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POPULAR MECHANICS

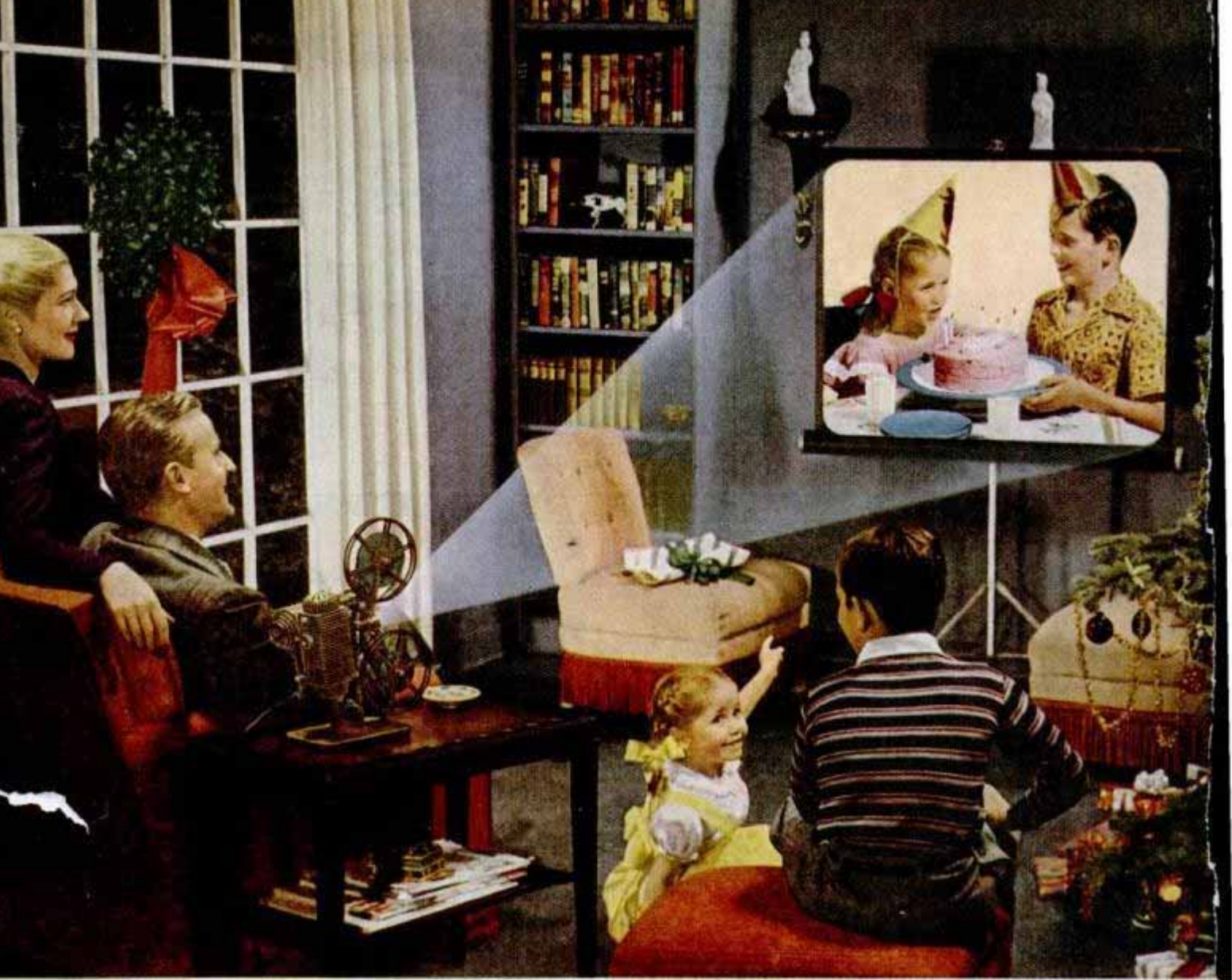
MAGAZINE

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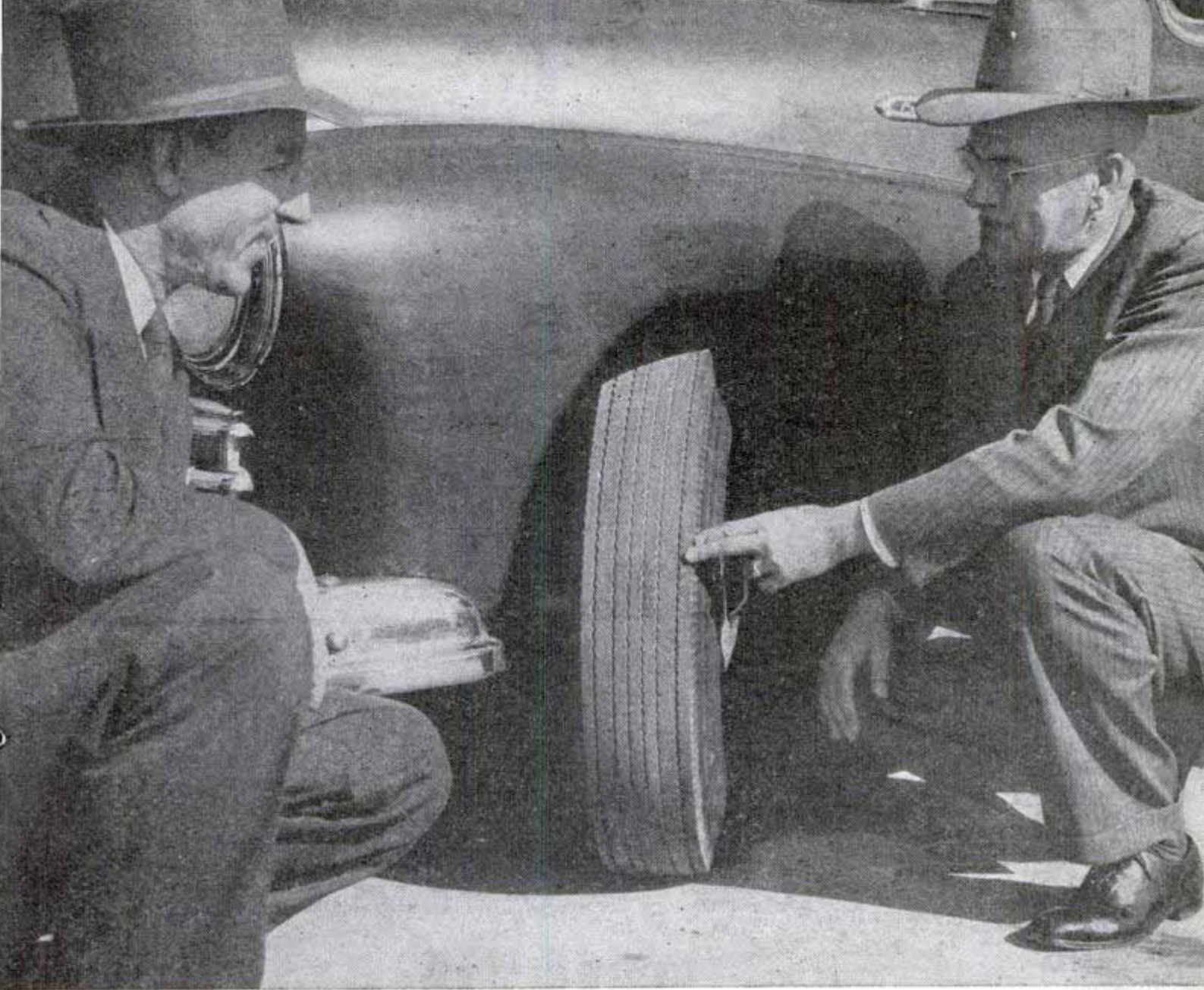
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Typical example: the B. F. Goodrich tire that outwears prewar tires

B. F. GOODRICH tires outwear prewar tires. Here's a letter from M. C. Dameron, Deputy U. S. Marshal, Pueblo, Colorado—typical of hundreds we have received from B. F. Goodrich owners. The picture, with Mr. Dameron pointing to the tire, was taken at the time this letter was written.

