

MAY 1947



POPULAR MECHANICS

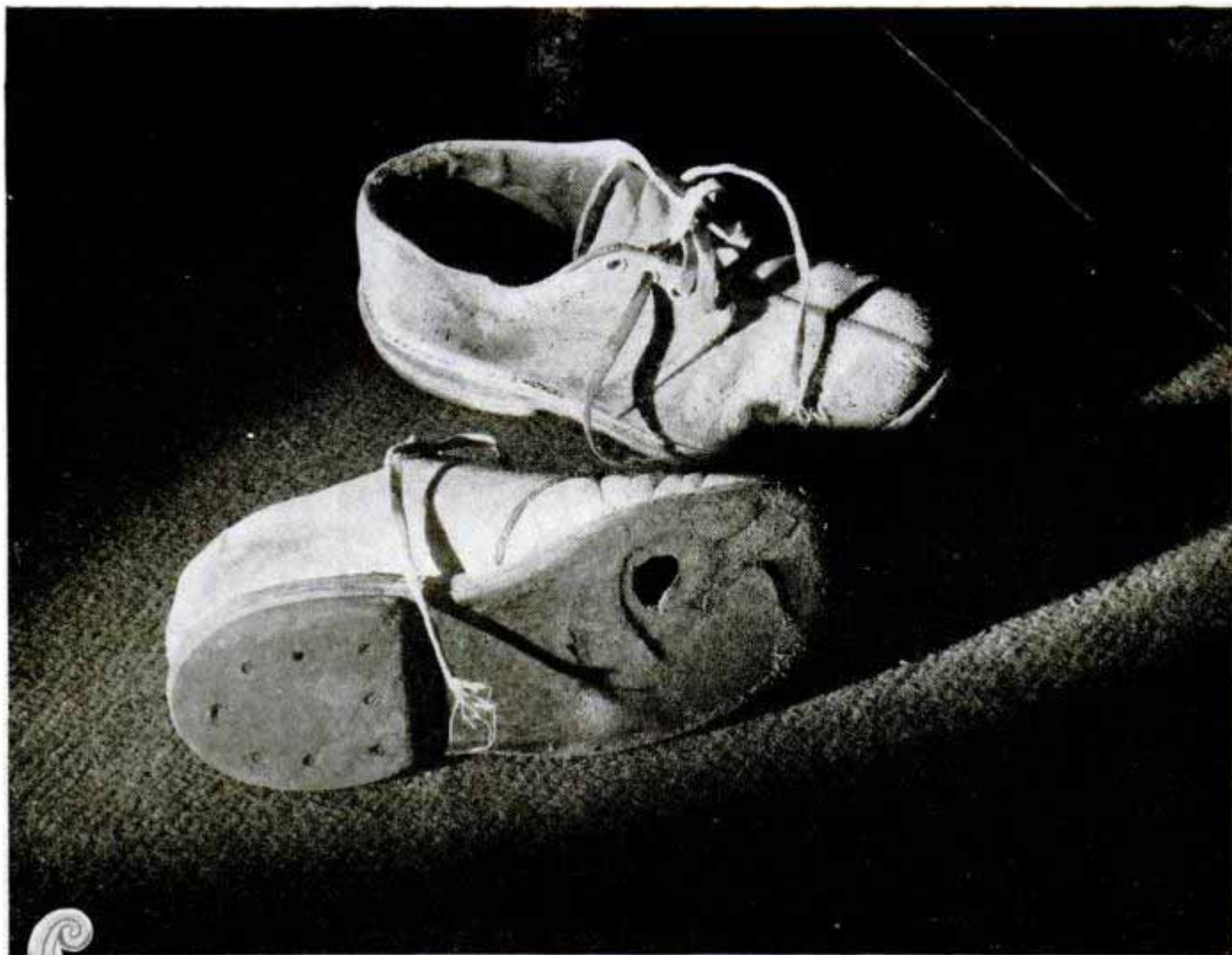
MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF. TRADE MARK GREAT BRITAIN NO. 40325



CHANNEL-WING PLANE
PAGE 81



Piston Rings wear out, too

Piston rings are *replacement* parts . . . they're made to "take" the wear . . . to protect your engine . . . to be replaced again and again. And the sooner you replace worn-out rings, the longer your engine will last . . . the better and more economical it will run.

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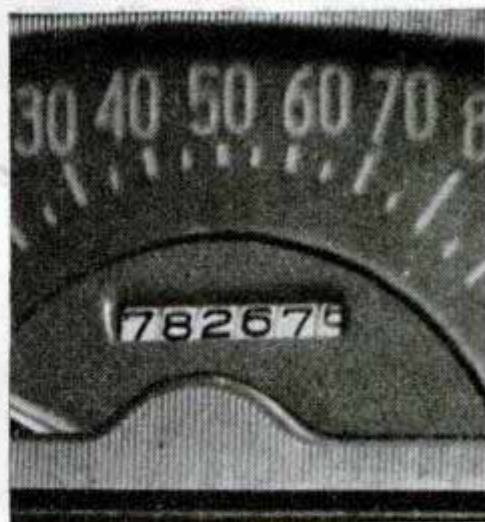
HASTINGS MANUFACTURING COMPANY, HASTINGS, MICH.
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HASTINGS

STEEL-VENT PISTON RINGS

TOUGH on Oil-pumping
GENTLE on Cylinder Walls



TYPICAL EXAMPLE: THE B. F. GOODRICH TIRE THAT OUTWEARS PREWAR TIRES

THE B. F. GOODRICH tires on the cab shown above had already gone over forty thousand miles when these pictures were taken and were still in good shape to be recapped.

Reporting on these tires, L. R. Lane, Jr., of the Yellow Cab Company, Marion, Ohio, says:

"As you know, in taxi service, it is necessary to operate our cars on all types of streets and roads in all kinds of weather. In addition, we believe the tire has been subjected to an abnormal number of starts and stops.

"Based on our experience with the new B. F. Goodrich passenger

car tire, we believe that it will outwear prewar tires even in adverse conditions.

"Speedometer reading at time tires were put on was 35,062. Photos were taken at 78,267. Mileage on tires is now 43,205, and as you see, they are about ready for recapping."

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Most people who need tires can now get the new B. F. Goodrich Silvertowns! Some sizes are still scarce, of course, but most dealers have a fair assortment right in stock. Talk to your B. F. Goodrich dealer—you may not have to wait at all. *The B. F. Goodrich Company, Akron, Ohio.*

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Dennis
Allison
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Pineville, La.*

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Next Month

WHERE do we go from here, scientifically speaking? Charles F. Kettering, research genius of General Motors Corporation, brings you the answer to this question in a June article: "Where Are Our New Frontiers?"

PART II of the story of *Popular Mechanics'* Build-It-Yourself House appears in the Craftsman section of this issue. Coming next month is a blow-by-blow account of how the roof and siding were applied. Then you step indoors to watch war veteran Jacques Brownson and his wife erecting and plastering partitions, hanging doors, laying floors and installing fixtures.

HOP aboard one of the new super-trains described in "Dress Parade on Rails," a June feature. While whizzing across the country at 100 miles an hour you can make a phone call, have your hair cut or see a movie.

NOW that fishin' time is here, sportsmen will turn to next month's Craftsman section for a lesson in bait casting.

HUMAN engineering has joined the coaching staff to create better athletes. Dr. Franklin Henry of the University of California tells "What Makes an Athlete Tick," an especially timely article as America's Olympic challengers go into training for '48.

WANT to find out how good a driver you are? A feature in the June Craftsman section describes a number of easy-to-build devices for testing the individual's ability behind the wheel.

YOU can play records through any radio set in your home with the one-tube "wireless" record player described in the Radio and Electronics pages next month.

Volume 87 MAY 1947 Number 5

Managing Editor.....Roderick M. Grant
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Shop Notes and Crafts Editor.....James R. Ward
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For the Craftsman

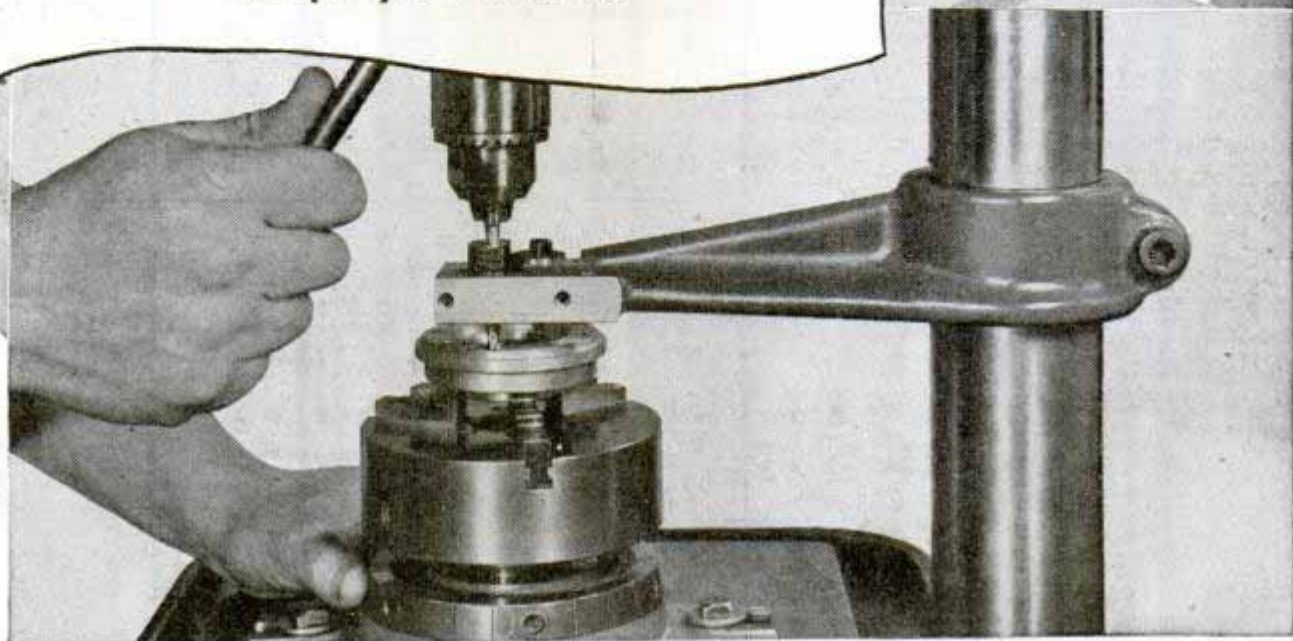
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Published monthly by POPULAR MECHANICS COMPANY, 200 East Ontario Street, Chicago 11, Ill. H. H. Windsor, Jr., president; Paul H. Dunakin, vice president and general manager; D. F. Windsor, vice president and secretary-treasurer; William Harrison Petridge, vice president and assistant to the publisher; Clover L. Perkins, advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 25 cents; subscription rates in United States and possessions, Canada, and countries of the Pan-American Postal Union, 1 year, \$2.50; 2 years, \$4.50; 3 years, \$6.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 60 days in advance so you will not miss an issue. Give both old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada, Copyright 1947, by Popular Mechanics Company, Copyright under International Copyright Union, Copyright in France. All rights reserved under Pan-American Copyright Union. Printed in the United States of America.

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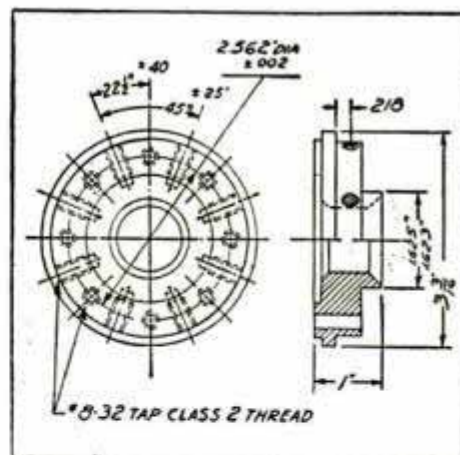
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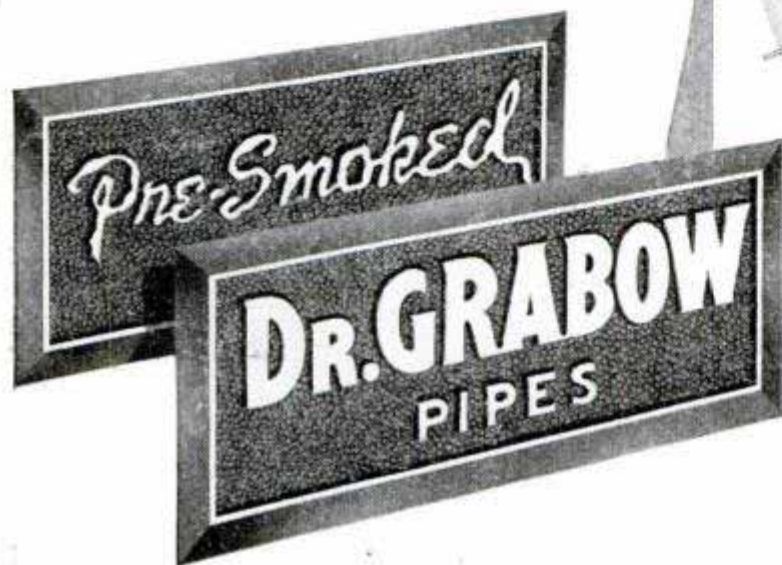


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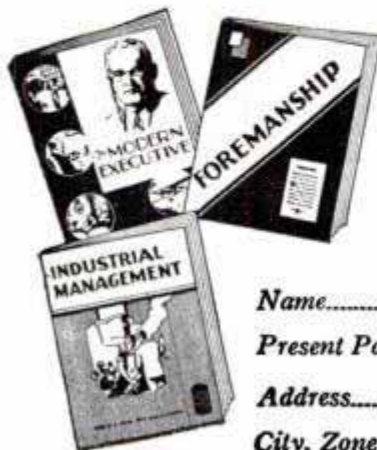
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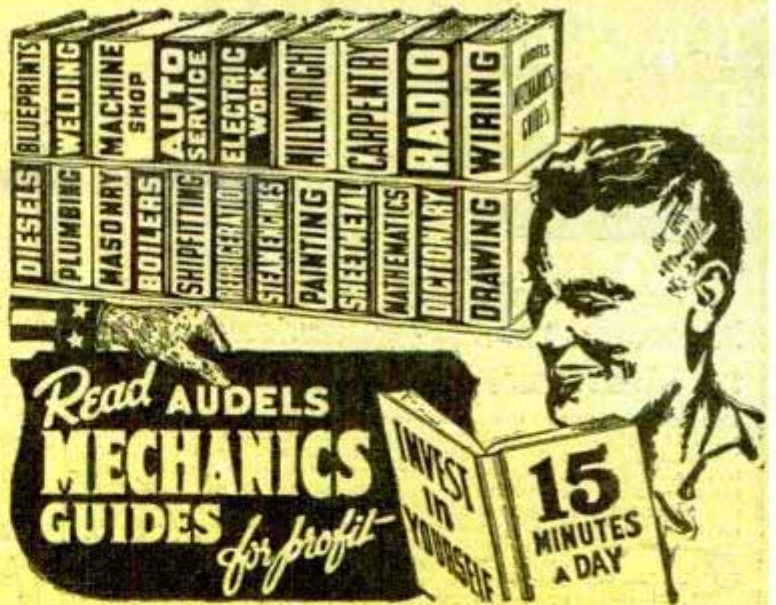
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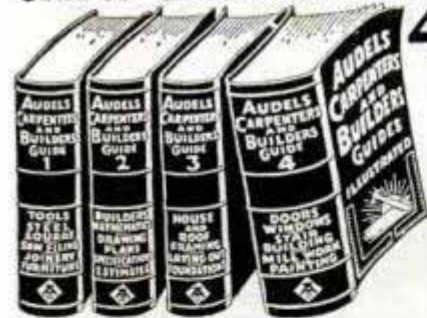
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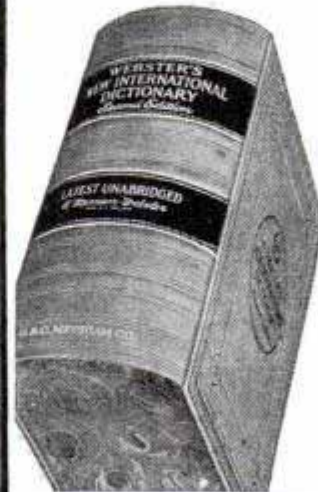
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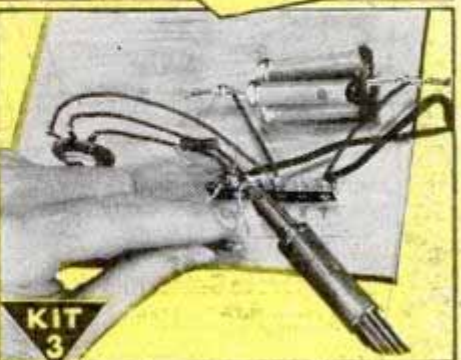
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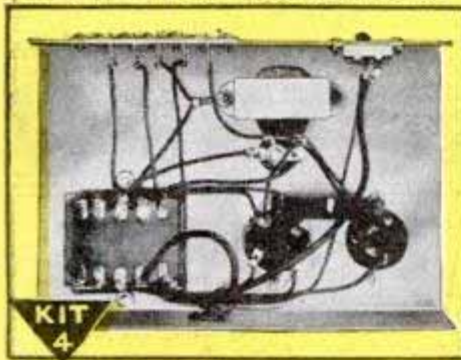
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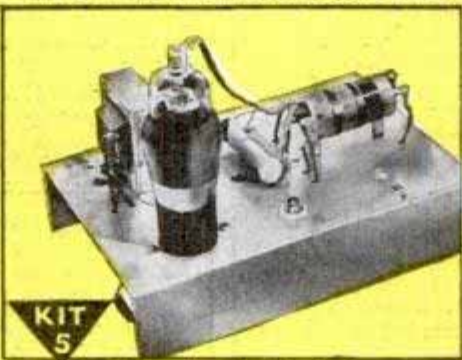
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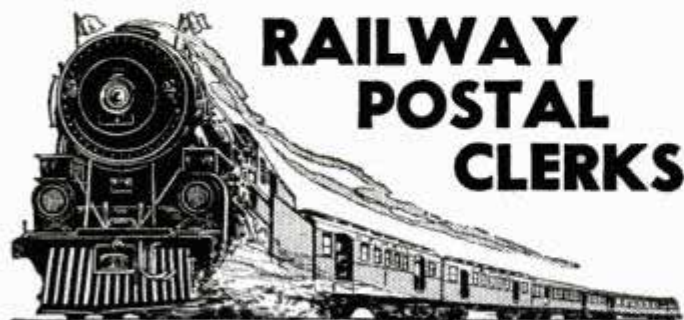
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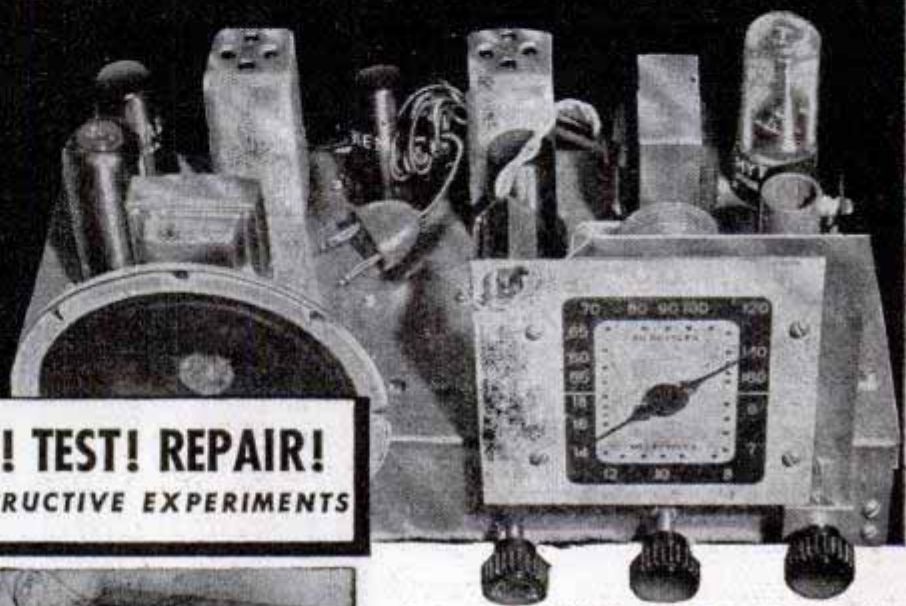


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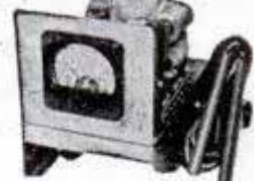
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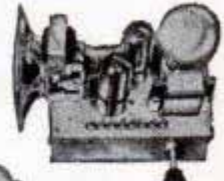
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Makes Muscles Grow
Fast!

Will You Let Me PROVE I Can Make YOU a *New Man?*



LET ME START SHOWING YOU RESULTS LIKE THESE

<p>5 inches of new Muscle</p> <p>"My arms increased 1 1/2", chest 2 1/2", forearm 7/8". - C. S., W. Va.</p>	<p>What a difference!</p> <p>"Have put 3 1/2" on chest (normal) and 2 1/2" expanded." - F. S., N. Y.</p>
<p>Here's what ATLAS did for ME!</p> <p>John Jacobs BEFORE John Jacobs AFTER</p>	<p>For quick results I recommend CHARLES ATLAS</p> <p>"Am sending snapshot showing wonderful progress." - W. G., N. J.</p> <p>GAINED 29 POUNDS</p> <p>"When I started, weighed only 141. Now 170." - T. K., N. Y.</p>

CHARLES ATLAS

Awarded the title of "The World's Most Perfectly Developed Man" in international contest - in competition with ALL men who would consent to appear against him.

This photo of Charles Atlas is not a studio picture but an actual untouched snapshot.

Here's What Only 15 Minutes a Day Can Do For You

I DON'T care how old or young you are, or how ashamed of your present physical condition you may be. If you can simply raise your arm and flex it I can add SOLID MUSCLE to your biceps—yes, on each arm—in double-quick time! Only 15 minutes a day—right in your own home—is all the time I ask of you! And there's no cost if I fail.

I can broaden your shoulders, strengthen your back, develop your whole muscular system INSIDE and OUTSIDE! I can add inches to your chest, give you a vise-like grip, make those legs of yours lithe and powerful. I can shoot new strength into your old backbone, exercise those inner organs, help you cram your body so full of pep, vigor and red-blooded vitality that you won't feel there's even "standing room" left for weakness and that lazy feeling! Before I get through with you I'll have your whole frame "measured" to a nice, new beautiful suit of muscle!

What's My Secret?

"Dynamic Tension!" That's the ticket! The identical natural method that I myself developed to change my body from the scrawny, skinny-chested weakling I was at 17 to my present super-man physique! Thousands of other fellows are becoming marvelous physical specimens—my way. I give you no gadgets or contraptions to fool

with. When you have learned to develop your Strength through "Dynamic Tension" you can laugh at artificial muscle-makers. You simply utilize the DORMANT muscle-power in your own God-given body—watch it increase and multiply double-quick into real solid MUSCLE.

My method—"Dynamic Tension"—will turn the trick for you. No theory—every exercise is practical. And, man, so easy! Spend only 15 minutes a day in your own home. From the very start you'll be using my method of "Dynamic Tension" almost unconsciously every minute of the day—walking, bending over, etc.—to BUILD MUSCLE and VITALITY.

FREE BOOK "Everlasting Health and Strength"

In it I talk to you in straight-from-the-shoulder language. Packed with inspirational pictures of myself and pupils—fellows who became NEW MEN in strength, my way. Let me show you what I helped THEM do. See what I can do for YOU! For a real thrill, send for this book today. AT ONCE, CHARLES ATLAS, Dept. 85, 115 East 23rd St., New York 10, N. Y.

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Send me further particulars as to patent protection and procedure and "Invention Record" form at once. I understand that this request does not obligate me.

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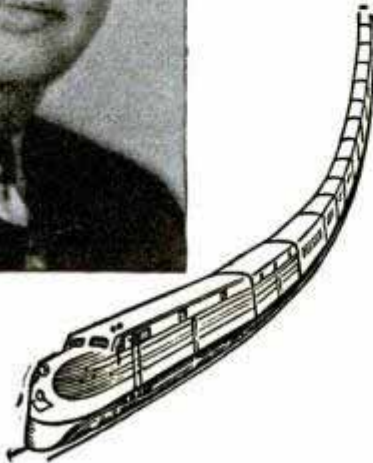
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The Evidence of Invention form mentioned below is offered as a convenience to the inventor in making his disclosure of invention. The inventor should date and sign his disclosure and have it witnessed by two or more persons who are capable of understanding his invention. The disclosure should then be mailed together with the inventor's authorization to conduct a pre-

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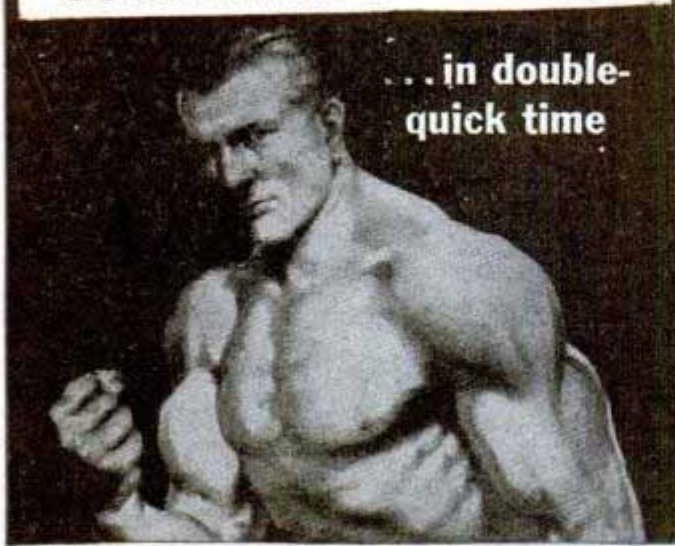
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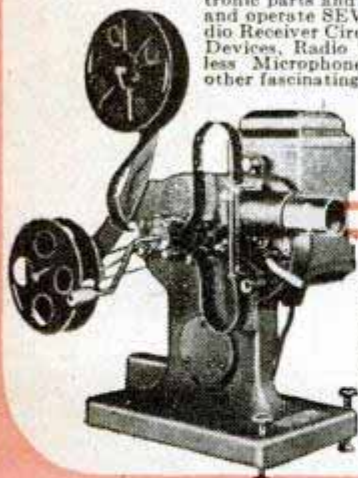
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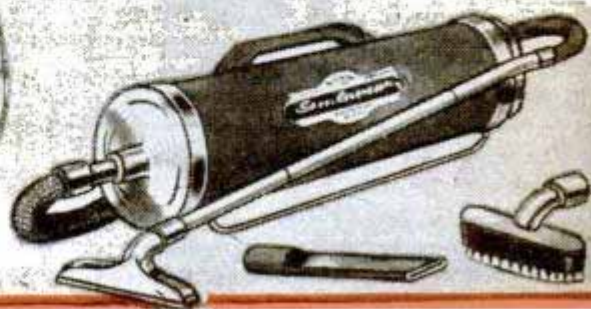
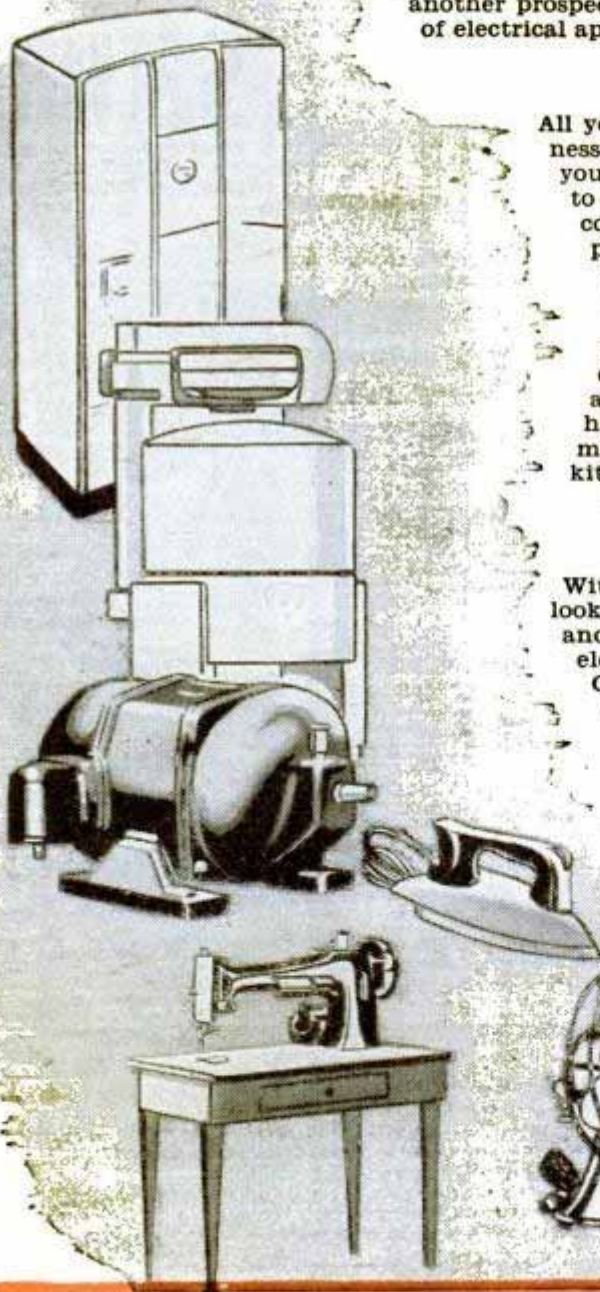
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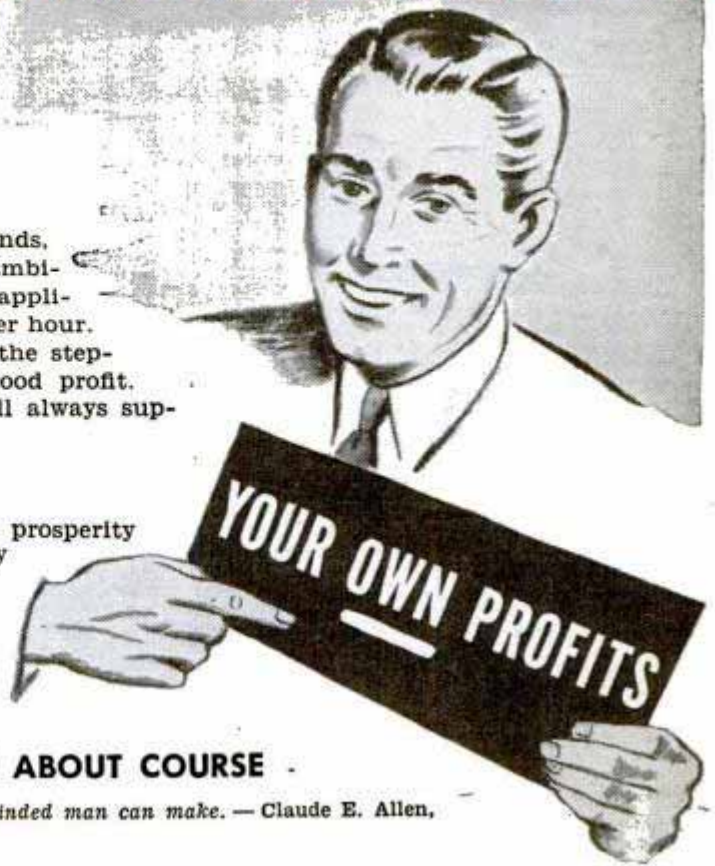
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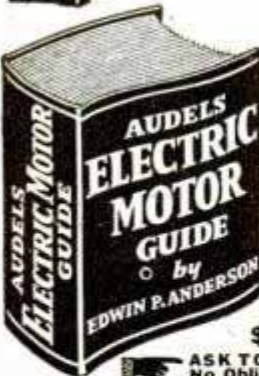
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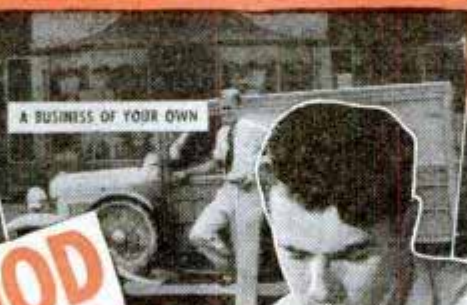
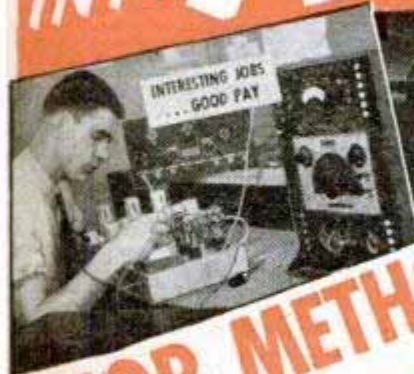
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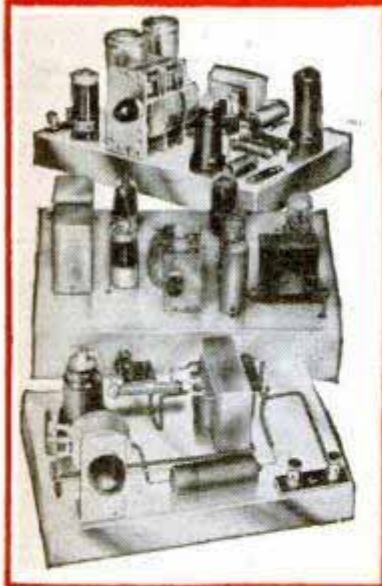
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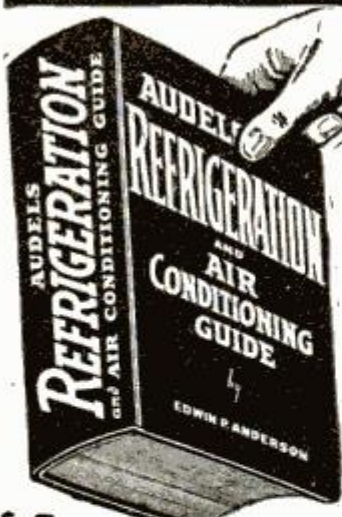
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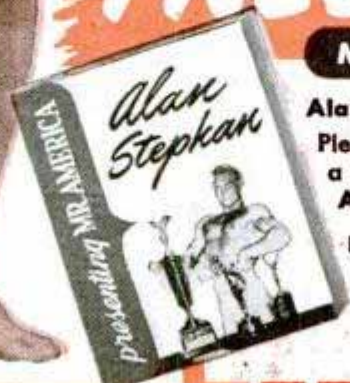
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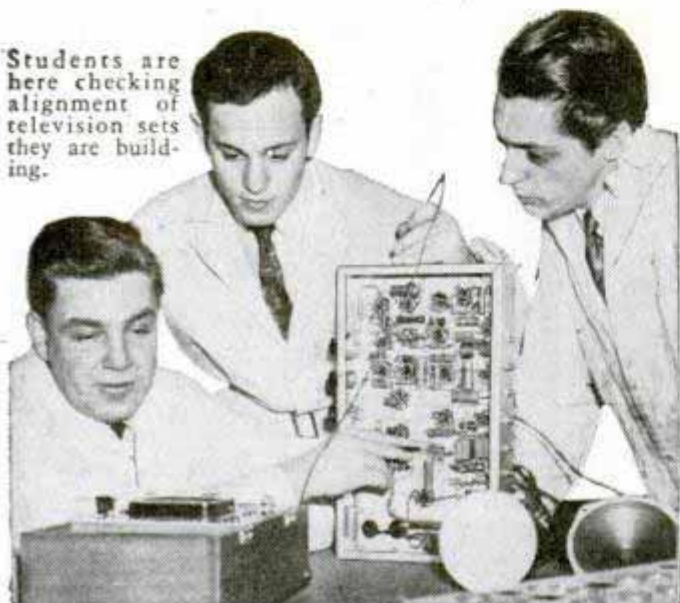
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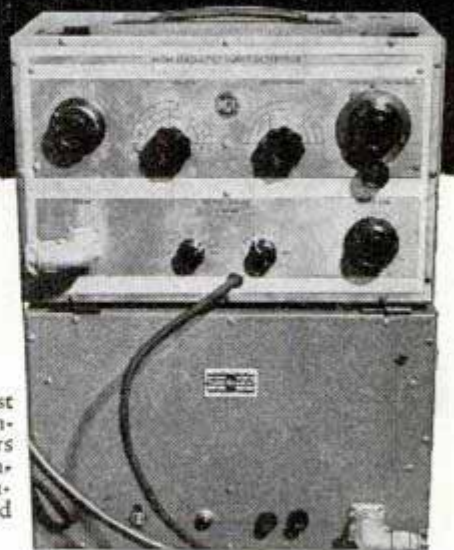
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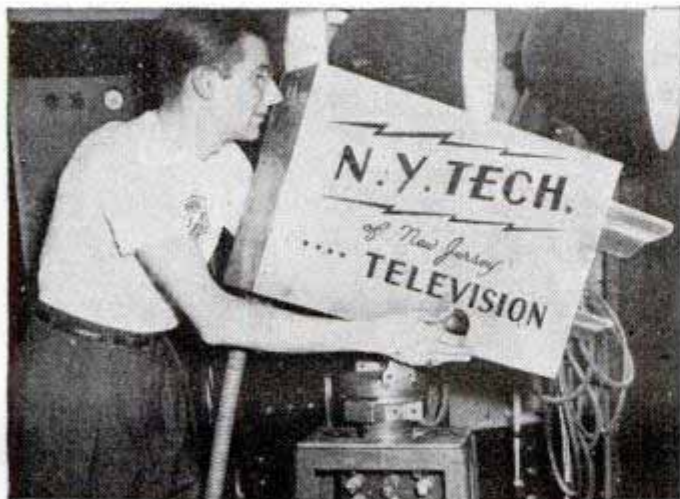


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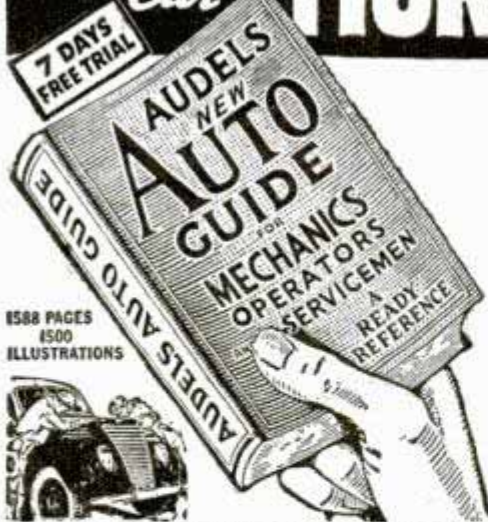
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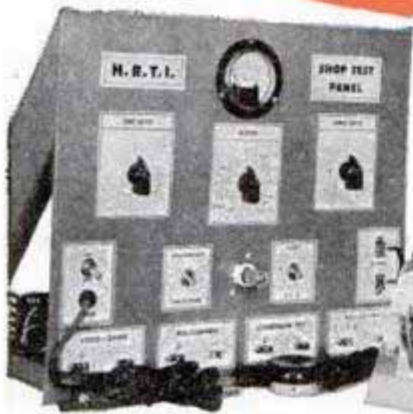
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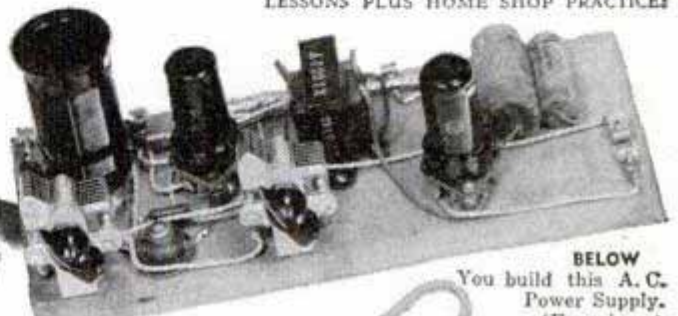
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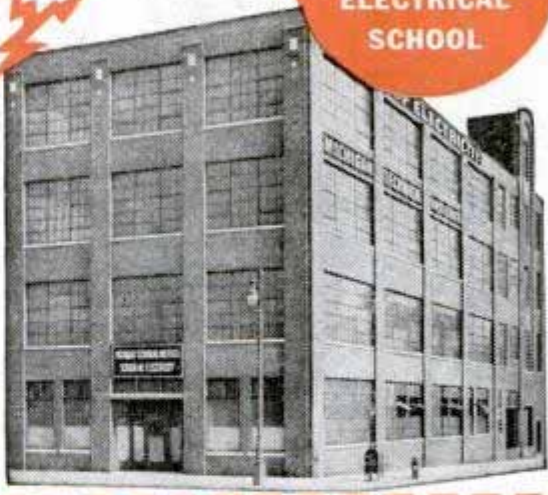
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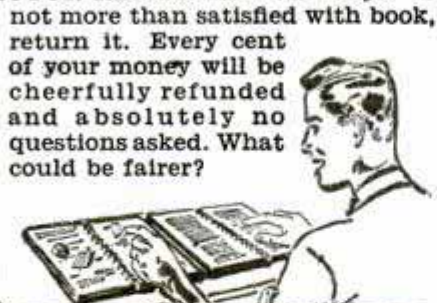
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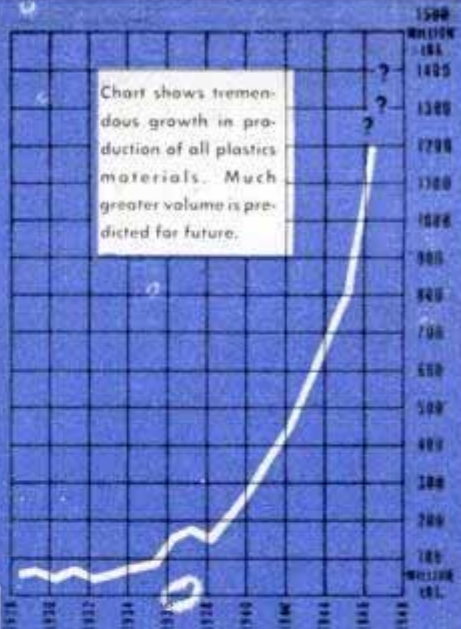
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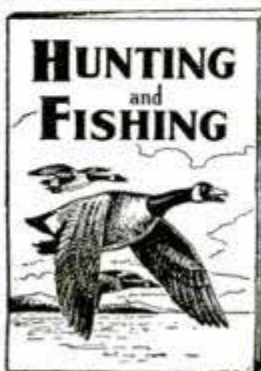
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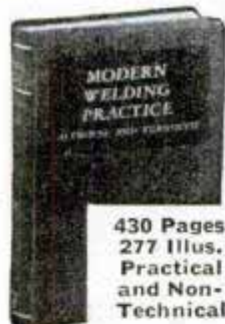
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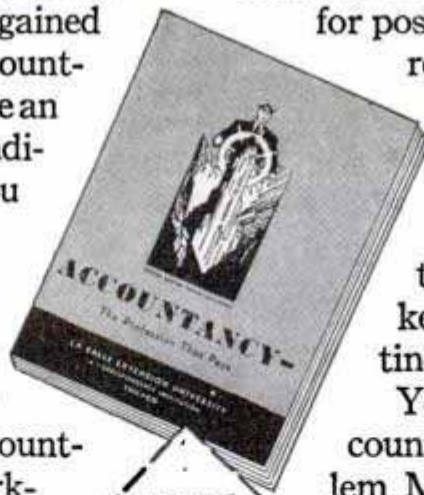
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AUTO Parts for all autos and trucks. Trans., motors, differentials, fenders, carburetors. Also body parts. Security Auto and Truck Parts, 1941 BJ Eddy, Chicago 13.

PLATING Outfits for auto parts. Connect to a battery. No tanks used. Free particulars and proofs. Gunmetal Co., Ave. J, Decatur, Ill.

AUTO TRAILERS

AUTO-TRAILER Travel, monthly magazine, \$1 year. Magazine Mart, Plant City 8, Fla.

TRAILER Manual. Construction blueprints. New circular, illustrates 14 to 24 ft. three room designs. 10c. Manual 17 ft. Streamliner has everything. \$1.00 includes circular. Craftsmann Books, Box 1153 P3, Milwaukee 1, Wis.

SOFT Tire indicators for trailers. Inquire. Laidlaw Mfg. Co., Box 1108, Pasadena 20, Calif.

BUILD Your own trailer! Save money! Have every feature you want! Plans for house, sport, camp and utility trailers. Catalog describing 9 models 10c. 15c in Canada and overseas. Jim Dandy, Box 125-A, Wausau, Wisconsin.

MOTORCYCLES, BICYCLES, MOTOR-SCOOTERS AND SUPPLIES

CHROME Plating on motorcycle and all other parts. Silver, gold, brass, bronze and tin plating on all metals. Send parts or description for prices. Master Silverplaters, 2031 Caniff, Detroit 12, Mich.

BIKES \$42.50 Delivered, rebuilds like new \$32.50. Wheels, parts, tricycles. Hillman Cycle Co., 142 Wilson St., Havre De Grace, Maryland.

HARLEY-DAVIDSON Parts, accessories, batteries, tires, and repair work. 24 hour service. Authorized factory dealer. Philadelphia Harley-Davidson Company, 857 North Broad Street, Philadelphia 23, Penna.

BICYCLE Sale! Finest American made brand new 1947 boys or girls full size 26" balloon bicycle, only \$36.85 send money order or check to Holtermans's Bicycle Store, 308 East Walnut, Kalamazoo, Michigan.

CUSHMAN Motorscooter \$30 (includes motor and extra tires), midget racer \$15! Send 25c for big summer catalog #938, just printed, listing these and scores of other sensational bargains in motors, wheels, motorscooters, motorbikes, Servicycles, tires, etc. Associated, Box CG-1764, Toledo, Ohio.

MODERN Motorcycle Mechanics manual, 560 pages, 300 illustrations, covers Harley, Indian and English makes. The most complete motorcycle book published. \$3.15 postpaid. Nicholson Brothers, Motorcycle Engineers, Saskatoon, Sask., Canada.

MOTORCRAFT Manual complete motorbike, motorscooter, midget car plans, instructions, other information. 75c. Details free. Reed Motorcraft Company, 215 No. First Avenue, Maywood, Illinois.

CLYMER'S Motorcycle books. Speedway Motorcycle Racing, \$2.00. Motorcycle Speedway Annual, \$1.00. How to Manage Motorcycles, \$1.50. Motorcycling Manual, \$2.00. How to Obtain Speed, \$1.50. Motor Scooter Plans, \$2.00. Books on Ariel, BSA, Norton, Triumph, Villiers, \$1.50 each. English Motorcycle Magazine, 50c. All postpaid. See our ad automobile section. Catalog free. Clymer, Dept. A-54, 2125 W. Pico, Los Angeles 6, Calif.

V-BELT Clutch for scooters. 3¼" built-in pulley, 3" long. No friction plates, \$11.75. V-Belt Clutch Co., 3759 Wilshire, Los Angeles 5, Calif.

MOTORCYCLE (Miniature) lapel pins. Exact duplicates favorite 1947 model. Chromed, colorful, non-tarnishing. Specify Harley, Indian, BSA, Norton, Triumph or Ariel, or Daytona race souvenir crossed flags. \$1.00 each, postpaid. Midget or Indianapolis racer same price. Any above pins on attractive tie-clasp. \$1.25; tie-holder, \$1.75. Postpaid. Clymer, Dept. A-59, 2125 W. Pico, Los Angeles 6, Calif.

BEAUTIFUL New bicycles, also tricycles all makes, all sizes. Reduced price list free. Atlas Cycle Co., 3002 SS Broadway, Chicago 14, Ill.

1947 **MOTORCYCLE** Catalog, 10c. Indian and Harley parts. Pistons, chains, sprockets, carburetor and motor rebuilding, batteries, tires, chrome accessories. Bootz, 622 East Grand, Des Moines 9, Iowa.

MOTOR Scooters, bicycle engines. 120 miles gallon. Dime for catalog. Clymer, Desk A-55, 2125 W. Pico, Los Angeles 6, Calif.

CUSHMAN Motorscooter \$15. Shaw bicycle motor \$15. Harley-Davidson motorcycle \$35! Send 25c for bargain catalog #8, just off the press, packed with money saving buys in motorscooters, motorbikes, midget cars, motors, wheels, tires and parts. Gail and Company, 538 Erie, Toledo, Ohio.

WHEELS! Build wagons, scooters, mowers, trailers, wheelbarrows, grocery carts, baby carts, play pens, baby carriages. 4" to 16". Free list. Trulsen Mfg. Co., 811 E. 31, Kansas City, Mo.

MOTORCYCLE Cams ground for speed and power, carburetion. For information write Harold Schaller, 247 West Main, Turlock, Calif.

BICYCLE Book, how to buy, rebuild, sell used bicycles 50c. John Collett, Handley, Texas.

TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

BUILD America's lowest priced motor-scooter speedster! Complete plans, specifications, \$1.00. Big list bargain priced used motors, etc., included free! Motor Supply, Box 1882-CS, Toledo, Ohio.

LARGE Stock Indian parts. Expert motor rebuilding. New and rebuilt Chief motorcycle, motors only, Indian Motorcycle Sales, Kansas City 1, Mo.

HARLEY Single motorcycle \$50. Harley twin \$65, complete. Motorscooters \$9 up, midget cars \$10 up, motorcycle \$25, less motors. Used motors \$3 up. Plenty of brand new 2 horsepower motors never taken from factory crates. Over 5000 balloon tires for motorscooters and small cars \$1 up, mailorder only. Send 25c for Big War-Bargain catalogue Number 18, just out listing the above and hundreds of other bargains in new and used motors, motorscooters, midget cars, racers, etc. (35c by first class mail.) Midget Motors Directory, Athens, Ohio.

HARLEY-DAVIDSON — New and used 45" motors, service, parts, accessories, tires. Send \$2.25 for army motorcycle manual, 10c for bulletins. Knuth's (Harley-Davidson factory dealer), 2491 Fond-dulac, Milwaukee, Wis.

TIRES, Inner tubes, wheels, for small trucks, wheelbarrows, power scooters, midget cars, farm equipment, carts, etc. Sizes 8" to 18" o.d. in 2, 4 and 6 ply first-line quality tires, with removable inner tubes and heavy duty demountable wheels. Also caster forks, straight or swivel types. Free circular and prices. Jahant Co., 626 East Exchange Street, Akron 6, Ohio.

"**BICYCLE** Repair Manual." Illustrated booklet, tells how to repair bicycles. 66c. Robert Klausner, Shelbyville, Ill.

BICYCLES, Schwinn's, Monarks, mens, ladies', \$37.50. Send dime for accessory list. Century Cycle, 3447 Lawrence, Chicago 25, Illinois.

AVIATION

CAREER Counselor. Guidance for beginners. 23 years aviation experience. George Miller, 1333 18th Street, Santa Monica, California.

PROPELLERS — Especially designed, Airliner 3 blade for ice-snow sleds, boats. Also 2 blade. Aluminum castings Ford A aircooled conversion. Free literature. Standard Aero Craft, Ft. Worth, Texas.

VETERANS: Flight training under the G.I. Bill. Private, commercial and flight instructor ratings. Write for information. Gottschalk School of Aeronautics, Adrian, Michigan.

NEW Catalog! Rush name. Experiment-er Supply, Tipp City 6, Ohio.

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CUBS, Wacos, Taylorcrafts, Aeronca. Big catalog, 25c, lists these and thousands of other sensational airplane bargains. Some are "easy to repair" crackups. National, Box 1682-CS, Toledo, Ohio.

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EDISON Non-acid lifetime storage batteries for home lighting, motors, radios, etc. Free complete interesting literature. T. Hawley Smith Company, Croton Falls, N. Y.

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ELECTRIC Razor sharpener. Easy, quick, guaranteed. 25c postpaid. Arnold, 621 E. 31st, Kansas City 3, Missouri.

LAMPS—All parts to build or repair. Harps, sockets, vase caps, bases, etc. Illustrated catalog 10c. Gyro Lamps, 5416 Clark, Chicago 40.

RUGGED Circuit and fuse tester. 110-440 volts, ac or dc. Positive indications, unlike neon testers, \$4.50 plus postage. V. Peterson, 7621 S. Park, Chicago 19.

ELECTRIC Shaver—Remington Rand's Foursome. Twin head. Nationally advertised. C.O.D. \$19.50. Cash less 6%. A. Kramer Distributing Agency, McDonald, Penna.

ELECTRIC Pencil: Writes, engraves all metals. \$1.00 postpaid. Beyer Mfg., 229-H Dixon Blvd., Uniontown, Penna.

CONTROL Garage doors from dashboard. "Build yourself" plans \$1.00, refundable. Vital parts available. Kaytor Laboratories, Lynwood, California.

ELECTRIC Fan assemblies. Assemble your own. Ted Riseman, 207 North Fifth, Springfield, Illinois.

CLOCKS, Radios, fans, irons, motors, toasters, etc. Jeannette Electric, 159 West 23rd Street, New York City 11, N. Y.

MAKE Powerful demagnetizer by using our ready made coils. \$4.25 postpaid. Heavy formvar magnet wire #20—750 ft., ideal for motorwinding, chokes, transformers, etc. \$4.75 postpaid. A.C. motor windings designed for all voltages, phases and speeds. Send for free data card. J. I. Weeks, 919 Neland, Grand Rapids 7, Mich.

ELECTRIC Pencil—writes, engraves all metals. Battery model \$1.00—110 volt model, \$2.00 postpaid. Guaranteed 5 years. C.O.D.s accepted. Reb Industries, Dept. 265-X, Elmhurst, Illinois.

WASHING Machines. Parts all makes. Northeast Burner, 1358 H St., Washington 2, D. C.

ELECTRICAL Supplies bought, sold and traded, agents wanted. Estes, Box 155, St. Matthews, Louisville 7, Ky.

MAGNETS — Alnico. Postcard brings 1947 list. Terry Sales Company, 3726 South Detroit Avenue, Toledo 9, Ohio.

LAMP Sockets, brass shell. Also Mogul sockets. Three way switches, cord sets, electrical repair parts, lamp parts, wires, etc. Catalog 10c. The Gearon Company, 4348 Broadway, Chicago.

B-29 FIRE-CONTROL Computers GEZ-CH1CL. Single parallax. New \$78.00. Free list. Erecos, 1006 Hewitt, Everett 1, Washington.

1000 AMPERE Starter solenoid relays. \$2.45. New. Specify coil voltage desired. Free list. Erecos, 1006 Hewitt, Everett 1, Wash.

PRACTICAL Winding of a.c. motors. A course of instruction on winding, connecting, and testing single, two, and three phase motors. Clearly written in everyday non-technical language. Illustrated throughout. This book is recommended for beginners interested in learning motor re-winding and repair. Satisfaction guaranteed or remittance refunded. \$2.00 prepaid. Educational Advancement Co., Dept. Y, Lakewood, New York.

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"MENDALL-METAL." Permanent repairs for leaks, cracks, splits, holes, in all pipe and fittings, right through rust, corrosion, paint. Also motors, cylinder heads, water gaskets, etc. Easy to use with blowtorch flame. Fuses with any metal at only 250 degrees of heat—less than red heat. Contains own flux. Permanently mends in ten minutes. Any part accessible to blowtorch can be mended in place. Money back guarantee. Used nationally for 30 years. Send \$5.00 for 6-bar package, prepaid to you. Immediate delivery. 4 A Manufacturing Co., Dept. 11, Littleton, Colorado.

MAKE Your own 20-200 amp. welder, using auto storage batts. Instructions \$1.50. One 5 KW 100,000 volt transformer cheap. Battweldco, Santa Barbara, Calif.

HOME-MADE Arc welder. Details free. International, Incorporated, 6347 Parnell-P, Chicago 21, Illinois.

A.C. Welders, 110 v., welds 1/2" steel, \$29. Money back guarantee. Paul Morris, 1850 State St., Schenectady 4, N. Y.

ACETYLENE Generator. Easy to build—plans, instructions \$2.00. Weldox, R. 2, Box 264, Phoenix, Arizona.

ACETYLENE Welding outfits, new, consisting of 2 gauge regulators, torch, 3 tips, hose, connections, clamps, lighter, \$54.50. Eagle Welding, Dept. PM, 5085 Broadway, Chicago 40, Ill.

SILICON Steel strips 30"x2"-5", Ernest Noyes, 32328 Brush, Royal Oak, Mich.

JOHNSON Jiffy-Kit, portable welding and cutting outfit complete with cylinders and carrying case designed especially for hobby shops, small repair shops, refrigeration and electrical service men. You own the cylinders! No rental charges! Free literature! A-A Welding Supply Co., E-9228 S. Ada St., Chicago 20, Illinois.

NEW Model electric welder 110 volt a.c.-d.c.; will weld all metals; easy to use; full directions. Complete with power unit, flame and metallic arc attachments, carbons, fluxes, rods, mask; all for \$19.95. Used by the navy. Magic Welder Mfg. Co., 239 MP5 Canal St., New York City.

PLANS To make welder of P1 aircraft generator \$1.00. Hoffman, 3136 W. 7th, Ft. Worth 7, Tex.

ELECTRO Plating outfit including solutions for jewelry, fishing spoons, etc. Plugs into lighting outlet. Instruction booklet tells how to plate baby shoes. \$19.50. Free folder. Hoover & Strong, Inc., 113 W. Tupper St., Buffalo 1, N. Y.

"THUNDERBOLT"—Transformer welder, dial-control, 3 heats, 60 amps., 110 volts—a.c., carrying case, accessories, instructions. \$39.50. Also "Super-Welder," 110 volts, a.c.-d.c. \$19.95. Save 2%, send check. Or order c.o.d. Dealers wanted, liberal proposition. Super-Welder Mfg. Co., 23 E. 20th St., New York 3, N. Y.

WELD, cut, braze with gasoline! Amazing new discovery shatters costs. Boosts profits. Important! Write Matthews Mfg. Co., Calgary 21, Canada.

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PILLOW Block bearing, bronze bushing, self aligning, large enclosed oil reservoir, steel construction, sizes 1/2", 3/8", 3/4", \$1.10 each postpaid, 95c lots six. Further information Ideal Products, 63 West Nevada, Oshkosh, Wis.

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EQUIP Your home workshop quickly, efficiently, economically by building your own mill, shaper, drillpress, vise, jointer or other metal and woodworking tools. Lewis castings and materials are ready to finish, detailed blueprints show how. Send 10c to cover cost of mailing new catalog describing 23 items. Lewis Machine Tool Co., P.O. Box 116, Station A, Dept. M, Los Angeles 31, California.

JOINTER Head for wood shaper, 2" wide, 2" cutting circle. Replaceable tool steel blades. State arbor diameter. \$4.75 postpaid. Hurley, 14 Lone Oak, Bethesda 14, Md.

BALL-BEARINGS, One-fourth list price. Free list. Burgess, Box 168, Ferguson, Mo.

20-1/4"x1" HARD Felt handgrinder buffs and 50 emery cloth discs, \$1.00 postpaid. Disco, 6136 Northwest Hwy., Chicago 31.

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TEEH Saw filing tool. Gets teeth uniform. 25c. 316 North 2, Maywood, Illinois.

BENCH Milling machine, 12" table travel, power feed. Rough or semi-finished castings with blueprint. Fry, 2229 McGee Ave., Berkeley 3, California. Write for information.

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LAWNMOWER Sharpening machines renew edges factory like. Write M. C. Hardies, 4148 Cornwell, Berkley, Mich.

LABEL Your cigar boxes for tools, hardware, screws, nuts, bolts, washers, electrical parts, machine parts, etc. Send postcard for complete details. Hinds Mfg. Co., 223 Second, Niagara Falls 1, N. Y.

V-BLOCKS At low prices, 10 sizes for all purposes. Free literature. Miles Products, 2532 Wabash, Chicago 16.

BENCH And jig saws, post drills, com-pressors, mandrels, block machines, sanders, etc. Circulars 5c. Sunshine, Berkshire Heights, Penna.

UNIVERSAL Mechanics tools: Dandy 10-piece set: Rldgid pipe-wrench, Channel-grip pliers, adjustable wrench, Cetee pliers, diagonal cutters, ballpeen hammer, plastic screwdriver, waterpump pliers, hacksaw and blade, cold chisel, \$19.85. Remit today. New catalog free. Universal Tool Company Has It, 1527 Grand, 10C, Kansas City, Missouri.

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SANDER, Guaranteed, colored plastic, fifty cents. Dollar includes assorted grits. Pegmar Products, 111 Sutter, Room 1031, San Francisco 4, California.

TAPS And dies. Buy direct from manufacturer at small cost. Send postage stamp for price list "D." King Tap & Tool Co., Inc., North Attleboro, Mass.

STRAIGHT Edge precision ground with name and address, to 12" \$1.50, 12" to 18" \$2.00. Send power hack saw blade, plus postage. (remove teeth). Tool castings etc. Model Tool Service, Rock Falls, Ill.

HOISTS, surplus Spur Gear Hand Hoist will lift 500 pounds 20 feet. Made by famous manufacturer to lift bombs into aircraft. Easy to install and operate. New, unused. Shipped postpaid anywhere in U.S.A. for \$10.00, or write for illustrated details and dozen uses. Hurry! Ireland and Vice, 48 Chedeles Place, Auburn, N. Y.

DRILL Grinder for twist drills \$2.95. See ad on page 258.

WAR Surplus in small tools for machine shop—Send 15c for bulletin. Travers Tool Company, Dept. P, 5 Court Square, Long Island City, N. Y.

NEW Glass drill. Free literature. Box R188B, Seal Beach, Calif.

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CONCRETE Building block machines and molds. Catalog free. Concrete Machine Co., 5129 South Compton Ave., St. Louis 11, Mo.

MAKE Cement bricks, Tri-Brik, the wonder brick maker, \$19.90 f.o.b. Richmond, Va. Write Welding Service, Sect. A, PO Box 6014, Richmond, Va.

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DRILL Grinder—Grinds drills to factory accuracy. Calipers with direct reading scales. Circle cutters. New Tool grinder. Lowest prices. Free literature. Factory, 811-B East 31st, Kansas City 3, Mo.

BLOCK Machines—Concrete, 200 to 240 hour, 2 blocks one time. Also other machines. 45 to 100 per hour. Power or hand brick machines. Batch mixers. Any size. Madison Equipment Co., Madison, Tenn.

SHEBEL Saw trial \$7.50. Files all saws. Circular. Free trial. Shebel, 730B S. 2nd St., Milwaukee 4, Wis.

BOATS, OUTBOARD MOTORS, ETC.

SAILS For yachts-canoes. Canvas for recovering boats, trailers. Wing dope, canvas cement. Marine paints, hardware. Sailcloth. Manila, linen rope. Marine flags. Outboard motors, rowboats. Alan-Clarke, 96 Chambers, New York City.

RUBBER Boats—Hold 1 to 5 men; weigh 5 to 40 lbs. Ideal for fisherman, duckhunters, yachtsmen, seashores. Made to rigid government specifications. Price \$14.81 to \$69.75 depending upon size and condition. Write for circular. Karl Ort, Dept. PM-2, York, Penna.

ANCHORS Navy type, sizes 10-15-20-25-30 lb. semi-steel, aluminum finish. Recommended size, 1 lb. per ft. Price 20c lb. f.o.b. Wilson Patterns, Coffeyville, Kansas. U.S.A. Discount to dealers.

PROPELLERS—Use Airpulsion, Airliner 3 blade, 2 blade aluminum castings, Ford A aircooled conversion. Standard Aero Craft, Ft. Worth, Texas.

PRACTICAL, Light, folding Kayak. Specify 10 1/2' or 15'. Rush \$1.00 for plans. Hoosier House, P.O. Box 1264, Indianapolis 6, Indiana.

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MARINE Plywood boat—Complete kit includes all necessary material to build nine foot dinghy. Send for free circular. Marine Division, Box 51, Chautauqua, N. Y.

USED Jeep motors complete. Less transmission. Ready to run. Seventy-five dollars each. Meyers, 820 Dryades St., New Orleans, La.

WHY Lug your outboard motor? New easy carrier \$8.75. Catalog free. Sportsman's Pal, Tahoe Valley 6, Calif.

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KAYAK Blueprints, deluxe models—cat-alogue 10c. Viking Canoes, Merrick, N. Y.

ATTENTION Sportsmen! Go kayaking! Build yours from complete easy-construction kits. Literature. Play-yacks, Dedham, Mass.

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PROPELLERS: New army surplus, Michigan, 3 blade bronze, 12"x10"RH; 7/8" hub bore. Made for Johnson 22 h.p. outboard. Modify for other engines. Only \$5.65 each postpaid (with order). We will increase pitch to 11", 12" or 13" at \$1.00 additional per each propeller. Baker Bros. Supplies, Box 301-C, Palatine, Ill.

ROWBOAT Dry indefinitely, years. Inexpensive, copyrighted, \$1.00. Crsa, Box 8, Nanticoke, Penna.

MARINE Conversions for Ford and Jeep engines. Catalog 10c. Lehman Manufacturing Company, Department D, Newark 2, New Jersey.

USED Outboard motor parts. Outboard Exchange, 1194 Remsen Ave., Brooklyn 12, N. Y.

KAYAKS. Rowboats, weldwood ready cut kits, booklet. E. J. Croot Co., #103-D, Basking Ridge, N. J.

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TWENTY Plywood boat plans \$1.00. Catalog boat building plans 10c. The Rudder, 15 Murray Street, New York.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

USED Marine motors, propellers, marine fittings, conversion manifolds. Stokes Marine Supply, Coldwater, Michigan.

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SPEEDY 1" Motor runs atop flashlight cell! Parts, instructions, 35c. Fonskov, 655-G Amboy, Perth Amboy, N. J.

SELSYN Motors, Bendix 3 1/2"x5 1/2" heavy duty 115 volts, 60 cycles, \$10.25 per pair. J. A. Weber, 150E Maple, Hershey, Penna.

MOTORS! 1/2 HP.—All new—High speed 110 volt, 25 or 60 cycle, d.c. converted to a.c. ball-bearing motors with forward and reverse switches. Countless uses for home mechanics. Actual cost about \$100.00. Now \$19.50, three for \$50.00. Order today while they last! No c.o.d. orders. "Bachman's is Amazing," 23 Herman St., Rochester 5, N. Y.

150 AMPERE Generators for welding \$47.50. Extra flexible cable, 6 ft. lengths \$2.75. Other bargains. Butler Electric Company, 1885 Milwaukee, Chicago 47.

NEW Amplidyne motor generators, 27 VDC input, 530 W, 60 VDC output. \$9.50. Government paid \$105.00. Surplex, 2409 La Salle, Chicago 16, Ill.

MIDGET Magnetic motor. Small flashlight cell operates. Parts plus instructions 30c. Eltro, Deer Park, N. Y.

MOTOR Winding tester, indicates burned out or partly shorted coils in single or three-phase motors, indispensable for repairmen. Send for bulletin. Motor Industries, Quincy, Illinois.

400 CYCLE Dynamotors. GE5D21N3JA. 27VDC to 110VAC. 485 watts, shaft extension. Will operate 60 cycle radio equipment. \$12.50. Free list. Erecos, 1006 Hewitt, Everett 1, Washington.

WINDING Data, listing 225 motors, single and three phase, \$1.00. Motor Data Co., Box 7631, Kansas City 3, Mo.

"BUILD Your Own" gas drive arc welder easily with Hobart Generator. Save \$300 to \$500, and need only add used auto engine and chassis to build portable gas drive welder that goes everywhere after profitable construction and repair jobs. Write for free instruction book, further details. Hobart Brothers Co., Box M-1066, Troy, Ohio.

AMPLIDYNE Motor-generators. GE5A-M31N9A. Input 27VDC, output 60-0-60 VDC. 530 watts. Shaft extension. New \$15.00. Free list. Erecos, 1006 Hewitt, Everett 1, Washington.

ATHLETIC EQUIPMENT, BODYBUILDING COURSES

BUILD Strength and health with bar bells, dumbbells. Six complete, illustrated courses \$1.00. Mail prepaid. Paramount System, 2440 East 23rd Street, Los Angeles 11, California.

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BARBELLS. Exercise and weight lifting types, world's finest. Stamp for folders. Jackson Barbells, Springfield, N. J.

BARGAIN Sales. Barbell equipment, muscle courses. Free strongmen physique circular. Write Sid's System, (CPM10) 8421 1/2 Evergreen, South Gate, California.

200 LB. Adjustable Barbells—Personal course \$29.00. EG, Elmsford, New York 1.

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AUTOMATIC Lure—Positively weedless. Greatest invention in ages. Nothing like it. Circular free. Babcock Reel Co., Oak Harbor, Ohio.

BOWS-Arrows. Write headquarters for archery equipment. Quality products. Popular prices. Catalog 10c. Large illustrated hand book instructions, making and shooting, 50c. Archery, 617-B So. State, Chicago 5.

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SWIZZLE Water "Magic Liquid" gets fishworms. No digging. \$1. 8 oz. bottle makes 50 gallon. Free catalog. Robt. Kochenrath, 1446-P Bardstown, Louisville 4, Ky.

FISHERMEN Want lots of worms, worms galore. Write Century Lab, Box 532, Hannibal, Mo.

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"HANDBOOK Of Formulas," 10,000 trade secrets for home, farm, and workshop. Unknown to general public. Make money—save money. Cloth, \$3.50. Foreign, \$4.00. The Audubon Book Service, 415 Lincoln Avenue, Brooklyn 8, N. Y.

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FORMULAS—High quality, fast selling products. We furnish electrotypes for flashy three color labels. Literature. Weinman, Box 442, Elkhart, Indiana.

100 SINGLE Ingredient formulas 25c. Tes-Co, Box 189-MG, Wilkes-Barre, Penna.

LATEST Formula lists; wholesale supply sources 100,000 items (chemicals, equipment) 10c. Wilborn, 706-P Judson Rives Bldg., Los Angeles 13.

15 TRADE Secrets that cost millions to develop and test—yours at low cost. You start your own business in spare time at home. Easy to make, easy to sell. See page 258 for details. Chemical Research Co., 130 W. 42 St., New York.

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

ROOFING 100% Fireproof, low cost, lasts like slate. Insulates better. Apply like plaster. Formula \$1. Rav Roofing, 3 Box 98, New Hyde Park, New York.

MANUFACTURE Cleaners, soaps, polishes, flavors, cosmetics. Literature free. Kemico, Park Ridge 16, Illinois.

FIREWORKS. Twenty formulas, one dollar. Pyrotechnics, 215 West Haskell, Tulsa, Oklahoma.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

FORMULAS—Latest, best. Analysis. Giant formula catalog and chemical instruction sheet 10c. Refunded first order. Belfort, Engineering Building, Chicago 6.

PLASTICS

NEW Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Manual tells how. Send \$3.35 for complete 20 project kit including one pound liquid Castolite. Castolite, Dept. E-21, Box 211, Kenilworth, Ill.

2 LB. Plexiglas first grade, size 6" x 6" or larger \$2.50. 2 lb. clear scrap 70 ct. 5/32", 3/16", 1/4", 5/16", 3/8", 1/2", 1". Schick Mfg. Co., 257 William St., New York City.

PLASTIC Injection machines, three sizes, toy, industrial, commercial. Full line jewelry findings. New low prices. Plexiglas, dyes and supplies. Tenite. Polystyrene rods, kits, etc. G. Baker Company, River Edge, New Jersey.

HOME Training through "Working With Plastics," covering every step, every material, \$1.25. Plastic hobby kit: 2 lbs. Lucite, Plexiglas, bottle cement, 2 bottles plastic dye (red, green) \$3.25 postpaid. (Includes instructions.) Modern Technical Book Co., Dept. MMC, 55 West 42nd Street, New York 18, N. Y.

LUCITE—Catalog dime. Refunded first order. Special offer. Midwest Plastic, 1717 No. 66th, Omaha 4, Nebr.

PLEXIGLAS—Dyes, cement, jewelry findings. Free listings. Novalte Plastic, P.O. Box 106-M, Brooklyn 19, N. Y.

PROJECTS. Ten marvelous plastic, guaranteed, \$1. Plasticplan Co., Box 181, Cincinnati 1, Ohio.

HOME Crafters! Plastic formula-moulding instructions \$1.00. Box 84, Station K, Toronto, Canada.

FORMALIN. Lustrous, quick setting liquid plastics. Casting supplies. Free literature. Kit \$3.00 F.O.B. Formalin Works, Box 199, Romeo, Michigan.

INJECTION Molded plastic parts for 4" baby ball, gyro singing top, three compartment tray. Red, blue, ivory, and pink colors. Tenite and Polystyrene materials. Easy to assemble. Complete kit \$1.00 postpaid. Quantity prices included. Economy Precision Products Co., 10 Main Street, Germantown, Wis.

PLASTICOR Injection molding machine molds toys, games, novelties. Economical. Easy to use. Precision built for professional accuracy. Each machine equipped with five molds and sufficient Tenite pellets for 250 moldings. Uses 110V a.c.-d.c. current. Regularly \$32.95, our price \$19.95 f.o.b. St. Louis. Also, send 10c for catalog, price list on plastics, accessories, etc. Plastic Parts & Sales, 1157 S. Kingshighway, St. Louis 10, Mo.

MONEY In plastics! Lucite plastic hobby kit. 2 pounds Lucite material, coloring dye, cement. Instructions. Send \$2.50 (plus 40c express charges). Also Swiss music movements, \$3.50 each. Plastic Specialty Co., (Dept. M), 127 East 28th St., New York City.

MAKE Money assembling our pre-fabricated plastic kits. Sample kit 50c. Catalog free. Fabros, Box 156, Station F-1, Buffalo 12, N. Y.

PLASTICS And supplies; book on plastics \$1.50; kits \$3.00-\$5.00. Special internal carving drill \$1.30 f.o.b. St. Louis. List. Plas-met Sales and Engineering, 4648 Shirley Pl., St. Louis 15, Mo.

PLASTICS. Sheets, rods, tubes. Free list. Swiss music units \$3.50. Plastic Supply Co., Dept. PM52, 2618 St. Louis Ave., St. Louis 6, Mo.

GOODYEAR—Has rubber for molds, self vulcanizing, air curing rubber. Quart \$3.00, gal. \$10.50. Instruction free. Goodyear, Lake Geneva, Wis.

HOME Crafters! Plastic formula and instructions \$1.00. Box 84, Station K, Toronto, Canada.

PLASTICS—7 Colors sheets and rods. Send stamp for price list. Hanson Plastics, 7625 South Parkway, Chicago 19.

LUCITE Sheets, rods, dyes, cements, cheap. Free price list. Thomas Cavaliere, 2141 So. Beechwood St., Philadelphia 45, Penna.

KITS: \$1.50 Each. Plexiglas tie-rack 18", 5"x7" picture frame or bud vase. Send for free price list. Free gift with each kit. Heah Mfg. Co., 5115 N. Neenah Ave., Chicago 31, Ill.

LATEST Postwar rage. Start business making gifts, useful articles from Lucite Plastic. "Easy Home Outfit," complete supplies, directions \$10. 20th Century Plastic, 1288 Mission, San Francisco.

PLEXIGLAS Masked sheets 12"x12"—1/16"—\$1.00, 1/8"—\$1.25, 3/16"—\$1.55; 1/4"—\$1.85. Include 10% postage. Dyes, rods, cements, smells, buffing compounds, jewelry findings, tools. Free listings. Craft Plastics, Box 129-P, Somerville, New Jersey.

FREE—"Amazing New Book"—"Profits From Classified Advertising." Tells how and what to advertise. Be sure to read this book before you invest one cent in advertising. Remember—it's free! Write for your copy now. F. W. Johnson, Classified Advertising Manager, 200 East Ontario Street, Chicago 11, Illinois.

CHEMISTRY

RUBBER Tubing, aprons, gloves, buckets, dippers, funnels, sheet. Free price list. Bucey Supplies, 19465 Ward, Detroit 21, Michigan.

THE House of Winn, home of supplies for amateur chemists. See Winn's New Idea chemical kits and apparatus outfits for home experimenting. Send 10c for retail catalog. Established 1931. John H. Winn, Dept. 505, 124 West 23rd St., New York 11, N. Y.

NEW Laboratory supply catalog of chemicals and apparatus, contains over 5000 items with illustrations, 212 pages. Send 50c. Standard Science Supply Co., 1232 No. Paulina Street, Chicago 22, Ill.

CHEMICALS—LAB. Supplies. New catalog 10c. Mel-Glo Chemical Co., 258 Fourth Avenue, Brooklyn 15, N. Y.

HANDBOOK For chemical experimenters, illustrated, hundreds of experiments, 50c. Experiment booklet 15c. Supply catalog 5c. Reading Scientific Company, Reading, Penna.

APPARATUS, Chemicals, ounce quantities, catalog 5c. Fleischer's Laboratories, Everett 49, Mass.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Complete supply service for correspondence school students. Send 3c for catalog. Dept. M-43, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, New York.

FREE Catalog. Chemistry, mineralogy, biology, optics. Tracey Laboratories, Evanston, Illinois.

HELP WANTED

WOOD Finishers beginners contact Satin Wood Products Co., 42 LaBelle St., Dayton 3, Ohio. Information free.

RELIABLE Man with car wanted to call on farmers. Wonderful opportunity now \$15-\$20 in a day. No experience or capital required. Permanent. Write today. McNess Co., Dept. 25, Freeport, Illinois.

MAKE More money selling individualized buckles, belts, tie holders, cap badges. Choice of 2000 emblems. Quick profits—repeats. Special outfit offer, write Hook-Fast Products, Dept. A, Columbus 6, Ohio.

AGENTS WANTED

CASH In on easy-selling Riteheat in your spare time. The automatic room temperature regulator needed by every owner of a wood or coal stove in your neighborhood. Backed by national advertising campaign. Others are getting liberal commissions now. You can do the same with very little effort. No obligation. Riteheat Regulator Division of Caloric Stove Corporation, Widener Bldg., Philadelphia 7, Penna.

EXCLUSIVE Protected territories to men calling on grocery stores or hardware, paint, drug, department stores, etc. Sell Wonder Plastic Linoleum Finish and the new Wonder Plastic "Wood Finish." Huge profits. Write Wonder Plastic Products Co., 2608 So. Kedvale Avenue, Chicago 23, Illinois.

EASY Sales—big profits. Hand painted, genuine leather, all around zipper wallets sell for \$3.00. Sample \$1.50. Quantity prices. Request wholesale catalog of exceptional wallets, belts, novelties. Golden Novelty Co., 648 Broadway, Dept. P-1, New York 12, N. Y.

WONDERFUL Year 'round cash profits showing folks everyday, birthday, get well, gift wrappings, comic, correspondence note boxes. Quickly, easily make up 100% profit. Special offers. Experience unnecessary. Write immediately for details. Request sparkling 14 card \$1 everyday box on approval. Pascale Greeting Card Service, 94 Campfield St., Dept. 300, Irvington 11, N. J.

RUBBER Wall plaques, colored fruits. Stick any where. Sample dozen \$1.00. Profit \$2.00. Liberty Sales, 2624 South Central Park Ave., Chicago.

LIQUID Shampoos available in bulk. Retail sales. Fast sellers. Details free. Delfa Co., 3958 Avondale, Chicago 41.

100% PROFIT Or more. No investment. Unusually steady business. Handle photo stamps. Amazing stamp size gummed-back glossy photographs, 100 retail for only \$3.00. Free samples and information. American Photo Stamp Co., 103 East 125th St., Dept. (301), New York 35, N. Y.

COSTS 20c. Sells \$1.00. Millions prospects. \$20 daily. Samples free. Burns Company, Johnstown, Penna.

NYLONS! Dozen, \$13.20. Delicious candy, \$10.80. Renschler's, Carrollton 7, Ky.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

EARNING Less than \$200 weekly? Boost income quickly. Fast selling celluloid price tags, metal molding, menu covers. Every store, restaurant buys. Pricing Press, Dept. PX, 124 White Street, New York.

NU PROCESS Products Laboratories, Dept. 296, Aurora, Illinois, have some choice distributorships open. Exclusive territory franchise. Big profits. Wholesale and retail. Age no barrier. Men and women eligible. Cash profits start first hour. Two products (1) Silver Plating Liquid (NuSilver Trademark Patent No. 245,336 and Re-Plate-O Trademark Patent No. 367,355), and (2) Lectrik Silver Kleener Plate for quick de-tarnishing of silverware. Full details free. Write them today.

VICTORY Ornamental. Practical shakers. Provable. Patented. Box 5024, So. Norfolk, Va.

DOUBLE-DUTY Shopping bag. Zips open. Instantly changes from small to large size. Lightning seller. Samples sent on trial. Kristee 135, Akron, Ohio.

WANTED Agents for house to house selling of plastic products including table cloth covers. Write for free details, sample \$1.00. House of Schiller, Dept. P, 180 N. Wacker Drive, Chicago 6, Ill.

GREETING Card money makers. Birthday, relations, everyday. Catalog free. Greenport Art Company, Dept. 508P, Brooklyn 15, New York.

BIG Money selling new hose nozzle. Shuts off automatically when dropped. Saves water. Sells on sight. Garages, service stations, homes, wash racks, gardeners, greenhouses. Free particulars. Watermaster, 19465 Ward, Detroit 21, Mich.

SELL Glass mail boxes, bonderized metal covers. \$13.20 dozen. 50 lbs. Circulars optional. Perfection, 637 E. 71st, Chicago, 19.

DISTRIBUTORS Wanted highly salable cosmetics. Amazingly lucrative. Full co-operation sales promotion. Stephanie Limited, 1280 Ontario, Cleveland, Ohio.

MAKE Big profits selling everyday greeting card box assortments. Fast sellers. Low wholesale prices. Write today. Bluebell Art Co., 1059 Avenue C, Bayonne, New Jersey.

BECOME Our costume jewelry jobber! Modern Fifth Avenue jewelry sells fast. Every woman a buyer! Big profits! Catalogue and literature free. Edward J. Paseka, 505 Fifth Avenue, New York 17.

AGENTS: All ages, earn \$30 to \$50 weekly selling for yourself, fibre brooms, mops, and floor dusters, start now. Write Burts Fibre Broom Co., Columbia, Penna., Dept. A.

EXTERMINATING Products harmless to humans, animals, food, etc. Nationally acclaimed. In demand by municipalities, industries, stores, homes everywhere. Offering lucrative proposition. Biocerta, 303 Fifth Ave., New York, N. Y.

DRIVER Salesmen—Men, women agents to sell aluminum giftware to homes. Fast sales. Regent Mfg. Co., 1477 York Ave., New York City.

SELL Ball point pen wholesale. Sample one dollar. Free details. Friendly, 17 South Penn Ave., Philadelphia 11, Penna.

AGENTS. Fastest selling, large profit pencil deal #25: 25 assorted pencils for every possible need, business, home or workshop; black, blue, red, etc. Indelible, drawing and carpenter pencils; free, with each deal, 5 stainless steel gold plated fountain pen points; that formerly sold 25c each. Pencils sold at 5c, 10c and 15c each. Bought singly deal would cost about \$3.00. Deal #25, costs you only 95c each in dozen lots; 89c each in gross lots. Deal can easily be resold at \$2.00 each. Deal packed individually. Sample deal one dollar. Money back. No c.o.d.'s. Foreign price \$1.50 per deal. S. Auctioneers, Box 434, Times Square, New York 18.

HOUSE To house salesmen—pleasant outdoor work applying "Tree Gum" to trees. No competition. \$3.50 investment brings in over \$30.00. Free particulars. Ross Industries, Box 5480, Philadelphia 43, Penna.

WARCO Polishing Paper. Cleans and polishes automobiles, furniture, glass, etc. A profitable fast seller. 25c brings regular package and wholesale prices. Warco Supply, 255 S. Meridian, Indianapolis, Ind.

WHERE To buy 800,000 articles direct from manufacturers; save middleman's profit; folder free. Glass Pub. Co., Ellwood City 4, Penna.

AGENTS—Dealers sell home entertainment radio microphones. Good profit. Century Lab., Box 532, Hannibal, Mo.

AGENTS. Substantial profits. Repeat order products. Not mere "job" but opportunity establish steady income. Additive lubricant. Limitless field. Factories, auto-lubricants, service stations, fleet owners buy big. Write Kidder Oil Company, LaCrosse 1, Wisconsin.

NEW Patented invisible belt, keeps shirttail in. Men, women, unlimited earnings. Sell easily. Millions prospects. Free particulars. Invisibelt, PM2, Box 26, Elmwood Station, Omaha 6, Nebraska.

\$1 STARTS You in business. Sell deluxe ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two deluxe ties. Catalog complete line free. Phillip's Neckwear, 20 West 22nd St., Dept. K-11, New York 10.

WONDER Cleaner, free sample! Other producers: unusual bubble bath—Glassklean. Sell homes, stores. Circulars furnished. Courier, 3829-I Delmore, Cleveland Heights 21, Ohio.

SELL Standard brand spark plugs. Completely rebuilt, neatly boxed. Guaranteed 10,000 miles. Sample 15c. Carl's Supply Co., 7927 Paseo, Kansas City, Mo.

SELL Blankets. Commission bonus. Zephyr Woolen Company, Oakland 1, California.

MEN And women to sell beautiful new deodorant tea-rose. Sell 4 out of 5 prospects. National Sales & Service, Dept. P, Main St., Greenville, Penna.

BE First with newest items—New Products Bulletin Service brings listing 100 newest products. Tells where to get them long before they're on open market. Sample bulletin only \$1.00, details free. American Enterprises, Box 595-P, Grand Central Station, New York 17.

PLASTIC Tablecloth covers, curtains, drapes, baby pants, bowl covers and other plastic articles selling like wildfire! Make big money now! Free details. Write Plastics, Dept. 58-E, 206 N. Fourth, St. Louis, Mo.

SELL Personal Initialed individualized belts, buckles, cap badges, tie holders. 2,000 emblems to choose. Fast profits. Repeats. Write today special outfit offer. Hookfast Specialties, Box 1425, PM, Providence, Rhode Island.

MILLIONS Want foot comfort! Amazing daily profits. Sensational new arch support body-balancer for men, women selling like hotcakes. Experience unnecessary. Complete outfit free. Special deal to distributors, crew managers. Write: Colt Shoe Company, 244-D5 Purchase, Boston 10, Mass.

PLASTONE: Amazing new polishes for floor, furniture, autos. Beautifully packaged. Low priced. Whirlwind seller to stores, gas stations, homes. Fast repeater. Big profits. Unconditional moneyback guarantee. Write for "free sample offer" now. Plastone Company, 2267 PM5 West Chicago Ave., Chicago 22, Ill.

POWER Lawn mowers. Live dealers—agents. Rotacut, M-2004, Ex. Springs, Mo.

ELECTRIC Appliances—toasters, automatic irons, clocks, etc. At wholesale prices. "Hard-to-get" items. Develop profitable house to house trade. General Products, 131-0, 621 Courtlandt, Bronx 51, N. Y.

NEED Money? Start your own business. 137 different detailed plans. Sparetime, home, office. Small investment, immediate returns. Free booklet. Twin Parks Co., Box 4696, Dallas, Texas.

AMAZING Daily profits. Big repeat business. Sell top-quality, lowest-priced men's, women's hosiery, full, part-time. Experience unnecessary. Take orders. We deliver. Complete outfit free. Write Colt Shoe Company, 242-D5 Purchase, Boston 10, Mass.

AGENTS Make big money with quick selling Utility Garment Hanger. Retail for 50c, your profit 25c. Send 30c for post-paid sample. House of Schiller, Dept. P, 180 N. Wacker Dr., Chicago 6, Ill.

AT Home—Your own business making, selling, popular \$1.00 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. T-6003, Loveland, Ohio.

REFLECTING Signs, lawn and house numbers. Carl Sign Co., Wooster, Ohio.

FACTORY Agents—dealers. Power lawn mowers. Shipments prepaid. Rotacut, M-2004, Excelsior Springs, Mo.

AMAZING Discovery. Miracle glaze puts brilliant glass-like surface on cars. Free sample, information. Big profits. Miracle Glaze Company, 9714 S. Austin Ave., Oak-lawn, Illinois.

AGENTS—Distributors \$28.00—\$140.00 daily. Flo-Glo plastic linoleum finish. Write, Acme, Box 404, Mount Vernon, N.Y.

SALESMEN, Saleswomen, Agents—Establish your own all year round business. Tremendous demand sweeping country for glass animals and brass miniatures. Sells on sight everywhere—homes, offices, stores, shops; everyone a prospect. Exceptional earning opportunity, large profits, quick turnover. Write for convincing details. P Box No. 531, Roosevelt Park Station, Detroit 32, Michigan.

JUST Out! History of World War II. Huge volume. Popular price. Authentic text. Official photographs. Big profits. Riverside Book Company, Iowa Falls, Iowa.

SELL Electric razors for \$5.00. Your cost only \$4.00 postpaid. Henderson, 1333 Santa Fe Ave., Los Angeles 21, Calif.

MAKE Flexible molds! Few cents each! Cast plaques, novelties, bookends! Free sample! H. Tooker, Hamilton 2, Ohio.

QUICK Money! Men! Women! "You'll love this!" Free details! Battery Shop, Grand Junction, Colo.

MAKE Money in your spare time! Helps furnished. Easy sales. Voluntary repeat orders. Liberal commissions. Write for free wholesale price list today! McGregor Magazine Agency, Dept. P.M.-7, Mount Morris, Illinois.

MAGIC Cleaner—Hotter than a fire-cracker. Saves soap—Big profits—Sample free. Bestco, 5007 Irving Park, Chicago.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2.00, pants 35c, topcoats \$1.25, overcoats \$2.00, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-B Jefferson, Chicago 7.

GREETING Card agents, "line up" with "Pines" for bigger, better, quicker profits. Rush name, address on postcard today. Box 32, Flushing 5, New York.

90c PROFIT Each \$1 sale. Sell positive mothproofing solution to housewives, stores, agents. Experience unnecessary. Postal brings details. Kinford, Wayne 3, Penna.

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

137 COMPLETE Plans for starting own business: local—mail order. Particulars free. Elite Co., 220 Grand St., New York 13.

COLLEGE Students! 100% profits selling costume jewelry. Wm. Morris, Maywood, New Jersey.

AGENTS—Big line including food products. Fast selling premium and bargain deals. Low prices. Send card for big profit offer with gift. Ho-Ro-Co, 2796 Dodier, St. Louis 7, Mo.

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

200 MONEY Making deals. Plans, rare formulas. Schemes. Polio free. Formico Service, Box 572, Dayton, Ohio.

\$3 FIRE Extinguisher; quick sales, wholesale or direct; liberal profits. "Fire-Killer." 109 N. Franklin, Syracuse 1, N. Y.

PLATING Outfits for autoparts, reflectors. Connect to a battery. No tanks necessary. Free booklet and particulars. Gunmetal Co., Ave. N. Decatur, Ill.

FREE Water and our concentrates, makes flavors, lotions, shampoos, 72 products, labels, bottles furnished. Qualco, E-20030 Russell, Detroit.

GOLD Lacquered window sign letters. Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

SELL Personalized soap. Name on every cake. Ideal for gifts. Get sample offer. Dunbar Soap, New Brunswick, N. J.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also make money applying initials on automobiles. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

LITTLE Library of Useful Information. 102 different books. Catalog free. Popular Mechanics Press, 200 E. Ontario St., Chicago 11, Ill.

HIGH-GRADE SALESMEN

ORANGE Concentrate direct from our Florida groves. One quart bottle makes six quarts delicious natural orange drink simply by mixing with five parts cold water. Groceries, foodmarkets, hotels, restaurants, taverns, roadstands, sodafountains, hospitals, resorts, camps, farmers, big buyers. Money-back guarantee. No investment. Protected territory. Salesmen earn \$100.00 to \$200.00 repeat commission weekly. Sunset Valley, 3357 N. Clifton, Chicago 13, Ill.

SELL Delicious candies, nuts, gum. Immediate delivery. Write Casterline, 2031-A Sunnyside, Chicago 25, Illinois.

STARTLING New line. Artistic waitress checks and daily menu sheets. Standard Printed Products, Box 29, Santa Ana, Calif.

SELL Filling stations, sales tested specialties. Good profits. General Sales Co., 915 Brooklyn, St. Louis 6, Mo.

BALLOONS, Fireworks, rubber novelties. Our salesmen make money. Write for territory. Ellswood Distributors, LaJunta, Colorado.

PATENTED Suction cup resilient arm; giant holding power; uses: advertising matter, stores, automobiles, homes, hospital, etc. \$1.00 per dozen. One sale to right company—fortune. L. G. H., 919 South Vermont, Los Angeles 6, Calif.

SALESMAN To sell coin-operated radios in every city. Liberal commissions. Johnstone Co., M-2, 5007 Duval, Austin, Texas.

BIG Profits for wagon-jobbers! Ballpoint pens (\$2.98 retail), leather work gloves, blades, lighters, films, hundreds fast sellers. Free details. Salesmanager, Box 27, Atlanta, Georgia.

AMAZING Daily profits, steady repeat business selling Colt's famous Foot-Balance Shoes direct. Exclusive features make selling easy. 216 styles! Experience unnecessary. Patented Foot-O-Graph assures accurate fitting. Free selling outfit. Colt Shoes, 601-D5 Atlantic, Boston 10, Mass.

\$70.00 WEEKLY Selling twenty boxes greeting cards daily. Eighteen money makers. One earned \$160.00 weekly. Samples on approval. Details. Carleton Distributors, 25-A W. 17th, Bayonne, N. J.

QUICK Profits selling full or part time, individualized buckles, belts, cap badges, tie holders, uniform shirts, caps, ties. Choice of thousand emblems. Sure repeat orders. Easy-selling outfit offer. Write Hook-Past Company, Dept. 12, Roanoke, Virginia.

ADVERTISING Book matches—Cash in on political campaigns—sell Union Label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices. Protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M57, 7530 Greenwood, Chicago.

AMAZING New zipper shoe sells on sight. Big profits for salesmen. Leads line 200 splendid styles. Territories open. Get free sample outfit. Write, Consolidated Shoe, Dept. S-757, Chippewa Falls, Wis.

START Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U-PPM, Freeport, Ill.

AMAZING Discovery. Master Glaze, puts brilliant glass-like surface on cars. Free sample, information. Big commissions. Master Glaze, Dept. 593, 7720 Harwood, Milwaukee, Wis.

POCKET Pal: The all-purpose cutting tool. Wagon jobbers-salesmen. Sell to retailers and jobbers. 50c seller. Steady repeat item. Exceptional profit. Sample 25c. Nelson Manufacturing Company, 222 West Kellogg, St. Paul 2, Minn.

DISTRIBUTORS, Salesmen—Patented cigarette case holder for automobiles, trucks. Fine seller. New. 200% profit. Samples \$3.00 per doz. Literature free. Little Giant Holder Company, 919 South Vermont, Los Angeles 6, California.

STATE Distributors to sell simplified bookkeeping system small stores and public accountants. Sells \$13.50, your commission \$8.00. Exclusive franchise. Write Hawthorne Sales Co., Decatur, Ala.

SELL Calendars full or part time—every business house a prospect—also wholesale to printers—calendars, novelties, sheet pictures. Fleming Calendar Company, 6535 Cottage Grove Avenue, Chicago 37, Ill.

WAGON Salesman—Fast moving carded goods and 10c line. Long profit. Free facts. Peckers, 2717 Dodier, St. Louis 7, Mo.

FREE! Latest Issue Opportunity Maga-zine. Salesman's Guide. Inspiring, constructive. Shows how to earn money selling for others or in your own business. Hundreds postwar opportunities. Send name and describe what you have sold or are selling. Illustrated copy sent free. Opportunity Magazine, 620 N. Michigan, Dept. 17, Chicago 11, Ill.

EDUCATIONAL AND INSTRUCTION

LEARN To "speak in public." Banish fear. Speak fluently with confidence. Easy simplified method. Absolutely guaranteed. Surprisingly low price! Send for free folder. Trissel-Heymann, Publishers, Mason City 1, Iowa.

BIG Pay for you in show business. Learn how to become a theatre manager. Complete course by a manager of big New York theatres for 20 years. Send \$1.00 now to Guide to Show Business, 635 Main St., Hartford, Conn.

TRAIN For aviation mechanics high salaries. This famous school approved for veterans. Immediate enrollment. For information write California Flyers, Inglewood, California.

LEARN Piano tuning. Approved system for beginners. Six simplified lessons. Complete treatise \$5.00. Music Mart, 711 West Greene, Carlsbad, New Mexico.

SLIDE Rule circular and instruction booklet \$2.50 C.O.D. GPB Associates, 1328 Chestnut, 622P, Philadelphia, Penna.

TUTORING Courses in practical mathe- matics and mechanics. \$10.00 either course. Send postcard for details. Math Tutor, Box 1214-B, Indianapolis 6, Ind.

LEARN Foot correction. Six weeks course. Low tuition. Tunis Corrective Foot System, 3041 S. Double Dr., Temple City, Calif.

WANTED: Publication rights on trade, occupation and business training courses. Purchase or royalty basis. Box 1058, Omaha, Nebraska.

ANALYZE Handwriting for profit! Complete outfit \$1.00. 4462-R Germantown, Philadelphia.

"UNCLE Sam" jobs! \$1756-\$3021 year. Men—women. Prepare for next examinations. Veterans get preference. 32 page booklet on Civil Service free. Write Franklin Institute, Dept. H-24, Rochester, N. Y.

TYPING Made easy! Modern course \$1.00 Write: Box 1052, Steubenville, Ohio.

NEW Courses. Self-advancement. Self- improvement. Self-promotion type. Send 25c for "Check-Chart." Mention occupation. Professor. Martin, 406 Panama Bldg., Portland 4, Oregon.

HERBALISM—Complete course in two volumes. 1000 recipes. Home Service, Forestville 2, Va.

CHIROPODY, Masso-Physio-Therapy. Evans natural therapeutics home study courses. Foot correction, adjustments, massage, arch supports, etc. All massage movements, diet, baths, etc. P.O. Box 1195, San Antonio 6, Texas.

HOME Study courses. 300 subjects. Tui- tion \$4.98. Free bulletin. DeVoto School, 35 Vicente, San Francisco 16, Calif.

LEARN Paint, Estimating, blue print reading at home. Approved easy system, prepared by expert. Write for interesting facts. Fred T. Schuttler, 5017 No. Wolcott, Chicago 40, Ill.

LEARN Photo-Retouching. One of the most profitable fields of commercial art. Positions always open. Experts earn \$5000 year. Practical and easily mastered course. Personal instructions. No special ability required. Write at once for full particulars. School of Commercial Illustrating, 3720 N. Penn St., #40, Indianapolis, Ind.

BECOME A Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of Ps.D. or Ms.D. Solve mental worries. Free book. College of Universal Truth, 5153-B North Clark, Chicago.

OPERATE Commercial employment agency. Many more needed nationally. Earn \$5000 upwards annually. Experienced director has low-cost full instruction course. Information free. Hunt, Box 308, Burlingame 21, Calif.

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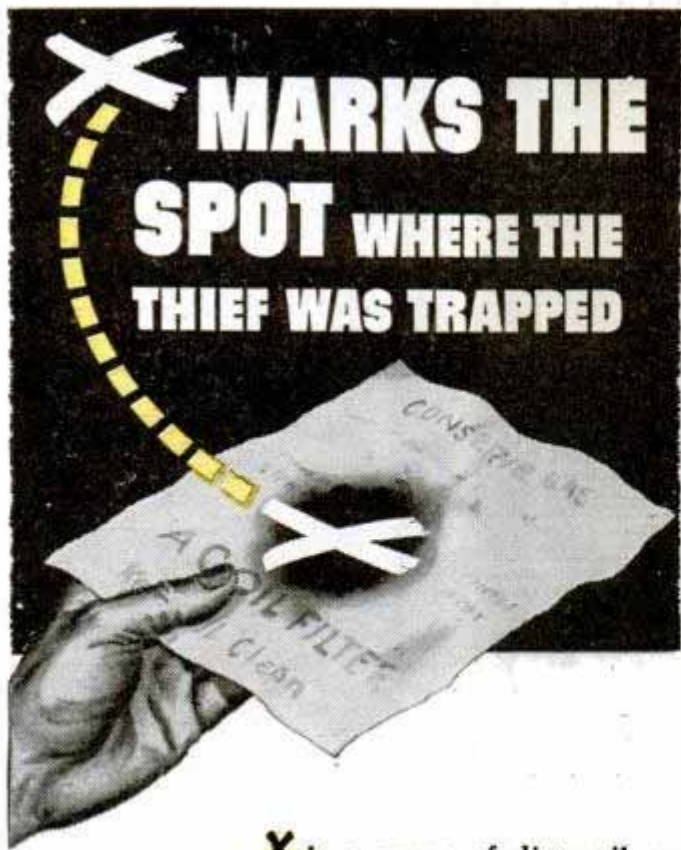
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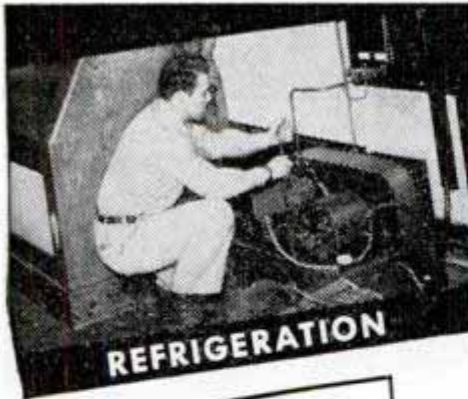
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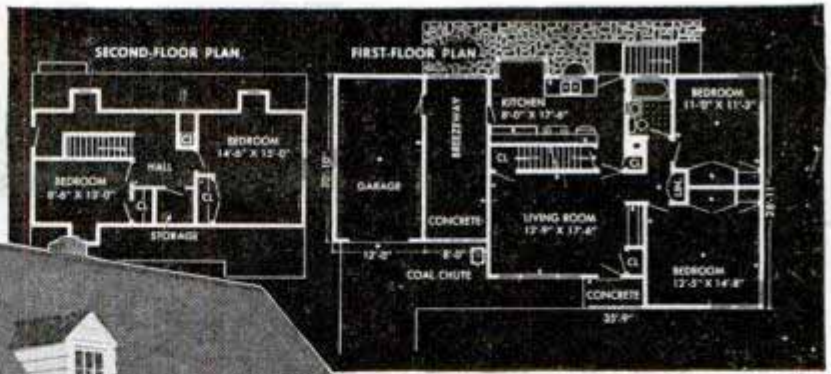
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The 75-mm. recoilless rifle, by contrast, weighs 110 pounds, and its tripod is the same used for the Army's caliber .30 machine gun!

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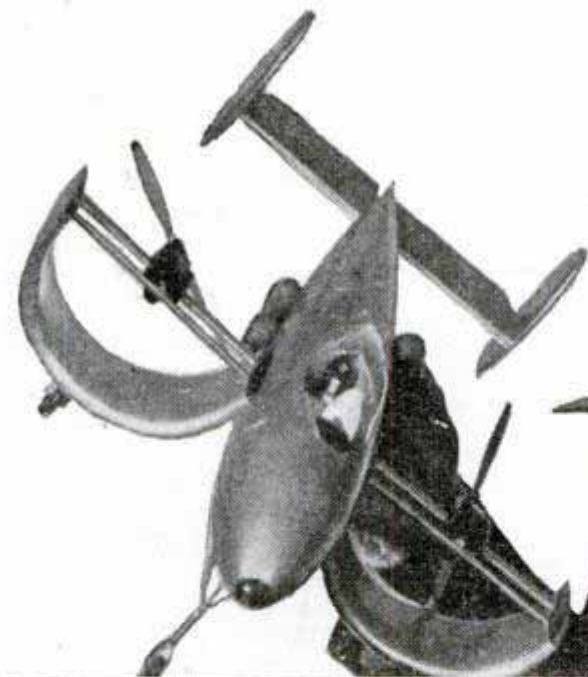
WITH stubby wings like half barrels flanking its fuselage, it resembles nothing you've ever seen in the air before—but it flies! Some experts who've seen it still can't understand why.

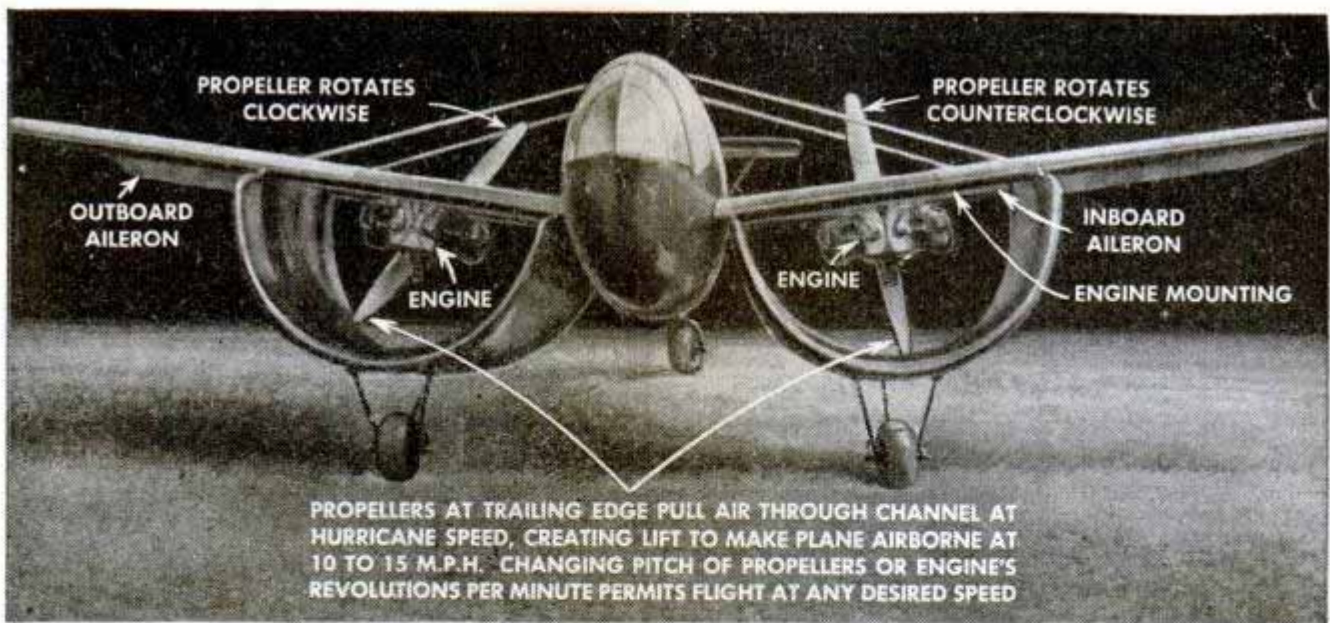
And before you recover from the shock of watching this strange craft perform in the sky, its inventor, Willard R. Custer, has many more surprising claims to make.

