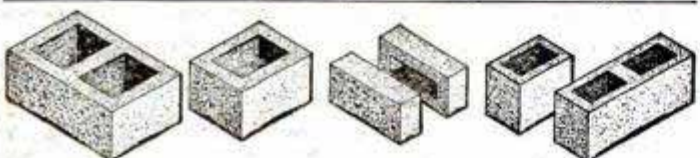
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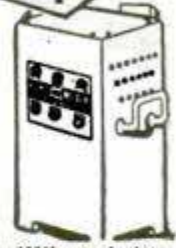
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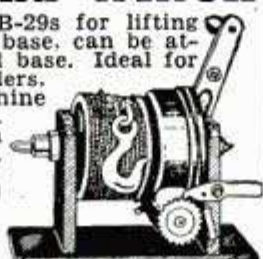
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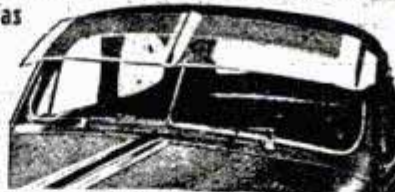
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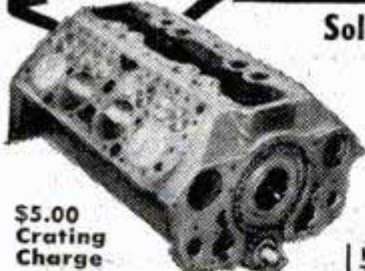
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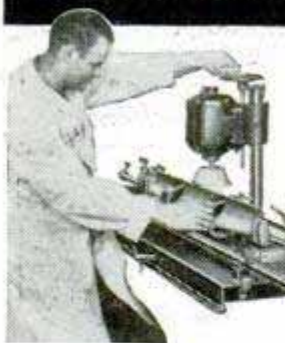
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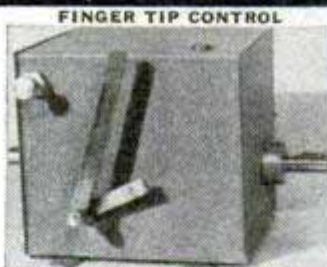
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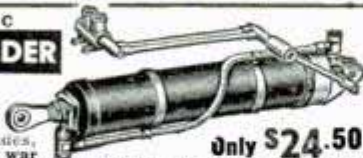
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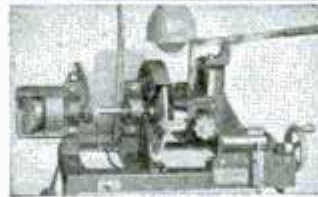
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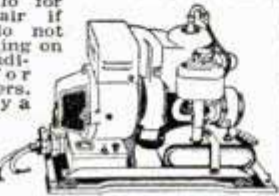
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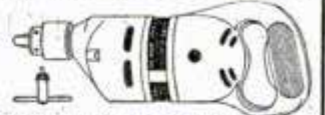


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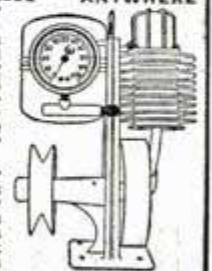


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VAPJET gives your car super aircraft power and performance. VAPJET users report 25% more mileage from regular gas. A double saving! Eliminates carbon, vaporlock and overheating. Complete kit permits easy installation—fits all cars. Order today—\$9.75 complete. Postage prepaid. \$1.00 deposit on C.O.D.—your check or money order in full saves postage. You take no chances—satisfaction guaranteed or money back! Specify car, year, number of cylinders. MAIL COUPON NOW!

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MORE GAS MILEAGE with VAPOR INJECTION

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Gentlemen: Please rush me _____ Vapojet units, complete with necessary linkage, instructions, etc. Enclosed is my check (or money order) in amount of \$ _____

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STREET _____

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she's some **SMOOTHIE!**
(YOUR CAR, THAT IS)

when equipped with
ADVANCE "ULTRA DEEP-TONE" MUFFLERS
DUAL OR SINGLE STRAIGHT-THRU

Rich, low, mellow tone. Also greater power, speed, and economy result from reduced back pressure. Rugged steel tube, blow-out proof. Simple to install. No welding. Dual set comes complete with rubber mounted clamps, fittings.