"On June 4, 1946, I put a complete set of B. F. Goodrich tires on my 1946 sedan in place of the ones which came with the car as original equipment. The speedometer at that time read 902 miles. I drive over all kinds of roads at all kinds of speeds. There are times

when it is necessary for me to drive at very high speeds.

"All four tires are still in service on this car and the speedometer now reads 43,956 miles. This means they have gone 43,054 miles and the original tread is still good on two of them.

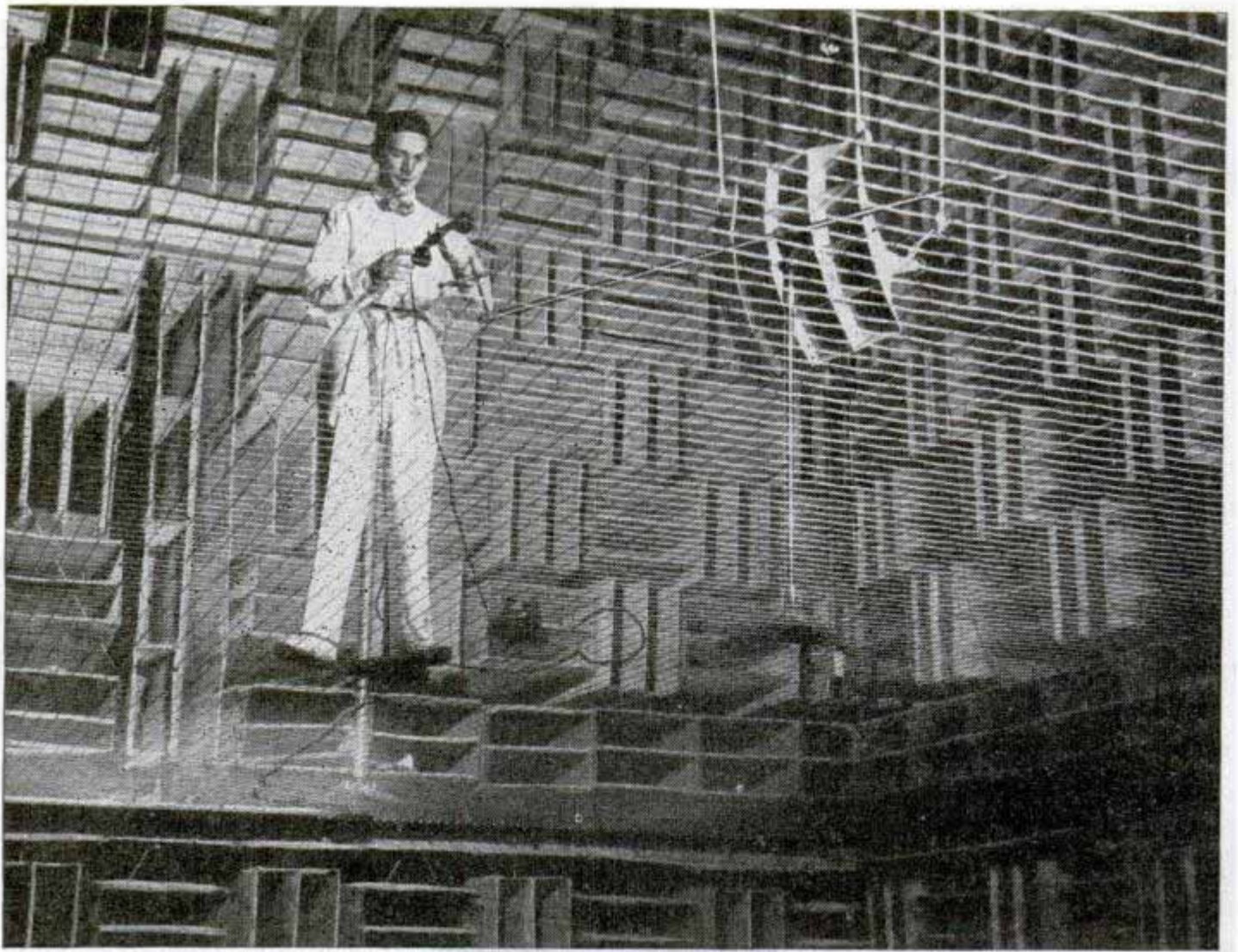
"This mileage is considerably more than I have ever experienced with any tire, even before the war. My work calls for dependable tires, and I must say that these new B. F. Goodrich tires have certainly filled the bill."