He says planes of this design can: take off and land at 15 miles an hour in 50 feet of space, lift twice the pay load of present transports using the same power, and either hover overhead or pierce the supersonic speed zone. And he supports his

Inventor Custer points to the channel wing design he says makes possible safe 15-mile-an-hour take-offs and landings and doubles planes' lifting capacity. Test version, below, has flown more than 100 hours

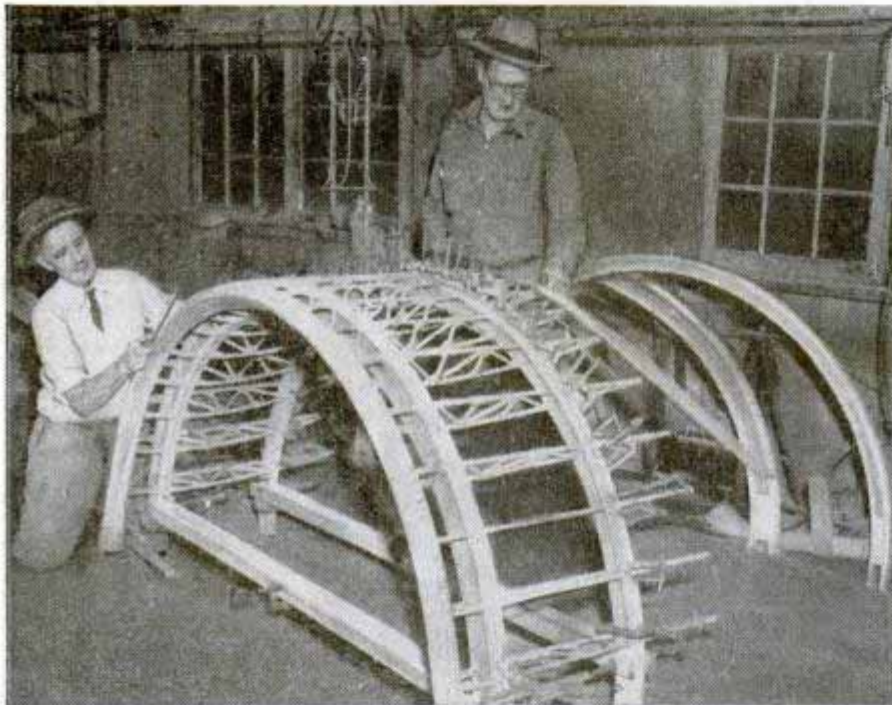
THE WING THAT FOOLED THE EXPERTS





PROPELLERS AT TRAILING EDGE PULL AIR THROUGH CHANNEL AT HURRICANE SPEED, CREATING LIFT TO MAKE PLANE AIRBORNE AT 10 TO 15 M.P.H. CHANGING PITCH OF PROPELLERS OR ENGINE'S REVOLUTIONS PER MINUTE PERMITS FLIGHT AT ANY DESIRED SPEED

Front view of experimental plane with 75-horsepower engines. It made take-offs and landings in less than 100 feet—upwind, downwind, crosswind



Readying six-foot channel for plywood skin prior to full-scale laboratory trials to determine lift, drag, thrust and pitching moment. Below, rear view of test model flown during Maryland trials. Despite its unusual appearance, the plane's controls are conventional and it is easy to fly



claims with results from Army and privately conducted tests.

Heart of this remarkable performance is the Custer Channel Wing, adaptable to any type aircraft, and to piston, jet or rocket power. In contrast to a conventional airfoil, it is shaped like the lower half of a tube and has an adjustable-pitch propeller at the rear. The propeller's tips sweep almost the entire trailing edge.

Simply stated, an ordinary wing is fashioned so that air pressure—or lift—is built up beneath it and decreased above it, as the plane speeds along the runway, until a slight difference between the two makes the plane fly. Atmospheric pressure on all sides of the wing is a constant 14.7 pounds per square inch at sea level when the plane is standing perfectly still. Modern transports like United Air Lines' DC-6s reach 125 miles an hour and use over 3800 feet to get off the ground, and they touch down at 100 miles an hour, using more than 1800 feet to stop.

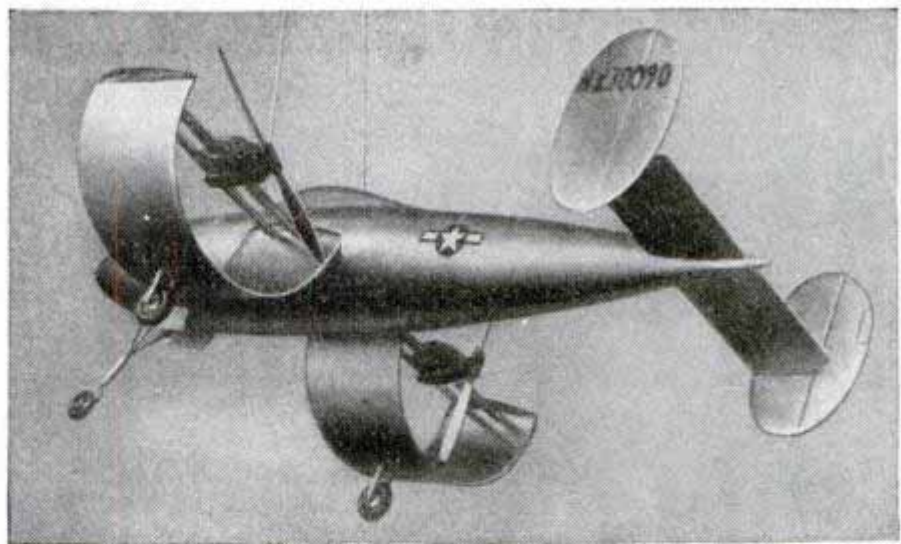
Custer's method is to relieve the pressure above the wing by the propeller's sucking action at the rear of the

channel, and let the undisturbed pressure of nearly a ton per square foot below the wing lift the plane off the ground. Instead of moving the plane to achieve lift he gains it by moving air masses through the channel. To better control the lower-pressure air thus created within the wing, he has built up its sides above the propeller's center and slightly constricted the forward portion.

This funnels more air to the propeller, increasing its efficiency so much that the pitch has to be adjusted to absorb unused horsepower, Custer says. In contrast to this concentrated lift, a conventional wing's efficiency varies along its entire length. Since the channel will lift 75 percent of the plane's weight without forward motion, very little movement is needed to add the 25 percent that makes the craft airborne.

His unorthodox attack on the problem of finding more efficient ways to fly can probably be laid to the fact that Custer is an auto mechanic by trade, not an aeronautical engineer. So he cut a simple and unique path to his solution. He uses familiar objects instead of complex technical formulas to illustrate his arguments.

Although the invention has many important potentialities if completely successful, Custer prefers to stress the safety features that will further popularize flying. With it, he points out, planes can sink slowly to earth through the worst weather, onto deep snow or any other kind of unprepared ground, at landing speeds slower than a man runs. The crash hazards of blind approaches and landings at high speeds are



Supersonic speeds are expected from the channel wing on fighter aircraft

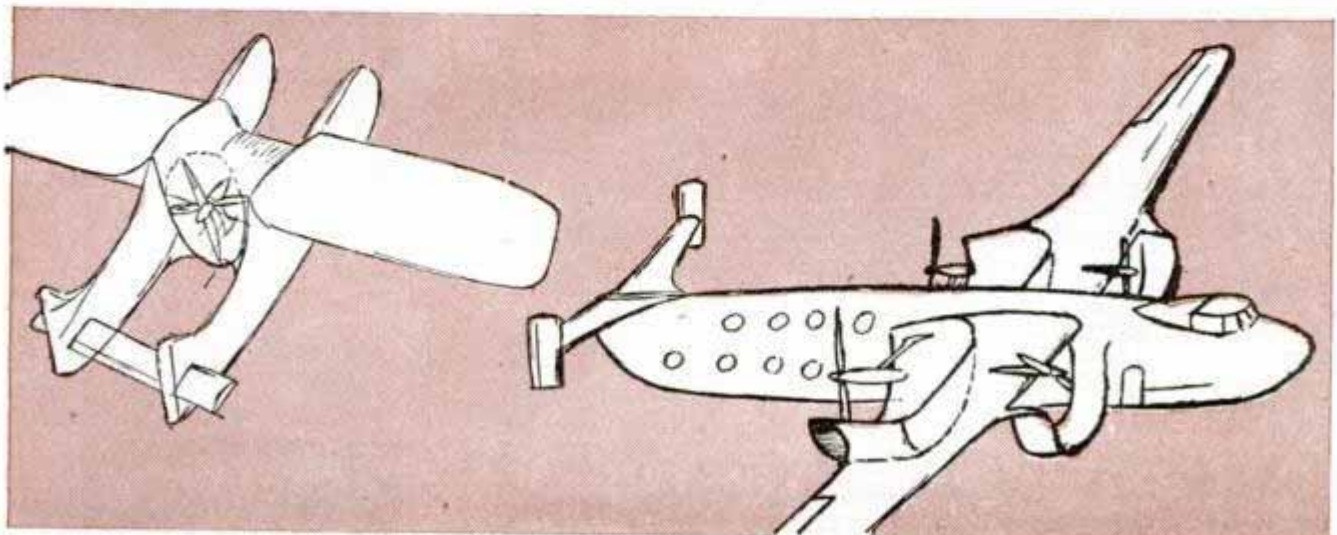
eliminated. Another important item is that all the controls of the channel wing plane are conventional and it is easy to fly.

While most experiments with the wing have been in wind tunnels and laboratories, a test ship flew more than 100 hours over a government field at Beltsville, Md., using 75-horsepower engines. The engines and propellers were mounted on metal supports extending across the upper rear section of each channel.

During those first test flights the plane, weighing only 1785 pounds with pilot, was held to a top speed of 60 miles an hour. Take-offs and landings were made under 100 feet, upwind, downwind and crosswind.

Two series of nonflying tests were later made by the Air Materiel Command at Wright Field. One fact established during trials was that the wing's lift increased even when its chord, the distance from front to rear, was reduced by half. Frank D. Kelley, president of the National Aircraft Corporation, said that a second flying model using a short channel wing will be ready for flight tests this fall at Hagerstown, Md.

Inventor's rough sketches showing adaptations of channel wing. One has large propeller sweeping rear of channel formed by section joining twin-fuselage fighter. Transport design uses double channels on both sides





Rubber Raft Wading Pool

There's fun for the whole family in an inflated rubber wading pool. By turning it bottom side up, adults can use it as a beach raft or float. Because there are no rigid parts to fall against, children can play in the pool safely. The inflated unit is six feet four inches in diameter. It is made of heavy duck canvas, double-coated with synthetic rubber, and it folds into a package 12 by 22 by 8 inches. It is equipped with a tire pump adapter which makes it easy to inflate. The portable pool can be set up or repacked by one person in a few minutes and is compact enough to stow in a small space in a car.

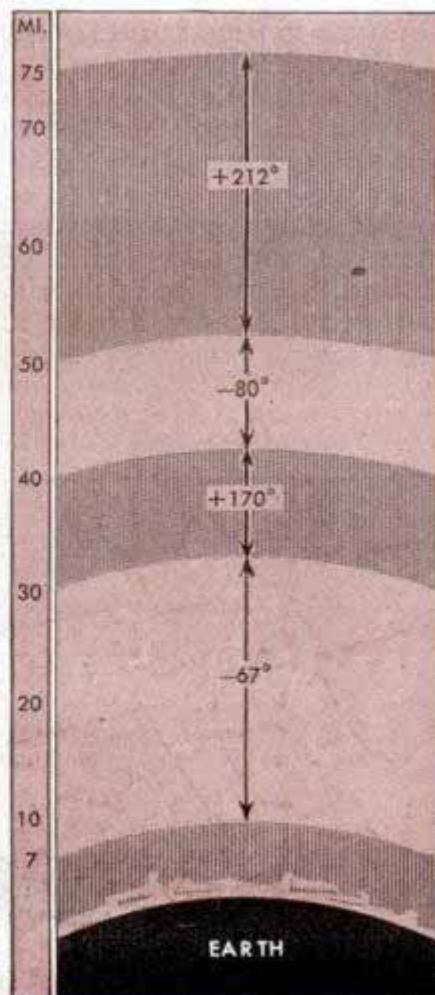
☐ Vending machines to dispense hosiery are being developed.

Torrid Belt 30 Miles From Earth

Like the filling in a three-decker sandwich, temperature zones are stacked in contrasting layers in the upper atmosphere seven to 70 miles above the earth. Until recently, weathermen believed that above seven miles the temperature remained constant at 67 degrees below zero. Thermometers carried by V-2 rockets exploded this theory when they returned to earth with evidence that just the opposite actually exists. From seven to 30 miles the temperature is 67 below. From 30 to 40 miles the temperature jumps to 170 degrees above zero. In the next 10 miles it drops back to 80 below. Above 50 miles it climbs to 212 degrees, equivalent to the boiling point of water. The hot and cold layers exist because of the changing composition of the air itself. This new information, according to the National Advisory Committee for Aeronautics, will be helpful in designing rocket aircraft to operate in the upper atmosphere.

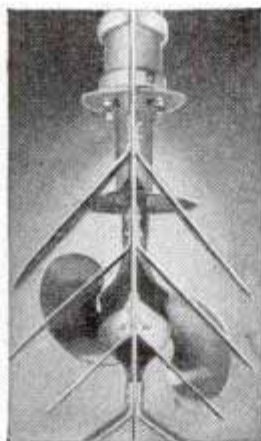
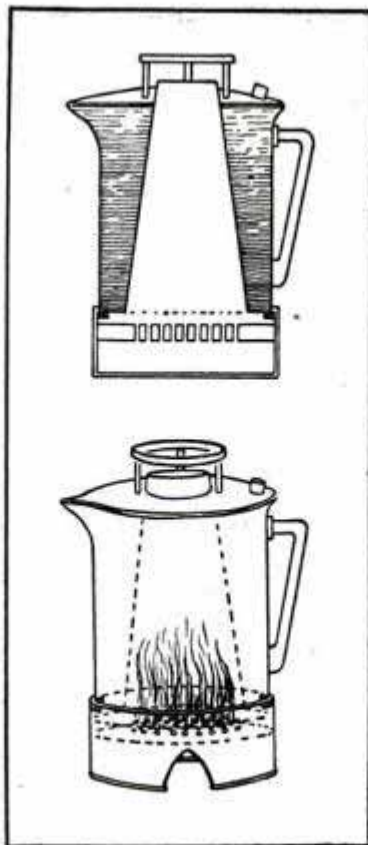
Air Conditioning Adaptable to Autos

Automobiles can be air conditioned like transport planes by circulating air and heat through hollow walls. The same system would also make possible fogproof windows and draftless ventilation. Another development is a hot water heating system for motor coaches which, used in combination with air-circulating fans and thermostats, gets heat from the engine and from additional booster units in extreme weather. Air is taken in just above the windshield, heated, and discharged through slots above windows on both sides of the coach.



"Volcano" Stove For Campers

Within five minutes a new aluminum camp stove will bring a half gallon of liquid to boil, using only sticks, twigs and dry leaves as fuel. The stove utilizes almost all the heat of the fire by surrounding the flame with the liquid to be boiled. The grate is placed on the ground, and the unit, which has a circular opening through the center, is placed on top of it. A lid with a hole in it covers the unit. The flame burns through the center of the stove to heat the liquid. A pan support on top of the lid permits cooking of other food at the same time.

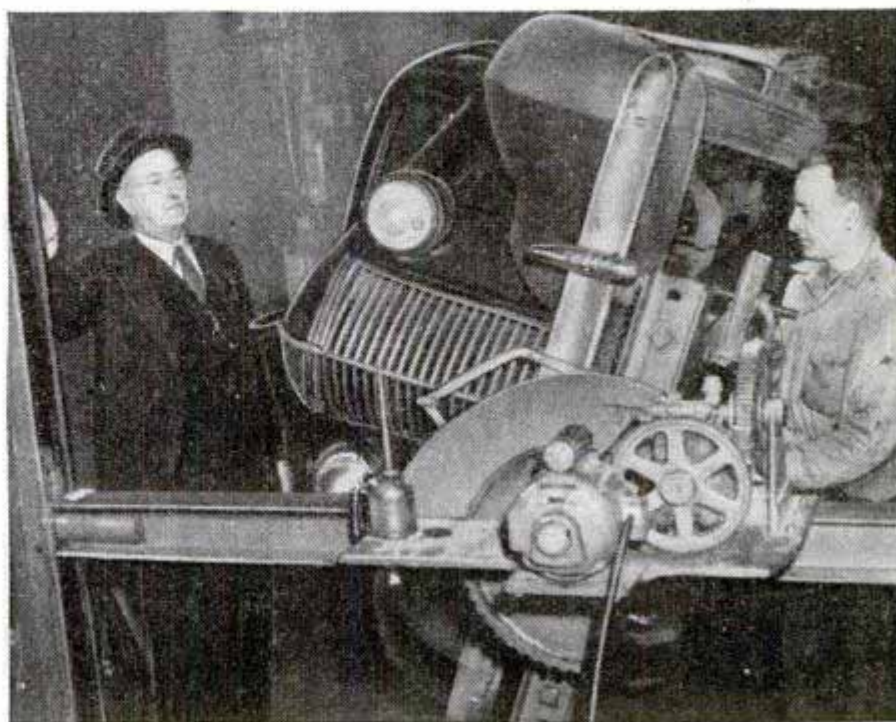


Outboard-Motor Weed Guard

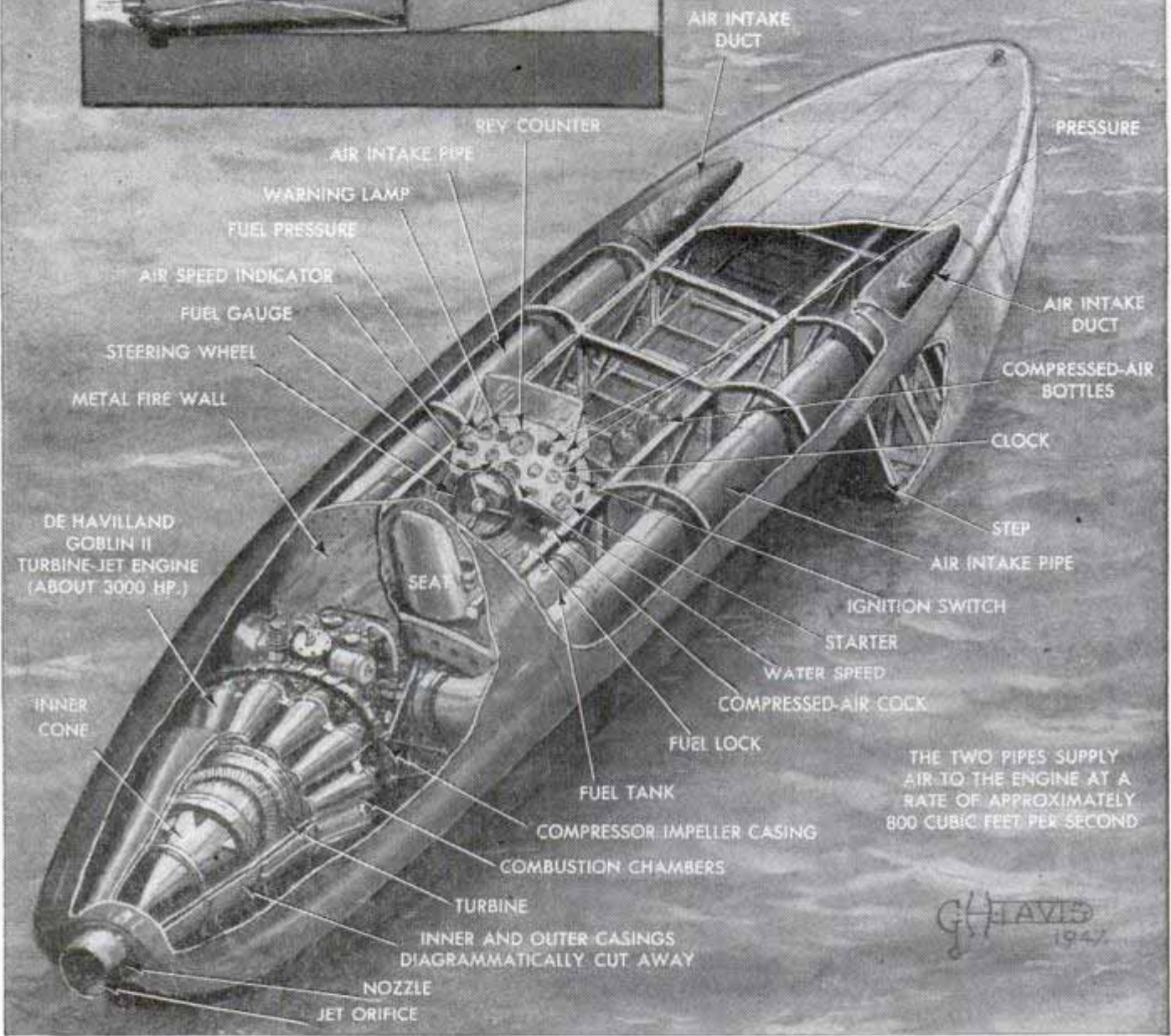
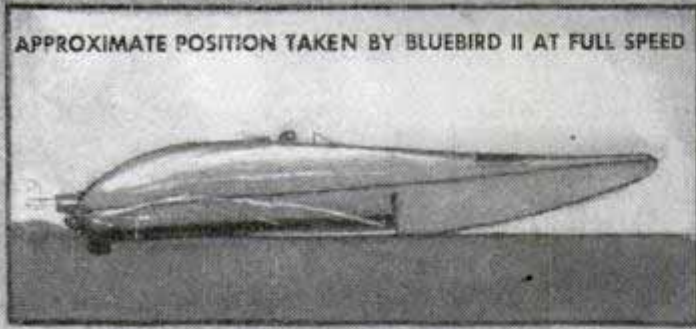
A guard for outboard-motor propellers protects the spinning blades against weeds, floating moss, submerged rocks and snags. Made of aluminum alloy, the guard weighs less than two pounds and has eight fins which shield the propeller. The fins are shaped so as to offer little resistance to forward motion through water. To attach the guard to an outboard motor, two holes are drilled through the lower fin of the vertical member. The unit is then firmly anchored with two screws and a clamp.

Automobile Hoist Lifts and Turns Cars

Automobiles are not only lifted by a tilting hoist but also turned sideways so mechanics can stand comfortably while working on the undercarriage. The hoist can be mounted on either a stationary hydraulic or portable mechanical lift. It was designed by Carlyle Hall, retired dairy products manufacturer, of Seattle, Wash., to "take the auto off the mechanic and put the mechanic on top of the auto." The hoist makes it possible for two or more mechanics to work on a car at once.

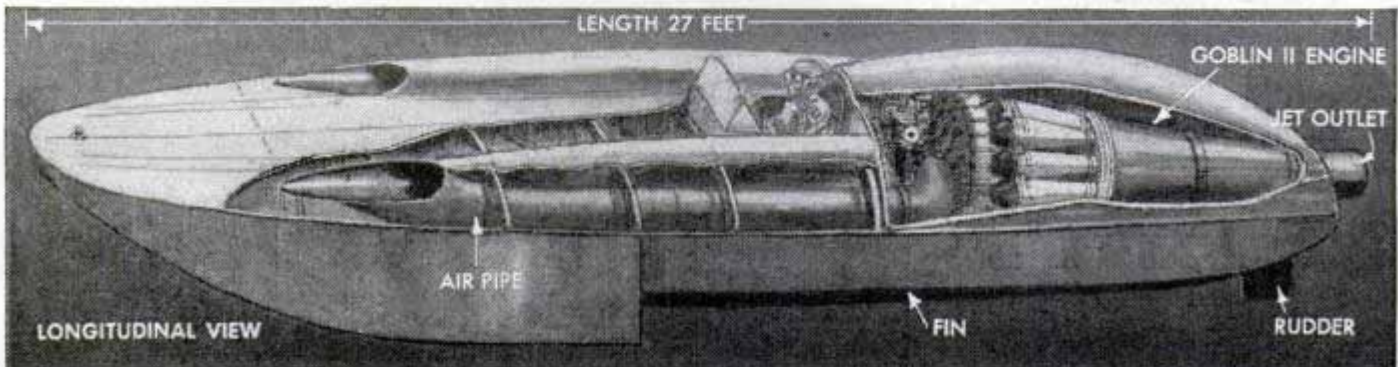


APPROXIMATE POSITION TAKEN BY BLUEBIRD II AT FULL SPEED



JET-DRIVEN BLUE BIRD II

The 3000-horsepower turbine-jet engine of this British speedboat may push the craft to a new world record—better than 141.7 miles per hour. Sir Malcolm Campbell will find out soon



BBRITAIN'S Sir Malcolm Campbell is ready to resume his war-interrupted quest for new speedboat records. Holder of the world mark (141.74 miles per hour), he plans an attempt this month to set a new high on Lake Coniston in his reconstructed Blue Bird II, powered by a 3000-horsepower turbine-jet engine.

The lower hull is the same used in the original Blue Bird which carried Sir Malcolm to the present record August 19, 1939, on Lake Coniston. But the upper portion of the jet boat has been completely redesigned by Commandér Peter du Cane, managing director of Vospers, Ltd., British boatbuilders.

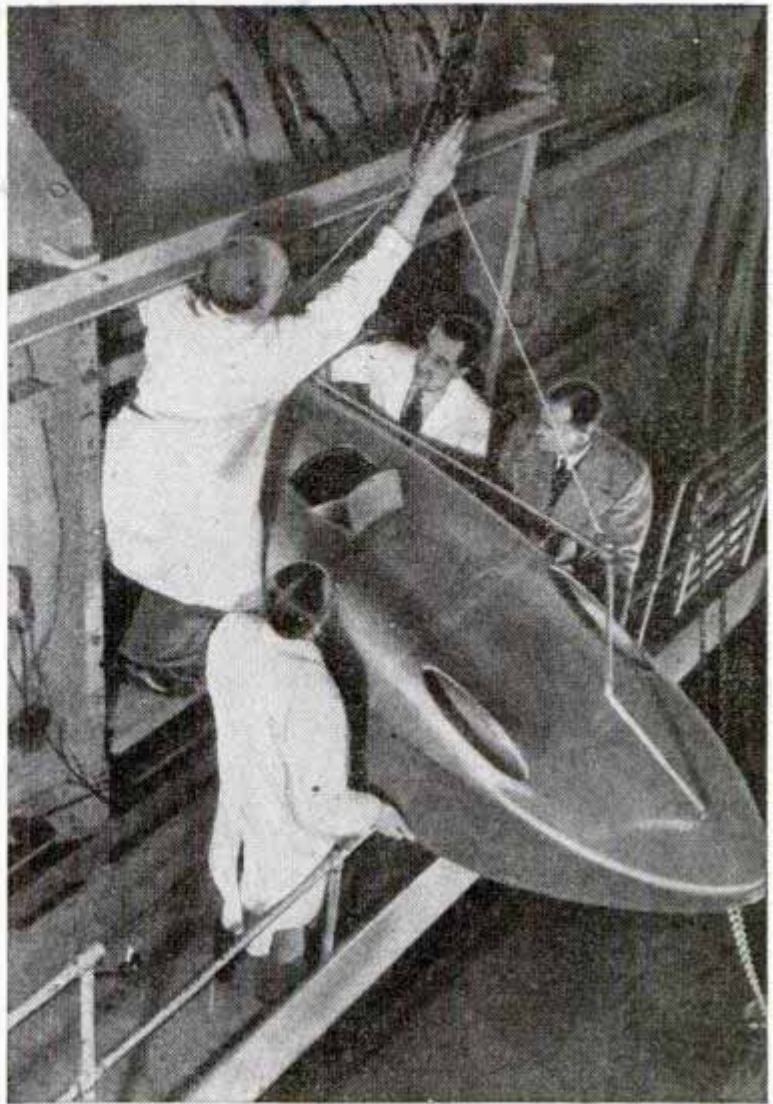
The propeller and shafting have been removed and in place of the former piston engine a De Havilland jet engine, similar to those used in British Vampire fighter planes, has been installed. It burns a refined kerosene. From the orifice in the stern, 1000-mile-an-hour jets will issue.

Sir Malcolm will not venture to forecast the speed he will attain. The jet engine in a Vampire develops 9330 horsepower when the plane hits 600 miles an hour. It uses 20 times as much air as a 2000-horsepower piston engine.

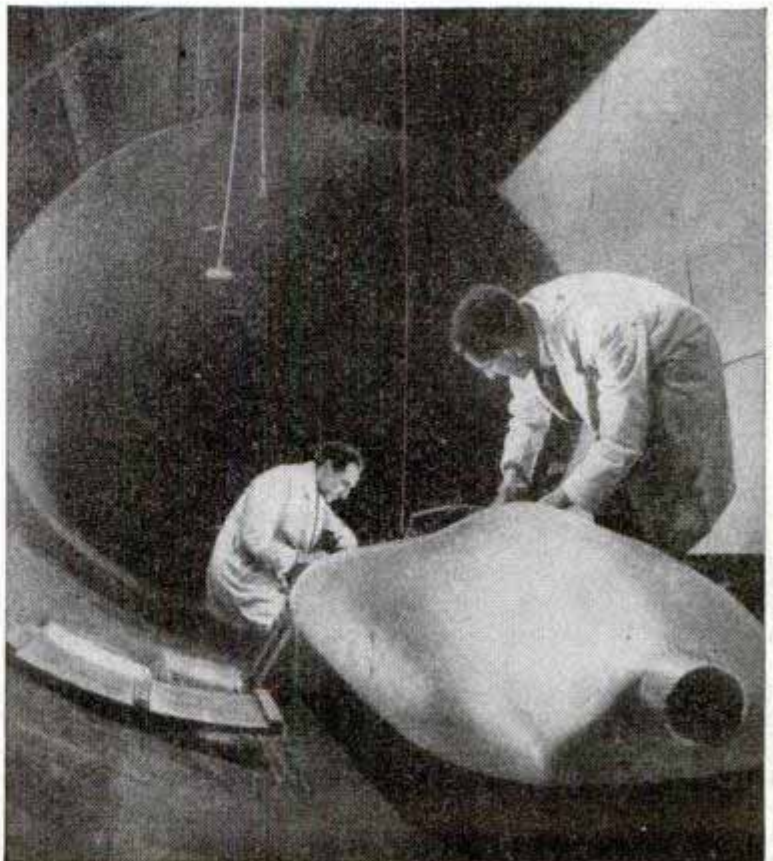
Some of England's top engineers have worked for more than a year in developing Blue Bird II. First there were tests with scale models in a special water tank. Then M. S. Hooper and other aerodynamic experts at Fairey Aviation Company conducted wind tunnel tests.

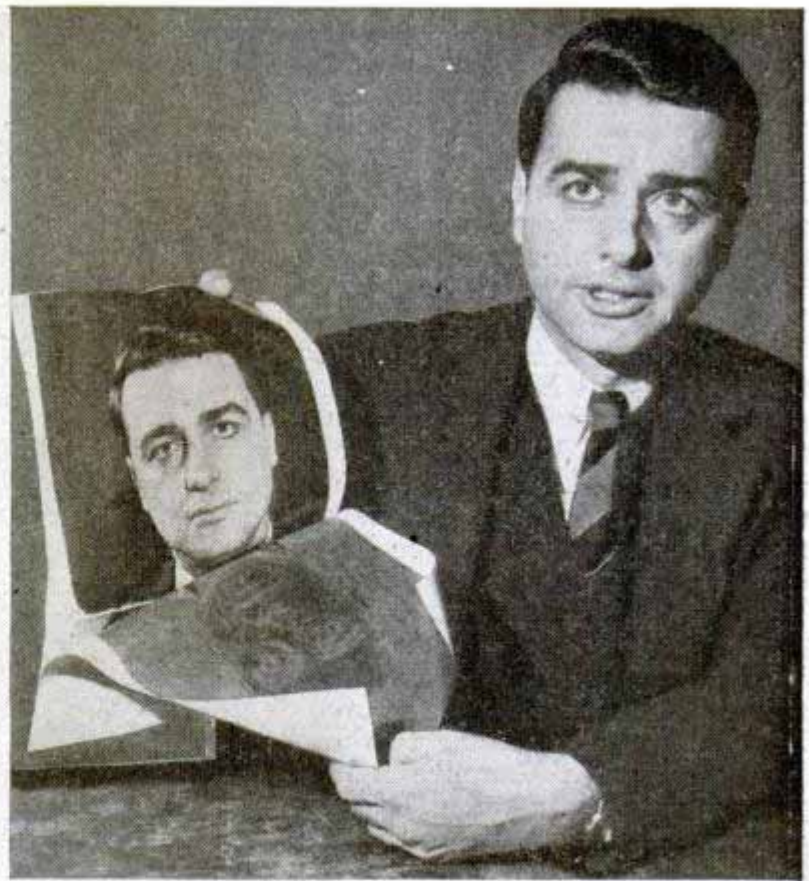
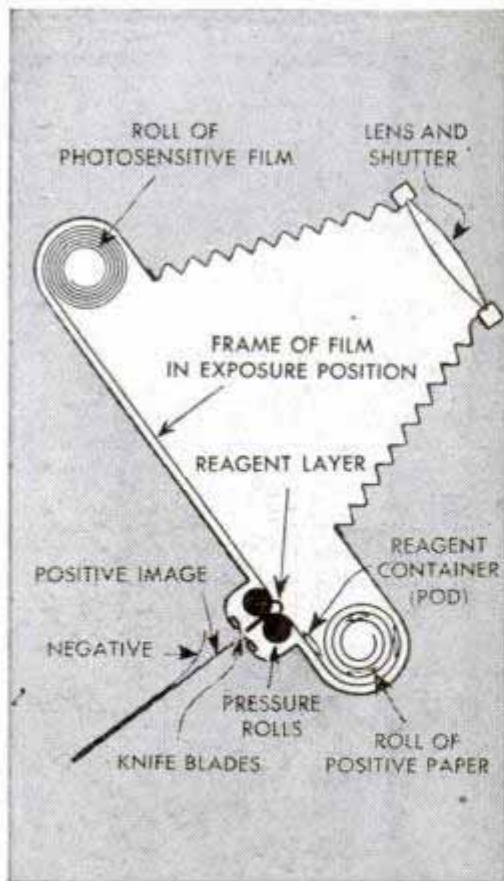
In the early days of speedboat runs, efforts were made to design a craft whose nose would rise out of the water to reduce water drag. But at the speed Sir Malcolm expects to reach, this rising out of the water could become dangerous. His boat might lift so much it would turn over. One of Hooper's toughest jobs was to modify the upper design of the old Blue Bird so that the dangerous angle of lift will not be reached at high speeds.

When the speed king climbs into Blue Bird II for a new record try, he will not engage in any long-drawn-out preliminary runs. Sir Malcolm believes that the behavior of the boat at moderate speeds would not necessarily indicate how the boat will act at top speeds.



Sir Malcolm watches as model of jet boat is placed in a wind tunnel for tests. Below, making design measurements in wind tunnel





Camera Develops and Prints Pictures in One Minute

Finished pictures are produced by a revolutionary new camera one minute after its shutter is snapped. The camera has two rollers, one carrying the film and the other carrying a roll of special sensitized paper. After a picture is snapped, a knob is turned to advance the film and paper through the rollers. Pressure of the rollers breaks a small vial containing developer and hypo

taped between the film and paper. The chemical develops and fixes the negative and makes the positive print during the minute the film and paper are in contact. In the final step, the film and paper "sandwich" is pulled apart, leaving a positive print on the paper. The camera was developed by Edwin H. Land, president and director of research of Polaroid Corporation.

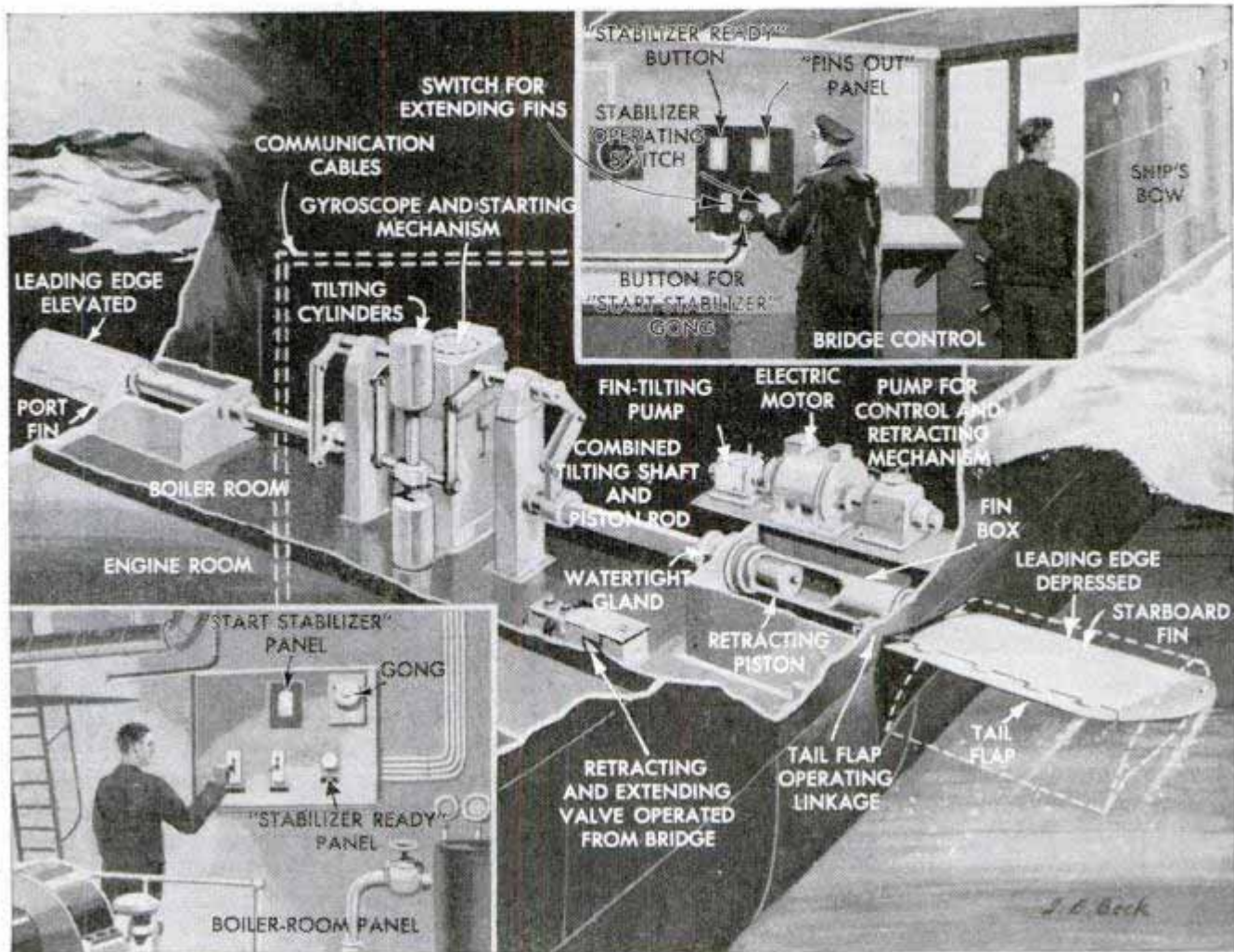


Magnetic Emergency Light

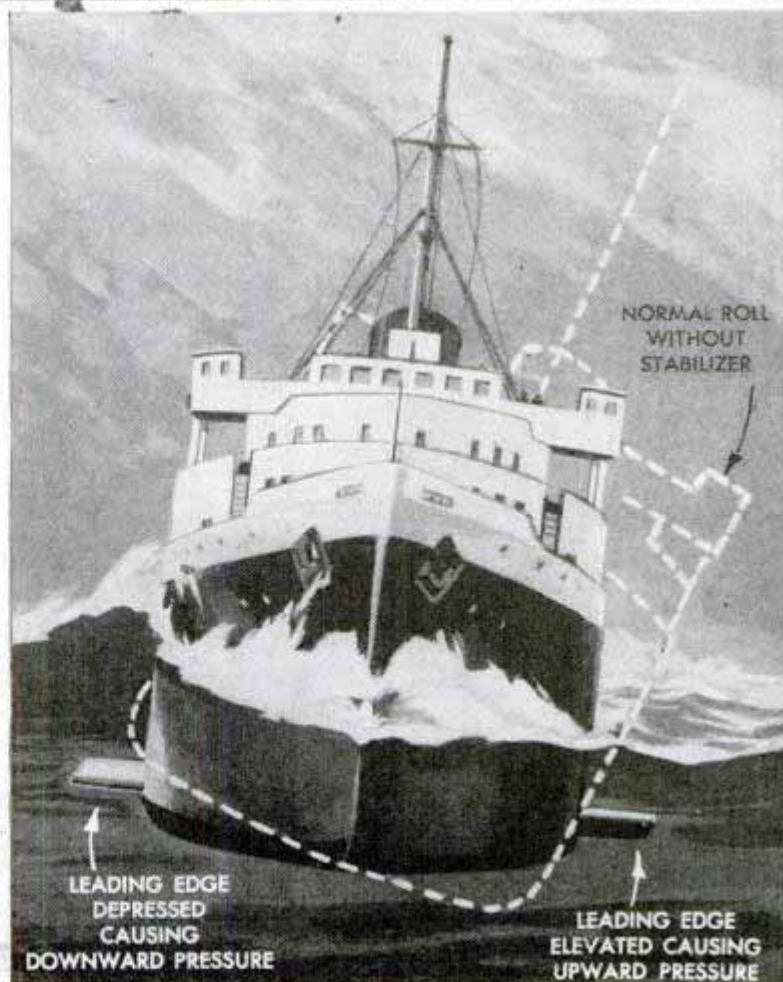
Electromagnetism holds an emergency automobile light securely against fenders, bumpers, hoods, engine blocks and other metallic parts. This action eliminates the trouble of looking for a place to rest the light, enabling a motorist to have both hands free to change a tire or fix his engine. The light, said to provide as much illumination as an automobile headlight, becomes electromagnetized as soon as it is plugged in. It comes in three types for plugging into a jack or cigarette lighter on an automobile dash, or for clamping onto a battery terminal.

Every day new products for homes and workshops, farms and factories, are appearing on the nation's markets, and every month you'll find them described in Popular Mechanics. For additional information about these products, write to Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois.

Ship's Stabilizing Fins May Prevent Seasickness



Tomorrow's ships may eliminate seasickness with underwater "wings" that reduce the pitch and roll of the hull in heavy seas. The retractable wings are part of a new stabilizing system for seagoing vessels described in British news releases. Two fins are installed amidships below the water line and project from the sides of the hull. They are connected by shafts to a gyroscope and a power unit. When the ship begins to roll, hydroelectric power is applied automatically, elevating one fin while depressing the other at high speed. The stabilizing effect is the same as that performed by the ailerons of an airplane, tending to counteract the natural roll of the ship. The stabilizer is operated from a control panel in the boiler room, which is connected by communication cables with the ship's bridge. The system was developed during the war to make naval gunnery more accurate. Stabilizers now are being fitted on new ships, it is reported.





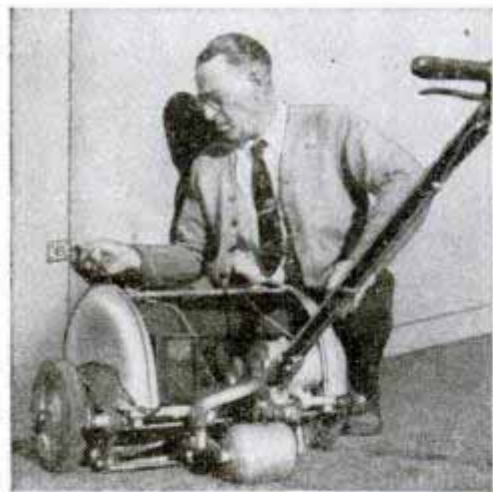
Book-Vending Machine

Pocket-size books are dispensed by a vending machine which offers a selection of 15 for 25 cents each. Manually operated, the machine holds 96 books and was designed for installation in hospitals, bus and railroad terminals and stores.



Miniature British Bus

In London, F. Renshaw got tired of waiting at street corners for overcrowded buses. He solved his personal transportation problem by building a small replica of a big bus. Renshaw's model is foot-pedal powered and gets through heavy traffic with ease.

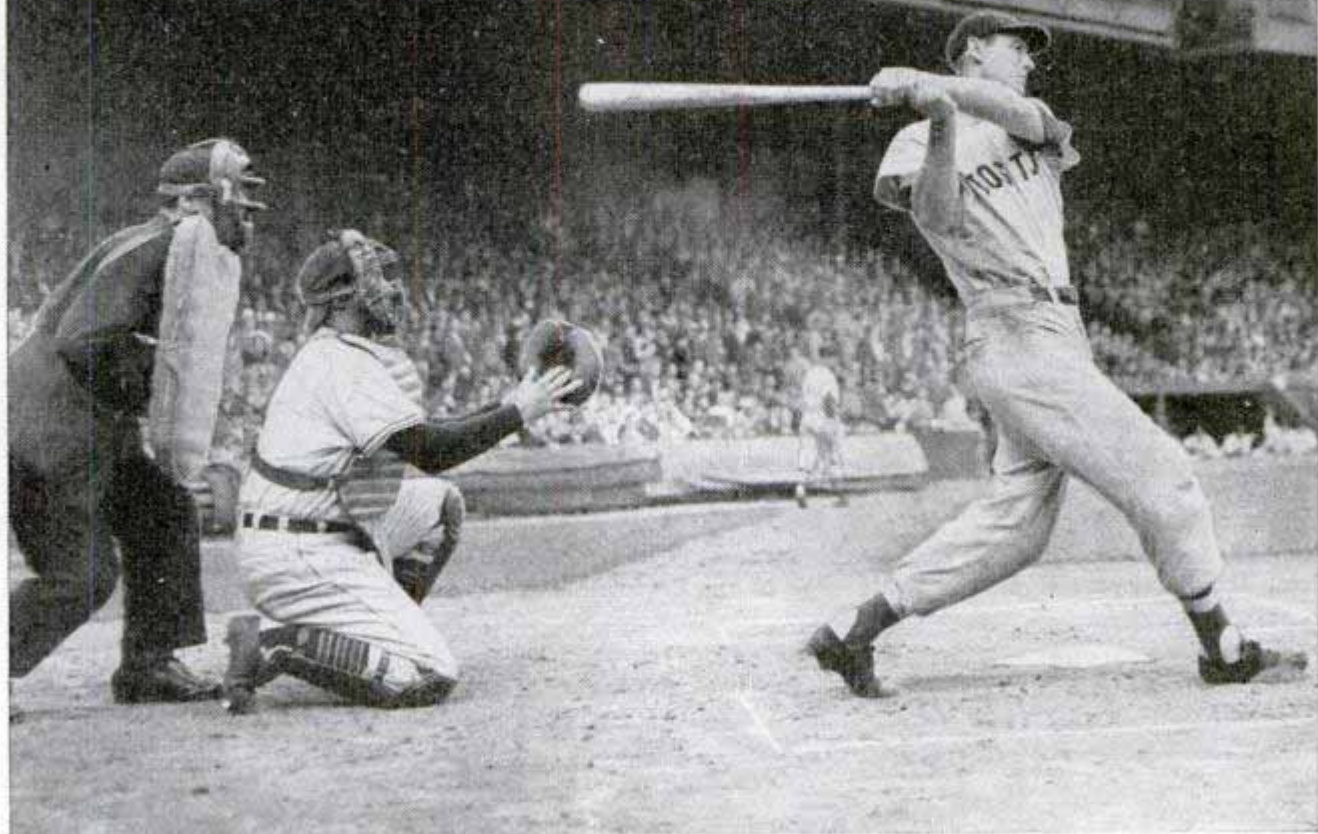


Battery-Operated Lawn Mower

Battery-operated lawn mowers make grass cutting an easy job. One model carries the battery, charger and electric motor in a streamlined housing above the cutting blades. It runs two to three hours before the battery needs recharging. This is done by plugging a cord into a 110-volt outlet. Both the cutting reel and the wheels are power-driven. Two controls in the handle simplify the operation. One starts and stops the mower while the other disengages the wheels to move around trees and obstructions.

There are 411 separate lights on the double-decked Boeing Stratocruiser and 82 are warning or indicator lights, all in the cockpit.

The MECHANICS of BATTING



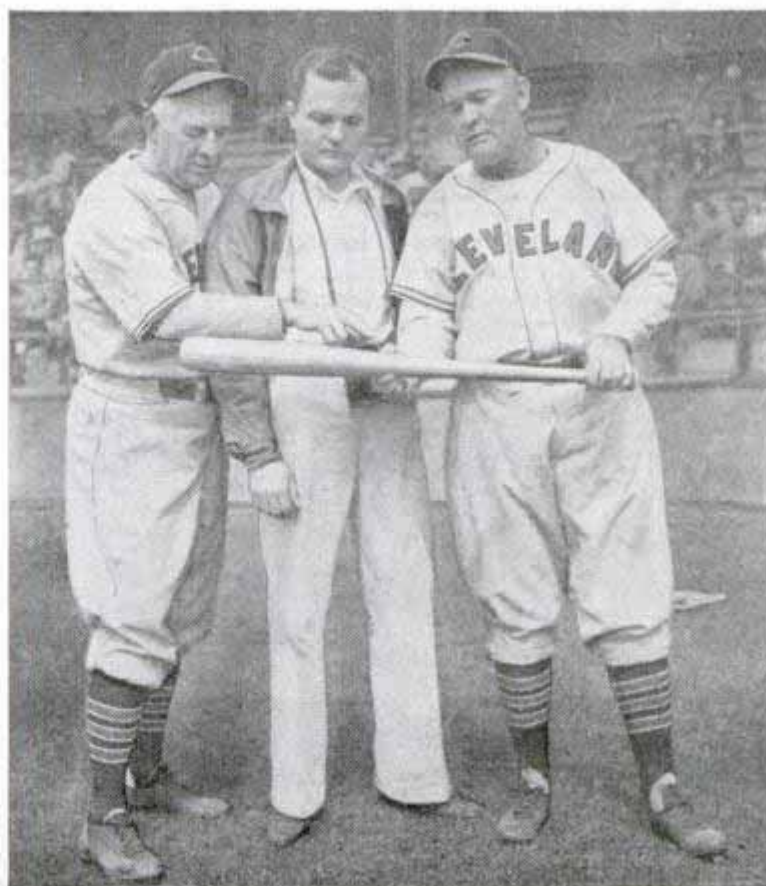
By
Aubrey O. Cookman, Jr.

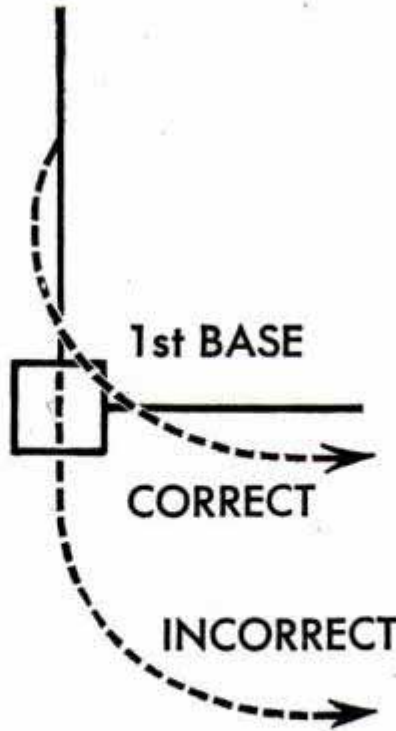
WANT to be a good hitter? Then keep that bat off your shoulder and stop waggling it as you await the pitch.

Rogers Hornsby, baseball's foremost batting coach, says those are the two most common faults of rookies, and he's worked with thousands during his 33 years in the game. This spring he was given the special assignment of injecting long-sought hitting skill into the Cleveland Indians.

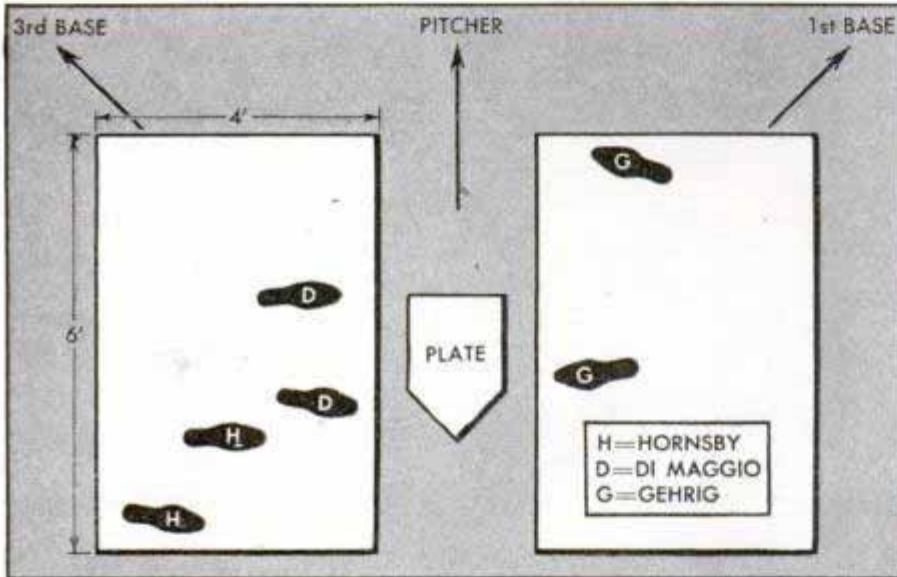
Few are better qualified to teach the subject. Called by many the most dangerous right-hand batter of all time, "the Rajah" led the National League for six straight years, with a .396 average for that time. In one season, 1924, he finished with a .424 mark that still stands as the highest in modern baseball. During his active big league years he rapped out more than 300 home runs and managed the St. Louis Cardinals to their first world's title. He has been elected to baseball's official Hall of Fame at Cooperstown, N. Y.

Wham! Power and good form in action as Ted Williams smashes a long one. Boston's "Splendid Splinter" may break Ruth's record. Below, two baseball immortals, Tris Speaker at left and Rogers Hornsby, right, give the author tips on holding bat for bunting

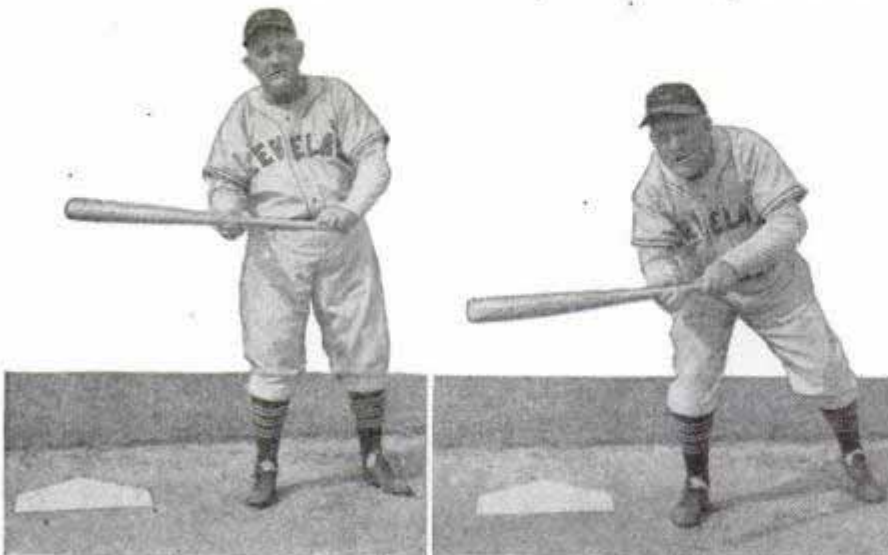




Manager Lou Boudreau shows the correct (left) and incorrect (right) ways to come into first on a hit to outfield. It is important to hit the inside edge of the bag with the left foot in making the pivot for second



Indicating there's a wide choice, here's how some of the stars stood at the plate. Below, "the Rajah" takes positions for sacrifice bunt (left) and offensive bunt (right). Hold bat loosely to deaden impact with ball



Hornsby says that most young ball players lose precious seconds, that mean the difference between hits and outs, simply by not being ready to hit. With pitchers like Bobby Feller firing the ball at you 100 miles an hour from a little more than 60 feet away, there's no time for hesitation or waste motion. There's just a split second to decide what to do, and do it!

He first teaches his charges to take a comfortable stance in the box. Surprisingly, Hornsby insists there's no "correct place" to stand within that area, four feet wide and six feet long. He just makes sure his pupils are relaxed—but ready. The stance's only purpose is to get the batter in his best natural position for the pitch, and solutions to that vary with individuals. What's perfect for a long, lean player might be awkward and uncomfortable for a squatty teammate.

Some star batsmen, imitating the late Lou Gehrig's style, crowd well forward in the box; others, in the manner of Tris

Speaker and Joe Di Maggio, straddle the midway mark, about opposite the plate. Hornsby planted himself at the farthest rear corner of the box. But all meet the ball squarely when it gets up to the plate, which is the most important thing. Hornsby doesn't recommend his own stance for others, only urging that they find one that's natural and comfortable, even if it means much experimenting.

Although favoring an erect waiting position in the box, the Rajah allows for personal preference here, too. Some very effective lead-off men, like Eddie Stanky of the Brooklyn Dodgers, get good results from a crouched stance. Some stand leaning forward slightly, and one long-time major leaguer, George Burns of Cleveland, kept both feet close together.

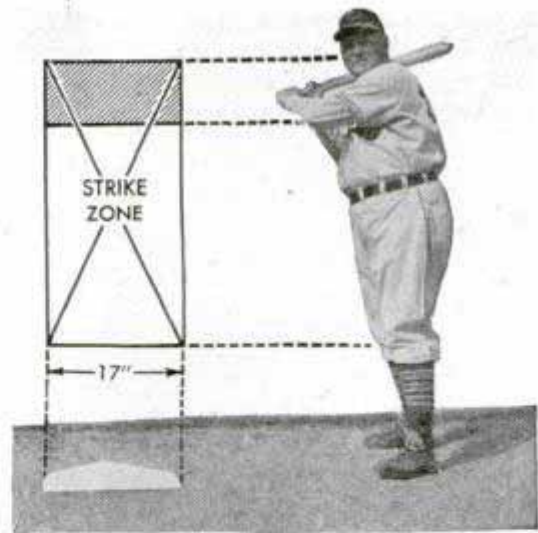
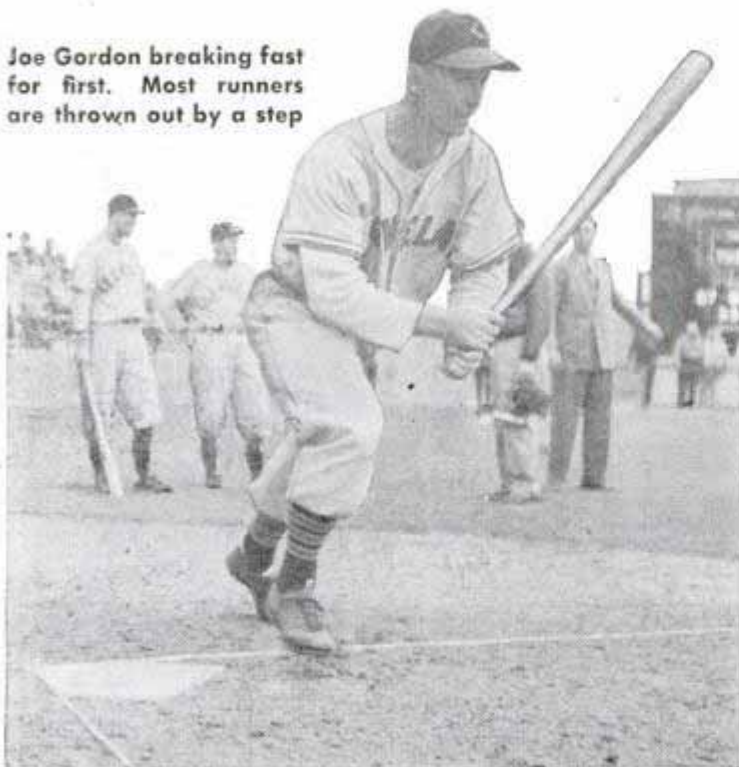
But before you get up to the plate, remember in selecting a bat to get one that feels free and easy, one that can be swung around easily on an inside fast ball. Don't pick a club that drags you. While most big leaguers use a stick around 34 or 35 inches long and weighing about an ounce an inch, there's no agreed best size.

Hillerich & Bradsby, batmakers for most of the game's stars, get requests that run from 33 ounces for Stan Musial to 36 ounces and over for Dixie Walker, Johnny Mize and Joe Di Maggio. Weight alone doesn't push the ball over the fence. Hard hitters like Hank Greenberg and Ted Williams use models weighing only 34 ounces, and Hank's isn't much larger than a softball bat in size.

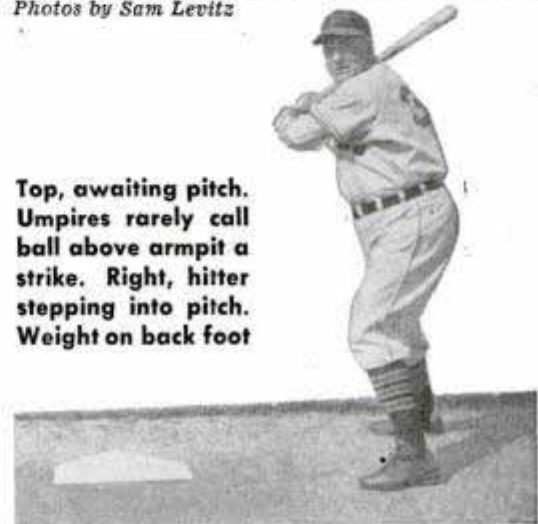
Early in Babe Ruth's career he toted a tremendous 54-ounce bludgeon, but in later years dropped to 46 ounces and less. Another slugger of his era, Ken Williams of the Browns, was also in the 54-ounce class, and Hornsby picked his between 36 and 42 ounces. Many stars swing bats as light as 32 ounces.

Al Simmons is generally credited with wielding the longest bat, a 38-incher; and "Wee Willie"

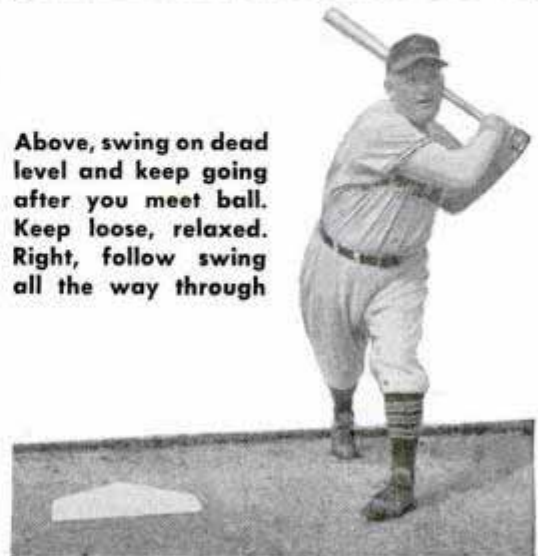
Joe Gordon breaking fast for first. Most runners are thrown out by a step



Photos by Sam Levitz



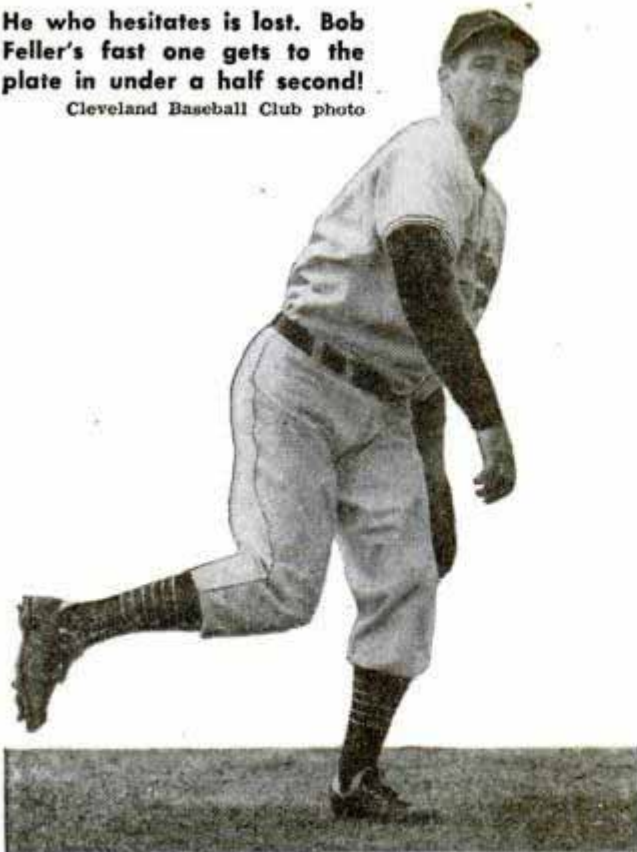
Top, awaiting pitch. Umpires rarely call ball above armpit a strike. Right, hitter stepping into pitch. Weight on back foot



Above, swing on dead level and keep going after you meet ball. Keep loose, relaxed. Right, follow swing all the way through

He who hesitates is lost. Bob Feller's fast one gets to the plate in under a half second!

Cleveland Baseball Club photo



Keeler, famed place hitter, the shortest, 30½ inches.

Incidentally, manufacturers say expert batters have the least trouble with breakage. They don't catch the ball way out on the end, against the grain or up on the handle, like less proficient players who go for the "bad ones."

Once you take that comfortable stance and the pitcher moves up on the rubber, get the bat well back and away from your

shoulder. And keep elbows and arms away from the body. If they're down close to you it's an added time-wasting motion to shove them away before starting the swing forward. The same advice applies to the fault of having the bat rest on your shoulder, then jerked up and back in those last split seconds as the ball whirls to the plate.

Hornsby has spent countless hours ironing out nervous, long-practiced habits of waving the bat back and forth as the pitcher gets set to throw. To the spectator it may seem a gesture of defiance toward the pitcher, but it is usually a tip-off that the batter is overly tense, and it's always ineffectual. Once the bat is back, hold it there until it is swept forward at the ball.

Don't grip that bat too tightly; just make sure it's under control for the swing. Squeezing the handle tightens the forearm muscles and spoils the rhythm of the swing. And while you're waiting for the pitch, remember the strike zone the man with the ball is shooting for. Although it is the 17-inch width of the plate, from the knees to the shoulders, Hornsby and many others claim umpires rarely call strikes on pitches above the armpits.

Watch the ball from the moment it leaves the pitcher's hand and swing at any good one. Don't wait out your favorite pitch; if your opponent is smart it'll never come. And don't attempt to outguess the pitcher, anticipating what he'll throw and getting set for that particular pitch. The odds are all in his favor in that kind of a guessing contest and four out of five times you'll be off balance for the ball that does come.

Hornsby demonstrates position of hands and grip on bat at three stages of swing. Inset 2 is just after impact with ball, moving into follow-through. Don't hold the bat too tightly, he cautions



1



2



3



It doesn't pay to be a first-ball hitter at all times; wait it out until you get one in the strike zone. If the pitcher knows you always swing at the first ball he'll be certain to serve up a bad one. Occasionally, of course, it's good strategy to offer at the first pitch, but not as a general practice.

Now when you stride forward into the pitch remember that the rear leg holds the full weight and the front one is only a pivoting guide. The power is going to come from the balance you get on that rear leg, and the full weight of your body moving forward on it.

Generally a stride of about six inches or less is enough, but that'll vary with the batter's type of build and his timing. Some take practically no step and a few remain flat-footed throughout. One of the latter type, Joe Sewell of the Cleveland Indians, went through several seasons with just a couple of strike-outs each year. The flat-footed stance apparently gave him a needed extra fraction of a second to distinguish between strikes and balls that a "strider" loses by moving in earlier to meet the ball. Although a really great batter, Mel Ott of the Giants is noted for the odd manner in which he lifts his front leg high in the air in striding forward, instead of taking a low step in the pitcher's direction.

Al Simmons is a good illustration of the front leg's minor importance. A notorious "foot in the bucket" offender, pulling his front leg to the side instead of forward as the pitch came in, the Athletics' star was a leading American League slugger for years. Disobedience of a general practice never bothered his fat batting average.

In swinging, move the bat straight through on the same long level plane you plan to meet the ball, neither uppercutting nor chopping, and follow all the way through. Don't press or strain—it'll ruin your timing. Swinging too hard is just a form of bad timing, not a distance getter. And check carefully to eliminate any fancy "hitches" that prevent your swing from being straight and level.

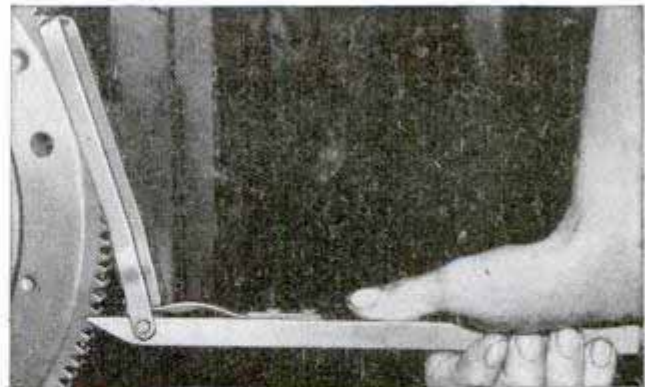
Try meeting the ball at the top of the swing, putting into the impact the wrist snap that produces extra bases. Until then the bat is angled backward from your hands and the snap pulls it out quickly to a perpendicular from the body. It's the rhythmic action of strong wrists, not brawn, that gives a star like Williams added power.

See if you can direct your hit according to where the ball comes into the strike zone. If you're a right-hander and it's outside, a curve, fast ball or change of pace, aim for right or right center. When it's inside, shoot for left field. When one comes down the middle, use the pitcher as a target

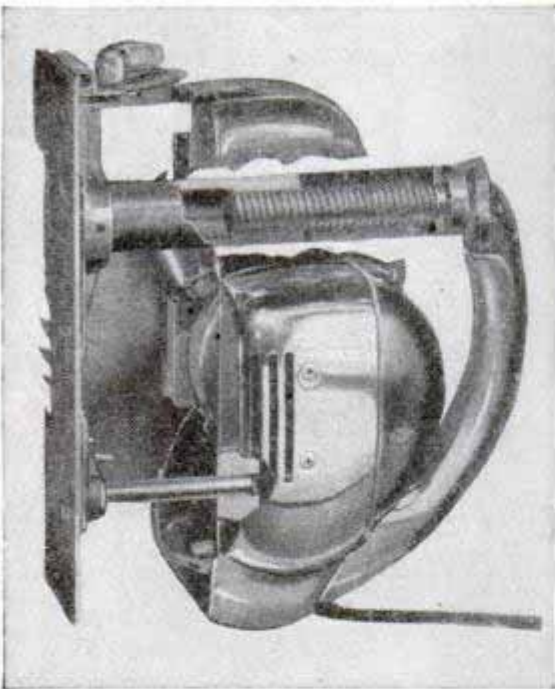
(Continued to page 268)



Wire Recorder Home recordings are made on stainless steel wire with a new unit combining a wire recorder, radio and phonograph. Each 3½-inch spool of wire records a program lasting one hour. Radio programs, "albums" of children's voices and copies of conventional disk records can be recorded. Recordings no longer desired can be wiped off the wire by a system of electrical erasure, making it possible to use the same wire several times. The combination also has a turntable for playing disk records.



Flywheel Tool Skinned knuckles or frayed tempers are avoided on engine repair jobs with a handy flywheel turning tool. The handle of the tool is long enough to give leverage so precise adjustments of flywheel and crankshaft can be made. Once in place, spring tension holds it, leaving the mechanic's hands free for other work. It can be used on any make of car, truck or tractor engine.



Portable Electric Saw Elevating and pointing mechanisms used in machine guns have been adapted for regulating the depth of cut made by a portable electric saw. The triple-lead thread used in the saw is similar in principle to the gun mechanism. It provides rapid, positive depth control. To make a depth adjustment, a knob is turned, causing a sleeve to move the relative distance of three thread spaces.

Pencil-Size Microscope

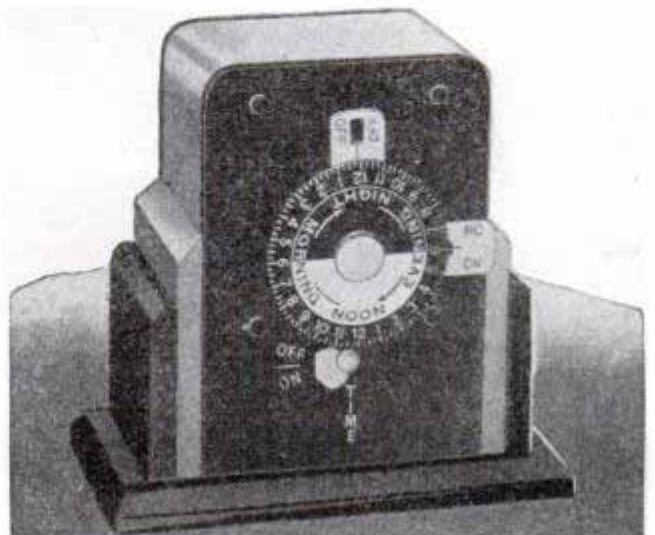


Grains of salt examined through a tubular microscope are magnified 25 times, appearing almost like pebbles

Pencil-size microscopes with 25-power magnification have been developed for inspection work and as an aid to students of chemistry and other sciences. To focus the instrument, the user holds the bottom section while rotating the upper part. In viewing tiny objects, the slanted cutoff at the bottom is faced toward a good source of light to provide maximum illumination.

Portable Time Control Unit

Radios, coffee brewers, roasters and lights are automatically turned on and off at predetermined times by a portable time control unit. One electric outlet of the unit is plugged into a wall socket and a second outlet is plugged into the appliance. Then the "on" and "off" settings are made. Bed-side radios can be set to turn off at midnight—in case the listener falls asleep—and to turn on at 7 a.m. to awaken him. When people are away on vacation, they can use the robot for burglar protection by setting it to turn the house lights on at dusk and turn them off at a later hour. On hot summer nights, fans can be attached to the time control unit and regulated to turn off later.





SHOOT FROM THE SIDELINES



Steeplechase's swift lateral action calls for highest shutter speeds. Below, elevation helps if you want a shot showing the field

By Richard W. Emery

AT BIG sporting events, amateur photographers have made such determined raids that now the managements and the professionals have drawn up rules and regulations for sideline shooting. To get a good spot for action close-ups, you have to show more credentials than a speckled hound has spots.

And that's a pesky situation, if you happen to be one of the amateurs.

A few years ago, when fast shutters began to appear on cameras priced under the stratosphere, hopeful sports-photo fans poured into the sidelines at big games. They got in, somehow, and they had a field day.

They got in front of the coaches or judges or umpires or referees. They bounced up in front of players. They trespassed upon the field of play. At critical moments they stood to their full height in front of pay customers to shoot pictures, despite wrathful yells. They put the whole photographic fraternity in a bad way with

the management. So the professionals, who have to get back to the office with a picture or else, drew up a truce with the management. All over the country it's the same, now, and you can get the terms from the Press Photographers Association in your home city.

The rules are specific, but they aim at broad targets:

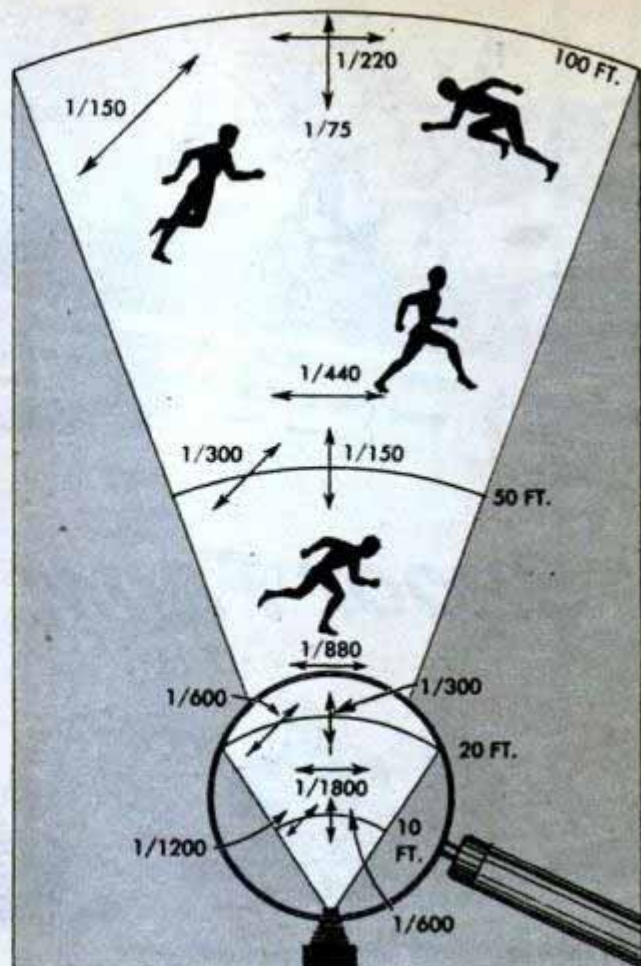
You must have an airtight reason for taking pictures.

You mustn't heckle the players, the officials, the bigwigs or the cash customers.

But all the games aren't big games—and all the good sports pictures aren't close-ups. There are pictures—good ones!—to be made from the bleachers. You can pick your spot at many a lesser game, fight or tournament, close enough to get pictorial action rather than record shots of plays.

Many of the best action pictures of individual players are shot by the news photographers not in the touchy moments of actual play, but at practice games or warm-ups. When you can get rid of guesswork and take ex-





Even the fastest shutter in ordinary use won't stop a golf club. Based on minimum shutter speeds for action with five-inch lens, the diagram above shows that halving the distance to the subject requires doubling the shutter speed. Action at 45-degree angle to the camera can be shot at half the speed of broadsides at the same angle

tra care with focusing, composing the picture and shooting at the best moment, you gain much in pictorial quality, sharpness and clearness. Those important things often are sacrificed to news interest when you shoot actual play.

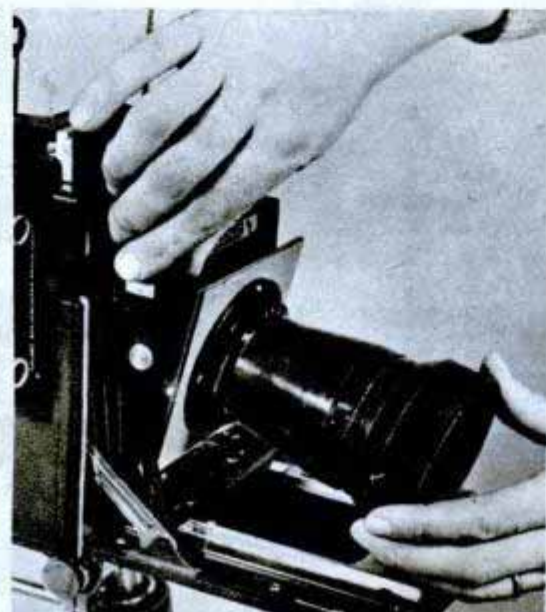
Knowing and liking the game helps you to get good pictures, whether you're shooting football or baseball or any other sport. It's not luck alone that puts you within range of where action will happen; it's

the ability to anticipate what may happen.

If you're going to try for good sports pictures, study up on the game itself, study the pictures of it in newspapers and sports magazines, and look for new ideas and new angles. That isn't the approach of a beginner, but rather of a professional. Even seasoned and expert sports photographers keep watch on what the other guy is doing.

Sports pictures include such a wide range of subject matter and photographic limita-

To put telephoto lens on Speed Graphic first remove the lens board, left, then place mounted lens in camera and lock it in position, center. The next step is to mask off the view finder, right, to fit the smaller field





Try for shots like this one at scrimmage. Shoot from low angle and use all the shutter speed you can muster

tions that no one set of rules would hold for all sports photos. Here are several suggestions from Hal Jensen, California sports photographer, winner of many state and national press sports-photo honors:

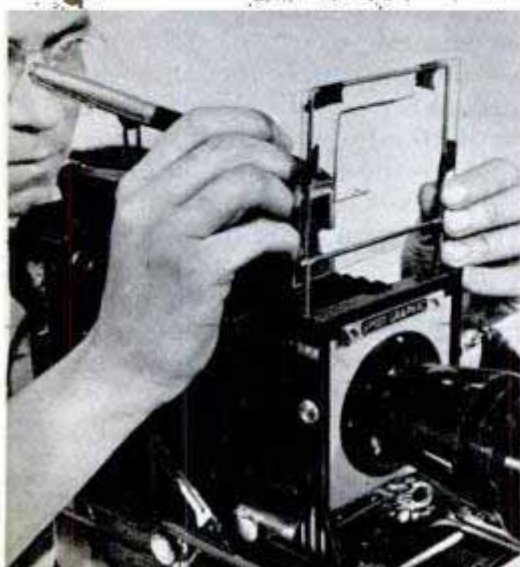
1. Shoot with the sun to your advantage. You'll see cameras shooting the other way, into the sun, but pictures shot that way won't stack up against competition from the other side of the field.

2. Set the shutter for the maximum speed you believe necessary to stop action in the sport you are photographing. Then let the diaphragm determine the amount of

light necessary for proper exposure. The reasoning here is that the speed of action in the sport won't change, but the light will; by opening the diaphragm you lose depth of field but keep sharpness of rapidly moving subject matter within the shallower depth of field.

3. Where your shutter speed is limited, pan with the action. Pick up the subject and follow it with the camera, shooting while you're still panning. If you time your swing with the subject, you can stop fast lateral action with half the shutter speed otherwise necessary.

Left, inking boundaries of telephoto area so smaller rectangle frames field, as shown on ground glass. Margins are masked off as indicated in center photo. The proper way to hold camera to avoid movement is shown at right





Photos by
Hal Jensen

4. Be sure that action comes within a reasonable focus range for your camera before shooting. A picture of distant action lacks punch. If you enlarge the picture tremendously and crop it down to the action, the picture loses technical quality—a hard thing to get in action sports pictures even under favorable conditions.

(For a Speed Graphic with five-inch lens, Jensen sets that "reasonable range" at 50 feet or less. When he covers football he carries two cameras. One is a Graphic with five-inch lens. The other is a Graflex with 14½-inch telephoto.)

5. Before you try for pictures at a major sports event, find out the management's rules and stick to them. Operators of sports arenas know that they can get publicity through good amateur photographs. Your chances for good pictures are better when you go with the management rather than against it.

6. Remember that development of the exposed film is very important and that it can be controlled. If you know that your negatives should have extra-long development to improve their contrast you can make the best of what you brought back. And, knowing that you will be able to develop your negatives fully, you can hang on to your high shutter speed to the bitter end of the fourth quarter—maybe!

If you shoot roll film, don't start off to the game with a half-shot roll in the camera. Suppose the pictures already shot were made with excellent lighting and you want to save them? Those negatives should have no more than normal development.

What kind of camera should you have? There are almost as many answers as there are sports photographers. A logical way to decide is to work back from the particular game or sport you want to shoot. Choose a camera you can use at the place you can get into. If you'll be squeezed into tight quarters with a crowd around you, a fist-sized 35-mm. may be the answer. If you'll have lots of elbow room and elevation, maybe you can set up a big camera with a tripod and telephoto rig.

A telephoto is good for diagrammatic shots showing a whole play. High shutter speed is essential. Your depth of field with a telephoto is very shallow and width of field is greatly reduced. You can mask down the view finder of your camera to match the reduced field of the telephoto. With a reflex-type camera you see on the ground glass what the telephoto sees.

Because the shallow depth of field of a telephoto lens makes quick focusing difficult and limits sharpness to a small area, a short lens is better for working on close action. The shorter the lens, the wider the field. And short lenses have the advantage of giving a greater depth of field. Your picture has a fighting chance to be sharp even if you are a bit sloppy in your focusing.

If your camera has a top shutter speed of only 1/200 or so, don't let that discourage you from tackling action pictures. The boys with 1/1000 are sitting pretty—if they can get enough light to use that 1/1000. You



Because the bases "stay put," baseball gives sideline shooters a chance to focus for action at a given spot

can do good work at much slower shutter speed if you watch for "peaks of action" where, for a fleeting moment, violent action hesitates. You can find those peaks of action in every sport.

You also can cut the necessity for high shutter speed by placing yourself where action will take a sharp angle toward the

camera, or away from the camera, instead of crossing the camera field broadside. Panning with action helps, at sacrifice of background—and often the background adds little or nothing to pictorial effect.

If it comforts you to know that even the $\frac{1}{1000}$ boys can't stop everything, consider the fact that a broadside view of a golf club



Put a lens shade on your camera, but check carefully to see that it doesn't cut into the camera's field



Use a light meter. For fast sports action you want as high shutter speed as light conditions will permit



Hold camera firmly against face with both hands and squeeze, don't jerk, trigger to avoid movement. Below, for long shots of action on known area use a tripod



swung by a hard-swinging pro blurs six inches at the head of the club—even at $\frac{1}{1000}$. If you want to freeze every part of a fast moving sports subject, try stroboscopic lighting. Some of the new portable stroboscopic rigs are being tried on action sports close-ups.

A few years ago, stroboscopic light was a laboratory exhibit, big and heavy and expensive. Portable rigs are on the market now at prices comparable to the price of a good camera or a good telescopic lens.

Here are some suggestions on getting sports pictures:

Choose a camera with high-speed shutter and fast lens.

Use fast film.

Put a lens shade on the camera.

If you can't use a tripod where you will be shooting, brace the camera against movement.

Shoot from a low angle to dramatize close-up action.

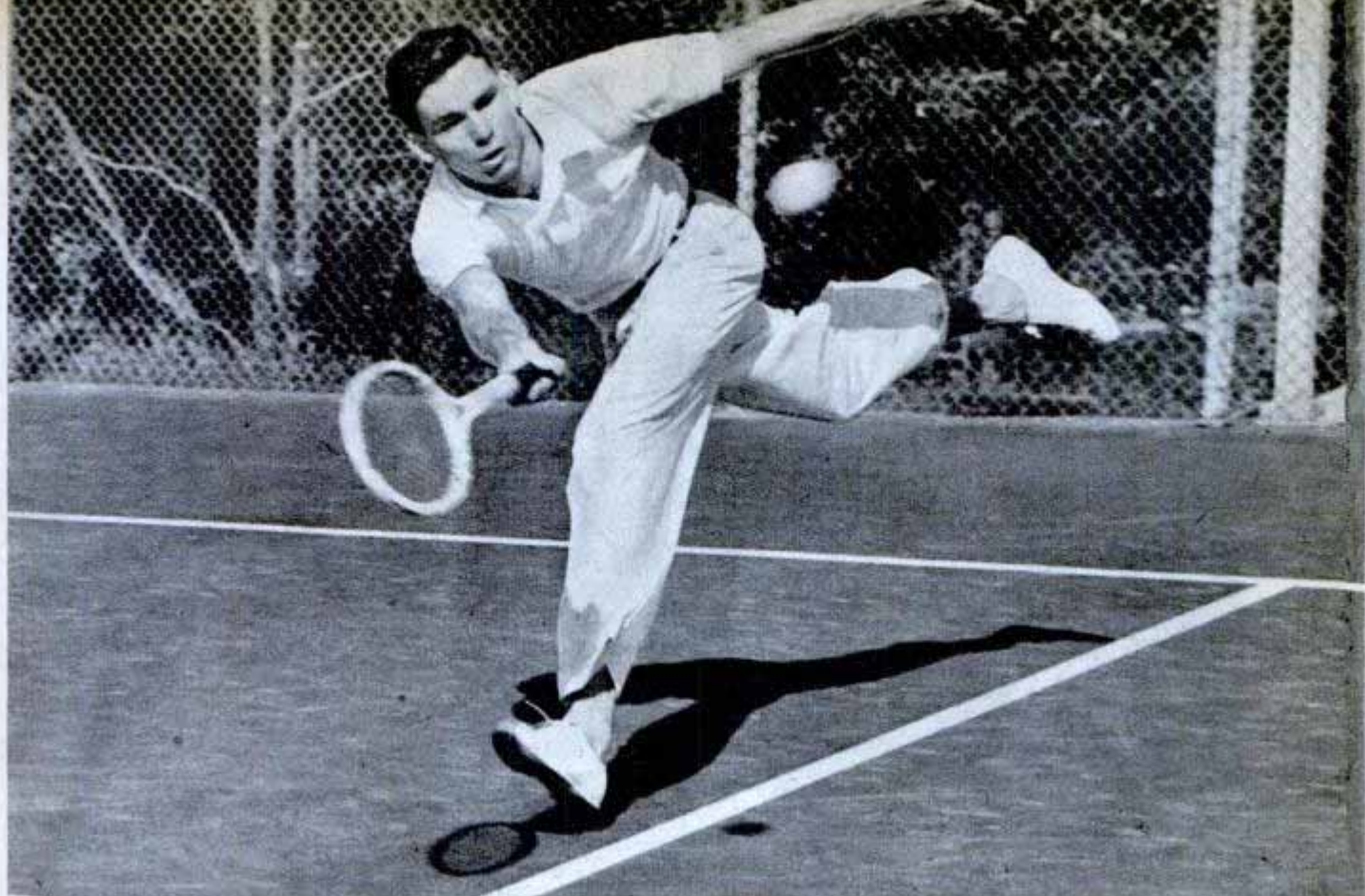
When the light goes bad, sacrifice depth of field before you reduce shutter speed; open up, don't slow down.

If you shoot roll films, try to standardize exposure on each roll so that you can develop for known light conditions.

Unless you're a human photoelectric cell, get a light meter and use it.

Don't be an outlaw and get the other photographers in bad—find out the rules of the field or arena, abide by them and do the best you can.





Tennis is a good subject if you focus where action is likely to happen, and then wait. Even 1/1000 probably won't freeze all the motion. Pools offer another natural but remember that splashes move faster than swimmers





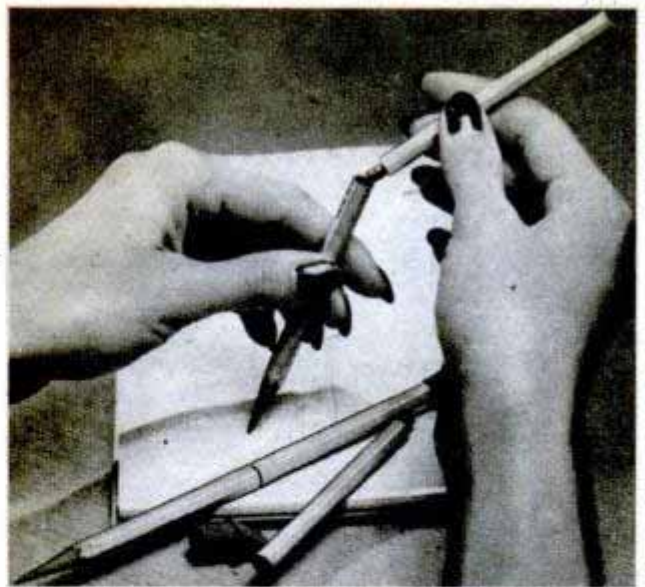
Copyright Central Press Photo, Ltd.

Transmitter-Receiver Fits Coat Pocket To Broadcast Over 1/2-Mile Radius

Small enough to fit into a coat pocket, a miniature radio developed in England transmits and receives messages over a half-mile radius. The receiver hooks over the ear and the microphone can be concealed beneath the lapel of a coat. In operation the radio receives continuously unless a button is pushed to change the set to transmission. More powerful batteries are proposed to add to the range of the radio. One of the suggested uses is to enable ushers to handle crowds more effectively.

Signs Pop Out of Subway Grilles—Latest Advertising Technique

You may be seeing pretty girls in the subway ventilator grilles in New York City soon. A method of painting designs on the vertical sides of the gratings enables pedestrians to read a sign or see a picture as they approach. By leasing the ventilators as advertising billboards, the city may collect as much as \$4,000,000 a year.



Pencils in Sections Eliminate Stubs

Pencils made in sections eliminate the waste of thrown-away stubs as a new section can be added when necessary. A dowel on one end of each new section fits into a socket on the unused end of the old. The dowel is coated with a glue that holds the two sections together when moistened.

Jar Rings Aid African Courtships

When a South African swain wants to impress a native belle he adorns his wrists and ankles with red and black rubber jar rings. A shortage of brass wire, which the natives formerly twisted into bracelets, caused the costume jewelry switch. During the last year, style-conscious natives used more than 500,000 rubber rings. But American canners need not worry. The U.S. Rubber Company says production will meet both canning and courting demands.





PAINTING WITH PEBBLES

In a New York studio Max Spivak fashions exquisite mosaics from pebbles, glass beads, steel washers, brass screws and bits of colored glass.

He turned to these materials—picked up at seashores and junk piles or bought in hardware stores—when the war cut off his supply of costly mosaic stones from Italy. The results were so satisfactory for unusual wall decorations that he continued to use the “pickup” substitutes.

Spivak draws a design on paper and pastes the colored stones onto the design. Next he transfers the pebbled figure, face down, to a concrete base. Water is used to wash off the paper and paste, leaving the design embedded in the concrete in reverse. When dry, the mosaic is cleaned with kerosene.

The artist uses few tools, mainly his fingers, a stone cutter and a chisel.

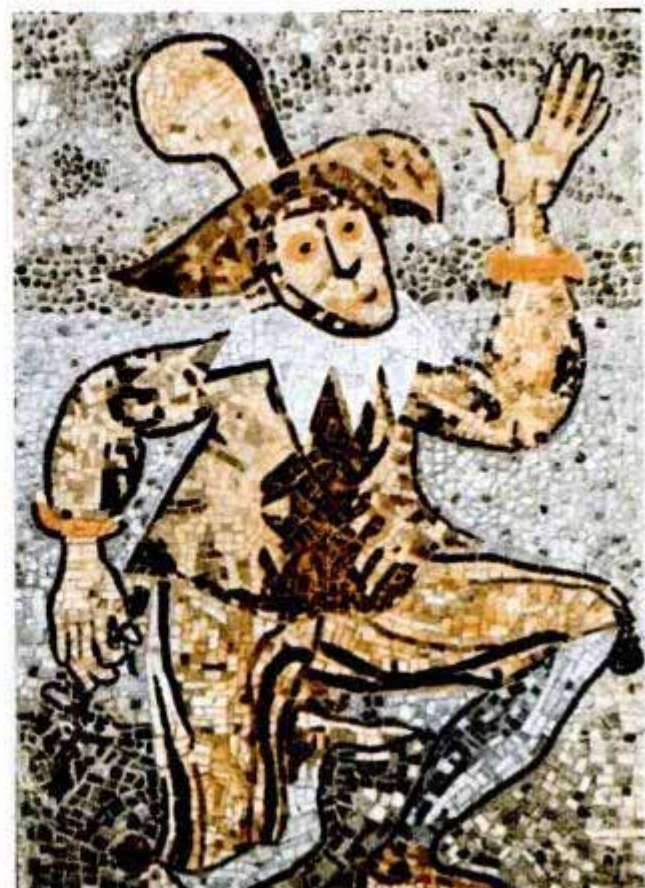
First step in making a pebble mosaic is drawing the design on paper. Spivak draws humorous-looking fish and strange faces and figures. Below, holding small pieces of colored materials with tweezers, he dips them in paste and fills in the outline of his drawing

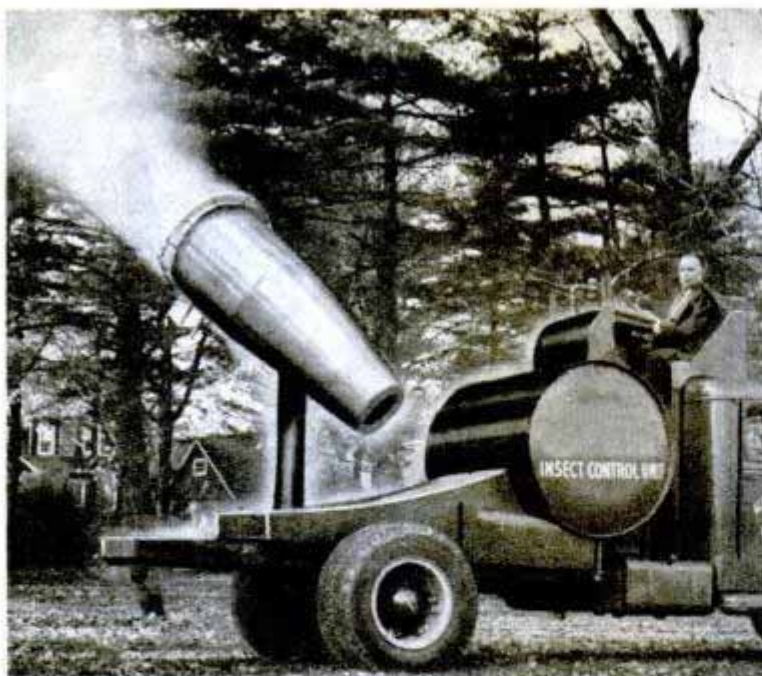


A full-length mosaic figure often requires several thousand tiny pebbles, glass beads, brass screws and steel washers. Spivak finds materials in odd places



Strips of colored glass from a hardware store are placed on a support and broken into desired sizes. Below, cleaning a mosaic embedded in its concrete base



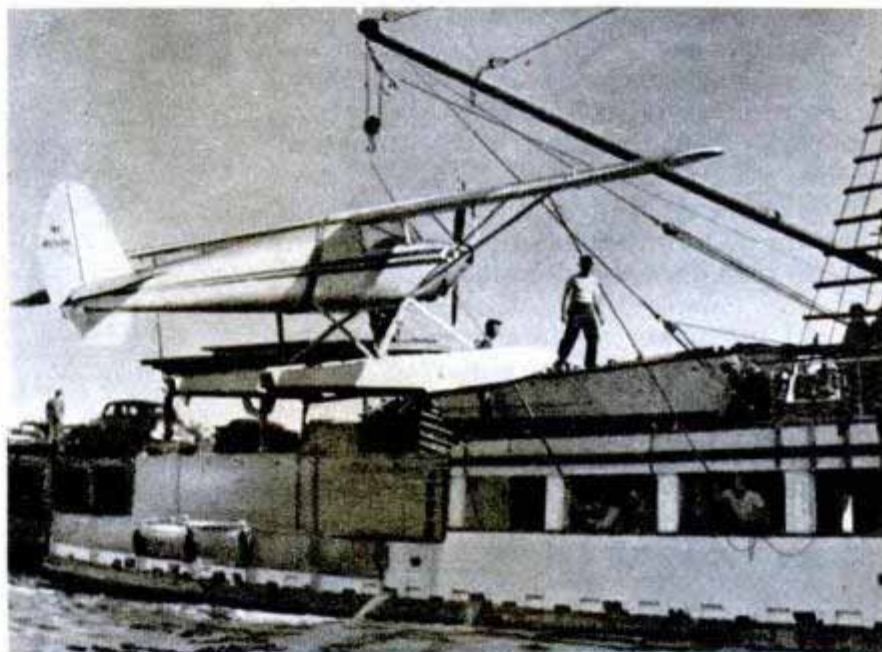


Aircraft Engine Throws Spray To Cover 100-Foot Tree

Insecticide is sprayed quickly over large areas by a truck-mounted insect control unit that is equal in power to airborne spray equipment. The apparatus sprays individual trees or can be operated while moving through tree-lined streets, swamps and parks. A 100-horsepower aircraft engine turns a four-blade propeller that can be aimed in any direction. A large tank holds the spray compound, which is fed through the propeller arc and blown across the area to be treated. The unit can spray a 100-foot tree in less than three minutes, using only three gallons of concentrated insecticide.

Plane Locates Tuna For Fishing Clipper

One Southern California fishing clipper now carries a hydroplane and pilot to spot schools of tuna within a radius of 100 miles. The plane is equipped with two-way radio and carries enough fuel for three hours flying at 120 miles an hour. The clipper's cargo boom lowers and raises the plane to and from the water, and when not in use the craft is lashed securely to the top section of the fishing clipper's bait tank.



Fire-Resistant Cotton Batts Protect Walls of Building

Fire-resistant cotton batting is now in use as building insulation material. Lighter than rock wool, the chemically treated cotton is reported to withstand high temperatures. The processing formula was worked out by cotton goods manufacturers and consultants of the Department of Agriculture in seeking uses for low-grade cotton.

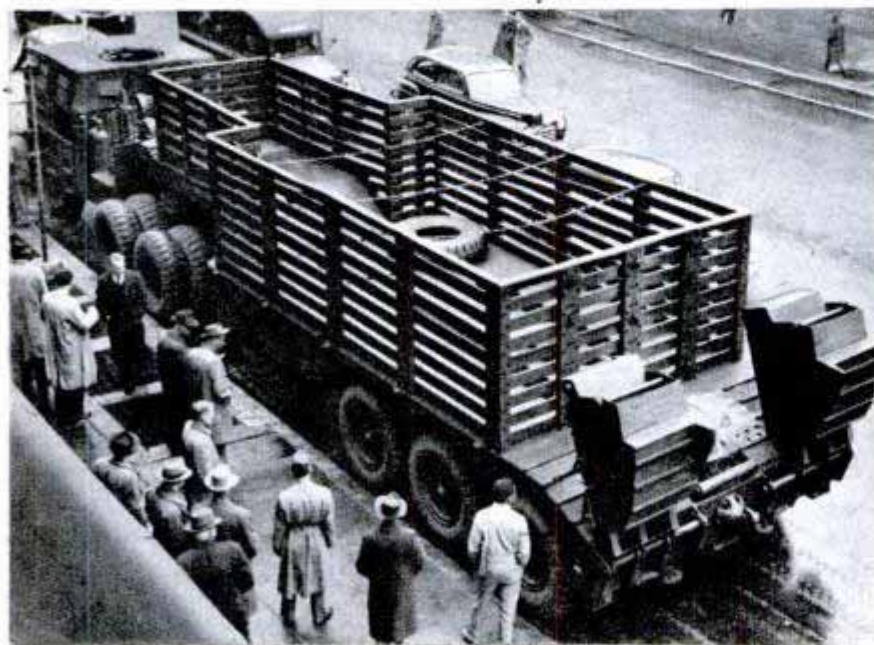
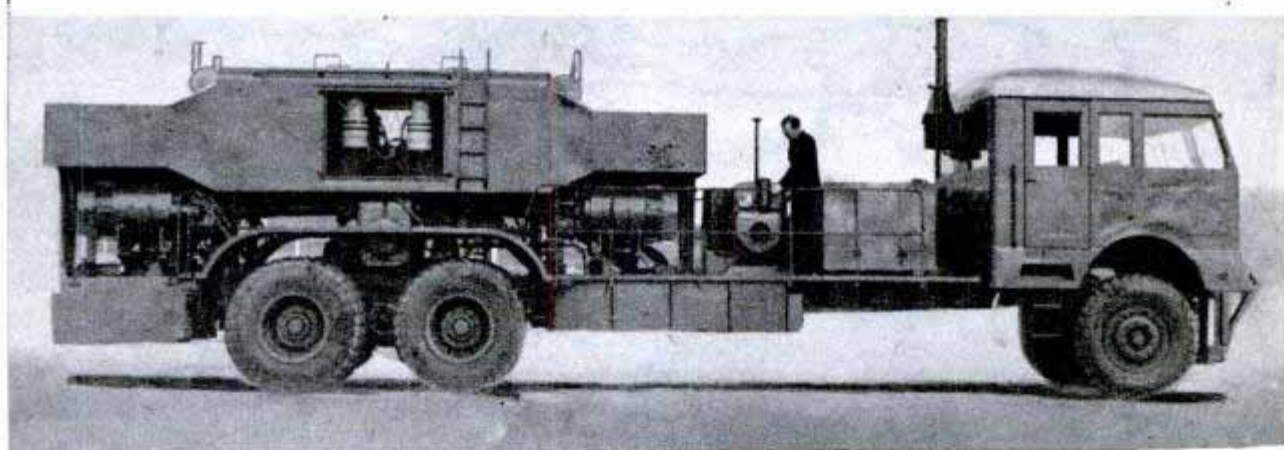
Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

Oxygen Tank for High-Altitude Flyers Will Inflate Five Auto Tires

Portable tanks holding air under pressure permit the inflation of automobile tires on the road. The tanks, originally used as oxygen containers for pilots of high-altitude planes, fit easily into an automobile trunk. They weigh 21 pounds, hold enough air to inflate five auto tires and can be refilled from any service station air line. Garages and service stations find the tanks useful in inflating tires without moving cars from gasoline pumps and for service calls to repair flats. A short hose and a valve are provided with each tank.



Huge Trucks Test the Pulling Power of U. S. Army's Biggest Tanks



Two huge trucks, recently put to work by the Army at Aberdeen Proving Grounds, will test and service the Army's biggest tanks. One, a dynamometer truck, is a combination gasoline-electric vehicle. It is used to test the pulling power and rolling resistance of tanks and heavy artillery pieces. It is 40 feet long, weighs 50 tons and develops 1000 horsepower. The other, said to be the largest ever built, is a 22-wheel tractor-trailer model. It is 50 feet long and can carry a 60-ton tank.



REPORT from ANTARCTICA

By Tom Henry

(Correspondent with the Byrd expedition)

PART II

ON BOARD the USS Mount Olympus (By Navy Radio)—The great continental mass stretching a thousand miles in every direction from the South Pole is a complete blank on all weather maps, yet it is the original homeland of tempests. Northward over the polar plateau to the three oceans, enormous masses of cold wind sweep almost constantly at velocities as great as 150 miles an hour. They largely create the weather of all South America, Africa and Asia below the equator, and this weather, in turn, has great effect on northern weather. What happens at the South Pole today may change Chicago's temperature a month hence. Reliable long-range forecasting with any of the present established methods requires daily reports from a land where it is impossible to maintain observers. One of the major objectives of the Byrd expedition is to find out if there is a way to keep track of South Pole storms from the continent's periphery, where



Weddell seal and pup. At 90 degrees below zero the big, friendly mammals huddle comfortably in sides of deep, inland ice crevasses. Fish is their only food



← Running interference, Coast Guard's USS Northwind cuts safe path through the ice pack. Above, a crab-eater seal that soon became sealburgers and dog food

there are habitable islands. Meanwhile, Weather Bureau observers are seizing the opportunity to study numerous unique atmospheric phenomena during the brief polar summer, such as snowstorms that start from clouds about the level of a man's eyes, showers of ice crystal feathers and visibility in clear weather that makes objects hundreds of miles away seem near.

Antarctica in winter is a continent that is stratosphere high. Its mountain peaks extend thousands of feet into this layer of the earth's atmosphere, which is at least six or seven miles high over most of the United States, and in which temperature no longer declines with altitude but remains constant or increases slightly. In summer the bottom of this stratum remains steadily at about 23,000 feet altitude, where temperature is 60 below zero Fahrenheit. In the next mile of altitude the temperature rises to minus 55. But, with the start of the long southern night, the stratosphere drops down to about 3000 feet altitude, which is less than the average height above sea level of the continent itself. This low stratosphere constitutes one of the major problems of antarctic aviation. Most problems

of high-altitude flying in middle latitudes are encountered here near the surface.