ADVANCE FENDER SKIRTS
These heavy duty steel skirts will beautify and streamline your car. Tight fit, no rattle, easy to install, prime painted. Real top quality, not to be confused with cheaper, light weight makes.

ADVANCE KI-YI AND RAZZ HORNS
Get these novelty horns for laughs.



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|---------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------|
| <input type="checkbox"/> Dual Muffler Set (Ford, Mercury only) .. \$20.00 | <input type="checkbox"/> Single Muffler (other makes) \$5.50 | <input type="checkbox"/> Fender skirts, pr. \$16.95 |
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| <input type="checkbox"/> Send free catalog showing complete line. | | |

Car make _____ Year _____ Model _____
Name _____
Address _____ City _____ State _____

← YOUR MOTOR

Foredom PRESTO-FLEX

with PENCIL-SIZE Handpiece \$5.95

WITH MARVELOUS EASE, you can grind, polish, drill, rout, mill, saw, sharpen, clean, carve, engrave, etch, etc. — on metal, wood, glass, plastic or linoleum. Simply attach to your electric drill, drill press or motor. Presto—a flexible shaft machine! Off again in a jiffy. Pencil-sized handpiece gives finger-tip control. Gets into tight places. Handy 35" overall length. And—only \$5.95 complete! ORDER NOW. If you order Presto-Flex for use on motor, specify motor shaft diameter. Add 50c for motor coupling. (Available for 1/4", 5/16", 3/8" and 1/2" shafts.) No. 50 Accessory Set available \$1.50 extra. Or, order the Foredom Model 99, ONLY \$15.95 complete with universal motor, flexible shaft and pencil-sized handpiece. Write for Catalog E-1119 and see the many Foredoms now available.

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OVER 50,000 SATISFIED USERS!

DYNAMIC HEAVY DUTY WELDER

MAKE OR SAVE TIME & MONEY! ONLY \$28.50 COMPLETE

Now You Can Repair Auto, Home Appliance, Farm & Shop Equipment for yourself & others with this Genuine Transformer Type Welder—75 Amp. Capacity. Does Welding, Brazing, Soldering and Cutting on iron, steel, brass and other metals. Portable. Easy to operate from any properly wired 110 Volt Line (other voltages at slight extra cost). Has 8 metallic and carbon arc welding heat stages. Comes COMPLETE ready-to-weld with helmet, rods, cable, etc. and Simplified Instructions which are actually a short course in welding. A few repair jobs will more than pay for it. SPECIAL GIFT \$6.80 ARC TORCH yours at NO EXTRA COST. Write today for FREE details and 10-DAY TRIAL OFFER.

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Now **CHEAP OIL BURNER**
FOR HEATING AND COOKING STOVES—FURNACES

HEAT YOUR HOME, COOK YOUR MEALS WITH CHEAP FURNACE OIL

NO MORE SHOVELING COAL OR ASHES. Sensational Fuelizer Starter Vaporizing System turns Cheap No. 1 Furnace Oil, also Rango, Heater, Tractor Distillate, Kerosene and like oils into oil heat—one of the quickest, hottest fires known. LIFETIME GUARANTEE. \$1.00 Bonus Offer for Testing. We will let you try it in your own store or furnace for one month. Get yours for introducing. Big profits QUICK. Be first. Send in your name today for details and cash in on the tremendous demand for this Amazing Invention.

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2 DRILLS IN 1

This attachment gives you two drills in one. It converts any 1/4 inch electric drill to 1/2 inch capacity. Reduction gears reduce the drill speed 5 to 1, the average speed of a 1/2 inch drill, and thereby increases the power. Absolutely indispensable for all shop work and home craftsmen. Satisfaction guaranteed. Order yours now.....

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NEWEST OTTAWA LOG SAW

SELF-PROPELLED — MOVES ANYWHERE on OWN POWER

World's fastest Log Saw. Powerful 6 H-P air-cooled motor. Attachments for sawing down trees, buzzing limbs, post hole digging and pulley for belt jobs. Big demand for wood, pulp, posts. Make big money sawing wood this easy way. Low factory-to-user prices. Nothing like it. FREE details.

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BUILD YOUR OWN POWER LAWN MOWER

WHY BREAK YOUR BACK MOWING FIELD OR LAWN?

WRITE FOR FREE Building Instructions The Rite-Way Mower Attachment Ball Bearing

SAVE MONEY SAVE TIME Now anyone can save time and effort mowing field or lawn by building their own whirl type power mower. Build according to your own ideas and needs at small cost. Cut close to fences, walks, buildings, etc. Build in short time with parts and instructions we furnish. Save hours of time and back breaking labor. Write today for FREE information.

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NEW 1949 CATALOG
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 SEND 25c TODAY!

Sportsman's Tent
 Sturdy, lightweight, easy to erect. Will pack into a 12" roll 36" long. Made of 8 oz. forest green, WATERPROOF DRILL. Full floor cover, with mosquito netting on window & door. Reinforced throughout—Hardwood jointed center pole & 12 stakes included. A LIFETIME VALUE
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FOLDING STEEL With Tubular Headlands and sturdy double heavy wire SC \$2.95 Ea.
COTS twine springs. A life time buy.
NAVY BUNK BED With steel angle headlands, steel frame spring made of twisted heavy gauge wire reinforced with lateral stringers. Can be used as single bed or joined two-high to serve as double bunk bed. Specially suited to hard wear, active children, dormitory rooms, etc. Single \$8.10. Ea. \$3.95
 In sets of two Ea. \$7.75
FILLOWS Curled Chicken Feathers 99c Each
 20 x 17 Blue & white ticking
 The coils of bed each weigh approximately 12 lbs. Consult your local motorist for shipping cost due to 100lb. min. mattress shown below can be included at no extra charge cost.
MATRESS for above cot or bed, cotton filled 3 1/2" thick spec. built not to flatten out. Tuffed edges, quilt top, blue & white heavy ticking. MT-1 \$6.95 Each

FOOT LOCKER Pine wood. Store clothes, bed covers, books, tools, and handy in moving. Removable tray 3" deep, rounded metal corners, screw hinge, length 30", width 17 1/2", height 13". Used, but in good condition. Sturdy & well built. Limited number. ONLY \$4.95

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CLAMP-ON ANYWHERE LAMP With adjustable ball and socket swivel head, long rubber covered cord and wall plug.
 The All Purpose Lamp. Wonderful for Indoor Photography, Floodlights, Baby Spot or Large Spot, Personal Bed Reading, Workbench, Garage, etc. Lamp Alone 99c
 Highly Polished 9" diameter Parabolic Reflector or 5" diameter Spot Reflector at Only 85c ea.

Sperry Aircraft Directional GYRO COMPASS
 Precision made for Positive direction. 360° swing calibrated in 1/10 degree (six min.) luminous dial. Built-in bank indicator and instrument light. Case is 4 1/2" square with 3" dia. face. Operates on vacuum. Ideal for autos, light planes and boats. Can be used in autos and boats by attaching one tube to intake manifold. Complete with caging and reset knob. Re-issue—good condition. ONLY \$449

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 6" chrome vanadium blade, handle, leather grip. In leather sheath. \$5.95 Value for ONLY \$1.89
 (Like Above) 5 in. polished blade \$1.69
 With Parkerized black finish \$1.49
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Genuine ARMY AIR FORCES SUNGLASSES
 HERE'S THE REAL McCoy!
 ARMY AIR FORCE & base. Precision Polished and Ground. Clear-Flex lens with leather case that can be attached to belt. Gold plated adjustable frame. Pearloid sweat bar and pads. \$3.95
 A real Policy \$17.50 Value for Only \$3.95
ARMY AIR FORCE TYPE SUNGLASSES
 4 base, polished and ground lens. 3 1/2" Ultra Violet Ray lens, gold plated frame, pearloid bar & pads, leatherette case. Our price \$2.39 ea.