The air has a curious exhilarating effect which may be partly psychological but which has some physical basis. It is the purest air in the world and has a composition of gases slightly different from atmosphere elsewhere, samples have shown. Analysis of air collected on previous expeditions indicates it is about two percent richer in nitrogen, probably because of the absence of plant life. It is also slightly richer in oxygen and the rare gas argon. The greatest difference is in the water vapor, which constitutes almost three percent of air at the equator and less than one percent here. The atmosphere here also has a slightly greater carbon dioxide content, an unexplained paradox because of the scarcity of living organisms producing this gas. This expedition has bottled air directly from the South Pole for analysis at the Bureau of Standards in Washington. The expedition will carry back special vacuum bottles filled with wind blown northward across at least a thousand miles of white desert at 6000 feet altitude. The pole is the remotest spot on earth from any possibility of atmospheric contamination with dust pollen, grains, germs or other microorganisms. Antarctica is the healthiest place on earth—as far as contagious or infectious diseases are concerned.

One of the most curious atmospheric effects found here is the "inversion layer."



Helicopter based on the USS Northwind returns from an observation flight to scout new routes through ice pack

Daily air soundings near the Bay of Whales show a fairly constant layer about 300 feet thick and 2000 feet above the earth in which the temperature is 8 to 10 degrees higher than it is at ground level. One day a sounding showed 18 degrees difference. This same phenomenon is found in the middle latitudes but it is usually much less pronounced there and present only in the early morning. Here it lasts during 24 hours of continuous morning daylight. After this layer is crossed the thermometer declines steadily to 60 degrees below zero at the bottom of the stratosphere.

Weather Bureau representatives brought into the antarctic for the first time special devices to study winds to an altitude of about six miles over the low cloud cover of the continent. Such studies are made by means of balloons dragging a target which can be followed by radar, a method de-

veloped by the Air Forces during the war. They also studied conditions to 12,000 feet by means of radiosondes, which automatically record and report the temperatures and humidity by radio.

Although the antarctic has long been recognized as a world weather factory, the only weather reports ever obtained came spasmodically from expeditions and whaling ships, so no systematic study was possible. Among the experiments this expedition is conducting is the establishment of robot weather observatories to record automatically and transmit observations by radio several times daily. Eventually there may be a chain of these observatories around the continent, as is also planned for the north polar basin where conditions are much easier. The present robots are expected to function for three months.

Weather prediction difficulties previous-

Sea leopard, left, antarctic's most vicious animal, can outrun man over ice fields. Right, surface thermometer



ly were the major handicap to antarctic exploration. Sudden changes in a few hours have meant the difference between life and death, as in the case of the 1912 Scott and Amundsen expeditions, both of which reached the pole the same month. Due to weather difference in a period of a few days the latter group returned without incident and the other band perished.

Curious atmospheric conditions not found elsewhere on earth make Antarctica a land of strange mirages. They are seen almost daily, especially over the ice pack when warm air strata over pools and lanes of open water cause irregularities in the surface of the ice that are projected against the sky as spires, pinnacles, skylines of cities and other equally strong pictures.

Double and triple halos are often seen around the sun. Most striking of the phenomena are prismatic sunrises and sunsets. These appear as high arches with the colors of the spectrum extending from the top of the arch to the horizon in the sky opposite the sun. Solar and lunar halos are produced by reflection and refraction through and from ice crystals. A common phenomenon in the Ross Sea area is a white rainbow caused by the refraction of light by the water particles in fog. Colors differ with the size of droplets; the smaller the drops the lighter the colors and the more violet at the end of the spectrum. Hence fog bows appear as broad bands of shimmering white across blue sky.

Also very striking are iridescent clouds which appear as a deep blue central tract with banded margins of vivid purple, orange and green. There are also dark blue



Inspecting huge pressure ridge broken in cross sections at Bay of Whales

ATMOSPHERIC CONDITIONS AT THE SOUTH POLE

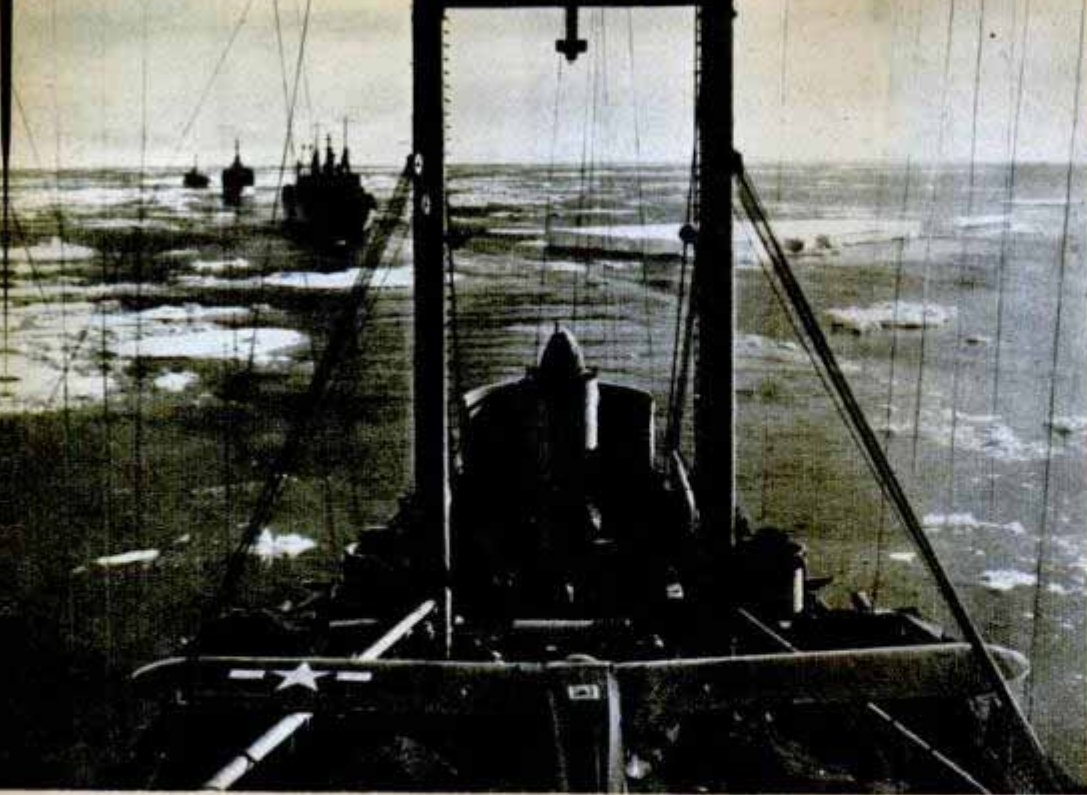
AIR 2% RICHER IN NITROGEN THAN ORDINARY AIR, AND RICHER IN OXYGEN, ARGON AND CARBON DIOXIDE.
1% WATER VAPOR IN ANTARCTIC AIR
3% WATER VAPOR IN AIR AT EQUATOR
NO DUST POLLEN, GRAINS, GERMS OR OTHER MICROORGANISMS

(Temperature rises from 60° below 0° to 55° below 0° first mile up in stratosphere)
LOWEST PART OF STRATOSPHERE IS 23,000 FEET

"INVERSION LAYER"
APPROX. 300 FEET THICK AT 2000 FEET ELEVATION

LOWEST PART OF STRATOSPHERE IS 3000 FEET. TEMPERATURE REMAINS CONSTANT OR INCREASES SLIGHTLY





Task force ships push way through stubborn ice pack off Ross Sea. From left, vessels in order are: Northwind, Merrick, Yancey and the flagship Mt. Olympus

bands projected into the sky, believed to be shadows of mountain peaks against clouds.

Complete radio blackouts are even more common here than in the arctic, supposedly due to the aurora australis, southern counterpart of the northern lights. Among the scientific objectives of the expedition is a thorough study of these blackout phenomena, which become very serious in ground control of planes flying over the continent. Radio, for example, was a complete failure in efforts to locate the crew of a plane which crashed on the ice, although the marooned men retained one set undamaged. The expedition expects to map a circular belt where the disturbances are most likely to occur.

The antarctic continent's edges are the extreme frontier of life on earth. This life

has taken extreme forms and differs radically from anything else on the planet. Here is a combination of Eden and Hades. The bloodthirstiest and gentlest animals live together, apparently without fear. Even the fiercest show no alarm at approach of the strange intruder, man. The southernmost living animal is the vulturelike skua, found within 200 miles of the South Pole. It is called the most voracious of all birds. Scavenger of the antarctic, cannibalistic and attacking mercilessly any weak or maimed creature, nevertheless skuas look and act much like the pigeons who gather about Sunday strollers in an American city park. They will cluster curiously about men on the ice and the flock will not move when disturbed. The fierce marauder has a downy head and the innocent eyes of a newly hatched chick.

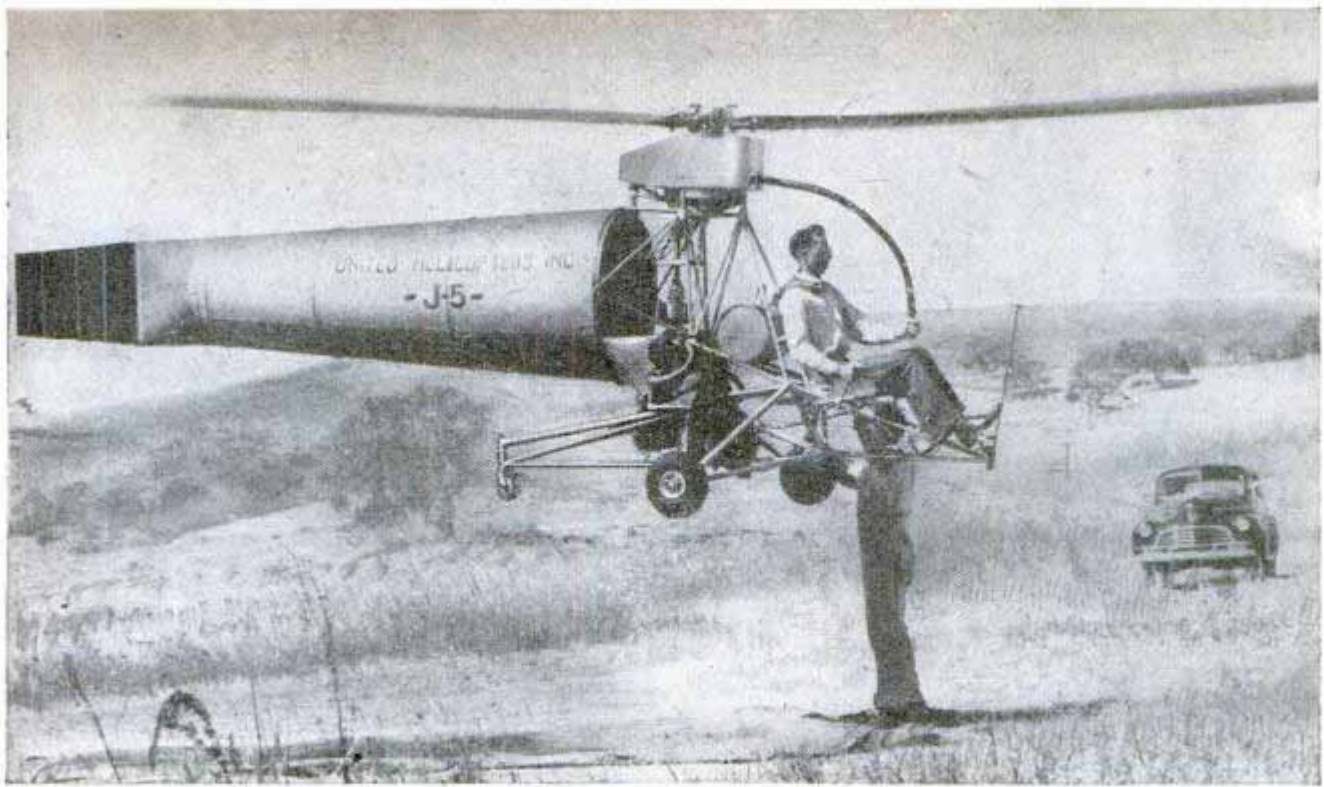
The best known antarctic creatures are the penguins, who display only friendly curiosity without the slightest alarm at human approach. Here in the Bay of Whales an emperor penguin almost four feet high and with comically human appearance tags constantly at the heels of sailors and tries ludicrously to imitate their movements as they play ball on the ice. Near the spot where ships of the central group are at anchor is the largest colony of southernmost mammals—big, friendly, sleepy Weddell seals—who live the year around among grotesquely shaped pressure ridges in the

Emperor penguins during courtship. Giants of family, they are 3½ feet tall



ice. Biologists of the expedition are making observations of their strange ways of life. They live about eight miles from the water's edge in a great ice canyon where there are deep crevasses through which they dive for fish, their only food. When the crevasses freeze over they saw holes through the ice with their long teeth. In winter they actually live under ice, apparently huddled on ledges in sides of crevasses where they remain warm with temperatures

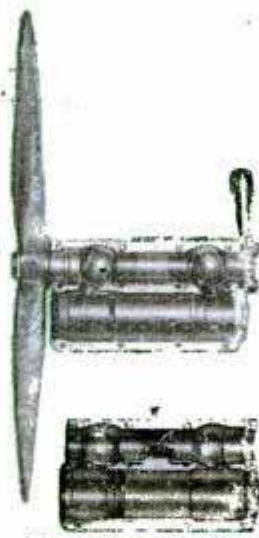
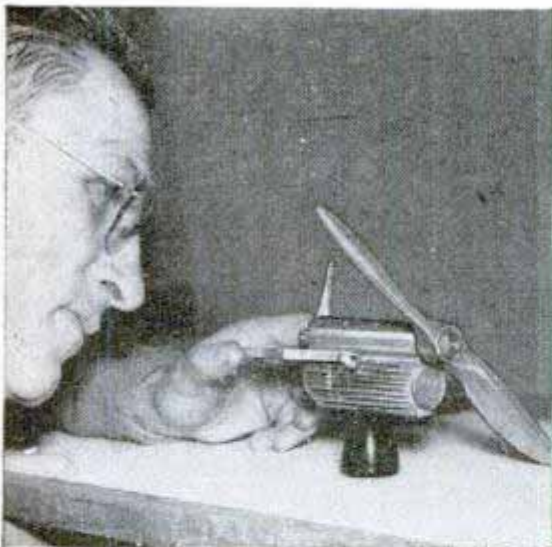
(Continued to page 260)



Rotor torque is counteracted in a new "stovepipe" helicopter by a compressor fan that forces air under high pressure through one side of the fuselage tail. Helicopter designers always have been plagued by a tendency of the helicopter to twist in the air because of the one-way thrust of the rotor. In the new craft the fan, mounted immediately behind the engine and forward of the tail, forces air under pressure

Tail Fan Stabilizes Helicopter

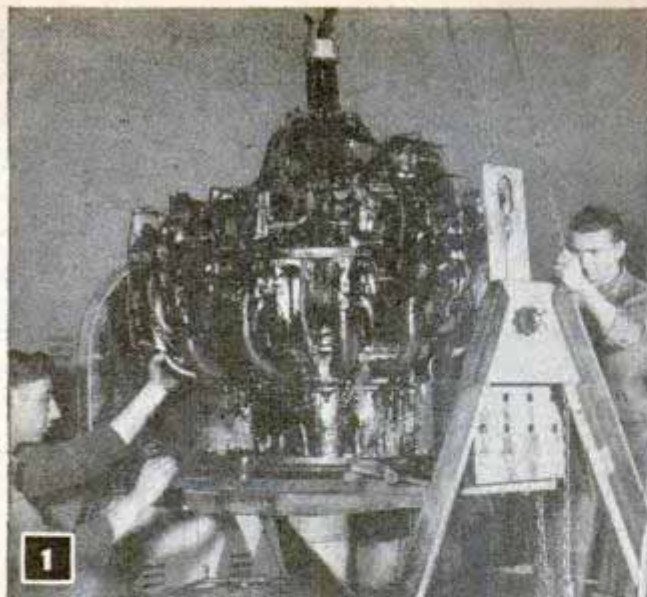
through the fuselage to vanes in the tail, which deflect the air stream to counteract the side thrust of the rotor. Part of the air may be drawn off through an opening on the opposite side of the fuselage to "trim" the helicopter. Before passing through the fuselage the air stream flows over the engine, eliminating the need for a separate cooling fan. The new craft is an experimental model not yet on production lines.



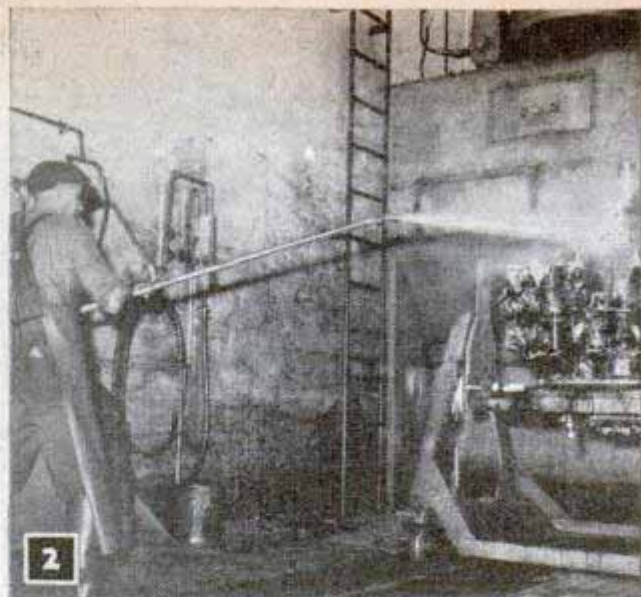
Midget engine for gasoline-powered model planes has a frontal area of only one square inch yet develops one full horsepower at 12,000 r.p.m. The engine has two opposed pistons that slide back and forth inside a horizontal cylinder, transmitting motion through wobble-plate mechanisms to a straight propeller shaft mounted parallel with the cylinder. The engine, weighing 13 ounces, is 5 inches long.

Stain-removing sticks made of waxlike chemicals remove spots from fabrics caused by tea, coffee, ink, grass and other substances. First, the fabric is laid on a clean undercloth and sponged. The first, or acidic, stick is daubed on until no more stain appears on the undercloth. Then the fabric is rinsed and the second, or reducing, stick is applied and the spot disappears.

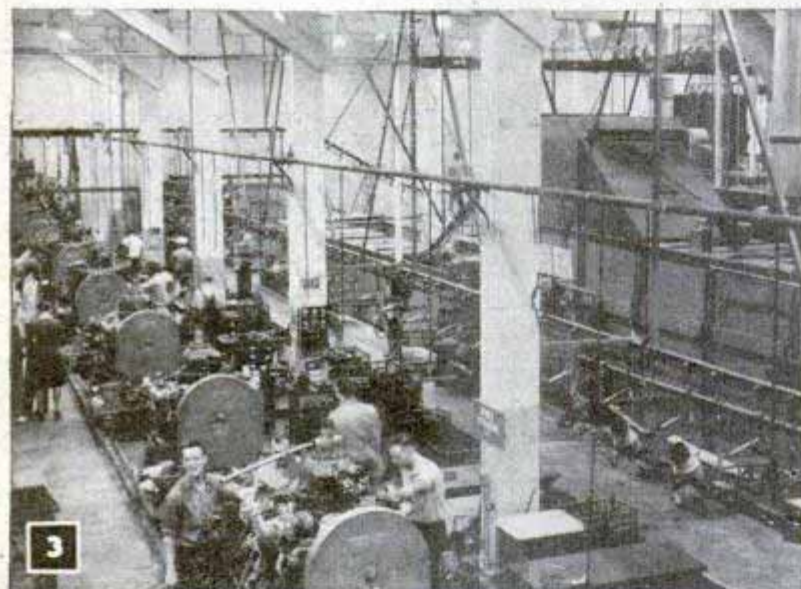
Automatic flight recorder which registers dangerous airplane and pilot tendencies may reduce aircraft crashes. It also makes it possible to determine the cause of an air accident. Electric signaling devices transmit all variations in instrument readings to the recorder. Checking the record gives a picture of the flight. The recorder was developed by General Electric.



1
Installing aircraft engine on wheel-mounted disassembly rack where it will stay until entirely torn down



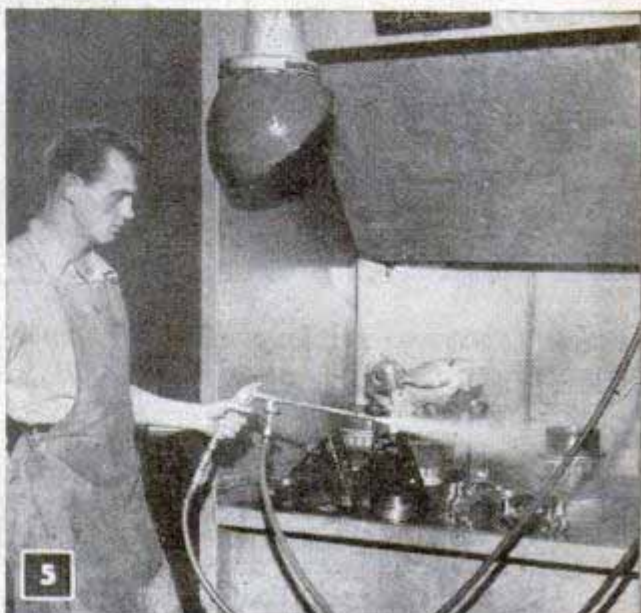
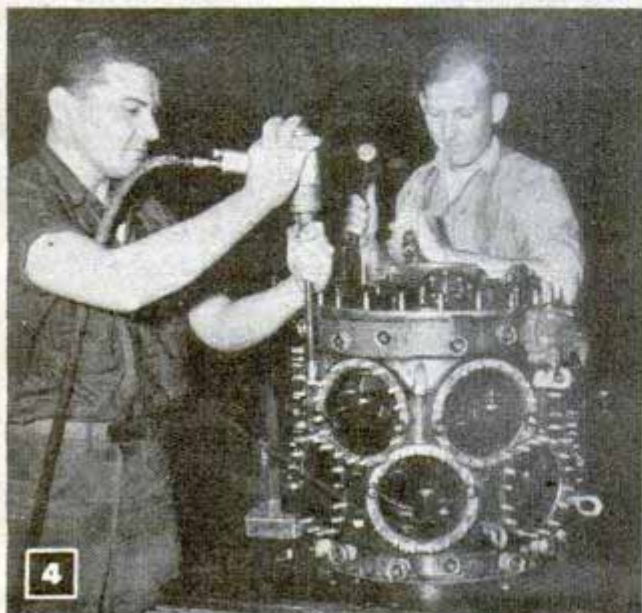
2
Pictures taken for *Popular Mechanics* by George Bankston, Naval Air Station, Alameda, Calif.
High-pressure spray treatment removes coatings of dirt and grease from airplane engines before disassembly



3
View of disassembly section where engines are taken apart. Conveyor baskets carry parts to other shop departments. Below, mechanics tear down power section

**NEW
ENGINES
for
OLD**

A second cleaning often is required to remove heavy preservatives from an engine part before its trouble is diagnosed. A solvent spray is being used here



By James Corcoran

THE Naval Air Station at Alameda, Calif., makes new engines from old. It disassembles, repairs, manufactures and reassembles the engines of seven widely different aircraft ranging from combat planes to four-engined transports.

This is not a casual motor teardown. Every part of the engine is removed, each part inspected, rated for rework or replacement, then 100 percent finish-inspected before reassembly. The aim is to give the pilot engines that are even better than those produced by the original manufacturer.

The bulk of the work in this department is the general overhaul after a maximum number of flight hours. These engines may come to Alameda from overseas, from the planes of carriers resting at Alameda between cruises, or from aircraft based in the Alameda service area. Or they may be engines that have failed in service from cracked cylinders, thrown rods or faulty ignition.

Engines covered with heavy preserva-

Hand-washing other engine parts in a cleaning solvent



7



6

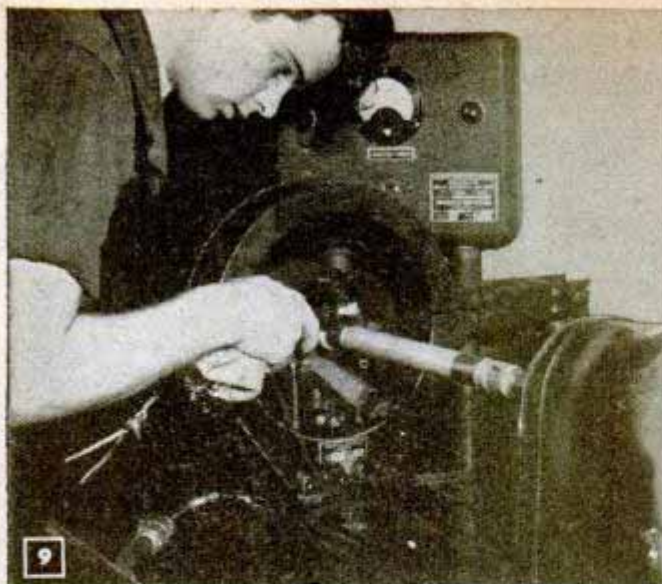
Worker uses a hot air blast method for drying the solvent-cleaned parts

tives or pulled off a plane, dripping grease and dirt, are mounted on four-wheeled work stands that run on rails through the shop. After a thorough high-pressure spray treatment, the cleaned engine passes from

High-speed buffing helps recondition a connecting rod



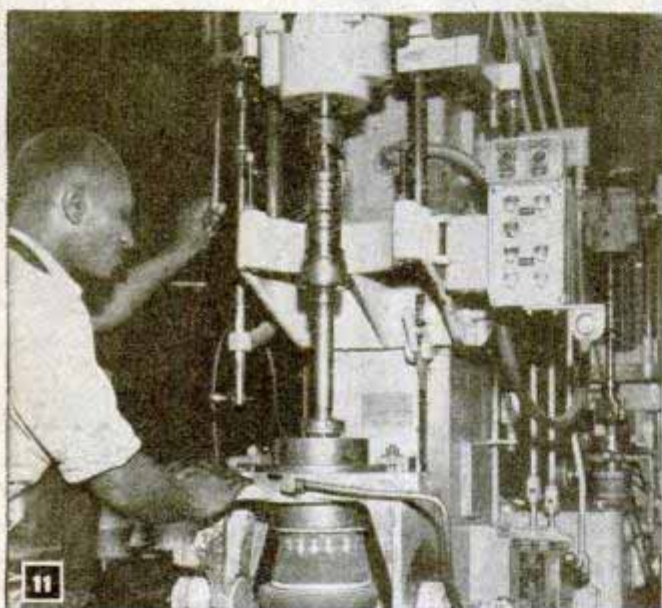
8



Cracks and other flaws in steel parts are detected by Magnaflux inspection which shows results on meter



Sandblasting cylinders. Worker at left puts hands into rubber gloves and sleeves to handle the parts

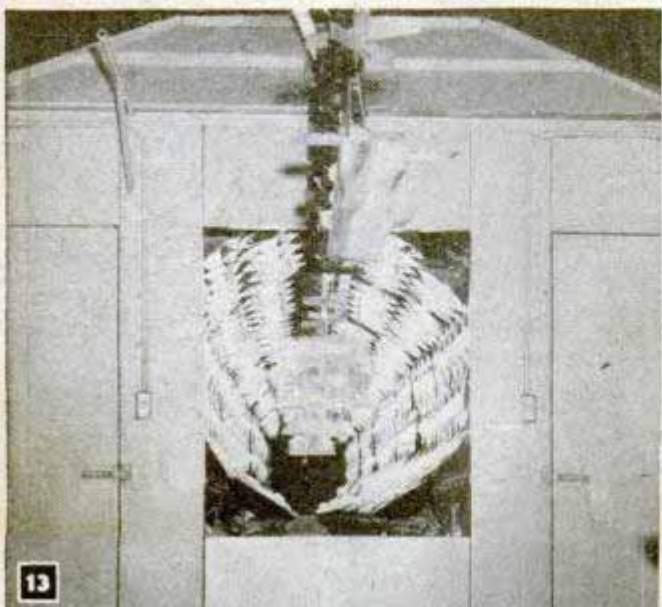


Aircraft cylinders are honed on this precision machine



Valves from hard-driven engines are ground here

Enamel applied to reconditioned parts is baked in an infrared drying oven. Parts move on a chain conveyer



13



14

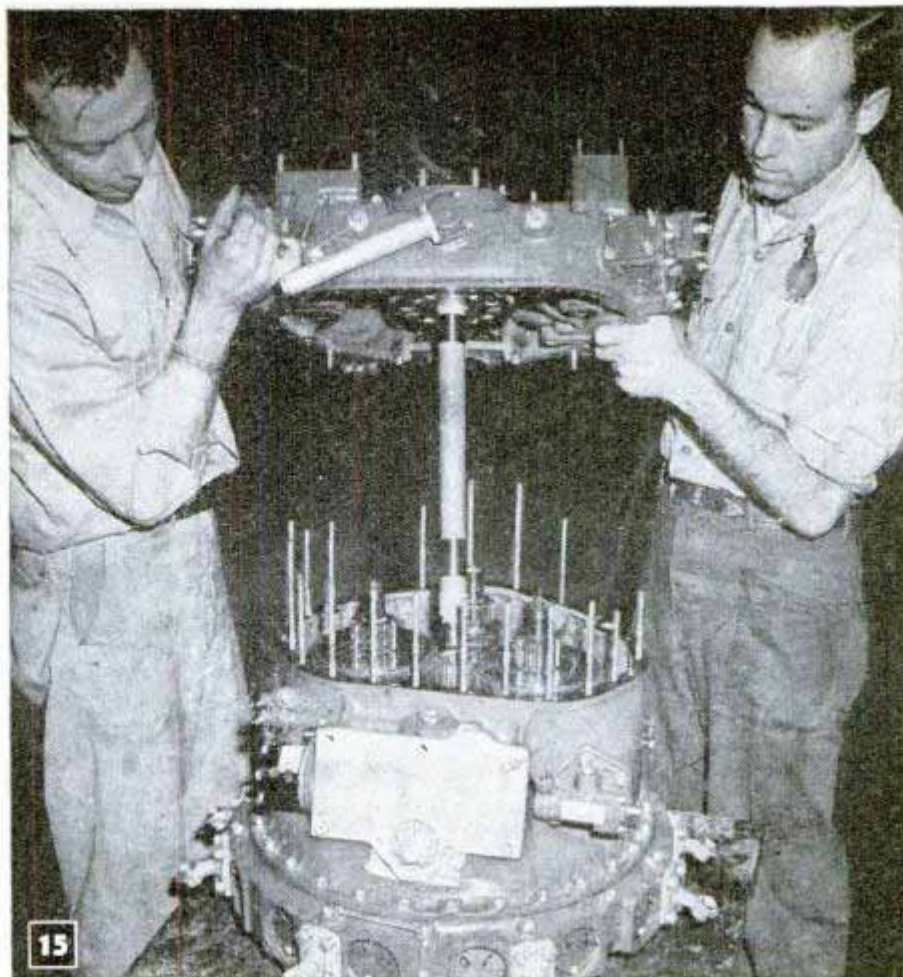
one disassembly station to another, losing its electrical equipment, prop shaft, gears, lines, pipes, power section, blower and clutch.

Each disassembled part is placed in a wire basket and carried to its own department for inspection, rework or replacement. Eleven such baskets hold the parts and, unless every compartment of each of the eleven baskets is filled, that engine cannot be reassembled.

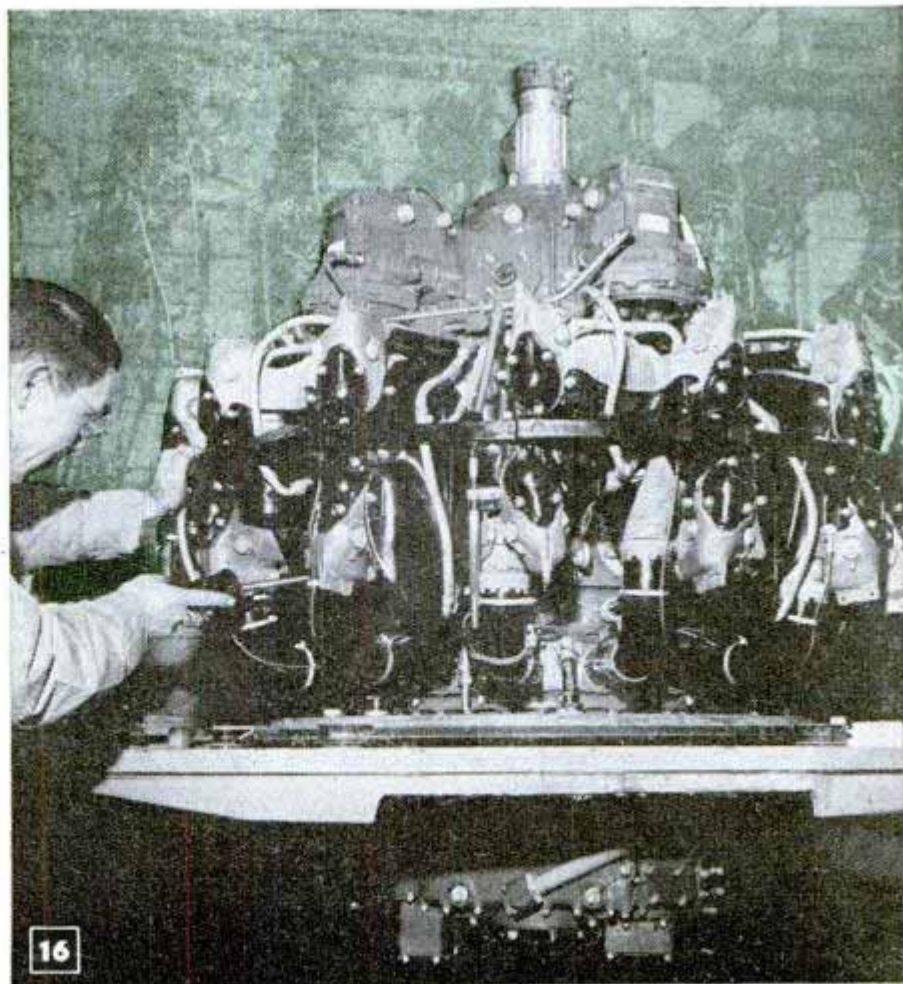
Meanwhile, all steel parts have been Magnaflux-inspected for flaws; cylinders, valves and pistons have been resurfaced and reconditioned; on subassembly lines, the power, blower and prop sections have begun to take shape. In the final assembly the work stands receive the various sections at proper points and the engines progress to completion.

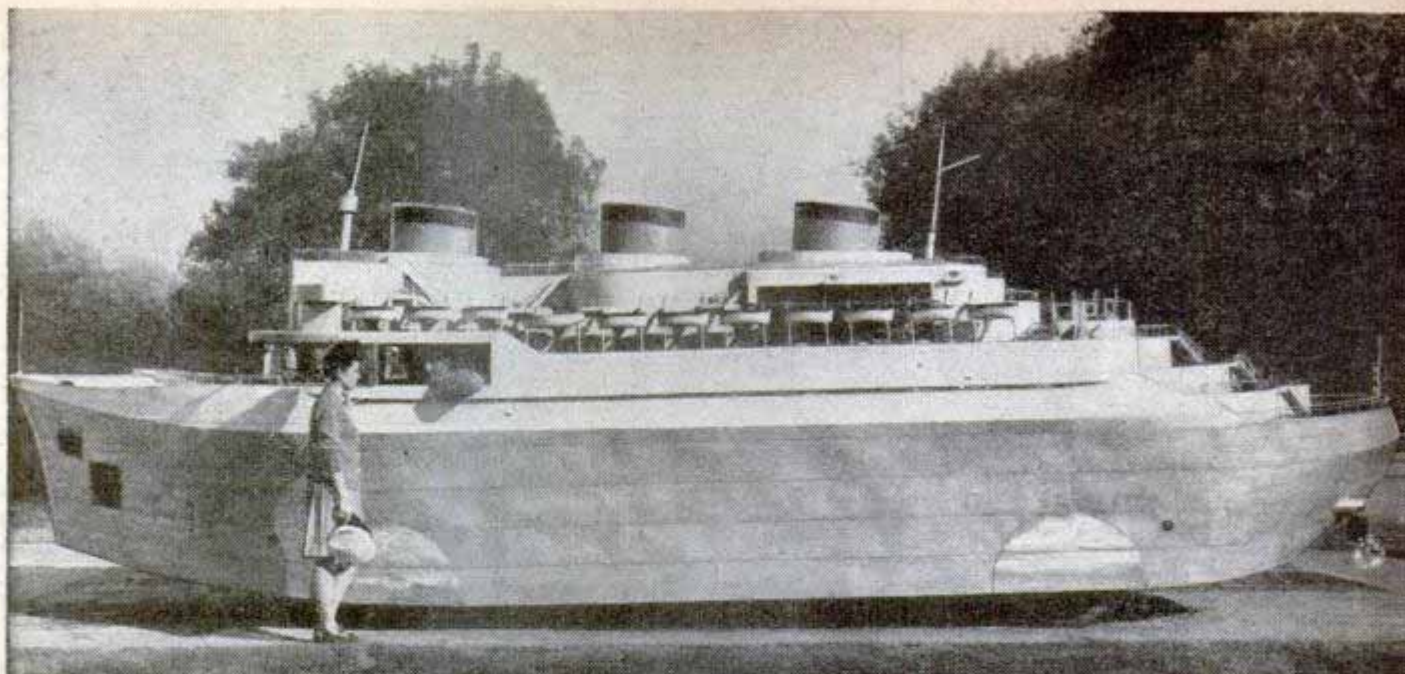
Then, in great test chambers, the engines are placed on stationary mounts and tested. Various flight conditions are simulated and a full range of fuel and air mixtures is fed each engine. Temperature changes to duplicate flight conditions are regulated by remote control. When inspectors pronounce an engine OK, it is installed and put back to work.

This department is but one of the air station sections under the direction of Captain Selden B. Spangler, assembly and repair division officer and long prominent in naval aviation. He was detailed in 1940 to report on jet propulsion, and his report could be accepted today with little change. He aided in the design of the Grumman F8F Bearcat, considered at Alameda as the combat plane with the highest performance in the world.



Nearing the end of the overhaul, two mechanics cautiously lower propeller gear into place. Below, inspector makes final check on sparkling new engine which was old and worn when it arrived at the Naval Air Station





NORMANDIE ON WHEELS

A "LAND LINER" patterned after the SS Normandie contains comfortable living quarters for two and can be driven almost anywhere that a truck or automobile can go.

Three years of work by three Los Angeles men went into the construction of the land-going ship. It is constructed principally of riveted aluminum sheeting and welded steel shapes. The ship has three funnels

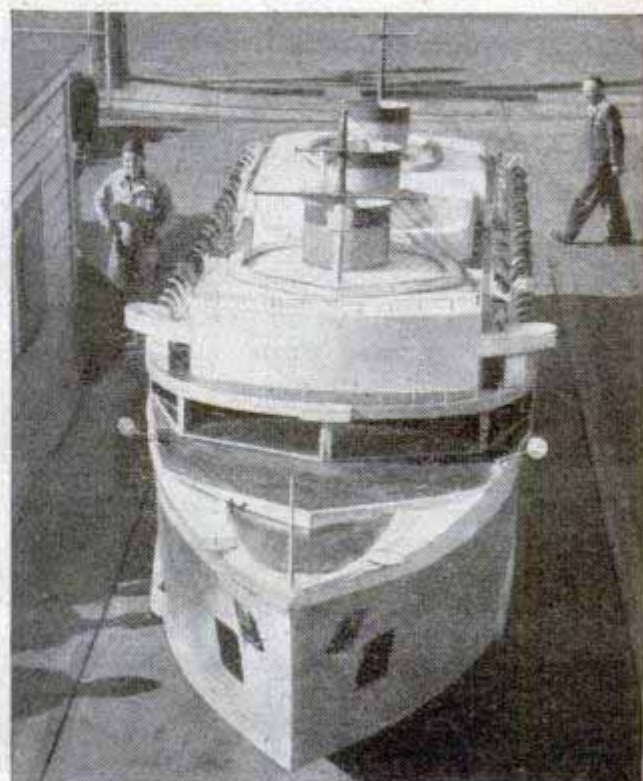
Door leads to the living quarters with full headroom

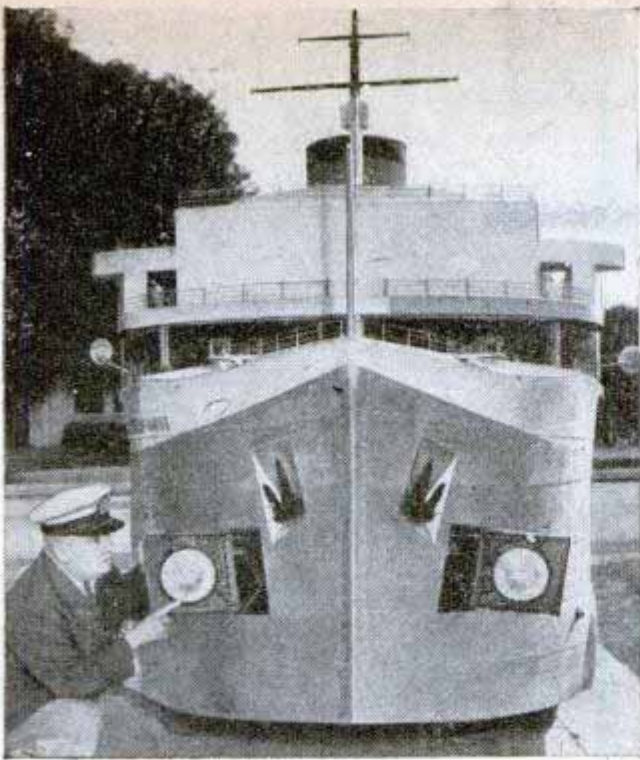


Highway is "sea" for this ship-shaped vehicle which has complete trailer accommodations for two persons

that serve as ventilators for the living space below, and six decks above the main deck with railings and stairs for each. Twenty-two miniature life boats, complete with covers, are rigged on their davits. The ship has its own air whistle and navigation lights in addition to standard highway lamps. Retracted during the day, the ship's head-

"Liner" tips scales at 4300 lbs., so license costs \$11

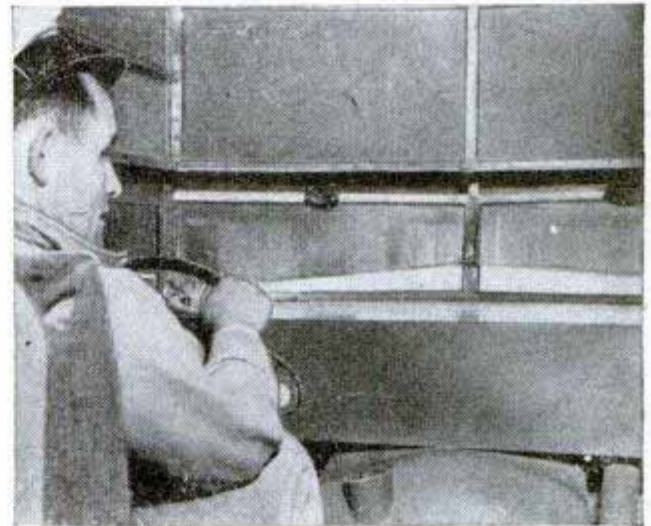




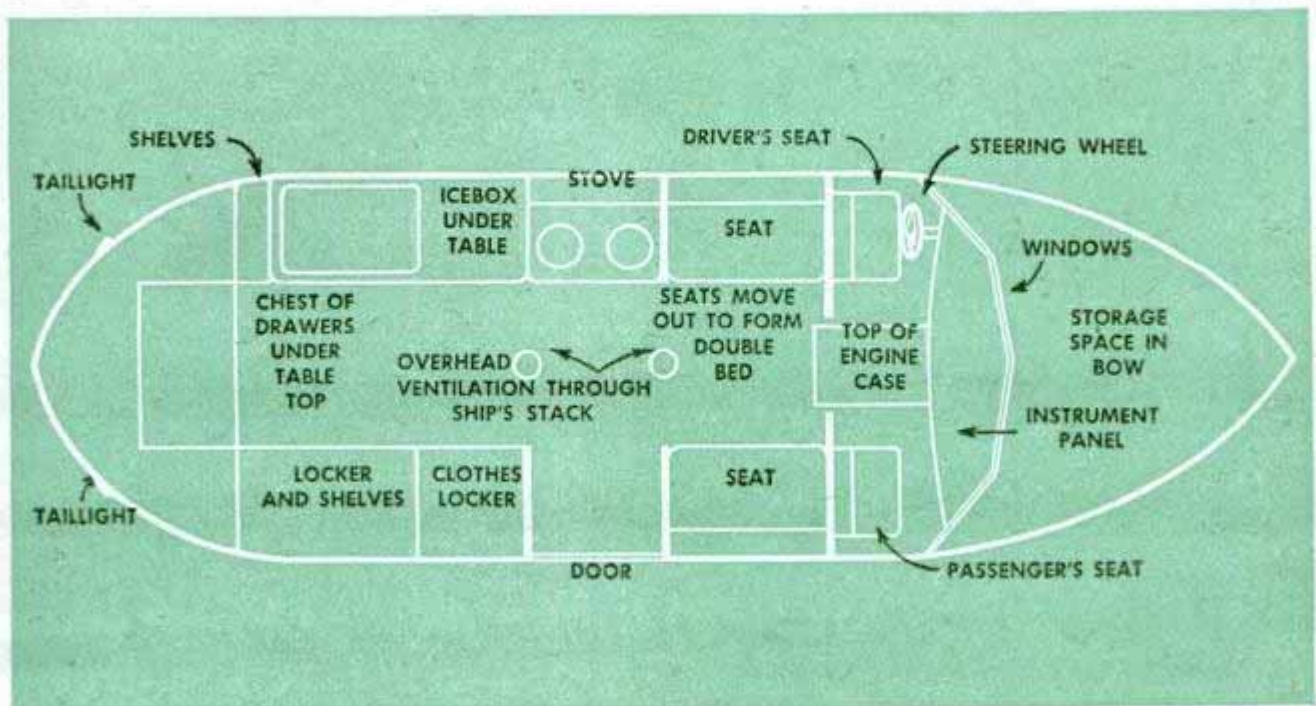
lights swing out through ports that open in the bow under the miniature anchors.

The land liner is powered with a stock six-cylinder automobile engine. Its chassis is made up of stock parts, extended and strengthened to support the exterior hull. Total weight is 4300 pounds. It is 28 feet long, 6 feet 4 inches wide and 9 feet tall.

The interior, with full headroom, has accommodations comparable to a good house trailer. It is furnished in marine style. Besides cruising western highways the owners plan to lease it to advertisers.

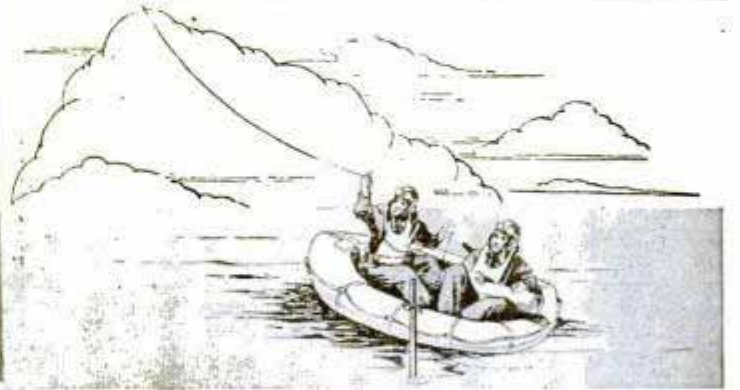
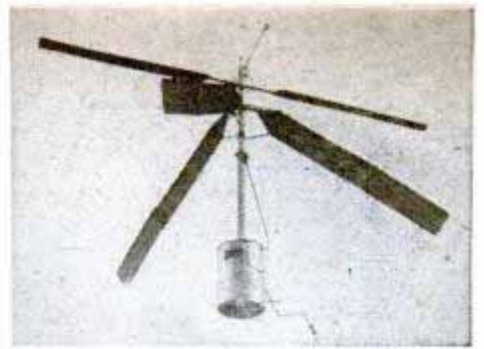


Front and rear views show retractable headlights and glassed-in promenade decks. Right, driver has 180-degree vision. Drawing shows interior arrangement





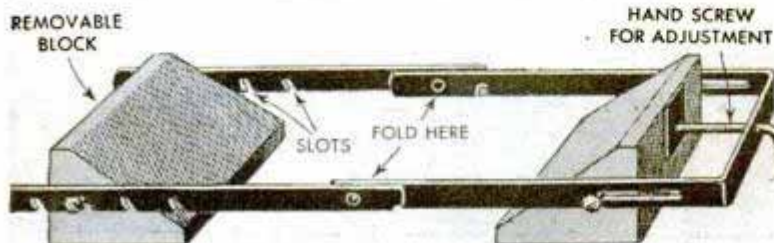
Universal Helicopters photos



"SKY HOOK"

Electronic distress signals carry beyond the horizon when sent from transmitters hitched to the U. S. Navy's "sky hook." The "hook" is a coaxial rotor with a small motor operated by current traveling through control wires from batteries in a raft or lifeboat. It replaces kites, which are useless without wind, and balloons, which are blown into the sea by strong winds. Without elevation the transmitter impulses have "line of sight" characteristics and head into space at the horizon

Adjustable Wheel Chock Keeps Car From Rolling Off Jack



Automobiles jacked up for repairs can't slip off the jack when held in place by a double chock that prevents one wheel from moving in either direction. The wheel is wedged between two triangular blocks that grip the surface even on ice or snow. Turning a hand screw on one end of the chock adjusts the blocks to fit automobile tires of any size. A larger chock is available for trucks. The metal bars that hold the two blocks in place are pivoted in the middle so the chock can be folded to occupy little space when stored in the tool or luggage compartment.

You may wish to obtain some additional information about the new products described each month in *Popular Mechanics*. If you want to know the name and address of the manufacturer or distributor, just write to Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Illinois

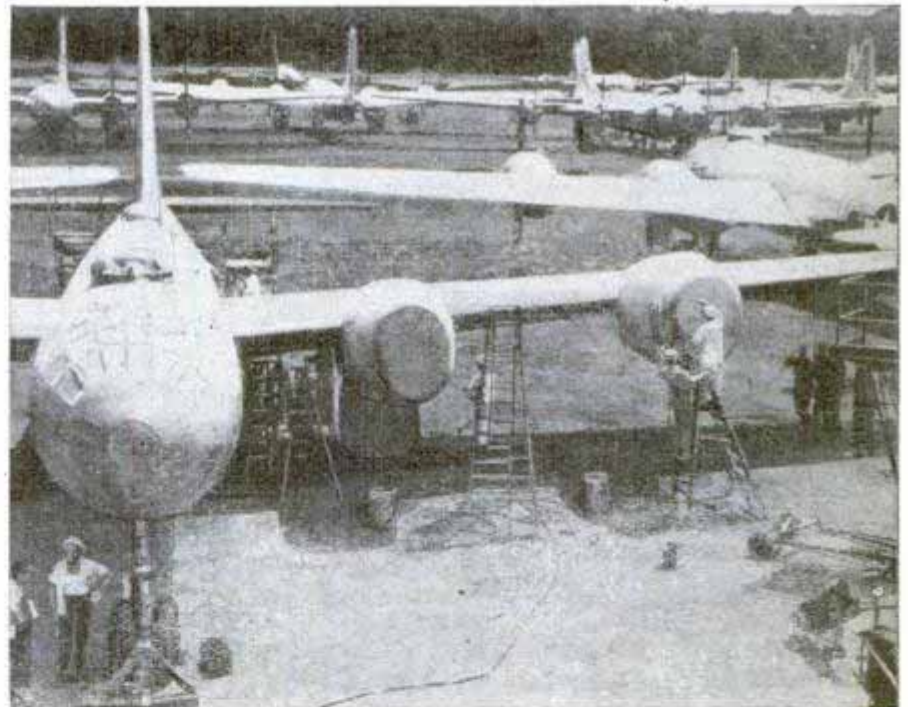
Superforts Are Wrapped in Plastic Cocoons for Storage



Hollingshead Corp. photos

Plastic cocoons are being spun with spray guns around 1500 Army B-29s to preserve them for possible future use. Because of a shortage of storage space the Boeing bombers will remain in the open subjected to all kinds of weather. The airtight cases, said to be seven times stronger than rawhide, are expected to prevent deterioration for 10 years. Five different-colored coats of a special plastic are applied so that workers know when the plane is completely sealed. This eliminates the possibility of leaks. The fourth coat has an asphalt base to keep out moisture and the fifth is aluminum colored to reflect the sun's rays and keep interiors at a more even temperature. Engines and all movable equipment are stripped and separately treated for storage.

All rough edges are covered and tape provides supports for the webbing coat. To check storage conditions, the cocoons have windows through which humidity indicators can be seen. Below, bomber getting final coat



Open spaces, such as ports, are bridged with synthetic cobwebs which are in turn sprayed with a solid coat of plastic.

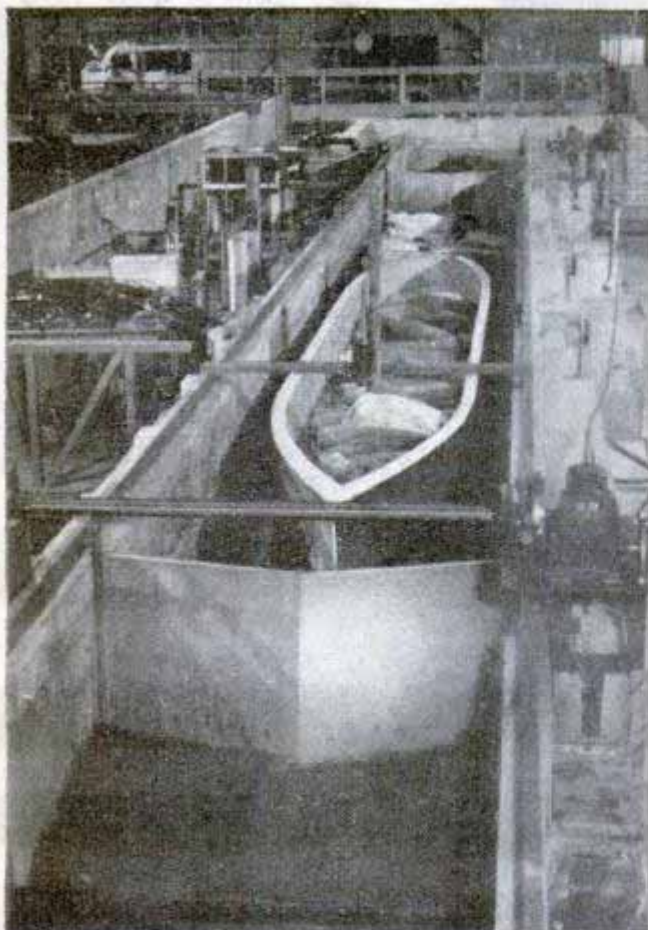
Uranium and Aluminum Discovered in Swedish Oil Shale Deposits

New sources of uranium have been discovered in Sweden through the development of a large shale oil industry to offset coal and petroleum shortages. Uranium oxide, the compound used in generating atom-

ic energy, is one of several by-products obtained in producing oil from shale. The shale is radioactive and contains about half a pound of uranium oxide per ton, plus aluminum, vanadium and molybdenum.



The mighty Mississippi River is reproduced in miniature in model studies of flood control for Cairo, Ill. Below, testing model of New Jersey canal and locks



FENCING IN THE WATERWAYS

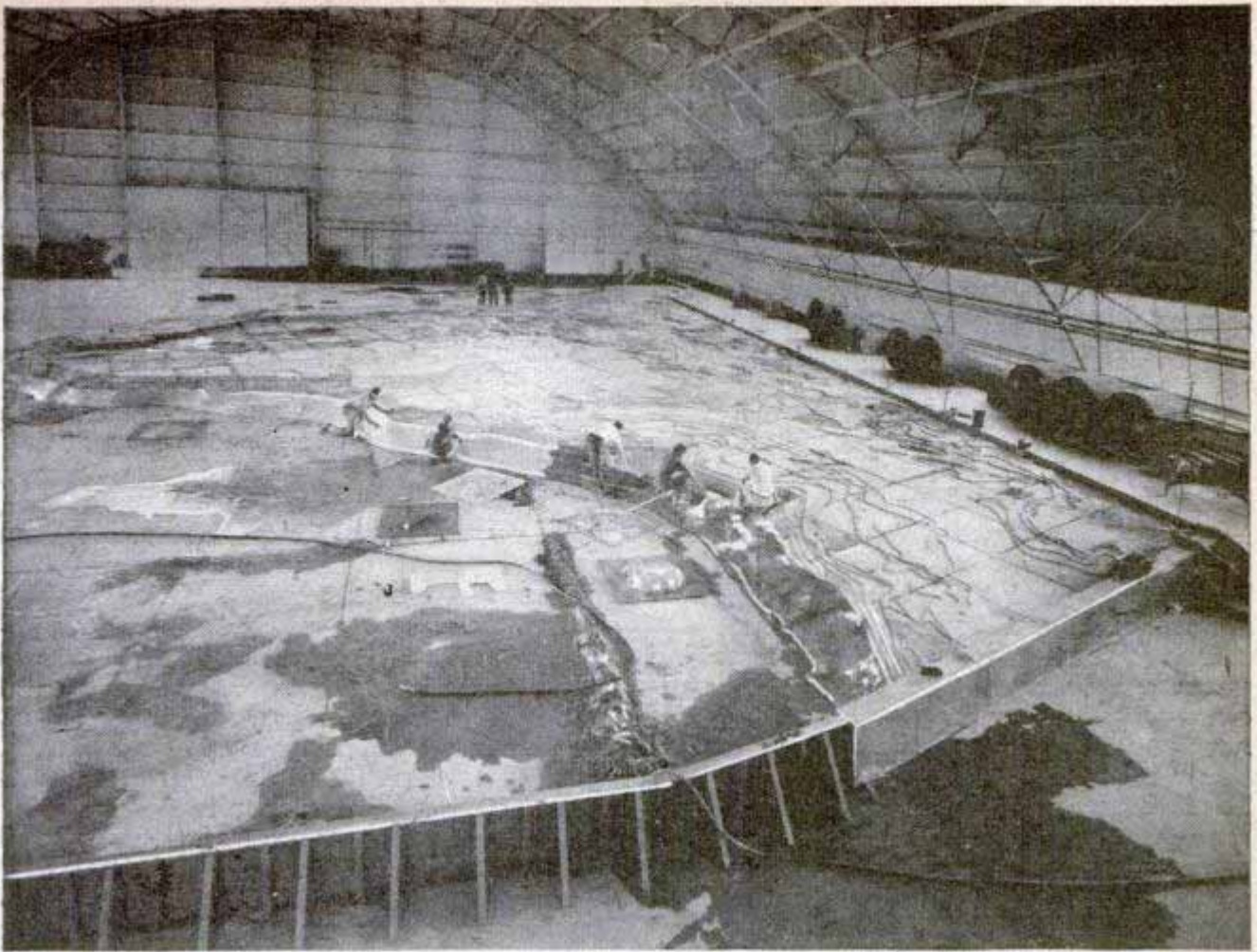
When typhoons menace ships in Guam Harbor or Old Man River goes on a tear, engineers turn to miniature models of the waterways to learn how rampaging Nature can be curbed

WHAT PROTECTION from the 30-foot waves of a Pacific typhoon can be given to shipping in Apra Harbor, Guam?

That's typical of the multimillion-dollar questions handed to the engineers who build Tom Thumb harbors and ports and then create miniature editions of ocean storms to batter their models.

Many problems that involve tides, currents and waves are too complex to be solved by mathematics. The best way to determine the value of a breakwater, for instance, is to construct the breakwater in miniature and study what happens.

When Prof. Robert T. Knapp and Dr. Warren Wagner of California Institute of Technology were asked by the Navy's Bureau of Yards and Docks to recommend a design for breakwater and other protective



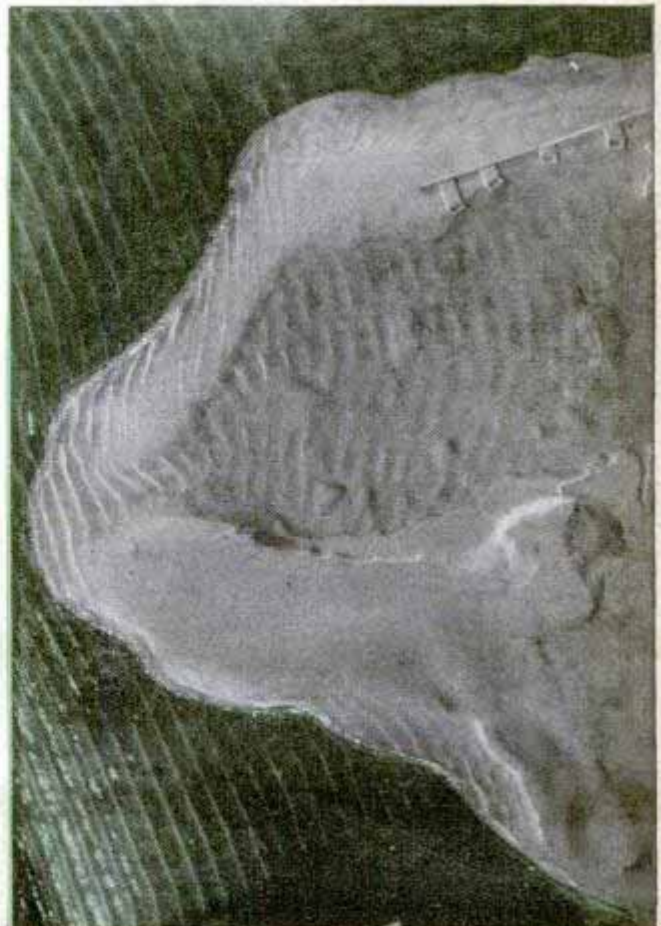
works for Apra Harbor, the two engineers and their staff erected a big aircraft hangar at Azusa, Calif., and built a shallow, steel-walled, 120-foot-square pool on the floor of the hangar.

Inside the pool they assembled a concrete model that represents seven square miles of the Apra Harbor area. Built to a scale of 1 to 360, the model is accurate to $\frac{1}{1000}$ foot. Terrain features, shore lines, harbor depths, coral heads, and the ocean bottom down to 550 feet below sea level are duplicated in miniature. It was unnecessary to model the sea floor to greater depths and, besides, since Guam is actually the tip of a tall submarine pinnacle, a true scale model of the island would rise 80 feet above the floor of the hangar. Wave machines were installed along the sides of the pool, plus pumps and water gates, so that scaled-down imitations of tides, currents, surges and wave actions could be duplicated.

To operate their miniature harbor, the engineers place a breakwater model at the entrance and turn valves and switches to start the water. Tides sweep in and out of the entrance, eddies and currents are set up, and tiny combers, product of a 100-mile-per-hour wind, pound the diminutive breakwater.

From 57 feet overhead, equivalent to an actual altitude of 20,000 feet, a cameraman

Scale model of Guam was built in aircraft hangar at Azusa, Calif., to design breakwater for Apra Harbor. Below, action of waves in harbor with no breakwater



makes still and motion pictures of the incoming waves and their action against the breakwater. Submerged oscillograph elements measure the rise and fall of the water at strategic points and transmit this information to recording machines.

After-dark studies are made of currents created by storm conditions. Tiny buttons with reflectors that sparkle under lights are placed on the water and their floating movements are photographed by time exposures, revealing directions and speeds of their travel.

One after another, breakwaters of different shapes, lengths and heights are studied. The effects of interior moles and other protective works are determined. When completed some time this year the tests will provide an accurate picture of currents and wave heights inside the harbor under all anticipated conditions.

One of the auxiliary questions is to find out whether Apra Harbor will be self-cleaning after its breakwater is built. If normal tidal action doesn't clean the harbor of industrial wastes and sewage, it may be necessary to excavate a canal across the rear of a headland to provide the needed sweep of water. Studies with the model will determine the course and size of the canal if it is needed.

The Navy is spending \$275,000 on this miniature and on a smaller one of the same harbor that California Institute of Tech-

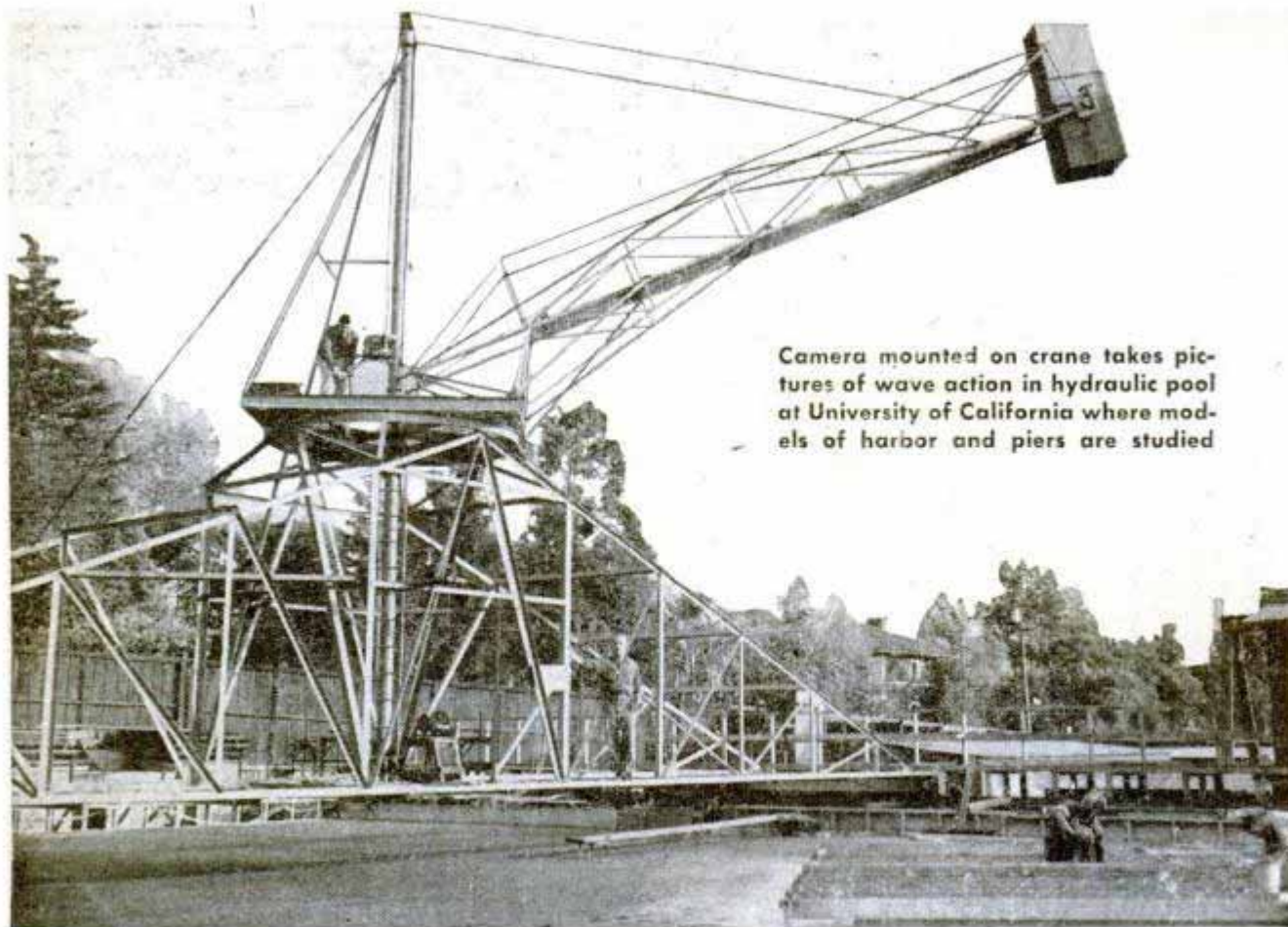
nology used for preliminary studies. About \$400,000,000 is to be spent in converting Apra into a huge, modern naval base. Model studies will help prevent design mistakes and save time and money.

During the war Cal Tech hydraulic engineers used models to solve a mysterious condition that was plaguing shipping at Los Angeles Harbor. On some days the ships berthed in one part of the harbor seemed to be jitterbugging. They would smash against their piers, charge back and forth to the extent of their mooring lines and pitch their bows and sterns into the air, all without any apparent reason. They behaved as if they were in a heavy storm and yet usually the weather was calm with little or no wave action. Sometimes the ships damaged themselves or the piers.

Oceanographers suspected that the trouble was caused by an invisible water action or surge that was intermediate in size between waves and tides. Apparently the phenomena had been aggravated by recent additions to the port's main breakwater.

At Cal Tech the engineers subjected a scale model of the harbor to normal tide, current and wave action and then measured the mysterious surge. Their remedy, tested on the model, included narrower entrances through the main breakwater, plus an inner mole. These improvements were made and the harbor trouble stopped.

A year ago the hydraulics research group



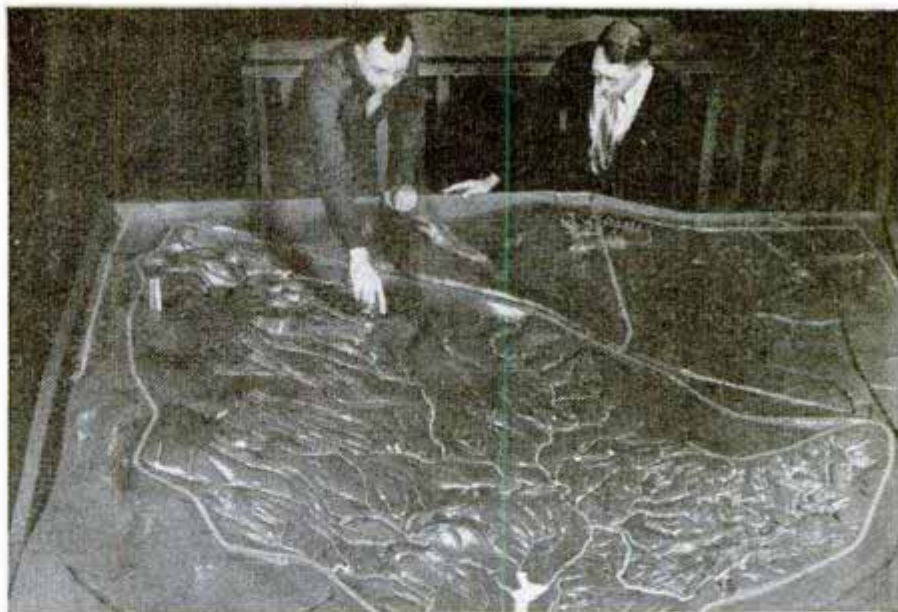
Camera mounted on crane takes pictures of wave action in hydraulic pool at University of California where models of harbor and piers are studied

at the Berkeley campus of the University of California was asked: Will the underwater atomic bomb explosion at Bikini create waves that will sweep entirely across Bikini atoll? To find out, Dr. Joseph Johnson and his technicians had to simulate the actual bomb explosion before anyone had any idea of what the explosion would be like.

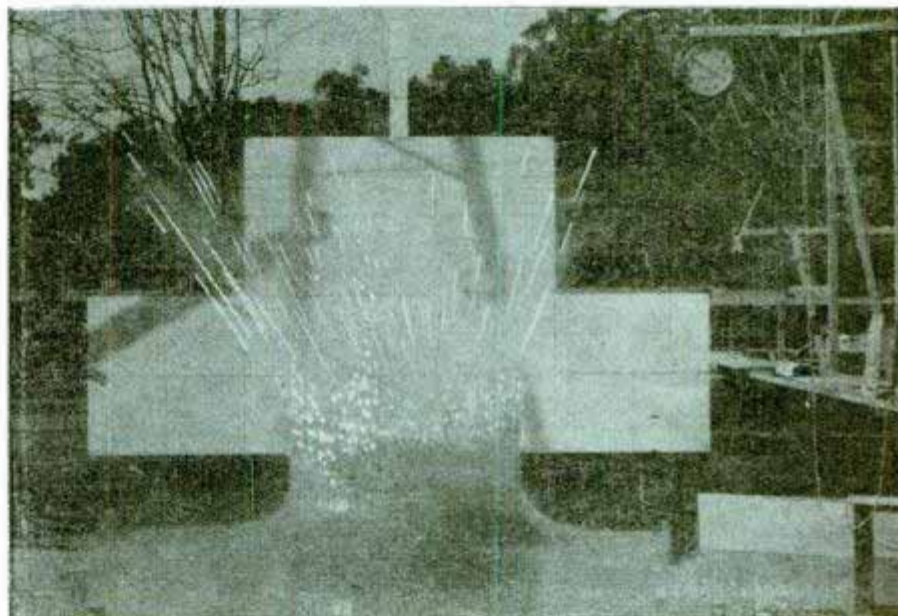
They succeeded so well that months before the Baker Day blast was touched off they had photographs of miniature upheavals of water that compared closely with photographs that were made later of the explosion itself.

They produced their effect by suspending an iron weight above a small model of the atoll and its lagoon. When the suspension rope was burned away the weight fell and created a miniature eruption of water. The waves spread and crashed against the surrounding beaches. Objects of varying weights and shapes were dropped from different heights in making the full run of tests.

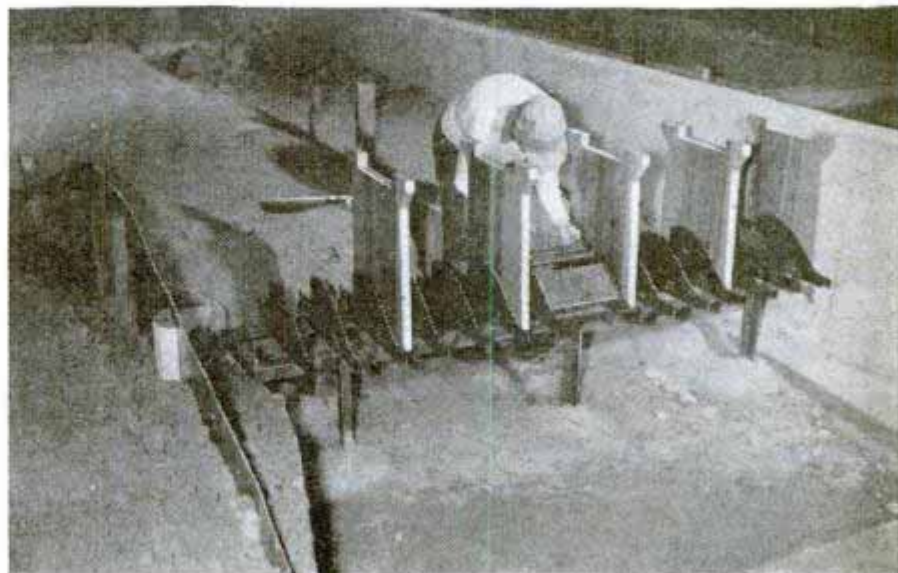
Part of the same problem was to determine the time that radioactive materials would remain in different parts of the lagoon after the bomb was exploded. For this a larger model was built in a 60 by 93-foot tank and water gates were manipulated to create the effects of tides and currents. Colored dye was released in the lagoon at the intended point of the explosion and then the movements and persistence of the dye were recorded during a large number of tidal cycles. Some areas were swept free of contamination almost at once; at other points, contamination remained heavy for considerable periods. This

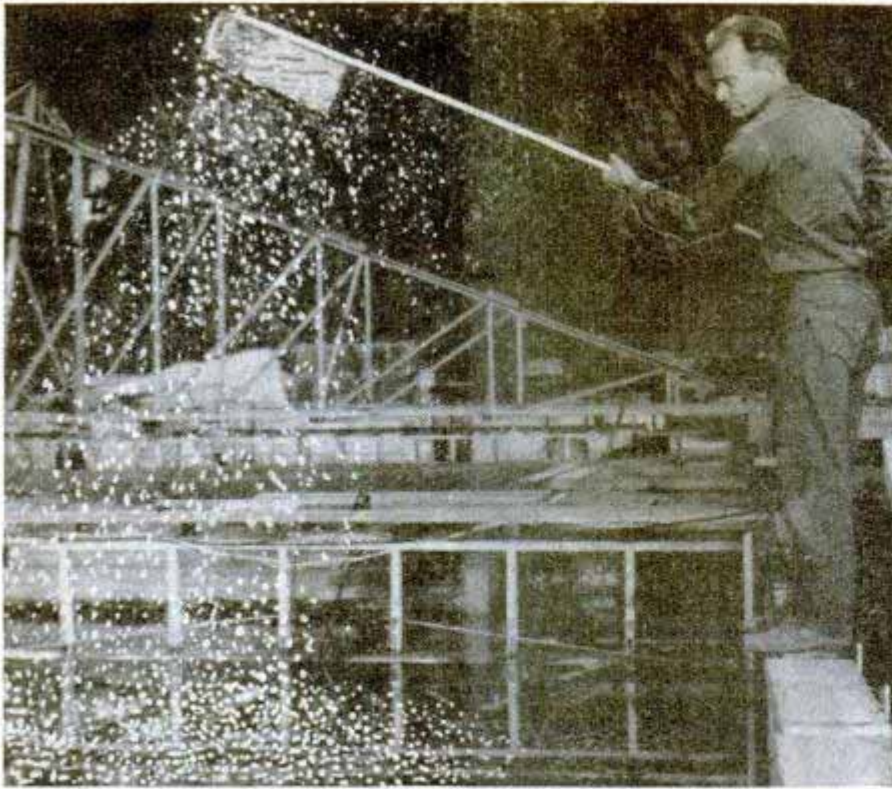


Engineers examine table model of 200-acre working model of Mississippi basin under construction near Clinton, Miss. Large model represents 31 states

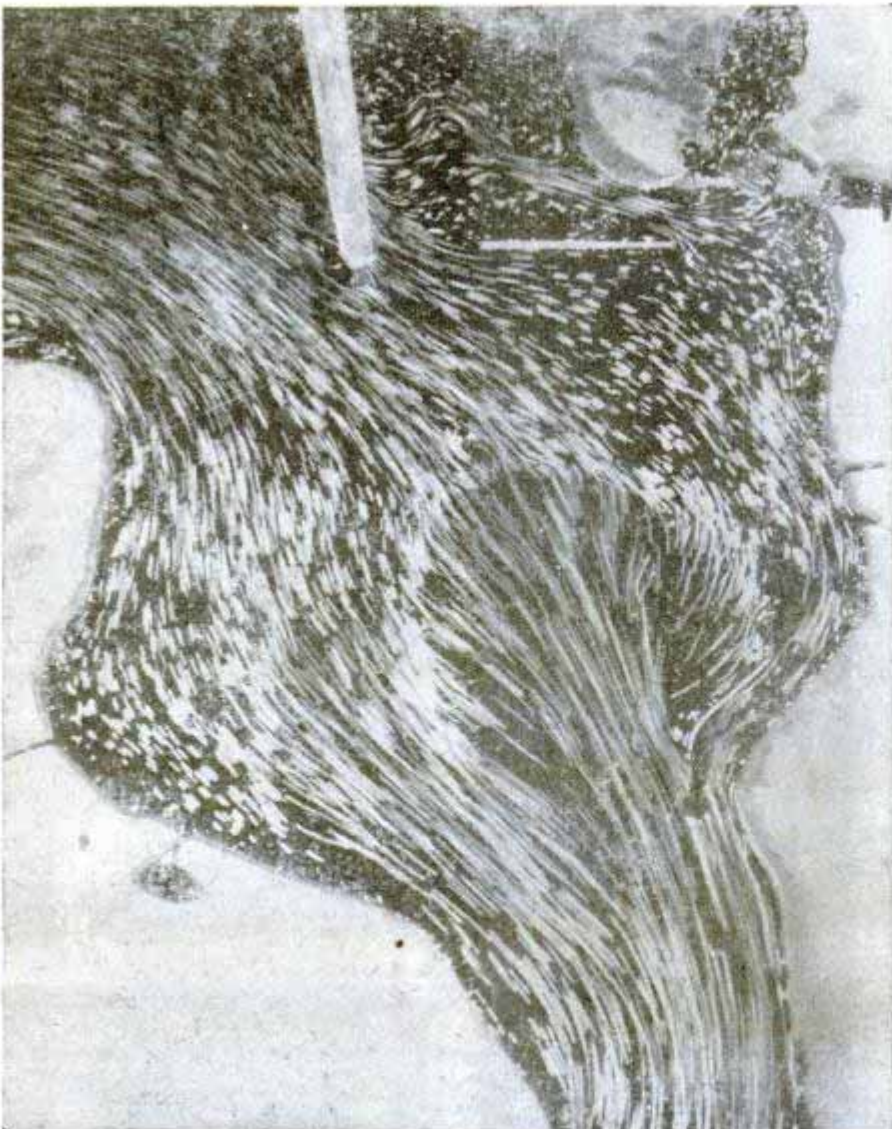


Weight dropped in pool at University of California simulated underwater atom bomb explosion before Bikini blast to test whether waves would pass over Bikini atoll. Below, skeleton of control structure for model at U. S. Waterways Experiment Station to test proposed Morganza floodway (Louisiana)





Sprinkling confetti on water so photographs will reveal directions and speeds of swirling streams in model harbors and canals. Below, six-second time exposure of confetti swept along by water in a model of St. Johns River in Florida. To create color contrast for photos, the water is tinted dark



information later was put to use at Bikini.

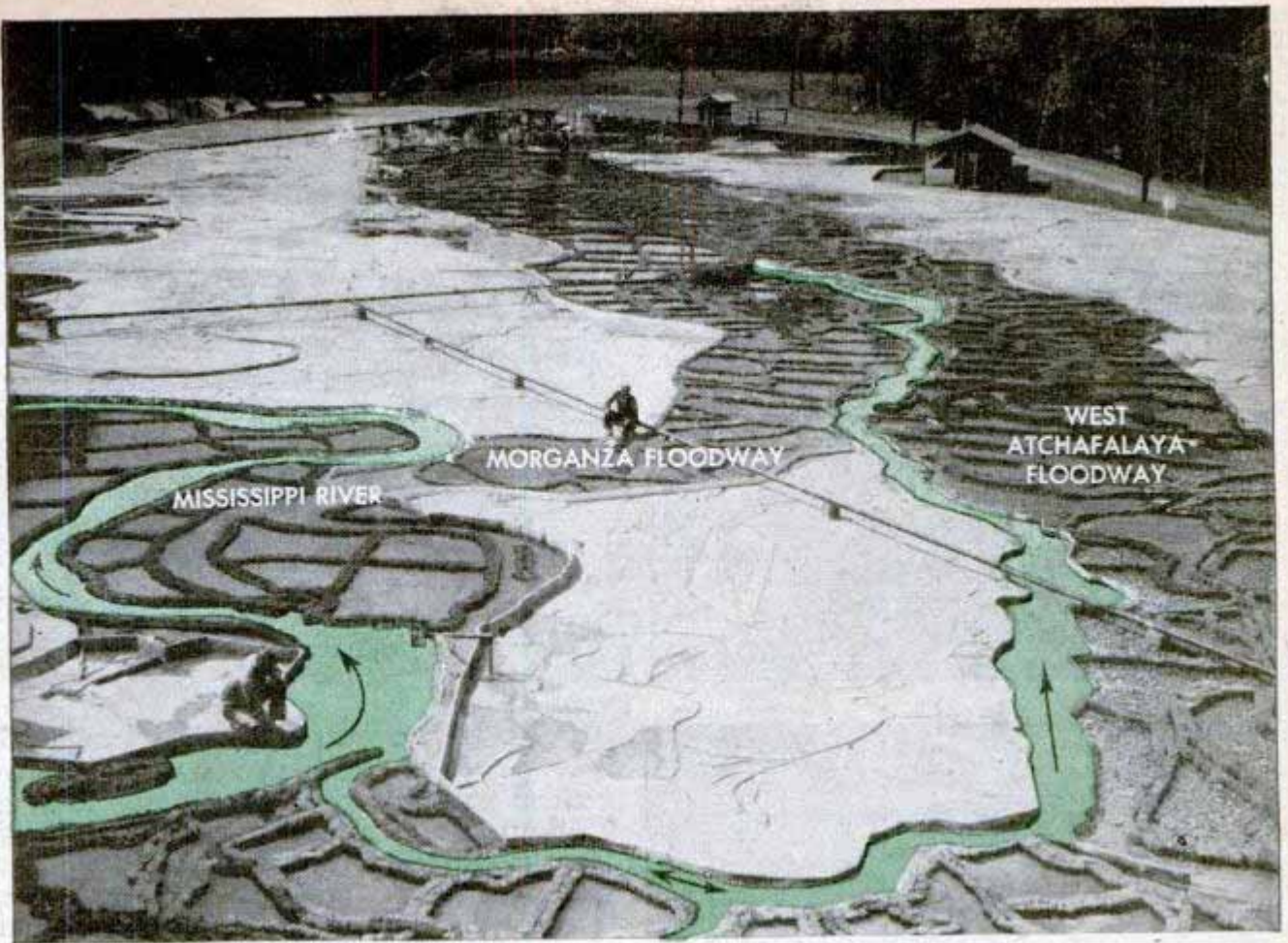
Largest of all hydraulics research laboratories is the U.S. Waterways Experiment Station near Vicksburg, Miss. Most of the flood control and other improvements made to the Mississippi River since 1930 were first tried out on practical working models at the laboratory.

Each task at the waterways experiment station is different. During the war, Colonel C. T. Newton, director, and his staff made final tests on new designs of pontoon bridges. They worked in a secret, covered laboratory to test different designs of caissons in stopping wave actions typical of the English channel. The study provided basic data for the design of the artificial harbors that were used in the invasion of Europe.

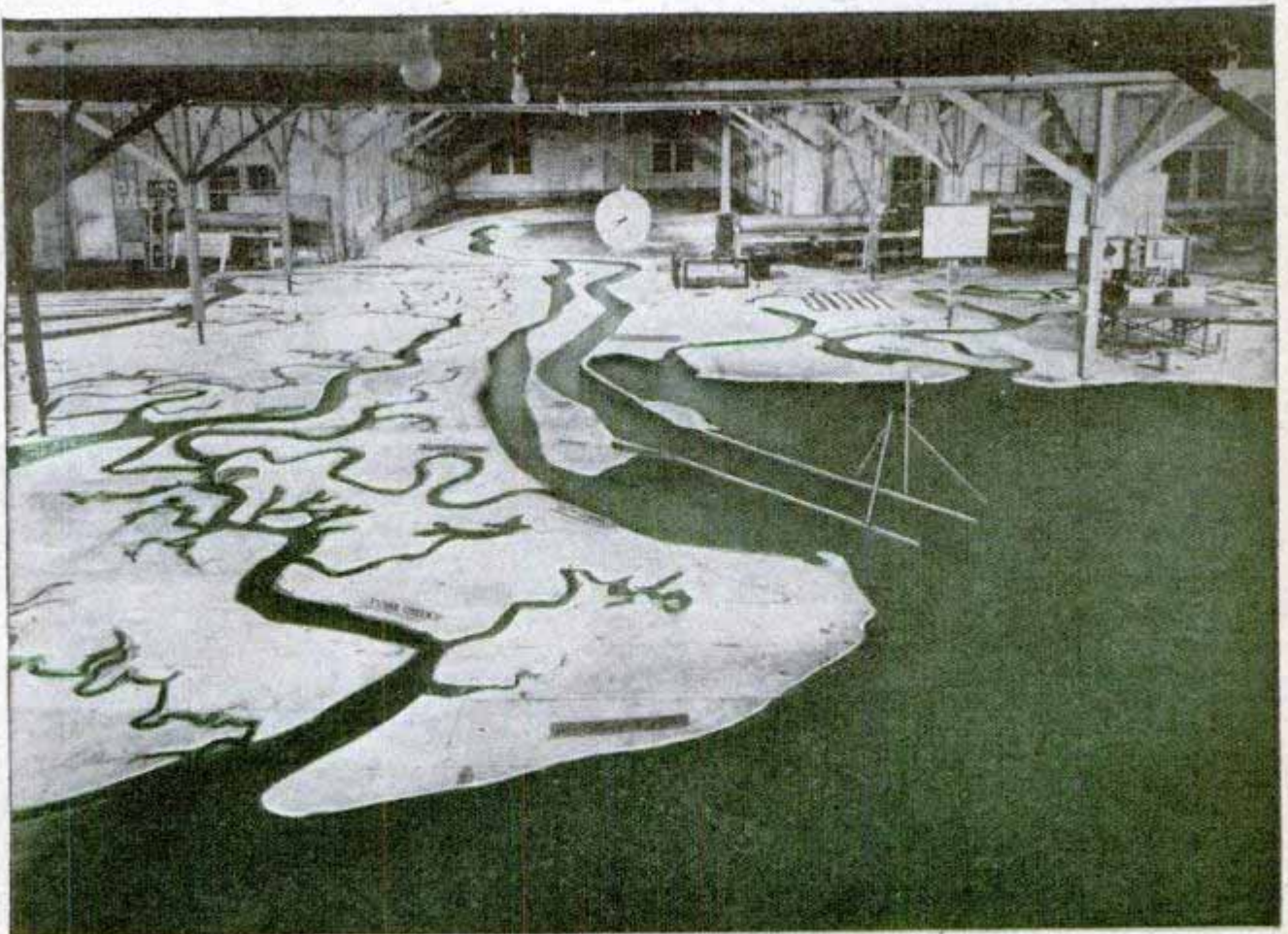
Right now the station is seeking practical answers to questions such as these: how to increase the depth of the ship channel leading to Jacksonville, Fla., without increasing river velocity and tidal heights, and without increasing the river's salt content; the best designs for spillways, outlet conduits and other works for a proposed dam on the North Santiam River, Ore.; the best alignment for a breakwater extension to protect Anaheim Bay, Calif.; and the value of proposed flood control improvements at Cumberland, Md., and Cairo, Ill.

Always concerned with the control of the Mississippi, the experiment station is now building a model of that river which will be the largest practical model ever built. Covering a 200-acre area near Clinton, Miss., the model will duplicate in

(Continued to page 244)

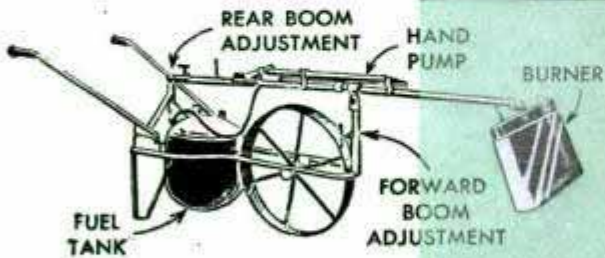


Dwarfed by the size of the model, government hydraulic engineers measure the flow of water through the lower section of the Mississippi River flood control model. Below, control mechanism (at extreme right) for automatic tide-producing machine operates the tides that pour in and out of this scale model of Savannah Harbor. The United States Waterways Experiment Station at Vicksburg, Miss., uses this equipment in channel silting tests



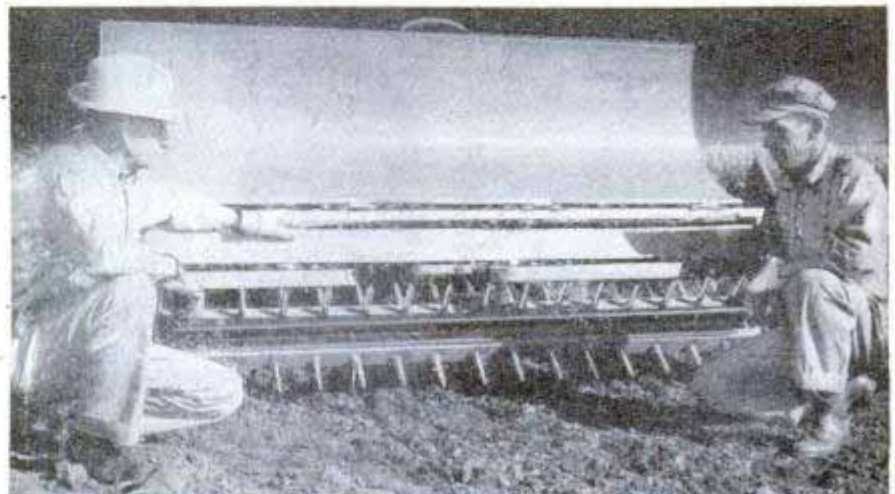
Wheel-mounted burner

that uses either gasoline or kerosene fuel kills weeds and unwanted grass instantly. The burner is attached to a boom which extends several feet in front of a tank containing a three-hour supply of fuel. The boom can be raised or moved sideways at a 45-degree angle.



Power drive cuts speeds of fractional horsepower motors to as low as four revolutions per minute. When attached to a 1725-r.p.m. motor the drive has a range of 20 to 750 r.p.m., and with an auxiliary shaft the speed can be cut further to four r.p.m. The drive has a universal coupling and an adapter that fits round, square, triangular and tapered threaded shafts up to $1\frac{1}{8}$ inches in size. The motor can be mounted right or left of the base to take care of shaft rotation in either direction. The base and housing are made of aluminum and the entire unit weighs only 12 pounds.

Whirling spikes on a new farm machine pulverize the soil to do the work of both disk and harrow. The rotary harrow, invented by John Rittenhouse of Washington, Iowa, has a long cylindrical shaft driven by tractor power at a rate of 450 revolutions per minute. Fastened to the shaft are four rows of spikes that rotate through the soil, leaving a strip of pulverized earth. The machine, which weighs less than one ton, pulls up weeds by the roots, according to the inventor.



❏ Synthetic resin cast in thin foils was used by the Germans as a wartime substitute for mica insulation in high-frequency electrical equipment.

BRAZIL'S ONE-MAN BOOM



Introducing Francisco Pignatari, a young wizard who is waving a magic wand over industry in Brazil

By Bill Reiche

SAO PAULO, BRAZIL—Brazil is on the march. Our great neighbor to the south, larger than this country by the area of Texas, is arming herself, not against an enemy, but industrially against an economic lethargy that has long kept her from assuming her place in the sun.

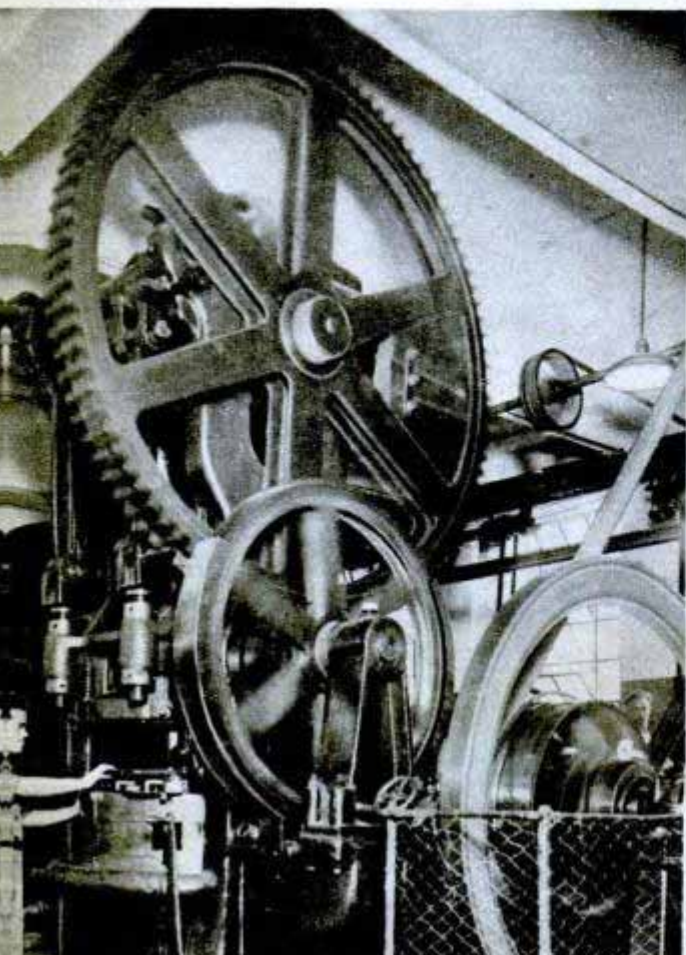
For 400 years Brazil has suffered from being too rich for her own good.

A large black and white photograph showing a worker in a foundry. The worker is wearing a dark, protective suit and a large, dark, rectangular face mask. He is leaning over a large, glowing furnace, using a long-handled ladle to pour molten metal into a mold. The scene is filled with heat and light from the furnace.

Molten metal in the booming Pignatari foundry in Sao Paulo is pouring new life into Brazil industry



↑ Air view shows aluminum plant that transforms bauxite into ingots to be made into pots and pans. Right, training plane designed by Pignatari's engineers is becoming popular. Below, 600-ton press stamps out finned basins



She hasn't had to work because of her wealth of natural and agricultural resources. Selling one commodity at a time to the world, she maintained enough foreign credit to supply herself with finished goods—until the crash came. First it was gold, until Africa took away that market; sugar was the meal ticket until Cuba took over; rubber paid the freight until the market was lost to the Orient; and finally overproduction of coffee brought on a market collapse in the late '20s.

Cotton became a major crop in the '30s, but in recent years a more important seed has been planted. Industries, stimulated by heavy Allied demands for products and raw materials, are springing up as never before. They promise to rescue the nation from the economic improvidence of the one-crop system.

Industrialization, for which Brazil has a firm foundation of vast natural resources of almost every type, is important not only to American industrialists but to everyone in the 48 states.

Contrary to what we might think, the greater commercial and technological progress a foreign nation makes, the better customer it becomes for our production machinery, finished products, li-



Aluminum from plant at left is processed into modern kitchen utensils to meet Brazil's growing demand

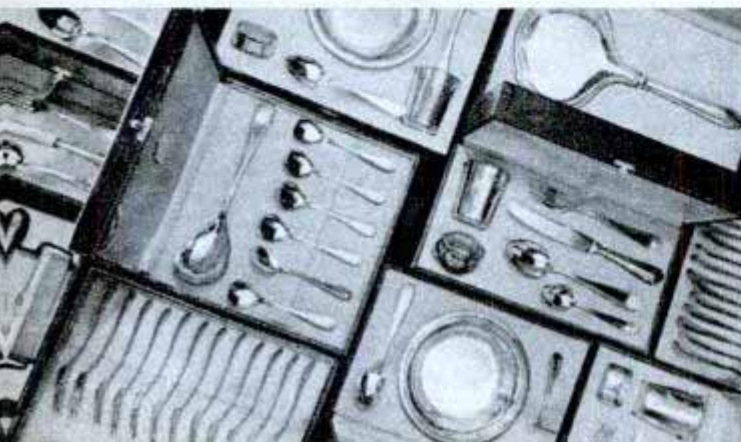
censes to manufacture, and engineering and technical know-how.

Hard-headed American business men realize this. William E. Knox, president of the Westinghouse Electric International Company, states that "we know from experience that industrialized nations make the best customers for our own industrial economy—and the best friends."

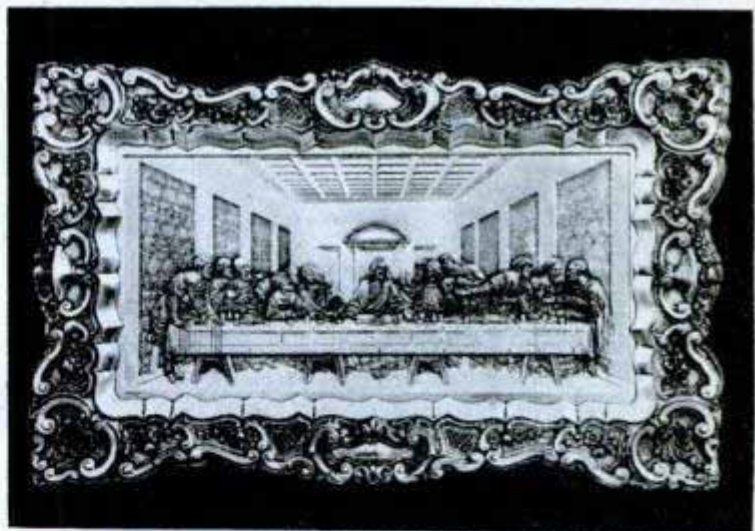
In the first half of 1946 Brazil imported \$186,000,000 worth of goods from this country—exactly two thirds of her total foreign purchases. During the same period we paid out dollars for 44 percent of her exports.

It was World War II and the Allies' scarcity of almost everything that shifted Brazil's industry into high gear. The nation's total industrial production in 1939 came to only \$750,000,000, but by 1945—the last year for which complete figures are avail-

All kinds of table service from tinned iron to gold-plated sterling are manufactured by the Wolff division

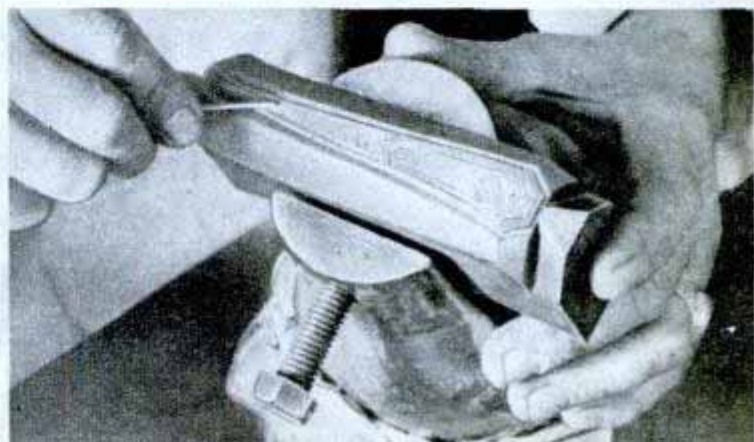


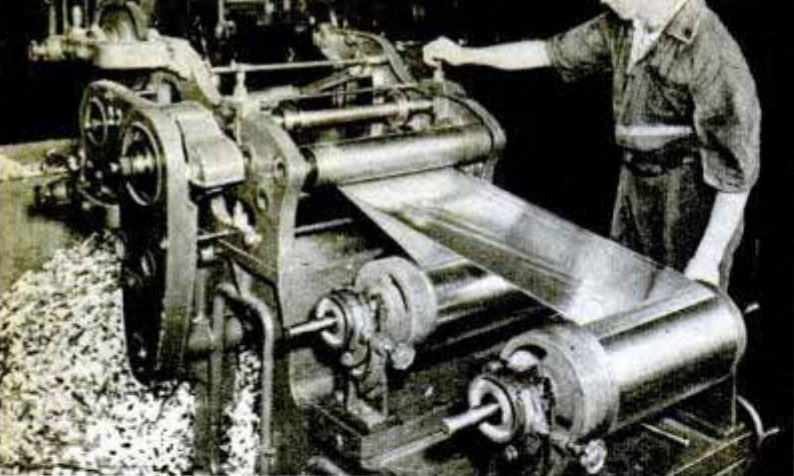
Exquisite pitchers and candlesticks are wrought from silver. Millions of units are manufactured each year



Silver tray depicts the Last Supper in fine detail. Such items may be exported to the United States soon

Master craftsman engraves a metal die for table service. Brazil needs workers with technical "know-how"



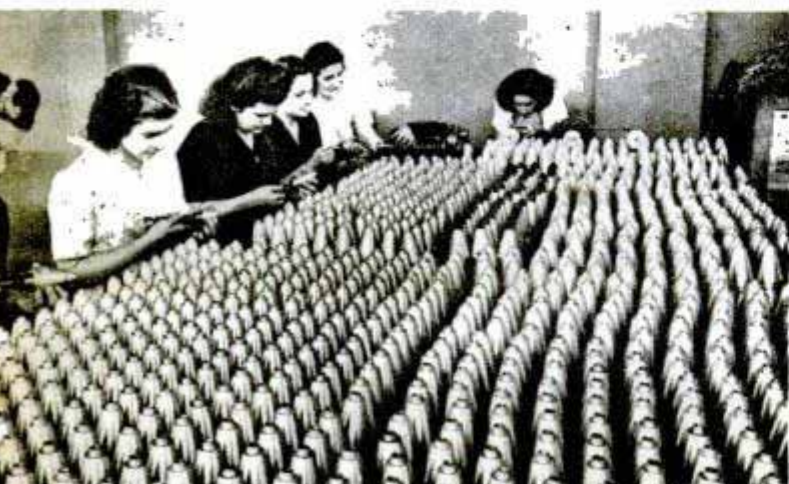


From machines like this roll thousands of yards of aluminum foil each year. Pignatari's lieutenants adopted a method of finishing the foil in any color



↑ Steam boiler parts are welded in a modern factory. The industrial combine also makes gas and oil tanks.

↓ During the war one subsidiary turned out shell fuses



able—production totaled more than \$2,800,000,000, an increase of almost 300 percent.

But the groundwork for the new day was laid in the '30s, which also saw the founding of one of the most modern industrial organizations in South America. In 1933 Dr. Julio Pignatari formed a small company in Sao Paulo, "the Chicago of South America," to manufacture aluminum foil for packaging, and bronze and aluminum powders for painting and lithography. The following year he embarked on the production and fabrication of nonferrous metals, forming a new company—Laminacao Nacional de Metais. This was a real accomplishment, since there wasn't a rolling mill in the country—and never had been—and no skilled labor. Mills were imported from Germany and Switzerland and labor was trained. A dynasty was in the making.

In 1936 Dr. Pignatari died and his 19-year-old son, Francisco, became director of the business. Until that time the son had been known chiefly as a playboy, with little or no business experience and displaying little indication that he would, within a few years, cause a splash which would be felt by the whole continent.

Young Pignatari was and is completely out of sympathy with the widespread Brazilian practice of making an exorbitant profit on limited production. He prefers the Yankee method of realizing a small unit profit on a large volume of production.

By 1941 annual production of Laminacao was up to 3364 tons and sales were more than \$3,000,000. Last year the company produced more than 8500 tons of plates, sheets, tubings, extruded shapes and wire of aluminum, brass, bronze, copper and nickel silver. Its sales exceeded \$9,000,000. During the war it manufactured shell fuses and is now producing machine guns for the army.

Compared to a hundred U. S. companies these figures are piddling. But a business is something like a projectile—it isn't so much where it is at the moment, but where it is going and how fast. This company is the major source of nonferrous metal fabrications in Brazil; it exported part of its output before the war and will export again when production exceeds internal demand. Its plant in a suburb of Sao Paulo covers an area of more than 14,000,000 square feet.

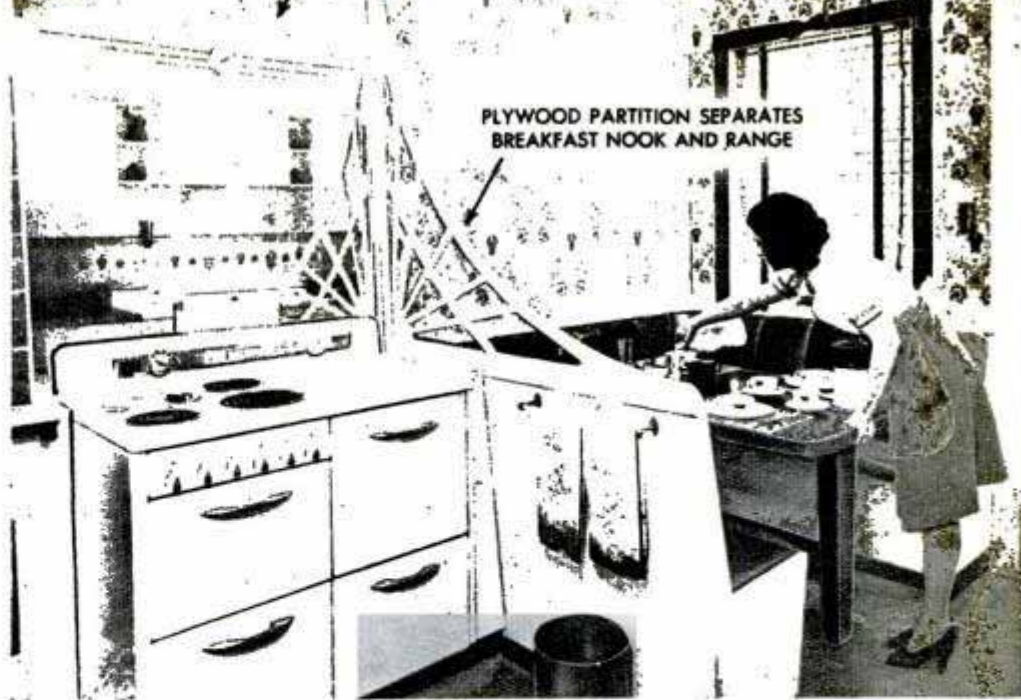
The Companhia Brasileira de Artefactos de Metais takes care of Brazilians' needs for pots and pans and table service. The Wolff division manufactures tableware, ranging from tinned iron to gold-plated sterling, in millions of units. It also makes a fairly complete line of kerosene lamps and stoves. Its sales have mushroomed from a little over \$500,000 in 1940 to approximately \$3,000,000 last year.

(Continued to page 228)

Glamorized Kitchen

New paint and wallpaper, modern kitchen appliances and a big dose of ingenuity have transformed the old-fashioned, inefficient kitchen in the home of Bernard S. Molay in Chicago. Now it is a cheery, comfortable work-room which eliminates, as completely as possible, stooping, bending or lifting.

The remodeling job was done by Molay and a friend, with advice from Mrs. Molay. It has several unique features. A new ceiling of acoustical tile absorbs noise and a ventilator changes the air in the room every two minutes. Curtains, which picked up dust and stopped part of the light coming through the two windows, have been replaced by a wire framework made from shrubbery fencing and laced with three-inch red ribbon. A mirror behind the electric stove creates an illusion of greater depth while adding visibility and light. The divider between stove and dinette was sawed from a piece of 3/4-inch plywood. Three legs of an office table were removed and it was installed as a dinette table and enameled blue. Behind the sink and table-top work cabinets runs a plate-glass splashboard. It is 13 1/2 inches high and 9 feet long. The colorful figures behind it were cut from the patterned wallpaper and covered by plate glass. Shallow bric-a-brac shelves link the wall cabinets. A trap in the kickboard under the work cabinets has a hinged door and serves as a convenient trash receptacle.



PLYWOOD PARTITION SEPARATES BREAKFAST NOOK AND RANGE

Mirror behind stove gives room greater depth. Trap under kickboard, below, eliminates stooping and makes disposal of floor sweepings easy



FLOOR SWEEPINGS DROP THROUGH OPENING TO TRAP IN BASEMENT

Wire frame and ribbons eliminate dusty window curtains; glass splash panel above sink can be wiped clean

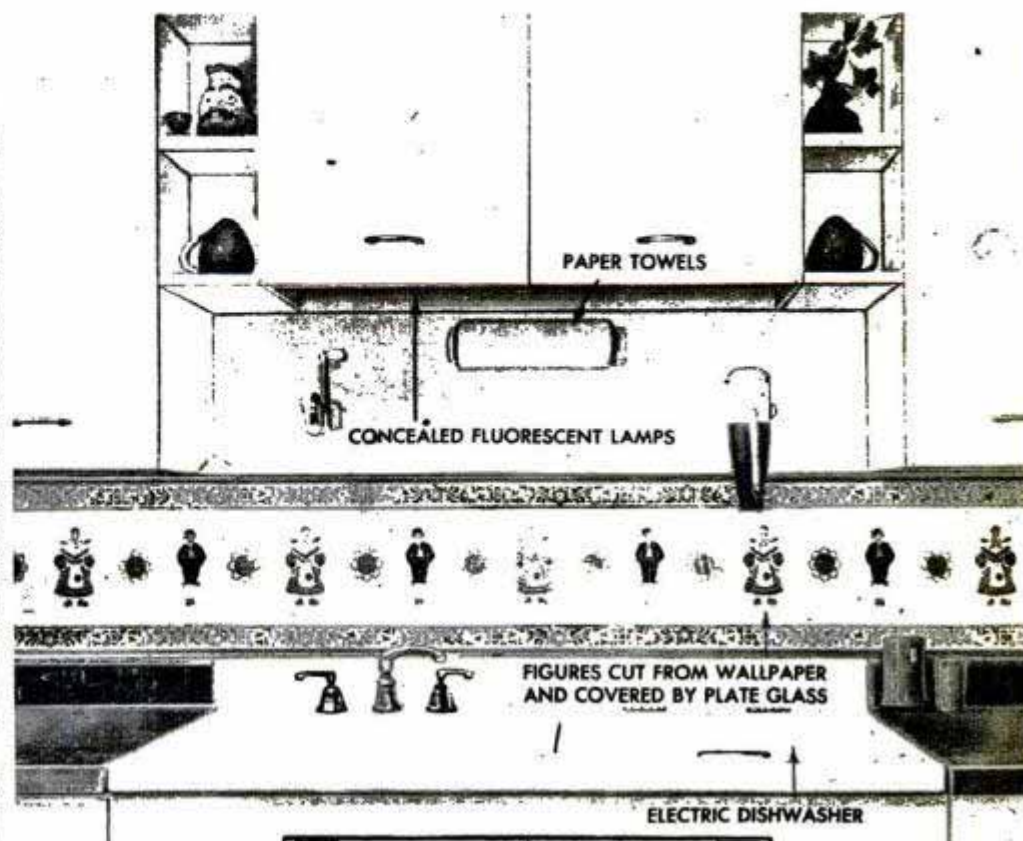


WINDOW DECORATIONS WIRE FENCING INTERWOVEN WITH RIBBON

COFFEE DISPENSER

RADIO

MAGAZINE RACK BUILT INTO END OF RADIATOR GRILLE

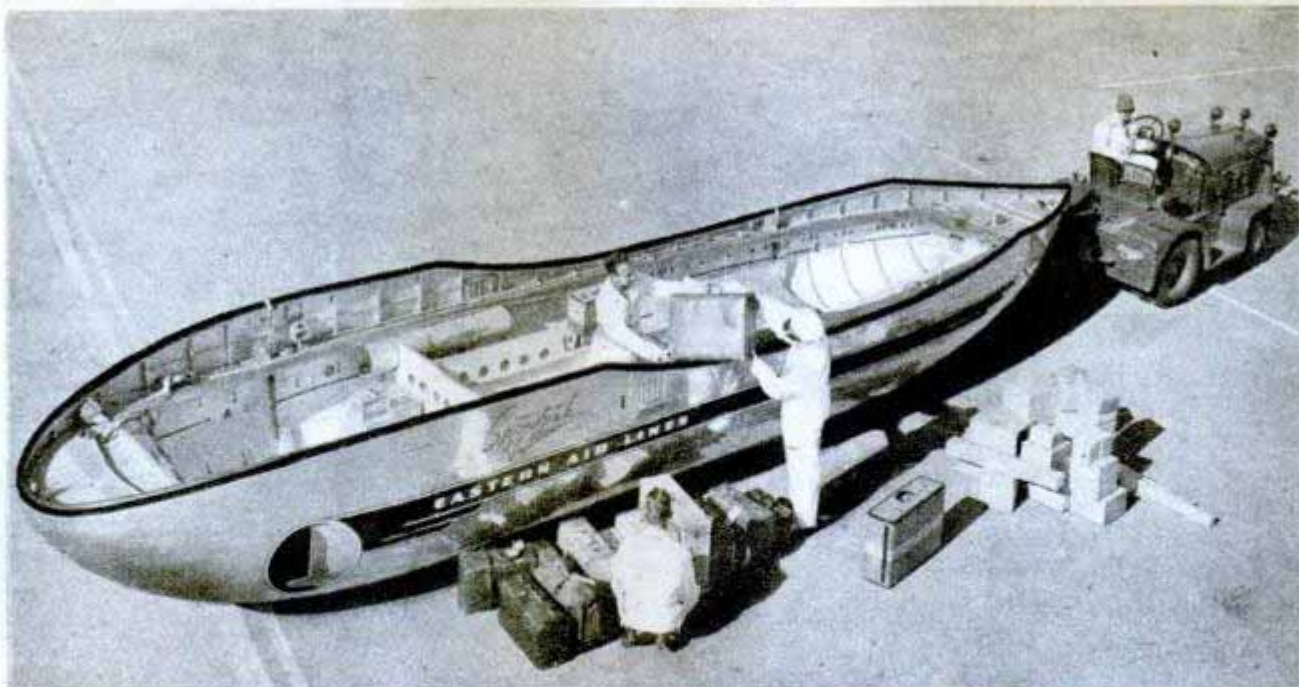


PAPER TOWELS

CONCEALED FLUORESCENT LAMPS

FIGURES CUT FROM WALLPAPER AND COVERED BY PLATE GLASS

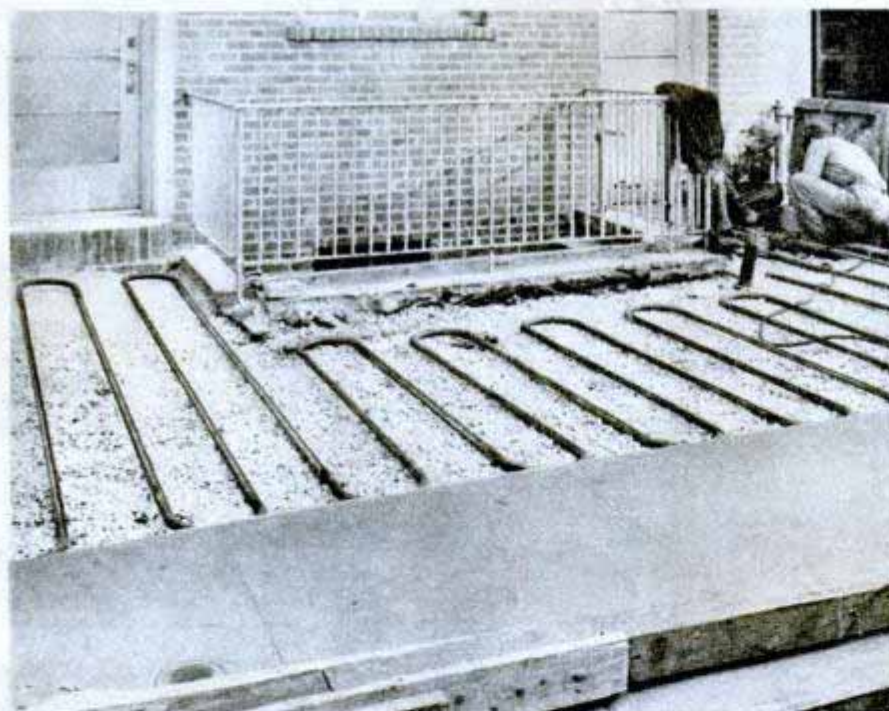
ELECTRIC DISHWASHER



Eastern Air Lines photo

Cargo "canoe," a metal container that fastens to the belly of a transport plane, permits rapid handling of air travelers' baggage. The container is 33 feet long, seven feet wide, three feet deep and weighs 1700 pounds empty. Its 400 cubic feet of space can be packed with about 8000 pounds of cargo. A built-in electric hoist raises and

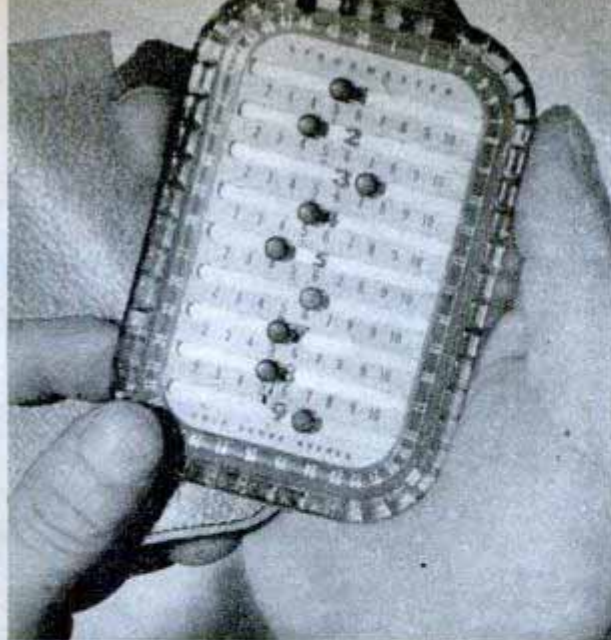
lowers the wheeled container. All of the compartments designed for intermediate stops can be removed and replaced as a unit. Single pieces of baggage can be loaded or unloaded en route through a small door. The units have their own heating and fire protection systems which can be connected to indicators in the pilot's cockpit.



Heated sidewalk under construction in front of a New York apartment building will eliminate snow shoveling. Hot water, with a quantity of antifreeze added, will be forced through a melting system of wrought-iron pipe coils embedded in the concrete. This will keep the temperature above freezing and the walk clear of ice and snow. The pipe, laid in a bed of gravel beneath the sidewalk, is set in strips about a foot apart to cover the entire area in front of the remodeled apartment building.



Wood sweller, a liquid which causes wood fibers to expand, quickly tightens loose chair legs, tool handles or stair treads. Applied either with an eye dropper or dauber, the liquid is said to effect a firm and lasting fit in 15 minutes. It is not a glue but a complex chemical solution which penetrates the wood and causes joints to swell tight. The new liquid has greater lasting powers than brittle glue, according to the manufacturer.



GOLF SCOREKEEPER'S movable buttons tabulate strokes for each hole and for course



PRESSURE CHAMBER, designed on doctor's orders for Winston Churchill's flights, has a couch, telephone, ash tray, shelf



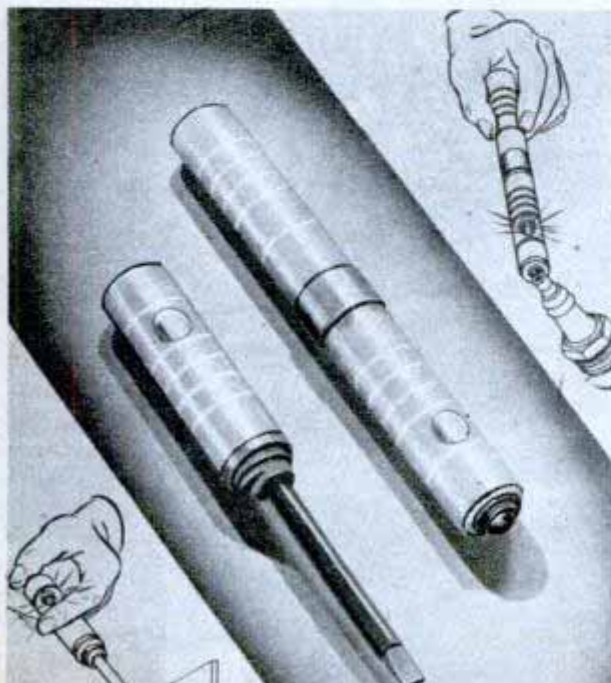
PLASTIC PUTTER resists changes in moisture and temperature. The club has a steel shaft



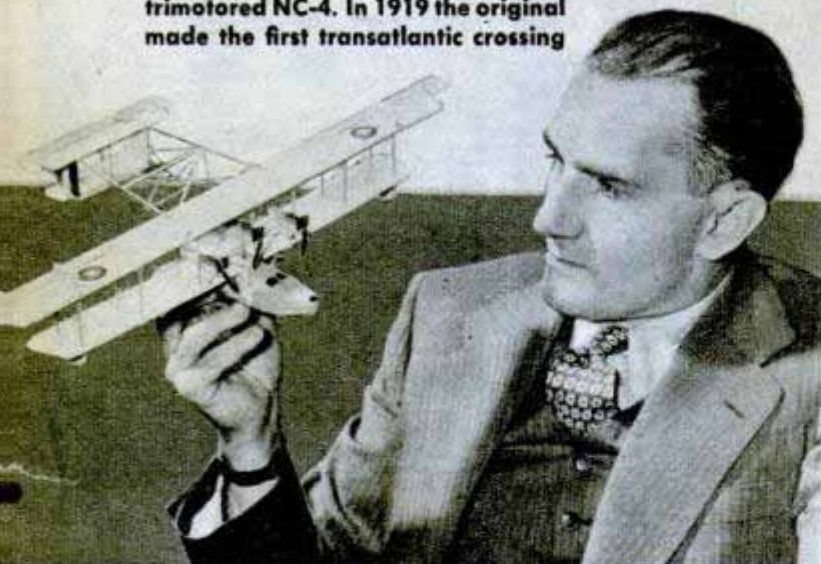
HOME AIR CLEANER picks up 85 percent of dust entering house. Dust is electrically charged, then attracted to metal plate

CURRENT TESTER has neon bulb that glows, indicating current flow or a good spark plug

HYDRAULIC JACK fastens to bumper, can be installed without stooping. Handle is on top and requires only slight pressure



Kettering holds model of the Navy's trimotored NC-4. In 1919 the original made the first transatlantic crossing



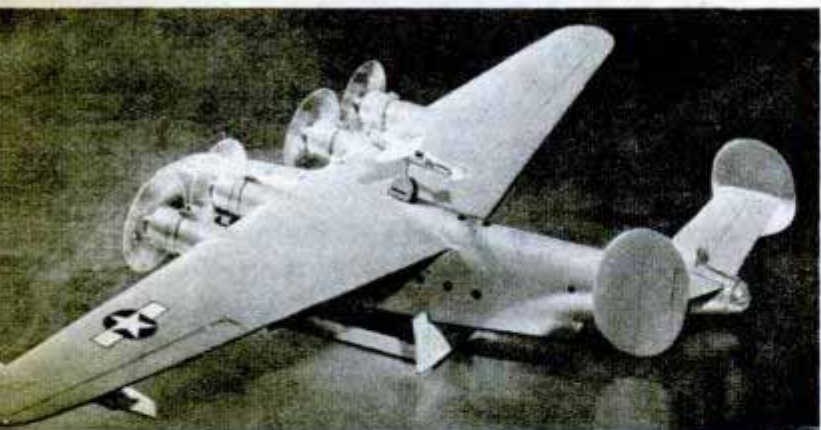
HOBBYIST OF THE MONTH

Eugene W. Kettering

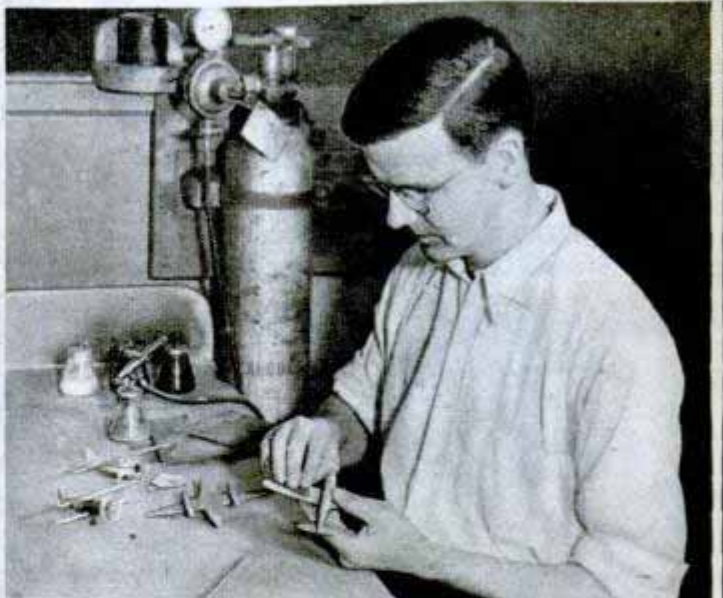
GENE KETTERING'S business is designing powerful Diesel locomotives. But after office hours his interest wings homeward to his pride and joy, the world's largest collection of model airplanes.

Built to an exact scale of four millimeters to a foot, an ever-growing array of over 450 models fills lighted wall cabinets in the library of his Hinsdale, Ill., home. All are made of balsa wood, the largest weighing almost four ounces and having a wing span of 32 inches. The smallest tips the scale under a quarter of an ounce and spans less than an inch.

Beginning with a Wright brothers' mod-



Each built to scale, the winner of the 1937 Thompson Trophy race perches atop the Martin Mars. Below, the collector touches up blister on a modern flying boat



In front of modelmaker Chaffee, sanding Jap "Tony," are an ME-262, Stinson and PT-13. Below, Wright plane on Mars wing was speed champ—at 50 m.p.h.!





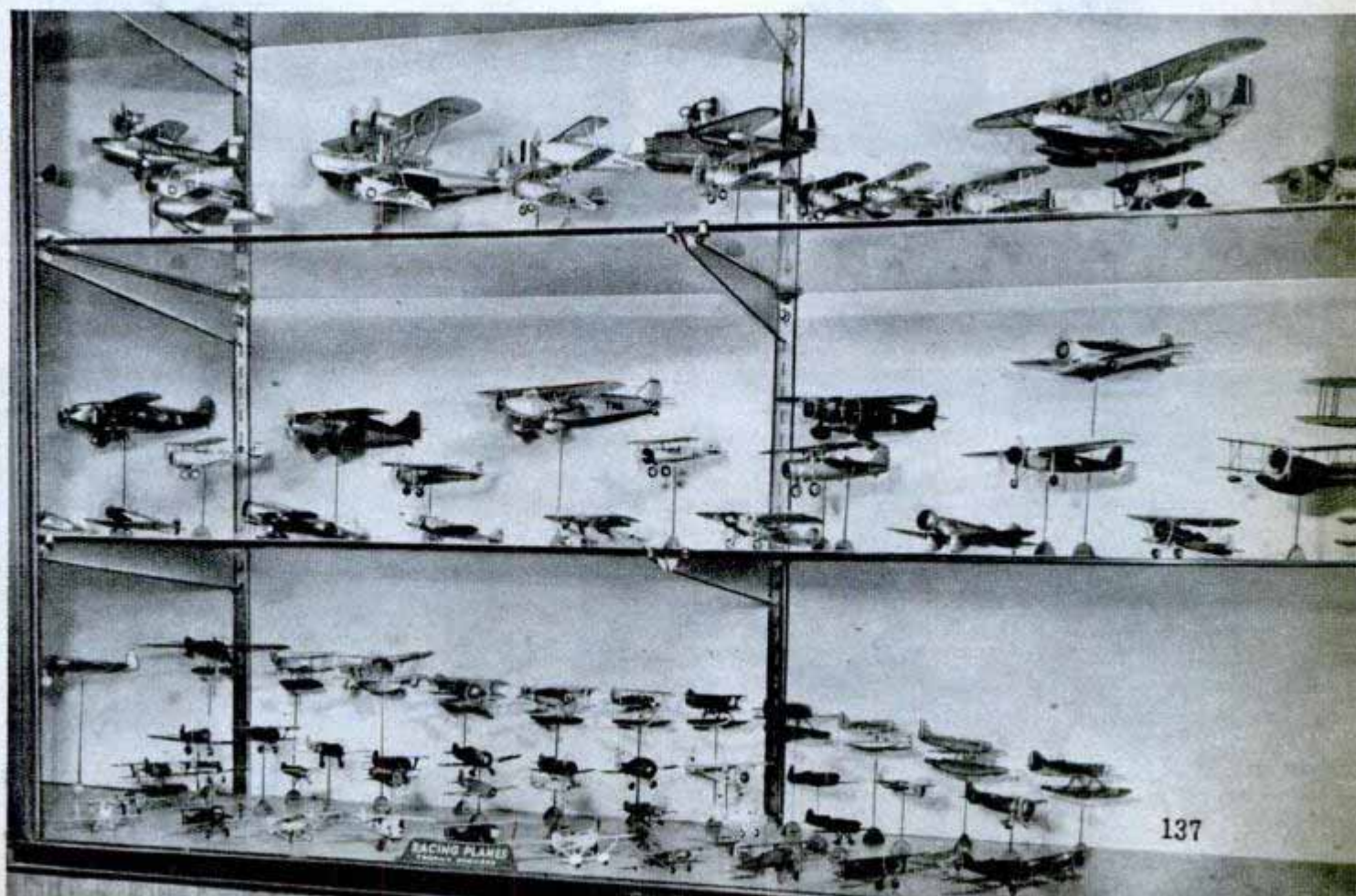
Enough planes for a small air force fill specially built and lighted cabinets along walls of the collector's library

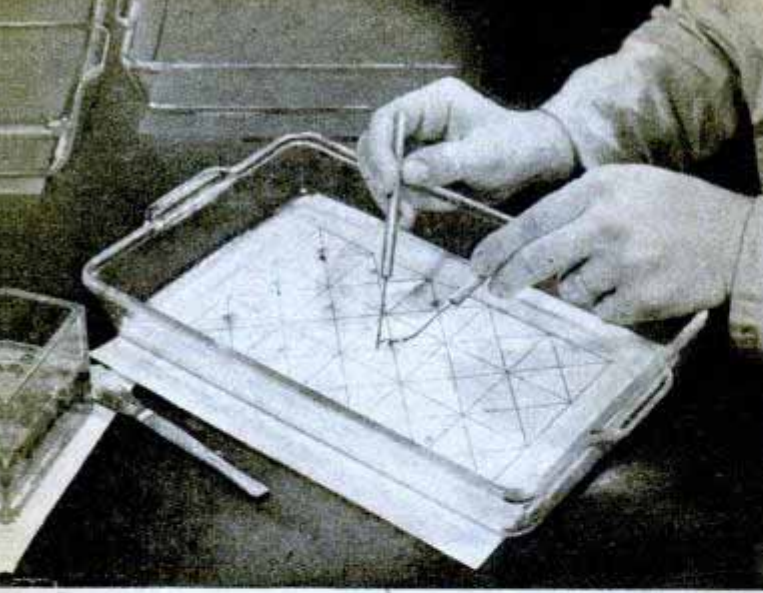
el, the collection is a visual history of aviation. Among its divisions are commercial, Army, Navy, foreign and racing planes, gliders and ships participating in famous flights, such as the Spirit of St. Louis and the Winnie Mae. On display are the winners in such notable speed classics, past and present, as the Bennett, Pulitzer, Bendix, Thompson and Schneider Trophy races. And running your eye along one of the shelves you can quickly trace the evolution of warplanes from the early crates to today's sleek speedsters.

Every detail is perfect, even to guy wires and the supercharger on a Liberty engine. They're painted their actual colors with regular aircraft pigmented dope, using an artist's airbrush, after the priming filler coat has been carefully sanded. Blisters and canopies are made by heating celluloid and pulling it over a form while still in a plastic state. A tiny, lifelike figure of Orville Wright at the controls of an early ship is carved out of soap.

Like many hobbyists, Kettering isn't
(Continued to page 260)

On the lowest shelf are winners of famous trophy races. Just above are early-day air liners and mail planes





Biological specimens are preserved in plastic blocks. Above, placing chick embryos on layer of plastic



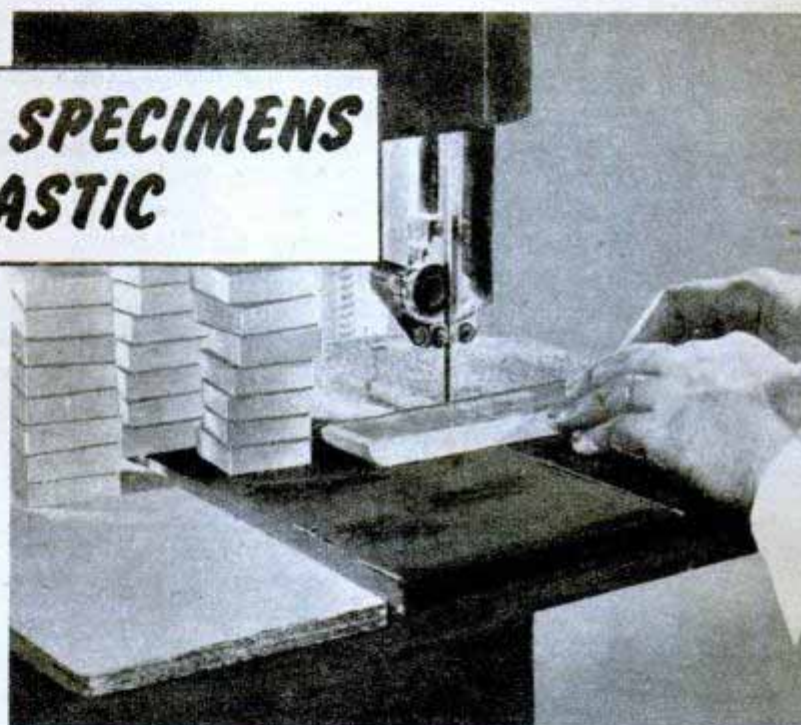
Next step in the process, developed by Ward's Natural Science Establishment, is adding a second layer of plastic



MOUNTING SPECIMENS in PLASTIC

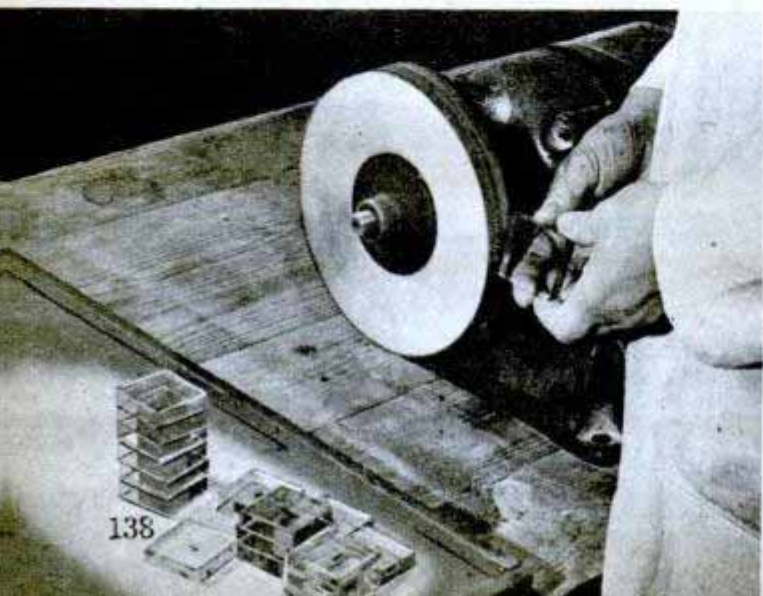
When dishes of plastic have "jelled," they are placed in oven for heat curing. Heat starts at 100 degrees Fahrenheit and goes up to 250 degrees

Final polishing is performed with high-speed buffer to prepare specimens for lab use or classes



Following heat treatment, cakes of plastic are sawed into blocks. Each block contains one specimen as a result of installing them in accordance with block pattern

Plastic mounting for the delicate embryo of a pig is compared with a glass microscope slide mounting (top)



THEY TAILOR THEIR OWN CARS

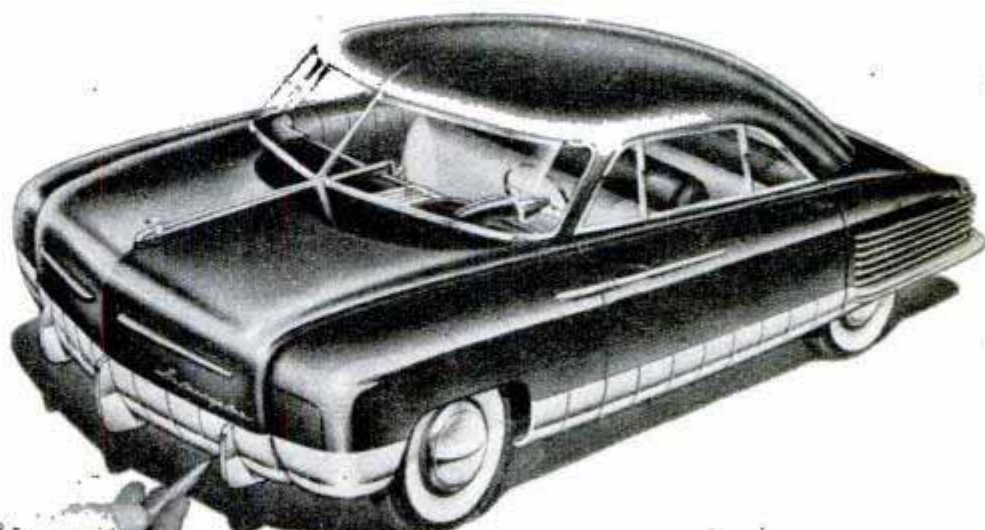
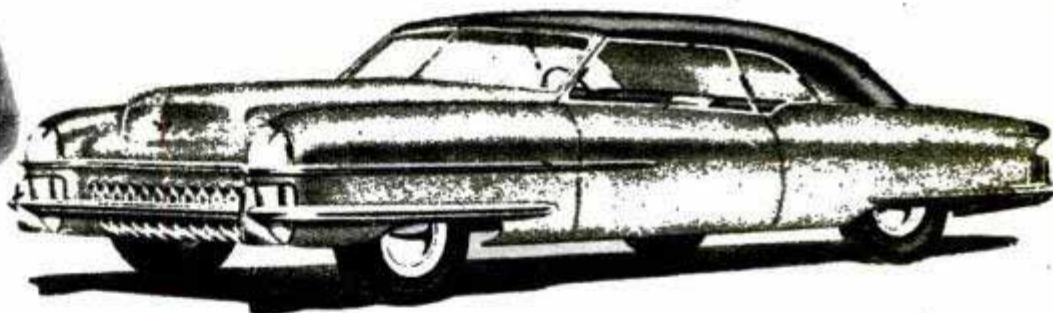
By Thomas E. Stimson, Jr.

EVER hear of the Kurtis car? Or the Summers automobile? Or the Smith or the Jones or the Brown makes? These and hundreds of others, each one different, are rolling along the highways today.

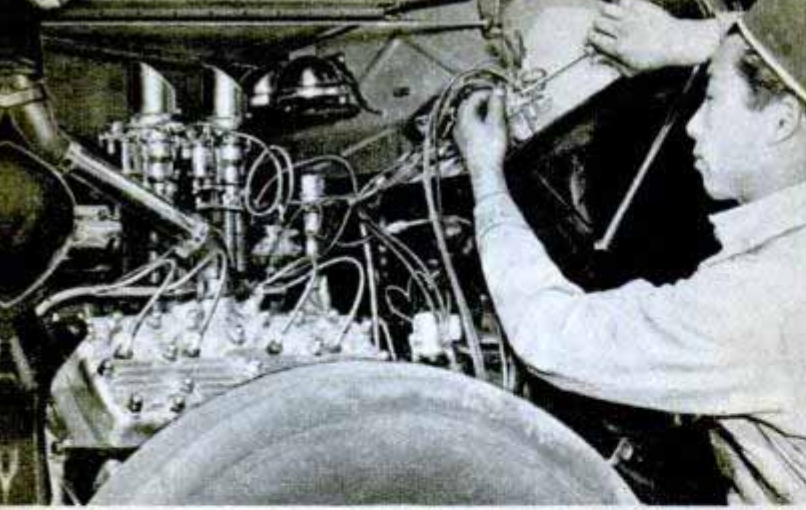
The Summers is a low-slung convertible engineered for roadability and ease of handling. Its taillights and rear license plate are built into the rear bumper. The luggage compartment has no handle and is unlatched from inside the car.

A typical Smith coupe has a high-powered engine, a one-piece body, and no locks or handles on its doors. The owner opens a door by pressing a foot lever concealed beneath the body.

The Jones may be a convertible with a low windshield and a semisolid cloth top that is removed from the car as a unit in good weather. The car has no dashboard and its instruments are grouped on a small panel in front of the steering wheel. Its



Industrial designer steps up auto styling. Rhys Miller works on a car with flush bumpers and a rear engine. Note "pontoon" fenders of top design



Proud owner has eliminated chrome from exterior but chrome-plated almost every part of his smooth engine



↑ Cloth is tacked to welded frame to complete a hand-tailored convertible top that will eliminate drafts

↓ Frame for semipermanent top is fitted to a cut-down car. Covered with cloth, it can be removed as a unit



rear license plate is mounted inside the body and is visible through a glass window.

All of these, actually, are stock cars that have been modified by their owners. Dissatisfied with the "peas in a pod" appearance of their cars or the conventional power plants, many owners redesign their factory-built automobiles. New cars as well as jalopies eight or ten years old are reworked. Some owners spend several times the original cost of the car for custom work by specialists. Others do much of it in their own garages in spare time.

Most of the modified cars are several inches lower than the stock models and have practically no chrome brightwork or gingerbread. Usually the engine has a high-compression head to deliver more power and is fitted with special mufflers. Often the entire engine is chrome-plated. Most owners are so proud of their tailored cars that they keep even the engine compartments meticulously clean.

Large chrome "ripple disk" hub caps and a chromed radiator grille are the only brightwork that most owners want. Chrome molding strips and other ornamentation are removed and the holes and slots by which they were attached to the body are filled in with body solder or welding metal. This spot work is filed smooth and painted.

The smooth streamlining of aircraft is simulated by filling in the sharp angles where fender and body lines meet. The fabric beading that serves to prevent fender squeaks is removed and the whole angle filled with body solder or welding metal.



Finished Summers car has been lowered 8½ inches, running boards removed, and new radiator grille installed

↓ Instruments are grouped at left of wood-paneled dash

Solder is easier to use but is more apt to work loose. Welding does the best job though the high heat of the operation usually ripples the body metal. These bumps must be hammered out. The whole fillet of added metal is filed to a smooth curve. The changes are concealed under a new coat of paint and the car has the rich appearance of a custom-built automobile.

Some owners alter the appearance of front ends by installing a radiator from another make of car or by designing their own. They cut or reshape the nose of the body to fit the new grille.

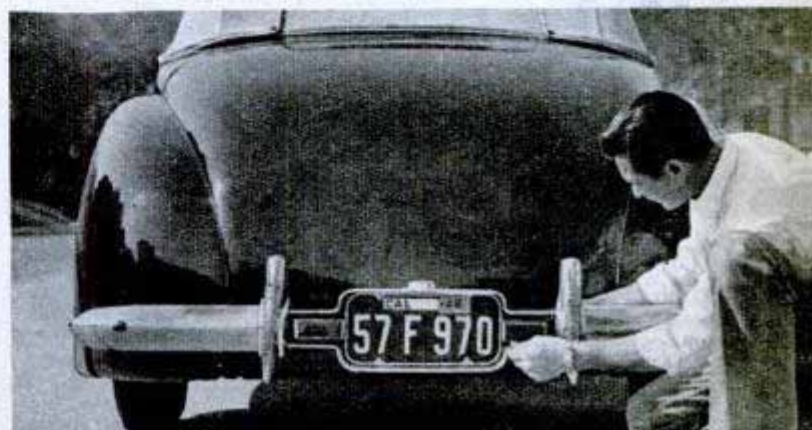
Special tools are needed for much of this work and few owners have the skill to do a good job. A new shape of fender, for example, must be hammered out, using a large leather-covered sandbag as an anvil. The hammer dents then are beaten out with a high-speed pneumatic hammer and the final imperfections are filed smooth. The finished fender looks as perfect as if it had been stamped out by a huge press.

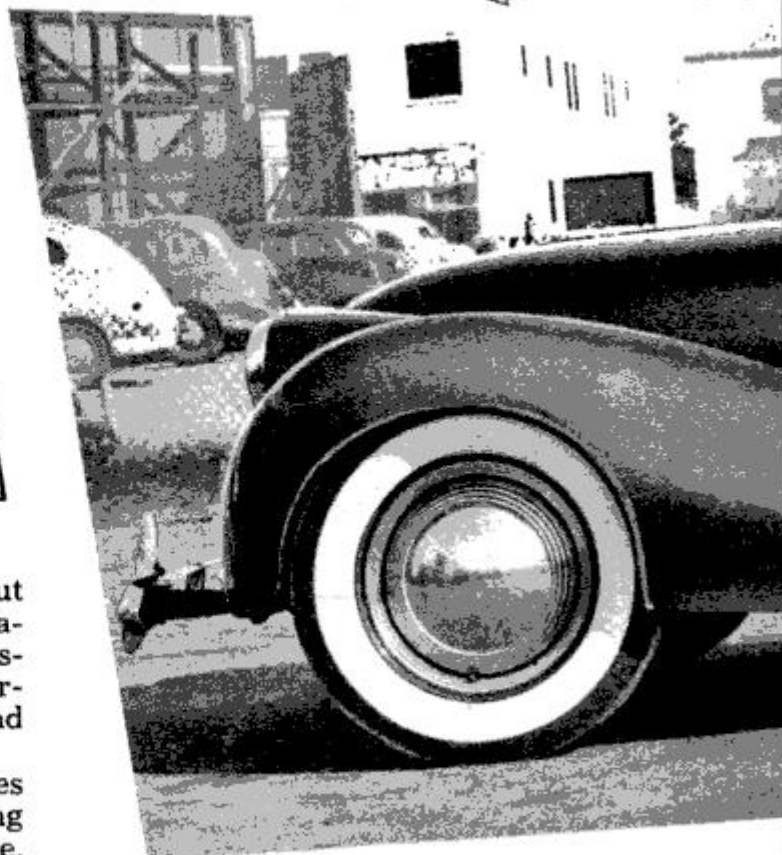
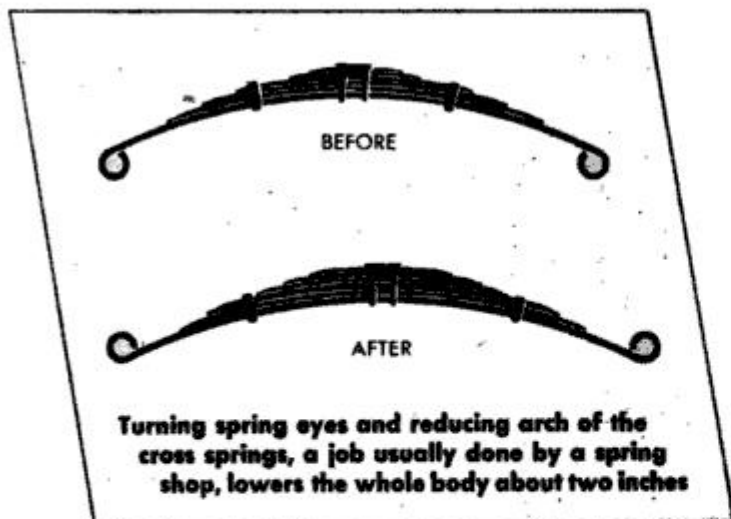
Numerous small shops specialize in different kinds of work. In southern California where modified bodies are an expensive fad, engine shops, top shops, spring shops and body shops have more work than they can handle. Changes sometimes total a thousand dollars or more per car.

Jimmy Summers of Hollywood special-



↓ Jimmy Summers' restyled 1940 Mercury has special bumper holding license, flanked by tail and stop lights





izes in custom work, hand-tailoring about one car per week to an owner's specifications. Many of the orders come from customers who have seen his redesigned personal car, which has been inspected and praised by Detroit factory officials.

The car, a 1940 Mercury, is 8½ inches lower than it was when he started working on it, yet it has standard headroom inside. It hugs the road like a heavy car and is easy to handle in traffic. The car is valued and insured at \$6200.

Summers lowered the entire body six inches on its frame but left the fenders at their original height, reshaping them to fit the altered body. He built a special radiator grille and redesigned the front end to fit it. The running boards were removed, the hood latch placed inside, and the handle of the luggage compartment door taken off. A control unlatches the door from the driver's seat. Front and rear bumpers were built from his own designs. The height of the windshield was reduced 2½ inches and a special semipermanent Carson top was installed. Instruments are grouped in front of the steering wheel and the balance of the dashboard is paneled in wood. The top is

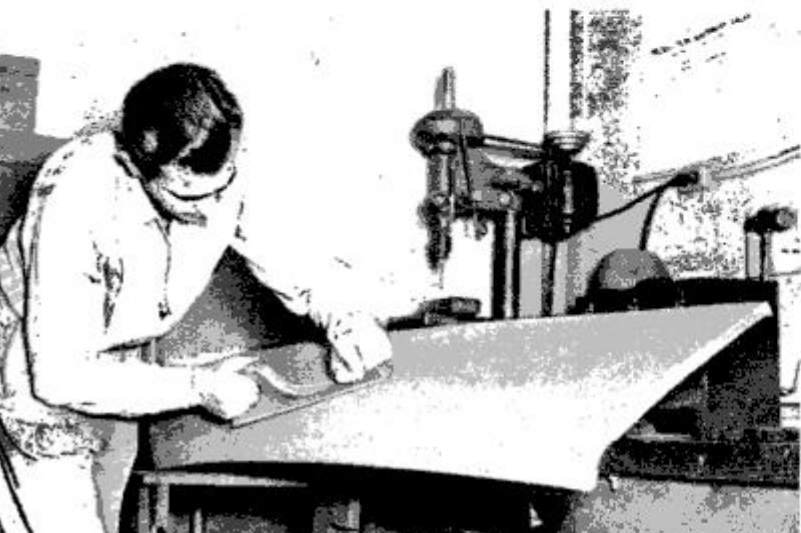
finished inside with dark broadcloth and the seats covered with top-grain steerhide.

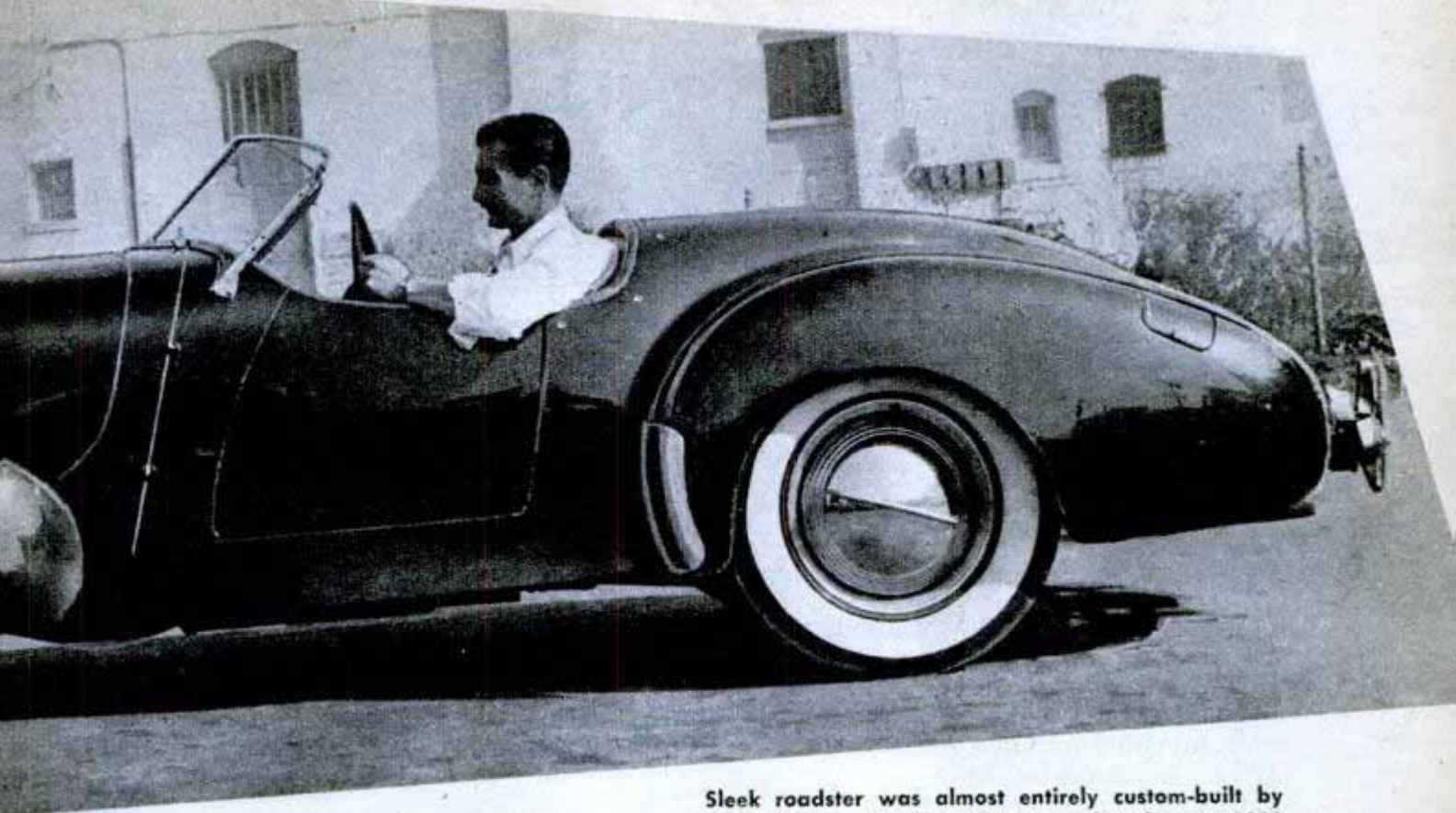
The paint job consists of 60 separate coats of maroon lacquer sprayed on one after the other. Then the finish was sanded with extra-fine sandpaper and a final coat of lacquer thinned out 80 percent sprayed on. This was rubbed down with a fine cleaner, burnished with a dry sheepskin mounted on a high-speed power disk, and waxed.

Designing brand-new bodies as well as modification of existing bodies is quite a hobby in itself. Rex Burnette, a young Douglas aircraft engineer, designed a bubble top roadster which a couple of his friends are building. He's now finishing plans for a rear-engine station wagon that

Sheet metal shaped into a special panel to add to the length of a fender is smoothed with a file

Unfinished panel is tested for size on the car, a Chevrolet, before the final rounding, cutting and painting





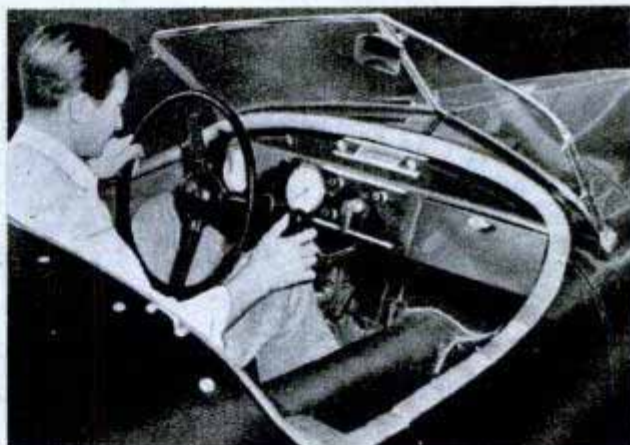
Sleek roadster was almost entirely custom-built by Frank Kurtis. Only the fenders, taken from a 1939 Chevrolet, and the engine were remade from old parts

features a forward storage compartment covered with wood paneling, air intakes built into the leading edges of the rear fenders for carburetor and cooling air, and a single horizontal high-intensity fluorescent tube headlight across the front of the car. Some of his other designs stress low radiator grilles that extend across the front of the car, plus semicircular lounge-type rear seats built to fit the curve of the body.

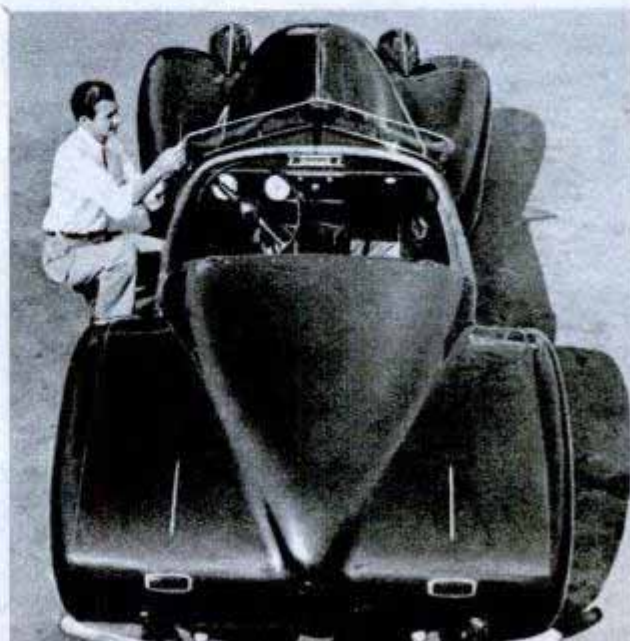
Rhys Miller, young Hollywood industrial engineer, has plans for a light 100-inch wheel base two-door car that has many attractive features, including a rear engine, flush-type bumpers mounted independent of the body, a curved windshield and extra-

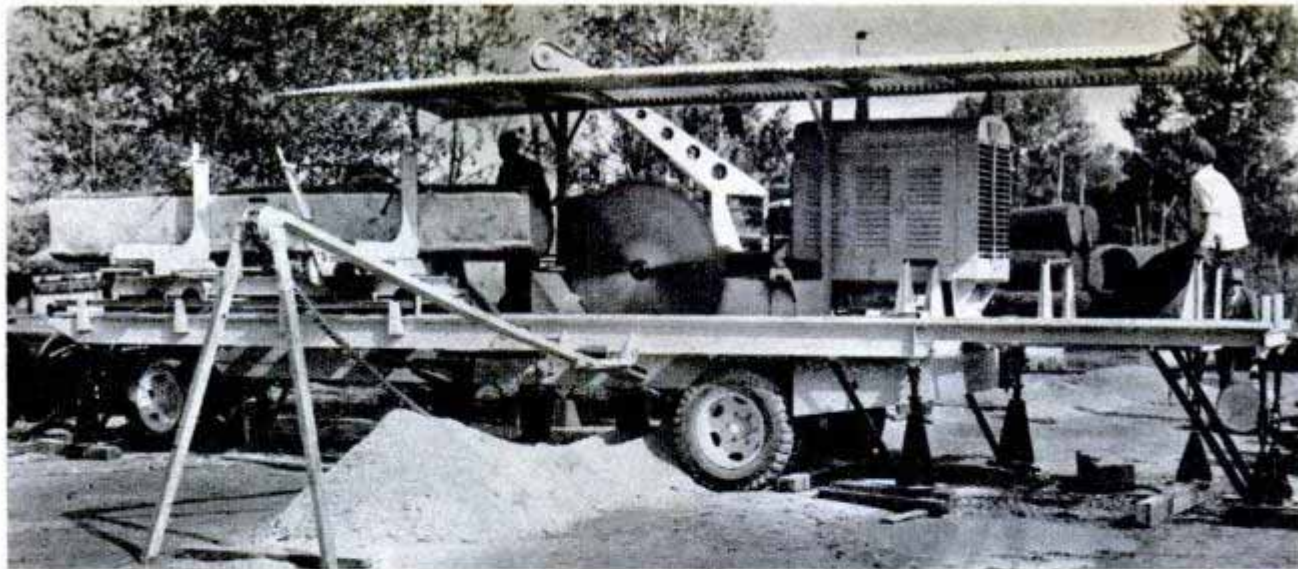
(Continued to page 240)

Electric jack that formerly raised top of a convertible is installed in luggage compartment to lift lid



Gearshift lever runs straight through the dashboard
 ↓ Altered fenders of the roadster give it a racy appearance. The car is powered by a Mercury engine





Folding Sawmill Rides Trailer

Waste timber and small stands of wood can be cut profitably by a mobile sawmill that "folds" into a compact unit when it is moved from one site to another. The mobile mill, invented by Glen Johnson of Tenino, Wash., is supported by a sturdy 28-foot trailer mounted on six tires. At the site it unfolds to a length of 36 feet and is steadied by 11 screw-type platform jacks. A chain-driven sawdust conveyer pivots out from one side while another conveyer unfolds from the opposite side to carry the logs to the trailer and hoist them into position. The 60-inch blade, driven by a six-cylinder Diesel engine, handles logs 16 feet long and

30 inches in diameter. The inventor claims the mill will turn out about 14,000 board feet of lumber a day, opening to loggers vast areas of lumber that are now wasted. Eight of the mills are already in operation by ten-man crews, which include loggers and haulers.



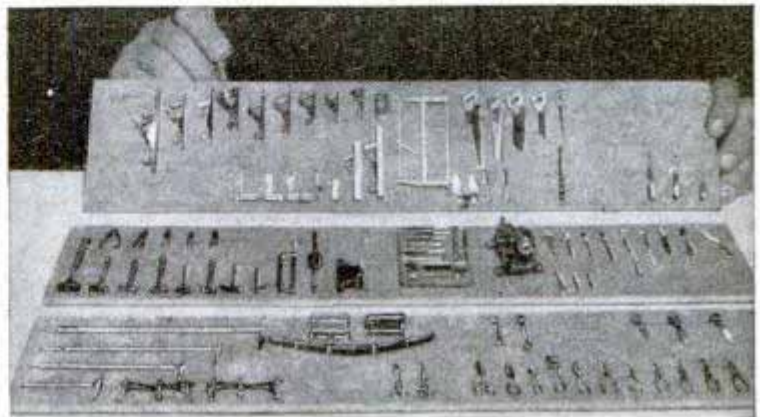
Rubber boat designed for the special needs of sportsmen is stable enough to permit a fisherman to stand up while casting. Four separate air compartments and an inflated bottom insure buoyancy. It can be propelled by oars or a two-horsepower outboard motor. The motor fits a rigid wooden mount attached to the aft air cell. All sections are made of tan cord canvas, double coated with Neoprene and vulcanized together. If a leak develops, it can be repaired by a hot or cold patch. The boat comes equipped with two wooden seats, two telescoping aluminum oars, an aluminum air pump and a canvas carrying case.

Planes 12 miles away were spotted by the Germans during the war with special infra-red-ray equipment that detected the heat from engine exhausts.

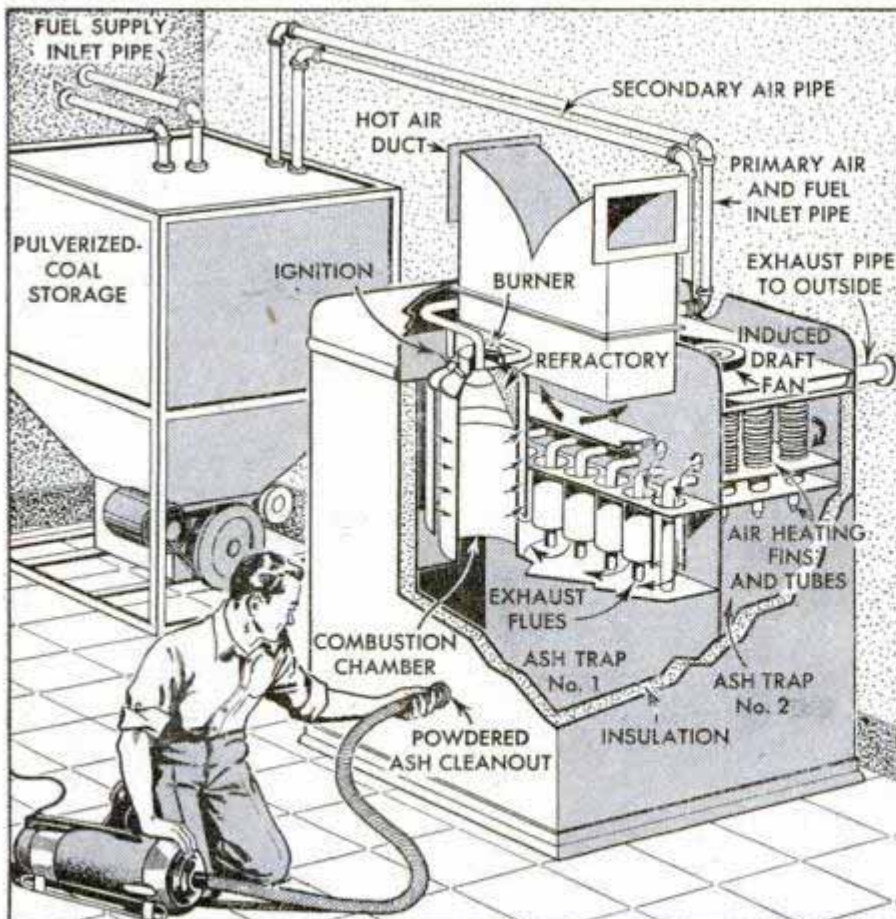


Hobbyist's Tiny Guns Shoot Blanks

Midget guns that shoot and carpenter's tools that cut wood are built to scale by Jose Tristhan of Mexico City. He uses a jeweler's lathe to turn out the parts. The miniatures are one eighth actual size and are finished to a .001-inch tolerance without the aid of a magnifying glass. Most of Tristhan's little guns fire tiny blank cartridges that he furnishes with the weapons. The smallest of the guns, 1 1/8-inch-long, watch-charm miniatures of Army service revolvers, can't be fired but their cylinders rotate and they can be taken apart. Tristhan's monkey wrenches have ivory handles and tiny thread adjustments. Among the other working models in his 15 sets of miniatures are barber's scissors and hair clippers, butcher's implements, shoe-



maker's tools and plumber's kits which include miniature blowtorches that throw pencil-point flames.



Down-Fired Heater Burns Powder Coal

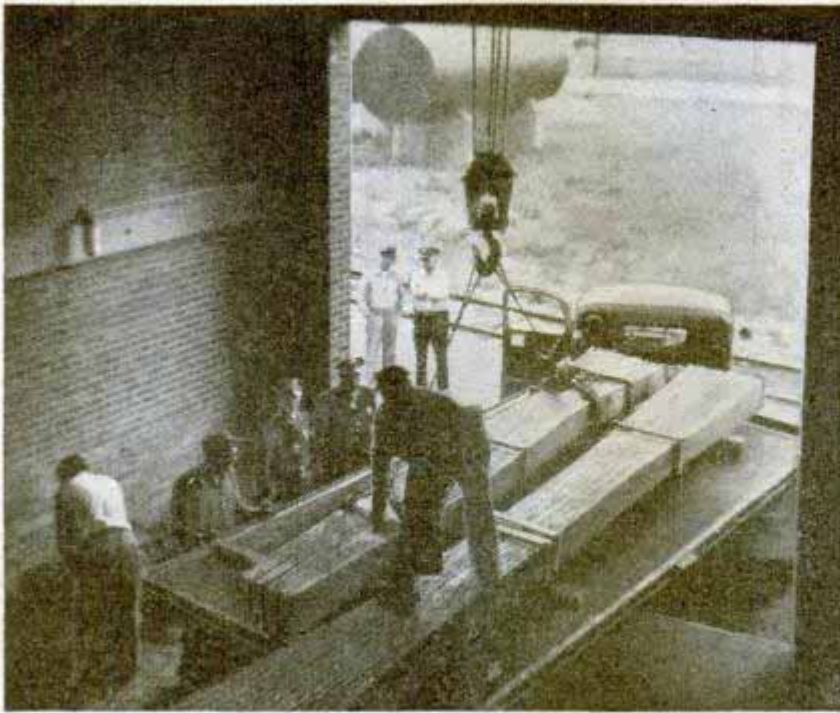
Built for low-cost operation, an automatic home furnace burns pulverized coal piped into a basement hopper like fuel oil. The furnace is a vertical sheet-metal cylinder lined with fire-resistant material. It is down-fired from a top-mounted burner after ignition by a gas pilot and spark plug. A screw conveyer at the bottom of the hopper moves the powdered coal to a blower for carburetion with the air going to the burner. The fire chamber gets added combustion air through a small take-off line from the blower. About 90 percent of the fly ash is separated from the flue gases and dropped in a trap, where it can be removed.

SILVER SHEDS THE OVERALLS

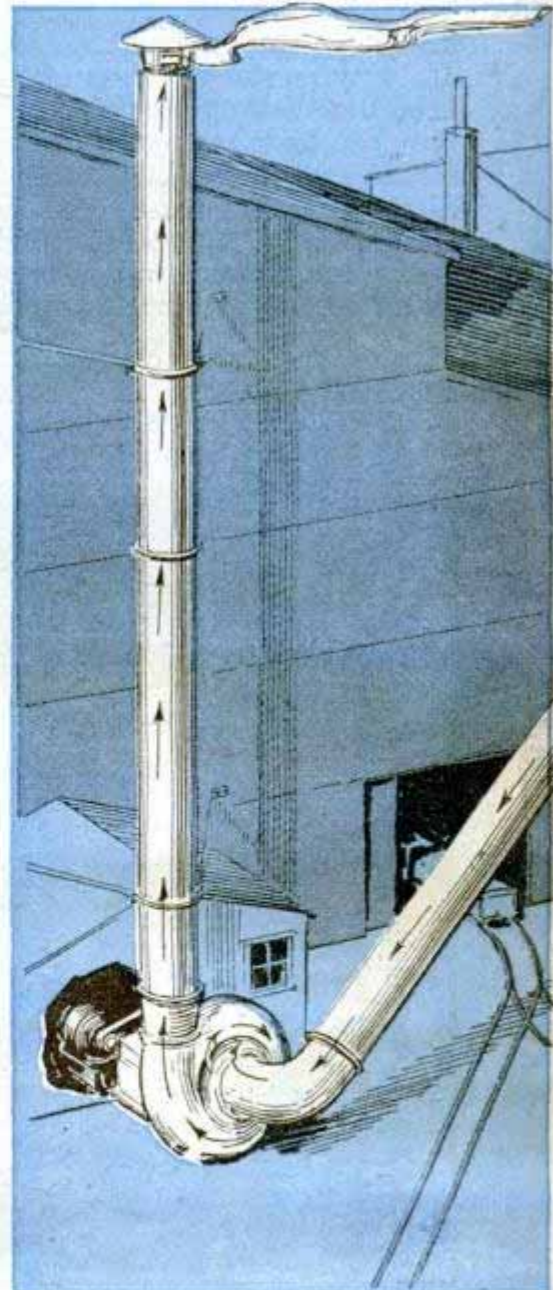
By John W. Snyder
Secretary of the Treasury

THE NATION'S silver resources are not diverted to bus bar manufacture, as a rule. Silver is more familiar as the raw material for coins, knives and forks, candlesticks and compotes, or as an occupant of treasury vaults. Bus bars normally are made from less aristocratic stuff.

It should be recorded, then, that half a billion dollars' worth of silver, enough to load 300 freight cars, is returning to the treasury from a tour of wartime bus bar



Silver bus bars head back to U. S. Treasury after wartime use in power lines at Marysville, Mich., magnesium plant. Below, after being cut into small bars the silver is returned to the West Point depository



duty. The duty was discharged in Reconstruction Finance Corporation war plants engaged in producing light metals such as aluminum and magnesium.

It was "free" silver, meaning that it had no immediate monetary responsibilities, when the treasury first released it for the bus bar assignment. But through a complexity of war exigencies and altered legal distinctions, most of it came to be "monetized" silver before the assignment was ended. This meant that for a time the silver was doing two jobs at once—serving the nation's needs on the war production front, while also serving as security for a lot of outstanding United States currency.

Bus bars are slabs of metal used as heavy-duty conductors of electricity. The slabs are built into lines in and around industrial plants which use large amounts of electrical current. Silver bus bars installed in 13 RFC war plants conveyed enough

electricity to light New York City for years.

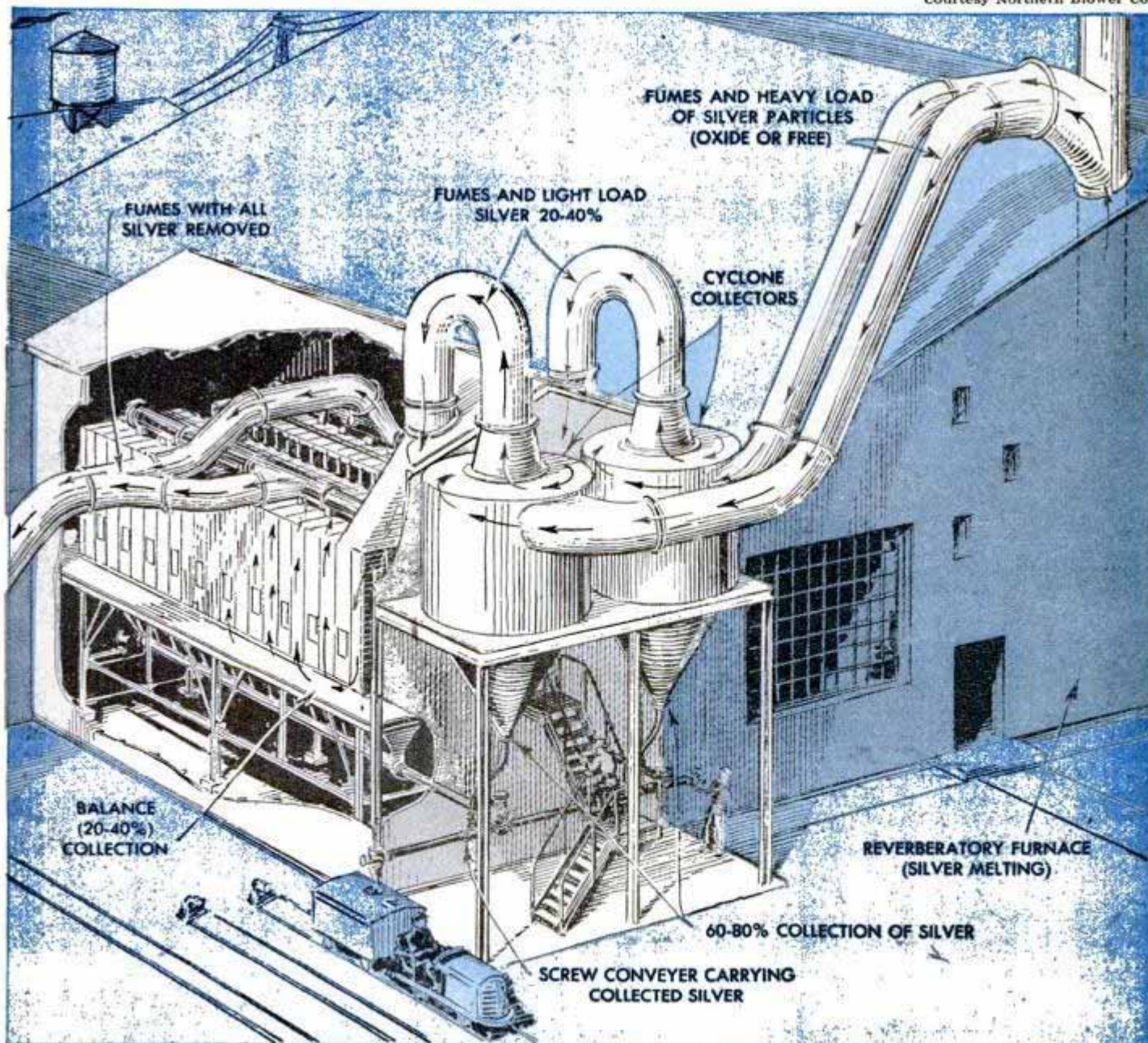
The electrical current did no damage to the silver. The properties of silver are such that it gets along with electricity very well. The metal suffered somewhat in other ways, however. A hundred pounds of silver melted from a bus bar line in the aluminum plant near Spokane, Wash., when a molten mixture of aluminum oxide and cryolite overflowed from an electrolytic pot which the bus bar encircled. When the mess cooled, all but half a pound of the silver was recovered.

The silver bus bars helped produce much more magnesium and aluminum than ever had been produced in this country before. Upon this production our wartime air power was built, for the light metals went primarily into airplane construction.

The National Research Council, the War Production Board and the RFC were interested in saving copper, the material from

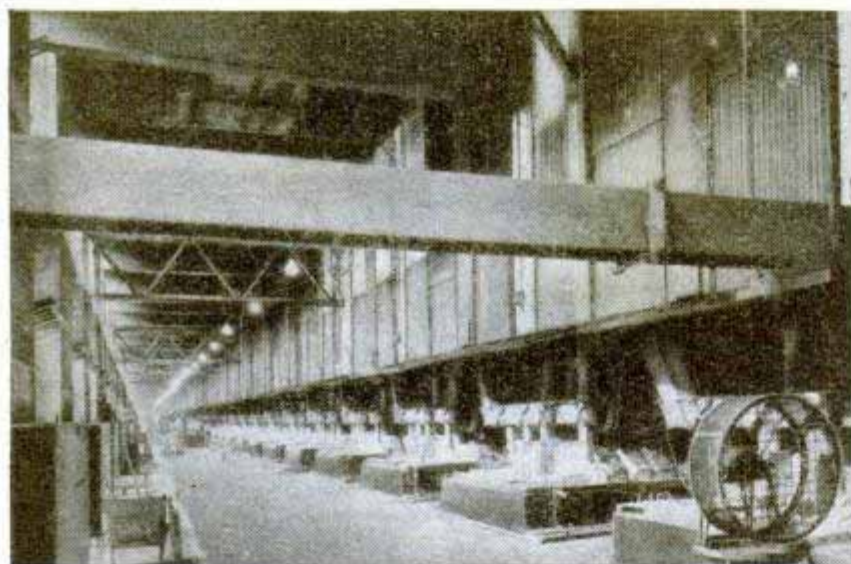
Special equipment recovered silver worth \$250,000 from fumes at New Jersey refinery which processed bus bars

Courtesy Northern Blower Co.





At Basic Magnesium Plant, Las Vegas, Nev., bus bars (background) connect to electrolytic cells (foreground) where magnesium was "cooked"



A lot of dimes could be made from this nine by nine-inch silver bus bar which served a Marysville, Mich., magnesium plant. Below, in a New York warehouse, officers guard 5000 tons of cut-up silver bus bars



which bus bars usually are made. Copper was scarce and getting scarcer in 1941 and 1942, when the RFC aluminum and magnesium plants were being built. Dr. Zay Jeffries, metals expert, reported to the National Research Council on September 6, 1941, that the electrical conductivity of silver is similar to that of copper. He noted that the government had a lot of silver in storage, that silver bus bar installations in war plants would be reasonably safe "because the lines would nearly always be hot," and asked: "May not the government's excess silver as well be working to conduct useful electricity as lying idle in a vault?"

Negotiations between the RFC's Defense Plant Corporation and the treasury began early in 1942, and an agreement by the treasury to lend the corporation up to a billion fine ounces of silver was signed May 6, 1942. To whatever extent silver was used in the war plants, an equivalent amount of copper was released for other vital wartime requirements.

Silver deliveries to 13 war plants in 11 states totaled 474,194,634 fine troy ounces, or about 16,300 tons. The treasury charged nothing for its use; the RFC agreed to return it within five years, a provision later amended to read "within six months after the formal ending of hostilities."

It was evident at the start of the project that guarding the silver would constitute a many-sided problem. The Army first was asked to take over the guarding responsibility, but it declined, and the RFC then formed its own guard units.

The silver was in commercial bars weighing about 1000 troy ounces each as it was turned over to the RFC at the West Point depository. Since these were not large enough for bus bar rolling operations, the bars were

(Continued to page 252)

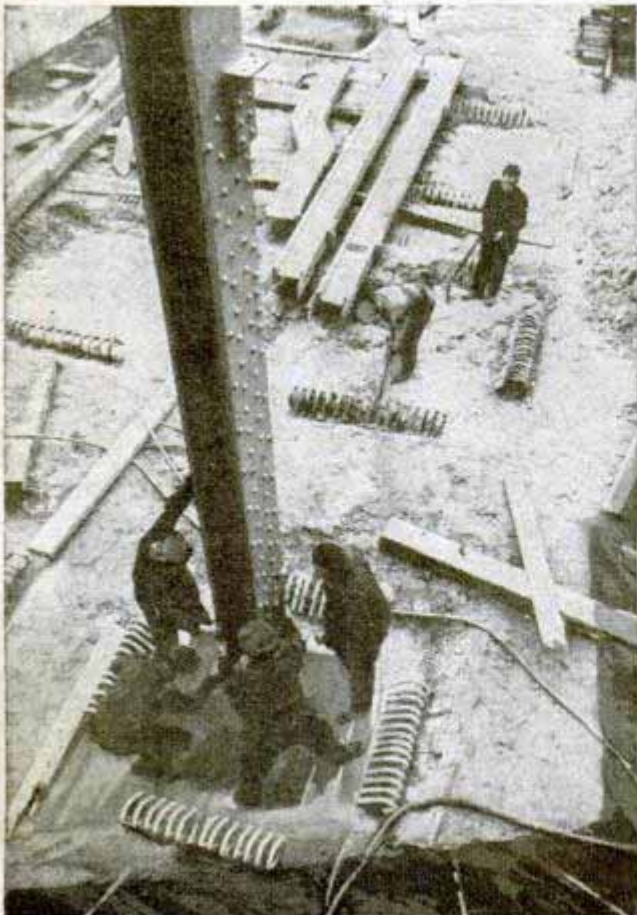


SUPERPIPE, a gift to Richard Kartheiser of Milwaukee, has whistle, fire extinguisher, a filter coil, ashpit door and a drain with a tiny bucket on the bottom



STOVEPIPES are made from German artillery and anti-aircraft shells by Wilhelm Kersten, a blacksmith who converts Nazi war scrap into essential products

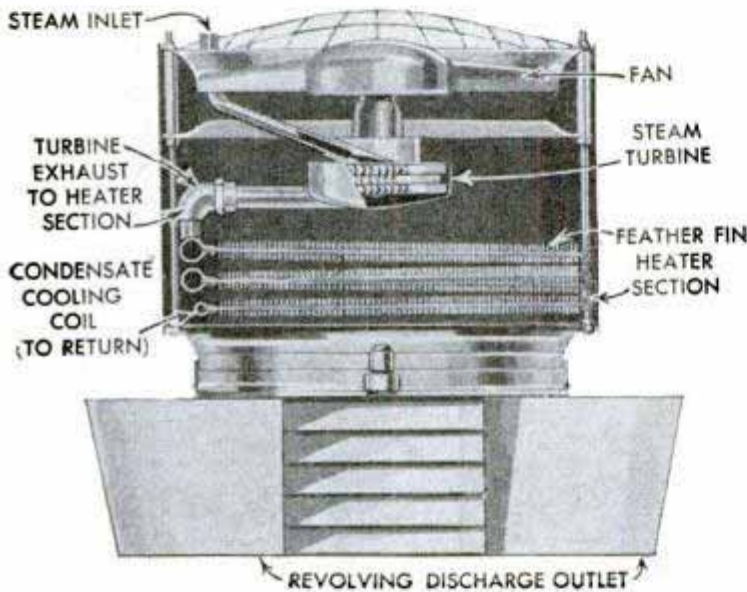
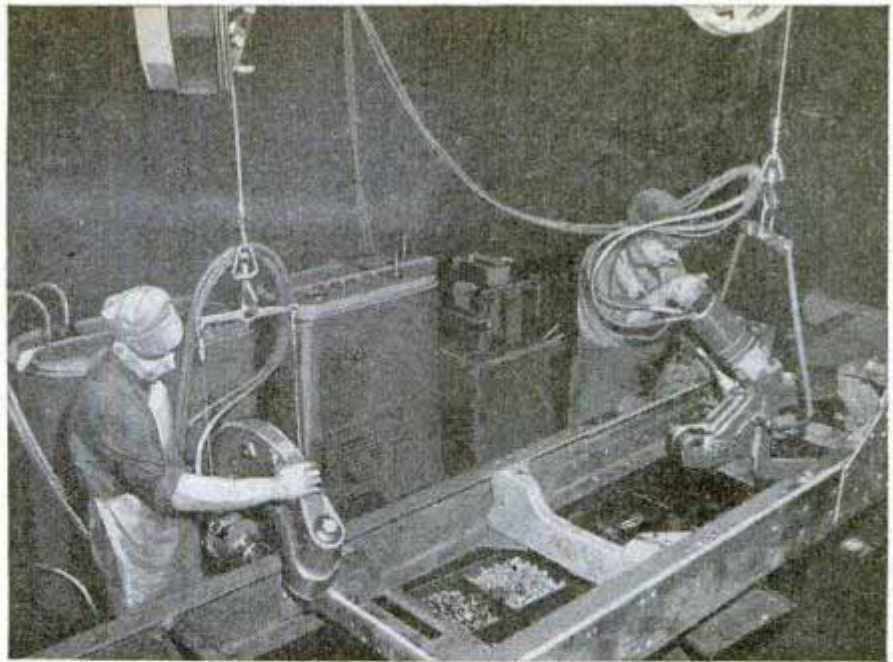
STEEL COLUMNS of England's new House of Commons rise on "bloom base" resting on concrete raft built in 1840 to support old House, destroyed by bombs



PORTABLE TELEPHONE for Pennsylvania Railroad picks up messages 15 miles away, receiving through air by induction with tracks as communication channels

Rivets Are Spread By 'Fluid' Hammer

When a rubber riveting hammer smashes a cold steel rivet there isn't any noise but the rivet is flattened just the same. Hydraulic fluid, encased in a synthetic rubber hose, does the job. The hose carries fluid under enough pressure to flatten a rivet with one stroke. The riveter looks like a huge C-clamp which slips over the parts to be joined. It is used in factories where the work can be carried to the big machine.



Heating Unit Uses Turbine To Turn Forced-Air Fan

Power for turning the fan in a new forced-air heating unit is supplied by a miniature steam turbine that is connected with the steam heating pipe. The unit, requiring no electric power, is designed for ceiling installation in commercial establishments. The steam passes through an inlet into the heater, turns the turbine and then is exhausted into the heater section where it heats the air that is blown into the room by the fan. After the steam is condensed it is returned to the heater's boiler through an open return system.

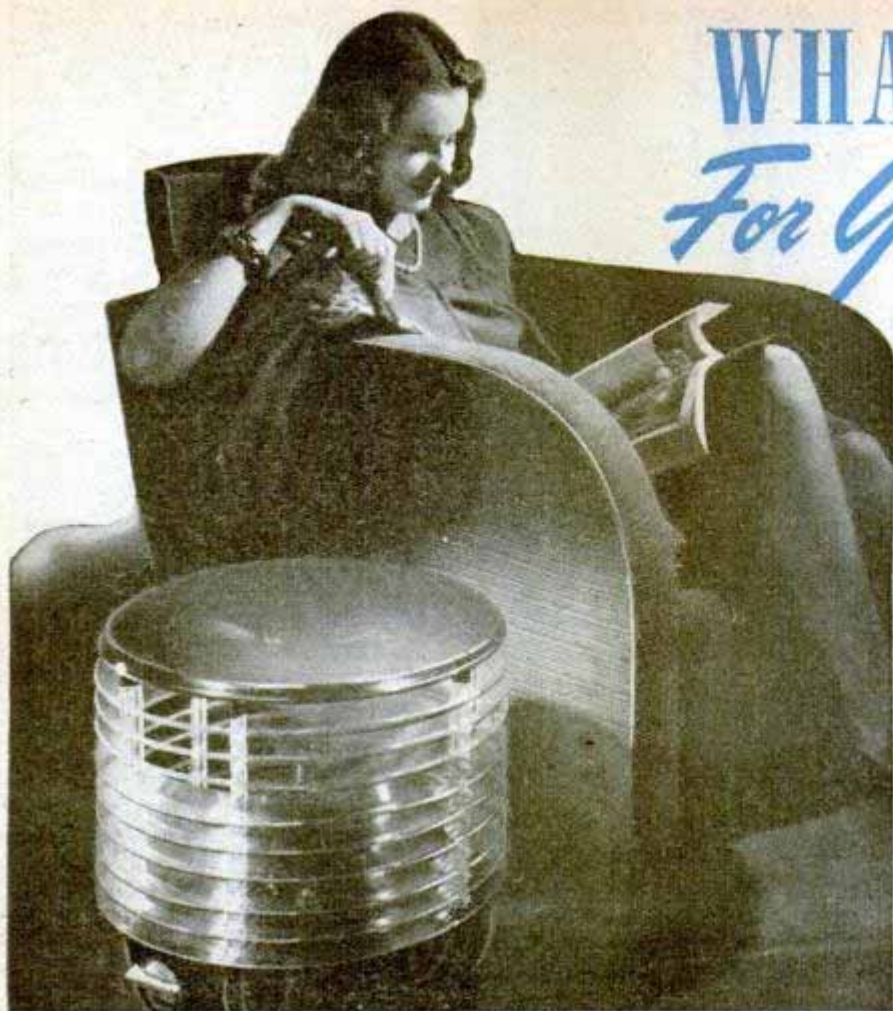
"Siamese Twin" Steel Boat Driven by Outboard

Twin boats linked by steel catwalks form one side-by-side pleasure craft powered by an outboard motor. Radically different from standard boat designs, the craft will carry heavy loads and cannot be capsized in ordinary use. Seams and joints are welded. The craft is 11 feet 4 inches long with a four-foot eight-inch beam. It weighs about 220 pounds.

⌈Admitting quantities of warmed air into a room without drafts has been recommended as the best way to achieve odor control, a home heating problem created by tightly built houses and greater numbers of cigar and cigarette smokers.



WHAT'S NEW *For Your Home*



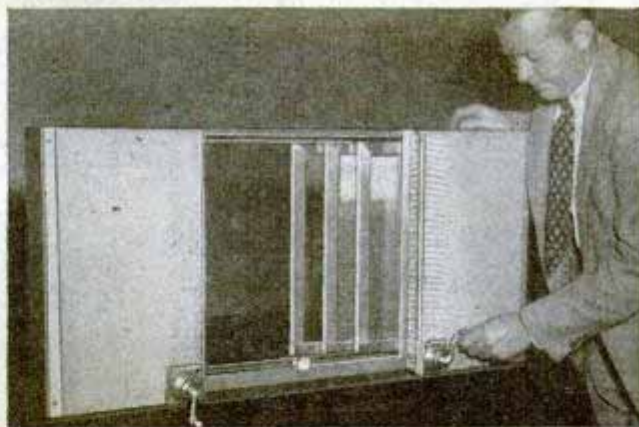
GLEAMING FAN adds eye appeal to a room while it circulates air into far corners. Made of Bakelite, it eliminates sudden gusts of cool air



Tennessee Eastman Corporation photo
ADJUSTABLE PLASTIC CAPS for furniture legs eliminate wobble



FIRE-SMOTHERING WASTEBASKET'S double lid catches carbon dioxide from flame, depleting oxygen in basket



THREE-IN-ONE CASEMENT for new homes combines ordinary window, storm window, aluminum screen

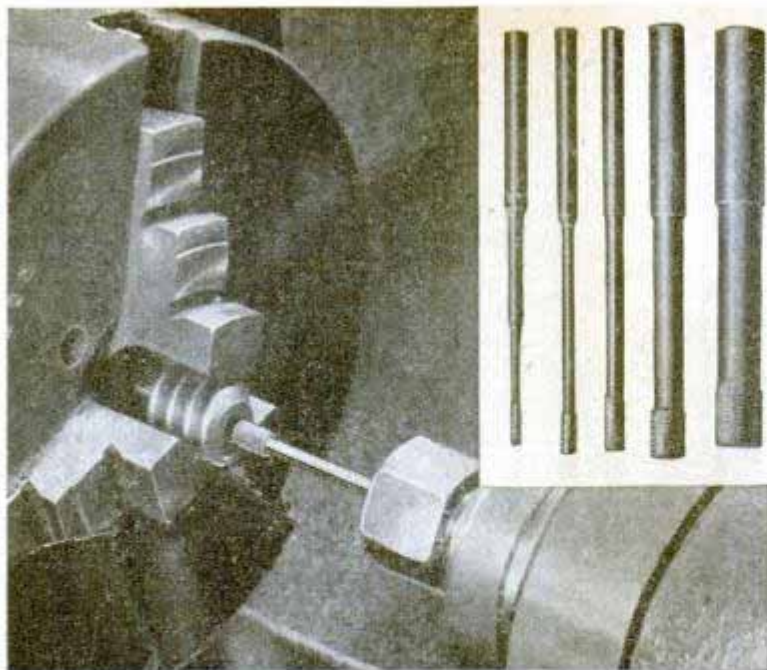
↓ **KNIFE SHARPENER** holds the blade at proper angle



↓ **RAZOR STROP GUIDE** doubles as knife-blade handle



(2) LARRY L. STEWART & ASSOC.
8731 S. WABASH - CHICAGO 19

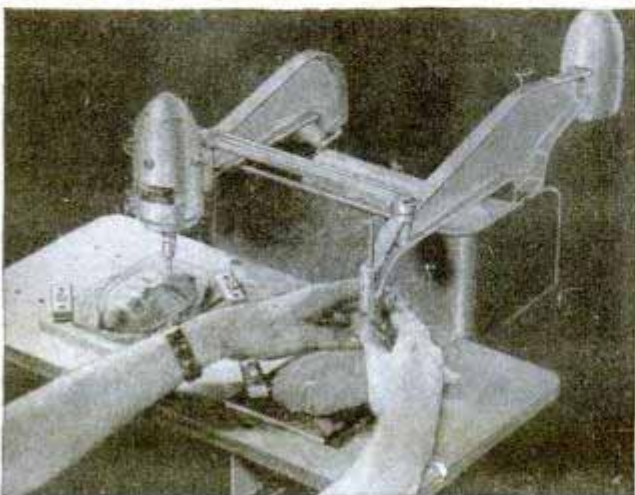
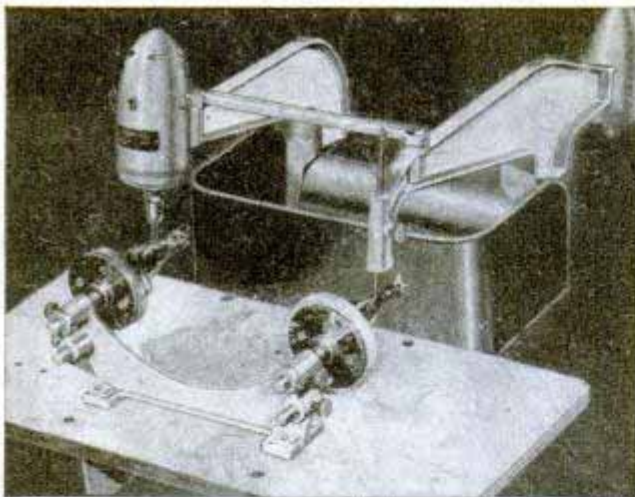


Midget Carbide Grinders Cut Metals or Plastics

Midget burrs and grinding wheels made of superhard solid tungsten carbide are speeding the production of such articles as steel dies and aircraft engine parts. Used as drills or grinders, the carbide wheels are reported to last 500 times longer and cut through metal much faster than other abrasive points. The midget grinding tools are made in sizes ranging from .03 to .25 inch. Because of their extreme hardness, the carbide tools will hold a sharp edge and cut through metal of any hardness. They are also useful in cutting soft but tough plastics which dull steel tools.

Memo Holder Under Phone Base Keeps Pad Out of Sight →

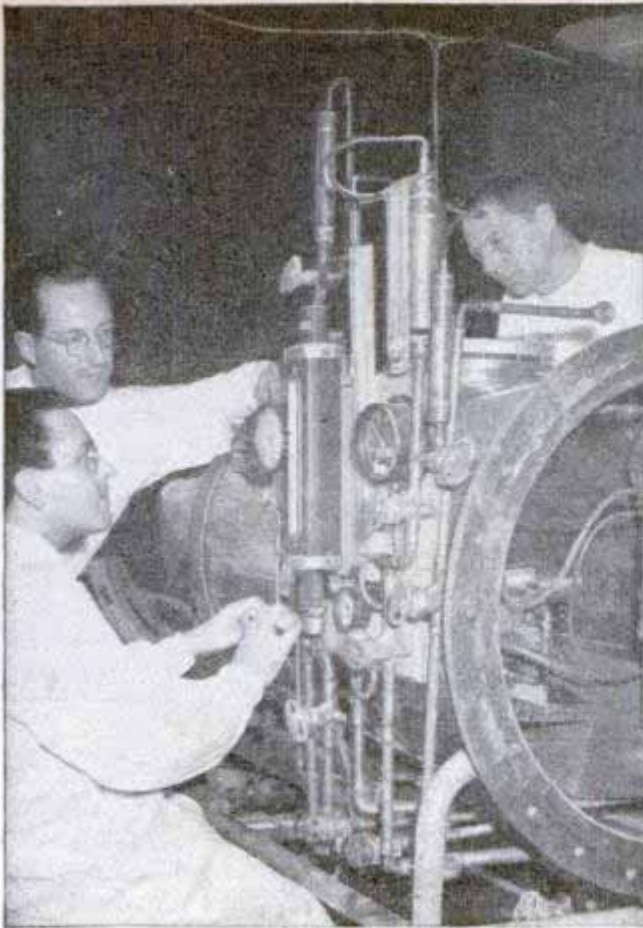
Memo paper and a pencil are stored inside a small stand that fits beneath a telephone. A slide inside the stand pulls out to reveal the paper pad and pencil. It will not mar polished surfaces because it remains rigid when extended. The stand will not fall off when the telephone is lifted. A separate base is made for different types of telephones.



'Sculpture' Tool for Wood Carver Duplicates by Depth Control

← Cutting-depth controls on a power tool for home workshops make it easy to carve wood reproductions of plaques, costume jewelry, ash trays or art figures. The tool consists of a pair of arms yoked together and moving in unison. The cutting arm carries a motor-driven router blade. Both the model and the block to be carved are clamped to the work table. As the tracer arm is guided over the raised contours of the model, the router carves a duplicate in the work piece. The tool, which cuts ebony and mahogany, can also be used for the free-hand carving of special paneling or molding.

You may wish to obtain additional information about the new products that are described each month in Popular Mechanics. If you want to know the name and address of the manufacturer or the distributor, just write to Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, Ill. Your letter will be answered promptly.



AIRBORNE GERM "CLOUDS" are concentrated in this chamber for study at the University of California. Laboratory instruments used inside are manipulated through airtight opening in the top of the chamber

INDOOR DRIVING practice is possible with a ball anchored to a sliding rod so that it can't damage furniture. Distance is gauged by a target set a foot away for every 50 yards of the user's average drive

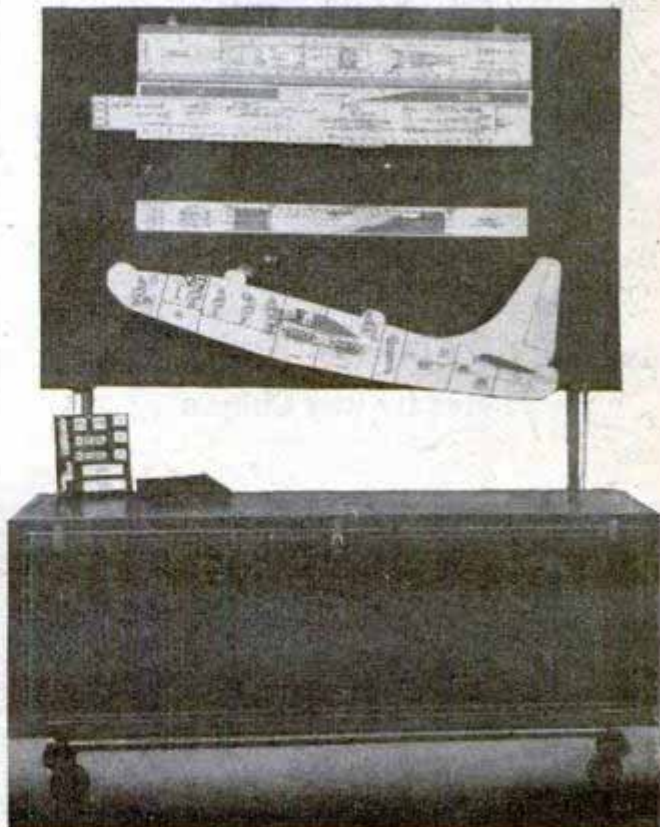


MAY 1947



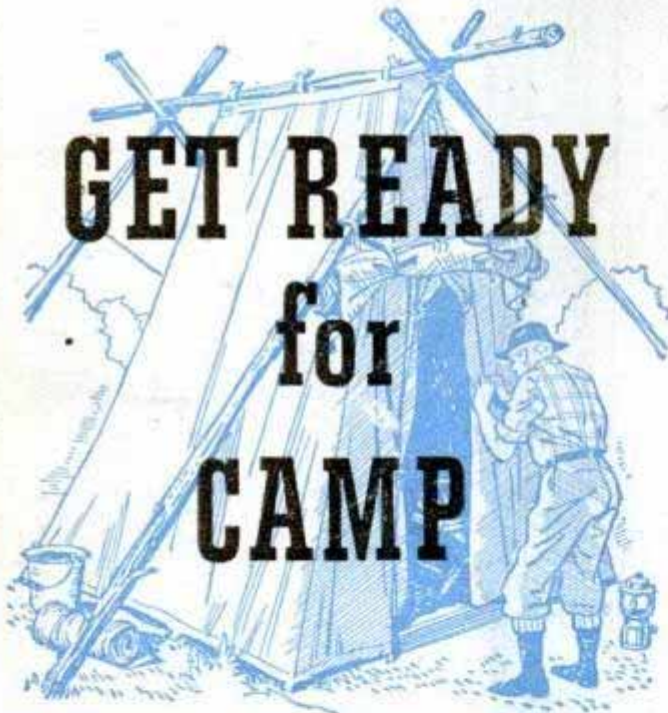
DOOR RAMPS are being tested by Southwest Airways to save time, labor and ground equipment at airports. They hinge at the bottom, have built-in steps to the ground and open from either the inside or outside

TRANSPORT LOADING principles are taught Navy trainees with small lead weights and a plywood cut-away profile of a PB4Y-2. A load adjuster slide rule checks results worked out mechanically on the model





Wise campers assemble and inspect their gear long before they leave home, allowing time for repairs



By Claude M. Kreider

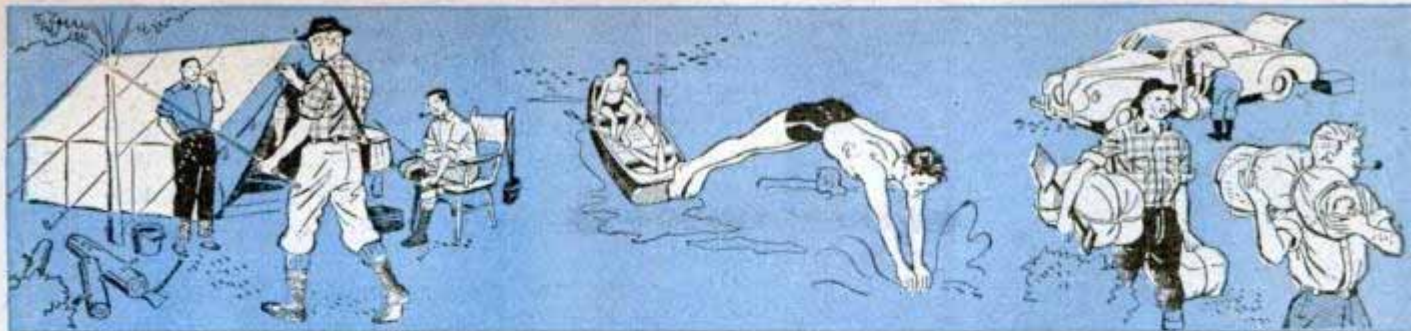
Photos by Ray Chapin

WITH vacation season just around the corner, it's time to check and test each item of your camping equipment, particularly if you belong to that increasing clan of real outdoor lovers who want to be entirely on their own. A camping outfit need not be elaborate, but it must be complete, for your pleasure, comfort—and even health—will depend on the forethought given the individual items.

It is best to list first everything that will be needed under three headings—shelter, bed, cooking equipment. Then assemble the whole, piece by piece, for a thorough inspection, with special attention to items that have been stacked up in the attic since last year. You'll find forgotten wear and tear that will need attention.

The tent—Erect your tent in the back yard for a close inspection. First determine whether it is really waterproof. A new one may be guaranteed to be water-resistant, which does not mean it will shed a hard rain. Fasten down the door and window flaps and turn a hose stream on the roof and sides. If even a fine mist penetrates the fabric a real waterproofing job is in order. The same test may be applied to the





older tent, which may leak due to age and wear. There are many good waterproofing products on the market, most of them easy to apply.

The tent fabric should be inspected for holes, and patched wherever necessary. The peg loops may need repairing or replacing and the pegs—at least 12 for secure erection of the tent—should be straightened and scoured free of rust. Those made of light angle iron, with strong, welded half hooks, are best.

The tent pole and stretcher will need a brief inspection. Often the clamp, which

slides on the pole, will need new bolts or nuts and the pole itself may have swelled or become splintery. In this case sandpaper it smooth, then add a coat or two of boiled linseed oil, rubbing it well into the wood.

And finally, be sure that the mosquito curtain over door and window is intact and that it fits snugly at all points. Just one night of discomfort in a mosquito country can spoil a trip.

The bed—Most experienced campers use sleeping bags, which retain one's body heat to give maximum warmth with min-

An old-timer flips his flapjacks from the skillet of a nesting cook kit that's ideal for the camp kitchen





**Air mattresses should be inspected or you may be in for a big letdown. Repair the leaks with a tire kit
↓ Bubbles from mattress immersed in water show leaks**



Nesting utensils of aluminum are light and compact. Table implements and a dishpan complete the kitchen



imum weight. The bag also offers protection to the bedding in transit and is ready to crawl into after a tiring day. Placed on an air mattress it will give maximum comfort, although many people prefer to use the bag on a canvas cot. In that case additional bedding may be needed underneath it.

A comfortable sleeping bag for one or two persons can be made at home by folding blankets or quilts inside a section of heavy canvas 6 by 12 feet in size. This is turned up to cover the bedding and fastened with large safety pins along the sides, simulating the cowpuncher's famous tarpaulin bed.

Estimate the weather likely to be encountered and apportion the amount of bedding accordingly. Remember, too, that wool blankets are warmer than cotton comforters and take less space. The air mattress—even if new—should be fully inflated and tested in a tub of water for possible pinhole leaks which, if not discovered, will surely let you down to the hard ground before morning. Leaks can be repaired easily with ordinary tire patching material that requires a heavy coat of cement, which will fill the rough surface of the material and insure a tight patch. Inspect your hip boots or waders for possible leaks at the same time and patch them with the same material if necessary.

The cook kit—Carefully chosen utensils from the kitchen serve adequately if proper consideration is given the number of persons in the party, the type of cooking to be done and the bulk that can be carried. Often saucepans and kettles with bails—not handles—may be arranged to nest compactly, with the coffee pot, holding the cups, inside the assembly. A compact, nesting aluminum kit will give many years of service if the material is heavy gauge and de-

Gasoline stoves and lanterns stored in attic dust may develop trouble if they aren't cleaned before the trip





Good shelter means comfort to the camper. Pitch the tent and test it with heavy "rainstorm" from the hose

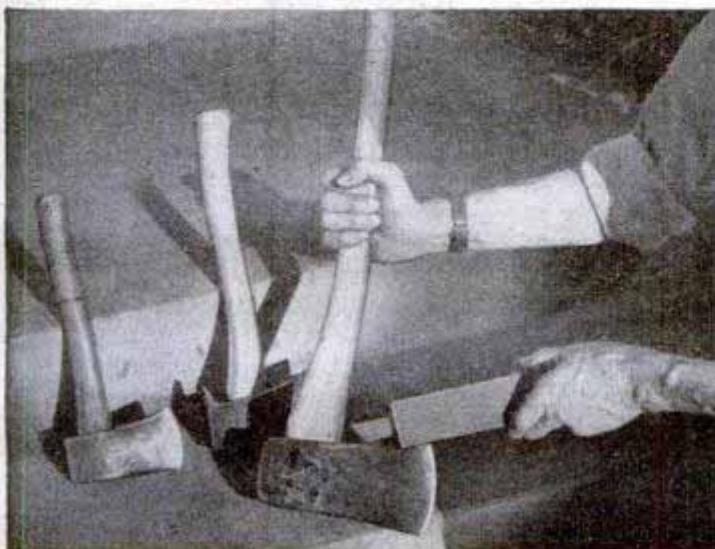
signed for hard use. One popular kit has two cast aluminum frying pans with detachable "cold" handles, fitting neatly over the largest of the kettles. The two-quart coffee pot with straight sides holds the cups. These should be of graniteware, as aluminum ones will burn the lips even while their contents are cooling because the metal is a good heat conductor. For this reason plates of aluminum are an advantage in outdoor cooking.