New Navigators Magnetic Compass
 #111 Type D-12 size 7" dia x 4 1/2" deep. Rubber lined, rotating verge range rings calibrated in 1 degree from 0-360° with 2 parallel grid wires for alignment with U.S. line. Best. \$14.95

FOAM RUBBER CUSHIONS
GOODYEAR AIRFOAM
 Molded and pre-shaped. Cement or cut to fit. Variety of sizes and shapes. For chair pads, auto & truck seats, trailer & boat seats outdoor furniture and nooks.
 18" x 18" x 6" \$4.89 ea.
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 42" x 18" x 3 1/2" \$6.89 ea.
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 7 jewel—sweep sec. hand, metal face, Radium Dial & Numbers \$7.95
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 17 jewel—One of the finest made anywhere. Cased in Switzerland. Sweep sec. hand, stop & re-set buttons. Measures distance, airspeed, groundspeed, races. Ideal for the sportsman. We've got a Special on these at \$23.95

COMPASSES #151 Marching, lensless, with luminous dial \$1.59
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 NEW 1 1/2" Jewel Watch Pocket Compass #153 \$1.59

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 Genuine Leatherette to cover Chairs, Patio Furniture, Nooks, Auto Seats, etc. 10 colors at a BARGAIN PRICE.

BUCKET SEATS
 Tough, durable construction of water and weatherproof plywood... lightweight and easy to mount. Real luxury for the pleasure or fishing boat. Seat 18" x 18", back 26" high. ONLY \$449

Hand Mike Highly Sensitive with thumb control button on handle. Ideal for home recorders, public address systems, etc. Comp. with 2 ft. rub. cd. ONLY \$1.19

WIDITH COLORS PRICE (per run, yd.)
 36" Grey, Brown, Black \$1.19
 36" Lt. Green, Dark Green, Blue 1.65
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NEW CUSHIONS
 Finest imitation leather. Filled with kapok to float. Yellow color for great visibility in water. Just the thing for your boat, truck auto tractor.
 SEAT, New, 17" x 16" x 3" thick \$3.49
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HS 33 NEW LOW IMPEDANCE RADIO HEADSET
 The latest and most improved style, currently in use in aircraft. New! Packed in original box. Leather head band, sponge rubber ear pads, includes JORD and JACK \$3.25
 High to Low Impedance Adapter 35c ea.
HEADSET HS-30-U Two Magnetic Type receivers in watertight brass case. Soft rubber inserts in each receiver to fit into wearers' ears. Flange steel head band. Ideal for communications, divers, workers in noisy compartments, etc. NEW! \$1.59

MESS TRAY 6 compartments, rustless, stainless steel. Barbecue, outdoor cooking, save dish-washing. Hospital, Restaurant, Home, or roughing. #311 New 83c ea.
 #311A Used but in Fine Serviceable Condition 59c ea.

GENUINE GOGGLES
 Aviators (AN-6530) Windproof & Dustproof
 Sponges and leather protected frame with ground lens in clear, amber or green. Clear set in replaceable metal frame with hinged nose bar. Ideal for Motorcycling, etc. Co-55 \$1.69 ea.

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 Just the thing for tuning beam antenna. Powered by 1/4 h. p. 24v G. E. Motor. Removable 4" Rev. Limit Switch - Cam Worm gears. Rev. gear. Solenoid clutch. Motor engaged to gear reduction only when electrical contact made. Operates in either direction. Ideal for auxiliary power take-off, opening and closing doors, etc. A TREMENDOUS VALUE \$4.29

SLEEPING BAG
 NEW! 100% wool. Mummy type. Heavy duty 30" zipper. 4000 Goo-Loc cost \$22.00. \$3.95
 Used water repellent cover \$1.95 extra. Sold only with Sleeping Bag.

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 UNSURPASSED VALUES for ARTISTICALLY INCLINED HOME HOBBYIST!
 Start Planning Model Kits GIVE NOW!
 Kit #1 contains 2 lbs. plasticine & 4 plastic sheets in various shades. 1 ea. bottle of clearset cement, and 5 bottles of colors in 1 ea. bottle of clearset cement, and the Plastic Handbook. A \$5.50 Value for ONLY 99c
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 Fabricators write in for our special quantity prices. All above are new & marked. Also inquire about our other large stocks of Plexiglas.