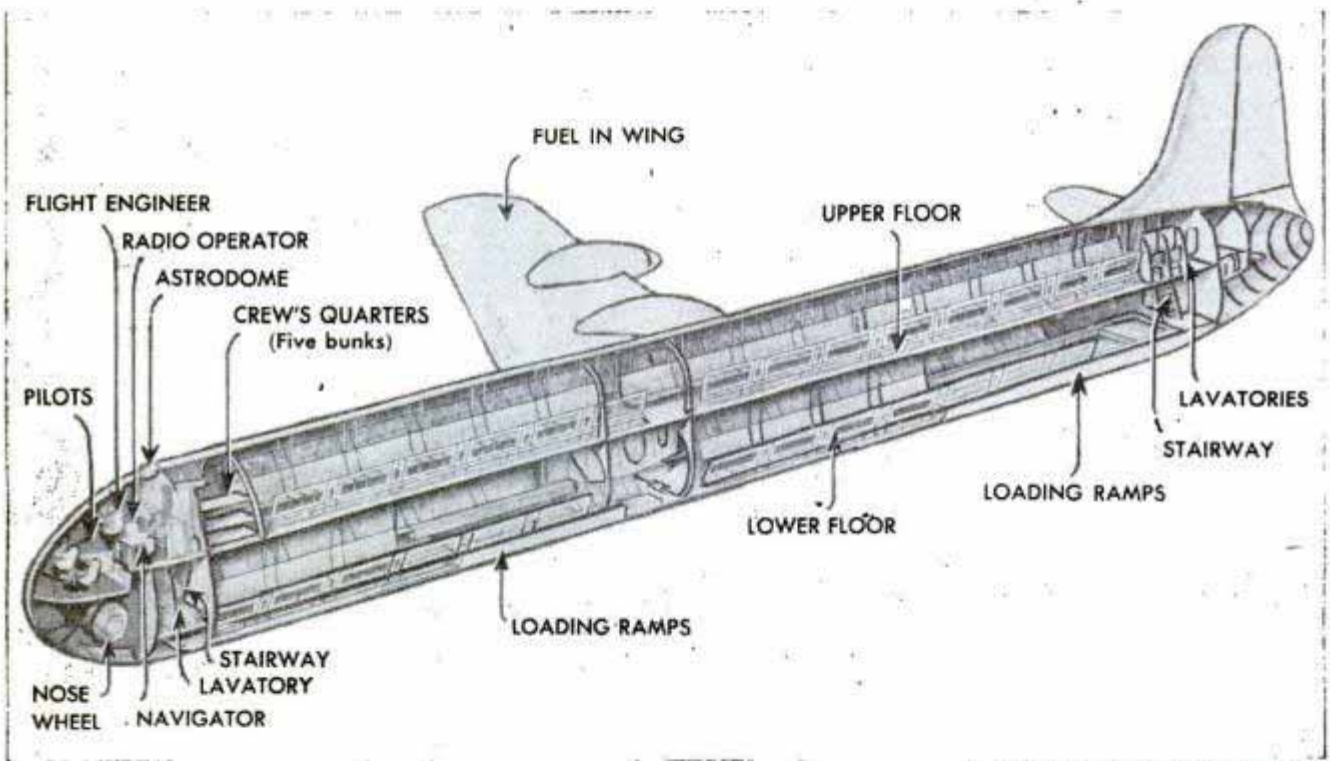
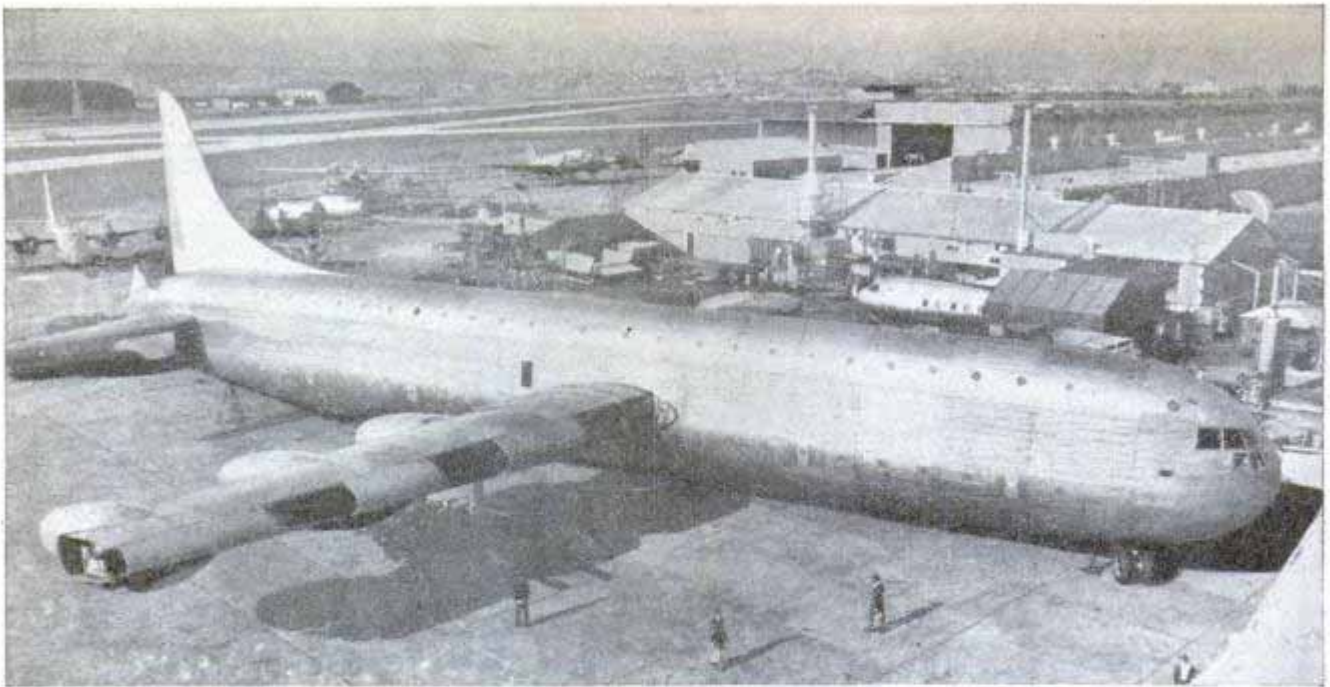
It's wise to have a cloth roll for all the table and cooking implements with a loop for each item. In addition to knives, forks, teaspoons and stirring spoons, a spatula

(Continued to page 248)



Large paintbrush makes waterproofing an easy job. † Canvas bag is an ideal container for your bedding





Consolidated-Vultee photo and sketch

AAF Plane to Carry 400 Troops

No building is big enough at the Consolidated plant to house the nearly completed XC-99 troop transport, world's largest land-based plane. An extensive ground testing program will start as soon as land-

ing wheels, wing sections and engines are installed. The double-deck version of the B-36 bomber will carry 400 troops, 335 liter patients or 100,000 pounds of cargo. It will have a range of more than 8000 miles.

Blood-Typing of Newborn Babies May Help Avoid Hospital Mix-Ups

Newborn babies should be blood-typed instead of footprinted in hospitals to avoid mix-ups in identification, according to Dr. Malcolm A. Hyman of the Jewish Hospital of Brooklyn. A total of 360 different types of human blood can be identified through varying factors in blood composition. Dr. Hyman advocates taking a sample of blood

from the baby immediately after birth and attaching this to the mother. Later if there is any doubt as to the child's identity another sample can be taken and compared with the first. Dr. Hyman points out that footprints change completely within a month after birth but that the chemical pattern of blood is unchanging.

ULTRASONICS - MAGIC ENERGY

H. D. Von Jenef, chief engineer of Tele-viso Products Co., regulates vibration frequency of an ultrasonic generator



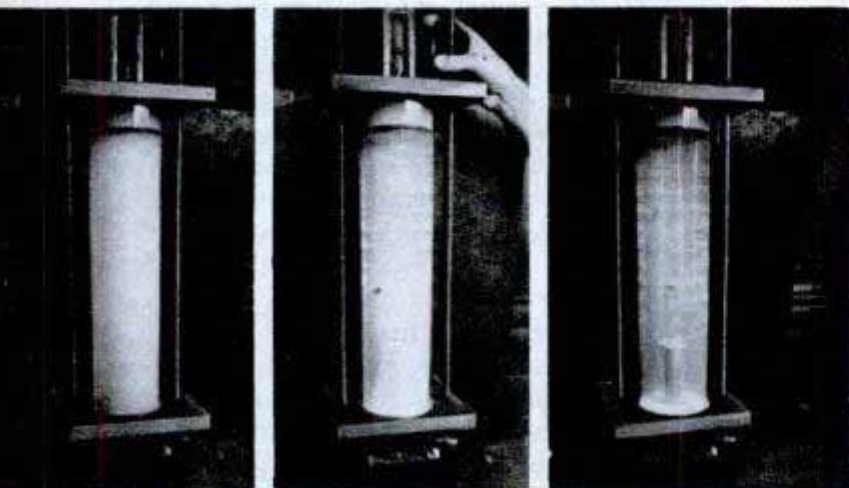
By John R. Kinsey

SOUND that can't be heard is science's newest "wonder tool."

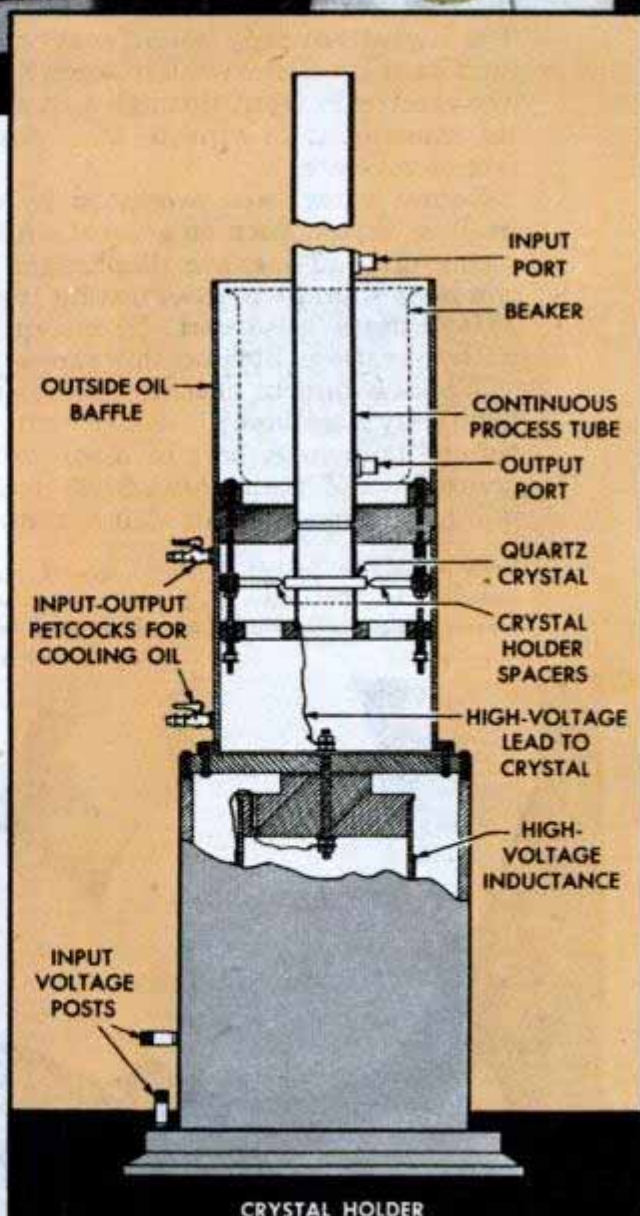
It pierces tin and steel, sterilizing and preserving uncooked foods without marring their taste. It kills insects, offering the farmer a possible new attack on crop pests. It disperses smoke and soot and may help keep cities clean. It transforms fog into rain so pilots can see well enough to land planes.

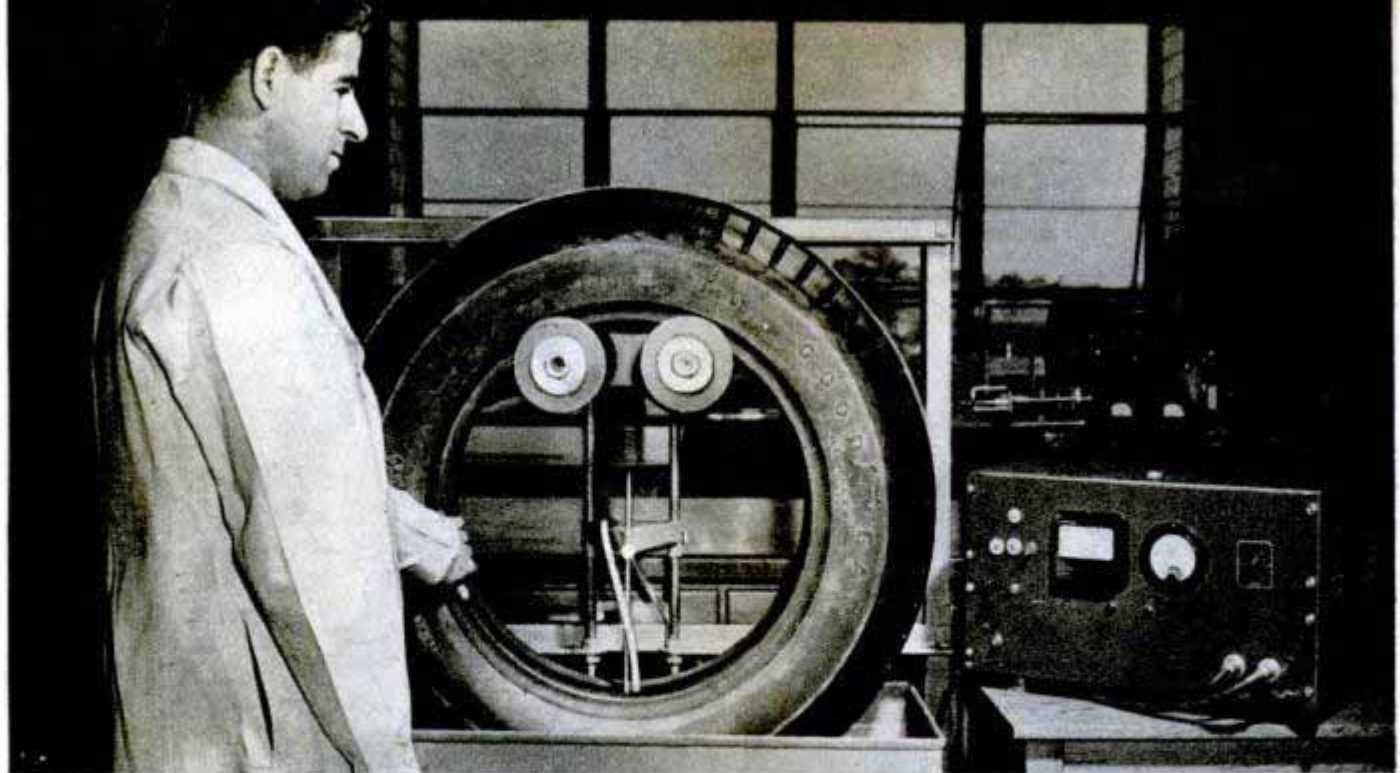
These unheard sounds are known as ultrasonics.

U. S. Bureau of Mines photos



Simulated chimney smoke is blotted out by ultrasonic power. Tube (left) filled with ammonium chloride fumes receives charge (center) which precipitates deposits (right). Drawing shows crystal holder which creates the high-frequency sound waves





High-frequency sound waves test used tires at Goodyear Tire Company to determine if recapping is feasible

They are sound waves beyond the scope of human hearing, vibrating at 20,000 to 100,000,000 cycles per second and traveling through air, water, metal, earth and rock. The high-frequency sound waves are created by a generator which sends high-voltage electric current through a quartz crystal, causing it to vibrate at a designated frequency rate.

Sound waves are produced by any vibrating object, such as a vocal cord, violin string or loud-speaker diaphragm. People can hear sound waves vibrating from 20 to 20,000 times a second. Ultrasonics deals with vibrations beyond this range.

When a quartz crystal is forced to vibrate, say a million times a second, strange things happen. A sort of magic energy is created which many industries—food, steel, paint, pharmaceutical, dairy, automotive,

aviation—are studying as a possible aid in making better products.

Tobacco growers are experimenting with ultrasonics to kill insects that infest tobacco during its curing. Flour mills may use it to exterminate weevils in wheat, and germs which sometimes mature in flour after it is processed. Producers of grape juice and wines are testing sound wave machines to kill acetic acid bacteria.

Sound waves kill germs by producing and rupturing microscopic air bubbles inside a microbe cell, according to H. D. Von Jenef, chief engineer of Televiso Products Company of Chicago. Von Jenef directs the ultrasonic research which guides his company's manufacture of high-frequency sound wave generators.

"Possible uses for ultrasonics are almost unlimited," Von Jenef declares. For one thing, he points out that ultrasonics knocks the truth out of the old saying that oil and water won't mix. Oil and water mix when treated with intense ultrasonic waves, and they stay mixed. So do water and mercury. Even paraffin and water can be mixed.

This mixing ability opens the way to many applications. Bombarding photographic emulsion with sound waves increases its resolving power, sensitivity and stability. Ultrasonics also may be the long-sought way of mixing all the constituents of paint.

In the field of medicine, Von Jenef says it is entirely pos-

Forty-millimeter (about 1½-inch) quartz disk (note metric ruler) is installed in ultrasonic oscillator to set up high-frequency sound waves which are utilized to mix liquids in production of penicillin

Courtesy North American Phillips Company, Inc.



sible that ultrasonics may make it unnecessary to put a "Shake Well Before Using" label on a bottle. A sound wave machine will stir the medicine so vigorously it will remain mixed permanently. Production of serums is speeded by sound waves. Treating a culture fluid with ultrasonics and then spinning the liquid in a centrifuge and filtering it destroys bacteria and creates antibodies for serums.

Sulfathiazole treatment is improved by ultrasonics. The coarse crystals are smashed by sound vibrations and placed in a salt solution to form a creamy emulsion which can be injected into a patient through fine hypodermic needles, a procedure previously impossible, according to Von Jenef.

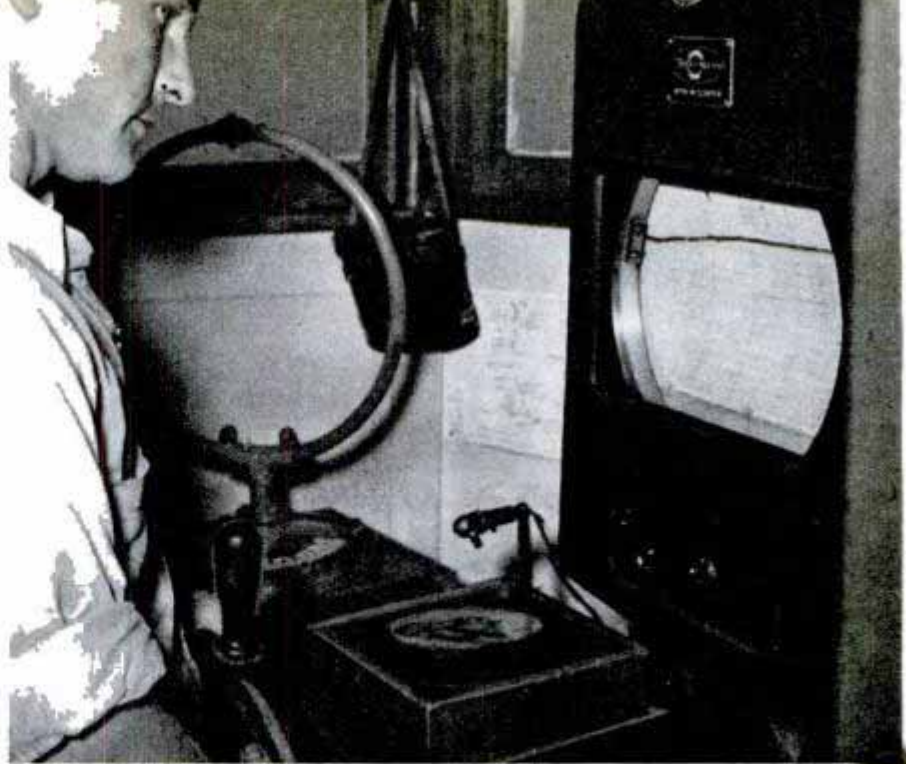
The dairy industry is testing ultrasonics to emulsify cream cheese mixes and pasteurize milk at low temperature. The Raytheon Manufacturing Company makes a sonic oscillator which homogenizes milk; as the liquid passes over a vibrating steel diaphragm, milk particles are made microscopically fine, producing a soft-curd milk suitable for stringent dietetic requirements.

The use of ultrasonic equipment to eliminate sooty smoke is being investigated by the U.S. Bureau of Mines. Sound waves, traveling through a column of smoke, cause dirt particles to collect and fall to the bottom of a tube.

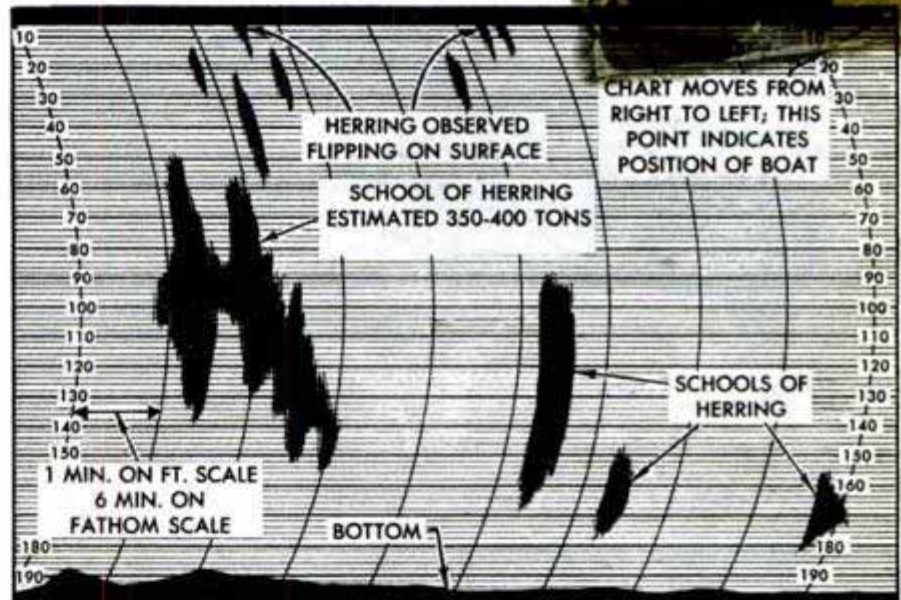
Airports may be equipped with sonic generators to dissipate fog. At the Naval Landing Aids Experiment Station at Arcata, Calif., sound waves turned heavy fog into rain, clearing the field sufficiently for planes to land.

Steel and rubber companies test their products with ultrasonic equipment. The manner in which a material absorbs or "sheds" sound waves reveals hardness, cracks, pits and other characteristics.

During the war the Navy used an ultrasonic radar trainer to teach pilots and bom-



Captain Lloyd Lindwall, Santa Barbara commercial fisherman, studies chart made by Bendix depth recorder which locates school of fish



Depth recorder chart not only spots schools of fish and estimates their tonnage, but also warns of underwater hazards and records ocean bottom profile. Below, Captain Lindwall's 45-foot fishing craft, Linda





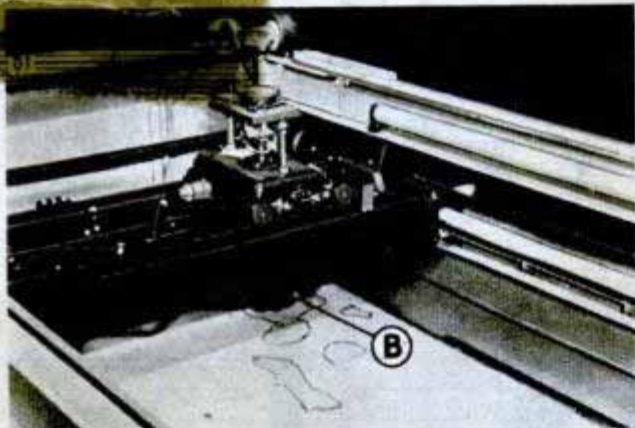
Bell & Howell Company photos

Ultrasonic machines simulate radar to teach Navy flyers how to aim bombs from high-altitude bombers

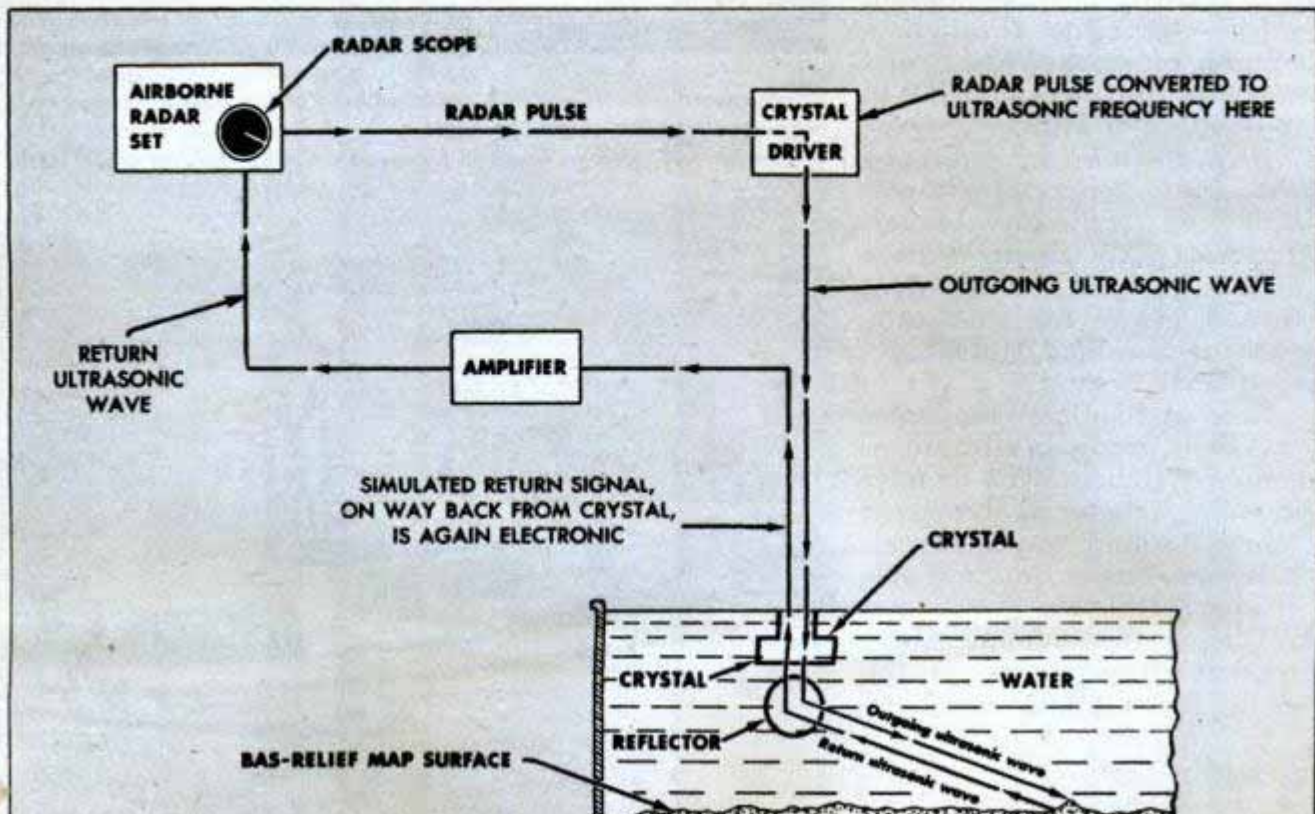
ardiers how to use radar equipment. Developed by the Bell & Howell Company, the trainer simulated the use of radar to aim bombs from planes. Ultrasonic waves, projected through water on a relief map, produced the same relative "echo" as radar.

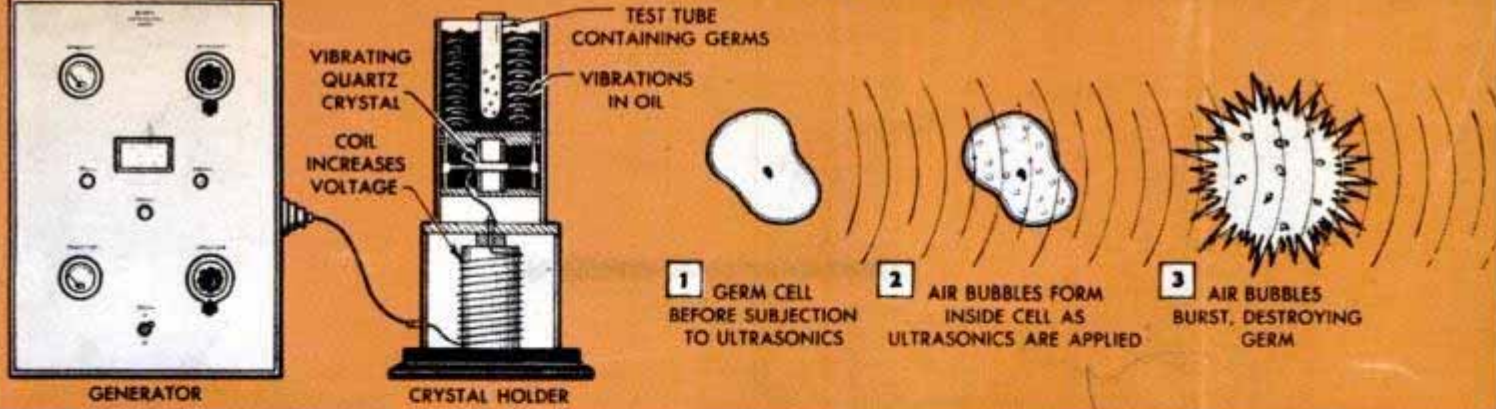
Bendix Aviation Corporation manufactures a supersonic depth recorder which aids commercial fishermen in locating schools of fish and spotting underwater navigation hazards. The Navy equipped ships and submarines with ultrasonic sonar sets during the war to locate enemy craft.

Two types of ultrasonic generators are

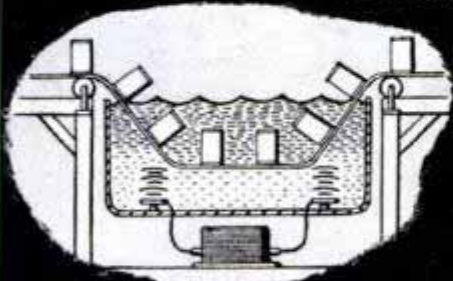


Inside view of tank of ultrasonic radar trainer, showing submerged relief map with trolley above it. Below, simplified drawing shows how trainer works

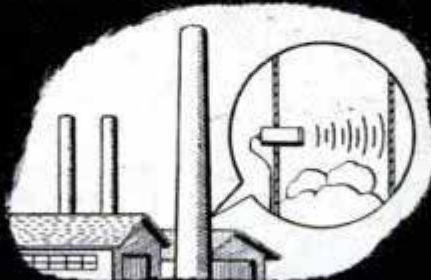




ULTRASONICS IN INDUSTRY AND SCIENCE



DESTROYS BACTERIA IN CANNED FOOD WITHOUT COOKING



DISSIPATES SMOKE AND GASES IN FACTORY AREAS



USED IN LABORATORIES TO MIX AND SEPARATE CHEMICALS

Artist's drawing (top) of ultrasonic equipment and method employed to destroy germ cells. Sketches show applications of high-frequency sound waves for industrial and laboratory purposes

manufactured: one for research work, the other for production processes such as sterilizing food and mixing pharmaceuticals.

Manufacturers of ultrasonic equipment are swamped with weird requests. Tele-viso received a letter from a Chicago official asking if a sound wave machine could be built to kill pigeons that perch on window sills and electric lines. An Oklahoma farmer wanted "some kind of sound wave gun to kill pesky birds in my orchard."

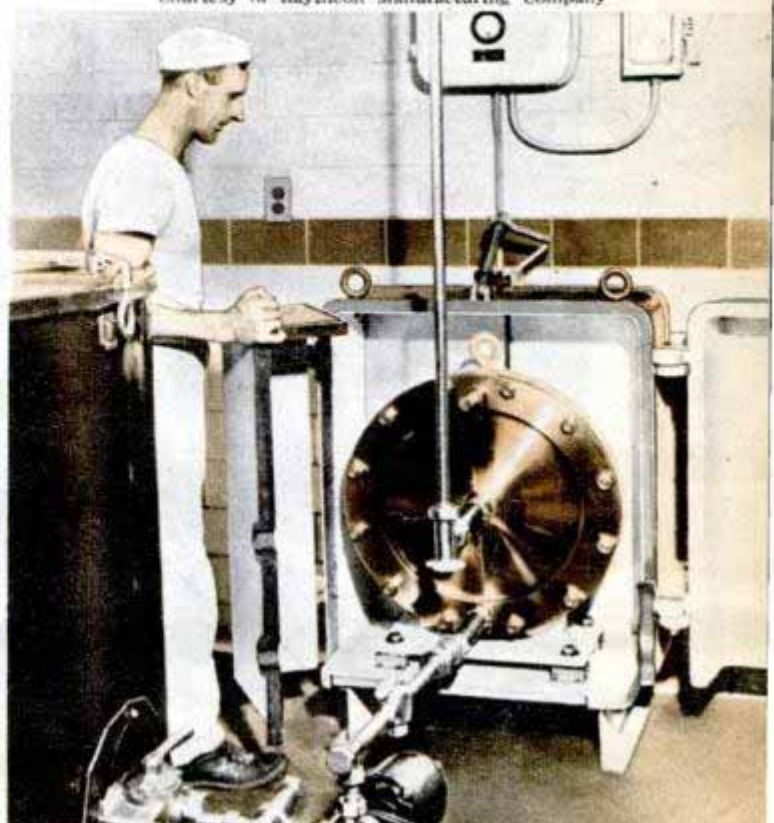
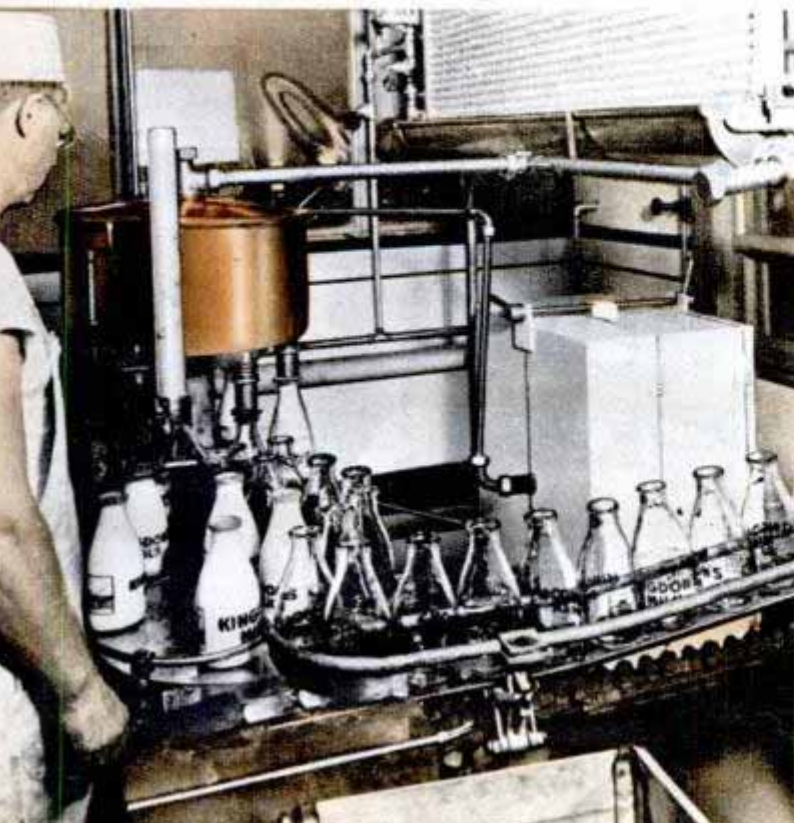
As a matter of fact, ultrasonics offers so many possibilities that scientists hesitate

to say anything is impossible. Von Jenef already has harnessed ultrasonic power to an experimental dental drill which he says will take most of the pain out of tooth drilling. "The ultrasonic drill," he explains, "does not revolve, as do conventional dental drills. Instead, it jabs, moving back and forth so swiftly that very little pain-causing heat develops within a tooth."

And, without batting an eye, Von Jenef says it would be easy to design an ultrasonic "death ray" gun that would kill a rabbit or dog at 60 feet.

Milk particles which pass over vibrating steel diaphragm, right, are made microscopically fine, producing soft-curd milk that is easy to digest. Left, after receiving sonic treatment milk is piped from oscillator to bottles

Courtesy of Raytheon Manufacturing Company



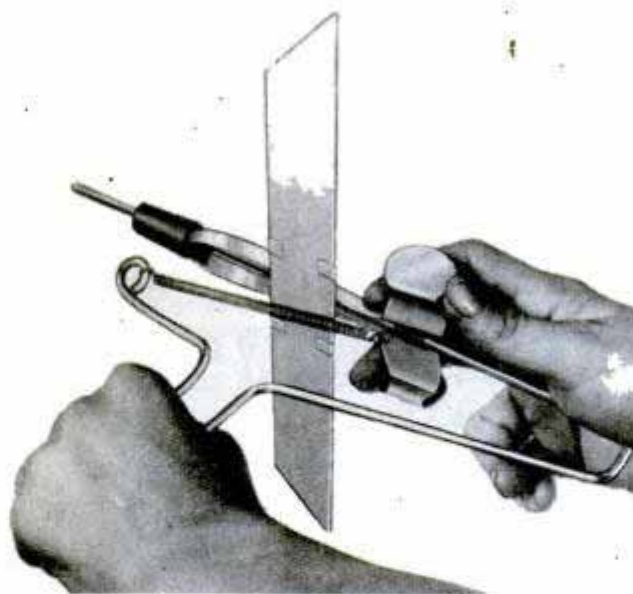
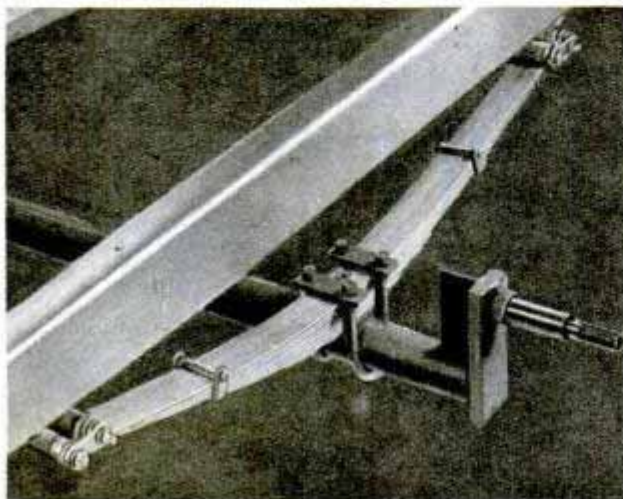


Extra Seat Attaches to Bike Frame

Carrying an extra passenger is easier and safer with an auxiliary seat mounted on a bicycle frame. The seat, made of wood and leather trimmed with plastic, can be attached with a screwdriver. Two clamps hold it in place so that it cannot slip and spill the extra rider. It is especially useful for carrying a small child.

Drop-Center Axle Lowers Trailer

Trailer owners can have either high or low road clearance for their vehicles by turning a new drop-center axle up or down. The steel axle supports 2000 pounds and fits most automobile front hubs. Having wheels the same size as those on the car makes it necessary to carry only one spare tire. The axles are built in standard and custom widths of 72 and 84 inches. Added use of an adjustable hanger permits mounting the spring to either the top or underside of the axle.



Slingshot Launcher Controls Flight

Each flight of a toy glider can be controlled by adjusting the position of the spring slingshot mechanism which launches it. The glider slides over the round steel rod of the launching device for the take-off. Constructed of aluminum, it has a balsa wing and a rubber nose to prevent damage to furniture or windows if used indoors.

Glow Meter Detects Vitamin in Liquid

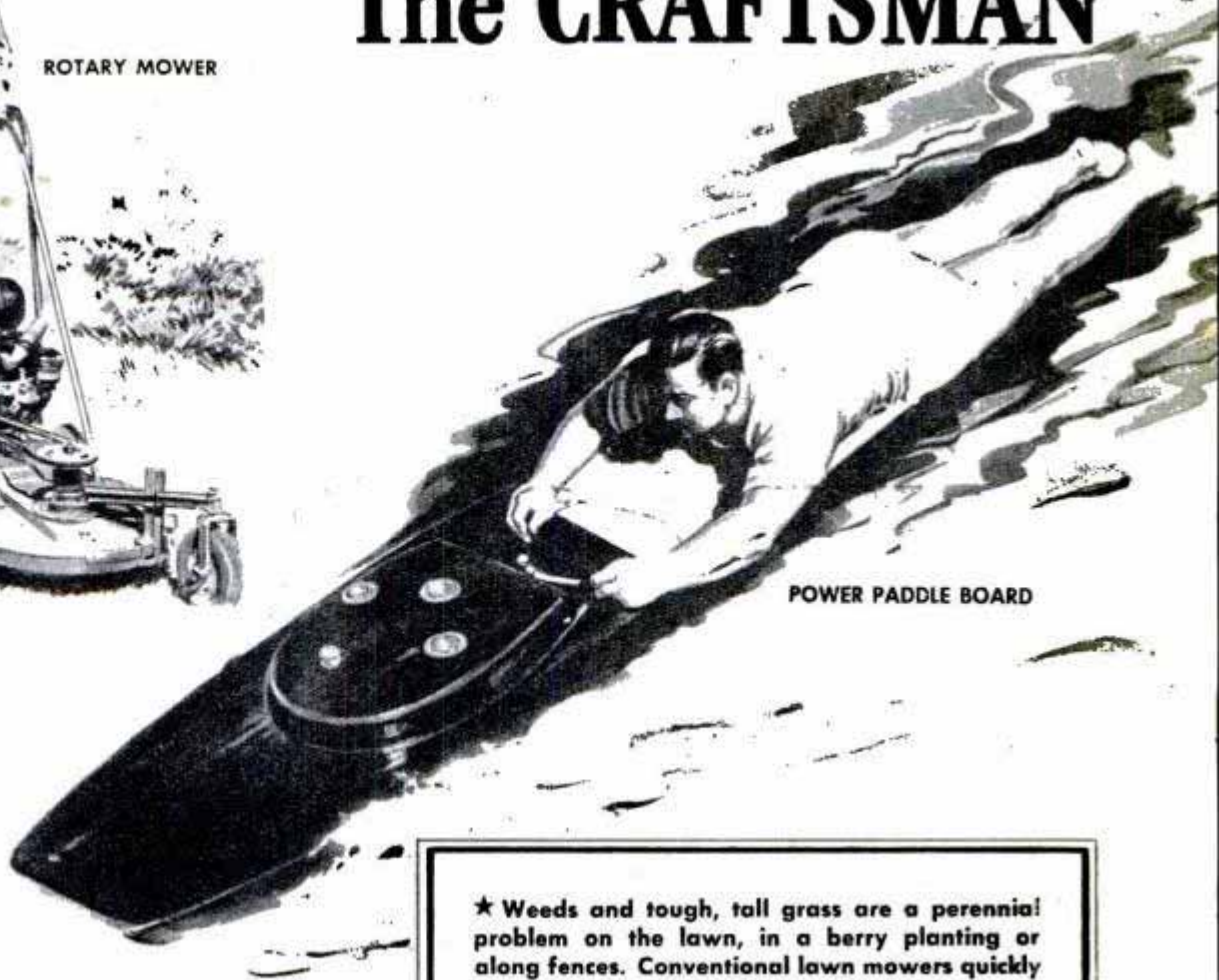
Minute amounts of vitamins and other light-emitting substances are detected instantly in liquids and body tissues by an electronic instrument which measures the amount of fluorescence, or light, thrown off by the material under study. Developed by Dr. Theodore E. Friedemann, associate professor of physiology at Northwestern University's Medical School, and George S. Liebeck of the American Telephone and Telegraph Company, the "glow measurer" is expected to aid chemical research, particularly in the field of human nutrition.



The CRAFTSMAN



ROTARY MOWER



POWER PADDLE BOARD



WEATHERVANES



COLOR-PROCESSING UNIT



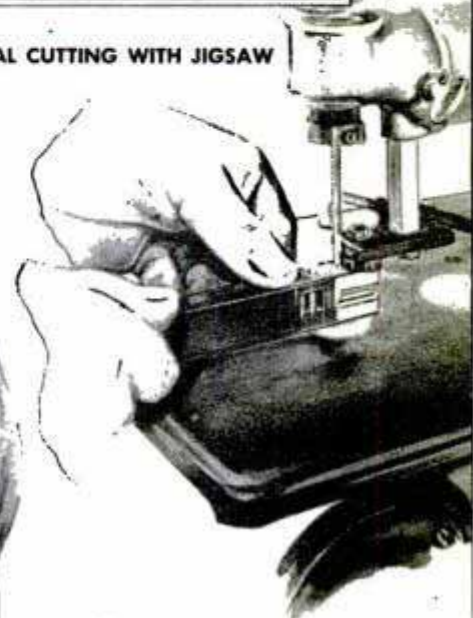
★ Weeds and tough, tall grass are a perennial problem on the lawn, in a berry planting or along fences. Conventional lawn mowers quickly bog down in the thick growth. But a rotary mower really mows 'em down. Clips the lawn neatly, too. Details on page 209.

★ You'll be in time for the water sports season if you start building a power paddle board right away. It's built just like a hand-powered paddle board but is driven by an outboard motor. That's the angle. Construction plans on page 193.

★ At last it's come to pass — a complete unit for processing color film! A darkroom in a suitcase, that's what it amounts to when you get it together. As you'll see from the story beginning on page 200 it's very simple to make.

★ Two other features, one on metal weather-vanes, page 185, and another on metal cutting with a jigsaw, page 217, will be of interest to the craftsman who likes metalworking.

METAL CUTTING WITH JIGSAW



Build-It-Yourself HOUSE

PART II

By James R. Ward

Interior views and construction photos show you how cozy this home is and how easily anyone with mechanical flair can build it



BREEZEWAY is one of the outstanding features of the house. Can be used winter or summer if it is heated. Glass panes replaceable with screens



KITCHEN has all the modern facilities to save work. Dining nook at one end is close to stove and sink



ALCOVE in living room lends itself to many arrangements: a built-in bookcase, desk or a small piano



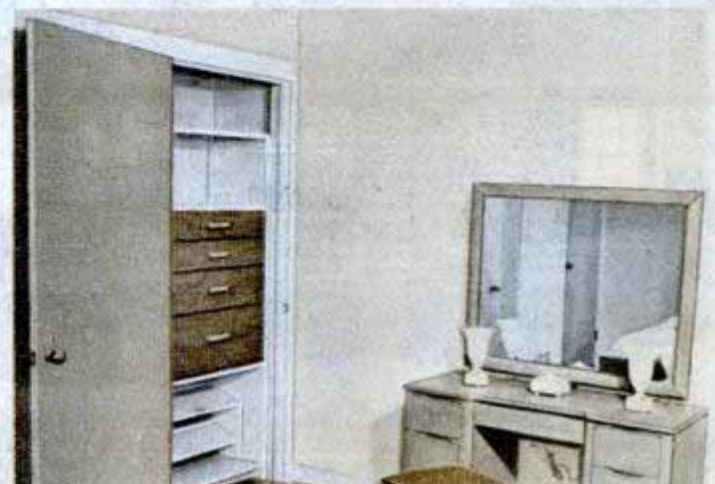
Furnishings by Simons Furniture and Rug Co., Aurora, Ill.

LIVING ROOM is spacious and a wide three-window unit helps to make the interior light and cheerful

AFTER last month's description of the *Popular Mechanics* BUILD-IT-YOURSELF HOUSE, telling how it was conceived by our editors and built by Jacques Brownson, you will want to know more about the interior. Photos on this and the opposite page will give an idea of the cozy atmosphere and honest-to-goodness living the house provides. The kitchen, for example, is designed for step saving. It's narrow and long with a dining nook at one end close to cabinets, stove, refrigerator and sink. Glazed doors and large windows provide a bright, cheery interior.

An alcove in the living room adjoins the guest closet at the entrance door and may be used as pictured, or for a built-in bookcase or desk, or as a place to house a spinet or other small piano. A shelf with drawers

BEDROOMS have simulated corner windows, which admit plenty of light without breaking walls to hinder furniture arrangement. Spacious wardrobes and built-in chests are hidden by beautiful flush-type doors





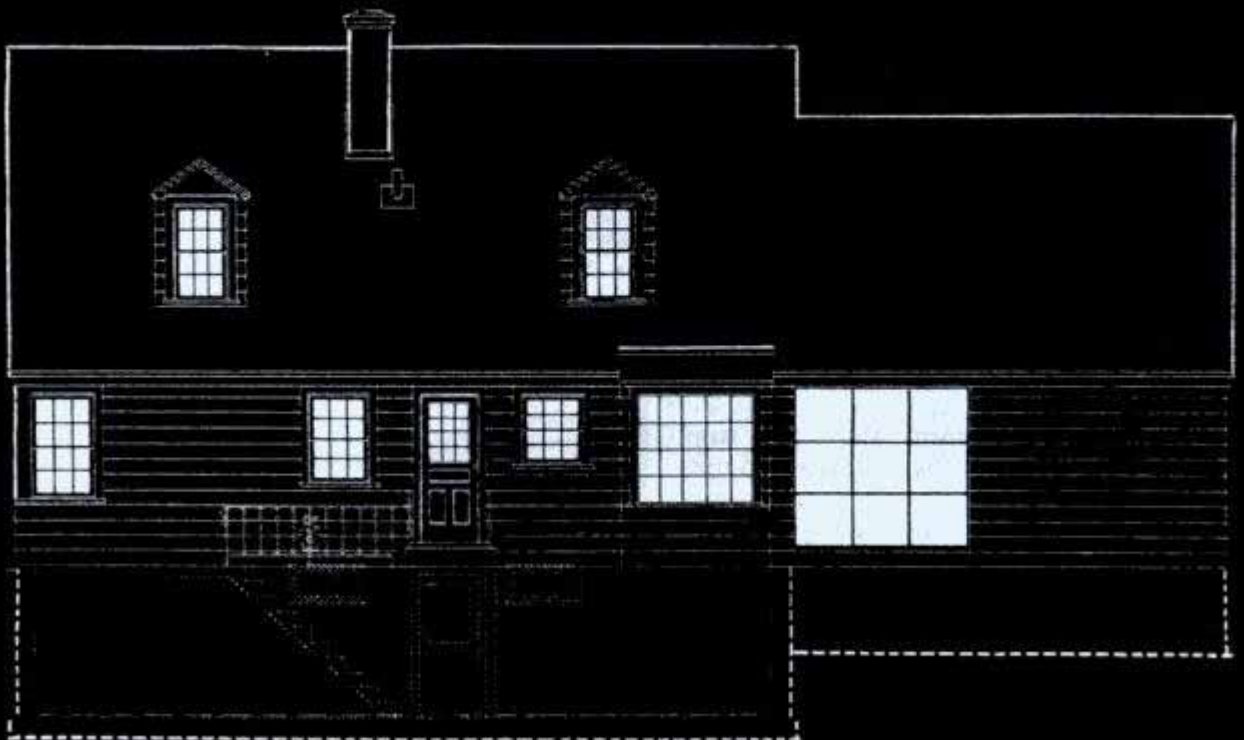
FRONT ELEVATION



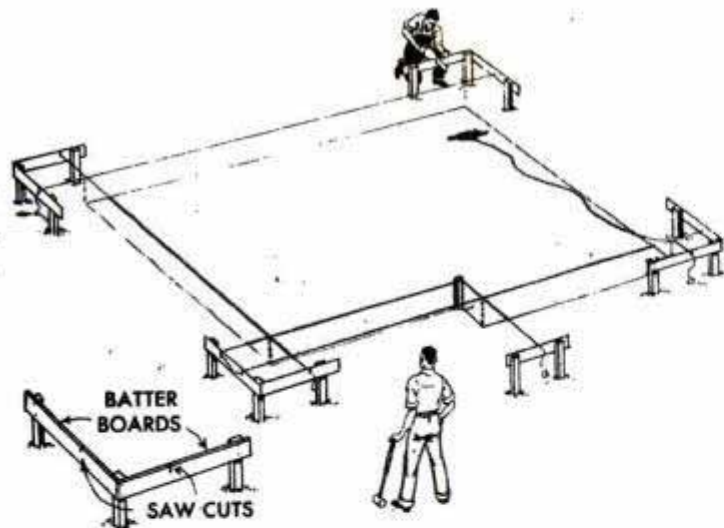
RIGHT SIDE ELEVATION



LEFT SIDE ELEVATION



REAR ELEVATION



The first step in starting construction is to lay out the excavation. The diagram above shows how this can be done to assure accuracy, which is necessary

underneath also would be ideal. Entrance to the breezeway is from the kitchen. This was done for convenience to the kitchen when dining in the breezeway. A door could be put in the wall of the living room instead of the kitchen if you desire, or you could have two entrances.

The two bedrooms are similar except the front one is larger. Simulated corner windows provide abundant illumination without broken wall space to hinder furniture arrangement. The second floor is unfinished, but a closed stairway off the living room is installed for future use, and now serves as a spare closet. Above the garage and breezeway is a large room that can be made into a playroom, a spare bedroom, or to provide storage for screens, storm windows and other articles that accumulate.

If your family is one of the many who want a fireplace and you don't mind the extra expense, one can be built in the living room next to the breezeway. In fact, a double type of fireplace could be made here to serve both the living room and the breezeway. Other interior rearrangements can be incorporated to suit your particular desires. As mentioned in last month's installment, the exterior design of the house can be altered by leaving off the garage and breezeway and merely changing the roof, and in some cases relocating the windows. If your lot is a maximum of 50 ft. in width, one of the latter designs would be necessary since the house as built is 55 ft. in length and would have to be set lengthwise of the lot, which is what we did on a 50-ft. corner lot.

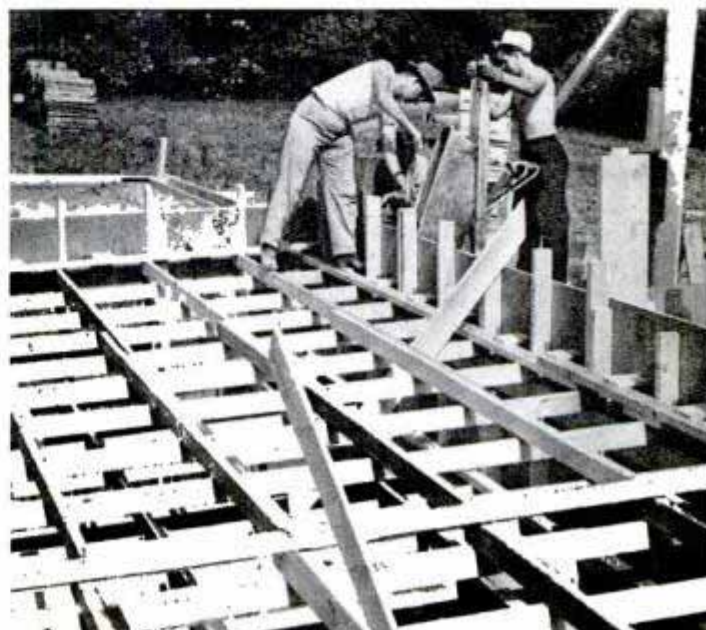
Magazine space does not permit us to give you blueprints and step-by-step instructions, but we have prepared a 100-page book and blueprints that show and explain every step, every joint and every dimension in drawings and photographs so that anyone can go right ahead and put up

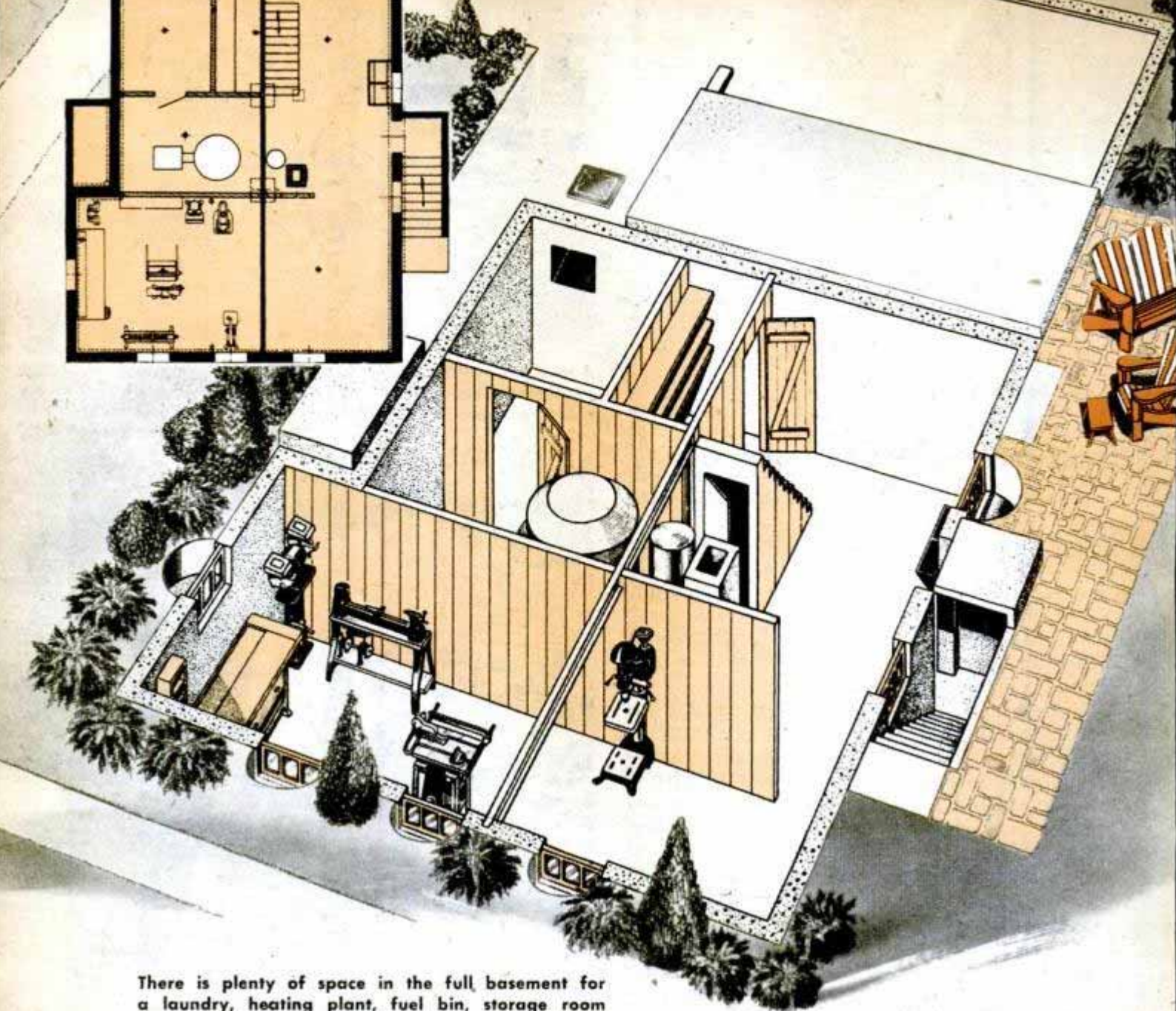


A mechanical scoop makes quick work of digging the excavation. You will have to do some shovel work, of course, to square up the sides before the forms are set



Plywood panels stiffened with 2 by 4s make good forms, and later can be used as a subfloor. The excavation walls serve as the forms on the outside. Bracing the forms as below makes it unnecessary to cut the stock and thus ruin it for use in the house





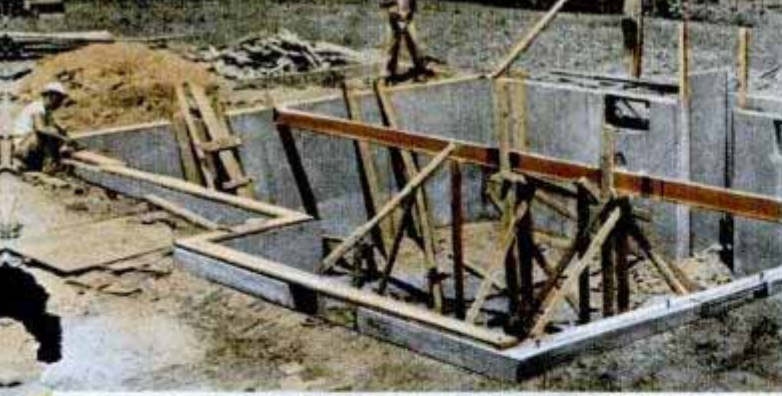
There is plenty of space in the full basement for a laundry, heating plant, fuel bin, storage room and a large room for your workshop or rumpus room

the house without trouble. If you are not planning to build a house, the information in the book will enable you to repair the one you have, add a dormer or a room upstairs, build on a wing or put in a playroom. Also, it will show you how to install or repair plumbing or wiring, put in or relocate doors and windows, etc.

To remove any doubt of your ability to build your own house, and to prove our statement that "anyone who can drive a nail and saw a board straight can build a house," let's analyze a house. I once overheard an old carpenter remark, "A house is a hole in the ground lined with stones on which 2 by 4s are set to support a roof and to hold boards which shed wind and rain." Let's refer to the photos and briefly go through the construction to see if he is correct. After laying out the excavation and removing the dirt, the footings are poured and forms set for the concrete walls.

If the ground isn't so sandy that it will cave in, use the walls of the excavation as one side of the forms. You will have to square them accurately with a shovel, but this method saves material and labor. Plywood panels stiffened with 2 by 4s provide good forms and can be used later as a subfloor. Bracing the forms can be done in several ways. We used the method shown to avoid ruining the material for later use.

After the concrete has been poured and allowed to set, forms are removed, pillars for the center posts are poured and the center supporting beam put in, in this case a steel I-beam as pictured in the upper photo of page 173. When pouring the walls, bolts are set in the concrete for attaching a sill. Next is laying the floor joists and bracing them. Nothing so very difficult so far. Now, the plywood used for the concrete forms is cleaned and laid over the joists and nailed down for a subfloor. Following this,



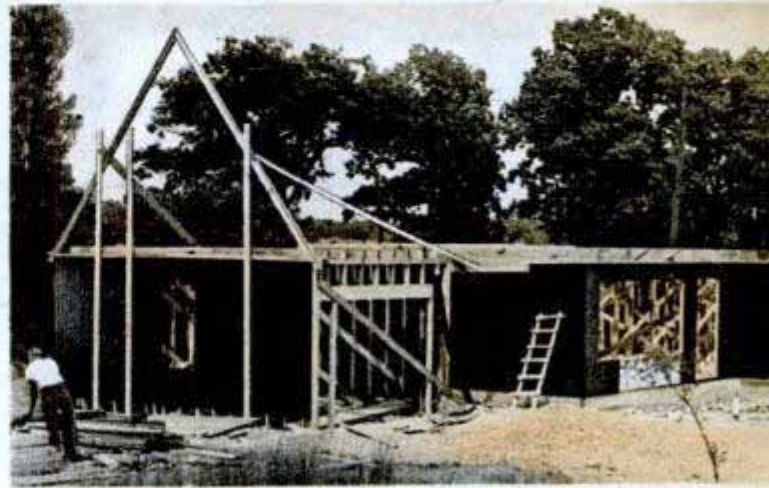
The center supporting member and posts are put in after the concrete has been poured and the forms removed. Posts are placed on concrete pillars



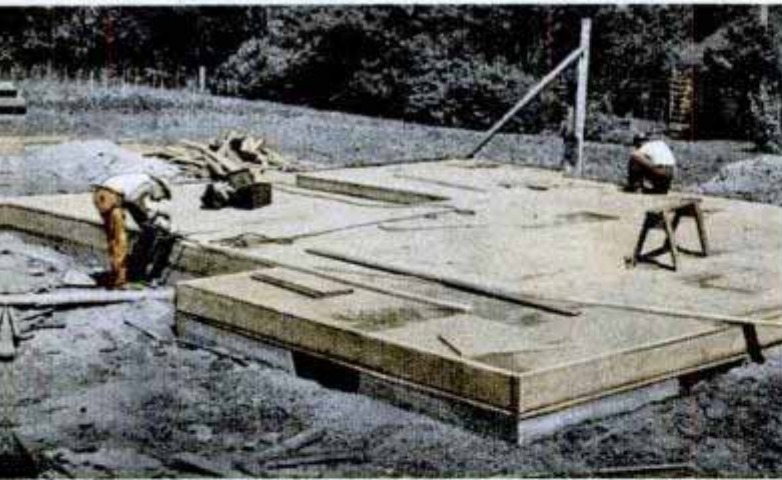
After erecting the studs for the main part of the house, put up those for the garage and bridge across the breezeway to support ceiling joists



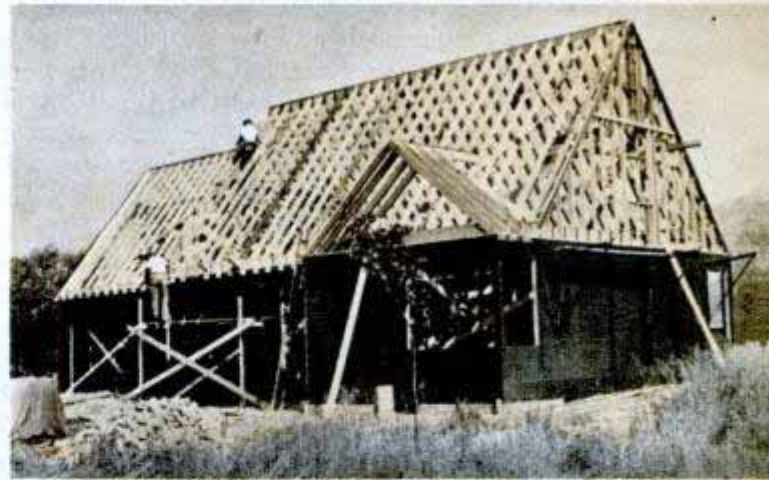
Floor joists are next. These meet and overlap at the center member. They are laid on a wide sill which is bolted to the concrete foundation wall



Studs for the main supporting partition go in next, followed by the insulating-type sheathing and the ceiling joists, ready to install the rafters



Plywood used in the concrete forms is laid on the joists for the subfloor, and then the wall studding is put up. The studs are assembled in panels on the ground and then erected. Triple studs should be used at all the corners for strength



When the rafters and gable and studs are all up apply the rest of the sheathing and then put on the roof boards. Nail them close together and let the ends project. When installed, saw all of them off at one time to get a straight roof edge





The photo above will give you some idea of how the small front gable is framed into the roof section. It is unnecessary to cut out the roof rafters for this. The other photo shows the gable end being trimmed.

the wall studs are erected. These are 2 by 4s all cut the same length, spaced 16 in. on centers and nailed to 2 by 4s across the ends, openings for windows and doors being cut out later. Usually, the studs are assembled in panels on the ground and then raised into position. This simplifies the job. It will be necessary to brace the panels temporarily to hold them in position. The main supporting partition comes next and is merely a repetition of the outside walls. Cross partitions are put in later. When walls and partition are completed, ceiling joists are laid. This work is similar to the floor joists. The frame or square of your house begins to take on strength, which is furthered by nailing on the sheathing; in this case an insulating type made especially for this purpose was used. The door and window openings are left open. You still haven't run into anything very difficult. It's been just a matter of measuring, sawing and nailing according to the plans.

You are now ready for the roof rafters. Those where the dormers will be installed are full length and later cut away to frame the dormers. Gable-end studs go up after completing the rafters. Follow with the small gable rafters and studs, and then frame in the dormers. The structure looks more like a house now.

Roof boards are next. Lay them close. It's unnecessary to cut them to fit; just let the ends extend over the roof edge if they are too long. They are all sawed off at once later to produce a straight edge. You will find this a good place to use up odds and ends of material that have accumulated in construction so far. After the roof boards have been sawed off, sheathing is applied to the gable ends and the cornice boards and part of the exterior trim are applied.

Many prospective home builders make up a cardboard model before starting construction. This shows in miniature just what your house will look like when completed so that you can make minor changes before it is too late. You are now over the worst hurdles in constructing the house and have gained confidence in your ability as a carpenter. Of course, it has required work — any worth-while accomplishment does—but you have saved money and experienced the pleasure of seeing something take shape under your own hands. In the concluding installment next month we will take up the roof, siding, doors, windows and interior.

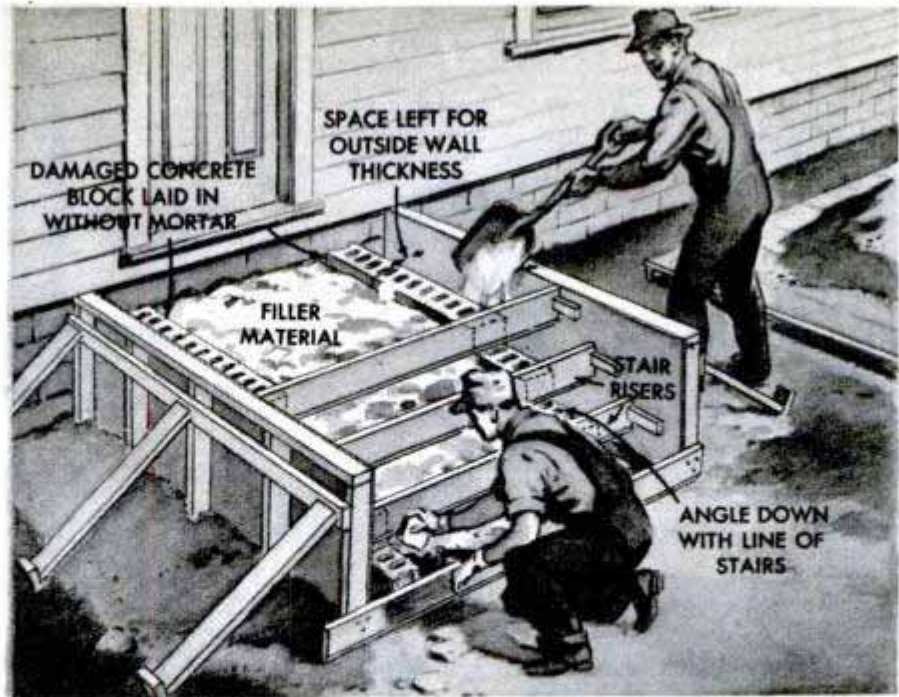
(To be continued)



Here is the book that gives complete step-by-step instructions and diagrams for building the Popular Mechanics House. Whether you build this house or any other house it will prove to be an invaluable aid.

Concrete Stoop Base Uses Cement Blocks

Proper preparation of a stoop before pouring the concrete can result in a saving of material and insure a base that is solid. Instead of using a wooden core, as is often done, one can be formed of concrete blocks and sand, or any other suitable filler. Broken blocks are used for the sides and smaller pieces are mixed with the filler. The outside form is made of wood and should be spaced so as to obtain the desired thickness of concrete.



Vertical Handrail at Corner of Stair Adds Safety and Convenience

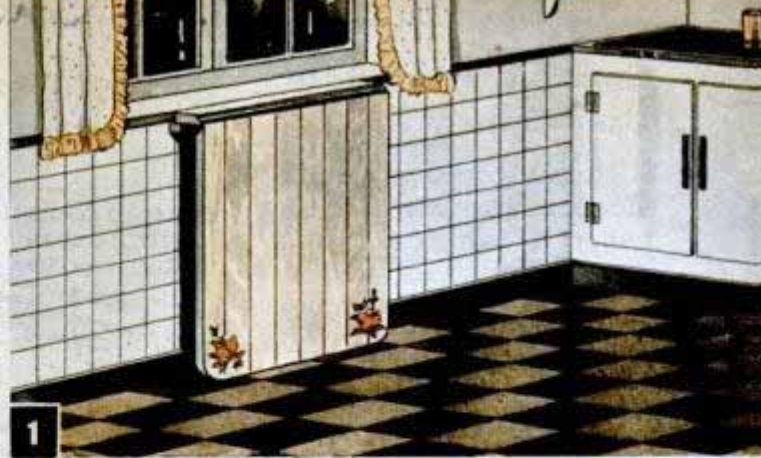
Fastened to the corner of the wall where there are winding stairs, a vertical handrail will add to the safety and convenience of users, especially when there are youngsters or elderly people. The rail is located at a convenient height so that it can be reached easily and should be long enough for people of different heights to grasp it while ascending or descending steps where the tread is narrower than usual. The same fittings that are used to fasten the regular handrail to the wall can be used for this section also. However, instead of the usual rail, it would be better to use a smaller piece that affords a firmer grip.

Michael Ligocki, Gary, Ind.

Pitch of Sloping Roof Easy to Figure

To determine the pitch, or rise, of a roof or other sloping surface in inches per foot, use a carpenter's square and a level. Lay the longer leg of the square on the roof with the shorter leg extending upward. Then place one end of the level at the 12-in. mark, as shown, and hold it so the bubble is exactly in the center of the glass. Pitch of the roof in inches is read from the scale on the short leg at a point where the level crosses it.





Fold-Away Table

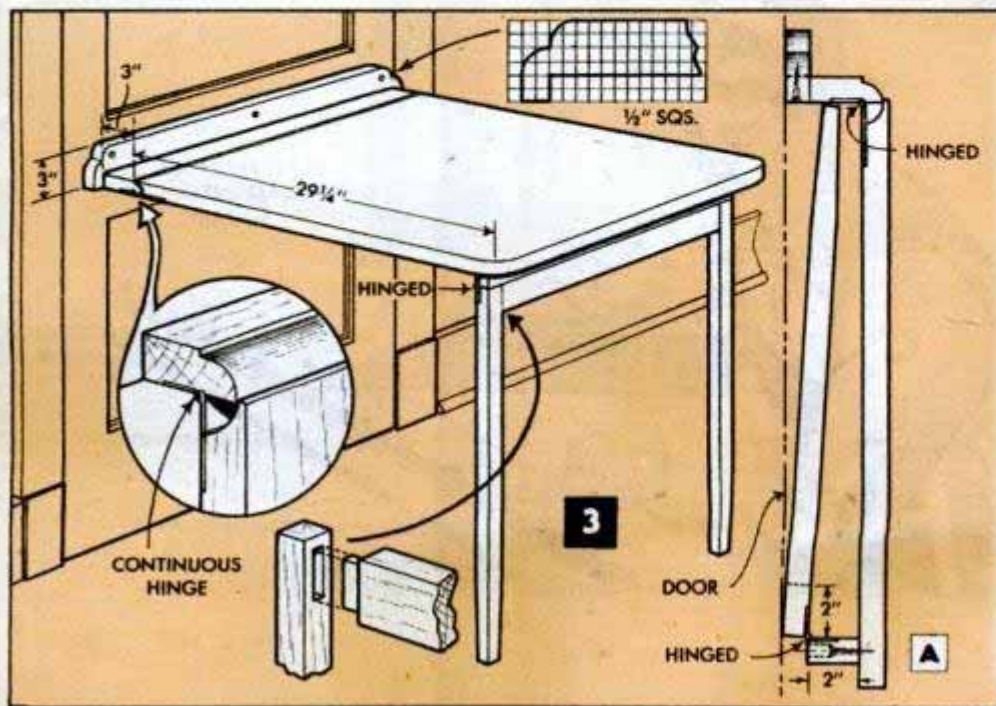
FOR THE SMALL KITCHEN

By Wallace W. Buffmire

NOWADAYS breakfast in the kitchen, also late-hour snacks and even informal parties are a regular practice in most homes. In small kitchens without breakfast nooks or other provision for seating space, the conventional table is a No. 1 problem. Here's a good solution: A look at Figs. 1 and 2 and you have it. The fold-away table

serves every purpose from breadboard to party top but when folded it takes only about 4 in. or so of room space, Fig. 3, A. In Fig. 1 you see it attached to the window sill; in Fig. 2 it's fastened to the kitchen door.

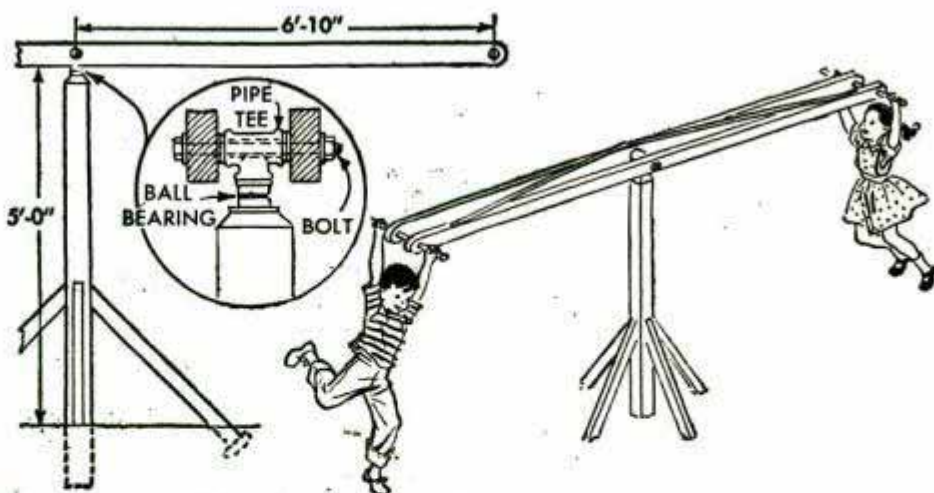
Fig. 3 gives construction details and suggests dimensions of the top. In this case the top is $32\frac{1}{4}$ in. square over all, but of course you can vary this to suit the location and space available. Table tops are usually 30 in. from the floor, but height, too, can be varied. Use hardwood for the top—birch is excellent—and join several narrow pieces with doweled joints and glue to give the necessary width. You can join the table top to the two-piece wall bracket with a rule joint and special hinges as indicated in Fig. 3, or with a plain hinged joint. Sand all parts thoroughly and wipe off the dust with a painter's tack rag. Finish with enamel or with clear brushing lacquer and wax.



SEESAWS NEED NOT ALL BE ALIKE

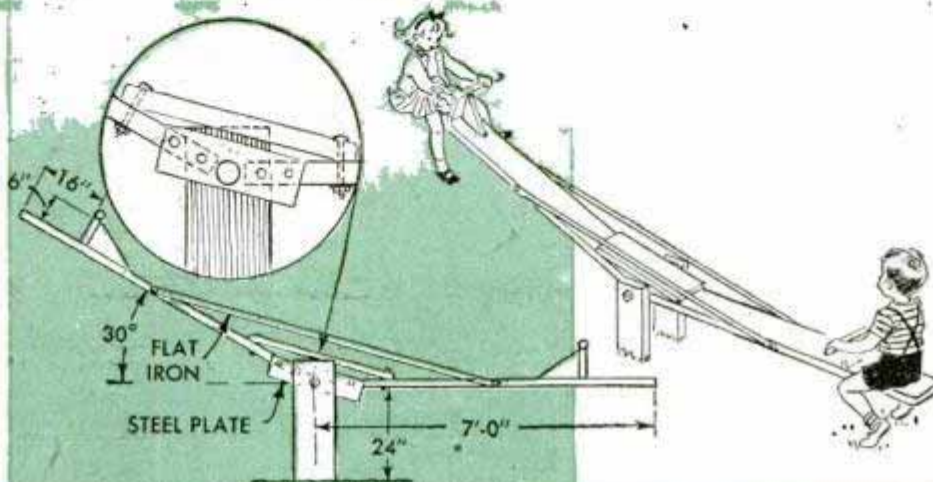
AERIAL

That's right. They needn't all be alike. They can have considerable variety. Here, for example, are four types, plus as many different kinds of fun. The first one, right, swings on a universal joint, that is, it can go up and down and around at the same time. One lad and a companion each grab an end. The lightweight really gets a ride 'round and 'round and up, too



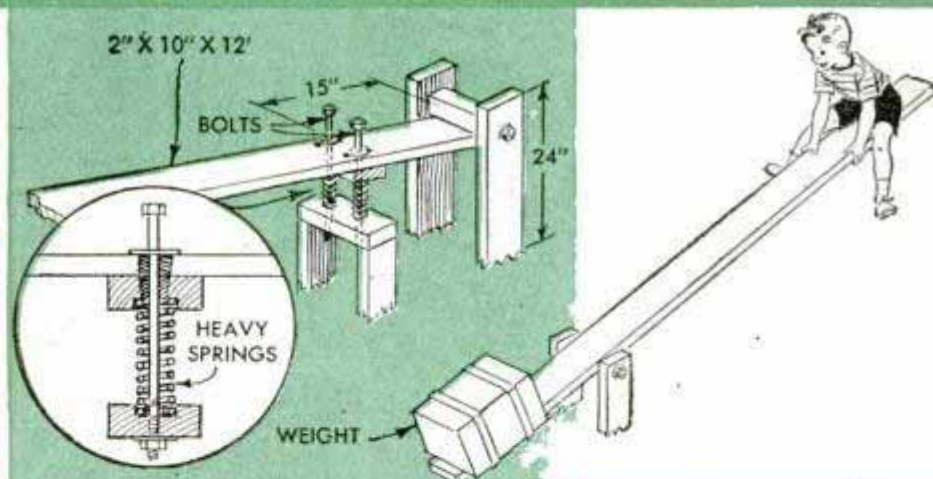
HIGH-LIFT

Then there's this version. The upgoing passenger may feel as if he's about to take off from a springboard but that's okay. If he hangs onto the sturdy handles provided he'll come down again. So will the other fellow when his turn comes. Detail drawing shows how it's made, in a sort of cantilever style. Posts should be anchored firmly in solid ground or concrete



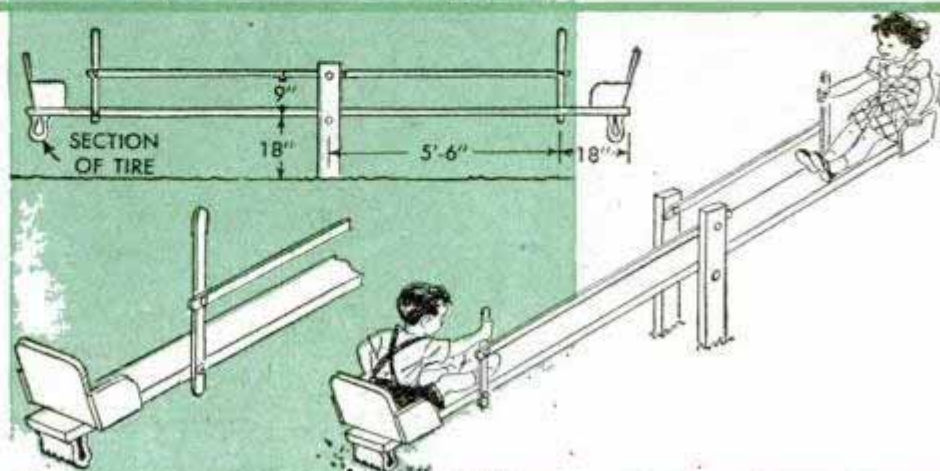
SOLO

These two are designed exclusively for solo flights. On one the dummy passenger is a box of sand. Find the right spot on the long end of the board where nice balance is attained and away you go. The other number, shown in the detail, performs much like a springboard. Strong coil springs give the bounce necessary to keep things lively. Parts should be amply strong



LAZY LOUIE

This one's still different. Arms instead of legs supply the motive power. Riders about equally matched in weight sit in bucket seats and make with the hand levers. Sections cut from old tire casings and attached to the plank keep the bumps safe and satisfying. Operating this one by hand actually takes a lot more energy, but the riders never know the difference

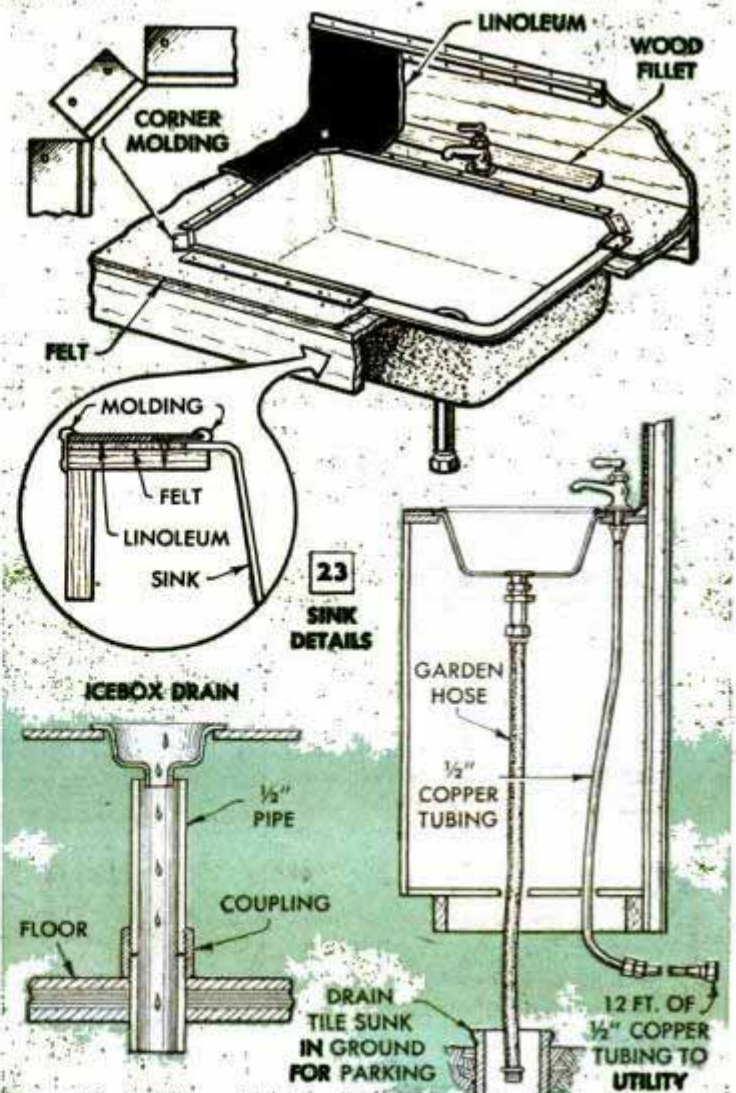
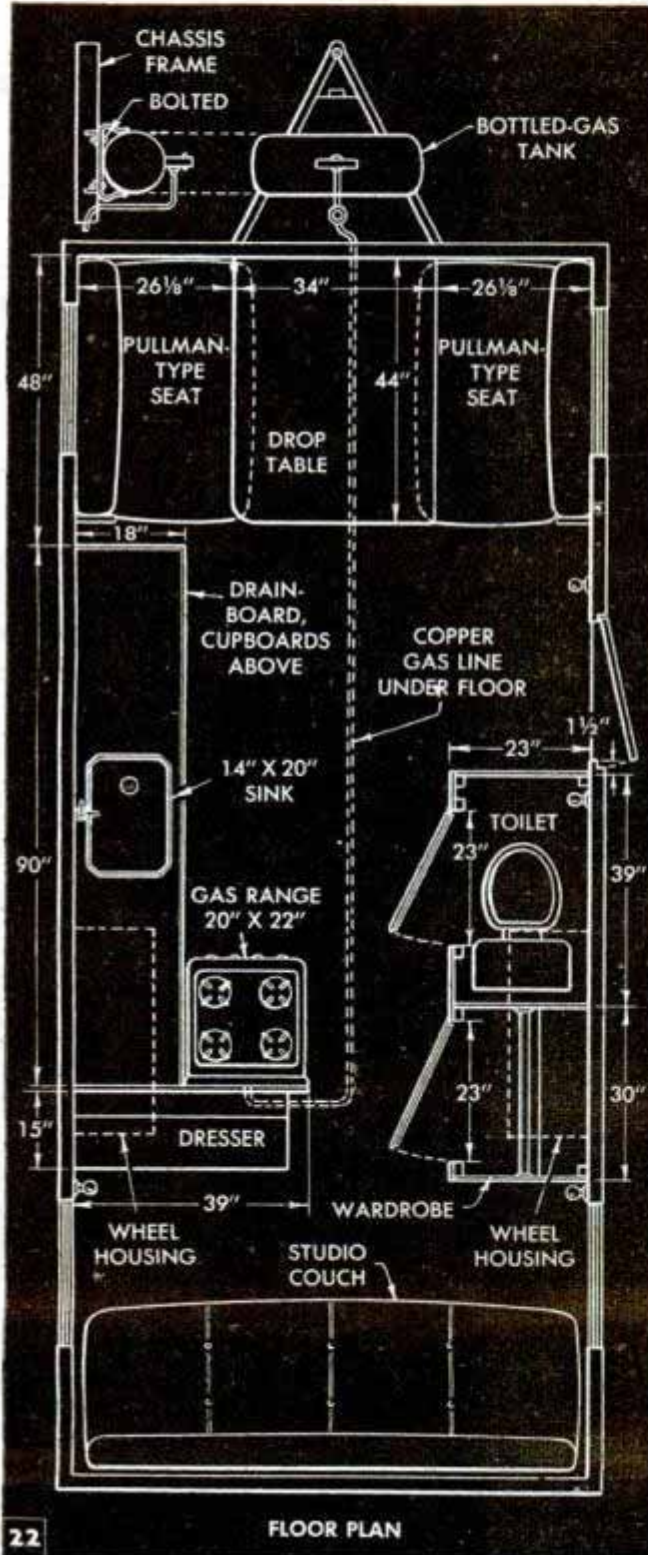


A Home of 1000

Numerous built-in features to make this trailer livable include a stove, a kitchenette with sink, icebox and wall cabinets, and a wardrobe and toilet. A dining nook at the front folds into a bed for two and a studio couch at the rear serves as a settee and sleeps two comfortably

AFTER completing the trailer proper, you are ready for the various built-in features which make it livable. Arrangements are shown in the floor plan, Fig. 22, and Fig. 2 of the March issue, the forward end serving as a dining room, and the rear end as a bedroom with a studio couch that folds out to make a double bed. In between, on the right side, are a toilet and wardrobe, and on the left side a kitchenette complete with four-burner bottled-gas range, a sink with cabinets below and cupboards above, and an icebox under the forward end.

The gas tank is mounted on the frame extension forward, outside the living quarters. Under no circumstances is it permissible to locate the tank inside, and in installing the gas line great care should be taken so that the copper tubing is not kinked with the hazard of cracking, and as few connections made as possible. Use the proper type of regulator for the tank you select and run as much of the gas line as possible under



Addresses

PART III

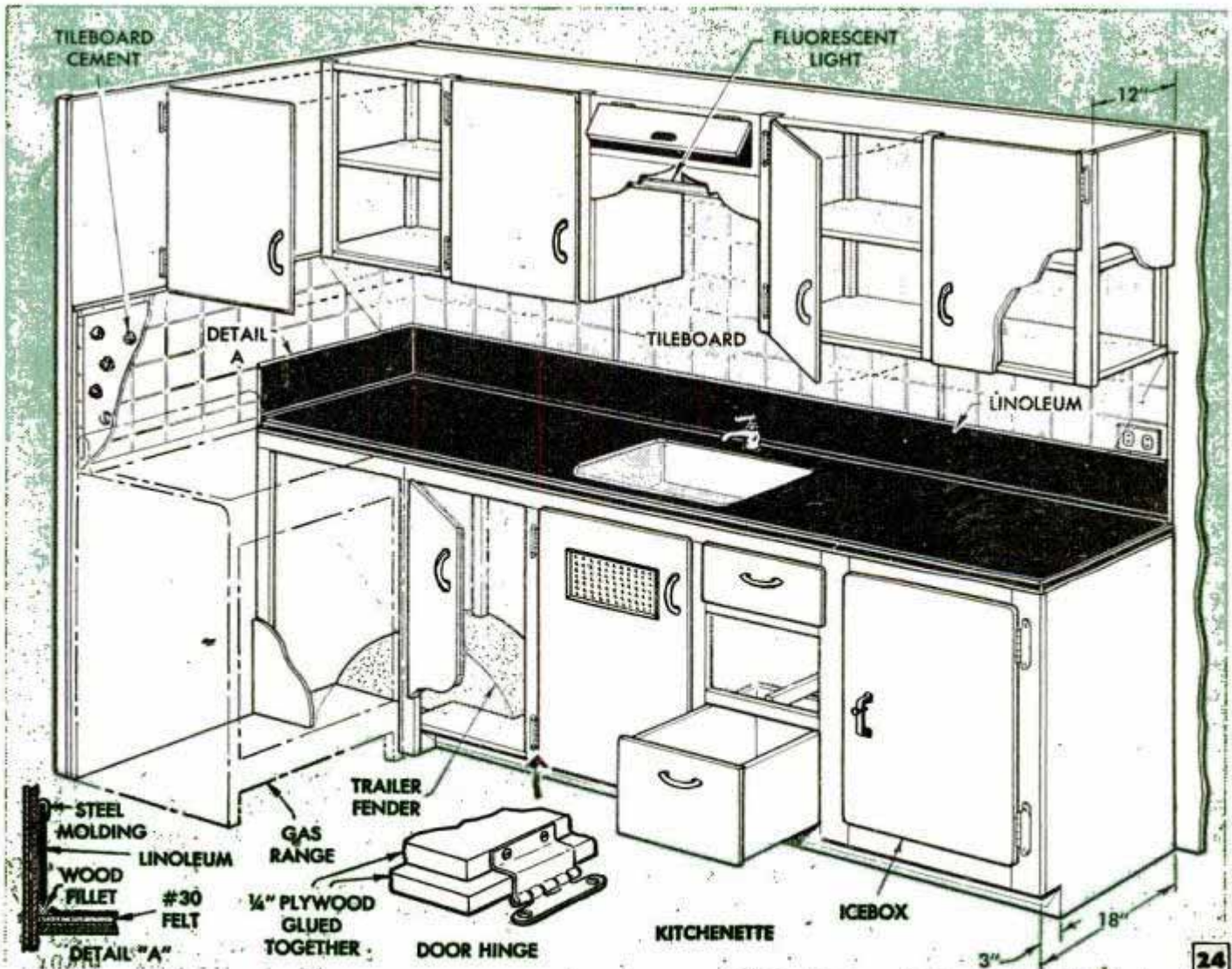
By Hi Sibley

the floor. Installation of the tank used in the original trailer is shown in Fig. 22, the legs being bolted to the angles across the V of the frame extension.

General layout of the left side of the trailer is shown in Fig. 27 with the kitchenette dimensions given in full. Further construction details on the kitchenette are given in Fig. 24. An exceptionally long drainboard is provided and, with the range at one side at the end, this will be found more convenient than in the average house trailer. Throughout, the kitchenette unit has been built and finished



with exceptional care. Cupboard doors, being built of two panels of plywood glued together, will not warp, and the back wall is cleaned easily, being of imitation tile. This attractive material is secured to the plywood by daubing on tile cement every four inches and pressing the tileboard against it. The same type of stainless-steel





25



26

Above, fine styling plus an icebox and three large drawers make this unit appealing. Special drainboard linoleum is laid over felt as at the left. Note wood fillet in the corner and the stainless-steel molding above

molding as used on the vertical joints outside is used on joints of the tileboard.

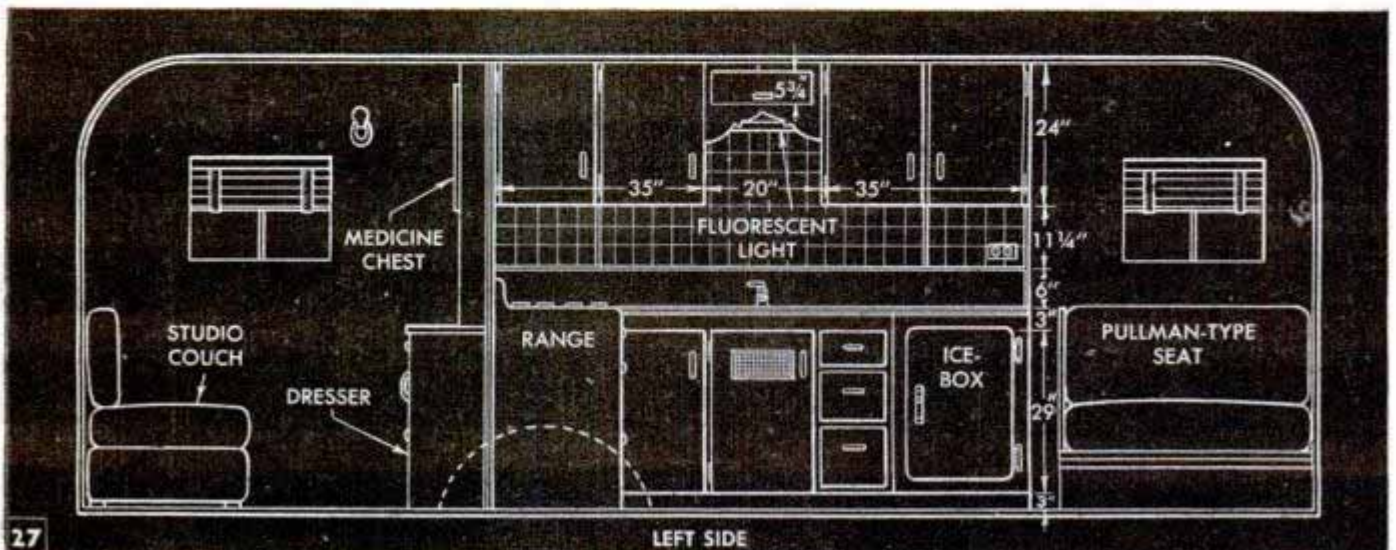
A fluorescent-light unit is installed just above the sink to cast a pleasing glow over the entire work surface. The latter is covered with 30-lb. felt, Fig. 25, and special drainboard linoleum, Fig. 26, and bound with stainless-steel molding. A narrow strip of the linoleum is installed along the front and end of the drainboard, and bordered with molding.

Details of sink installation are given in Fig. 23. First the sink is set in the opening cut in the plywood top and the felt laid up to the edges of it in cement. Next a stainless-steel strip with rolled edge is lapped over the rim of the sink and nailed in place. The corners are cut at 45 deg. Then the linoleum is cut to fit right up to the roll of the metal strip and cemented to the felt, after which edges are bound with stainless-steel molding. Note that the rolled-edge molding is laid in mastic to render a watertight joint. For drainboard use, select a linoleum that does not have a burlap backing. Such

material is undesirable because if any water seeps under it, each burlap strand serves as a wick to carry the moisture all through the fabric by capillary attraction.

The water system is illustrated in Fig. 23, and is connected to the local supply through copper tubing. The builder carries extra tubing for this purpose. It can be disconnected when on the road. The drainage is carried out through garden hose, and when parked for an extended time a hole is dug in the ground and a drain tile set in it for a miniature cesspool. Arrangement of the icebox drain is also given, the small amount of waste water merely dripping onto the ground below the trailer.

Arrangement of the right-hand side of the trailer is shown in Figs. 31 and 32. Much of the partition work can be built of 1/4-in. plywood left over from paneling the inside, and reinforced with battens at top and bottom and in corners. In this case 3/4 by 1 1/4-in. pieces were used, with quarter-round molding on the floor and ceiling. Incidentally, joints of plywood on interior



27

LEFT SIDE

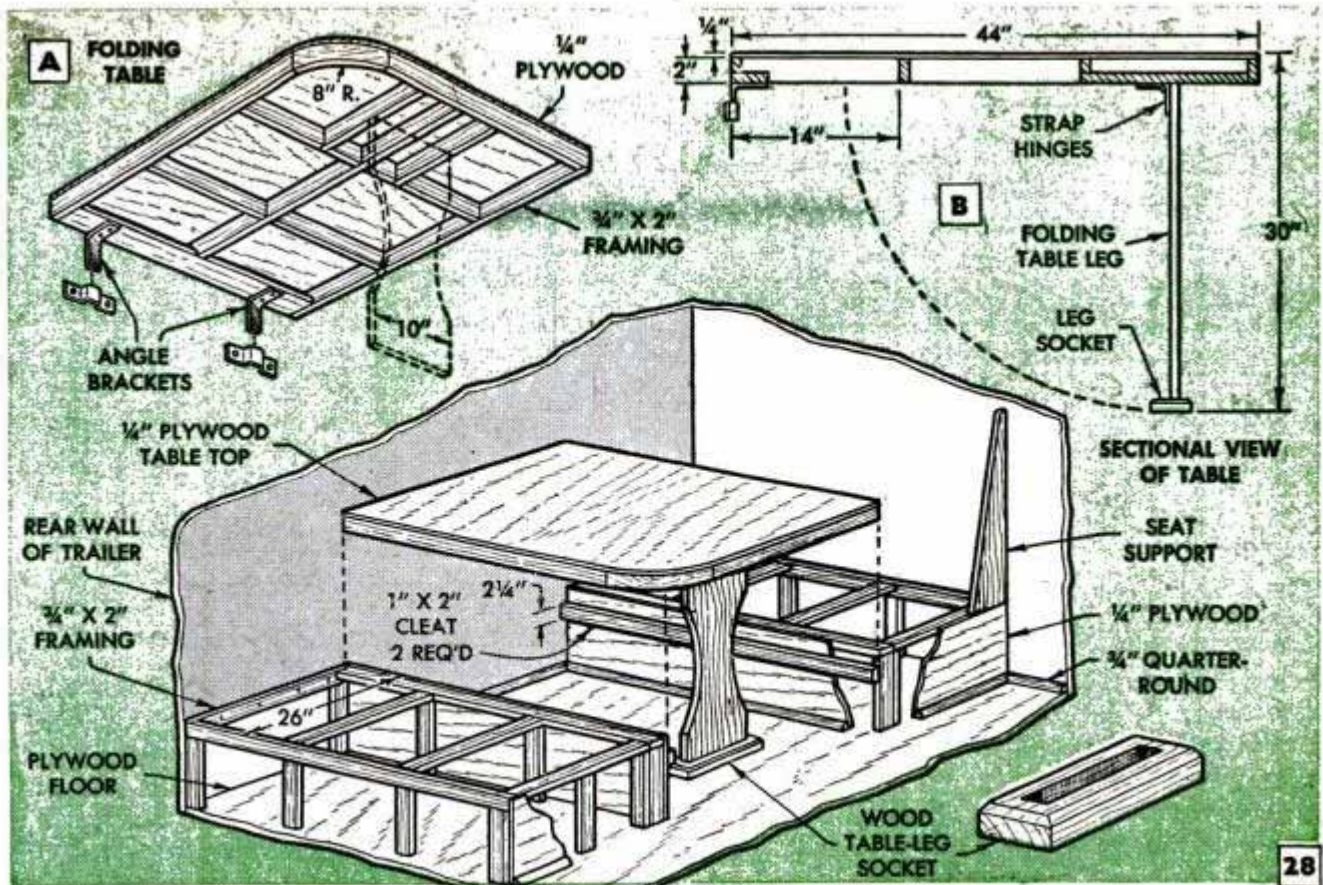
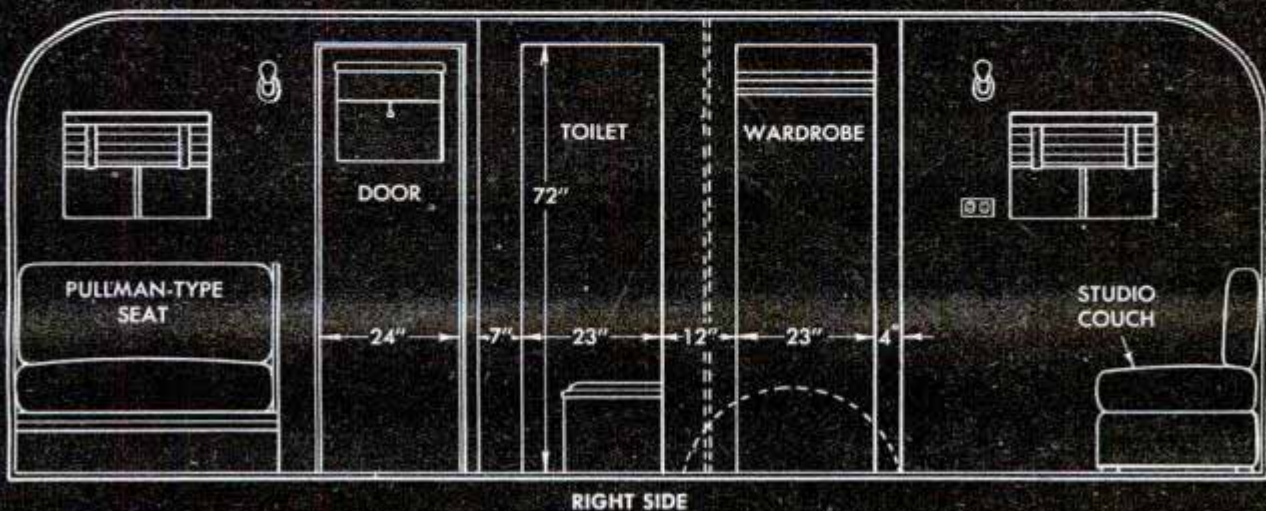


Photo above shows the dining nook made up into a comfortable bed that will sleep two. At right, table and seats are quickly made up so that four can dine without crowding



walls are concealed with $\frac{1}{4}$ by 1-in. strips.

The chemical toilet is a trim enameled one with a "tank" for charcoal to absorb odors, and sets over one end of the wheel housing. It requires no installation beyond screwing to the floor.

A shelf and clothes pole are provided for the wardrobe adjoining the toilet. Note that the wardrobe is built over most of the wheel housing, which does not interfere with garments hung there.

Wardrobe and toilet doors are identical, except that the latter has a handle on each side. Both are equipped with friction catches. The doors are made from a single panel of $\frac{3}{8}$ -in. plywood with battens of scrap $\frac{1}{4}$ -in. plywood on the inside, secured with casein glue and small screws, Fig. 32. They are hung on offset hinges.

The folding table with Pullman-type seats, Fig. 30, will comfortably accommodate four adults and is within easy serving distance of the kitchenette. Framing of the seats is built as indicated in Fig. 28. The folding table is made to drop down between the Pullman seats, the cushions of which are laid over it to form an extra bed, Fig. 29. The top is built of $\frac{1}{4}$ -in. plywood over a frame of $\frac{3}{4}$ by 2-in. material. The corner near the icebox, detail A, is rounded to per-

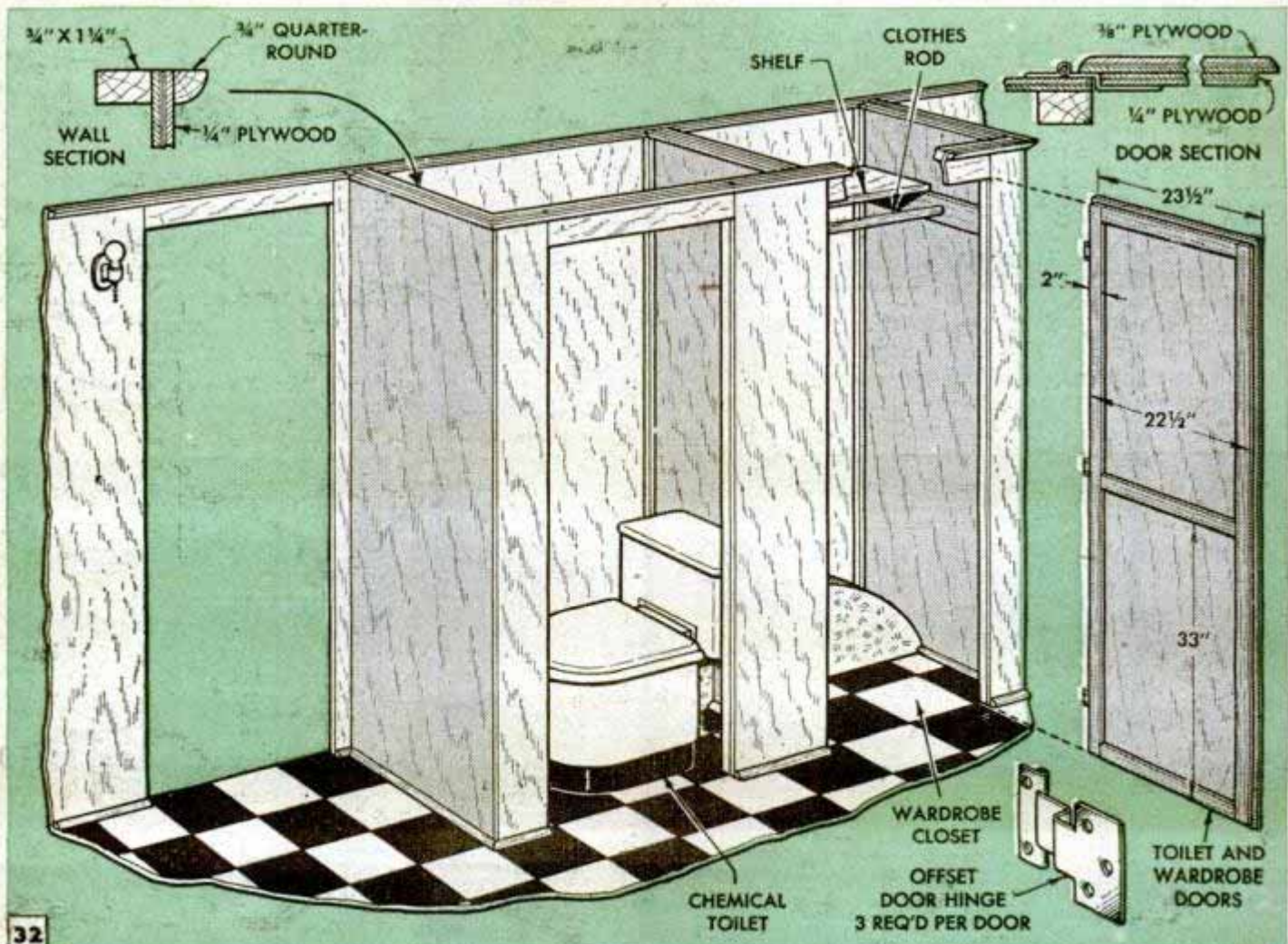
mit easier access to the seat. The under frame around the curve is scrollsawed. Two angle brackets in sockets support the table on the forward wall, and a folding leg is provided at the other end, fitting in a floor socket or slot, detail B. To make a bed, the top is simply lifted out of the end supports and the leg folded under and then placed on cleats on the fronts of the Pullman seats.

A dresser, Fig. 33, is built against the wall just back of the stove. At the right a panel door opens into a shallow compartment for general storage, and also gives access to the gas line into the stove. On the left are two drawers and a door hinged at the bottom for a soiled laundry compartment. This is deeper than the right-side compartment, extending back under the sink drainboard and over one end of the wheel housing.

Drawers are made in the conventional manner and are fitted with plastic handles, as are all other drawers and doors inside the trailer.

The medicine chest is a standard item with glass shelves and a mirror on the door. It is installed flush with the wall, and is flanked with small shelves as illustrated.

In the final finishing of the interior, see



that all joints are covered with battens. In the original, $\frac{1}{4}$ by 1-in. strips were used, and in the upper curved corners $\frac{1}{4}$ -in. plywood with the exposed grain crosswise was used, allowing bending to that radius. Standard venetian blinds manufactured for trailer use are hung over all the windows and, with the natural finish of the wood, give a very pleasing effect. A manufactured doorstep is a convenience, as it folds up and slides back under the body when traveling.

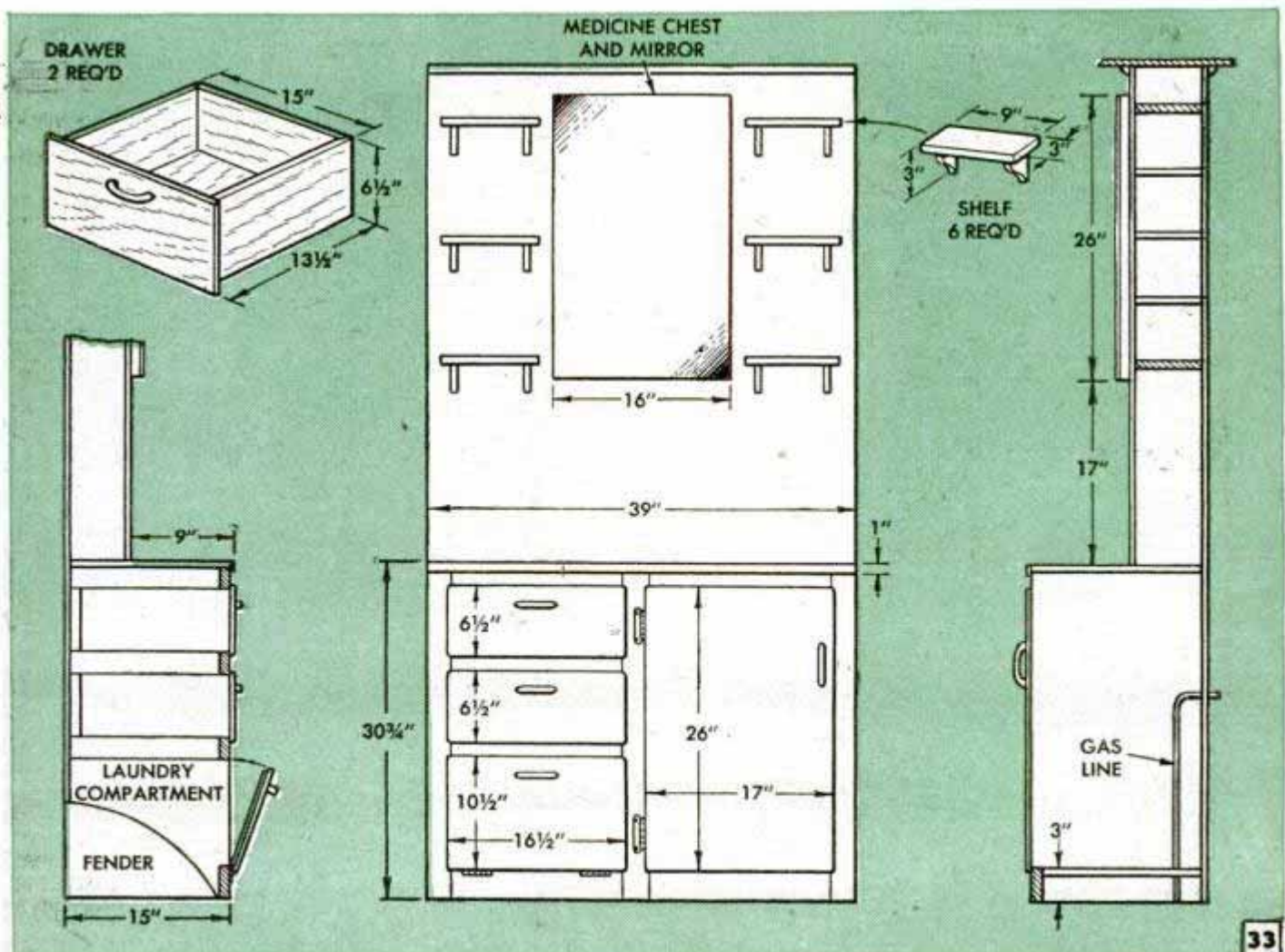
Many owners provide their trailers with pressure water systems independent of any outside source in a camp, thus enabling them to have water available regardless of where they park. Usually, this is done by installing a tank either under the trailer or someplace inside it and then providing fittings so it can be filled from outside the trailer and pressure applied with a tire pump or an air hose. Connections can be provided at the sink to use either the tank or an outside source of water supply.

For sake of safety, obtain the best hitch possible and acquaint yourself with and obey all laws pertaining to trailers in states in which you intend to use yours. Construction blueprints to aid you in constructing this trailer are available.

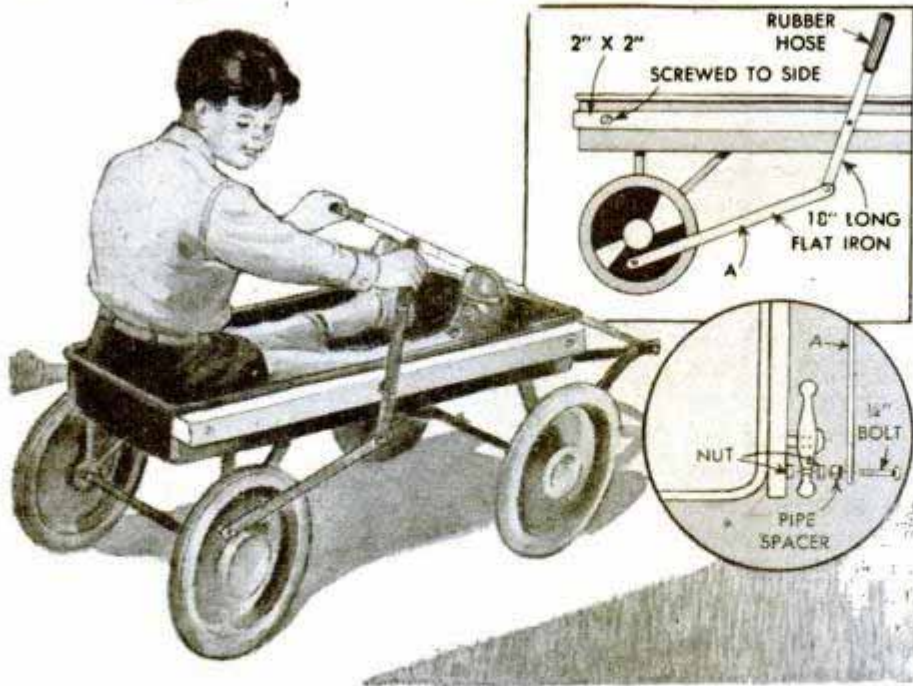
(THE END)



A built-in dresser base topped by an ordinary medicine chest with side shelves provides facilities for shaving, dressing, etc. Base has compartment for soiled laundry and two large drawers for other storage



Youngster's Coaster Wagon Is Hand-Propelled



It doesn't take much in the way of material or labor to convert an ordinary coaster wagon into a hand-propelled vehicle. Two flat-iron levers with the necessary bolts and nuts for linkages are about all that's required. The length of the levers depends upon the size of the wagon. A 2 by 2-in. spacer strip is bolted to the side, and the lever, with a rubber-hose grip that serves as a handle, is fastened to this. Connections for the driving lever are shown in the circular detail. — David Heggie, Whittier, Calif.

Improvised Sawbuck for Wood Lot Can Be Set Up Easily

For heavy work in the wood lot, this improvised sawbuck can be set up in a few minutes and it will hold fairly large logs. Four medium-size saplings sharpened at one end are driven into the ground at an angle on opposite sides of a log as indicated and then tied where they cross.

Hi Sibley, Nuevo, Calif.

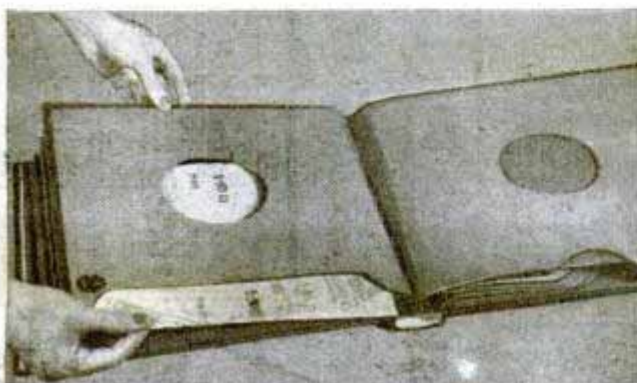
How to Reverse Window Shades

Reversing and cleaning window shades can be done in a few simple operations, and the result is well worth the effort. Begin by removing the tacks that fasten the shade to the end of the roller. Cut away any damaged material and square this end of the shade. Next remove the stick from the other end and rip out the stitching. Reverse the ends, stitching a seam for the stick on what was the roller end. Then square the shade and attach it to the roller.

Louis G. Barkley, Glendale, Calif.



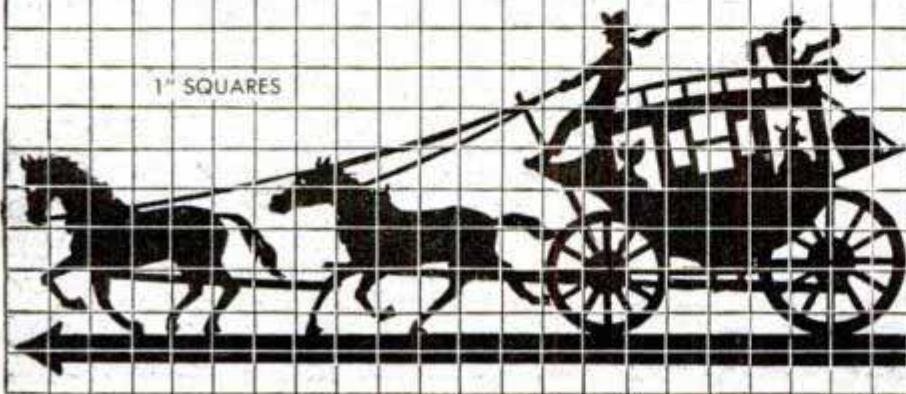
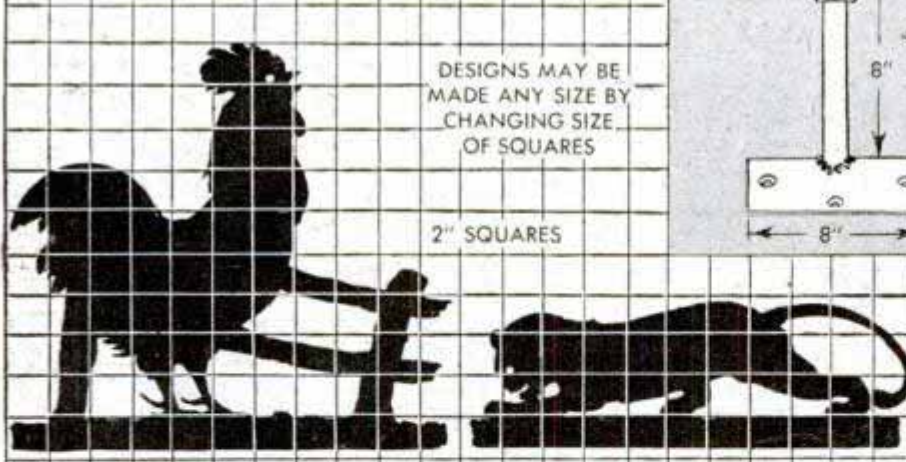
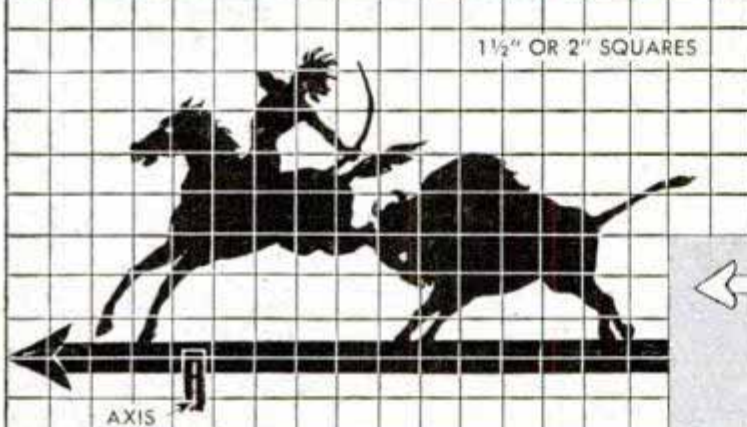
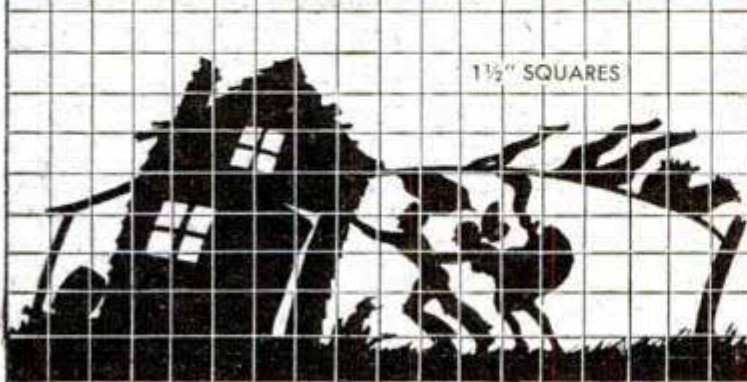
Sheets of Sandpaper Stored in Discarded Phonograph Record Album



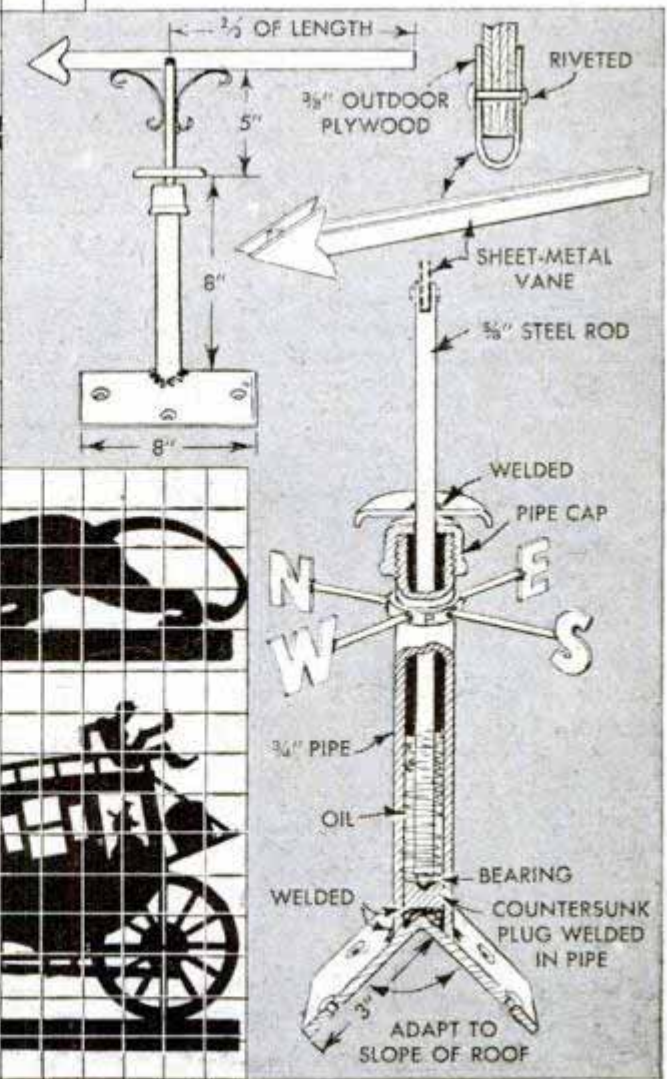
An old phonograph record album is an excellent container for various grades of sandpaper. When inserted in the pockets—a different grade for each—the number of the grit is read through the hole in the center of the pocket. Index tabs may be attached.—Benj. Nielsen, Aurora, Nebr.

☞ Before storing overshoes, wash them in warm water to remove oil and grease spots. Then stuff them with crumpled newspapers and keep them in a dark, cool, dry place.

WEATHER VANES



In fair weather or foul, any of these vanes will tell you faithfully which direction the wind is blowing. The silhouettes are cut from outdoor plywood or sheet metal and finished in black so they can be seen clearly against the sky. If sheet metal is used, it should be fairly heavy to stand the buffeting of the wind. A suggested method of assembling and mounting the parts of the unit is given in the lower right-hand detail. Also note that the standard, which carries the arrow and silhouette, rides in a sealed bath of oil



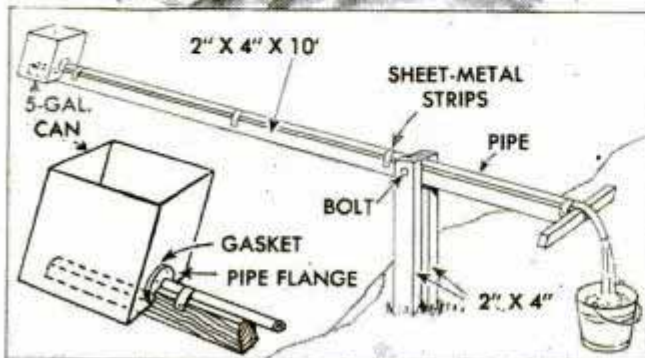
Adjusting Screws Under Bench Serve to Level It



When your workbench rests on an uneven floor, or if one or more of the legs are of unequal length, you can avoid propping the legs to make the bench level and steady by the use of lag screws. These are turned into the lower end of the leg, as shown in the detail, until the bench is properly adjusted. Care should be taken not to use screws that are too large as they may split the wood. A hole for the screw is drilled first.—Wm. A. Novak, Maywood, Calif.

Water for Summer Camp Lifted By Using Lever and Bucket

If you are camping by a river or lake where steep or muddy banks make it difficult to dip up water, use a simple water lift that can be operated from the top of



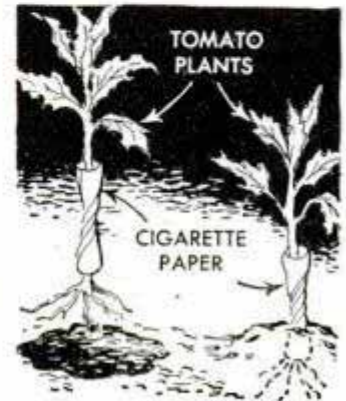
the bank. The lever illustrated is about 10 ft. long, although this dimension will be governed by the height of the bank above the water. A 5-gal. can with the top removed serves as a bucket to catch the water, which drains out through a pipe along the lever into a container at the handle end. Two uprights and a bolt provide the fulcrum on which the lever pivots.

C. L. Meehan, Lakeview, Ont., Can.

Cigarette Papers Keep Cutworms From Damaging Tomatoes

You can protect newly set tomato plants against cutworm damage by wrapping the stalks with cigarette paper or strips of newspaper. The paper should be twisted to hold it in place, and should project at least $\frac{1}{2}$ in. above and below the ground. By the time the paper has rotted away, the plants will not be liable to cutworm damage.

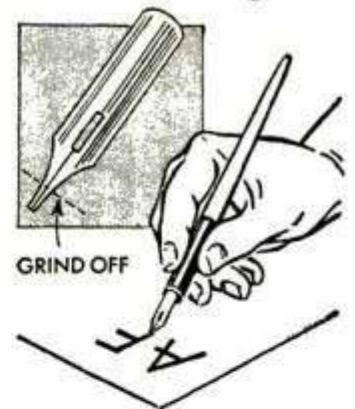
G. E. Hendrickson, Argyle, Wis.



Letters Printed With Writing Pen

An ordinary pen point can be converted to a lettering pen suitable for printing fairly large letters by grinding or filing the point until the nib is the width desired for the letter. When grinding, hold the pen with a pair of pliers, and when finished, smooth the nib with a whetstone. Do not use too much ink on the pen.

William B. Eagan, Charleston, W. Va.



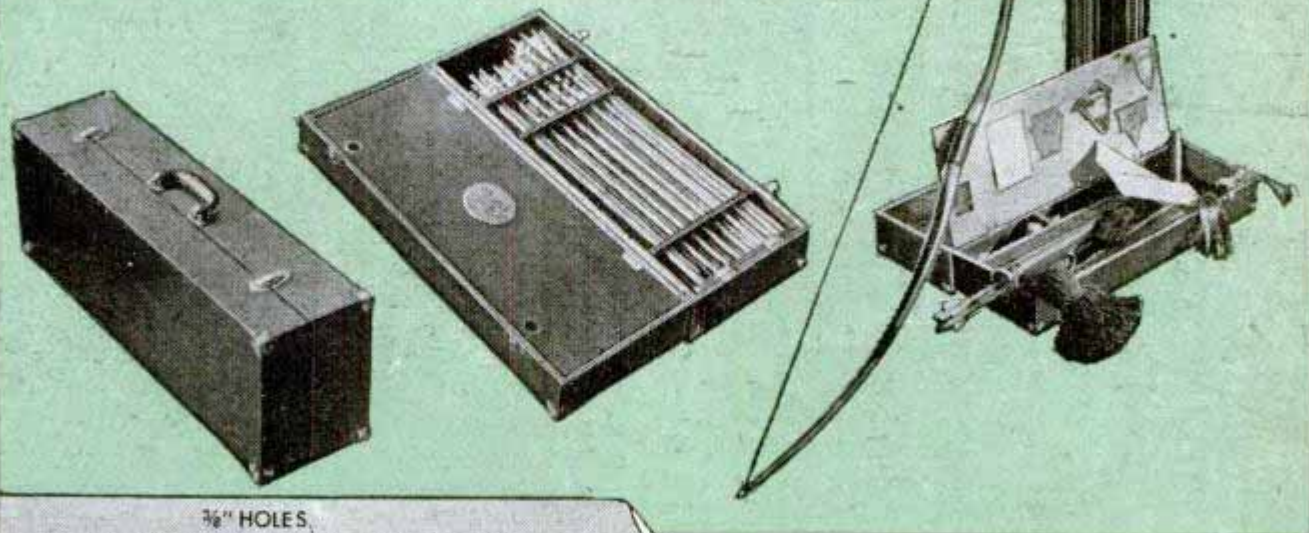
Weather Seal on Auto Starter

Many automobiles have starters that are fitted with a rubber "skirt" which acts as a weather seal on the floorboard and also keeps gases and noise from coming into the interior of the car. After a time these skirts wear out and often are difficult to replace. If there is a boot from the master cylinder of a hydraulic brake system on hand, this may serve as a substitute.

D. W. Brentlinger, Richmond, Calif.

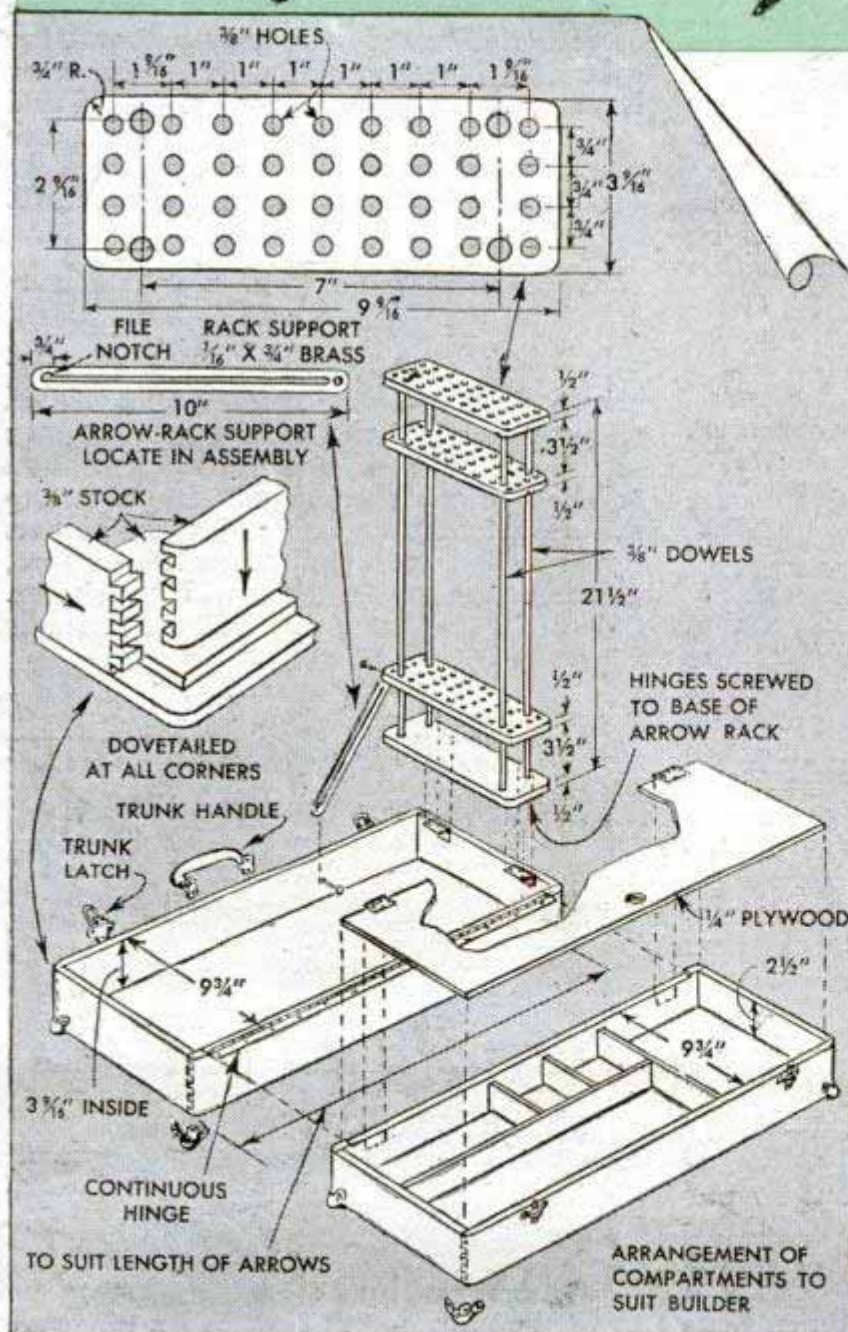
Archery Tackle Box

Compact and easy to carry, this archery tackle box has space for almost everything that's needed in the field. Compartments can be arranged to suit your convenience



By Kenneth B. Wikel

IF THE over-all dimensions shown on the drawing are followed, one half of this archery tackle box will have space enough for 36 arrows and the other half can be divided into compartments to carry such necessities as arm guards, gloves, string wax, repair thread and other items that are a part of every archer's kit. The corners are dovetailed and the two sidepieces are rabbeted for a close fit. Arrangement of the compartments is made to suit your own requirements. The dividing section fits into the half that contains the compartments and has a finger hole reinforced with a metal grommet. Construction of the rack for the arrows is shown in the upper and right-center details. Notice that the metal arrow-rack support is fitted after the rack is completed and hinged to the box. After the two halves of the box are joined with a continuous or piano-type hinge, all corners are rounded and fitted with metal reinforcements. The handle and latches are of the type used for trunks.



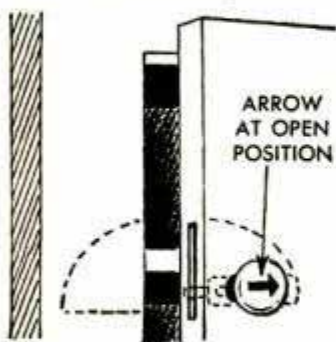
Roller Attached to Paste Brush Aids in Mounting Clippings



Clippings, photographs and other items that are pasted in scrapbooks can be mounted more easily with this combination roller-brush. An ordinary paste-jar brush is used with the roller attached to the end opposite the brush by means of a wire handle. The roller itself is a dowel covered with a length of smooth rubber tubing. Tubular rivets are driven into the dowel to serve as bearings for the handle.

Arrow Shows Position of Latch

To indicate the open and closed position of the latches on kitchen cabinets, one householder painted arrows on the knobs. Each arrow is parallel with, and points to,



the free end of the latch. When the head of the arrow is toward the hinges on the door, the latch is open. Fingernail polish will make a suitable "paint." — David Streby, Lancaster, Pa.

Walnut Is Darkened by Using Lye

If there's a piece of black walnut in your stock that isn't quite dark enough, paint it with a 10 percent solution of lye to get the proper effect. The best way to do this is to work the wood to the desired dimensions

first and then wash or paint on the solution. After drying, the piece is polished with fine sandpaper. Care must be taken not to make the lye solution too strong.

Erik Sollid, Denver, Colo.

Campfire Irons Made With Rod

Why carry a heavy grill when lightweight campfire irons will serve the same purpose? The ones shown here are made of $\frac{3}{8}$ -in. cold-rolled rod 24 in. long. They are bent at right angles about 6 in. from each end, and the ends are pointed



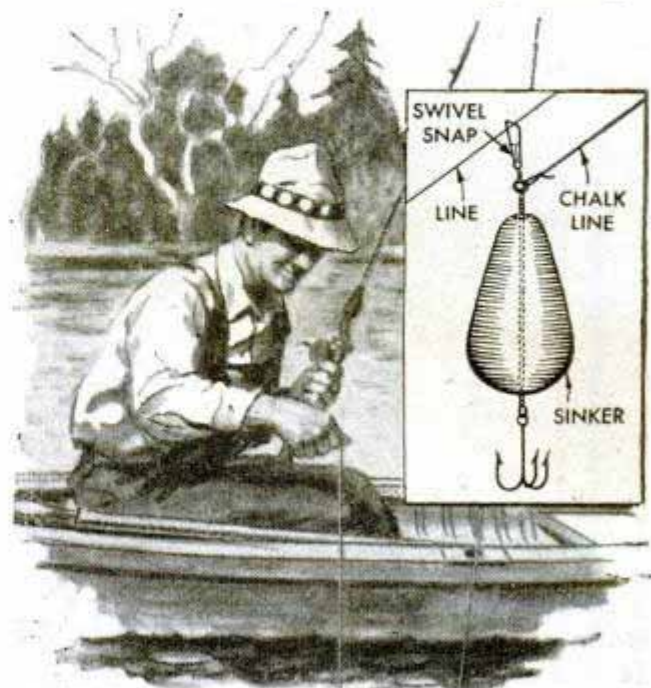
so they can be driven into the ground easily. When setting up the irons, drive two of the ends fairly close together and the others farther apart. Utensils with narrow bases are set where the rods are close and larger utensils, such as frying pans, are placed at the other end.

D. E. Horn, River Forest, Ill.

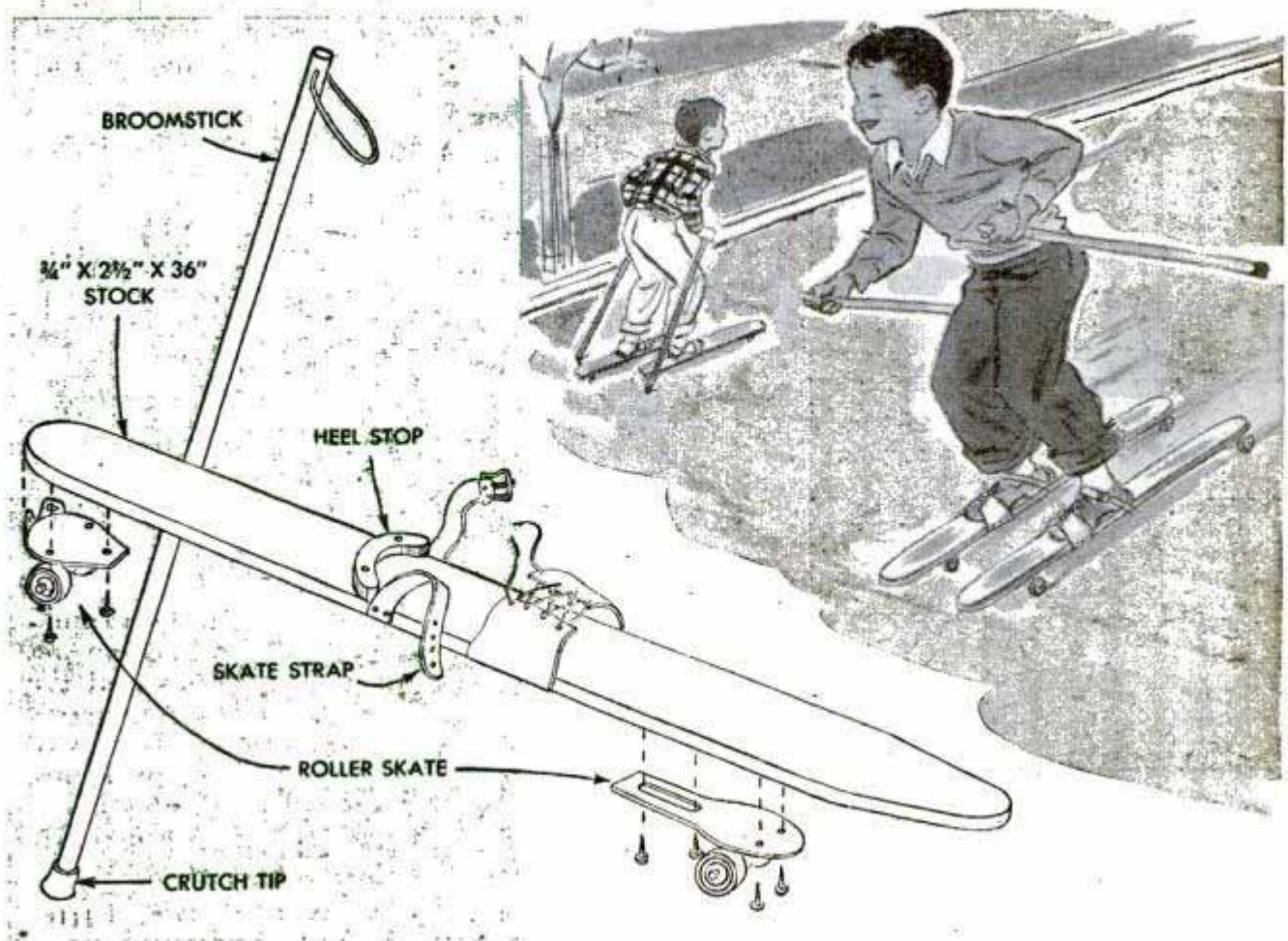
Bell Sinker Snapped Onto Line Frees Snagged Fishing Lure

By using a fairly large bell-type sinker rigged with a treble hook, and a swivel snap to attach it to the fishing line, plugs or spoons that have become snagged often can be worked free. A chalk line is tied to the swivel snap to manipulate the sinker, upper right-hand detail. To release a lure, get above the snag and bob with the sinker.

Francis C. Zuiker, Chicago.



These Sidewalk Skis Furnish Year 'Round Fun



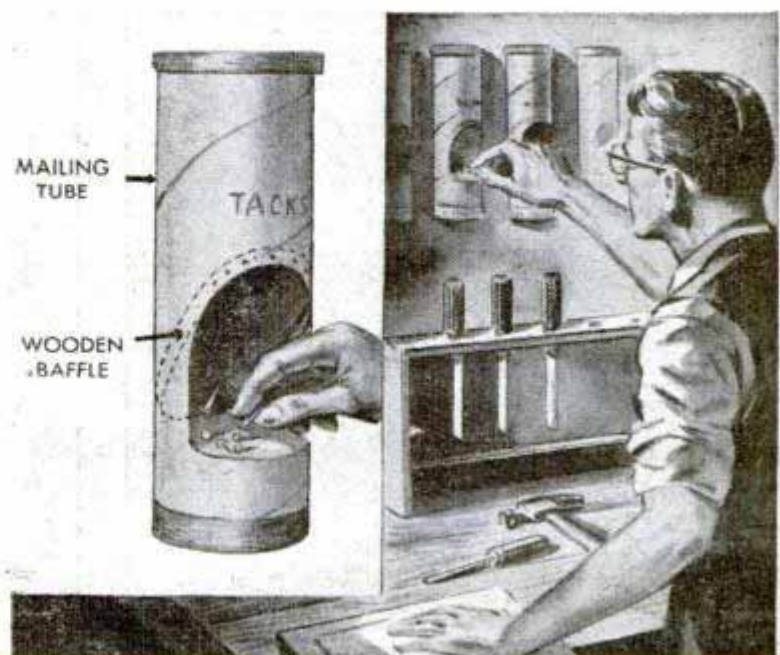
"Ski-skates" would be another good name for such novel funmakers as these. One pair of roller skates, in reasonably good condition, and two 3-ft. lengths of $\frac{3}{4}$ -in. hardwood will make a pair of sidewalk skis. Cut off the "heel" of each roller-skate frame as indicated, shape the ends of the boards and smooth with fine sandpaper and

then screw the two parts of each roller skate in place as shown in the detail. Finish with leather ankle and toe straps and screw a curved heel stop to each ski. Suitable poles can be cut from discarded broom handles. Each is fitted with a wrist loop of strong cord and a crutch tip to prevent slipping.—Harold Gluck, Bronx, N. Y.

Mailing Tube Holds Small Parts for Easy Dispensing

Plugged at both ends with wooden disks and having an access opening cut into the side, a mailing tube makes an ideal dispenser for nails, tacks, screws and other small parts found around the workshop. The upper left-hand detail shows how a baffle plate is fastened inside the tube to control the flow of parts. The reservoir space above the baffle permits the storage of large quantities.

☞ When sending a cake or cookies through the mails you can be sure the pastry will arrive fresh if you pack marshmallows around it. These not only act as humidors to retain moisture, but are an additional treat to the recipient.



Cover chipped spots on pottery with colored nail polish mixed with vegetable dye to secure an exact match



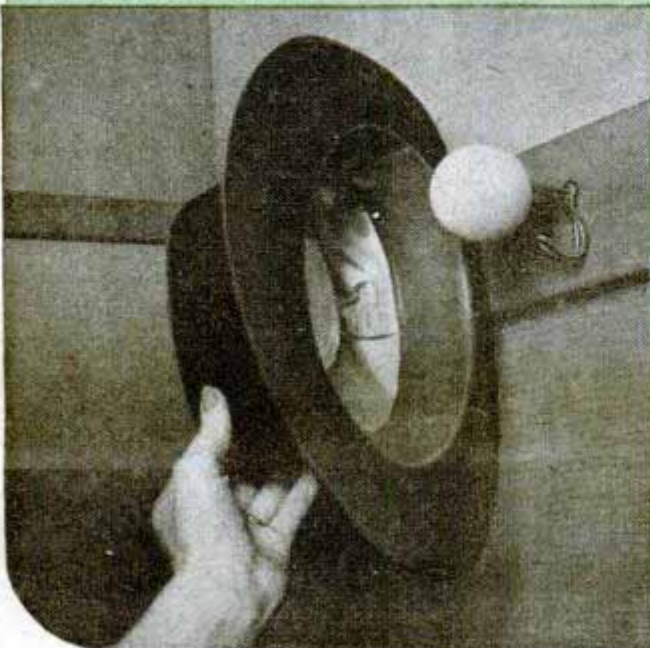
Caster cups under the legs of an ironing board will prevent its slipping



Keep your sewing machine bobbins handy by placing them on spool racks



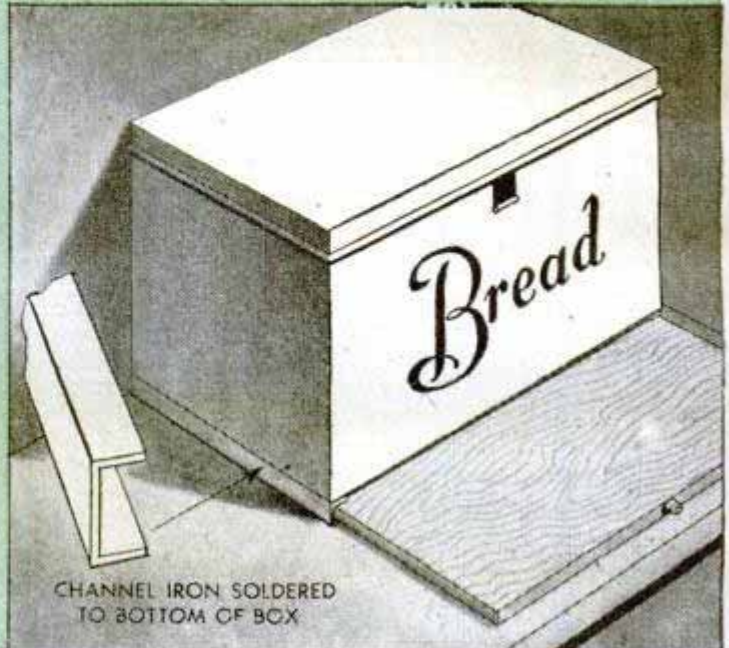
Your hat won't fall off the coat-closet hook if a sponge-rubber ball is slipped over the hook. Balls that are gaily colored will add a decorative touch



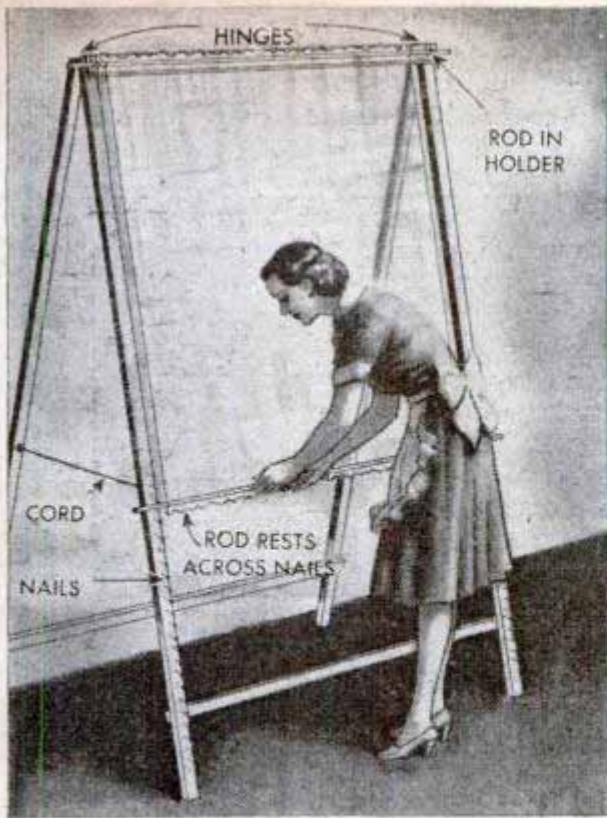
Wooden coat hangers can be made to do double duty by using them as skirt hangers. Fasten screw hooks to the hangers and slip the loops on the skirt over the hooks

Solving HOME

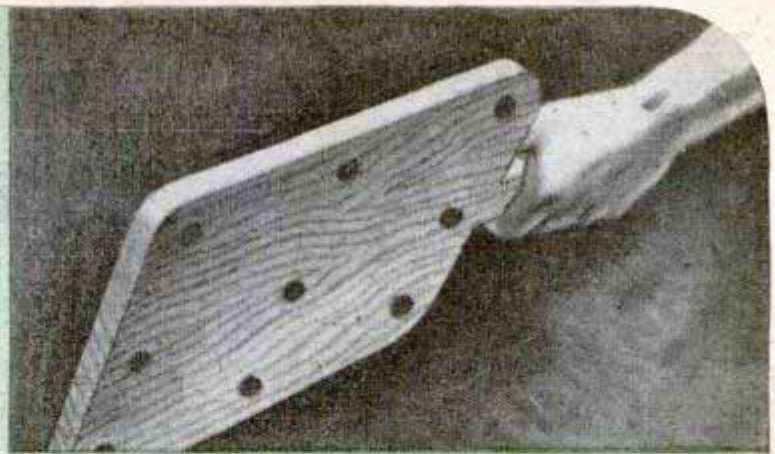
Always at hand when needed, this board is kept beneath the breadbox where it is not in the way. The board slides in two sheet-metal channels which are formed by hand and soldered to the bottom of the box



CHANNEL IRON SOLDERED TO BOTTOM OF BOX



If you want to dry curtains in a hurry, this stretcher will do the job. Sides of the easel must be far enough apart for the widest curtain and the length is adjusted by means of the bottom rod



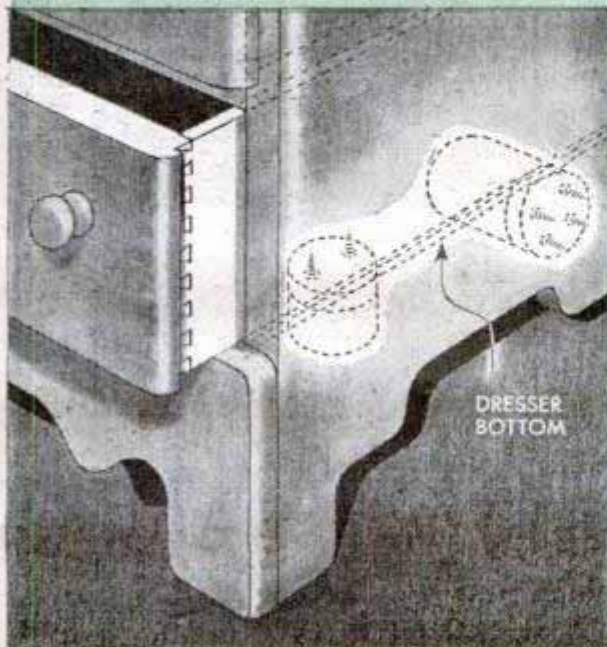
When a number of rubber tacks are fastened to the bottom of a meat or bread board, they will keep it from sliding



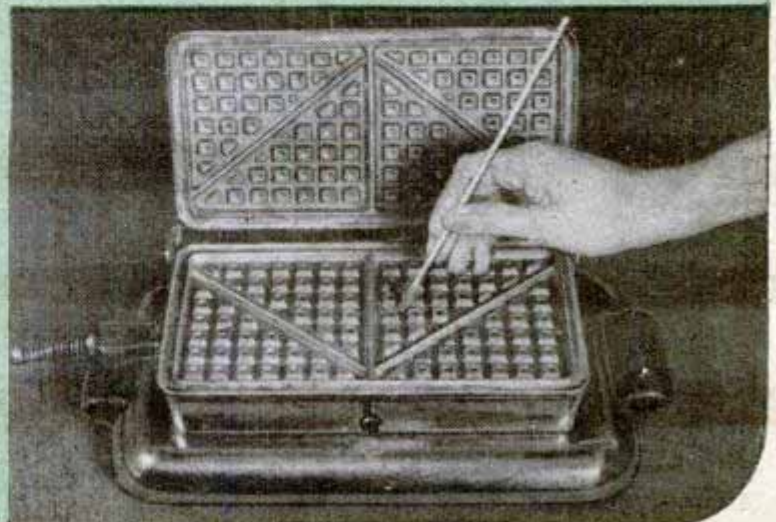
Take the work out of waxing and polishing flat surfaces, such as end-table tops, by using a thick, soft, shoe buffer

PROBLEMS

Screw-top jars will make ideal places to conceal valuables around the house. Two possible locations are shown at the side or bottom of a chest of drawers



Small particles of food clinging to a waffle iron are removed by using steel wool wrapped around the end of a dowel



Cast-Concrete Birdbath Repaired With Cement and Screen Wire



If a sizable piece of concrete has been broken from a birdbath, it need not be discarded. Soak the broken piece or pieces and then fit them in place. Cut a piece of screen wire to cover the area and pour a mixture of cement and fine sand over it. This should be a thin layer. As soon as it has set somewhat, smooth and brush the surface. Let the repaired bath harden, propping the broken pieces in place. Finally, when the repair has hardened, sand the rough areas.

Franz J. Serdahely, Philadelphia, Pa.

Candid-Camera Film Cans Used To Make Salt Shakers

Cans that 35-mm. photographic film is packed in may be used as salt and pepper shakers for the picnic basket. It is neces-



sary only to punch holes of the proper size in the tops, which are unscrewed for filling. The shakers can be used in the kitchen also.
Herman Klein, Pittsburgh, Pa.

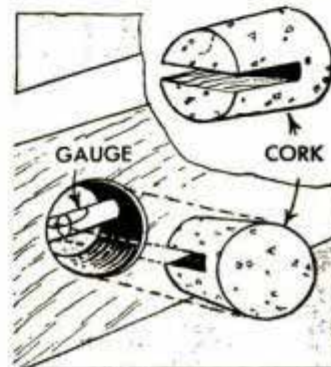
Eliminating Squeak From Oarlock

After two holes have been drilled into the wooden base of an oarlock at an angle as shown in the circular detail, they can be used to lubricate the oarlock and eliminate the squeak caused by a dry condition. To obtain best results, insert wicks in the holes. Wicks should be kept lubricated.



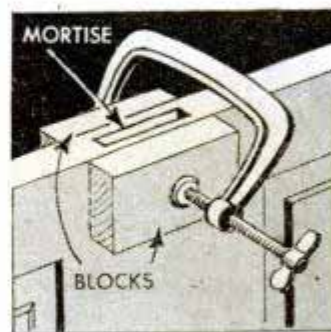
Slotted Cork Will Protect Gauge

Accidental breakage of the glass gauge in a level can be prevented by slipping a cork guard over the glass when it is not being used. The slot in the cork should be a snug fit over the glass and the cork should be a tight fit in the mounting hole. Cut the cork so it does not project from either side of the level.—Stanley B. Nichols, Cold Spring Harbor, N. Y.



C-Clamp Aids in Cutting Mortise

When cutting a mortise with hand tools for the lock in a door, or doing similar cabinet work, clamp a block of wood on each side of the door where the cut is to be made. These will prevent splitting the door when working close to the edges. The bridge of the clamp is turned so that it will not be in the way.



Should you have odds and ends, such as artificial flowers and bits of dry goods, that need cleaning, put them in a fruit jar containing nonflammable cleaning fluid and shake thoroughly. Then rinse with clean fluid and the job is done.

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p. 1



Skim the Waves in this motor-driven paddle board

HERE'S something new in water-sports equipment—a motor-driven paddle board. It combines the common characteristics and seaworthiness of the surfboard and paddle board, but, more than that, it's power driven by a conventional outboard motor. That's the new angle. Smooth, sweeping "hull" lines, crowned deck and low motor hatch make this the sleekest, trimmest little craft you ever looked at. Light enough to be easily launched by one person, it rides rough water like a cork.

The hull, or board, itself is constructed just like the nonpower jobs, except that it is 5½ in. deep instead of the usual 3 in. or so on the conventional surfboard and paddle board. Deck and outboard plan views shown in Fig. 3 give the general over-all dimensions. Note that the motor hatch is placed well forward, giving ample room for a tall man to lie full length aft of it. Con-

trols consist of tiller and speed lever, and a plastic-glass transom permits a view inside the "engine room" from the rear. This, together with a midget headlight, could be lighted from a small storage battery for night cruising. General arrangement of the hull is shown in Fig. 1. Note that three of the bulkheads are only about half the width of the others and serve as deck beams. In the engine compartment is another half-bulkhead on the bottom, and the only one that is not spaced 12 in. on centers. The location of this is determined by the particular outboard motor you select.

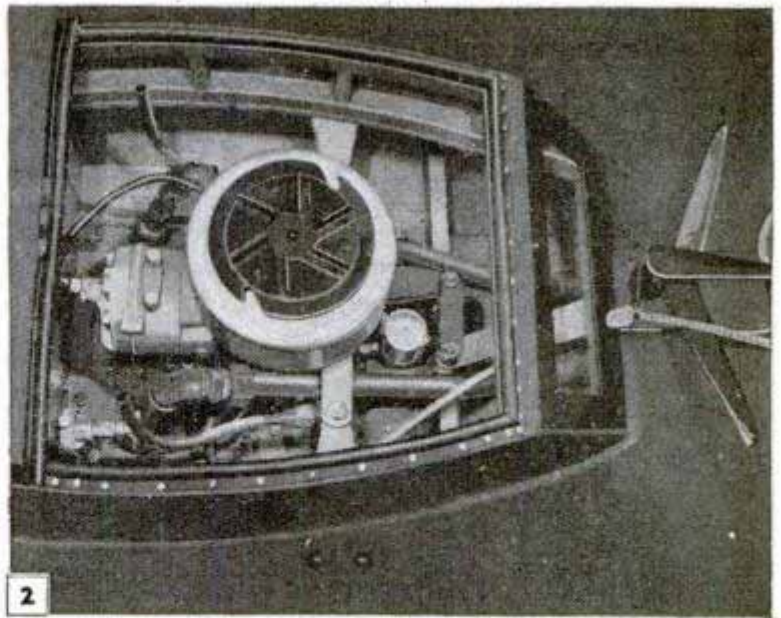
In laying out the board, follow the dimensions given in the station layout, Fig. 1, which shows the stations all spaced 12 in. apart. To achieve a true curve, use a 7/8-in.-square spruce or pine batten, and, by bringing pressure at the ends, let it take a natural bend. Drive nails into the plywood

bottom $\frac{1}{8}$ in. outside the station dimensions so that nails will not mar the panel, and at the same time leave material for trimming. The mark should be on the inside of the batten. The deck only is completely streamlined, the bottom having extensions aft which act as planes.

Details of construction are shown in Fig. 1. Side members of mahogany are notched into both nose and stern blocks after bulkheads have been installed. The latter are of soft pine, $\frac{3}{4}$ in. thick, with lower corners cut away for limber holes to permit any bilge water seeping in to flow from one compartment to another. Drain holes plugged with roundhead brass screws are located just forward of bulkhead No. 3 and aft of No. 5. When necessary these screws are removed and the hull tipped to drain.

In assembling, apply casein glue to all edges of the bulkheads and on edges of the side members. Where these parts contact nose and stern blocks, use marine glue. Brass or galvanized flathead screws, 2-in., No. 8 size, are used to fasten parts to bulkheads and to nose and stern blocks. The bottom, which is installed before the deck, is fastened with $\frac{3}{4}$ -in. No. 6 screws spaced 3 in. apart.

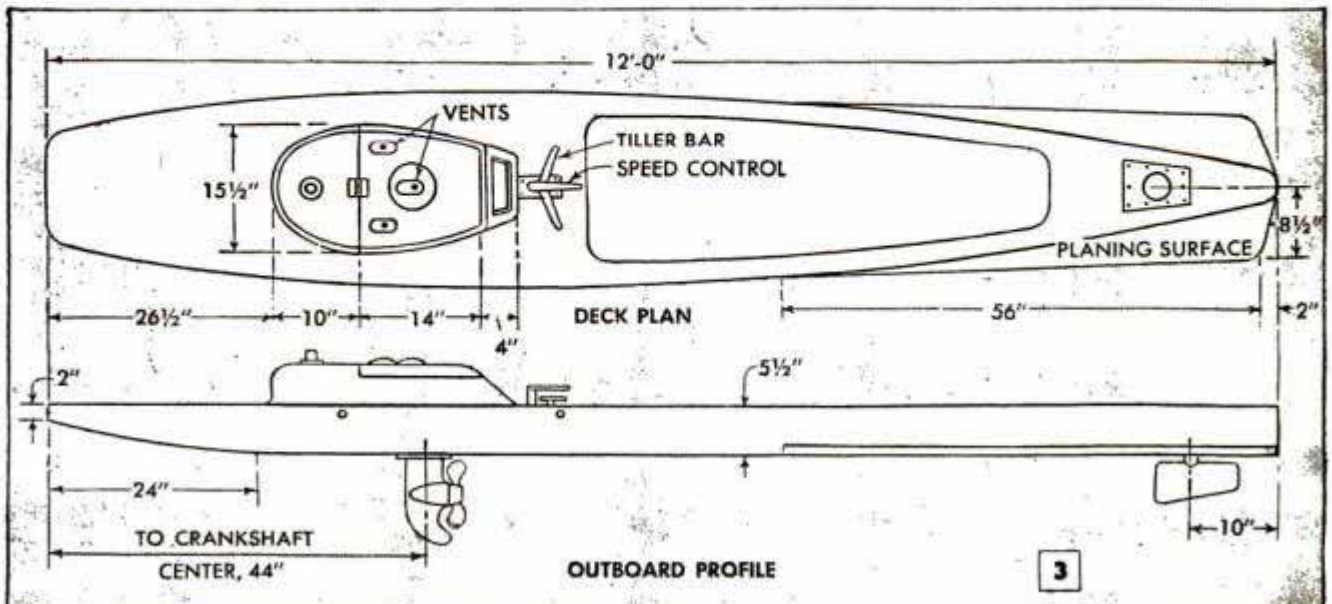
Extensions of the bottom serve as planing surfaces and are reinforced with $\frac{3}{4}$ -in. soft-pine stock glued to extensions of the $\frac{1}{4}$ -in. plywood bottom piece. Holes are cut in the full-size bulkheads for the steering cables, as indicated, and should be the same distance apart in each, in this case 11 in., or the width of the cable arms. An opening in the bottom for the propeller unit and various pipe fittings is cut later on. Steering is

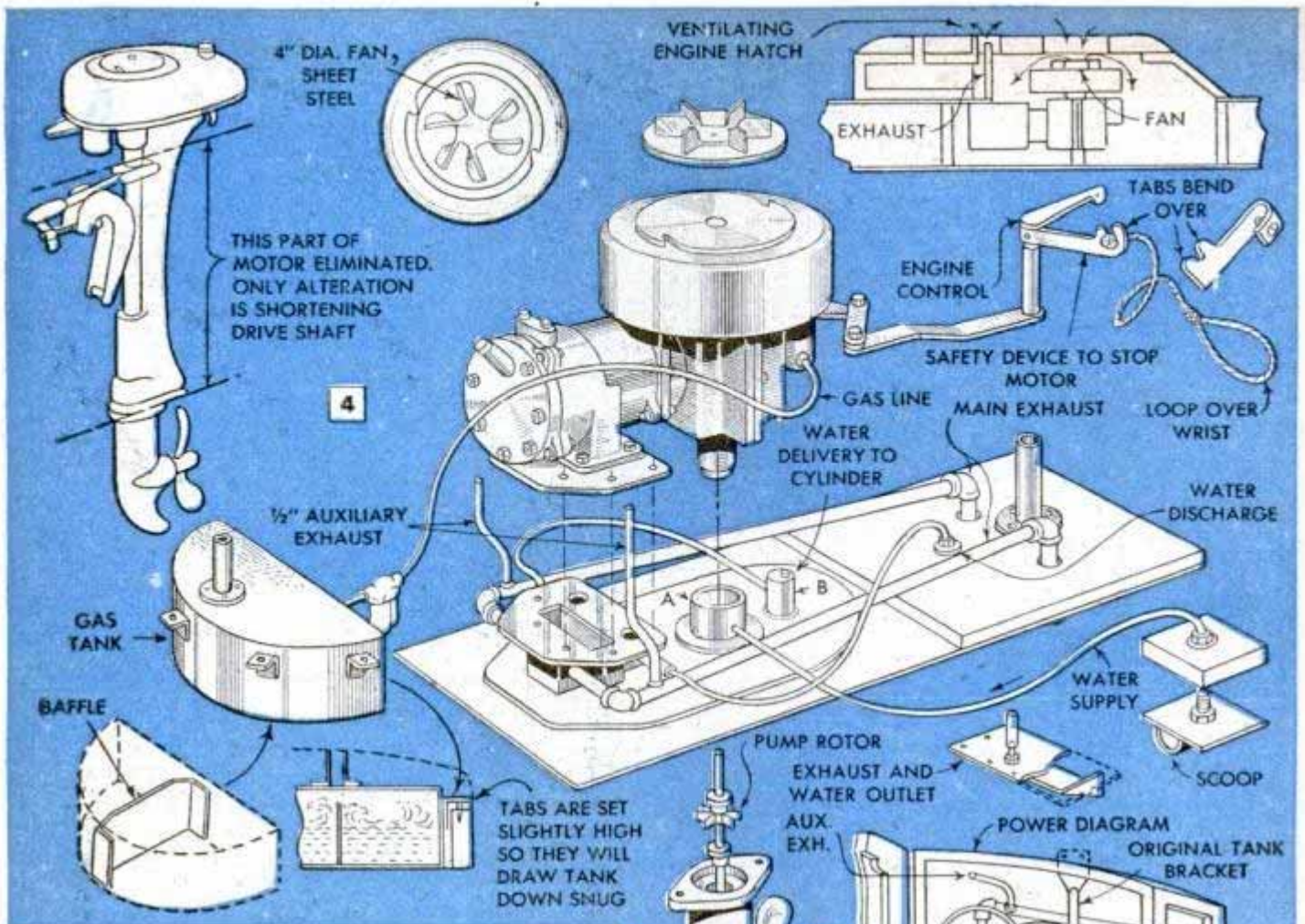


Down view into engine hatch showing all fittings and flywheel fan in place. Note safety cord which attaches to the rider's wrist

opposite that of a bicycle. Pulling the right end of the tiller back causes the board to turn left and vice versa. If one prefers the bicycle arrangement, cross the cables, cutting holes in the bulkheads accordingly.

The deck is cut from $\frac{1}{4}$ -in. waterproof plywood, the same material as is used for the bottom. There are two openings in the deck piece, one for the engine hatch and a circular hole at the stern for steering gear inspection, to be covered with plastic glass and a brass plate secured with roundhead brass screws. Aluminum bent around a scrollsawed framework forms the wall of the superstructure, with a plastic-glass panel in the after end covered with a brass frame and waterproofed with aquarium cement. At the juncture of wall and deck a fillet is made of wood putty, Fig. 1. The forward top is stationary, with a hole for the gas tank filler cap. The rear end is hinged, and both are neatly rounded. Three

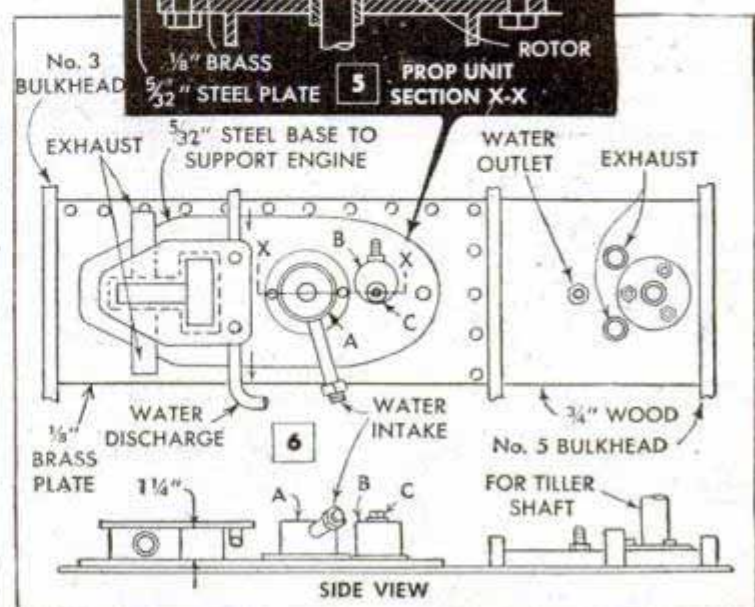
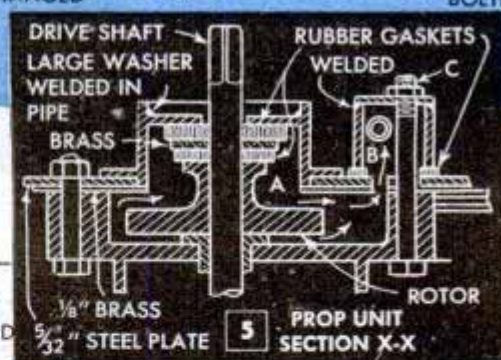
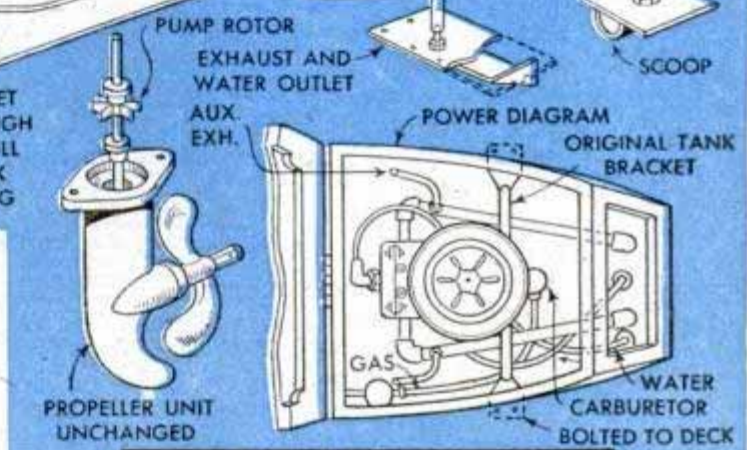


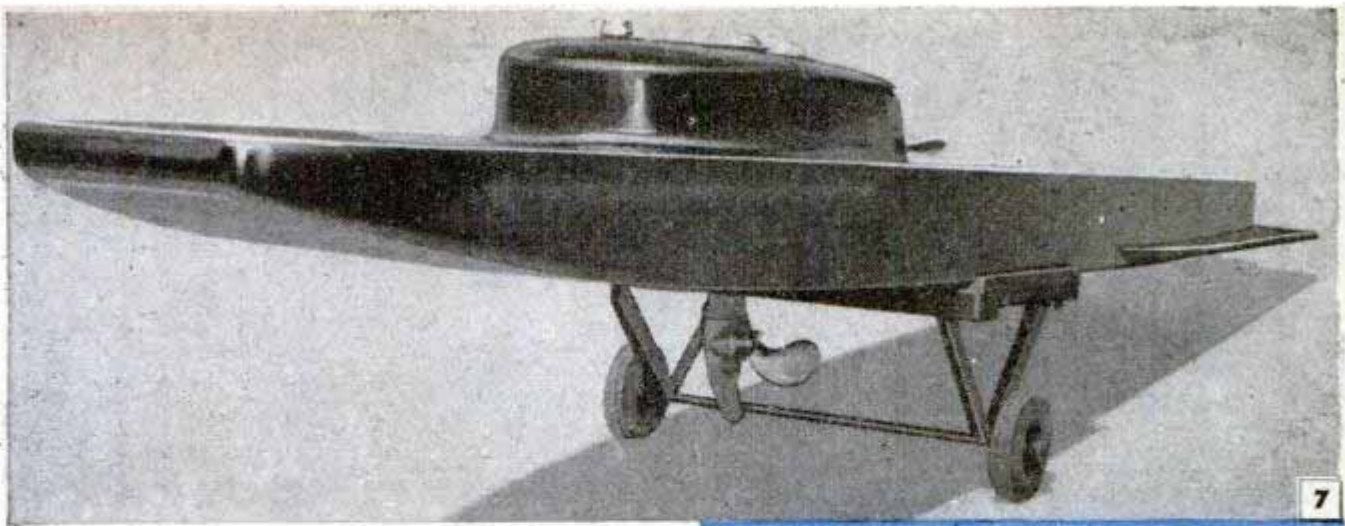


vents are provided in the hinged section and covered with standard scoop strainers obtainable from a marine hardware dealer. Top edge of the open section is fitted with a rubber door seal, making the compartment watertight when closed. A latch is installed at the rear end.

Any small outboard motor is suitable for this craft. In the original a 3½-hp., single-cylinder, 2-cycle motor was used. No alterations were required except removing the parts shown in Fig. 4 and cutting off the drive shaft and filing the end square. A 4-in.-dia. fan bent from sheet steel is bolted to the top of the starting disk on the fly-wheel to ventilate the engine hatch. The engine control unit is fitted with a safety device consisting of a notched arm to which the starting cord is attached. A loop of the cord is put over the wrist. If the rider slips overboard the tug on the cord automatically shuts off the power.

The semicircular gas tank is made of sheet brass, with four tabs, Fig. 4, located so that they will draw the tank down snugly on the deck. A baffle is installed with corners cut away. The filler cap is simply a pipe with a flange brazed to the top. Ventilation by the fan is aided by exhaust from two auxiliary pipes discharging through two forward openings as in the upper right-hand detail, Fig. 4.

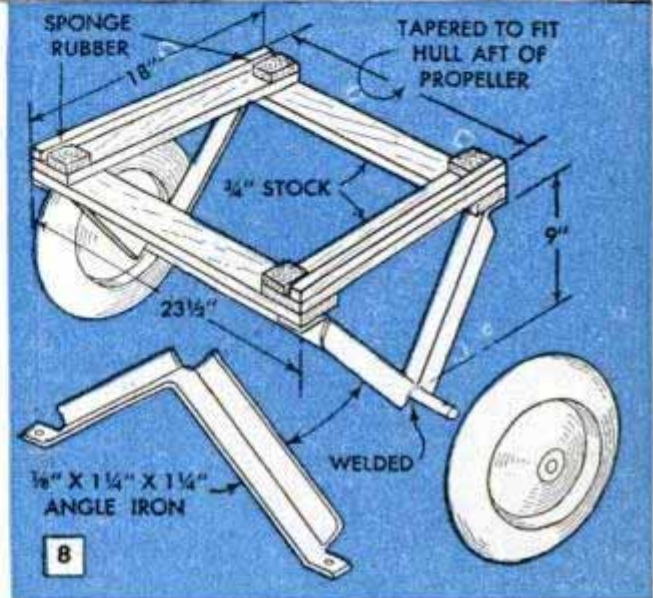




Because of the propeller-shaft extension a launching dolly is necessary. This is designed to fit the hull snugly and makes the craft easily portable on dry land

In order to keep the engine as low as possible, a special base is made upon which to mount it, incorporating connections for water and exhaust, Fig. 7. This is a welding job on $\frac{3}{8}$ -in. steel plate and makes a very compact unit to which the engine is bolted. It rests upon a brass plate bolted to the bottom. A similar plate has the exhaust and water outlets brazed in. Assembly of connections on these two units is shown in Fig. 4. Exhaust pipes are installed as indicated, with an auxiliary exhaust of $\frac{1}{2}$ -in. copper tubing in each adding to the power of the motor by relieving back pressure of the underwater exhaust. The underwater outlets are covered by a reverse scoop into which the cooling water also discharges. The scoop is bolted through the plywood bottom, the brass plate upon which the outlets are brazed, and also through a board on top. This assembly is just forward of bulkhead No. 5.

Water is drawn into part A, Fig. 4, from the intake scoop through copper tubing, delivered from B, Fig. 5, into the engine base, then up around the cylinder and out again to the outlet between the exhaust pipes. All brass-tube fittings are silver-soldered. The housing of the crankshaft bearing fits down in part A and the pump rotor is directly under it in the flange of the propeller unit, Fig. 5. The plywood bottom is cut away to receive this streamlined flange, and is bolted through the brass plate and steel engine base. The rear bolt C, Fig. 5, also passes through part B. The latter consists of a section of pipe with the top welded on and a nut also welded to it. This is offset to allow for the water opening at the bottom, Figs. 5 and 6. Part B is drawn down on a synthetic-rubber gasket. This material is impervious to oil. Washers of this same material are used around the drive shaft above and below a brass wash-



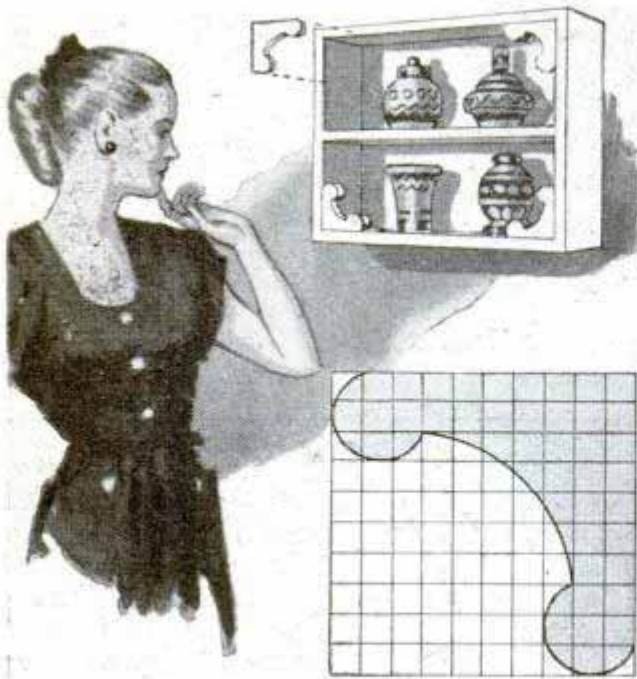
er, part A, forming a watertight joint. Part A is a section of pipe with a washer welded just below the top, forming a cup for the accommodation of the crankshaft bearing hub. Another sectional view of part B is shown in Fig. 5, indicating where the welds are made.

A down view of the power plant is shown in Figs. 2 and 4, indicating how the engine is braced crosswise by extensions on the original tank bracket bolted to the deck.

The tiller consists of a handle bar of heavy sheet metal bent as in Fig. 1 and welded to a collar which in turn is bolted to a $\frac{5}{8}$ -in. shaft. Below deck is another collar with a spring above it. The latter holds the tiller down against a rubber washer, making a watertight joint. The tube for the engine control shaft is high enough above the deck to keep water out.

A simple but sturdy dolly for launching is built as in Figs. 7 and 8 and mounted on balloon-tired wheels for running over sand. The axle is welded to the angle-bar brackets, which in turn are bolted to the cradle. The latter tapers to fit the hull just aft of the propeller, and balances the craft nicely so that it is very easy to handle. Finish hull with two coats of enamel and then wax.

Corner Brackets Decorate Shelves Of Plain Wood Cabinet



If you have a small cabinet with plain shelves, ornamental brackets like these will add to its appearance. The brackets are scrollsawed from $\frac{1}{4}$ -in. plywood or similar stock and are attached with nails or screws. It is best to draw the design on a piece of cardboard first, then use this as a template for tracing the pattern onto the wood so that all brackets will be the same. They are painted in a contrasting color.

I. M. Fenn, Chicago.

Numerals for Children's Games Cut From Calendar

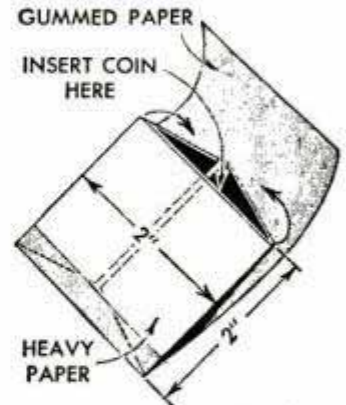
When constructing games that require numerals, such as dart games, bean-bag boards, etc., use numerals cut from a large-



size calendar. After they are pasted in place, a coat of shellac will make them more durable.—Ronald Eyrich, Milwaukee, Wis.

Coins Are Mailed Conveniently In Gummed-Paper Envelopes

Convenient and safe, these envelopes for mailing coins are made from a 4 by 6-in. filing card and three $3\frac{1}{2}$ -in. strips of gummed tape 2 in. wide. Cut the filing card into three 2-in. strips and fold 1 in. from both ends to the center. Overlap the tape $\frac{1}{4}$ in. at the bottom and seal the open side of the card. This will allow about $\frac{3}{4}$ in. for the flap. Three envelopes are made from one card, each capable of holding up to a 50-cent piece in size.—R. A. Jenkins, St. Louis, Mo.

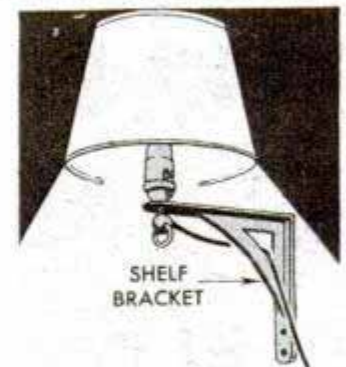


Fuel Tank Should Be Drained If Tractor Is Stored

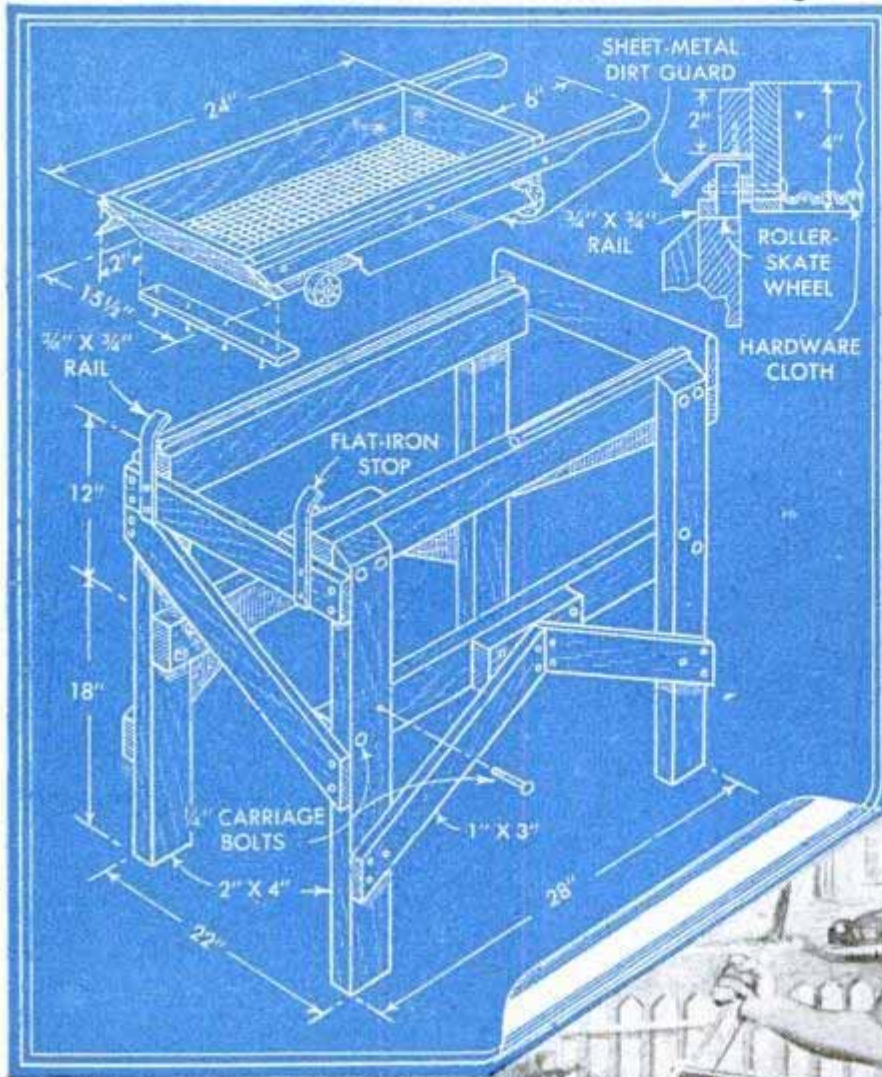
Should you find it necessary to put a tractor in storage or keep it idle for an extended period of time, it's best to drain the carburetor and fuel strainer of gasoline. Otherwise there is a gumlike substance that will deposit on these parts as the gasoline evaporates and this will impair the operation of the motor. To compare different gasolines and determine which contains the most gum, place several kinds in shallow dishes and let them evaporate. Then compare the deposits that are left.

Bracket Used as Lamp Support

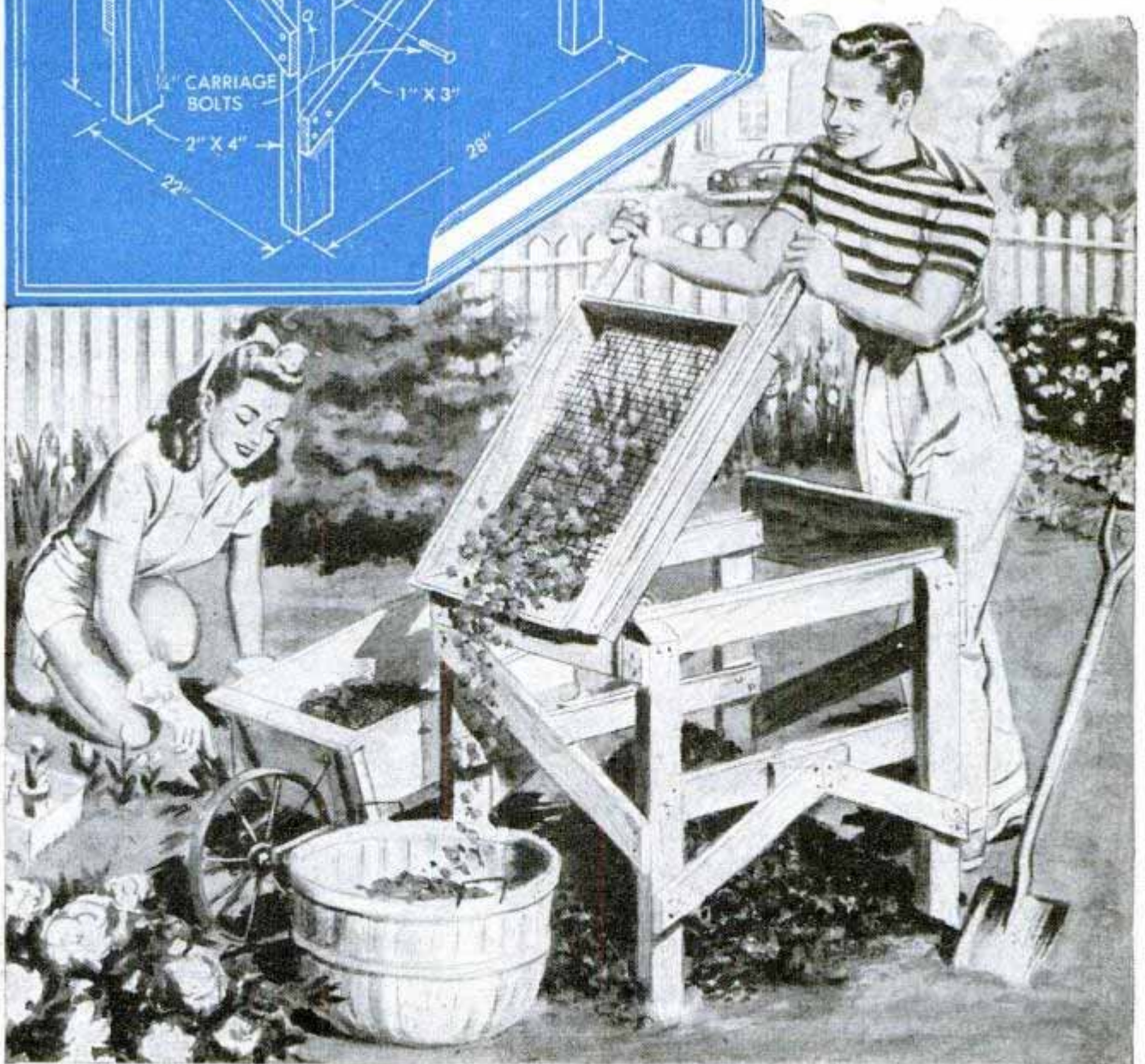
As a substitute for a side-wall lamp, use a shelf bracket and an ordinary drop-fixture socket. The end hole in one of the legs of the bracket will probably have to be enlarged to fit the threaded extension at the base of the socket. In the case of this particular lamp, an ornamental fitting from a chandelier was used to fasten the socket to the bracket, although any fitting with a male thread that fits will do. The cord is attached to a baseboard outlet.—Mabel-Ruth Jackson, San Bernardino, Calif.



SIFTER-MIXER for garden soil



Where a quantity of soil, leaf mold, fertilizer, etc., is to be prepared for special planting it's worth while to build this efficient sifter-mixer. Frame can be mounted on four legs set into the ground and diagonally braced. The screen frame rides on four roller-skate wheels and the track is protected by a sheet-metal guard. After the good soil has passed through the screen the siftings are dumped in the manner indicated. Flat-iron stops prevent the skate wheels running off the end of the track.



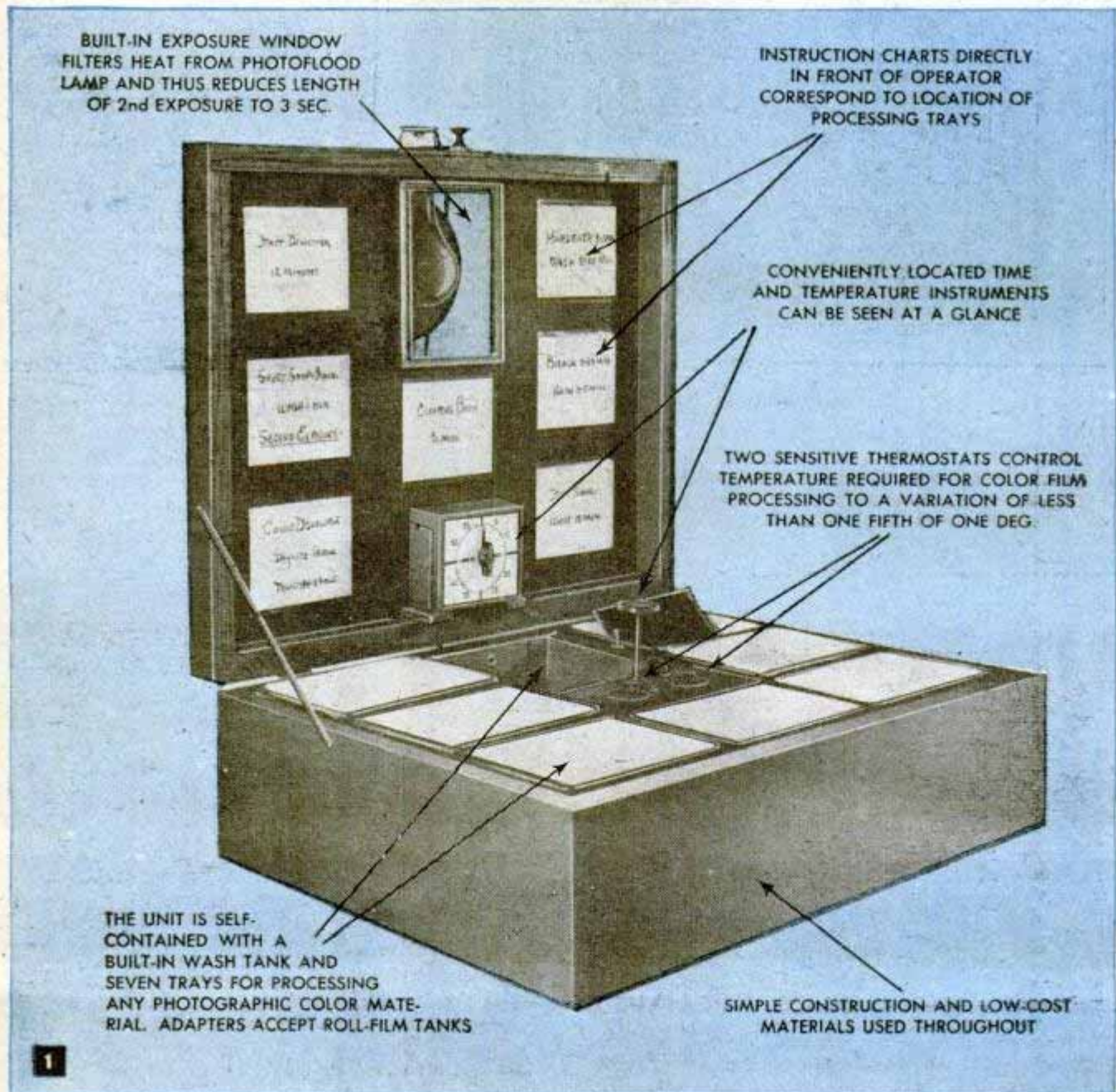
COLOR PROCESSING

for transparencies or prints

UNTIL recently color processing transparencies and prints was one of those things no amateur even talked about doing for himself. But now he can process his own color work. More than that, he can set aside a few evenings and build this processing unit in his own workshop.

The completed unit is shown in Fig. 1, and the tank, which is the principal part of the assembly, is detailed in Fig. 8. It can be cut from a 28 by 34-in. piece of 24-ga. galvanized sheet steel. When cutting the metal allow $\frac{1}{2}$ in. for lap joints at the corners. All joints are soldered and should be tested to be sure that they are leakproof.

Water inlet, as well as the main tank outlet, is made from 2 ft. of $\frac{3}{8}$ -in. copper tubing. A short piece of $\frac{1}{2}$ -in. copper tubing also is required for the wash tank outlet. Obtain a tire valve and cut off enough of the threaded end to expose the release pin so that the valve may be opened by pressing on the pin. To make the necessary bend in copper tubing, plug one end and partially fill with solder which then is melted with a torch. When the solder is cold the tubing can be bent without flattening. After shaping the tubing, melt out the solder, then solder the valve stem to the tubing as in Fig. 8-A. Two $\frac{1}{16}$ -in. holes, Fig. 8-A, drilled



UNIT

By Kenneth Murray

in the side of the inlet pipe where it passes through the wash tank, have a combined opening somewhat less than that of the inlet opening. When connected to a faucet part of the water passes through the valve into the larger tank where it is utilized for cooling purposes. Temperature is controlled by sensitive thermostats. The two holes in the tube keep the wash water in rapid circulation and constantly replenish it with fresh water.

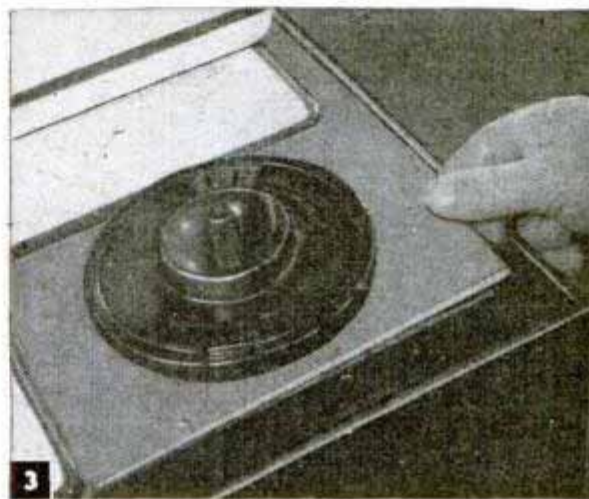
Wash tank, Figs. 4 and 8, has a double wall, the space between the two walls being filled with insulating material. Where the water inlet tube passes through at the bottom of the walls, measure off and carefully prick-punch centers for the $\frac{3}{8}$ -in. holes. With the inlet tube loosely in place, solder the inner wall from the inside, the outer wall from the outside, Fig. 4. Solder the inlet tube in place last, making sure that it is exactly located, with the top of the valve stem $2\frac{7}{8}$ -in. above the tank bottom. Drill holes for the two tubes that serve as an outlet for the wash tank and an overflow for the main tank, using center distances indicated in the detail, Fig. 8, and solder them in place. Control-panel supports are $\frac{3}{4}$ -in. angle pieces bent from strips of scrap 24 or 22-ga. galvanized sheet steel. Bend the ends over as shown and solder in place as indicated in Fig. 5.

Frame for the tank is detailed in Fig. 8 and consists of a wood frame to support the tank so that it can be effectively insulated against heat and cold. The frame sections are mitered and the corner pieces are rabbeted $\frac{1}{4}$ in. to provide a seat for the tank. In assembling, squareness is achieved by the method illustrated in Fig. 6. Corner pieces are braced as in detail B, Fig. 8. A waterproof wallboard bottom is tacked to the frame. Cover the bottom of the frame with a layer of fire-retardant insulation and then place the preheater element on top, as in Fig. 9, so that it will be in contact with the bottom of the tank when the latter is in position. The element is of the type used as an incubator heater, rated at 100 watts.

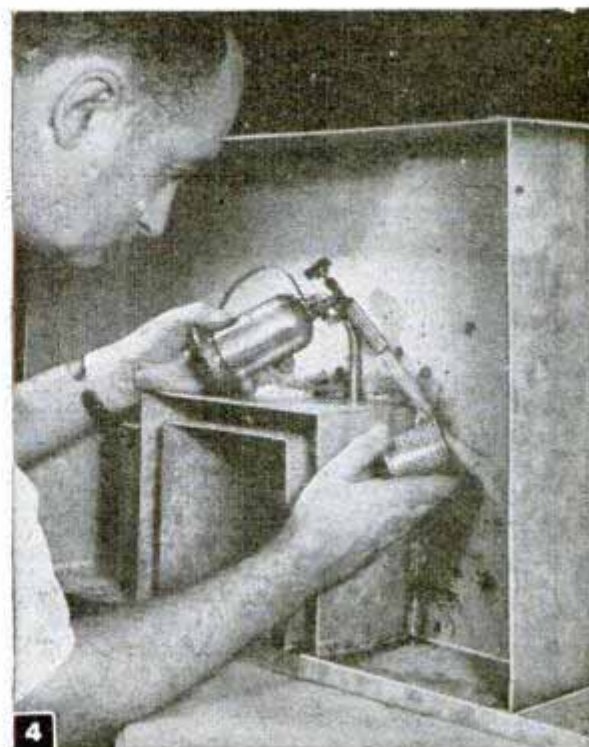
Control panel, Fig. 7, is the heart of the unit. Two thermostats are controlled with micrometer accuracy by a knob and dial on the control panel. One thermostat applies pressure to the stud projecting from the cold-water inlet valve. The other operates a snap-acting Micro switch in a self-contained "heat well," turning on 15 watts of electric heat to keep the

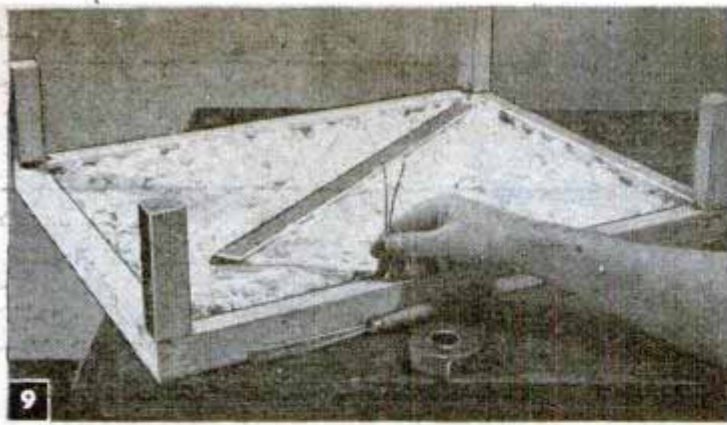


2 Second exposure requires only a few seconds because light from photoflood lamp is heat-filtered by absorbing glass in window



3 Above, by use of adapters roll and cut-film processing tanks fit neatly into the unit. Below, soldering wash tank and insulation retainer in place





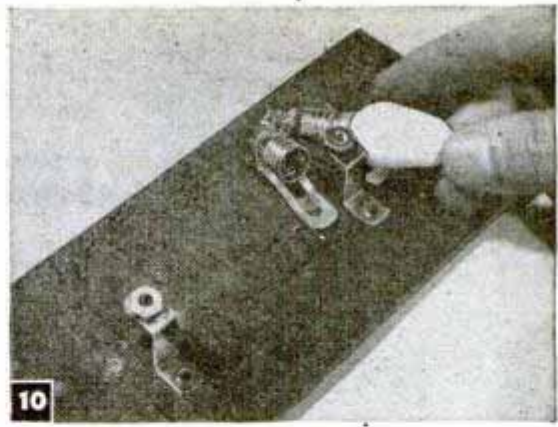
9 Preheating unit is laid directly on top of insulating material with which frame is packed. Protect leads with rubber tape

temperature up to the required degree. The preheater also is wired into this circuit. After the preheater has brought the tank up to temperature, it is shut off by the snap or toggle switch and the heat well takes over. The latter dissipates its energy quickly, responds immediately to the thermostat and therefore is extremely sensitive. The heat well is a short tin can of 3 $\frac{3}{8}$ -in. diameter. Either a Micro or Mu switch is stamped to indicate contacts for normally open or closed circuits. Connections should be made so that the switch is normally closed.

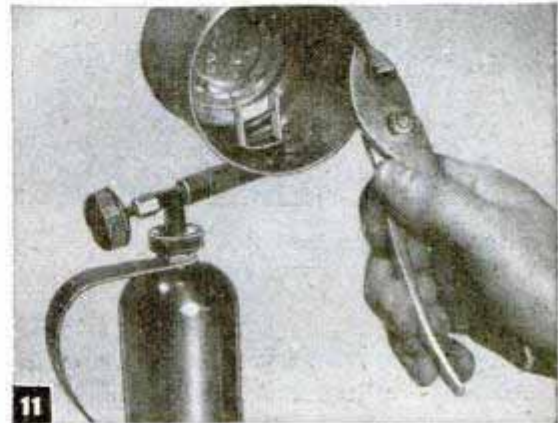
Radio angle brackets having double angles serve as supports for the brass thermostat control bolts. The latter, $\frac{3}{16}$ dia. and threaded to fit the thermostats, should be at least 2 in. long. Two brass nuts are required for each. Solder them on either side of one end of each angle bracket, using the bolt to keep the threads in line. Rivet the brackets to the control panel as in Fig. 10. Details of the assembly are shown in Fig. 7. Radio dial plates are likewise riveted to the face of the panel, Fig. 18.

Heaters are two 7 $\frac{1}{2}$ -watt candelabra lamps. Sockets are mounted on either side of the right-hand angle bracket and are wired in parallel and coated with heat-resisting black paint to avoid light leakage, Fig. 17. A bracket bent from sheet brass supports the Mu switch inside the heat well, Figs. 7 and 11. It is sweat-soldered to the inside wall of the can as shown. Exact distance of the hanger from the bottom of the can is measured with the thermostat in place. The activating stud of the switch should be centered exactly over the pressure plate of the thermostat when the latter is at normal distension, or at a temperature of around 68 deg. F. It will be noticed that a single-angle bracket is bolted tightly over the back of the switch, so as to be under the activating stud. The bracket serves as a pressure plate for the end of the control bolt.

Thermostat and pressure plate are shown in Fig. 12. As the thermostat is of smaller diameter than the can, a wood embroidery hoop, Fig. 12, is split and cut down to make a spacer. Thermostat should not fit tightly. Extra sensitivity is accomplished by covering the thermostat to the top of the bellows with heavy lubricating oil



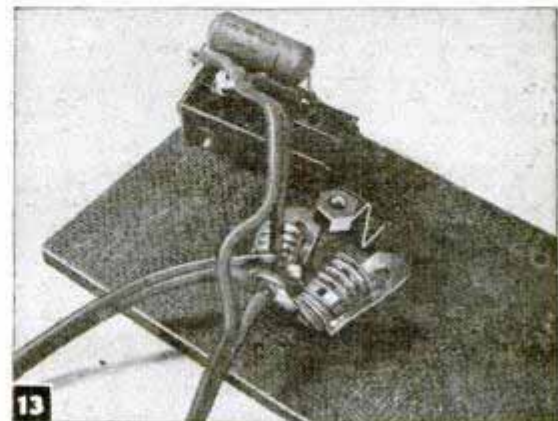
10 Before riveting sockets tightly, test with lamps. Afterward lamp bulbs are enameled flat black



11 Soldering switch bracket inside heat well. Be sure it is properly located above the bottom



12 Section of embroidery hoop serves as a fitting for thermostat, which is covered with heavy oil



13 Switch and candelabra sockets are wired in series as in Fig. 15 and the preheater connection is made across socket contacts, or lugs



Packing insulating material between walls of unit. Insulation is covered with strips of hard-pressed board

after the control panel is finished. When wiring as in Fig. 15, a .1 mfd. tubular condenser is wired across the Mu switch to eliminate radio interference. Switch is wired in series with the two lamps, and the preheater leads, Fig. 13, are cut in on each side of the pair of lamps. A single-pole snap or toggle switch, Fig. 16, cuts the preheater circuit in and out, but is under thermostatic control at all times and cannot overheat. All connections should be soldered and taped. Completed assembly can be seen in Fig. 17. Heads of the 2-in. control bolts are cut off so that small radio knobs can be fitted as in Fig. 18. Cooling thermostat is screwed onto the lower end of the other control bolt, and the latter is screwed down until the thermostat comes directly over the valve stem of the cold-water inlet as you see in Fig. 19.

Paint the tank with an acid and alkali-proof plastic paint. Apply primer first, then two or three coats of the plastic paint. Do the painting with the tank on edge, Fig. 20. For covering over the outer frame use $\frac{3}{16}$ -in. black hard-pressed board. Fit the tank inside the frame and attach the cover pieces with screws as in Fig. 8. Note that the sides are $\frac{3}{16}$ in. higher than the frame so that there will be space for finishing strips which retain the insulating material.

Figs. 8 and 14 show how the tank is insulated. Attach rubber feet to the bottom of the unit. The hinged cover, Fig. 8, is fitted with a window covered with a $\frac{1}{4}$ -in.-thick sheet of heat-absorbing glass. This means that the film can be held closer to the light source than is ordinarily done. In processing, color films require a second exposure,

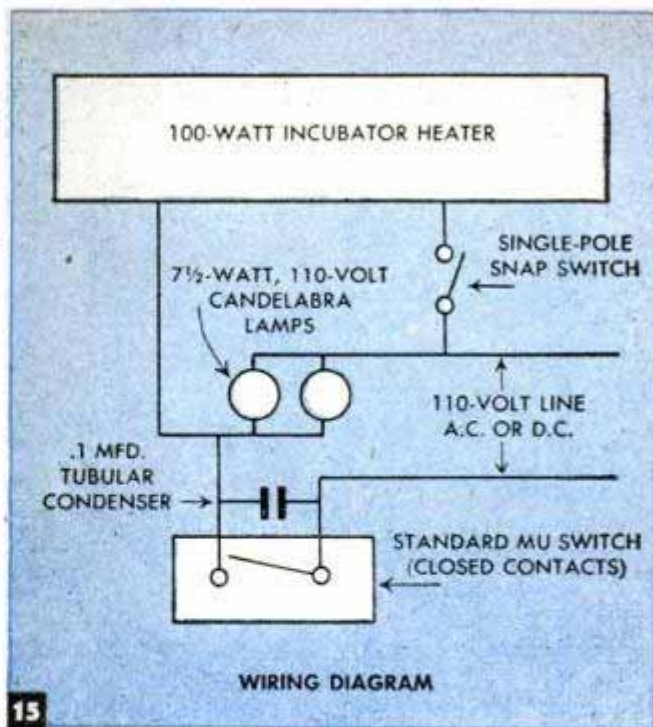
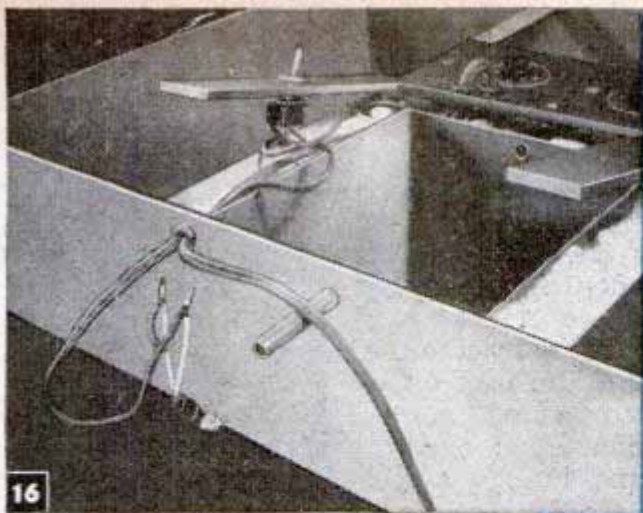
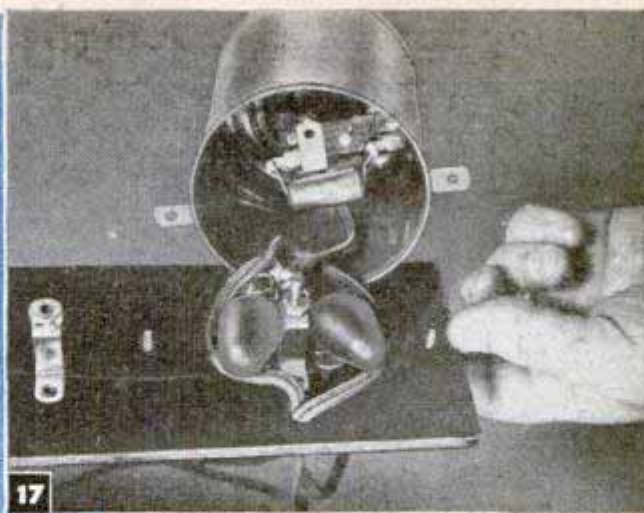


Fig. 2, and with this unit the exposure time is reduced to about 3 seconds by using a powerful photoflood lamp, mounted as in Fig. 21. As the lamp is directly back of the window, illumination will spread in a wide angle. However, when processing roll film, the second exposure will require that the strip be held at a distance sufficient for the entire length to be illuminated, or it will be necessary to move the strip so that the ends receive exposure equal to that at the center. The fixture is detailed in Fig. 8, and consists of a piece of hard-pressed board, a porcelain sign socket and an old photoflash reflector. A No. 2 photoflood lamp is used. As shown in Fig. 21, the fixture is held in place on the cover by an ordinary screw-type drawer knob which provides adjustment for locating the lamp.