NYLON FISHLINE Special
 Strong—Lightweight—2 ply NYLON FISHING LINE. ROT-PROOF and WATERPROOF... Especially treated for strength and long life. ON SPOOLS.
 a. 10 LB. TEST. \$1.69
 b. 15 LB. TEST. 150 FT. \$3.19
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FEATHER & DOWN BAG
 Water repellent Poplin cover... Heavy duty 3/4 length zipper... Weighs only 5 1/2 lb. Prepare for that vacation NOW... We made a TERRIFIC BUY... Yours while they last for ONLY \$13.95
KAPOC BAG with air mattress compartment and wind-breaker hood... Just the thing for the outdoor man. ONLY \$15.95
AIR MATTRESSES 25" x 72" \$11.95

Clear Plexiglass Window
 12 1/2" x 9" — 3/8" thick with aluminum piano hinge for attachment. Fine for boats, trailers, etc. \$1.69
NAVY BATTLE LANTERN
 This powerful battle tested lantern complete with 2 standard 1 1/2 volt dry cell batteries. Size 6" x 7" x 4" with a 4" dia. reflector. Comp. Only \$3.29
THE Air Forces' BEST Loose Leaf BINDER
 3 metal post cylindrical locking heavy duty 3/16" fabric and lined cover. End identification window. Ideal for price books, salesman catalogues, photo albums, students, publications, reference books, artist sketch books, etc. Will hold 500 sheets. 8" x 11". A \$5.00 Value for Only 59c
PLASTIC PARALLEL STRAIGHT EDGE
 with knobs and rubber pads for non-slip on each section. A must for navigators, mechanics, draftsmen, and engineers... You've never seen 'em at 97c ea.

PALLEY THE LARGEST FIRM OF ITS TYPE SUPPLY CO. IN THE WORLD DEPT. PM 7 6321 SAN FERNANDO RD GLENDALE 1, CALIF.
 Order from this Ad. All sales final. All Prices F. O. B. Los Angeles. Pay by M. O. or Check. P. O. A. Acctd. from D & B firms. 1/3 deposit with C.O.D.s

"Wellworth" Sensational Offer! Reg. \$60.50 WESTINGHOUSE AIR COMPRESSOR

Model T-1
Brand
New!

plus pressure tank, air gauge, air chuck, 20 ft. hose, pop valve, and fittings as shown.

COMPLETE OUTFIT OF 6 ITEMS ONLY....

IDEAL for HOME • FARM • FACTORY
Wherever Compressed Air Is Needed

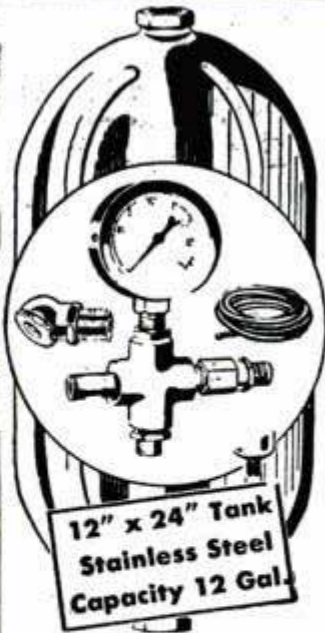
A fortunate purchase from the Government enables us to offer you this amazing buy at a small fraction of the price of the manufacturer and of leading mail order houses. All brand new. You get the WESTINGHOUSE COMPRESSOR and all of the accessories shown for Only \$31.50. Shipping wt. 50 lbs. Designed for automotive truck or tractor mounting. Can be run off fan belt or power take-off, or mounted horizontally. Comes with automatic clutch. Can be installed for use on farm trucks, jeeps, tractors, tire or garage service trucks, contractor or road building machinery, pneumatic devices, etc. Can be operated with 1/2 H.P. or more electric motor or equivalent portable gas engine. Replacement parts available.

This low price is but a fraction of the price of manufacturer and of leading mail order houses.

\$31.50

COMPRESSOR SEPARATELY
\$21.50

Equipment less
Compressor..... **\$12.50**



12" x 24" Tank
Stainless Steel
Capacity 12 Gal.