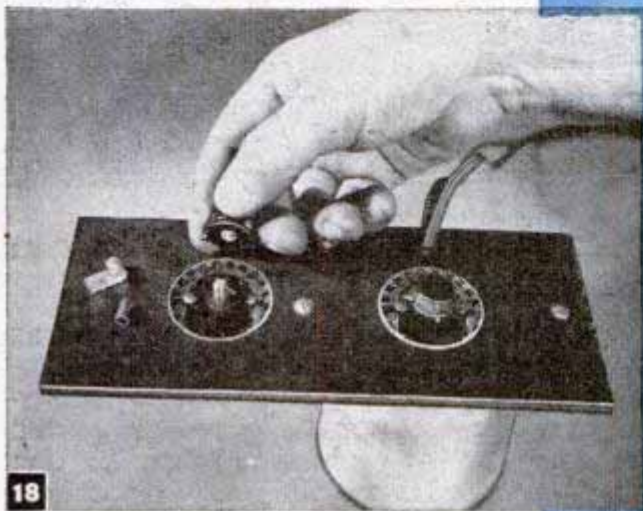
Regular equipment consists of seven 4x6-in. porcelain enameled trays which fit on the tank. Processing is done from left to right and, to make it easier to keep proper sequence, instruction sheets are attached to the inside of the cover, Fig. 1. These occupy the same relative position as the trays and information on them pertains to the corresponding tray. On each card, letter or type the necessary data, such as description and time, for that step. Number them if you wish. Use a stiff cardboard and cover the face with Cellophane to prevent soiling. If you use more than one kind of color material have an alternate file of data cards for each. Use art corners to hold the cards in place on the cover. A set of roll-film tanks can be substituted for the trays by the use of adapters, detailed in Fig. 8-C and also in Fig. 3. To set up the unit for processing, connect the inlet tube to a water tap with a length of rubber hose. Attach another to



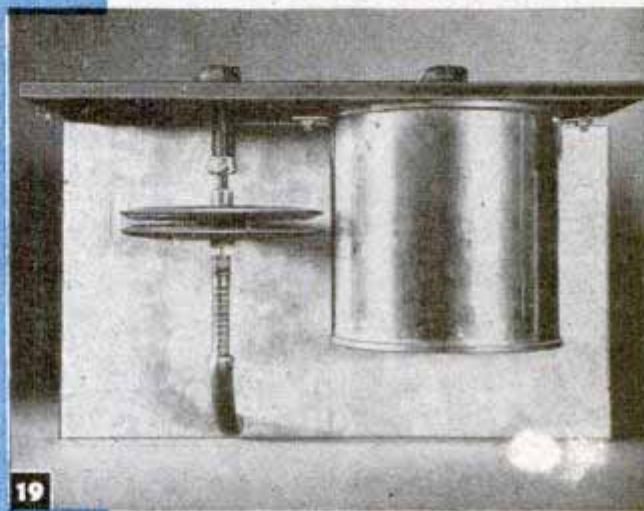
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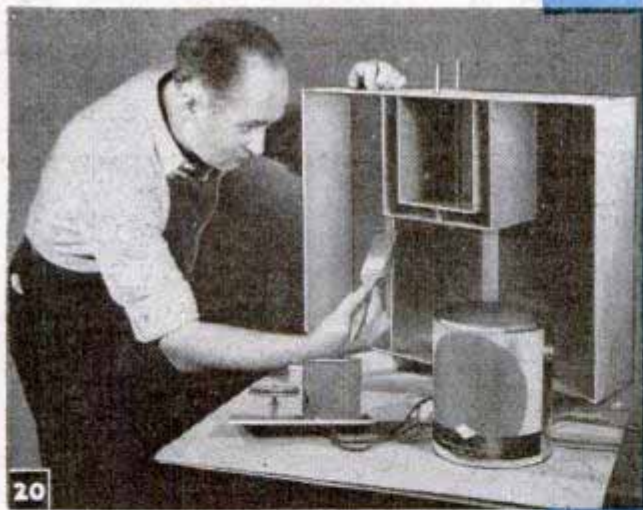
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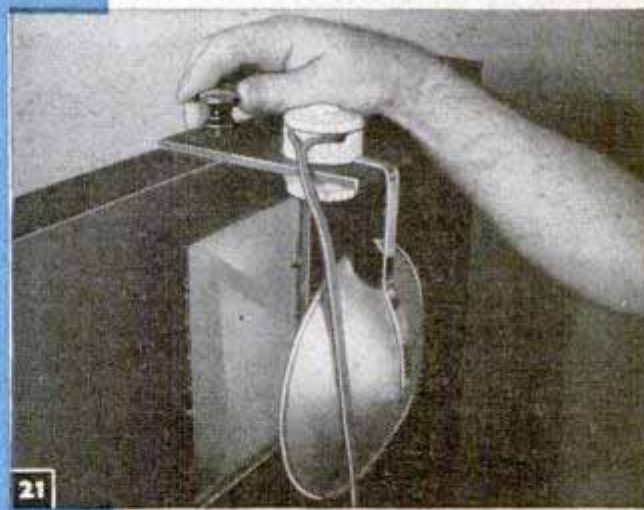
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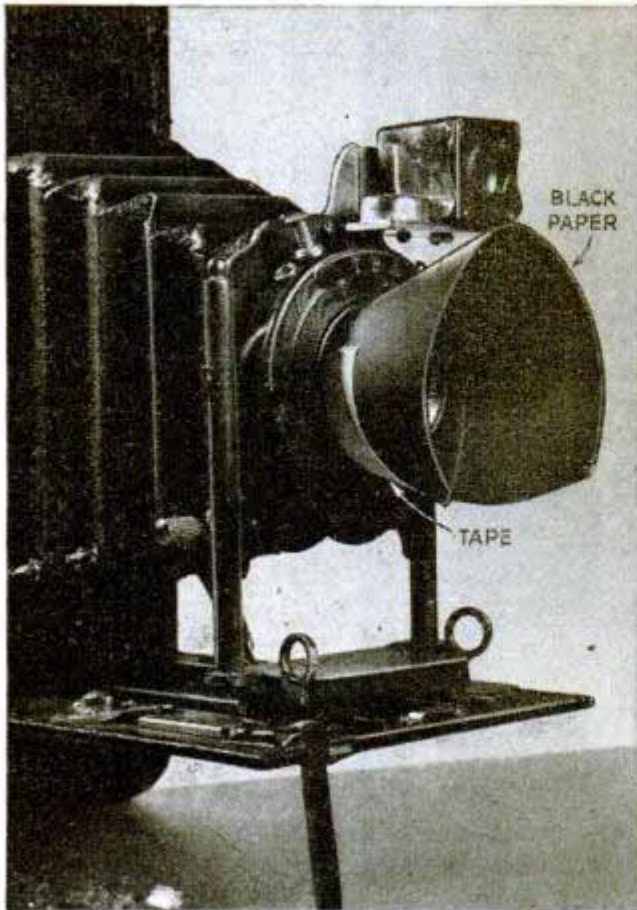


21

the outlet pipe and lead it to a drain. A third piece of hose is useful for filling the tanks for the first time. After the tanks have been filled, open the cold-water faucet just enough to circulate water rapidly in the wash tank. Insert dial thermometer through opening in the control panel and note temperature. If it reads above 68 deg. F., adjust the cooling thermostat, on the left side of the panel, by turning the knob to the right. Adjust to the desired 68 deg. Then loosen the locking screw of the knob and set it at the 68-deg. position on the dial plate. If the thermometer should read be-

low 68 deg. F. in the first test, switch on the preheater until water is warmed to that temperature. Turn off the preheater and adjust the heat-well knob. When you turn the knob to the right until there is an audible "click," it indicates that the switch is open. On turning the knob to the left there will be another click and the current will be on. Leave the knob in the "on" position until the thermometer registers exactly 68 deg. Now turn the knob to the right until you hear the click, then stop. This is the correct setting. Loosen the lock screw and position the knob.

Quickly Improvised Lens Shade

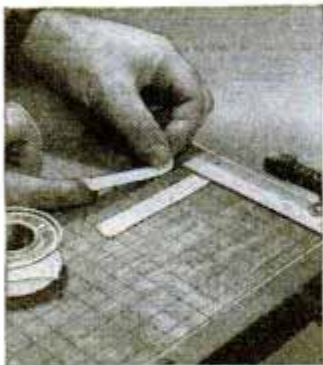


If you're taking pictures outside and find you have no lens shade at hand, one can be improvised by using black paper. Roll it into a cone that will slip over the lens and attach it with tape.

Kenneth Murray, Colon, Mich.

Tape Marks Position on Trimmer

When it's necessary to trim photographic paper under a dim light, make the work easier by marking off the distances on the trimmer with adhesive tape.



trimmer with adhesive tape. This can be done ahead of time and the marks will stand out in a dim light. If working in total darkness, the strips can be located by touch. The tape is easy to remove.

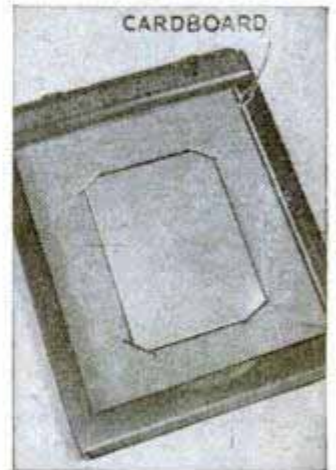
Burning-Title Effect for Movies

For the movie maker who likes titles that are unusual, this burning title will furnish variety. Paint the wording on a sheet of clear Cellophane with colored nail polish. Then paste stiff cardboard at each end of the sheet so it will slide into the title holder. Place the holder in front of a scenic view

or enlarged photograph to serve as a background. After taking a few frames, light the bottom of the Cellophane evenly and continue photographing as the title burns.

Small Film Will Fit Large Holder

Small sizes of sheet film can be used in larger holders by mounting the film on a sheet of cardboard, as shown, and inserting this in the holder. Mark off the area of the smaller negative on the ground glass to guide in composing the picture.



Measuring Cup Used in Darkroom To Make Up Solutions

An ordinary glass measuring cup, such as is used in kitchens, makes an ideal darkroom graduate to make up photographic solutions. These cups usually are graduated in ounces and may be used when diluting developers and fixers. They can be obtained in half-pint, pint and quart sizes to cover a variety of needs. The pouring lip avoids spilling and the handle allows such cups to be used without staining the fingers.

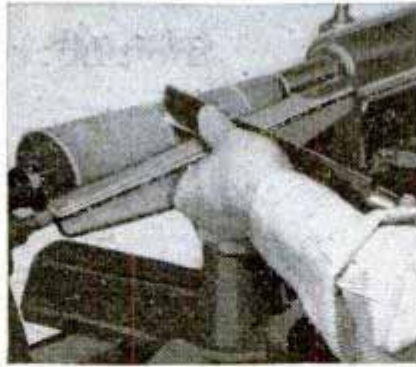
Bob Hurst, Chicago.



CRAFT QUIZ



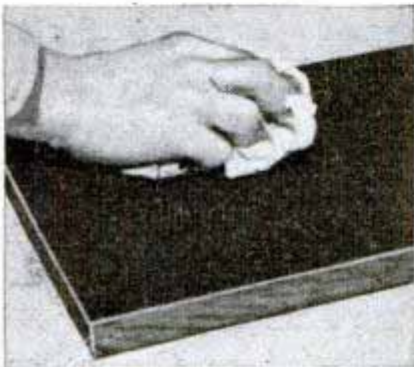
1. A square of roofing covers—
 (a) 10 sq. ft. (c) 1 sq. ft.
 (b) 100 sq. ft. (d) 5 sq. yds.



2. Wrong in turning taper is—
 (a) Kind of chisel (c) Hand position
 (b) Turning direction (d) Tool rest



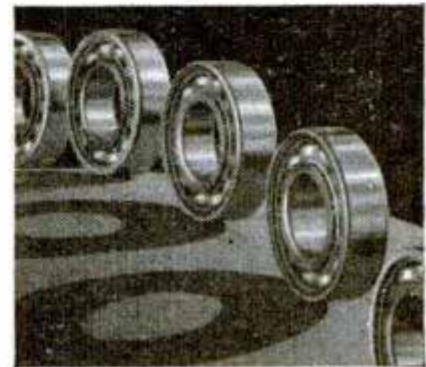
3. This is a—
 (a) Circular saw (c) Dado saw
 (b) Hole saw (d) Keyhole saw



4. Staining with—
 (a) Oil stain (c) Water stain
 (b) Spirit stain (d) NGR stain



5. She is leaning on the—
 (a) Baluster (c) Riser
 (b) Newel (d) Corner post



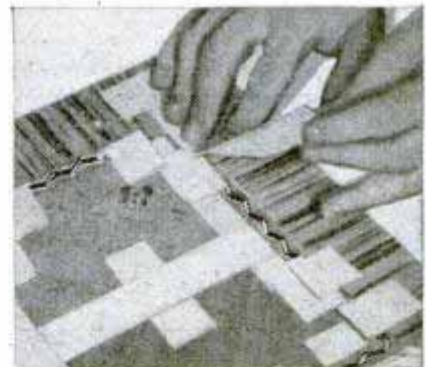
6. In wood lathe these might be—
 (a) No. 3 bore (c) No. 16 bore
 (b) No. 10 bore (d) No. 22 bore



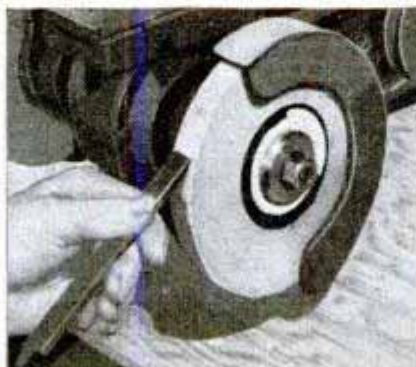
7. This wood grain is—
 (a) Mottle (c) Crotch
 (b) Burl (d) Feather



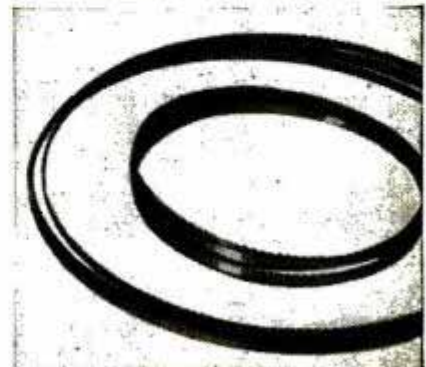
8. He is mixing—
 (a) Purple (c) Orange
 (b) Green (d) Tartrazine



9. This kind of work is—
 (a) Inlaying (c) Veneering
 (b) Parquetry (d) Herringbone



10. Best wheel for tools—
 (a) Aluminum oxide (c) Silicon carbide
 (b) Emery (Turkish) (d) Green grit



11. Bandsaw folded in—
 (a) 4 loops (c) 2 loops
 (b) 5 loops (d) 6 loops

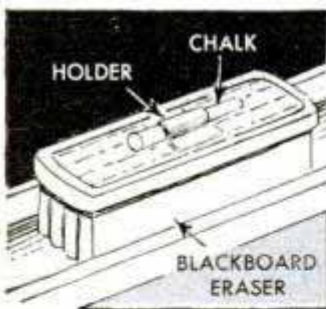
ANSWERS: 1—b; 2—b (taper should be turned downhill to prevent digging-in); 3—b; 4—c (others are not wiped); 5—b; 6—a (approx. 1 1/16" dia. hole); 7—b; 8—b; 9—c; 10—c; 11—b (either 3 or 5 loops as shown but not 2, 4 or 6)

Raffia Used to Repair Creel Makes Permanent Patch



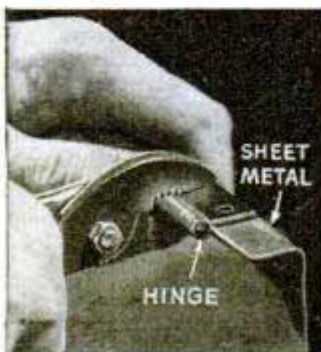
When the fibers in a fishing creel break, or when it starts to fray and pull loose around the edges, repairs can be made with raffia, which is obtained at most florists' shops. Place the raffia in a pan of warm water for a few minutes, then remove and stretch it slightly. The repair can be made more easily if the raffia is threaded through a bent sailmaker's needle. Shrinkage of the material will make the patch more secure.

Blackboard Eraser Holds Chalk



As a convenience, one teacher attached a holder for a piece of chalk to the back of a blackboard eraser. Then, when moving from one board to another, the chalk, as well as the eraser, was always at hand. The holder is made of inner-tube rubber and should fit the chalk tightly.

Hinge Serves as Bending Brake



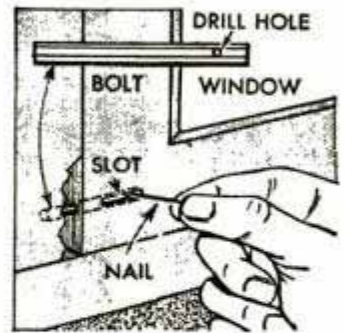
If you want to shape a small piece of light sheet metal, a butt hinge makes a good bending brake. Using pliers alone may produce a bend that is uneven, but if a hinge is held in the pli-

ers, sufficient area is covered to obtain satisfactory results. For most jobs the hinge should be about 3 in. long.

A. H. Waychoff, Phoenix, Ariz.

Bolt Lock for Basement Window

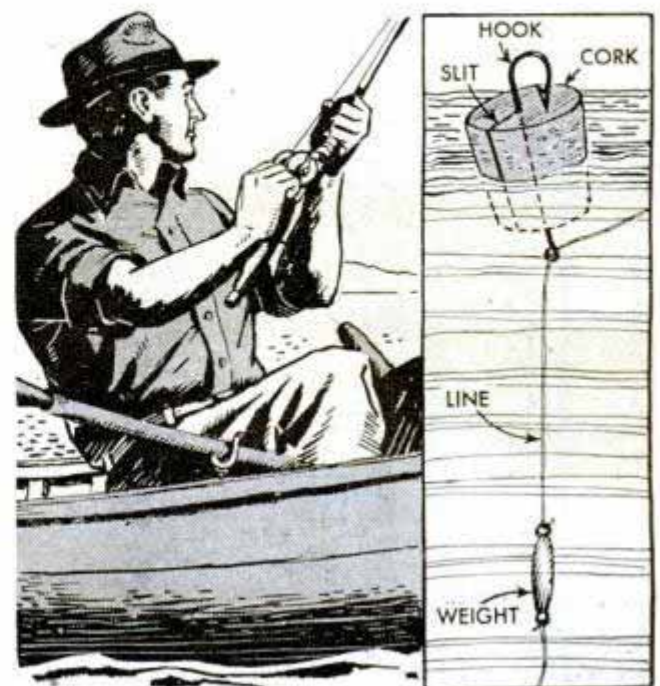
Hidden from outside access, even if the window is broken, this lock will foil the efforts of intruders to get into a house through a basement window. It is made from a bolt-action lock. A



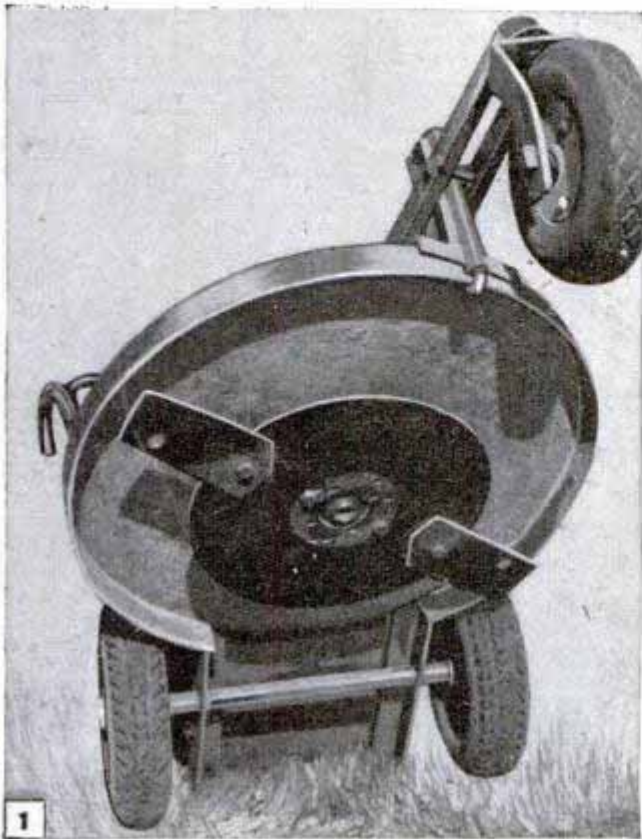
hole is drilled into the lower corner of the sash and frame so the bolt can slide completely into the sash to open the window or slide partially into the frame to lock the window. A slot is cut into the bolt hole on the sash side and a hole drilled in the bolt will permit using a nail to slide the bolt into the open or closed position.

Fishhook Embedded in Float Cork Adjusts Line Automatically

Fishermen who like to fish with a float or bobber attached to the line will find this rig handy because it will automatically adjust the bait to the varying depths of a lake or stream by permitting the line to slide through the eye in the hook. As the right-hand detail indicates, the cork is slit and the barb embedded in the top so that the eye extends out from the bottom. The line is threaded through the eye. By keeping the line fairly taut, the hook will be suspended off the bottom and not snag easily.

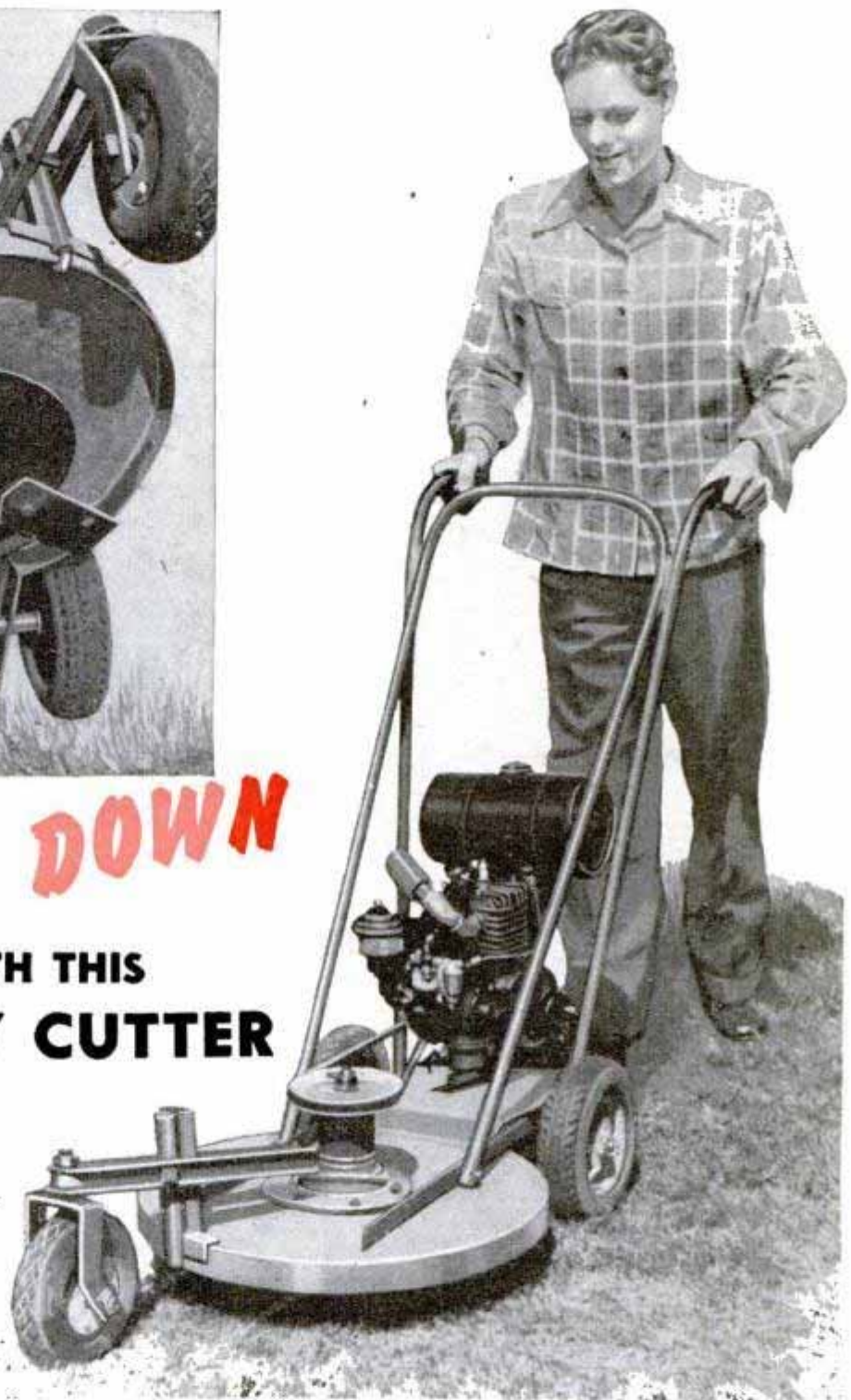


Shop Notes



MOW'EM DOWN WITH THIS ROTARY CUTTER

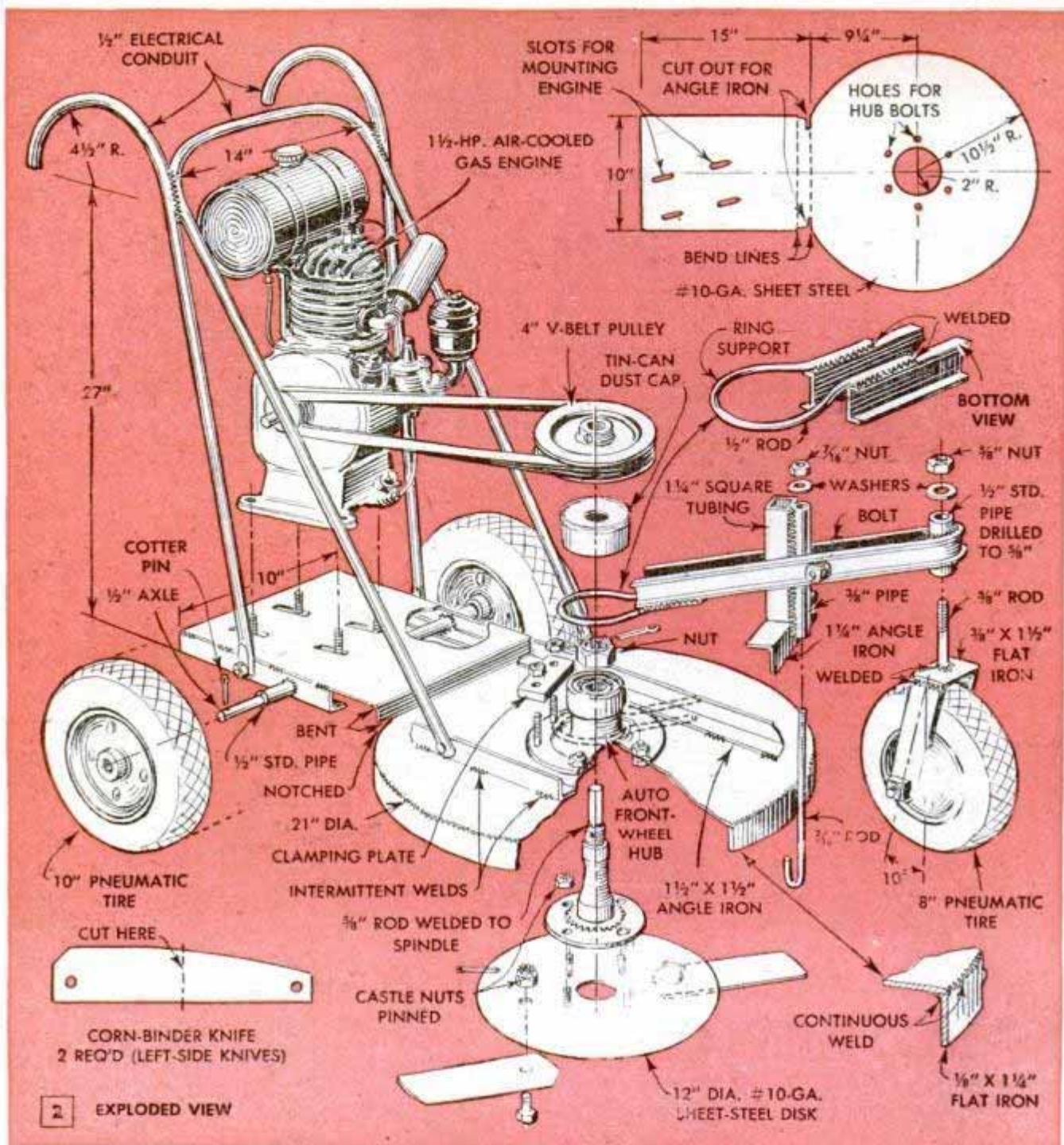
By Benj. Nielsen



POWERED by a 1½-hp. air-cooled engine, the rotating blades on this powerful mower cut everything from dandelions to the tallest and toughest weeds. An outstanding feature of this machine is that the front wheel may be set to either side of the cutting path to avoid rolling down uncut grass. This insures clean cutting with no ridges left standing. Also note that the center of gravity of the engine is well back

of the rear wheels to secure a nice balance.

The engine platform and guard for the cutter blades are cut and bent from a piece of No. 10-ga. sheet steel to the dimensions given in the upper right-hand detail of Fig. 2. Then a band of flat iron is welded around the edge of the guard. Two lengths of 1½ by 1½-in. angle iron are welded to the top of the guard and the bottom of the platform to give additional strength and



furnish mounting surfaces for the handle and the rear-wheel sleeve bearing. The cutter assembly consists of a cut-down spindle and hub from the front wheel of an auto. A short piece of rod is welded to the spindle and threaded for a castle nut. This rod also serves as a shaft for the driven pulley, center detail. As shown in the lower left-hand detail, the cutter blades are made from two corn-binder knives and are bolted to a 12-in. disk of No. 10-ga. sheet metal. After these parts are completed, the disk is bolted to the spindle, the hub is bolted to the guard and a V-belt pulley and tin-can dust cap are fitted for a trial assembly. The parts should turn freely and be in line, Fig. 1.

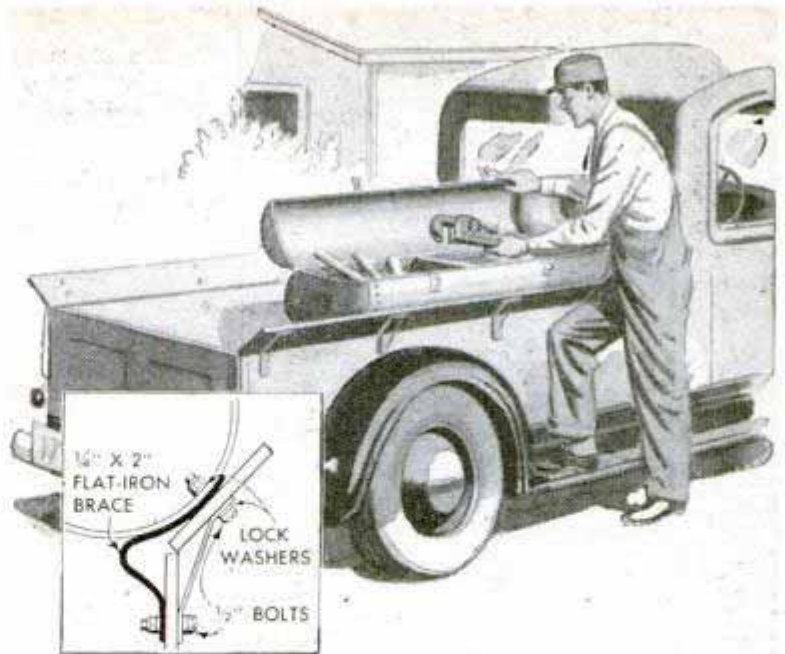
The front-wheel assembly, which consists of an adjustable arm, a clamping plate

that bolts to the auto hub, and a fork, are illustrated in the right-hand center detail of Fig. 2. The height of the arm, and consequently the height of the cutting blades from the grass, is adjusted by means of a J-bolt and sleeve that fit between the two sides of the arm. In addition, the arm furnishes a means of lateral adjustment so the wheel can be set to either side of the cutting path. The rear wheels ride on an axle that turns in a pipe-sleeve bearing welded to the platform angle iron. When slotting holes for the engine mounting, notice that these holes are off center and at an angle so the centers on the driving and driven pulleys will line up correctly. To complete the mower, form the handle and brace of 1/2-in. rigid electrical conduit.

Modified Heater Tank Will Carry Tools

Pipe fitters, plumbers and others who carry a large number of tools on a job will find this box, which is made from a domestic hot-water tank, a convenient carryall for everything from a can of white lead to a 36-in. Stillson wrench. The tank is cut in two lengthwise, the top part that serves as a lid being smaller than the lower portion, which is the box proper. Hinges and a hasp are welded in place. When cutting and welding galvanized metal, always work outdoors or, if inside, be sure there is sufficient ventilation. Otherwise the fumes will be obnoxious. Flat-iron braces to support the box are bolted to the side of the truck, using lock washers to hold the nuts securely.

W. S. Head, Miami, Fla.



Numbered Tacks Mark Zones For Delivery Routes

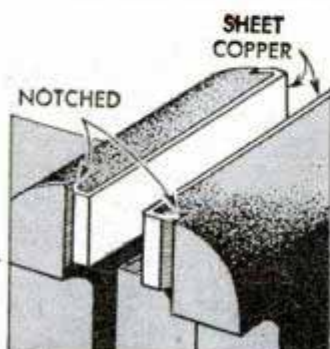


Numbered tacks of the type used to mark windows and screens make good zone markers when laying out delivery routes. The zones are laid out on a map of the city and the number

assigned to any delivery truck is placed on the territory to which the truck is assigned.—Opie Read, Jr., Chicago.

Copper Lining Held in Vise Jaws

It's a common practice to insert strips of sheet copper between the jaws to avoid damaging the work when clamping soft metals in a vise. However, the copper sheets have a habit of dropping from between the jaws, resulting in lost motion and time in picking them up. To avoid this, one metalworker notched the ends of the



jaws and slipped the ends of the strips into the notches. Although the strips are easy to remove, when fastened in place they will not drop out easily.—Clarence Klumb, Rockfield, Wis.

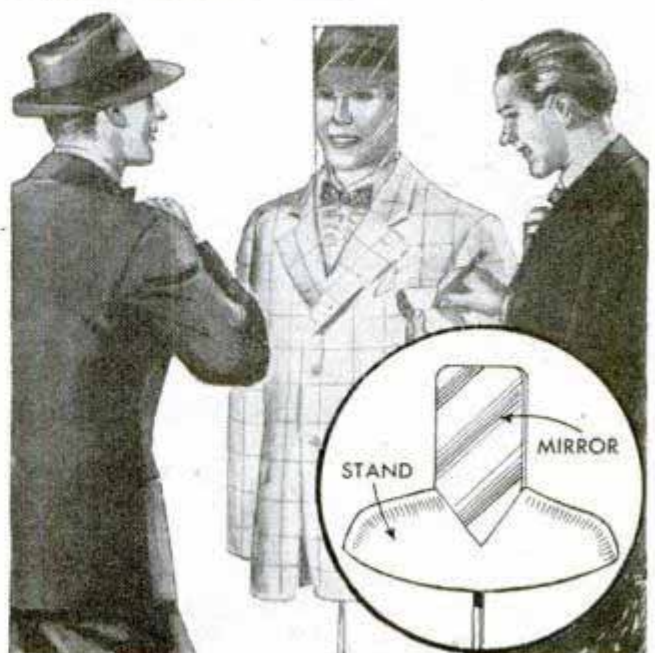
Decalcomanias Removed Easily

When redecorating furniture, walls or other painted surfaces, it is often necessary to remove decalcomanias. Ordinary scraping is tedious, but if acetone, which usually is used as a nail-polish remover, is applied to the decalcomania it can be lifted off with ease.

Charles H. Hardy, Los Angeles, Calif.

Mirror on Clothier's Mannequin Shows How Suit Looks

To show a customer how a suit will look on him, without his having to change clothes, one clothier placed mirrors on mannequins or clothing forms in such a manner that a customer facing the form would see his reflection in the mirror as though wearing the suit. If several mannequins are fitted with mirrors, a customer can "try on" a number of suits in a short time.

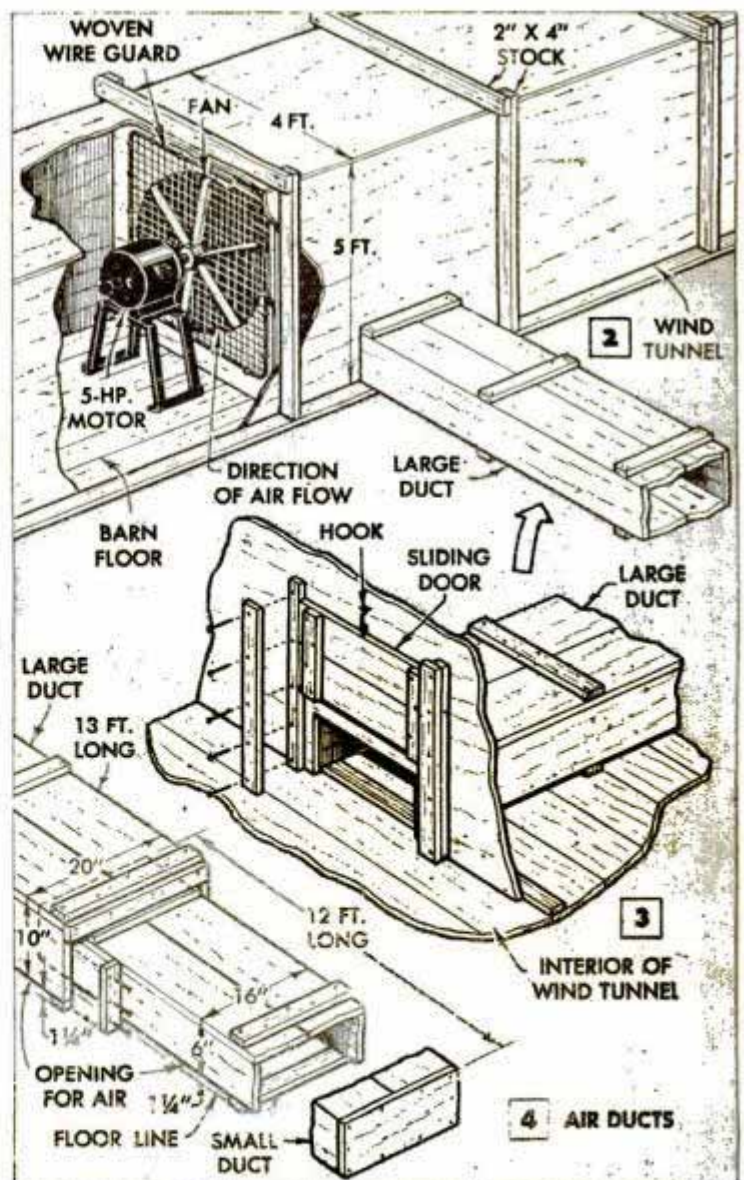


6 REASONS FOR



Here's a typical installation with telescoping ducts leading from a wind tunnel built across one end of the mow

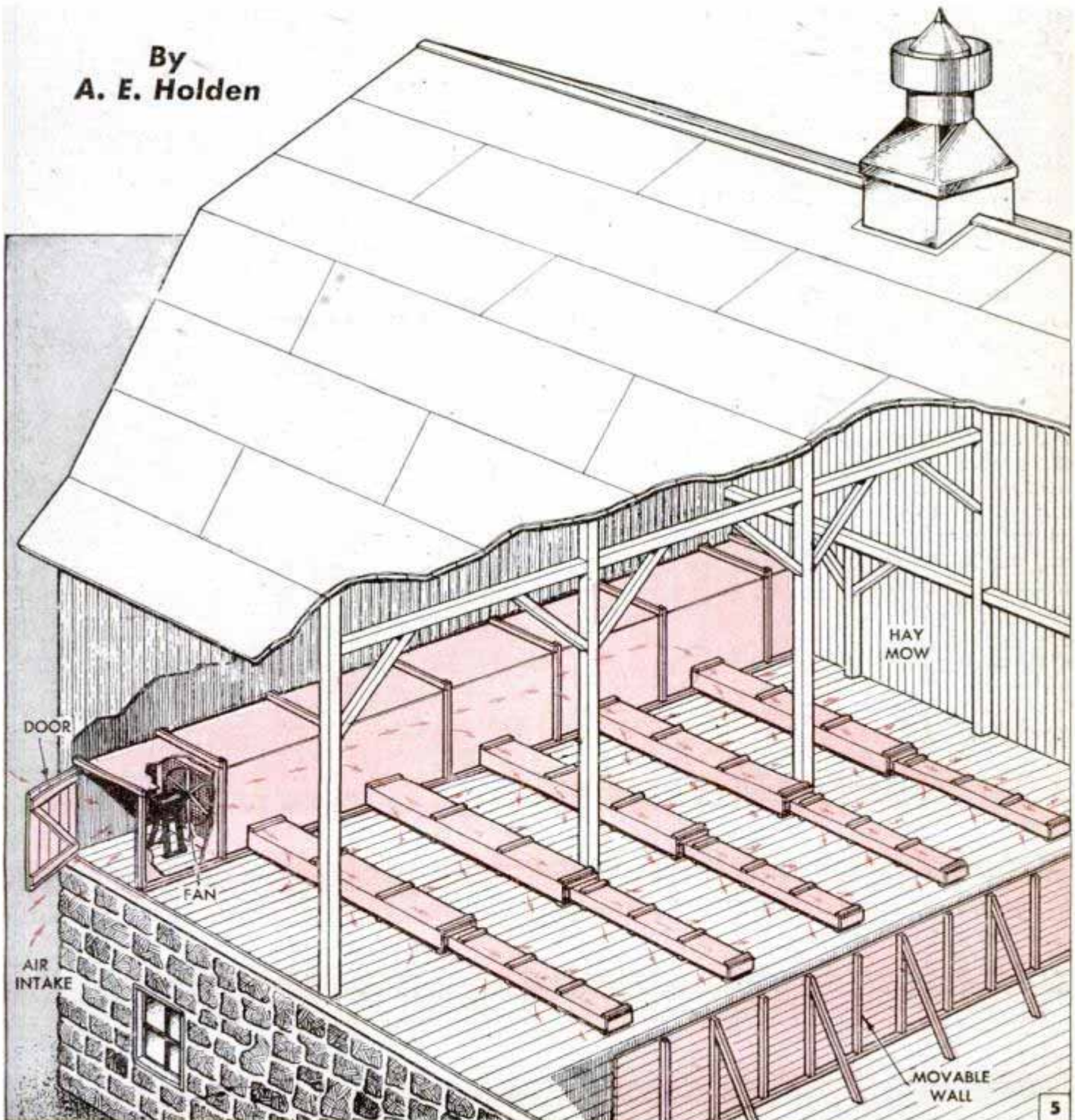
IT'S possible to put haymaking on a 4-hour schedule when you use the new methods of field processing and cure the hay in the barn with this electric drying unit. From the mower to the drier the whole process practically eliminates the hazards of field curing and results in a roughage of far better feeding quality. Loss of the valuable leaves, one of the most nutritive parts of the plant, is reduced to the minimum as the material is handled while still green. Figs. 1 to 5 inclusive detail a typical installation using a propeller-type fan, Fig. 2. The centrifugal, or blower-type, fan also can be used in this same installation. As you can see from Figs. 1 and 5 the unit consists of a wind tunnel, usually built across one end of the haymow, and a series of lateral air ducts extending across the mow floor at right angles. The wind tunnel is constructed of plywood nailed to a rigid framing and is made as nearly airtight as possible. Doors are fitted at both ends, one allowing access to the interior of the tunnel, the other opening and closing the air inlet. Ducts are open at the bottom and cleats raise them $1\frac{1}{4}$ in. from the floor to allow air circulation. As you see in Fig. 4, the ducts are made in two parts so that they telescope. The opening into each duct from the wind tunnel is provided with a sliding door, Fig. 3. That's all there is to it, except to say that the usual practice is to distribute the chopped hay over the mow floor to a uniform depth of about 9 in. Also, a movable wall, Fig. 5, can be provided to keep the material within a given area.



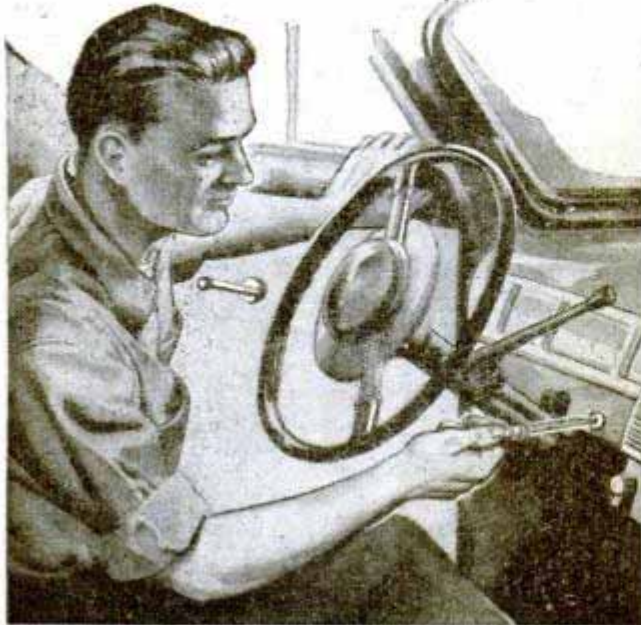
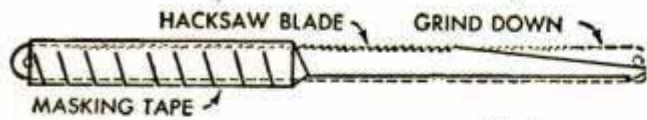
BUILDING A CHOPPED-HAY DRIER

- 1** Cuts field curing time from days to hours. Saves crop from discoloration and spoilage due to rain and heavy dew
- 2** Prevents waste due to handling. Makes it possible to save the leaves, which are the most nutritive part of the plant
- 3** Saves harvesting labor and time. In good weather crop can be chopped and stored in about 4 hours after mowing
- 4** Crop can be stored in much less space and with far less labor than is required to mow away loose hay in the barn
- 5** Cost of electric power is more than offset by savings in labor, time and crop nutrients which otherwise are lost
- 6** Greater economies in feeding, less waste, higher beef and milk production are advantages of this new curing

By
A. E. Holden



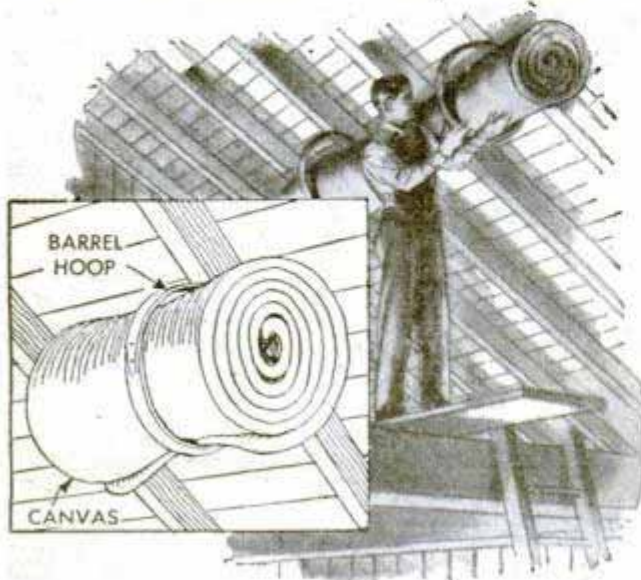
Hacksaw Blade With Hooked End Retrieves Broken Keys



An old hacksaw blade may be converted into a handy tool for extracting keys that have been broken off in auto locks. Grind the blade down to a tapering point, leaving a hook on the end which can be worked into the lock behind the broken key. The other end is wound with tape to provide a comfortable handle. After a bit of practice it will be found that sections of broken keys can be removed from locks with ease.

Canvas Tarpaulin Stored in Barn Is Suspended From Rafter

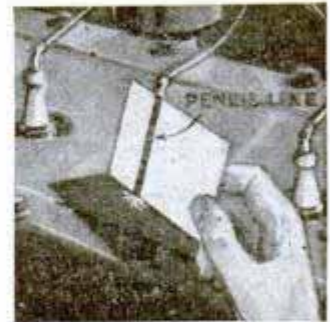
To keep that good canvas tarpaulin from being damaged by rats and mice, suspend it from a barn rafter by using a barrel hoop as a holder. A metal hoop should be used.



Be sure that there are no leaks in the roof that would permit water to drip on the canvas and possibly cause mildew. The hoop should be nailed as near the peak of the roof as is practical.

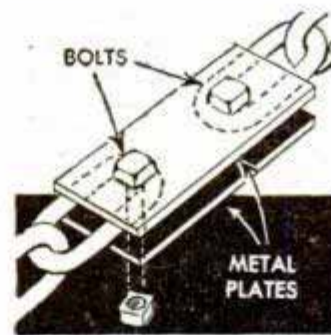
Heavy Pencil Line on Cardboard Used to Test Auto Spark

When a suitable testing instrument is not available, strength of the ignition spark on your car can be tested by means of a heavy pencil line drawn with a soft pencil across a strip of light cardboard which must be wide enough to reach from the top of the spark plug to the motor block. Test as shown, and if a hot spark travels the length of the line, the current should be adequate.



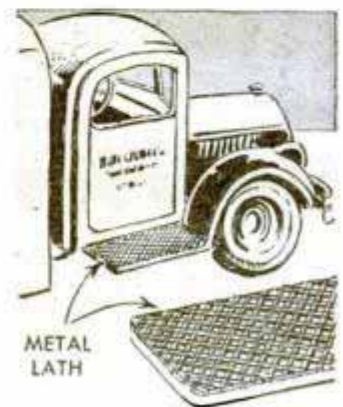
Chain Link Made of Metal Plate

If a chain breaks when you're out logging in the woods, or you need a quick repair for any chain, for that matter, two pieces of metal plate and two bolts will provide a substitute link. The plates are drilled at both ends for bolts, which should fit snugly in the links of the chain. It's a good idea to carry such a spare "link" whenever you are using chains.

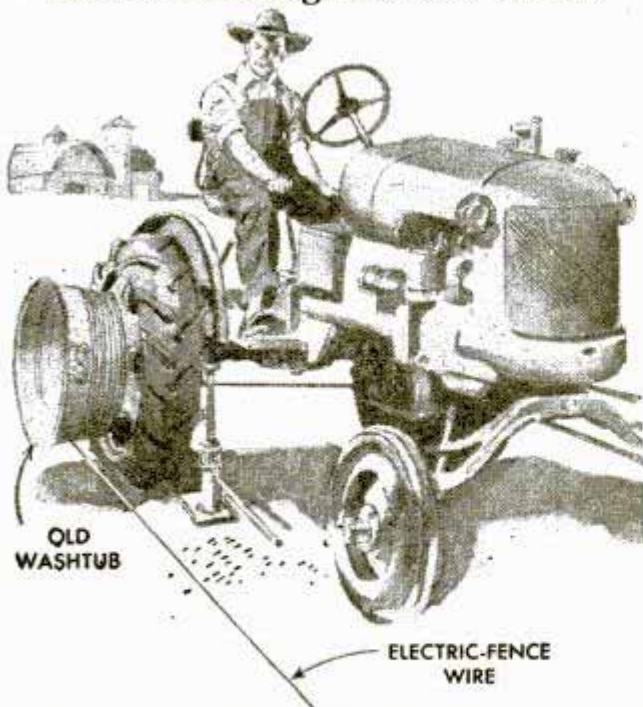


Nonslip Surface for Step Plate Increases Driver's Safety

Although the step plate on most trucktractors has a raised pattern designed to provide a safe surface, during muddy or snowy weather the surface of the plate is apt to become slippery. To provide a safe surface, cut a piece of expanded metal lath approximately the size of the step and weld it in place. In addition to providing a better surface, the lath will do double duty as a foot scraper.



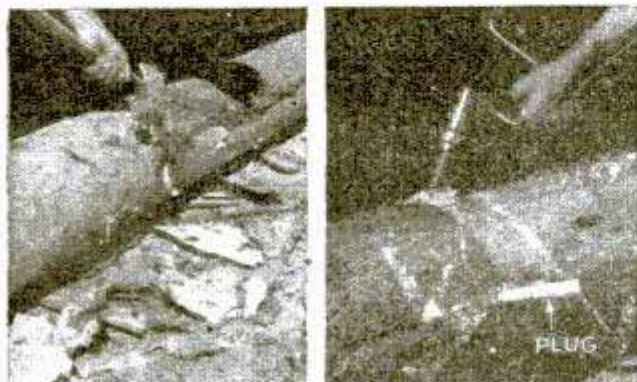
Tractor and Washtub Are Used When Coiling Electric Fence



Not wanting to waste a lot of time coiling electric-fence wire by hand, one farmer developed an ingenious way to do this by using his tractor. A rear wheel is jacked up and a washtub or other suitable drum is bolted to the wheel. Then the tractor is put in low gear and the wire wound on the tub. After it is completely wound, the tub is removed from the wheel and the wire is slipped off. Of course, it's necessary that someone guide the wire while it is being wound onto the washtub.

Way to Preserve Fence Posts

If you want to keep fence posts and poles from rotting, an inexpensive salt-solution treatment may be the answer to your problem. It's best to use round posts of green wood. The bark is left on the portion that will be underground but is peeled from the rest. Holes about 2 in. deep and $\frac{3}{4}$ in. in dia. are drilled in the posts 6 in. above the ground line. One hole should be sufficient for a post 4 to 6 in. in dia., two holes for posts 7 to 9 in. in dia., and three holes for 10 to 12-in. posts. Freshly cut green

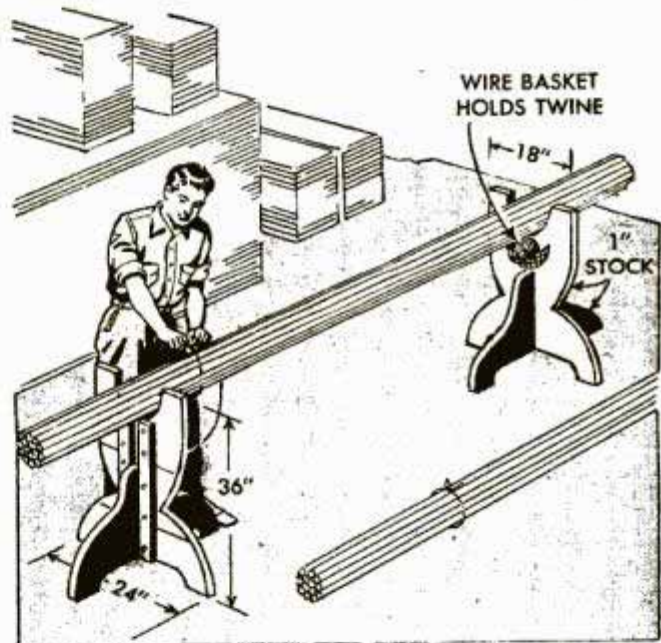


wood is used because the solution is carried through the fibers by moisture in the wood plus that which is absorbed from the ground. For the solution use equal parts, by weight, of white arsenic, corrosive sublimate and common salt. One tablespoon of the solution is poured into each hole in the post or pole. After the holes have been filled, the openings should be well plugged so that cattle cannot lick the mixture.

A. M. Morgan, Lafayette, Calif.

Racks Hold Lengths of Molding So They Can Be Tied

One annoying task, that of tying lengths of molding or other narrow strips of lumber, was eliminated by one dealer through the use of racks that held the wood while being tied. The upper part of the rack is U-shaped and the lower part is made like a pedestal with four feet. The exact dimensions need not be followed, but can be varied to suit the individual's own require-



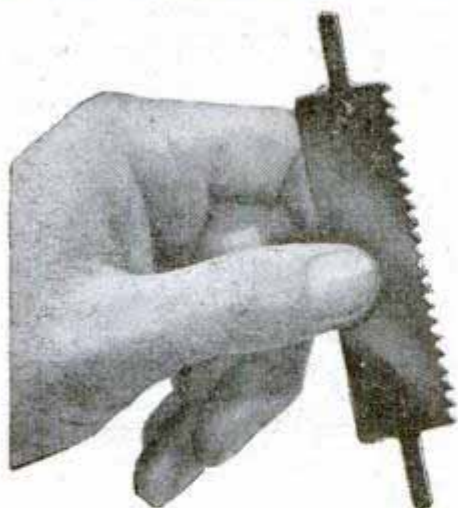
ments. Each rack has a wire basket nailed to it that holds twine for tying the bundles. The racks should not be fastened to the floor as it will be necessary to move them farther apart or closer together in order to accommodate different lengths of wood.

Installing Springs in Typewriters

To install a small spring in an inaccessible place, such as is found in many typewriters, use a length of fairly stiff wire. Bend it to fit the opening in which you are working; run it through the center of the spring and attach with a small piece of adhesive tape. Slip the end loop of the spring over the proper fitting on the typewriter and release the wire with a slight tug.

Val Bruce Galbreath, Hollywood, Calif.

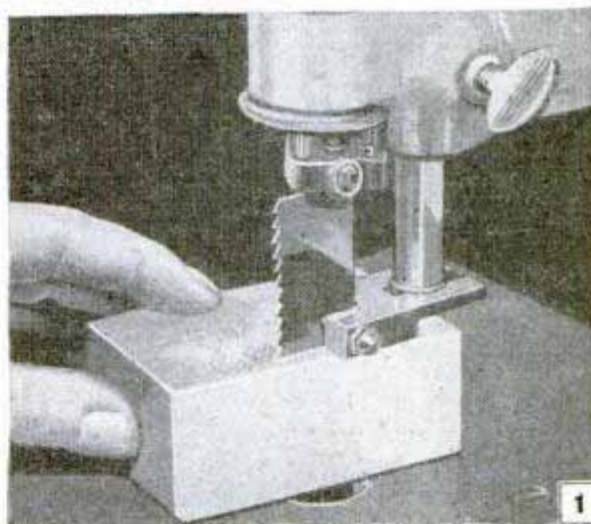
CUTTING HEAVY METAL WITH YOUR JIGSAW



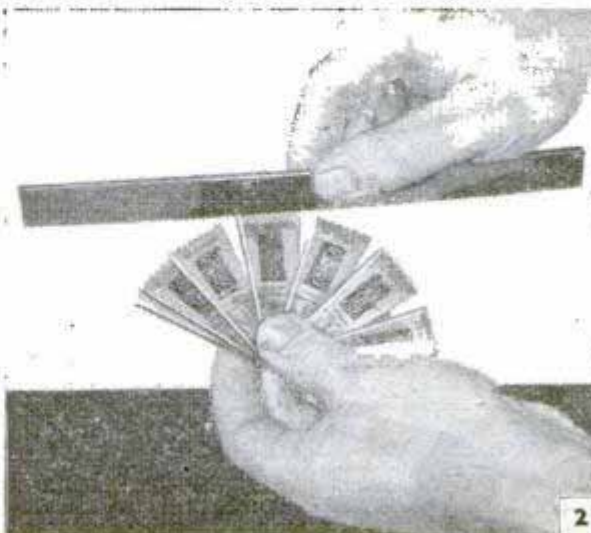
By Alexander Maxwell

BANDSAW blades capable of cutting tough steels and other hard materials at high speeds now are available in narrow and wide widths. Cut into short lengths, they also make the best jigsaw blades available for heavy work in the hard-to-cut materials. The toothed edge of the blade is hardened by an electrical process which makes the points of the teeth almost as hard as diamonds and at the same time leaves them pin-point sharp. The balance of the blade retains all the pliability and toughness of the original steel. You can cut this portion of it with ordinary tin snips, but not the teeth. This part must be broken by bending back on itself several times. Then you grind the ends down to fit the jigsaw-blade chucks or holders and you're ready for sawing anything from wood to tough alloy steels.

The usual narrow width of ordinary jigsaw blades makes the cutting of thick wood a problem due to the blade bending and cutting on an arc. With the substantial backing of a 1-in. blade made from these new bandsaw blades, the heaviest and hardest lumber can be handled at high speed, Fig. 1. A special roller guide, Fig. 9, must be made to accommodate the wide blade. Aluminum and brass can be cut at a top speed of 1725 cutting strokes a minute. Steel goes more slowly because the teeth tend to skid instead of biting, especially at the higher speeds. With steel, a low speed and considerable pressure give best results. To get these low speeds a countershaft and step-down pulleys are used. It also is advisable to lubricate the blade with graphite grease and use cutting oil on materials requiring it.

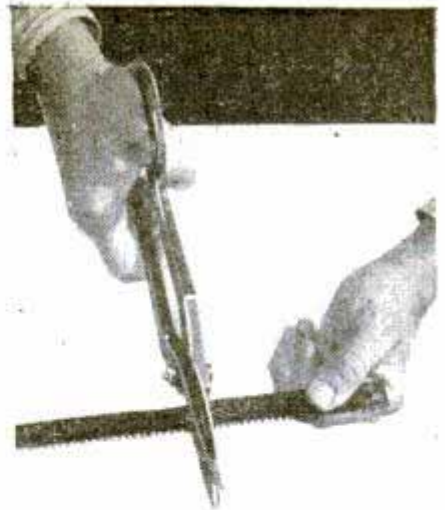


Above, wide blades work effectively in heavy cuts as they are stiffer. Below, measure the teeth with a gauge to make sure of proper blade selection

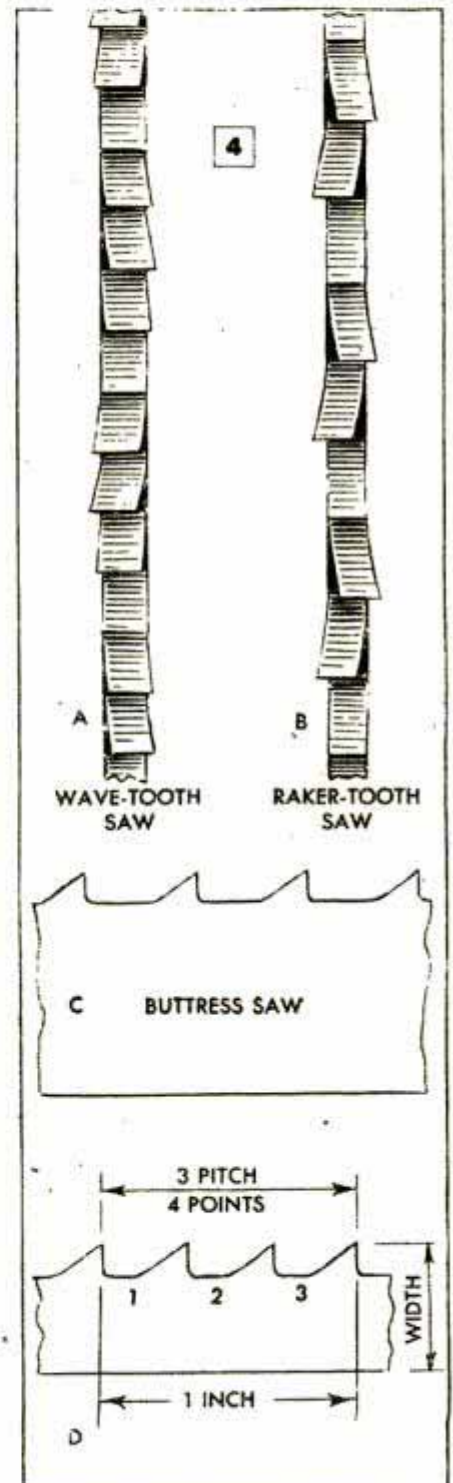


(3) GUIDE FOR PROPER SELECTION OF JIGSAW BLADES

MATERIAL	SAW PITCH				STROKES PER MINUTE			
	Work Thickness				Work Thickness			
	1/8"	1/4"	1"	More	1/8"	1/4"	1"	More
Carbon Steel	24	14	10	6	500	500	250	150
Free Machining	18	14	10	6	500	500	250	150
Chrome Vanadium	18	14	12	8	250	175	100	90
Silicon Manganese	18	14	10	6	200	100	50	
Armor Plate	18	12	10	8	175	90		
High Speed	24	14	12	8	100			
Stainless Steel 18-8	24	14	10	8	90			
Rolled Shapes	24	14	10	8	175	100	90	
Thin Wall Tubing	32	14			250	100		
Cast Iron	18	14	10	6	500	250	100	90
Aluminum	18	10	6	6	1725	1725	1300	650
Babbitt-Lead	14	8	6	6	1725	1725	1725	1725
Soft Brass	18	14	8	6	1725	1300	1100	650
Phosphor Bronze	18	14	10	6	1100	650	250	90
Tobin Bronze	18	12	10	6	650	500	250	90
Copper	18	10	6	6	1300	1100	650	500
Magnesium	14	10	6	4	1725	1725	1725	1725
Monel	18	12	10	6	250	200	90	90
Nickel	14	8	6	6	200	100	90	90
Nickel Silver	18	14	10	6	650	500	250	90
Silver	24	18	14	8	650	500	250	90
Asbestos	24	14	6	4B	1725	1725	1725	1300
Bakelite	10	8	6	4B	1725	1725	1725	1725
Wall Board	14	10	6	4B	1725	1300	1100	650
Cork	10	8	6	6	1725	1725	1725	1300
Fibre	14	10	6	6	650	500	250	100
Pressed Wood	24	18	6	4B	1725	1725	1300	650
Plastics	14	10	6	4B	1725	1725	1725	1725
Porcelain	24	18			500	100		
Hard Rubber	24	18	6	4B	1725	1725	1725	1725
Transite	32	18	14	8	1300	1100	90	90
Paper	10	8	6	4B	1725	1300	1100	675
Hard Wood	18	10	6B	4B	1725	1725	1725	1725
Soft Wood	14	6	4B	3B	1725	1725	1300	1100



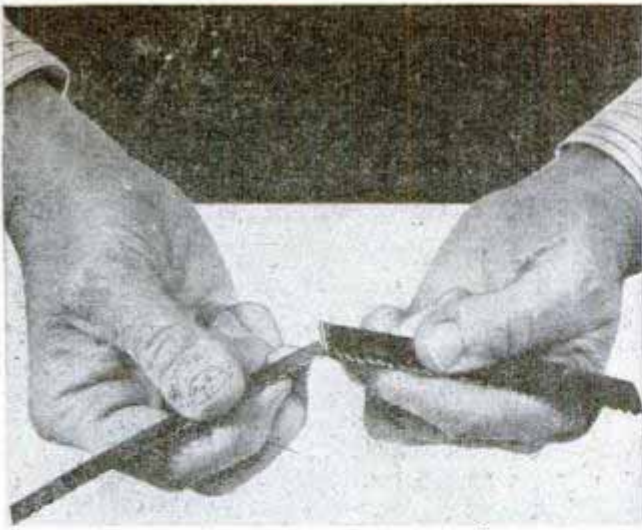
5



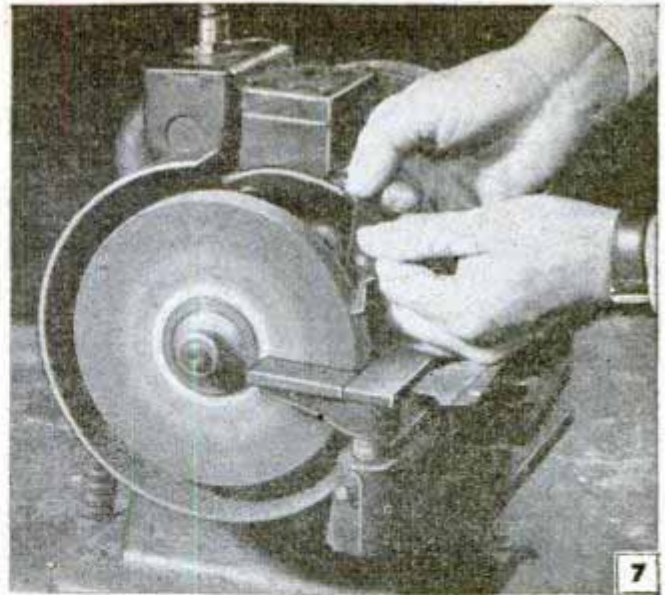
There is no such thing as an all-purpose blade, so to handle a wide range of materials a selection of blades is required. Tooth pitch and speed are of the utmost importance. The table, Fig. 3, gives a list of the materials most likely to be cut and the proper blade to do the job. Using the wrong size blade as well as running it too fast or too slow will result in poor work and short blade life. Check with a gauge, Fig. 2, and count the teeth, Fig. 4, D, to make the proper blade selection.

Although these blades sometimes are sold cut to length and ready to use, they are now readily available as mill ends. It is more economical to purchase a yard or so of blade and cut it up yourself as in Fig. 5. Grind down the ends, Fig. 7, and if the blade is too thick to enter the chuck, grind down the ends to the required thickness. Also it's generally best to grind away the teeth for 1 in. or so at each end of the blade.

Blades are commonly made with three types of teeth. The wave tooth, Fig. 4, A, comes only in 32 pitch and is used for tubing and thin sheet metal. The raker tooth, Fig. 4, B, has teeth set alternately to the right and left with one straight tooth between pairs to clear away the chip. The buttress tooth, Fig. 4, C, has every other tooth missing and is used on work where there is a tendency to clog. It is specified as 3B or 4B in the table. All types cut both wood and metal. The point to remember is to use the pitch and speed best suited for the material.



6

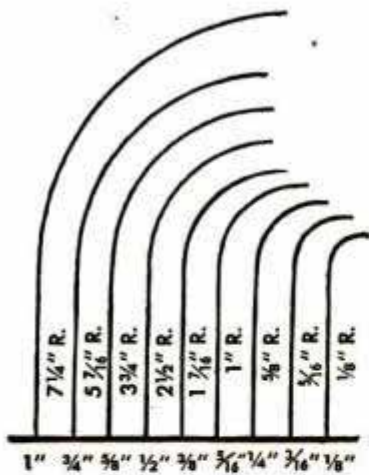


7

Blade life is comparatively short on the harder materials, as the upward drag tends to dull the teeth. From 6 to 12 in. in medium steel is about all you can expect from one blade. On the jigsaw a blade lasts much less time than it does on a bandsaw and cuts less rapidly. Always use the widest blade possible. This is governed by the arc of the minimum circle to be cut. The average minimum radius of various blades is shown in Fig. 8.

Jigsaw guides are not all alike. If your saw does not have a roller guide capable of handling the heavier blades, one should be made as in Fig. 9. Select a bar of $\frac{3}{8}$ "x1"

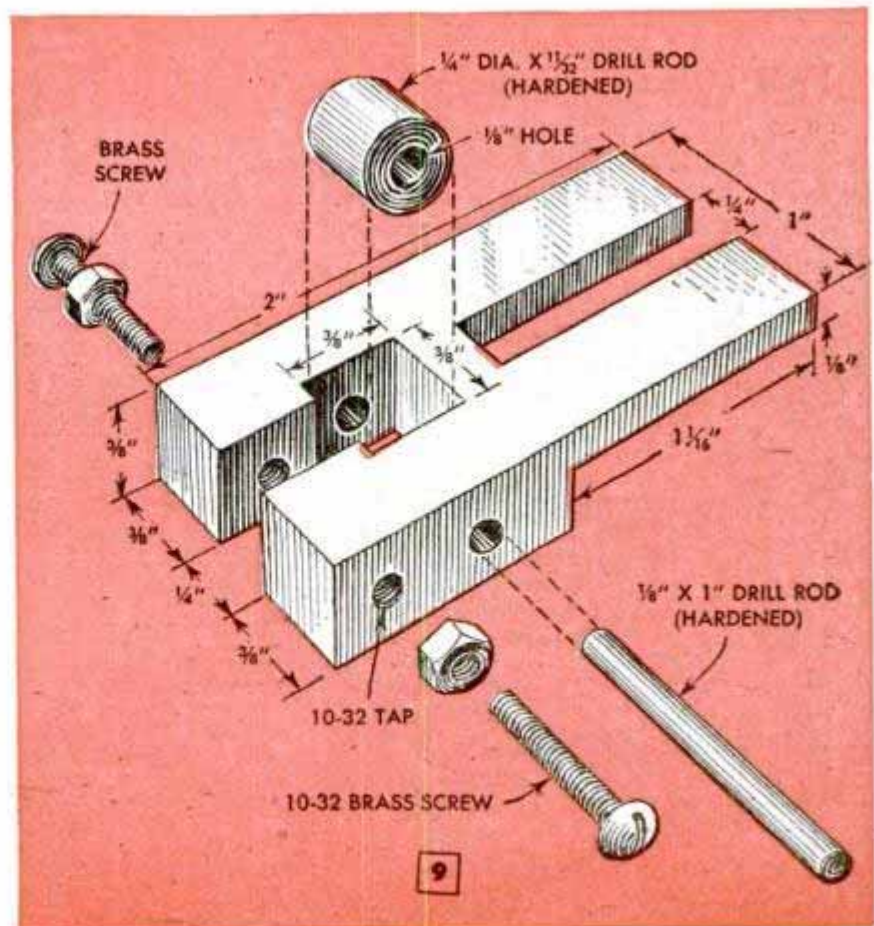
cold-rolled steel stock and lay out a guide which will fit your saw. The type of guide detailed in Fig. 9 fits a popular model, now superseded. Other blade guides are different in minor details. Use a hacksaw to cut the body of the guide to the required shape, then finish by filing. It is advisable to leave a considerable "handle" on the stock, so that you can hold it easily in the vise. Saw off the handle when no longer needed. Drill holes before making cuts, to assure alignment. Harden the shaft and roller of the guide after fitting. The two guide screws are adjusted each time a blade is changed and any wear can be taken up quickly.



SAW WIDTH
FOR 1" WORK THICKNESS
ALWAYS USE THE WIDEST
SAW POSSIBLE

8

Above you have charted approximately full size the average minimum radius cuts for blades of various widths. When turning a radius in either wood or metal, the trick in getting a smooth-edged cut is to keep the blade cutting uniformly while in the curve. If you stop the work or move it irregularly you will get "flats" along the sawed edge



9

Feed Bags Hung Over Iron Pipe As Protection Against Mice

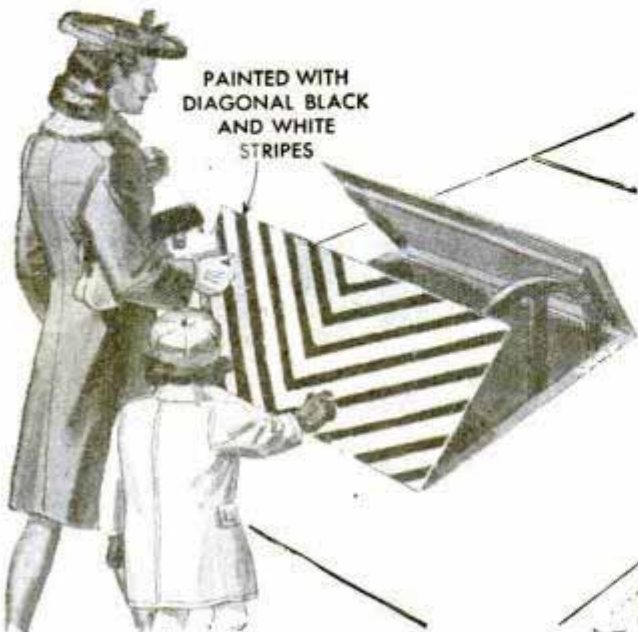


To keep empty feed sacks from being damaged by mice or rats, take a piece of iron pipe slightly longer than the width of the sacks and suspend it from the ceiling with two lengths of wire. Mice and rats are unable to get down the wire to the sacks.

Jerry Pokorny, Kewanna, Ind.

Safety for Pedestrians Insured By Painting Elevator Doors

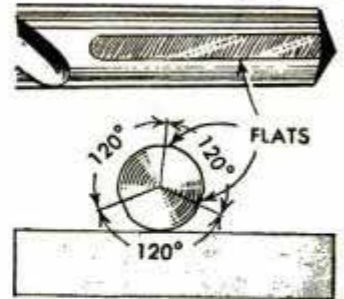
Often sidewalk elevators are not equipped with warning bells, and since the elevator doors do not stand out too clearly from the sidewalk, there is danger that pedestrians will walk into the opening or



stand on the doors when the elevator is coming up. To serve as a warning, diagonal stripes of black and white can be painted on the doors to attract attention.

How to Stop Drill From Slipping

If the shank of a drill is scored, or if the jaws of the chuck are weak, frequently the drill will slip in the chuck. To prevent this, grind or file three flat surfaces on the shank 120 deg. apart. Then clamp the jaws of the chuck directly on these flat surfaces and the drill will hold.



Earl R. Goddard, Denver, Colo.

Automobile Tire Around Stake Keeps Rope Untangled

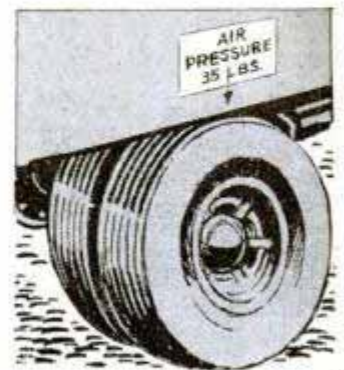
Instead of tying a tether directly to the stake, fasten it to an old auto-tire casing and then drop this over the stake. The lat-



ter, of course, should be much higher than ordinarily so the animal will not pull the tire off the stake. This keeps cattle from winding the tether around the stake.

Tire Pressure Printed on Body Of Truck Avoids Mistakes

In order that he might be sure the tires in his fleet of trucks were always properly inflated, one operator had the correct pressure stenciled on the side of the truck, directly above the tire. This eliminated considerable confusion that had existed previously, especially when drivers used different trucks or trailers.





Special Purpose Voice Recorders

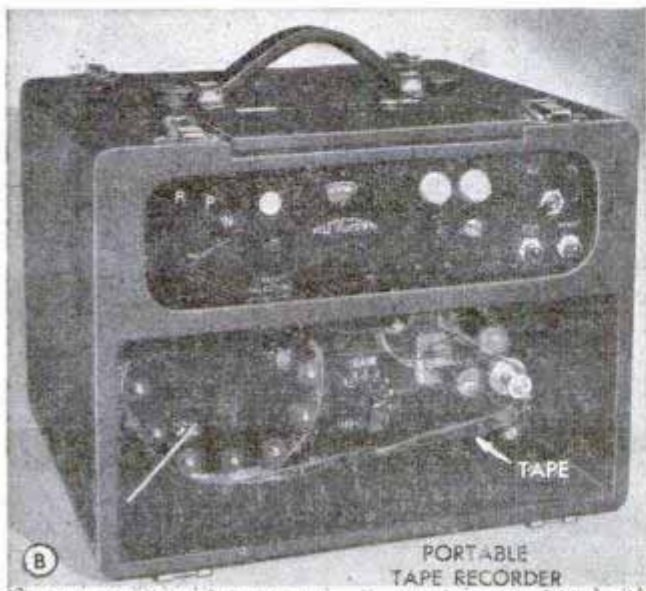
NOW you can mail your voice instead of writing a letter. The Brush magnetic recording unit, illustrated in the sketch and photo A, records your words and plays them back—with every personal meaning you gave them. These magnetic recordings are made on paper disks that may be folded and inserted in ordinary envelopes for mailing. The electronic recordings play back just as you recorded them, and the folds do no harm as there are no grooves to break or scratch. Each recording holds three minutes of your voice and costs only a few pennies. The small paper disks may be erased and used over, or they may be filed for permanent records.

Designed for recording lengthy conferences, examinations or court proceedings where a continuous record must be made, a new Miles portable tape recorder, photo B, employs an endless loop of film for uninterrupted recording and playback up to three hours. Starting on track No. 1, it automatically moves over to track No. 2 and continues until 100 tracks are indented across the width of the film.

Although the Peirce magnetic wire recorder shown in photo C has a wide range of uses, this improved model is a heavy-duty business unit that includes all the dictating, transcription and playback features and accessories demanded by businessmen and educators. Remote control permits dictation to the recorder from distances up to 100 feet. In transcribing, the secretary or typist controls the instrument by a button attached to the typewriter, or by a foot pedal, leaving her hands free for typing.



MAGNETIC VOICE RECORDER



PORTABLE TAPE RECORDER



OFFICE DICTATION WIRE RECORDER

BEGINNER'S FOUR-TUBE

By S. A. Johnson

ALTHOUGH primarily designed for beginners, this second low-cost unit in the series that began in the April issue is not intended to be easy. It is an entirely different receiver and employs 3 plug-in coils that tune from 550 to 18 meters, or, in other words, from about 545 to 16,670 kilocycles. All of the parts used in the 1-tube set are again specified, with the exception of the coil. The chassis base and panel details are exactly the same. Therefore, those who built set No. 1 will need only the additional tubes, audio transformer, speaker, plug-in coil forms and small parts.

Self-powered by using a 6J5 as a rectifier tube, no B-battery is required and the set has sufficient sensitivity and audio output to operate a loud-speaker. On the short-wave bands it is an excellent performer, bringing in stations at surprising distances. Placement of parts is not critical but, in or-

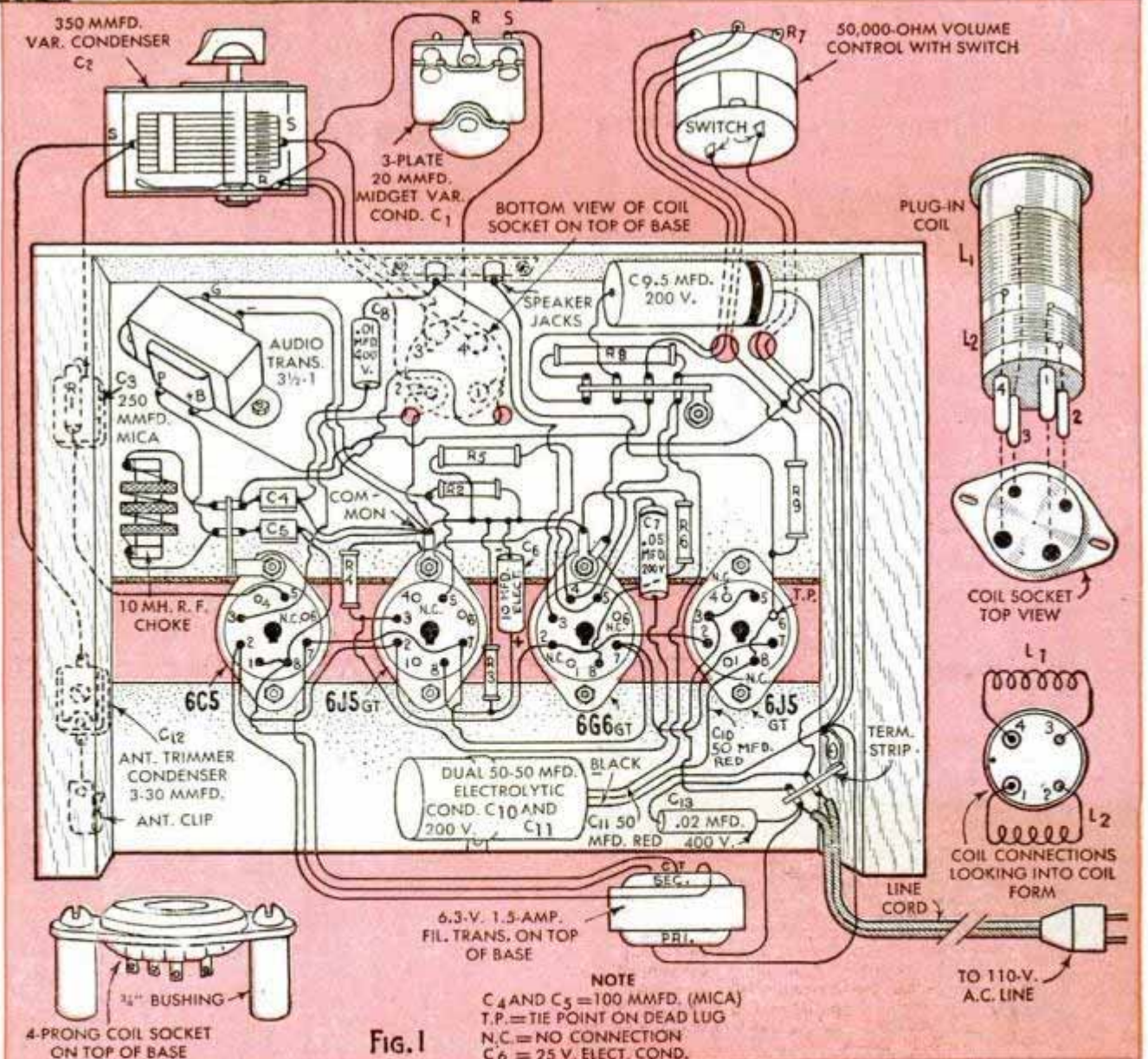
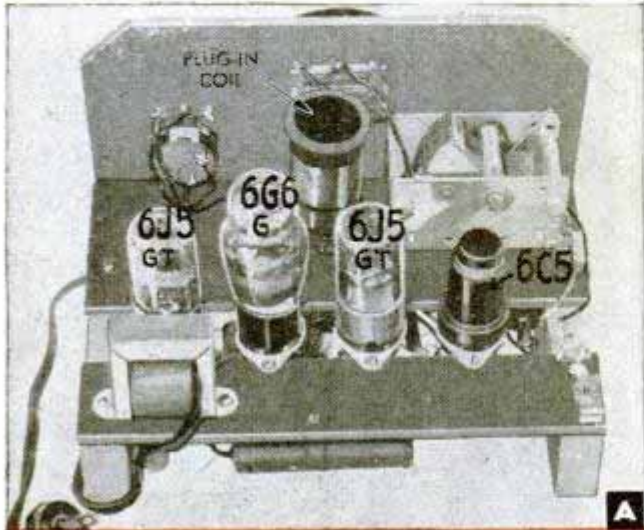
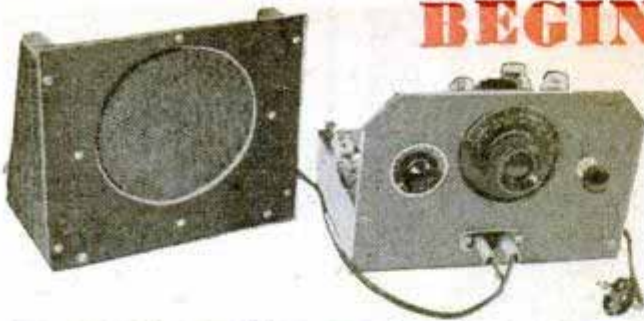


Fig. 1

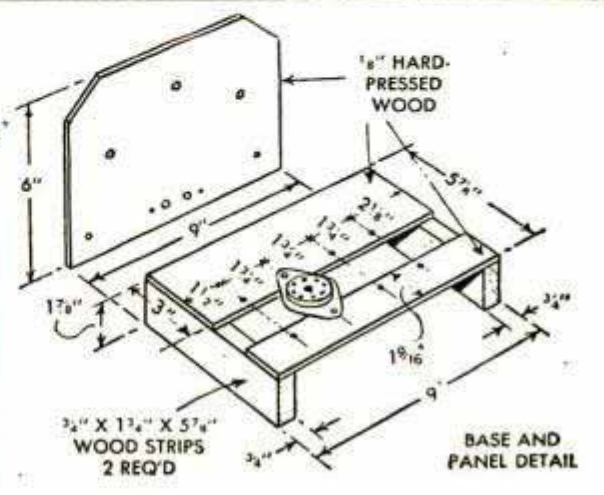
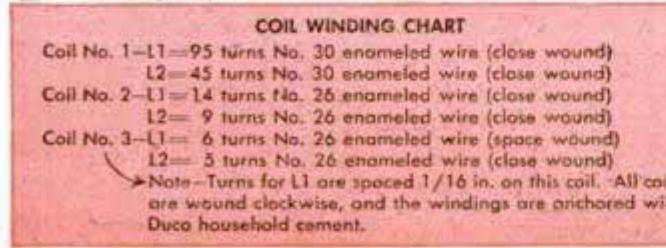
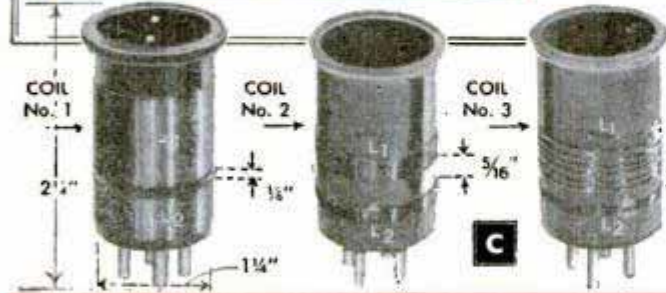
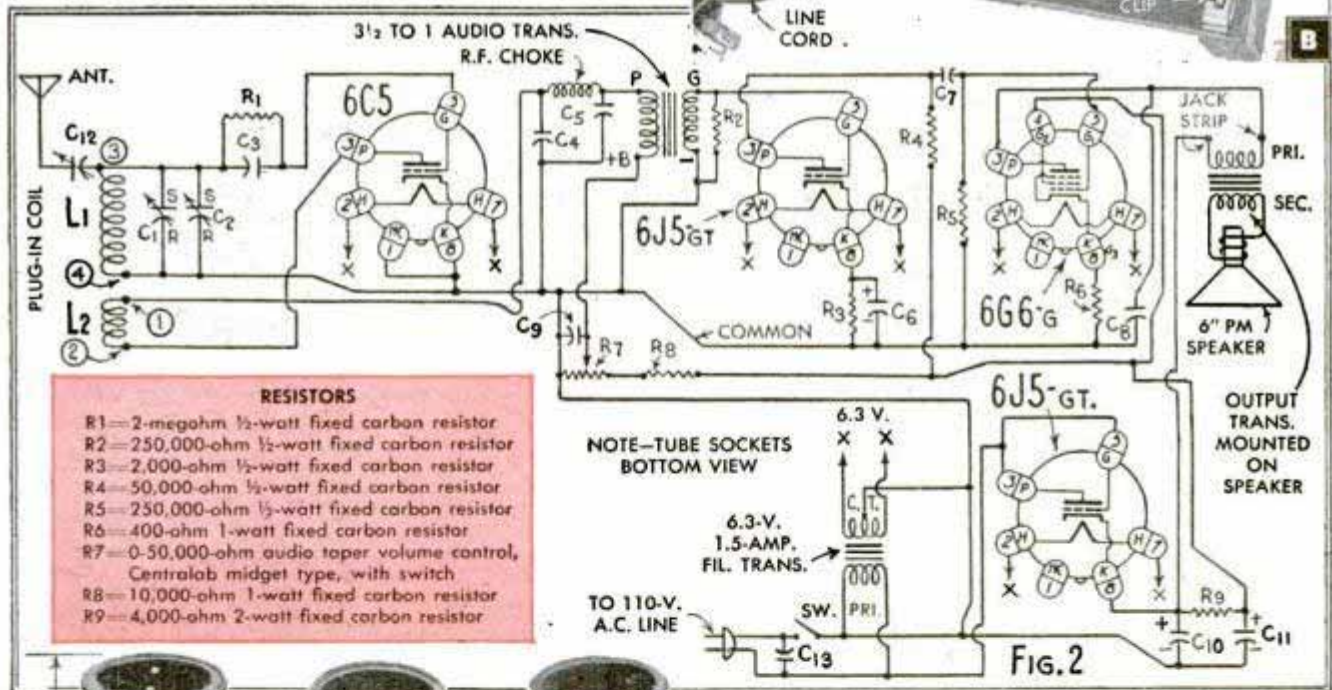
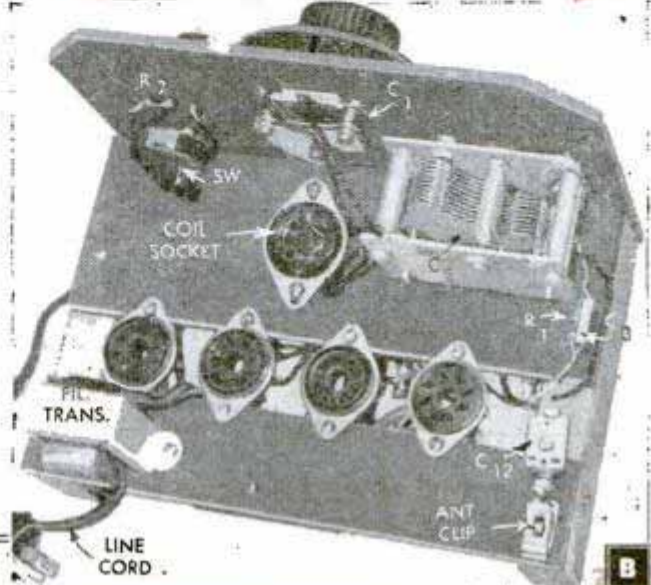
PROGRESSIVE RECEIVER--SET No.2


der to prevent confusion in wiring, the builders of the 1-tube receiver are advised to remove all of the No. 1 set wiring and make a fresh start. The 350-mmfd. variable condenser, volume control and 6.3-volt filament transformer remain in the same positions.

In order to keep the audio transformer as far as possible from the a.c. leads it is mounted close to the front of the pressed-wood chassis on the underside in the position shown in the bottom view, pictorial wiring diagram Fig. 1. This is necessary to prevent hum pickup. Photos A, B and E show various views of the completed receiver. The separate speaker unit appears in photo D; it is a 6-in. permanent-magnet dynamic type and a universal output transformer is mounted directly on the speaker. The voice coil connections are made on transformer taps Nos. 1 and 4. Dimensions are given for the speaker baffle and frame.

When wiring the set, check each lead with the schematic circuit diagram, Fig. 2.

(Continued to page 236)





Kodak Combination Lens Attachments increase scope and picture-taking ability

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● Here you have three great rifles for small game and all around sport. Marlin's 39-A is the only lever action .22 repeater made...a favorite in hunting circles the world over since 1892. As a practical weapon for vermin and small game, the 81-DL is a wise selection. It carries a full day's ammunition, and its light weight is a great asset in the field. The loaded clip of the 80-DL provides extra shots for fast-running game...and allows use as a single loader for target work. All three are rugged, man-sized Marlins, famous for accuracy and dependability. All shoot .22 short, long and long rifle cartridges—regular or high speed—without adjustment. Whichever you choose, you'll buy years and years of trouble-free sport!



Often called the "world's best all around .22," Marlin's 39-A is a light rifle of remarkable accuracy and versatility. Only lever action .22 made. Extra fast for snap and exhibition shooting.



A full day's hunting is provided by the large 25-shot capacity of the Marlin 81-DL. Removable bolt assembly; Off and On safety...a fine "learning gun."



With eight shots to the clip, Marlin's 80-DL gives you a rapid fire load for fast-running small game and vermin. Also handy as a single loader on the firing line.

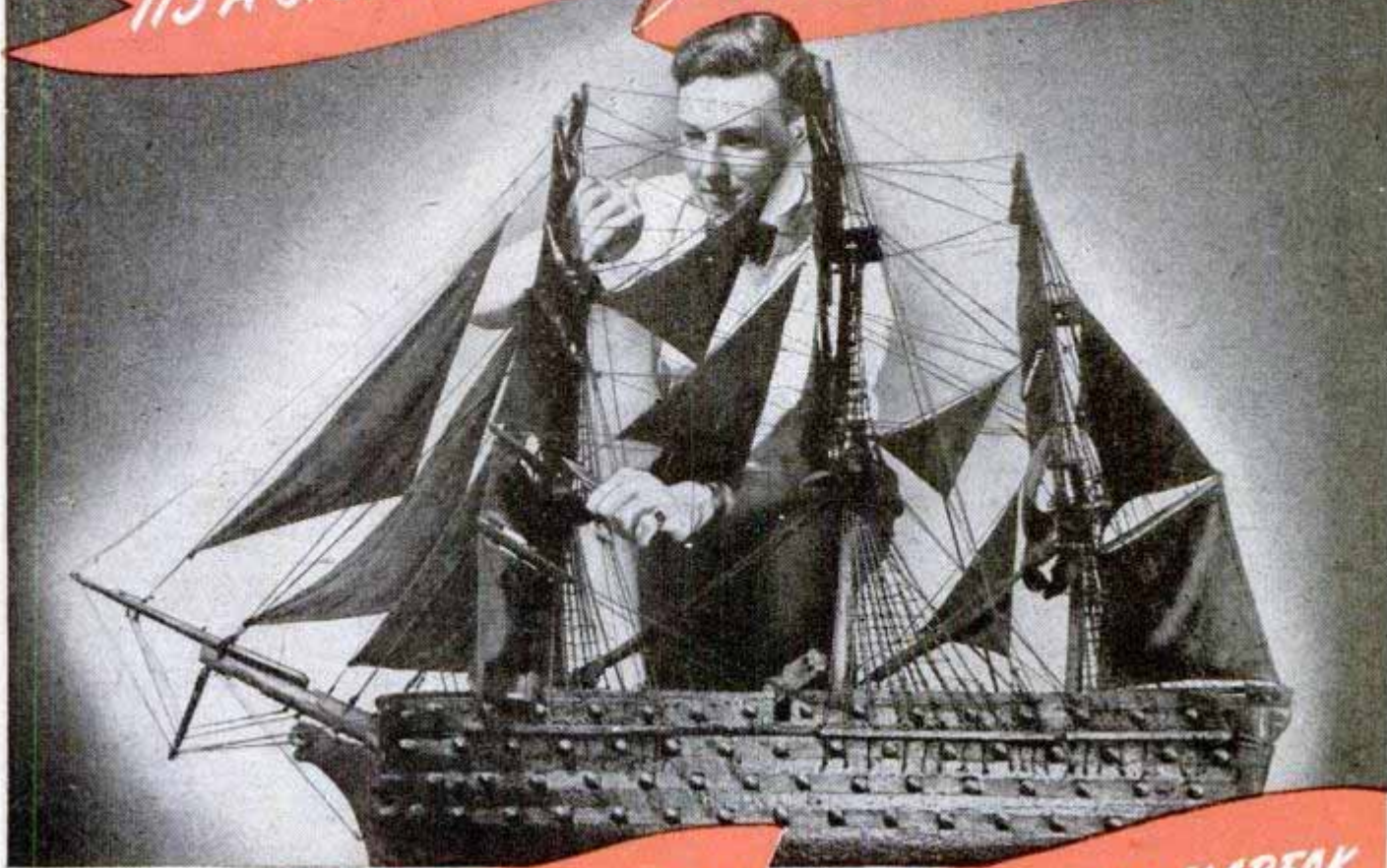
Marlin .22 Rifles

Outstanding for accuracy, dependability, long life

THE MARLIN FIREARMS CO., NEW HAVEN, CONN. • Fine Guns Since 1870

IT'S A GRAND FEELING

TO BUILD A MODEL SHIP



IT'S A GRAND FEELING, TOO,
WHEN YOUR CAR IS

CUSHIONED WITH MARFAK
CHASSIS LUBRICATION

THAT CUSHIONY FEELING LASTS LONGER WITH MARFAK!

It's a grand feeling to build a model sailing ship . . . the same grand feeling you get from your smooth riding, *Marfak* lubricated car.

Marfak is scientifically designed to cling to bearing surfaces, resist wash-out, jar-out and squeeze-out and stick to the job for a thousand miles and more. See your Texaco Man today, and get that grand feeling with a *Marfak* lubrication job.



THE TEXAS COMPANY

TEXACO DEALERS IN ALL 48 STATES

Tune in: TEXACO STAR THEATRE presents the new TONY MARTIN show every Sunday night. See newspaper for time and station.

ANCO RAIN-MASTER

"Dead-Locker"
WINDSHIELD WIPER
ARMS and BLADES

BLADE SNAPS ON...
STAYS PUT

FINGER-
TIP
RELEASE



CAN'T FALL OFF
CAN'T BLOW OFF

(A war-born invention—by ANCO—first)
for military aircraft—now for your car.)

DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car... in stormy weather... with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them—Newest Models! But he forgets to remind you? Too busy? You can't shoot him for that!



After all, it's *your* car to protect. So *you* remind *him*. Get RAIN-MASTERS... patented features... original equipment on many makes of high grade cars and trucks... used in war—on our fighting tanks and trucks and ships and bombers too... because ANCO RAIN-MASTERS clean quicker, clean cleaner... last longer. May save you a costly smashup.

Ask for RAIN-MASTER Windshield Wiper Arms and Blades next time you buy gas.

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA

Brazil's One-Man Boom

(Continued from page 132)

The Rochedo division produces aluminum cooking utensils—and at a remarkable rate of acceleration. Its total business was in the vicinity of \$1,750,000 last year—10 times its sales in 1940. Both divisions are far behind in filling orders and there is no apparent limit to the table and kitchenware which the country can absorb.

Other of Pignatari's bright young men—many of his leading engineers and executives are about 30—have evolved a process for the production of colored aluminum sheets. This process, based on a Canadian patent, is done by electropolishing and anodizing. All colors are possible, although of varying degrees of permanence, and the sheets may find wide use in such applications as tiles for interior decoration and as an outside finish for planes and automobiles.

Another component of the Pignatari enterprises makes slide fasteners. Eight million feet of fasteners were turned out in the first six months of last year—a third more than was produced in the whole of 1944. Brazil is rapidly becoming a nation of "zip-pers" instead of buttoners. The company also exports fasteners to the U. S., Europe and Africa.

The Companhia Aeronautica Paulista, another subsidiary, is one of the leading producers of planes in Latin America with a planned 1947 output of more than 50 two-seat and four-seat planes a month. The model, which somewhat resembles a \$2500 Piper Cub, sells for about \$3000. Except for the engines—imported from the United States—the planes have been designed and built by Brazilian engineers and workers, and certain important developments in the use of tubular fuselage members are claimed for the plane.

Brazil is a fertile field for the sale of planes, being a nation of vast distances and inadequate rail and motor road facilities.

(Continued to page 232)

Model Builders Attention!

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	5/32
Weight, Grams	8	3 1/2	2 1/2

Actual Size V-Plug

Champion spark plugs for model gas engines give the same dependable performance as regular Champions. Sillment sealed. Sillimanite insulator. Alloy needlepoint electrodes for easy starting. One piece construction.

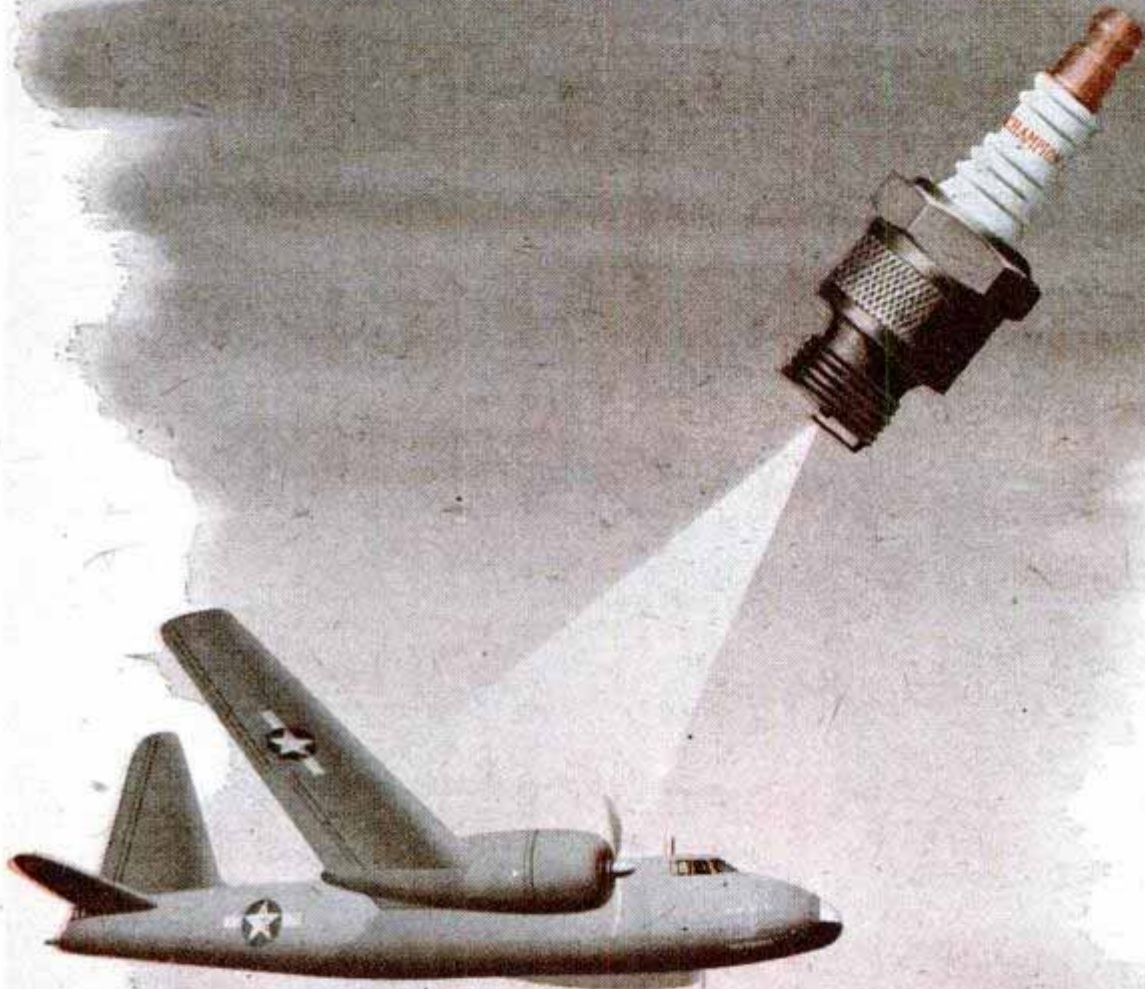
CHAMPION

SPARK PLUG COMPANY • TOLEDO 1, OHIO

Dependable

CHAMPION

AMERICA'S FAVORITE SPARK PLUG



When the Navy's Patrol bomber "Truculent Turtle" set a world's non-stop long distance record in a flight of over 11,000 miles, it was equipped with Champion Spark Plugs. This flight from Perth, Australia, to Columbus, Ohio, provided another exceptional example of the outstanding dependability of Champion Spark Plugs. The name Champion and the word "dependable" are synonymous, a fact that has made it America's Favorite Spark Plug — for every engine. Champion Spark Plug Company, Toledo 1, Ohio.

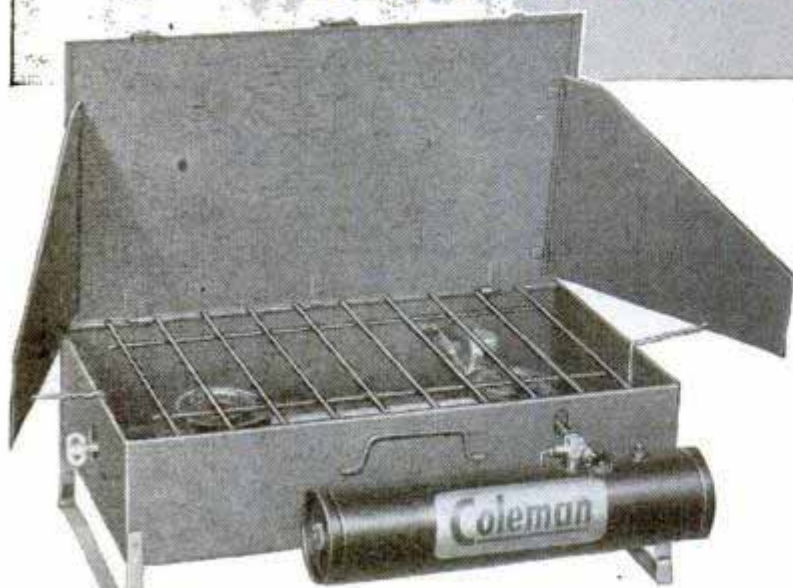
FOLLOW THE EXPERTS

DEMAND DEPENDABLE

CHAMPIONS FOR YOUR CAR

Listen to the CHAMPION ROLL CALL, Harry Wismer's fast sportscast every Friday night, 9:55 EST over the ABC network

Big, Delicious Meals Wherever You Go!



Coleman

Folding CAMP STOVE

The Smooth Way to Rough it

Easy meals... more fun... less work... better eats... anywhere with a Coleman Camp Stove. It's the speedy answer to outdoor appetites — ready at the touch of a match and the turn of a valve. Cooks like a gas range. Bakes, boils, roasts, fries, broils, toasts.

Sets up or knocks down in a jiffy. Folds up with everything inside.