THE COMPRESSOR

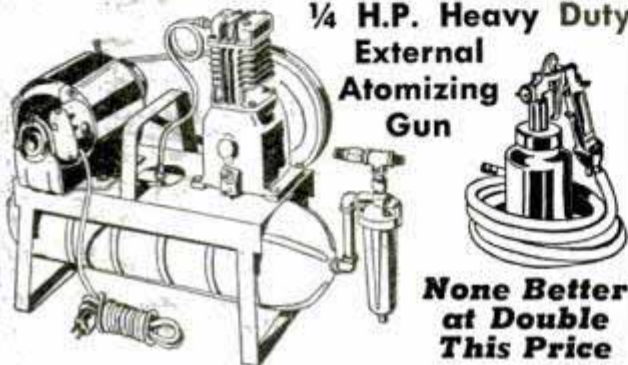
Piston Type, 2-cylinder, 2 inch bore, 1 1/2" Stroke Ball Bearing AUTOMATIC CLUTCH. OIL FREE AIR 3.27 C.F.M. at 600 R.P.M. 8.54 at 1200. Suggested operating pressure 75 P.S.I. DIMENSIONS: 9" wide, 11 7/8" high, 6 3/8" deep. Wt. 26 lbs.

TANK AND ACCESSORIES

12" x 24" stainless steel tank suitable for 150 lb. pressure. Two 1/4" openings. Air gauge, pop valve, air chuck, 20 ft. hose and fittings as shown.

PORTABLE SPRAY OUTFIT

1/4 H.P. Heavy Duty
External
Atomizing
Gun



None Better
at Double
This Price

Paint Sprayer mounted on 6 x 24 inch tank, 1/4 H.P. 110 V. 60 cy. Heavy duty motor with overload relay, 10 ft. cord and plug, V belt drive. Piston type Compressor with 2 Compression rings, 1 oil ring, 2 inch bore, 1 3/4 inch stroke, displacement 2.86 C.F.M. at 60 lbs. pressure, Safety Valve. Gun external atomizing. Flat and round spray, quart cup; maintains 35 to 40 lbs. working pressure. Oil and water extractor, 1 air gauge, 20 ft. heavy duty 2-braid air hose with leak proof fittings, complete with carrying handle. Net weight 54 lbs., ship. wt. 60 lbs.....

\$57.50

Outfit less motor..... **\$47.50**
Compressor only..... **17.50**
Spray gun and 20 ft. hose **12.95**

300 GAL. COOLANT PUMP A HEAVY-DUTY PUMP AT 40% LESS

You pay less and get a larger, higher pressure, higher capacity, heavy duty coolant-type, recirculating pump. Also extensively used on evaporative coolers. Will deliver 60 gal. per hr. at 8 ft. head and 300 GPH at no head. Heavy duty 1/30 H.P. totally enclosed, 110V., 60C., motor with long life oiling. Noncorrosive shaft and pump. 10 1/2" high, 3/8" I.P.T. Shpg. wt. 12 lbs.

\$19.50



PNEUMATIC AIR TOOLS

Used. Guaranteed like new.



CHICAGO PNEUMATIC RIVETER
& CHIPPING HAMMER

CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 6 lbs. List price \$73.00.

SPECIAL PRICE..... **\$14.50**

Same as above, brand new..... **\$22.50**

Size CP3. Takes 5/32" Rivet..... **\$10.95**

A.V.C. 11 INGERSOLL RAND



Push button, takes 5/32" rivet. Wt. 3 lbs. List price \$65.00. Only **\$10.95**



Ingersoll Rand
AIR DRILL

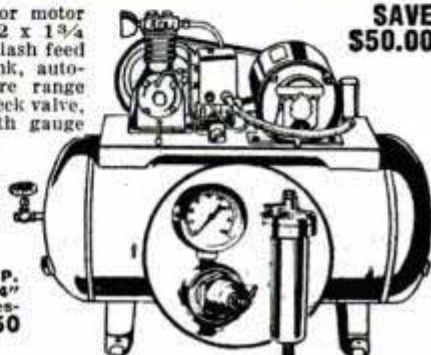
With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$55.00. Only **\$17.50**

AUTOMATIC COMPRESSOR UNIT

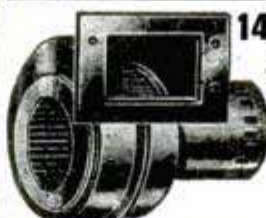
1/3 H.P. heavy duty capacitor motor AC 110/220 volt 60 cycle, 2 x 1 3/4 inch piston type compressor, splash feed lubrication, 12 x 24 inch tank, automatic pressure switch, pressure range 100 to 125 lbs., CFM 2.2, check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Shipping wt. 90 lbs.

Special Price **\$79.50**

Same unit as above with 1/2 H.P. motor, furnished with 13" x 24" tank. CFM 2.8 at 125 lb. pressure. Shipping wt. **\$98.50**
125 lbs.....



SAVE
\$50.00



140 CFM "WELLWORTH" BLOWER

Single-inlet blower that gives top performance on heating, ventilating, exhausting, cooling, drying and similar applications. 5 1/8 x 4" mounting flange with 2 1/2" square discharge, 3 1/2" dia. blower wheel powered by direct-motor with conduit box and 20" leads. 7 1/2" wide less flange by 7 1/4" H. x 6 3/4" D. Suited for hundreds of new and replacement uses. Shpg. wt. 6 lbs.....

\$16.50

"Wellworth" CHECK VALVES



1/4" valve **\$2.75** 1/2" valve **\$4.50**

6 FT. STOW FLEXIBLE SHAFT

Heavy Duty, 3/8" Core. Best piano wire. Ball bearing handle and arbor, rubber covered housing; for 1/2" motor shaft; for 1/2" bore wheels. Operates on 1/4 H.P. Motor at 1725 or 3450 R.P.M. \$20.00 Value, **\$14.50**. Wt. 8 lbs.



Reduced Price
Only **\$14.50**

Chicago Pneumatic Lever Type AIR DRILL



With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$55.00. Only **\$17.50**

AUTOMATIC PRESSURE SWITCH WITH UNLOADER

Double pole, with 2 way release valve. Set at 125 to 150 lbs. pressure. **\$10.25** Wt. 4 lbs. Only..



Prices f.o.b. Chicago. Immediate delivery.
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**NOW... LIGHT
WHEN YOU NEED IT!**

Ray-O-Vac LEAK PROOF batteries
stay fresh for years!
(because they're sealed in steel!)



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See how much more you get

in these truly modern batteries. Each Ray-O-Vac Leak Proof starts with a powerful, well made battery. Then...

1. Steel bottom is added. 2. And a steel top.
3. Next—multiple insulation. Nine layers of protection against corrosion.
4. Last—a steel jacket. This completes an air-tight seal, to stop corrosion and keep the battery fresh and powerful. Only Ray-O-Vac builds batteries with all four of these safeguards.

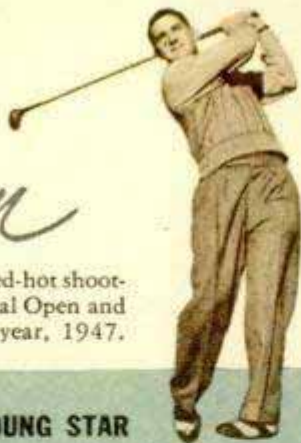
GUARANTEE on every Ray-O-Vac Leak Proof: "If your flashlight is damaged by corrosion, leakage or swelling of this battery, send it to us with the batteries and we will give you FREE a new, comparable flashlight with batteries."

Ask for Ray-O-Vac Leak Proofs

Buy Spares

they stay fresh

Lew
Worsham



"Powerhouse" Lew, whose red-hot shooting captured both the National Open and the Denver Open the same year, 1947.

Gene
Sarazen



The ever-amazing shot-maker of pro golf... U.S. Open and P.G.A. champion back in '22, and collector of a long list of titles ever since.

THE BRILLIANT YOUNG STAR

AND THE GREAT VETERAN OF GOLF AGREE:

Camels for Mildness!