The Coleman makes and burns its own gas from gasoline. Instant lighting. Two wind-proof burners; instantly regulated to any desired cooking heat. See the Coleman Camp Stove at your dealer's. Ask him for free demonstration.

FREE! Write for illustrated book telling about these and other Coleman Appliances. Address nearest office.

THE COLEMAN COMPANY, INC. Dept. 204-PM, Wichita 1, Kans.; 401 N. Broad St., Philadelphia 8, Pa.; Los Angeles 54, Calif.; Honolulu, T. H.; Toronto, Canada.

You'll Want This Amazing



Coleman

POCKET STOVE

3 lbs.; 8½ in. high; take it anywhere, for cooking, making hot drinks, boiling water. Burns any kind of gasoline—white or leaded. Aluminum case makes two handy cooking utensils. Ask your dealer.

And This Powerful

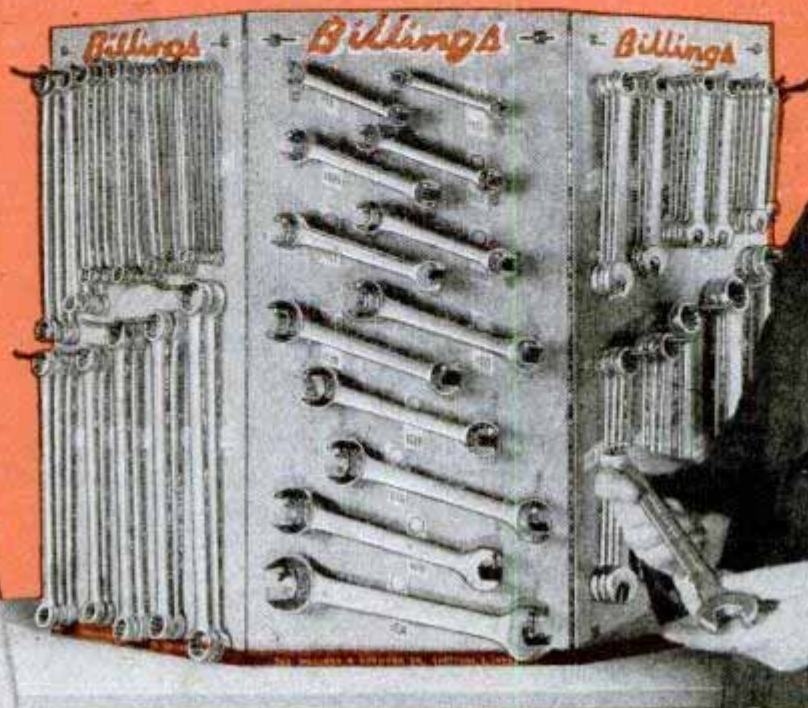
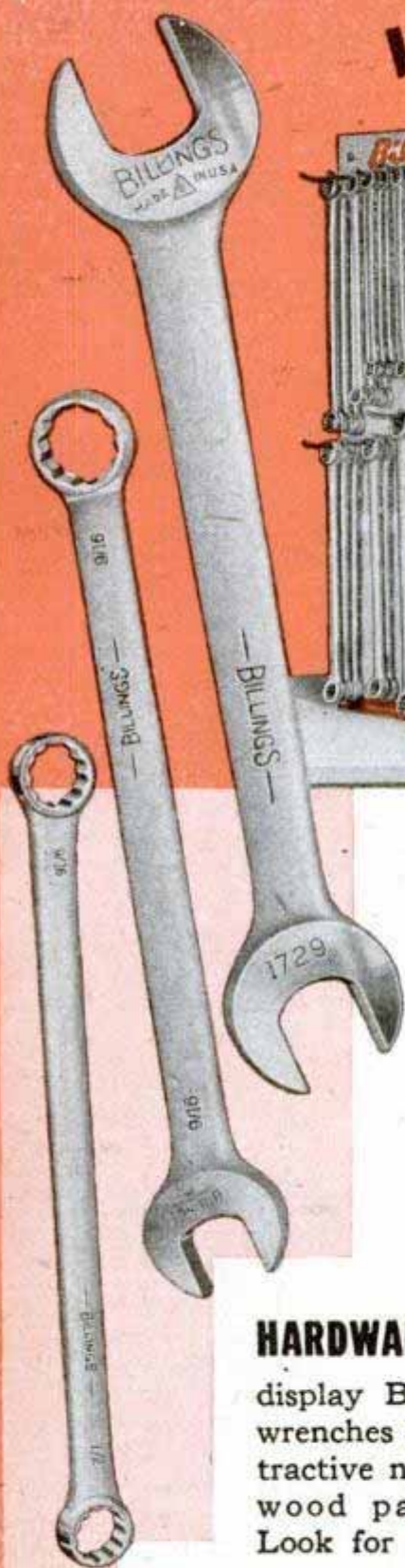
Coleman

FLOODLIGHT LANTERN

Floodlights 100-ft. area so bright you can read a newspaper 50 feet away. A 105-mile gale can't put it out. Safe—can't spill fuel even if tipped over. Ask your dealer.



HAVE THE RIGHT SIZE WRENCHES HANDY WHEN NEEDED



You'll like the "feel" of Billings quality wrenches — they're scientifically designed to give balance, proper leverage without strain and to fit all popular size nuts, bolts and cap screws . . . Have the right size handy when needed . . . Billings *Vitalloy wrenches are drop forged from special analysis steel with a heavy chrome plate over a nickel plated copper base — light weight — laboratory tested for strength — openings accurate to size — polished heads with size stamped on each wrench . . . You can buy Billings in sets, too!

HARDWARE STORES

display Billings wrenches on attractive natural wood panels. Look for them!

. . . Say "BILLINGS" when buying wrenches



TOOL CRAFTSMEN SINCE 1869
THE BILLINGS & SPENCER CO. HARTFORD 1, CONN.



For New-Car Pep, Economy Say, Burd "Graf-Flox" Piston Rings

● No, Burd doesn't advocate breaking speed-laws, but you don't have to confess that the old bus hasn't the pick-up she used to have. Install Burd "Graf-Flox" Piston Rings, and "hang onto your hat!" No kidding, the right Burd Combination Set in your engine will really work wonders . . . will give it surprising new power and snap . . . will cut fuel and oil bills. Yes, you'll get new-found pleasure in driving. Ask your service man about Burd Piston Rings . . . they are "Engineered for Results." Two free booklets, packed with handy information for the car-owner, are available *free*. Mail the coupon tonight!

BURD PISTON RING CO.

Dept. PM • Rockford, Ill.



THIS COUPON BRINGS FREE BOOKS

BURD PISTON RING CO., DEPT. PM
Rockford, Illinois

Gentlemen:

I'd like copies of your "Servicemen's Handy Handbook," which tells how to keep my car in good working order, and the booklet "No Job For A Dub."

Name

Address

City State



Pignatari had learned to fly at 19 and last December received the Diploma d'Honneur of the Ligue Internationale des Aviateurs. He covers his widely separated plants by plane and uses his own transports on his frequent trips to the United States.

Other plants manufacture electrolytic zinc, sulphuric acid, copper and zinc sulphate, steam boilers and oil and gasoline tanks. At Saramenha an aluminum plant with an annual capacity of 10,000 tons transforms the bauxite of the rich Pignatari mines in Minas Gerais into ingots for Laminacao's sheets. Eventually it becomes pots and pans.

During the war Pignatari took over a barely started modern plane factory at Lagoa Santa in the wilderness north of Rio de Janeiro. The plant, which produced advanced trainers for the Brazilian air force, was placed in this out-of-the-way spot as a move in the decentralization of industry during wartime.

Material had to be brought 500 miles from Sao Paulo, labor had to be imported and local workers trained, materials for manufacturing the planes had to be brought by truck from the nearest railroad—10 miles away. Despite these prodigious handicaps the plant was completed and planes were built. But Pignatari, surveying the costs of production and the small government purchase guarantee, now wonders whether he didn't pay a rather stiff price.

His industries cannot compare to their American counterparts in efficiency or rate of production, but this young man expects to catch up with us in a hurry. He needs tools, equipment and men to teach his engineers and supervisors the North American way of manufacturing.

Pignatari asks no financial assistance and makes it clear that he will permit no one to invest in his enterprises. He prefers complete independence.

The young man scoffs at those who tell him that an already booming inflation and the inevitable depression which will follow will ruin his over-expanded empire. The threat of communism in a land where there is great poverty doesn't frighten him. He says that, come good times or bad, there will be more than enough demand for everything his industries can produce.

Brazil is fantastically rich in natural resources; no man knows just how rich. Approximately 40 percent of her great area has never been explored by white men—or by anyone else interested in its resources, for that matter.

According to conservative estimates she has 13 billion tons of iron ore—22 percent

(Continued to page 240)

Closeup of a shining success!

How Johnson's Carnu,* the efficient, liquid type car polish, brings out your car's original "showroom shine"!



BEFORE CARNU:

Dirt and oxidized paint make your car's finish rough and dingy. Dirt sticks in crevices... won't wipe off readily.



AFTER CARNU:

Your car shines like new again, because Carnu both cleans and polishes in *one* application. The finish is lustrous and bright—the surface so smooth that future dust and dirt will wipe right off.



Just follow these simple directions



1. RUB CARNU ON!

It's easy... rub just hard enough to loosen the grime, then let Carnu dry completely to a white powder.



2. WIPE CARNU OFF!

Nothing to it!... just wipe off the powder. You'll find the dirt comes with it, leaving the finish shining like a brand new car. Yes, Johnson's Carnu cleans *and* polishes in one application.

Extra protection for the man who demands "perfection"

A tough, preservative coat of Johnson's Auto Wax does all these things:

1. Maintains the "Carnu" shine



2. Protects the finish



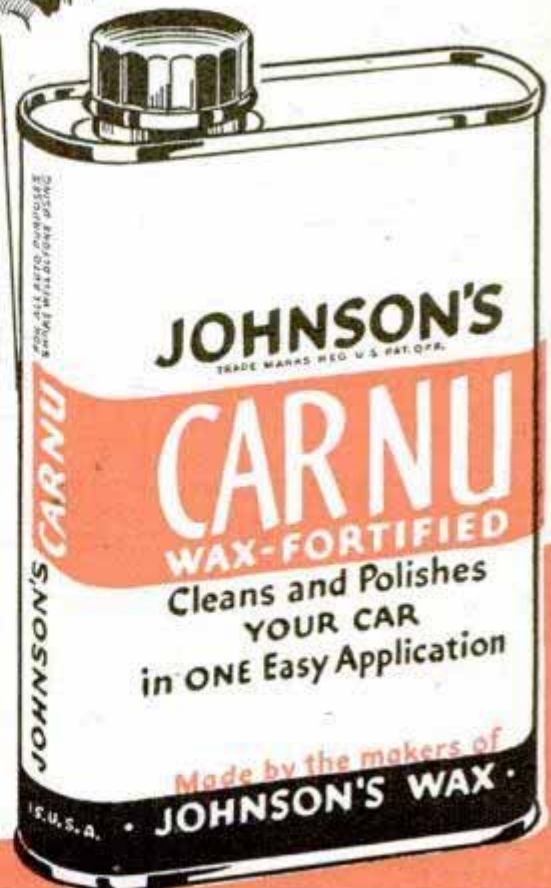
3. Helps preserve the color

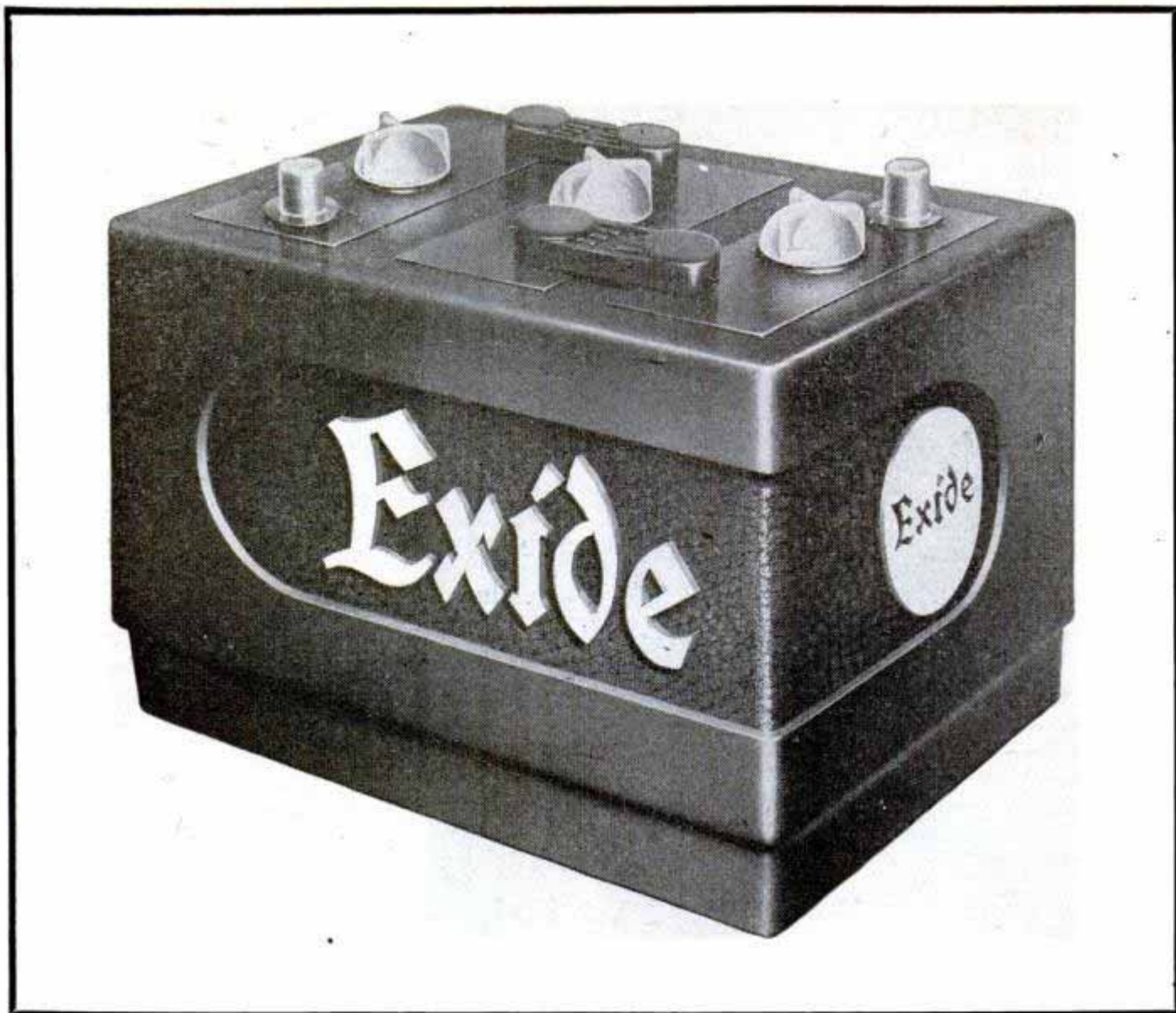
This special car wax gives the finish a tough, protective film, protects it against sun, heat and moisture. Auto Wax also makes it easy to keep your car clean and shining because dirt can't get a foothold on the smooth, hard, waxed surface. Your auto supply store, filling station, or regular Johnson's Wax dealer has Johnson's Auto Wax. Try it!



© S. C. JOHNSON & SON, INC. • Racine, Wisc., 1947

*Trademark Reg. U. S. Pat. Off.





Announcing the New Exide Batteries

In design, construction, performance . . . the NEW Exide BATTERIES excel even Exide's best efforts of the past. A natural result, for with this valuable past experience is combined the new scientific, and technical knowledge gained from modern research and severe, wartime service in all climates of the world.

There are many noteworthy improvements and added features:

- Extra-duty capacity—for greater power.
- Heavy, over-size plates—for longer life.
- Double insulation between plates.
- Dirt-proof, non-spitting vent plugs.
- "Bull's-Eye" electrolyte leveling device.
- Heavy, over-size inter-cell connectors.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

"That brand name means plenty, Mister"



JONES: Sure it does—to you hardware dealers. Tools with advertised names get you higher prices. But how about me? I want the most I can get for my money.

DEALER: Well, sir, let me ask you this. Do you think you get more for your money when you buy unknown tools at bargain counter prices?

JONES: Not necessarily. But I know this much—you can't change a poor tool into a good one just by putting a well-known name on it.

DEALER: Of course not. But don't forget that when a reliable manufacturer puts his advertised brand name on a tool—or

any other piece of hardware—it's got to be good.

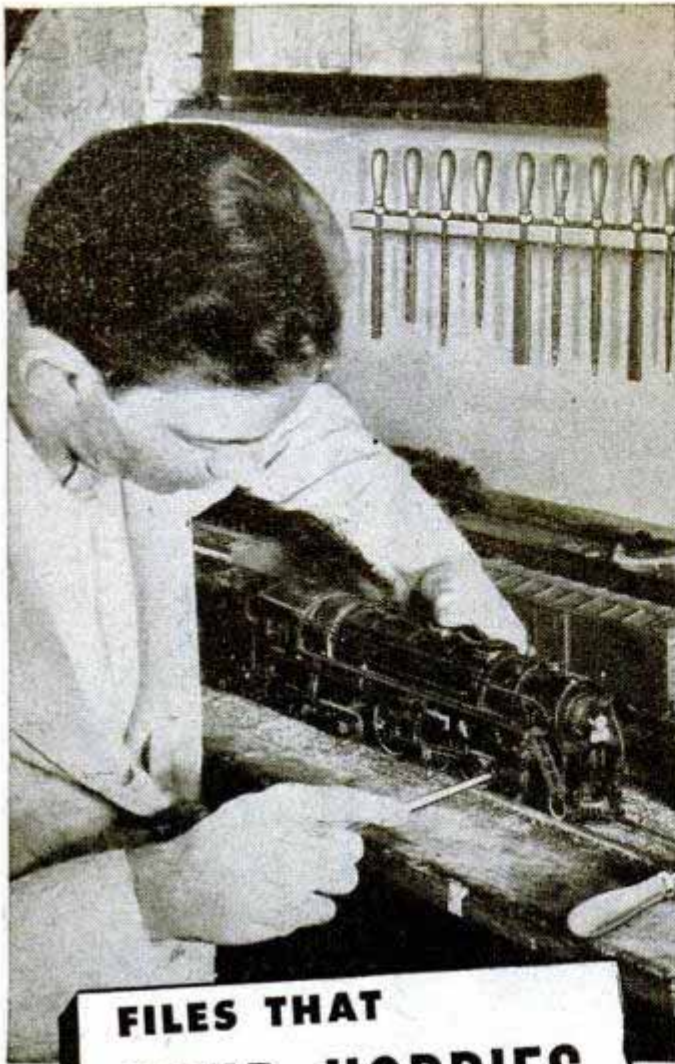
JONES: How do you figure that?

DEALER: The manufacturer has a reputation to protect. Thousands of men *believe* in that brand name... *depend* on it... and he can't afford to let them down. It's the same way with me and my hardware store. I've got to keep *my* reputation for quality merchandise or I couldn't even stay in business.

Your **HARDWARE DEALER** sells **QUALITY** tools
and hardware... Buy from HIM



POPULAR MECHANICS



**FILES THAT
SPUR HOBBIES**

LET A MAN—or a boy—get his hands on a few fine tools and he's sure to feel that instinctive urge "to make something."

That's the way it is with Nicholson or Black Diamond files. Just the feel of them—their perfect balance and sure, keen bite—is enough to start you looking for something to sharpen, or to smooth, or to create.

You'll take pride in owning a versatile assortment of these high-quality files. Then, whether you work in metal, wood or plastic—tinker with delicate models or turn out full-scale projects—you'll be able to reach for *The right file for the job.*

Your hardware dealer offers Nicholson or Black Diamond files in a wide selection of shapes, cuts and sizes.



NICHOLSON FILE CO.
22 Acorn St., Providence 1, R. I.
(In Canada, Port Hope, Ont.)

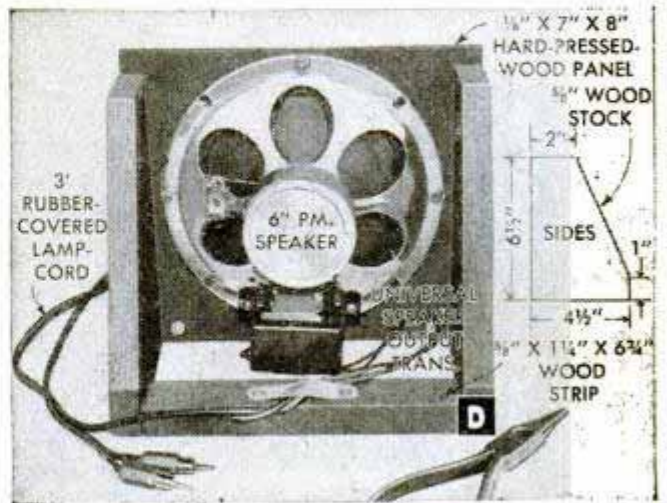


**NICHOLSON
FILES** FOR EVERY PURPOSE

Beginner's Four-Tube Progressive Receiver—Set No. 2

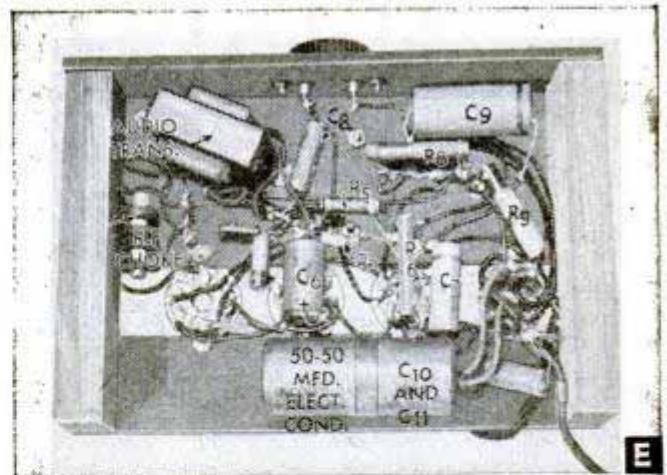
(Continued from page 223)

and carefully solder each connection with rosin-core wire solder. The 3 coils are wound on standard 4-prong coil forms and overlap to cover the broadcast and short-



wave bands. Coil connection details are given in Fig. 1, and the winding chart appears under coil photo C.

For receiving local broadcasting stations, a 10-ft. indoor antenna will give best selectivity. A good outdoor antenna is best for distant stations. To tune the receiver, plug it into your 110-volt a.c. line and rotate the large condenser C_2 for the broadcast band. It is also employed as a "band set" condenser for the short-wave bands.



For short waves it is set for the approximate frequency of the stations to be received, and then all fine tuning is done with the small band-spread condenser C_1 . This condenser spreads small segments of the band across the dial, making short-wave tuning easier. No external ground should be used. Detailed student material list R-355 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



My dentist looked down in the mouth!

I see my dentist twice a year, regular. But does he see me—his Doctor of Motors—regular? He does not!

"Look," I told him a few days ago, "cars, like teeth, need good care: You expect good service from your car every day, yet you never think to take care of it."

Boy, he certainly looked down in the mouth. But after I had ground the valves and put in new gaskets and a set of Perfect Circle Piston Rings, she stopped pumping oil, gave him more power and

drove like a dream. He was one happy Doc as he drove away.

A Doctor of Motors, like a dentist, can spot trouble before it happens and keep little troubles from becoming big ones. Just that regular care can save plenty in worry and money.

NOTICE TO CAR OWNERS

Perfect Circles are available at any automotive repair shop. Your favorite mechanic — your Doctor of Motors — recommends them.

Listen to the Indianapolis 500-Mile Race — Mutual Network, May 30

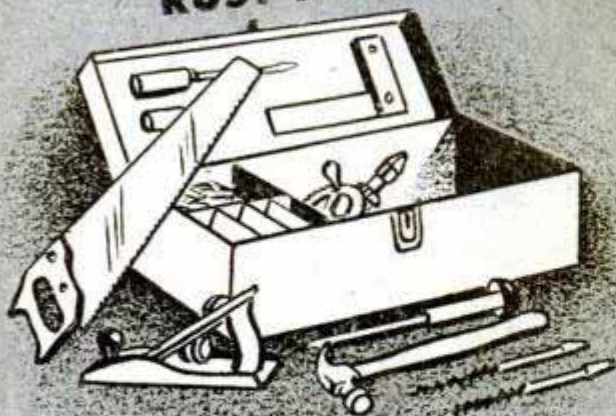
See Your Newspaper for Time and Station (4 Broadcast Periods). Sponsored by Perfect Circle Corporation—Dedicated to the Doctor of Motors.

Your Doctor of Motors
restores power . . . saves gas
. . . saves oil with . . .

PERFECT CIRCLE

PISTON RINGS

Craftsman's Aid
IN COMBATING
RUST AND MILDEW



*Absorbs Moisture
IN THE AIR!*

Rust and Mildew are a constant worry, trouble and expense to every craftsman who prides himself on having bright, gleaming tools—in safe, smooth working order. And how often such damage occurs from exposure to damp air, even though you take ordinary precautions . . . even though you keep your tools and sports equipment in closed, tight-fitting boxes!

Damp air simply seeps in and, in time, does damage to metals that rust and leather that mildews. That's why you need Tamms MIDGET DRI-AIR unit—filled with the kind of crystals used extensively by U. S. Armed Forces during the war—the *thirsty* crystals that protect your prized possessions as they absorb moisture in the air!

HOW IT WORKS . . . LONG LASTING!

Just set the shallow, round Tamms MIDGET DRI-AIR unit in with the equipment you want to protect. In the window of the perforated, aluminum case you'll see *blue colored* crystals—the sign that they are *dry*, ready to absorb harmful dampness. When they have absorbed enough moisture to require reactivating, the crystals turn *pink*. Then—no dripping, no bother or expense with refills—simply place the Tamms unit in a hot oven 'til the crystals return to their *dry*, blue color. Then, the MIDGET DRI-AIR is ready to resume its dehumidifying service at top efficiency.

THIS EXTRA SAFEGUARD—ONLY 69¢!

Don't take unnecessary risks with rust and mildew. Do something about it. Buy Tamms MIDGET DRI-AIR from your hardware or sports dealer—*right away!*

TAMMS SILICA CO. Chicago 1, Illinois

Stop This!

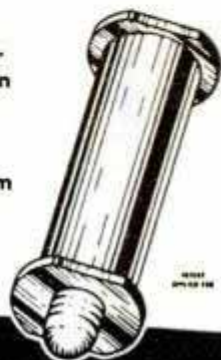


with original

HaCAR Safety Locks 2 DOOR SAFETY ON 4 DOOR CARS

Perfect safety for every rear seat occupant. Ideal theft protection, too. Simple, concealed HaCAR installation makes it impossible for the rear doors to be opened accidentally.

Easily installed by any garage. From your dealer or write for complete descriptive literature.



**Consolidated
Sales Co., Inc.**

4525 12TH STREET
DETROIT 8, MICHIGAN



CROSMAN Silent RIFLE

**POWER
without POWDER**

You'll like a Crosman because there is no recoil to spoil your aim . . . no noise . . . no odor . . . no cleaning! Rifled barrel for greater accuracy . . . adjustable power, too, for short or long range shooting indoors or out. Available in .177 and .22 cal. models.

WRITE FOR COMPLETE INFORMATION

CROSMAN ARMS CO., INC.

3 HENRIETTA ST., ROCHESTER 7, N. Y.

Shoot CROSMAN SuperPells

The BETTER Ammunition for ALL .177 and .22 caliber Air Pistols and Rifles.



.177 cal. . . \$2.50 per M
.22 cal. . . \$3.00 per M

POSTAGE PREPAID

At your dealer or order direct

FOR
GREATER
ACCURACY
MAXIMUM
POWER

CROSMAN ARMS CO. HENRIETTA ST., ROCHESTER 7, N. Y.

Sand Casting — Forging — Heat Treating — Case Hardening

BRONZE FOUNDRY



is again available in limited quantity without priority. Orders filled in sequence as received. INVENTORS—SCHOOLS—CRAFTSMEN use FOUNDRYETTE for making castings quickly for new inventions, for instruction, and general purpose. Order now for early delivery. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc. Domestic gas supply and 110 volt AC or DC energy required for operation.

Write for circular.

Box 6022, Dept. P-78

KANSAS CITY SPECIALTIES CO.

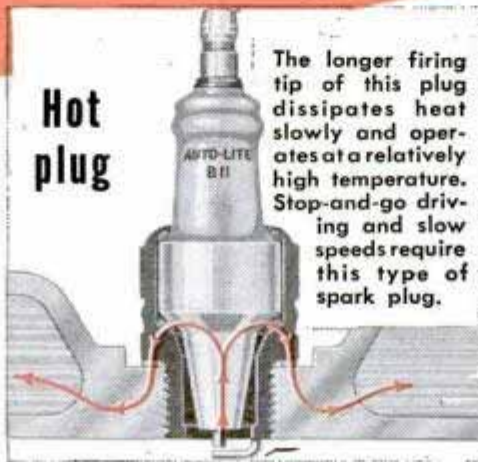
Kansas City, Mo.



AUTO-LITE "Plug Tips"

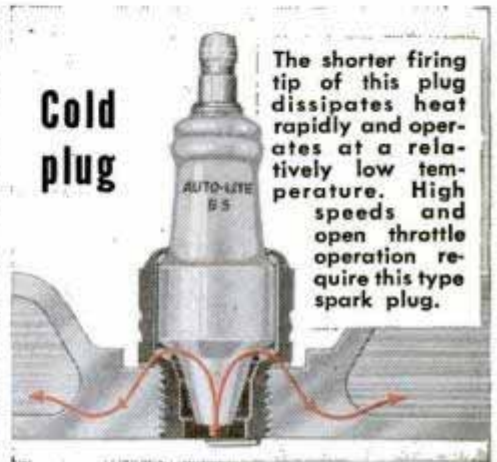
Are your plugs wasting time and money?

The right type of spark plug will save you time and money. Plugs which are faulty and mis-fire waste as high as 10 per cent of your fuel, according to experts. And hard-to-start engines can lose valuable time. Check all your spark plugs regularly to make sure you have the right plugs for your engines.



Hot plug

The longer firing tip of this plug dissipates heat slowly and operates at a relatively high temperature. Stop-and-go driving and slow speeds require this type of spark plug.



Cold plug

The shorter firing tip of this plug dissipates heat rapidly and operates at a relatively low temperature. High speeds and open throttle operation require this type spark plug.

Send for Auto-Lite "Plug-Chek" kit...only 10¢!



Too Hot *

If spark plug firing tips are fused or blistered, plugs are operating too hot and may be causing loss of power and damaging spark knock.



Normal *

If spark plugs look like this, they are of correct heat range. Get your Auto-Lite "Plug-Chek" Kit right now and check your spark plugs.



Too Cold *

If spark plug firing tips show deposits of carbon or are wet with oil, plugs are too cold, may cause poor starting and waste dollars in costly gas.

This Auto-Lite "Plug-Chek" Kit quickly helps you find spark plugs that are causing trouble. All you do is match plugs with pictures on the "Plug-Chek" Indicator—each example refers to a page in the "Plug-Chek" Data Book that shows you what to do.



* Because these illustrations are not in full color, they do not accurately reproduce the actual firing tip appearance. For accurate, full color reproduction, mail the coupon.

Switch to
AUTO-LITE
SPARK PLUGS

THE ELECTRIC AUTO-LITE COMPANY
Department PM2, Toledo 1, Ohio

Enclosed find ten cents for the Auto-Lite "Plug-Chek" Kit that includes both the "Plug-Chek" Indicator and Data Book.

Name _____
Address _____
City _____

USE AC's FOR
**UTMOST
RELIABILITY**

"The mail must go through"—and does, with the help of today's AC's in thousands of mail cars and trucks. You can enjoy utmost reliability in spark plug performance by having your spark plugs checked to be sure they are right for today's driving and fuels.



Look for this sign



Spark Plugs cleaned and adjusted "By the AC Method" may save as much gas as 1 gallon in 10



AC
SPARK PLUGS

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

of the world total; 120 billion tons of manganese; 150 million tons of bauxite, a billion tons of coal and very considerable quantities of cement.

Brazil, in the opinion of qualified economists, is headed for a boom and eventually for a place in the front rank of industrial powers. To the United States she will be a good customer as well as a good neighbor—perhaps our best customer. To enterprising young men and young women she will be a new frontier.

A few years ago President Roosevelt said: "If I were a young man, I would go to Brazil. Some day this will be the most important area of development in the world. The whole history of our own West will be repeated."

They Tailor Their Own Cars

(Continued from page 143)

wide doors. Steering wheel and instrument board are similar to those of an airplane.

An easy way to lower the body of a stock automobile equipped with cross springs is to use longer spring shackles. But this is not recommended because it may impair riding and steering qualities. The best way, which should be done by a spring shop, is to reduce the arch of the springs and turn the spring eyes. This drops the car about two inches; it also lowers the center of gravity.

Elliptic springs are lowered by placing a two to three-inch hardwood or steel block between the axle housing and the spring assembly and using longer U-bolts. Coil springs of knee-action units are cut to reduce the height of the coils. The car may pound on rough ground after this change but it rides well on pavement. Care must be taken not to lower the body so much that the tires rub on the fenders. On most makes the shock absorbers can be repositioned to provide normal stroke.

Windshields are lowered by cutting 2½ to four inches from the sides of the frames, then cutting the glass to match. Convertible tops must be cut down to fit the new height of the windshield.

Lowering the hard top of a coupe is more difficult. Usually the entire top is sliced off across the center of the rear window. Two or three inches of metal are trimmed away all around, leaving comfortable head-room inside. The windshield, rear window frames and glass are cut to fit. The roof now must be lengthened to match the rest of the body. This is done by cutting the roof in half, crosswise, and fitting the front and rear sections in place. The gap is filled by carefully welding in a strip of metal. The

(Continued to page 244)

Here's your "FOUR" - for more fun
fishing

EVINRUDE

Zephyr

FOUR CYLINDERS

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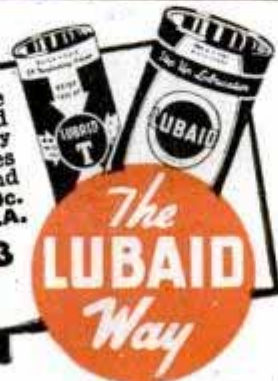
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entire top then is welded back onto the car.

Various methods are used for unlatching the luggage compartment by remote control. One way is to reverse the positions of the lock and its catch, attaching the lock to the body and the catch to the deck lid. A flexible cable is installed to pull open the lock from the driver's seat. The lid handle is removed and the hole is welded over and painted. Two small coil springs inside the lid may be installed to spring open the lid when the catch is pulled.

An entire extra door-locking mechanism is used when a door handle is removed and the control pedal is mounted below the body. The extra lock is mounted in the body, facing the existing lock in the door. The bolts of the two locks are modified so that the door opens when either bolt is withdrawn. The lock mechanism in the body then is connected to a foot treadle under the side of the car by a metal rod. Car doors also may be opened electrically from inside the car by using a concealed push button to operate a solenoid that withdraws the bolt. In all such cases the standard door handle outside the car is removed and its installation hole is welded over.

Back in the '20s many automobile owners spent their spare cash on extras and accessories that they added to their cars to improve the performance or comfort of their vehicles. Gradually the factories adopted many of these extras as stock equipment. Perhaps today some of the car owners who are modifying the designs of their automobiles are pointing the way to future factory changes in our stock cars.

Fencing In the Waterways

(Continued from page 126)

miniature the entire watershed of the Mississippi. The model will be 4500 feet long and 3900 feet wide, of sod and concrete, and will represent the terrain of all or parts of 31 states from the Appalachians to the Rockies and from Canada to the Gulf. About 41 percent of the total area of the United States will be reproduced.

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When completed in two to four years, the

(Continued to page 248)

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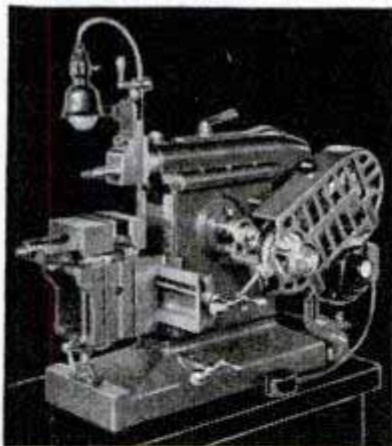


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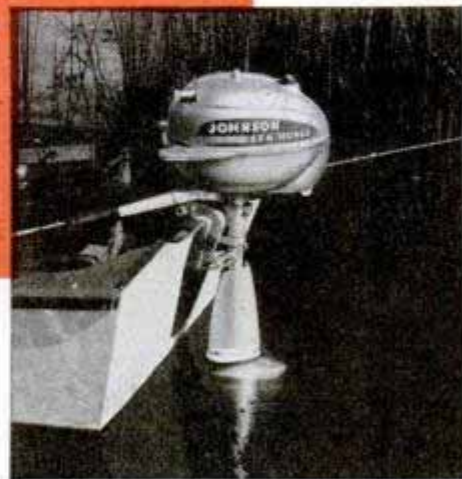
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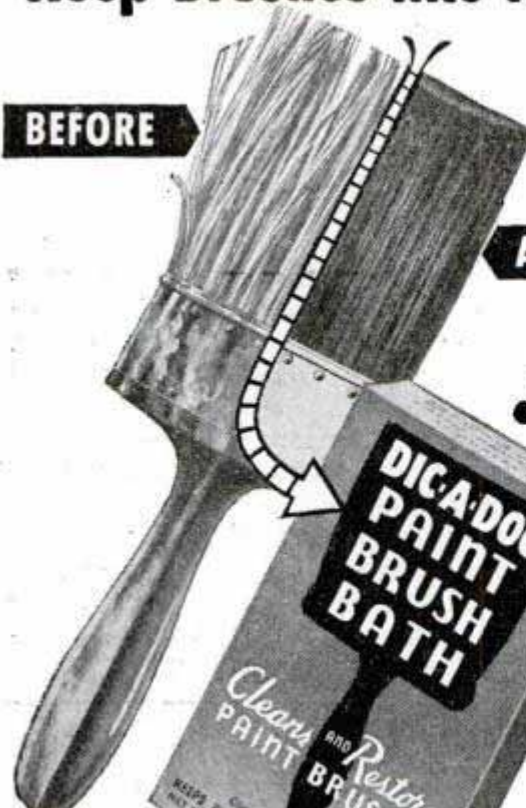
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Here's a WHIZ item that belongs in every garage and home workshop—Loosen-All. A few drops quickly frees stubborn bolts and nuts, or any other part seized by rust, scale, corrosion, paint, shellac, red or white lead.



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colossal model will permit engineers to work out the best technique for over-all river operation. How to operate the scores of reservoirs in the system most efficiently, for instance, is a major problem in itself.

Approximately 1000 gallons of water per minute can be pumped into the model to duplicate any combination of storms. A major storm near the headwaters of the Red River, sustained but gentle precipitation along the upper reaches of the Mississippi, and a sharp flash flood pouring down the Ohio can be created simultaneously. The course and effects of each flood will be measured by gauges at 1500 strategic points on the model, each connected to electrical recorders that will make permanent records of water heights.

Already the experiment station uses a 2½-acre model of the lower Mississippi for flood control studies. Huge as it is, this model will be dwarfed by the vast watershed model that is now being built.

Get Ready for Camp

(Continued from page 159)

and cake turner should be included. Don't forget a sharp butcher knife and a can opener. For cleaning dishes and taming the stickiest of frying pans include a can of powdered cleanser and plenty of steel wool. A dish mop and plenty of dishcloths rolled up with the implements will complete the "kitchen." A large square of white oilcloth makes an ideal tablecloth for use on the ground or camp table.

The gasoline stove and lantern—These modern servants go far to take the curse from camping, but they are efficient only if given proper care. The stove tank should be drained of old fuel and refilled, and the burners brushed clean and lighted. If the air pressure drops quickly it indicates that the packing glands need tightening. If the pump leather is dry add a few drops of neat's-foot oil to give it a good, tight seal. If the stove has had much service a new generating unit may be advisable, for old ones become clogged with carbon.

The lantern should be emptied, refilled, carefully tested, and the same measures applied as to the stove. If the generator gives the least sign of trouble by all means replace it, for the tiny hole in the generator tube is difficult to clean out and rarely works well after it has been cleaned. A supply of extra mantles should be carried in a compact metal box to prevent damage.

Finally—and most important—have a good, tight gasoline can painted red for safety. Fill it at home with white gasoline,

(Continued to page 252)

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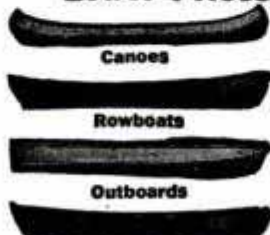
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since neither the stove nor lantern will handle colored automobile fuel properly. The white, untreated gasoline is sometimes difficult to find when you are on the road.

A good ax of full or three-quarter size is always useful and may be a necessity in woods country where an evening campfire is wanted. It is required, along with a shovel, in national forest camps throughout the country. Sharpen the ax to a keen edge at home, using a good two-grit oilstone, and carry the stone along for later treatment of the ax and butcher knife.

Final tips—Include a simple first-aid kit, with the necessary antiseptics and bandages for minor wounds. Remember what pests mosquitoes can be and carry a bottle of proven "dope" to apply to the face and hands. Your druggist will know of several formulas that he can prepare. And last, take two supplies of matches with at least one supply in a waterproof can for use in emergencies.

Silver Sheds the Overalls

(Continued from page 148)

sent to a commercial plant in New Jersey and recast into heavier ones. These heavier bars were shipped to other plants in Baltimore and Detroit to be turned into bus bars of varying shapes and sizes. Finally, the bus bars were distributed to the 13 plants in which they were to be installed.

Guards were on hand at all times during all of these procedures. They kept watch over 171 shipments by freight, up to 14 carloads each, and 1660 shipments by motor truck, and over stacks of silver bars spread over acres of space, indoors or out.

The war plants were scenes of feverish activity during the construction rush. The chances were that nobody would pay any attention to one more or one less truckload of silver, worth perhaps \$300,000, being hauled around the grounds or unloaded at a building entrance. Installing the silver bars was, for the skilled workmen employed, just another task such as putting sections of fabricated steel together—a lifting, fitting, bolting, clamping job. But guards' eyes always were present.

Completed and in operation, the plants presented the circumstance that, in the average case, value of the silver bus bar circuits far exceeded the cost of everything else—site, plant, equipment. Guards patrolled the bus bar lines at regular intervals, reported meticulously any damage done to the silver, checked records daily to be sure that the 10 or 20 or 75-million dollar investment in bus bars still was intact.

(Continued to page 256)

REAMING TAPER CUTTING TURNING THREADING

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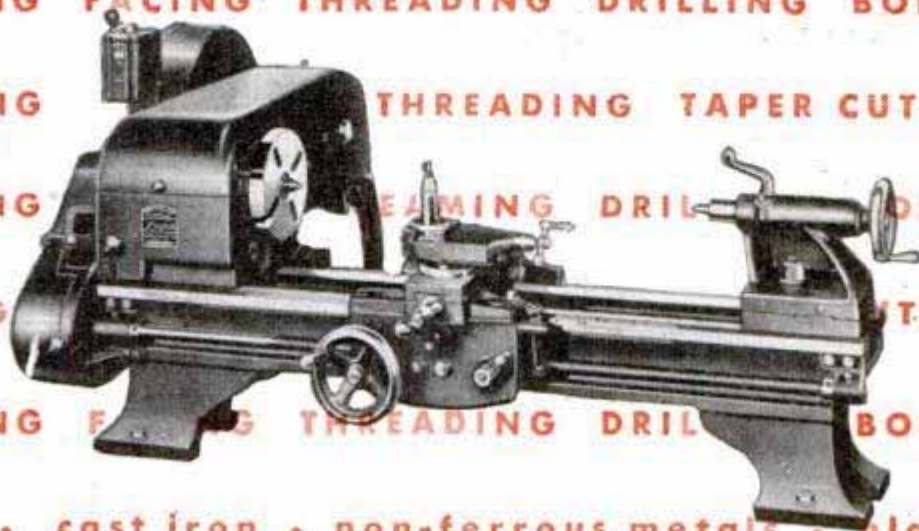
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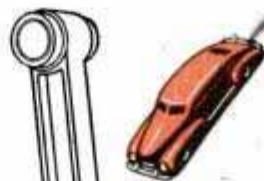
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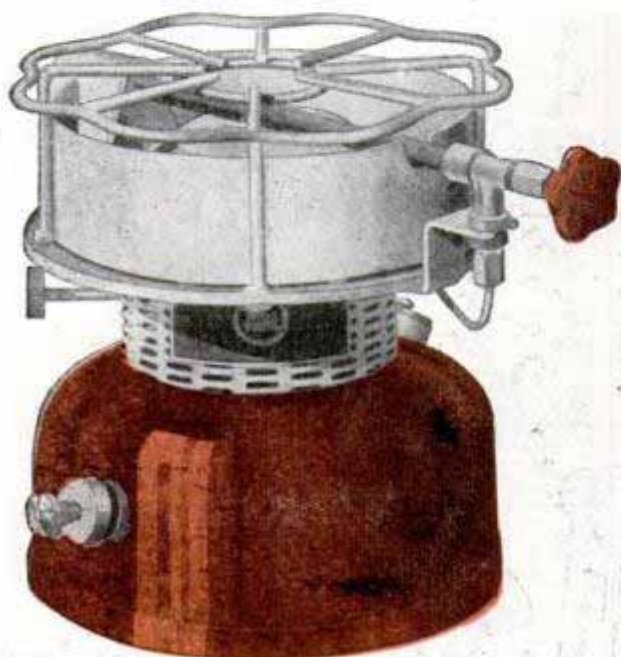
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Lieutenant Martin Clair, head of the RFC guards at a plant where 54,000 slabs of silver were used in building the bus bar circuits, took the plant's employees into his confidence. He made a speech to them over a public address system, told all about the silver—emphasizing that it was .999 percent pure—and warned that, since it belonged to the government, trying to steal any of it would be ridiculous because the thief would be "followed to the ends of the earth."

Clair had only one suspect to deal with thereafter, and had to follow this one only to a plant locker room. There the suspect disgorged from his pocket a chunk of silver weighing two or three ounces. A traveling crane knocked it from a bus bar and he picked it up, he said. He intended to turn it over to the guards, but had forgotten.

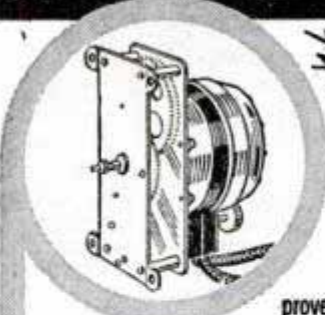
The man was found to have been in and out of the plant several times since acquiring the silver. That he still had the metal in his pocket argued against any evil intentions. Nevertheless, the case went to the Attorney General of the United States for a decision as to whether the man should be prosecuted. He wasn't.

Not until all the borrowed silver has been returned to the treasury, recast into coinage ingots or commercial bars, and tested for quality and fineness, will it be known how much of the metal was lost in the war project. Preliminary examination has indicated that at most plants damage to the bars amounted only to slight oxidation.

The pains taken to guard against unnecessary silver losses and damage while the metal was in RFC custody were of wide variety. At the New Jersey refinery where the silver had its first processing for RFC use, dust discharged through the flues of a furnace used for melting the silver was trapped in cloth bags, and from accumulations of the dust silver worth \$250,000 was recovered. Sweepings from freight cars and trucks in which silver was shipped were similarly processed. During installation of the bus bar lines in the war plants, bits of silver scrap were carefully saved. In lifting heavy bus bar sections with a derrick, lengths of rubber hose rather than metal chains were used to bind the slabs of silver together and fasten them to the lifting blocks. Slabs of silver stacked for storage were separated by wooden laths.

When bus bar lines in a magnesium plant near Marysville, Mich., were dismantled and the slabs of silver sheared into short lengths for storage, a small aluminum trough was mounted under the cutting edge of the shearing machine. After each cut, a workman armed with a brush and tin can salvaged the silver dust from the trough.

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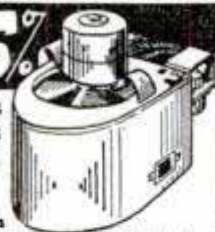
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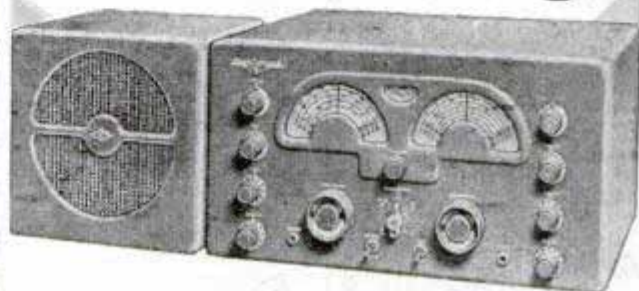
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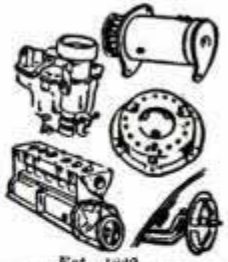
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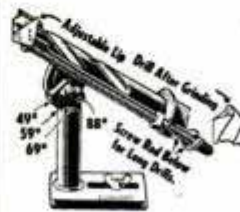
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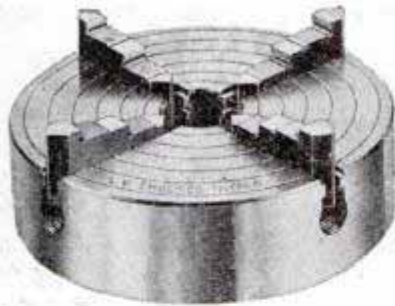
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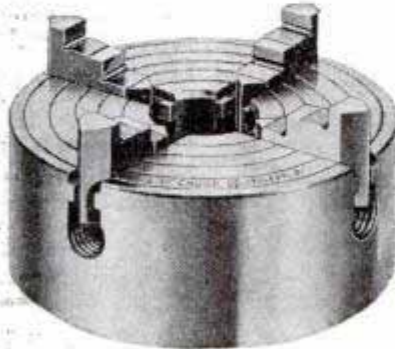
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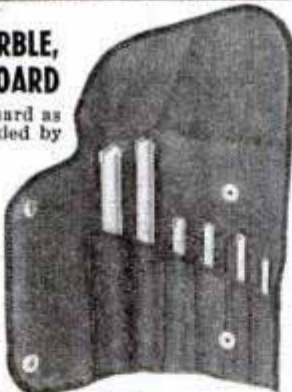
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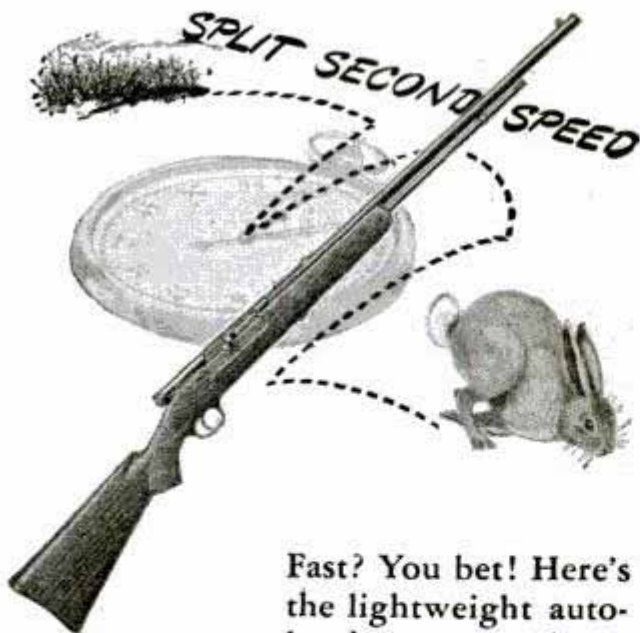


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**MANUFACTURER OF SAVAGE-STEVENSON-
SPRINGFIELD-FOX RIFLES & SHOTGUNS**

Hobbyist of the Month

(Continued from page 137)

content with a single extracurricular interest. A complete model railroad takes over a good share of his home basement and he also collects finely made cameras. Probably much of his interest in things mechanical is inherited. His father is Charles F. Kettering of General Motors, chairman of the National Inventors Council and the inventor of automotive starting, lighting and ignition systems.

Making models the caliber of Kettering's is almost a full-time job. He's been able to build only about 60 himself since starting the collection in 1930. Most of the others have been made for him by a young man named Bill Chaffee at Northville, Mich.

Chaffee says the toughest to build were old Navy flying boats like the NC-4, which were so burdened with rigging, wires and struts that alignment, the hallmark of good modeling, was quite a problem. All surfaces have to be true and square with each other or the whole miniature effect is spoiled. And it takes skilled fingers to get trailing edges razor sharp and contour lines exact.

Report From Antarctica

(Continued from page 112)

falling to 90 degrees below zero. These creatures have apparently chosen the southernmost home in the world because of their laziness. They have no enemies except an occasional sea leopard, a fierce, solitary seal and the most vicious antarctic animal, which can outrun a man across ice fields and is the most dangerous creature encountered here on land. The country of Weddel seals is so dangerous that scientists enter three at a time, roped together.

Creatures basking beside water holes are only mildly annoyed when prodded with ski poles. They open their eyes and look curiously at intruders, then fall asleep again. The reason for their lack of fear is that all animals here are conditioned for generations to expect complete safety on shore, with danger only in water where a fierce struggle for life goes on. For example, the favorite sea leopard food is penguin, but only a very hungry creature bothers to chase a bird across the ice. The sea leopard hunts entirely in cold water among the ice floes, where penguins must come for fish. Great seals, in turn, are fearless on ice because the only enemy they know is the fierce, voracious and formidable orca, or killer whale.

Among the expedition's jobs has been

(Continued to page 264)

When you're glad
you have a
Snap-on

Snap-on's Blue-Point **VALVE COMPRESSORS** remove the stiffest valve springs easily . . . safely

Here is one of the most practical lifters on the market today. Universal in its scope, this valve spring compressor works efficiently on many different makes of cars.

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"I bought a Foley Saw Filer, one year later had all debts paid and also \$400 on a new home. Many days I earn as much as \$16," says J. H. Kellogg.

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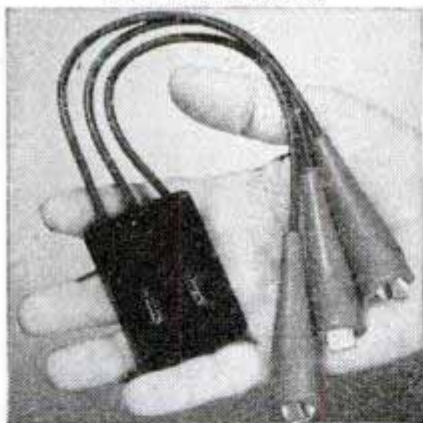
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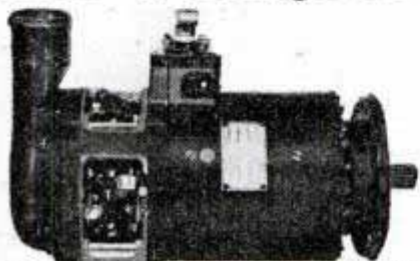
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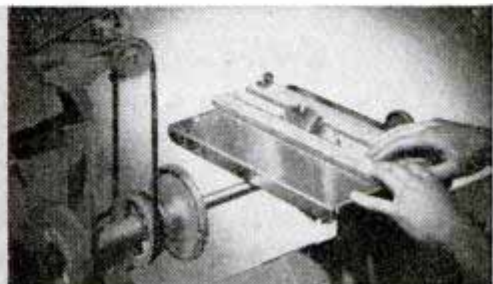


LATHE 10" swing, 30" between cen-
ters, 3/4" spindle, face plate,
spur center, tool rest.

\$34⁹⁵

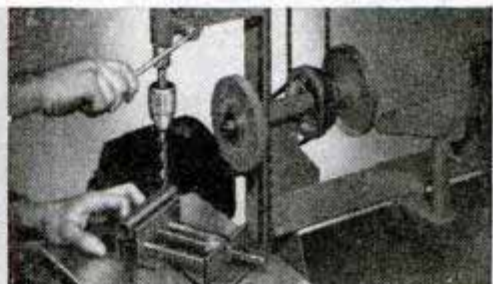
SAW

Takes 6" to 8"
blade. Arbor
handles scratch
brush, grinder,
buffer. Saw
blade not
included.



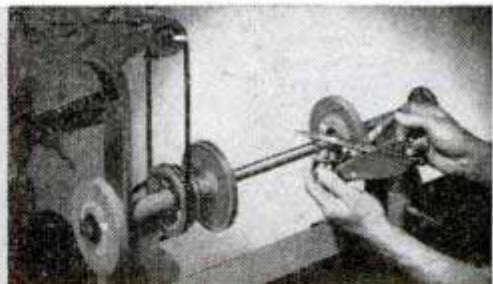
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Takes drills to
1/2". 2" travel,
1/2" spindle.
Drills to center
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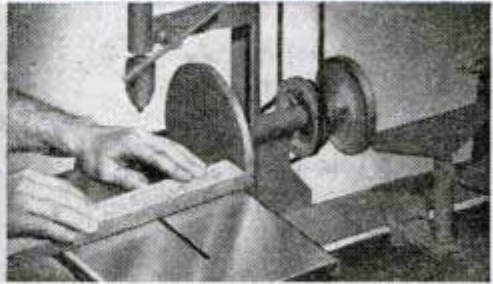
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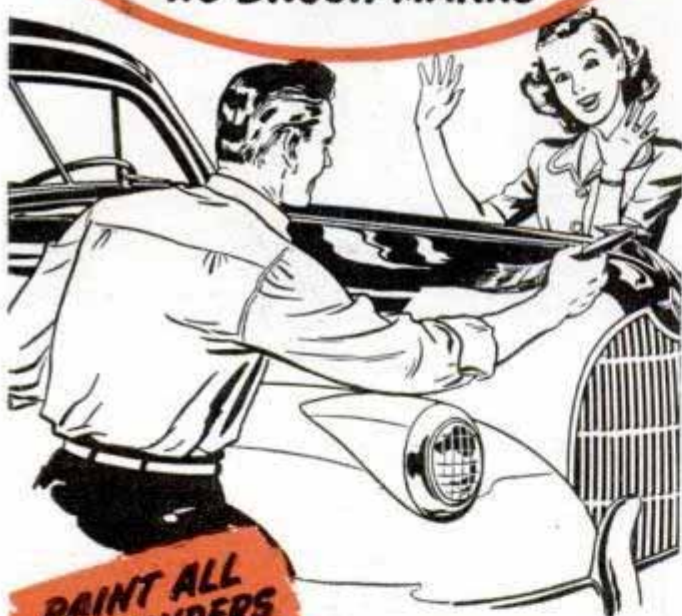
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the making of a partial census of whales throughout the area by a sampling count from the air.

Annual bird migrations are of particular interest and a special job has been to band on these shores the arctic tern, which makes a 25,000-mile pilgrimage almost from pole to pole every year. The tern nests and breeds in the arctic summer within a few miles of the North Pole. The first arctic sunset stirs some weird impulse that starts it southward over Europe and Africa, speeding madly through brief intervals of darkness, until it reaches another nightless habitat on the antarctic continent's shores. In early February the tern is ready to start for the North Pole again, this time over North and South America.

Although all this is generally accepted by biologists, it is based on very few observations, say agents of the Fish and Wildlife Service on the expedition. The northern route along American coasts, the time required to reach the arctic, and the migration reasons are unknown. One theory is that millions of years ago its ancestors were glacier birds, following the edges of moving glaciers for debris left behind, and it has been unable to break the habit. The tern must have ice and light, and eight months each year are spent in flight to find them together.

Another bird-banding experiment was planned but abandoned due to the protests of sailors. This was to capture and mark several wandering albatrosses. The belief that any injury to these birds means disaster is one of the oldest superstitions of seafarers, far antedating Coleridge's "Ancient Mariner." Next to the arctic tern the albatross is one of the earth's greatest wanderers. A single bird follows the ship for days, presumably for debris cast overboard. Even modern sailors believe an albatross is attached to the ship as a guiding spirit. When it leaves, it is a sign land is near. Such a superstition outweighs scientific interest.

Through the ice packs the ships passed a great field of lemon yellow ice, which microscopic examination showed contained colonies of countless quadrillions of microscopic diatoms, apparently the only living things able to survive and multiply while frozen solid in an ice cake. These diatoms are not in hibernation; they live in tiny air holes between ice crystals. Although in the plant kingdom, these diatoms are free-moving with a unique jet-propulsion mechanism. They are the chief food of tiny crustaceans which support whales and fish.

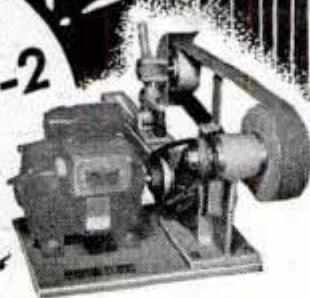
All antarctic life depends on the sea, where food is abundant. The continent is

(Continued to page 268)

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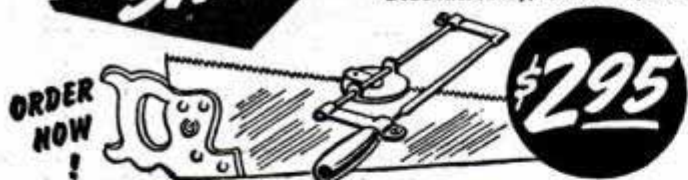
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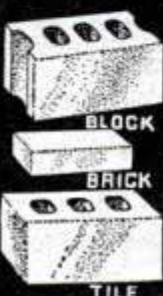


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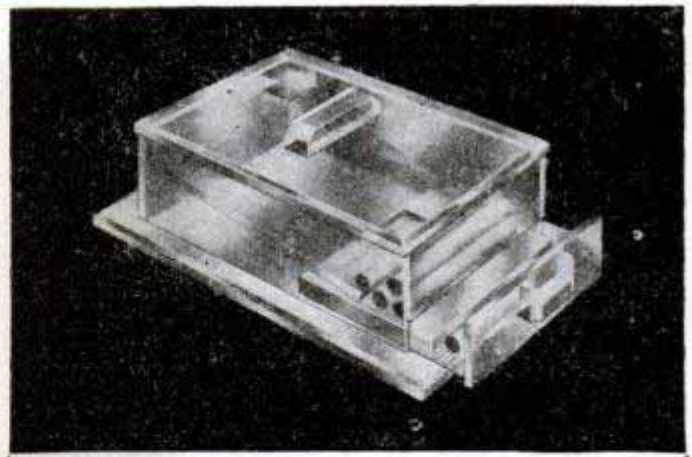
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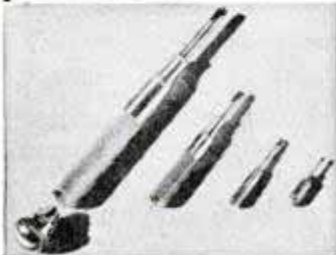
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It's no ordinary screwdriver you see pictured here but actually four screwdrivers in one! Handle made of solid brass with screwdriver blade made of finest tool steel in four different sizes! Here's a lifetime tool you'll be proud to own or offer as a worthwhile gift. Sold under full money-back guarantee. Don't miss this. Order today before Present supply is snapped up.

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Use this quick, sure remedy for loosened tool and cutlery handles, metal door knobs and fixtures, casters, bolts, nuts, screws, rivets, etc. Fill screw hole or handle hole with a soft putty of Smooth-On No. 1. Insert screw or handle, turn it up tight and allow the Smooth-On to harden. The loose part will stay tight, because Smooth-On No. 1 expands slightly in hardening and holds screw or handle in place. You'll find Smooth-On No. 1 also a time-saver and money-saver for sealing cracks and stopping leaks in piping, boilers, radiators, tanks, etc. Buy it in inexpensive 1 3/4-oz. or 7-oz. size at your hardware store. If they haven't it, write us.

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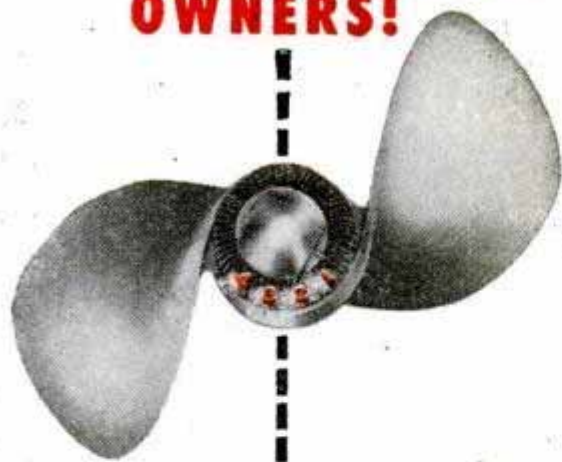
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4 speeds!
1. Low 3. High
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all from one propeller permanently installed on your motor!

Now you can troll as slowly as you wish, without plates or special devices. Merely set the pitch of a Paul Bunyan Vari-Pitch propeller at low and you barely move. To speed up, change the pitch, just as you would shift gears in a car. For extra fast speed, use pitch 2, 3 or 4, depending on load. Adjustment is simple, self-locking, fool proof, can't come loose.

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Above Models \$10.00. On these adjusting ring is in front of propeller as illustrated.

TYPE "A" For Champion singles 1938 serial number 3000 and over, to and including 1942. Also Firestone 1946 10-A-4 and 10-A-1A.

TYPE "B" Champion singles up to 1938 serial number 3000. (Note: some of the older motors have replacement lower units which take type "A" propellers.)

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BUNYAN**

VARI-PITCH PROPELLER

almost as barren as the moon. It has no plant life except a low order of mosses and lichens found on sheltered rock faces. There is no food for animal life except in the extreme northern Palmer Peninsula, which is very different from all other parts of the south polar land. But antarctic shore life is abundant. Single rookeries contain millions of penguins. A question for future biologist-explorers is the origin of life here. Doctor Paul Siple, chief scientific adviser of this expedition, believes most forms may be remnants from 20,000,000 years ago, when much of Antarctica apparently had a temperate climate.

(Concluded next month)

The Mechanics of Batting

(Continued from page 95)

and smash it right back at him. There's more safe hitting space through the center of the diamond, Hornsby points out, than any place else.

When you've hit and finished your follow-through, drop the bat quickly and break fast, on your toes, for first base. Don't hesitate to watch where the ball goes and run all the way at top speed. Coaches claim that 8 out of 10 runners are thrown out at first base by a single step. A moment's "loafing" at the plate or on the base line costs that step.

Speed also has psychological value in making the opposition's infielders "edgy" and inclined to hurry their throws. Ty Cobb used to streak for first so fast that he not only got on base a good share of the time, but also forced errors that brought extra bases.

If the ball is hit through the infield or to the outfield you'll know it well before getting to first. When you do, swing a step or two to the right of the baseline about 10 to 20 feet short of first, gauging the remaining distance so you'll hit the inside edge of the bag with your left foot.

Coming into the base at this slight angle, pivoting on the inside foot, you're already turning and set to continue for second without wasting steps if a fielder bobbles the ball. Costly seconds are lost if you charge into the bag on a straightahead run, striking it on the outside foot, if a chance comes to go on to second. Sheer momentum will send you veering yards wide of the 90-foot interval between bases.

An important phase of hitting that's often slighted is bunting. There are two kinds: a sacrifice, intended primarily to advance runners already on base, and a "drag" or "push" bunt to get the batsman on first.

(Continued to page 272)

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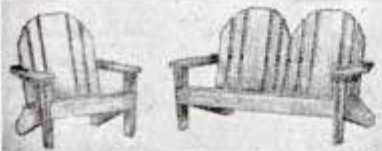
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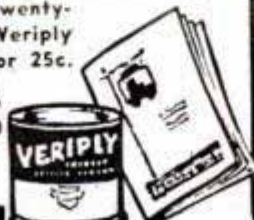
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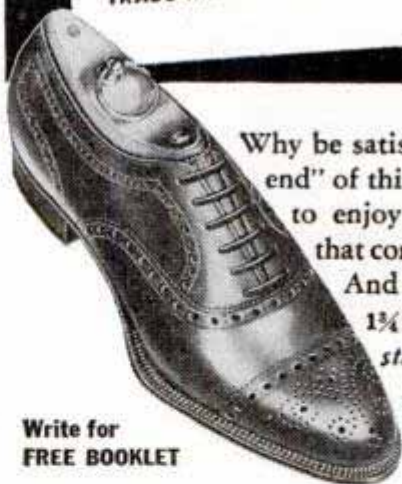
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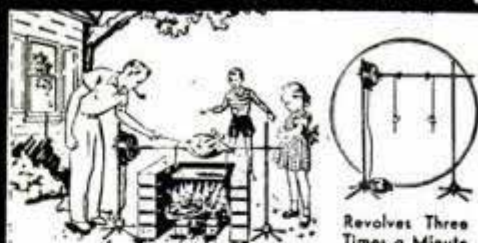
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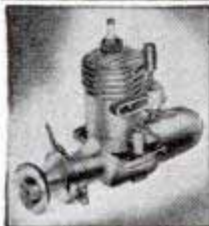
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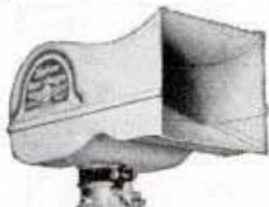


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On a drag bunt the hands are closer together and the bat meets the ball with a shoving motion, generally pushing it between the pitcher and first sacker. Hitting it there normally forces the latter to field the ball and throw to the pitcher covering first base, which requires perfect timing for success and gives the runner a good chance to get on safely. Unlike straight-away hitting, the weight for offensive bunts is on the front foot.

Good bunting is an ace in the hole against weak fielding pitchers or infielders and in tight games where one run will win. Two present-day stars who can expertly plague their foes with well-placed bunts are "Red" Schoendienst of the Cardinals and Johnny Pesky of the Red Sox.

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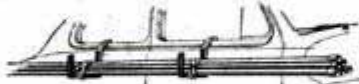
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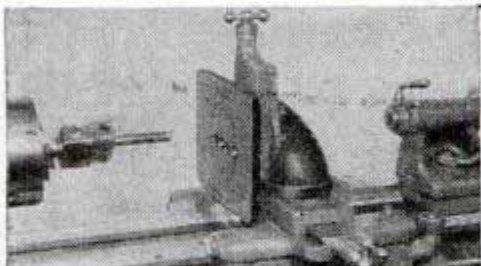
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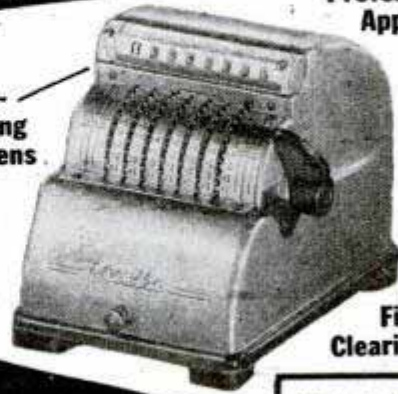


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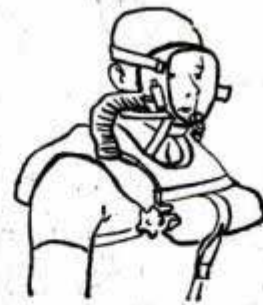
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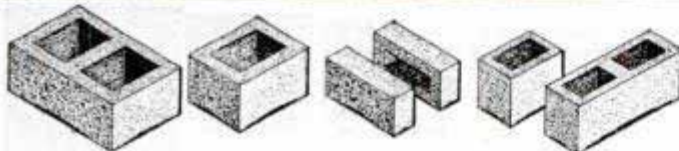
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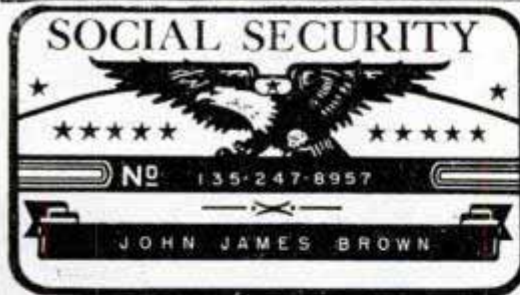
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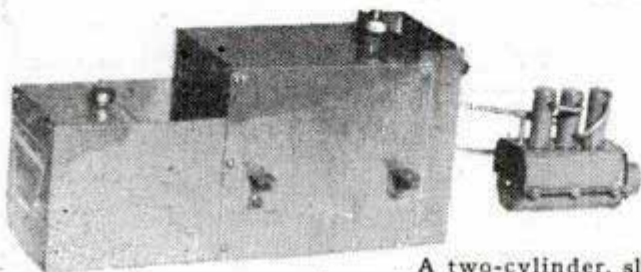
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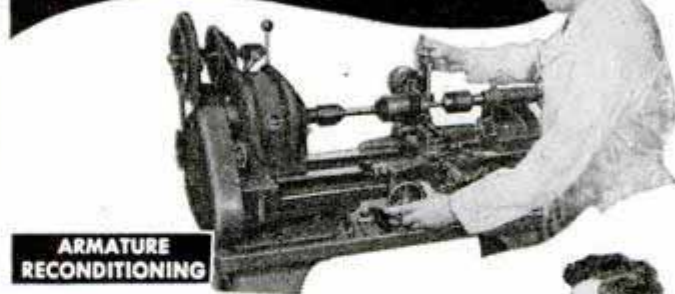
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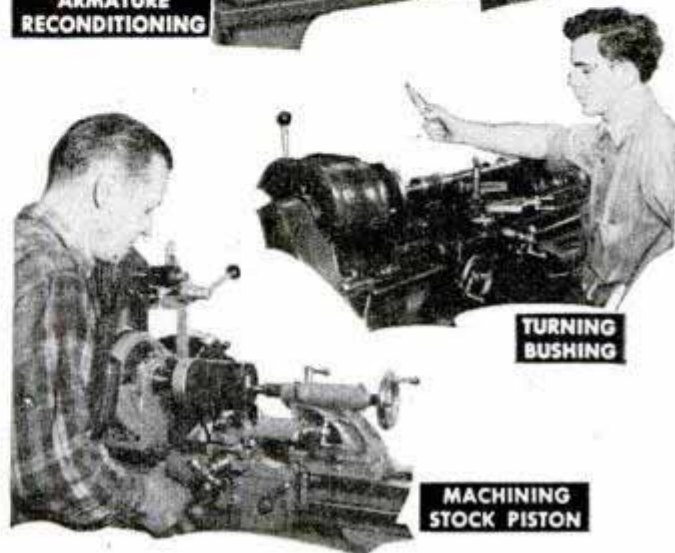
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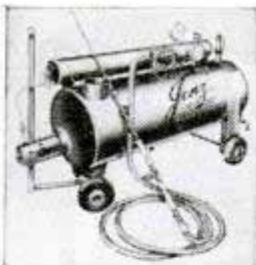
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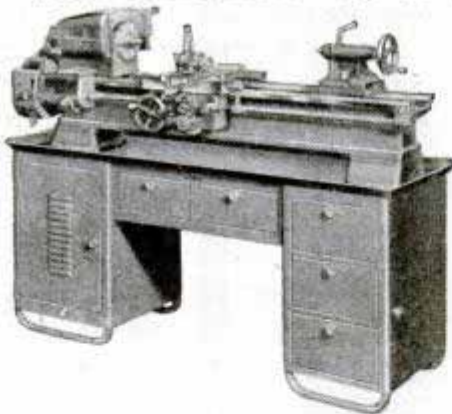
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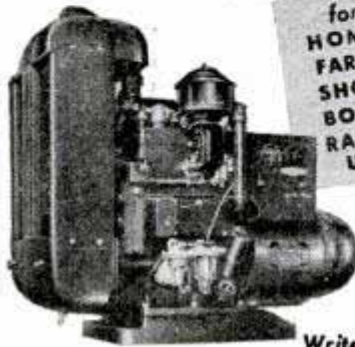
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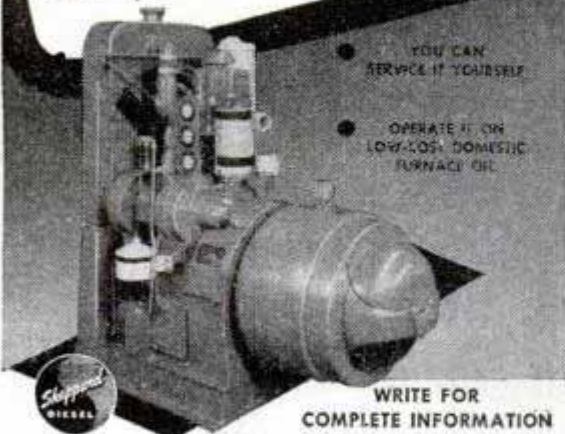
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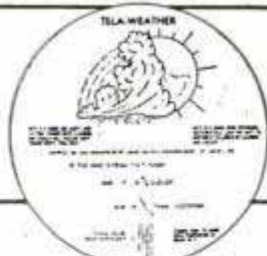
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WORTH \$50

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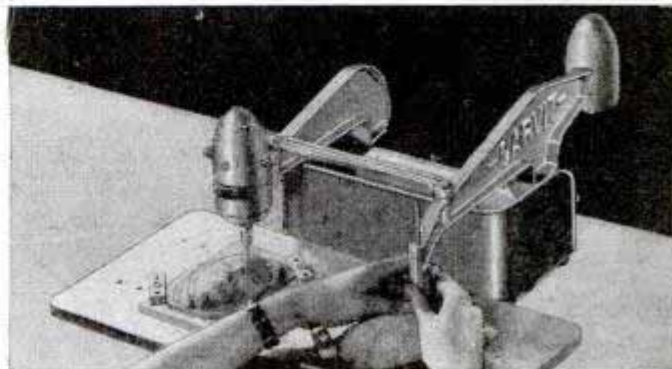
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\$8.25

Here's the slide rule you've been wanting—an all-plastic precision instrument! This rule operates smoothly and accurately under any atmospheric conditions. Precision graduations are not affected by weather or temperature changes. Backed by the famous name Bruning, this new rule has numerals and graduations of the CI scale in RED to provide easier reading. A, B, CI, C, D, K, S, L and T scales provide widest possible range of service. Beveled edges of rule are graduated in inches and centimeters. Glass indicator is enclosed in a stainless steel frame that holds it firmly in place — tension of slide easily adjusted by four screws on back of rule. Instruction manual furnished with each rule at no extra cost.

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In One Simple
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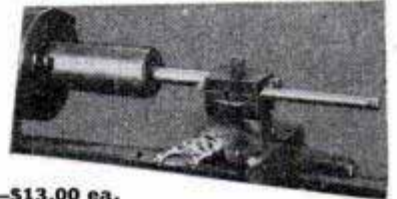
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Kit includes everything needed to build 8" racer and jet unit. Additional fuel at any drug store. Speed guaranteed or money back. Send cash, money order, or C.O.D. to

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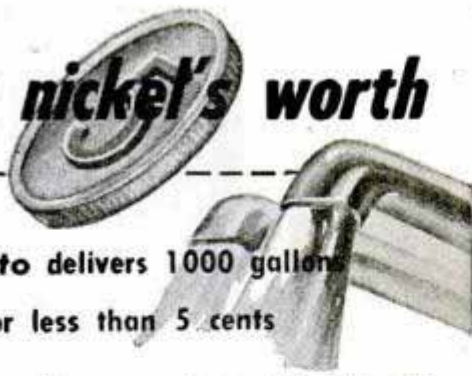
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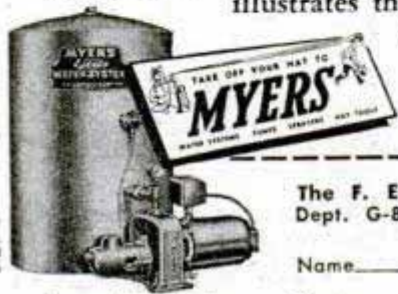
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Get a MOW-MASTER... the Rotary Mower built to do a hard job the easy way. Plenty of power from famous air-cooled, 2 H. P. gasoline motor with muffler. Easily adjustable rotary blade.

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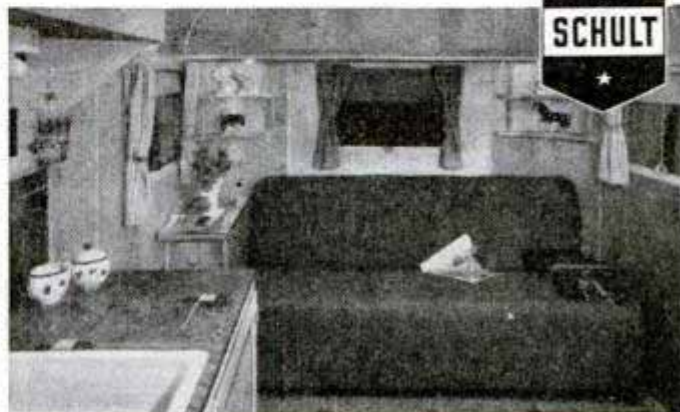
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21-foot marvel of compact completeness. (Living room illustrated.) Amazing in drawer, locker and other storage space. For those who want every facility for comfort, in a lighter, more economical coach.

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SCHULT Trailer Coaches

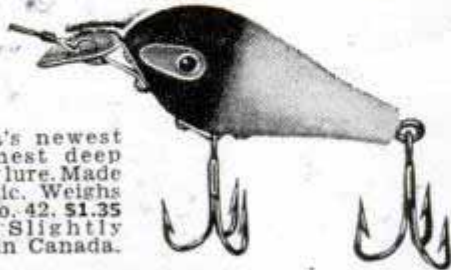
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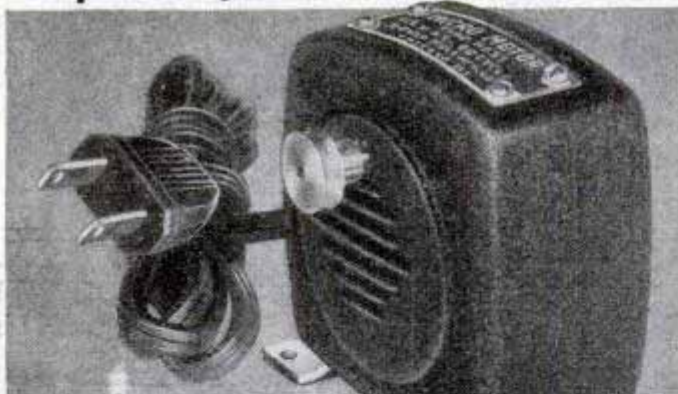
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GUARANTEED UNCONDITIONALLY FOR ONE YEAR!
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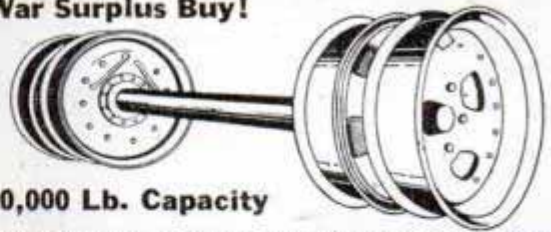
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Yes! Send me at once _____ motors at \$5.95 each.
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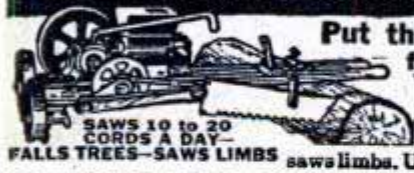


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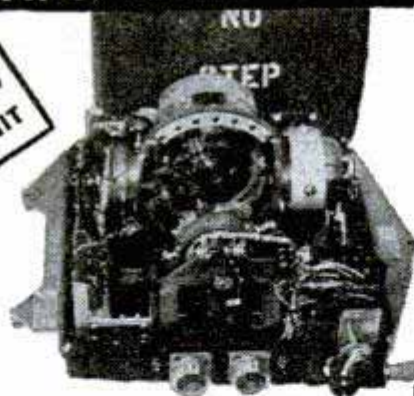
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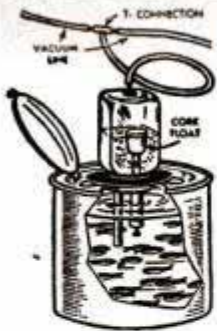
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"Humph," I snort.

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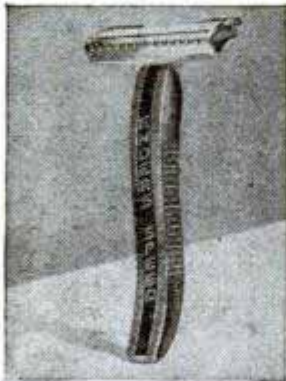
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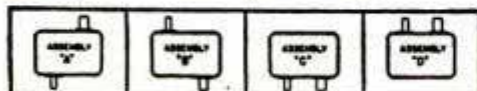
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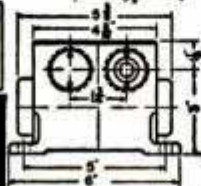
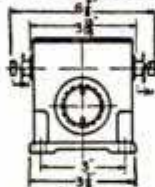
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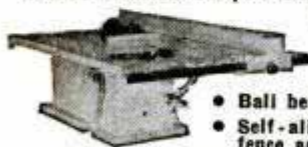
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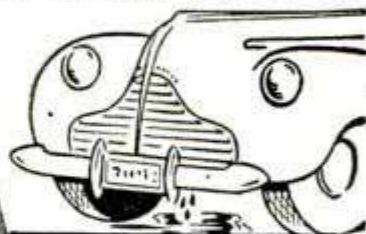
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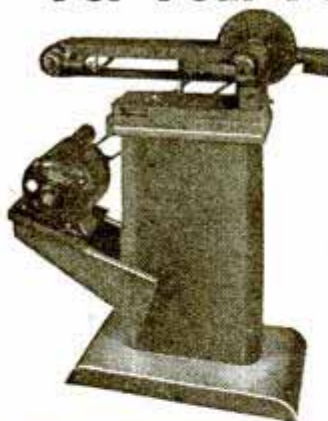
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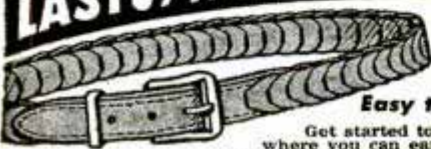


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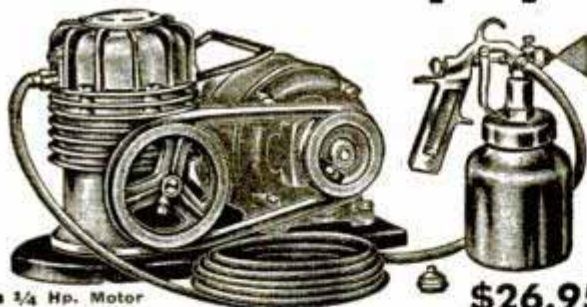
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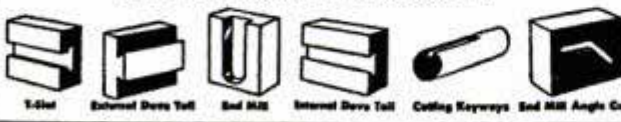
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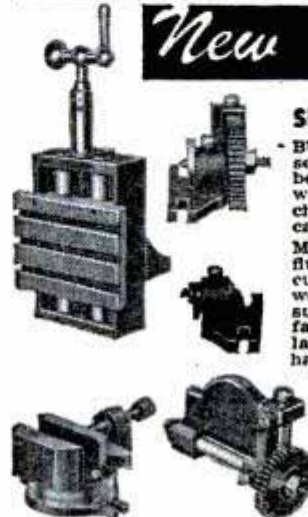
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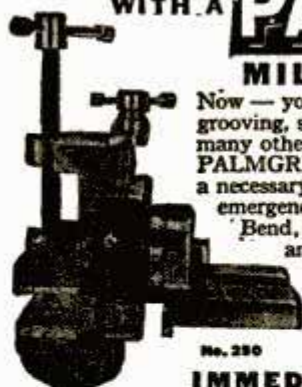
Will consider the purchase of a controlling interest in the manufacture and sale of a **PRACTICAL PRODUCT** which can be made **IN OUR OWN PLANT, OR IN ANOTHER PLANT UNDER OUR SUPERVISION**, and which can be sold through our own sales organization. We will exchange financial and credit information with principals only. Please state briefly all the essential facts about your product . . . its present status . . . and enclose a photo or drawing. All information confidential! Reply in writing only.

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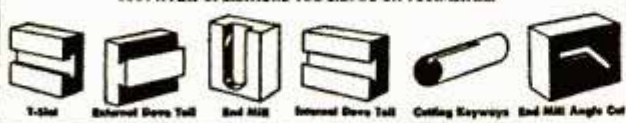
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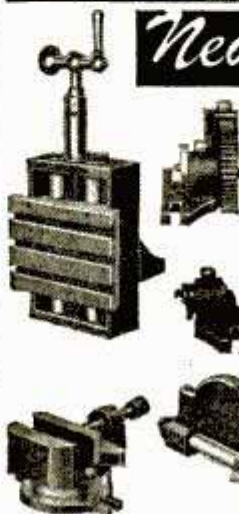
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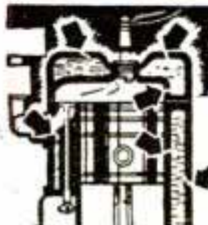
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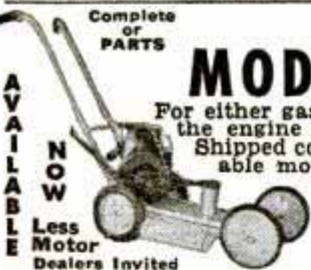
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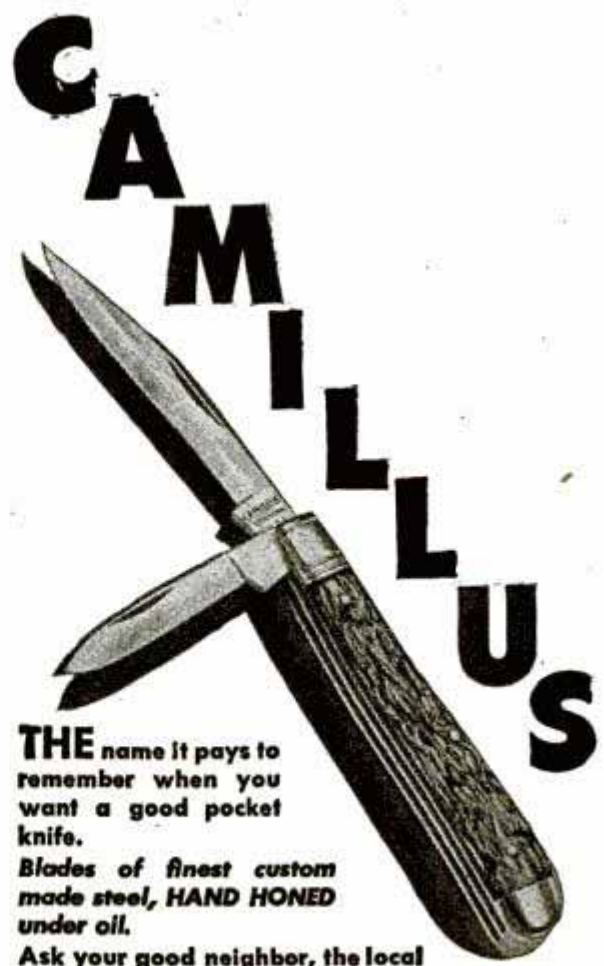


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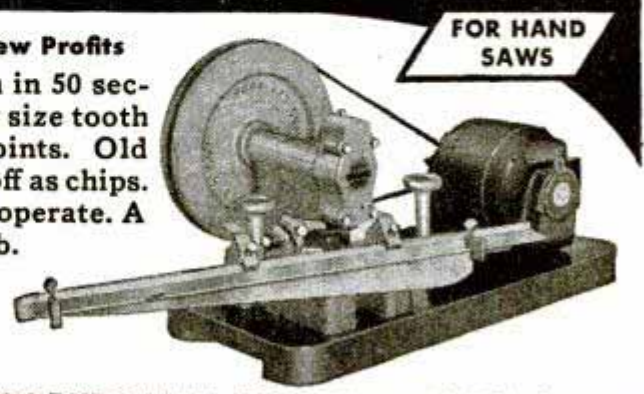
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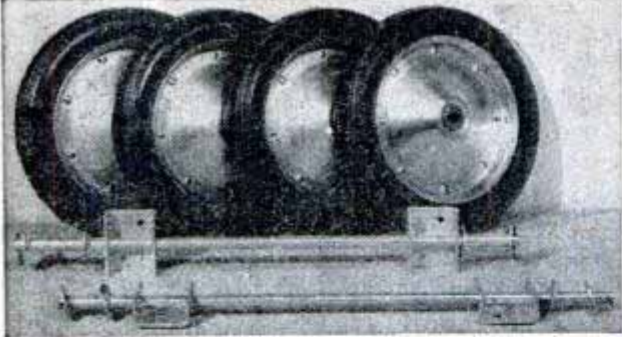
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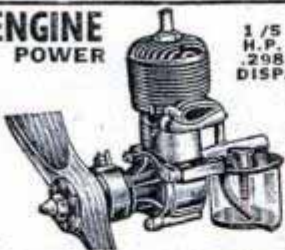
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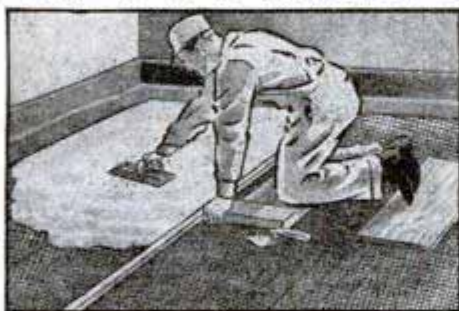
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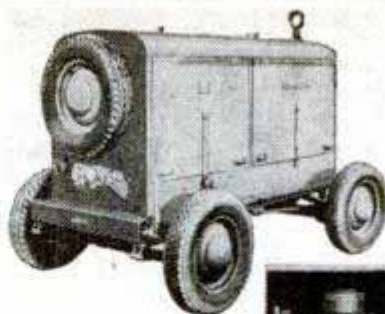
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POWER PLANT
Left-Side Interior View

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Oblique Drive-End View

POWER GENERATOR: (G-E Type GT-1508-b1)

Rotation—CCW (facing commutator end)

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Poles:

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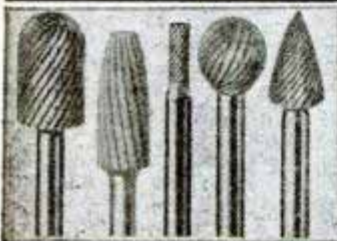


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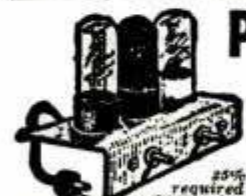
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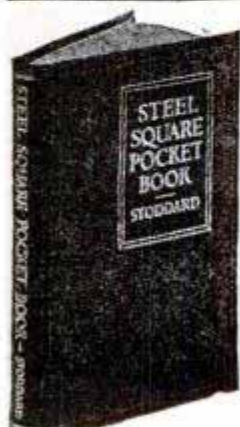
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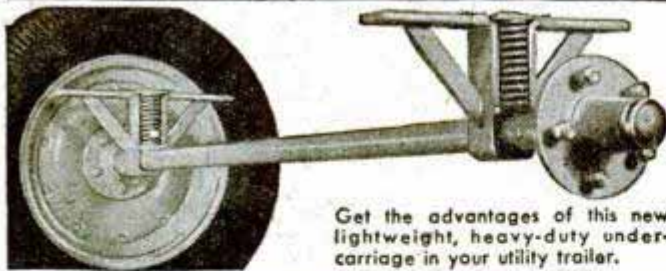


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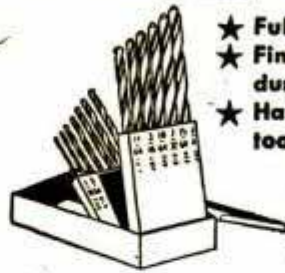
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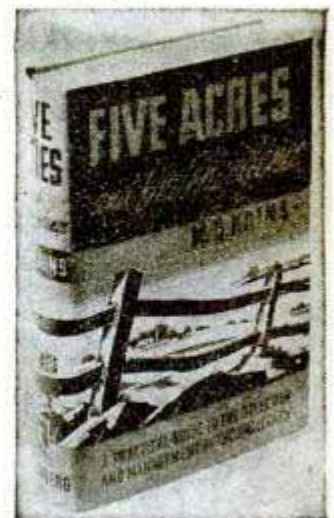
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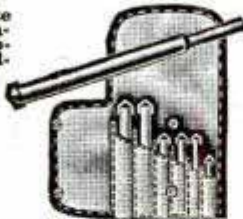
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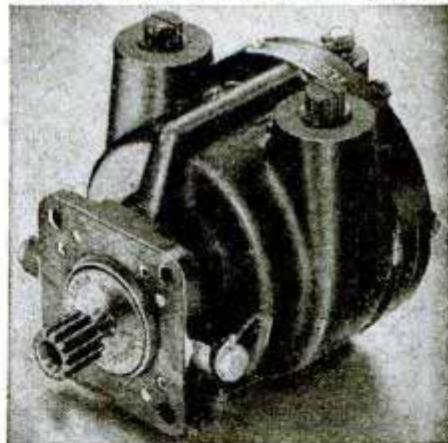
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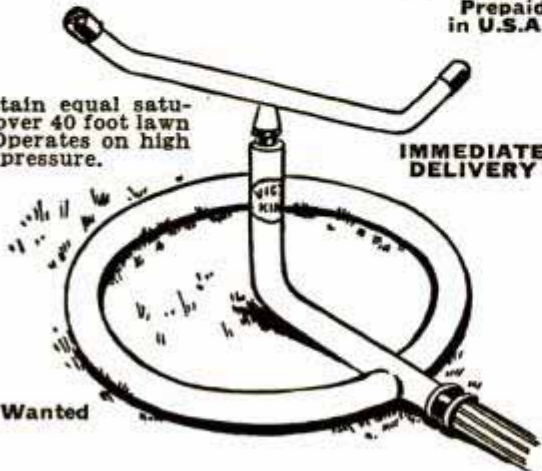
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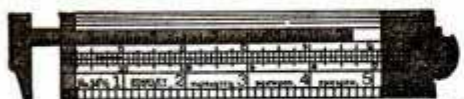
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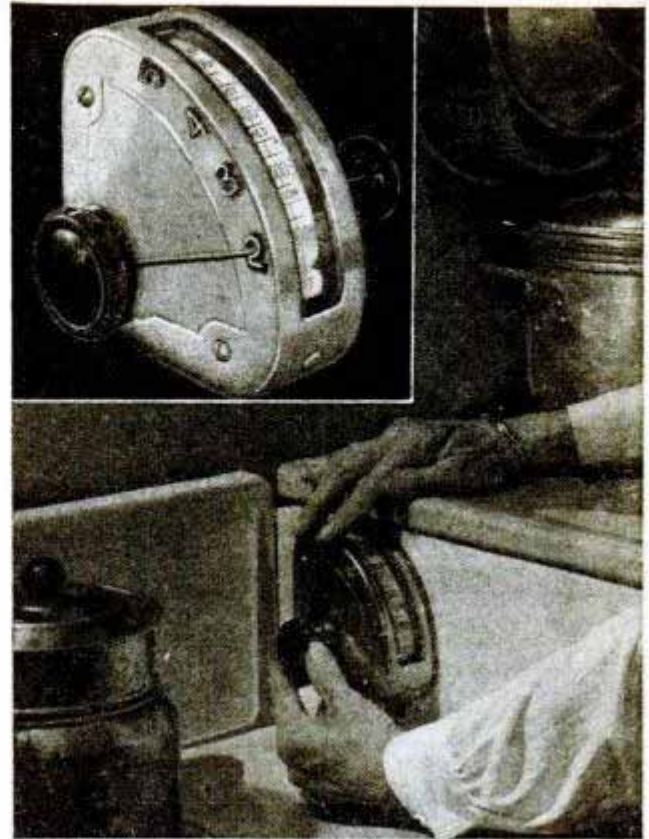
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Small clinkers are easily removed from stoker-fired furnaces by a scoop which swivels on a friction joint. It gets into hard-to-reach places to pick up soft ash and small, broken clinkers. Swivel action is produced by pulling or pushing the handle which is attached to a curved shaft.

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So sweet is a newly discovered sugar substitute that the tiniest pinch of the substance on the tongue can still be tasted a half hour later. Unnamed as yet, the ultra-sweet chemical compound is derived from benzene and is 4000 times as sweet as cane sugar. Saccharin, a common sugar substitute, is only 200 to 700 times as sweet as sugar. The new compound, sweetest substance known, was developed by Professor Pieter Eduard Verkade of Holland.

Dirt Road Driving Proves Costly

Driving on dirt roads costs almost twice as much as driving on paved roads, according to figures compiled in a 330,000-mile test. On dirt roads, cars use more gasoline and nearly twice as much oil. Tire wear is two thirds greater and maintenance cost is doubled. Prof. R. A. Moyer of Iowa State College reported that on paved highways gas, oil, tires, maintenance and depreciation cost a little over two cents a mile compared with four cents a mile on dirt roads.

HAND MICROPHONE



Top quality hand microphone with control button in handle. Highly sensitive. Has rubber covered cord and tel. plug. Fine for use on home recorders, public address systems, etc. Brand new—perfect. Shp. wgt. 2 lbs. Stock No. 170. Each **\$1.95**

MESS KITS

Regulation two-piece Army Mess Kits with folding handle. Used but perfect. Weight 2 lbs. No. A116—Ea. **69c**



CANTEENS

Reg. U. S. Issue canteens. Plastic screw top chained to body. Slightly used but perfect. Wgt. 1 lb. 117—Metal **69c**
118—Plastic—Ea. **69c**



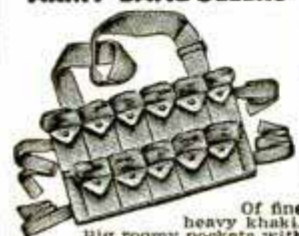
CANTEEN CUPS

All metal. Folding handle. Wgt. 1 lb. No. A120—Each **25c**

CANTEEN COVERS

Heavy canvas. Button fastener. New No. 530—Each **69c**
Used No. 119—Each **35c**

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Of fine heavy khaki. Big roomy pockets with snap button fasteners. Fine for hunters, campers, boy scouts, etc., also for shop work in carrying small parts, etc. Material alone is worth this price. Shp. wt. 1 lb. 11 Pocket **49c**
120 Each **29c**

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Fine forged steel. Ground but not polished. May be made into throwing or hunting knife or spear. Blade 6 3/4 x 1/2 inches, 11 3/4 inches overall. Will take and hold a fine edge. Shp. wgt. 1 lb. No. 664-R—Each **49c**

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No. A301—25 Records. Hillbilly, Race and Blues. Wgt. 14 lbs. Set... **\$4.88**

No. 302—25 Records. All Hillbilly numbers. Wgt. 14 lbs. Set... **\$4.88**

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For hunters, scouts, fishermen. Waterproof and transparent. Use it for liquids. Use it for matches, files, bait, etc. Has screw cap top for liquids, plus full open top. Size 5 1/4 x 4 1/8 x 1 1/8 ins. Has hundreds of other uses. Wgt. 1 lb. No. A347. Each **29c**



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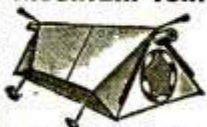
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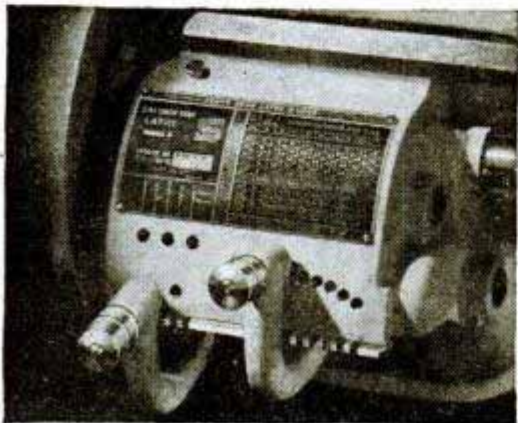
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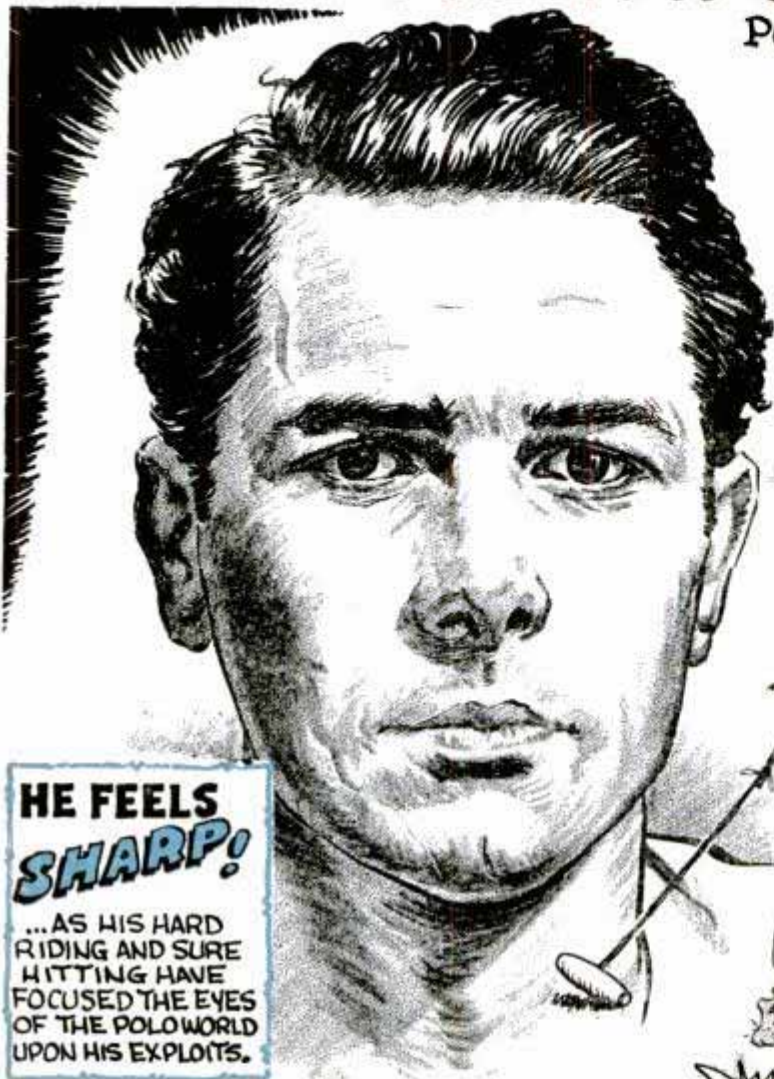
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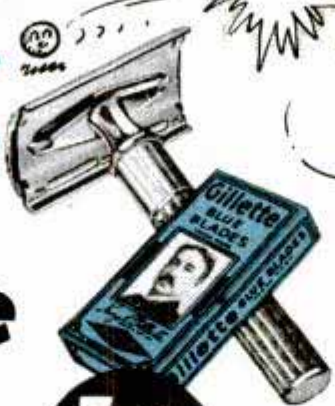
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