In a recent test of hundreds of people who smoked only Camels for 30 days, noted throat specialists, making weekly examinations, reported

NOT ONE SINGLE CASE OF THROAT IRRITATION due to smoking CAMELS

Every day...every week...all over the nation...smokers are making this simple "prove-it-yourself" test—*smoking Camels, and only Camels, for 30 days!*

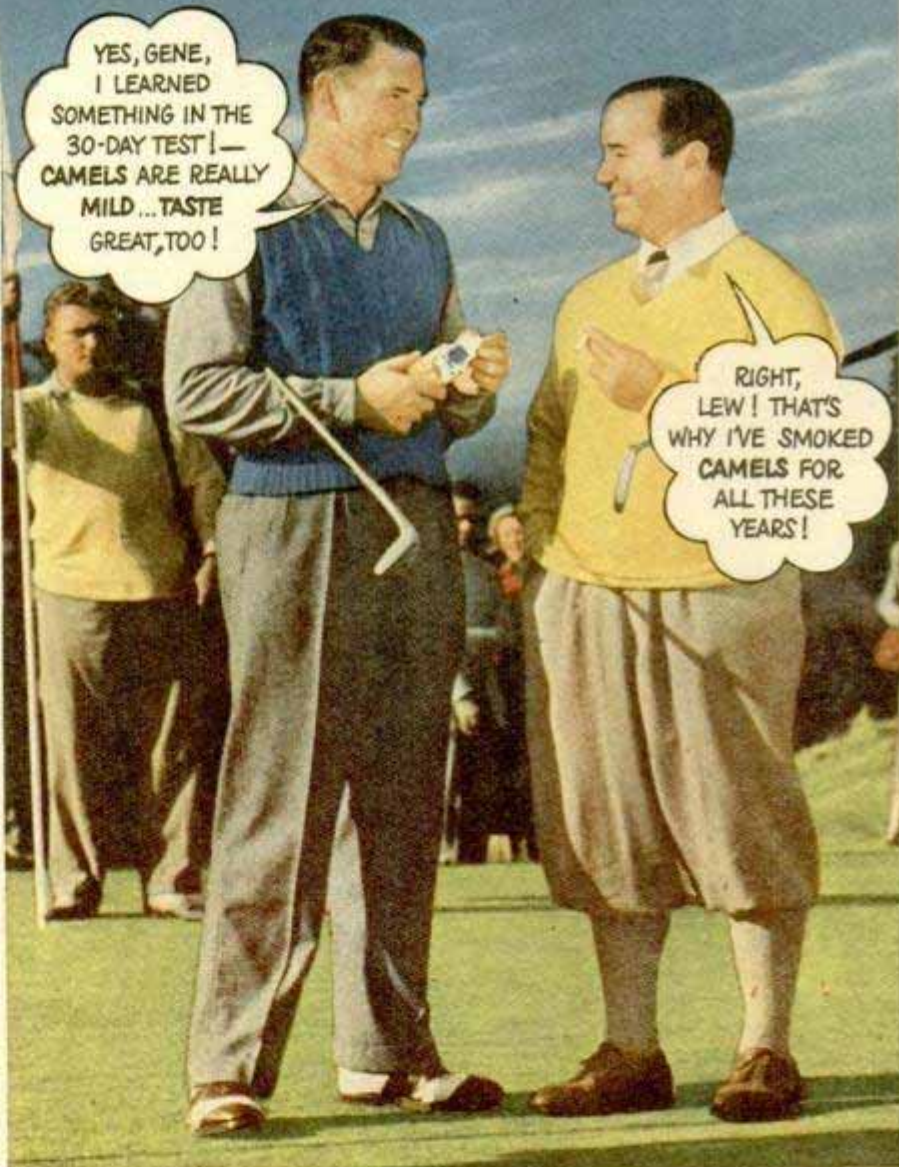
There's change in the air and this change is to Camels... for *mildness, for flavor!* Make your 30-Day Test in your "T-Zone". See if you, too, don't change to Camels!

H. J. Reynolds
Tobacco Co.,
Winston-Salem,
N. C.



YES, GENE, I LEARNED SOMETHING IN THE 30-DAY TEST! — CAMELS ARE REALLY MILD... TASTE GREAT, TOO!

RIGHT, LEW! THAT'S WHY I'VE SMOKED CAMELS FOR ALL THESE YEARS!



According to a Nationwide survey:
MORE DOCTORS SMOKE CAMELS THAN ANY OTHER CIGARETTE

When three leading independent research organizations asked 113,597 doctors what cigarette they smoked, the brand named most was Camel!