Some of the reasons why B. F. Goodrich tires give more mileage

under severe conditions are:
1. Broader, flatter tread to distribute the wear over a wider area.
2. Tougher tire body made with stronger cords resists bruises, protects against blowouts.

Even at today's low prices your B. F. Goodrich dealer will give you a good allowance on your old tires if they are still good enough to be used or recapped. *The B. F. Goodrich Co., Akron, Ohio.*

B.F. Goodrich
FIRST IN RUBBER



A telephone listens to a loud speaker in the new "free field" acoustic test room at Bell Telephone Laboratories. The sound-transparent "floor" is built of steel cables.

Test-tube for Sound

This giant "test-tube" is actually an echoless sound room at Bell Telephone Laboratories. Here engineers seek new facts about sound which will help them make telephone service still better and more dependable.

Bell scientists know a great deal about what happens to sound in electrical systems. This new room will give them a powerful tool to find out more about what happens to sound in the air.

In an ordinary living room, most of the sound addressed to you comes by way of reflections. At 10 feet less than 10% reaches you directly.

Sound that *bounces* at you from walls, ceilings, and your body is all right for hearing—but it poses questions for scientists who would study it uncontaminated by reflections.

The Bell Laboratories "test-tube" gives telephone people the chance to produce pure sound and analyze it reliably with respect to intensity, pitch, and direction. The entire room is lined with glass wool, contained in wire-mesh cases, wedge-shaped to give maximum absorbing area. Sound bounces along the sloping surfaces, sifts into the soft glass wool, and is gradually stifled.

This is one more example of Bell Laboratories' constant work to learn more about everything which can improve telephone service.

BELL TELEPHONE LABORATORIES

Exploring and inventing, devising and perfecting for continued improvements and economies in telephone service.



Popular Mechanics Magazine

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

Next Month

HOW could a ship which does not have propellers, sidewheel, sails, oars or jet propulsion move under its own power? The answer is: on stilts! Huge hydraulic sand dredges used in the Columbia River actually walk on 90-foot timbers extending down through the stern. How these dredges operate in the never-ending battle against sand in the Columbia is told in a January feature.

ASPEN, Colo., skiing paradise, has a chair-lift which holds two records. It's said to be the longest (14,000 feet) in the world and to have the greatest vertical rise (2200 feet in 8400). The chairs move 550 feet a minute. Visit this resort on our January pages.

ONE HOBBY which costs little to start and pays off big dividends both in enjoyment and cash is bee-keeping. A January feature tells why "There's Money in Honey"—also when not to handle a bee.

JEEPERS is what we've named an electrically driven jeep described in next month's Craftsman section. This is an ideal father-son project: father builds it and son rides in it. Jeepers looks and runs like the real thing. For craftsmen who make weaving a hobby, or a spare-time business, there's a story giving detailed construction of a cam-operated loom of the two-harness type. A newly designed spline roller makes it unnecessary to tie individual knots in the warp threads. Another article tells how to make realistic sound effects for home recordings. Shop feature for the month concerns construction of a drill press made mostly from pipe fittings.

RADIO beginners can start with a new and highly efficient one-tube progressive set in the Radio and Electronics section next month.

Volume 88 DECEMBER 1947 Number 6

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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 Pettridge, 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, Philippines, 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 30 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.

Gone with the wind currents!

THE U. S. Air Force is making time these days against its gusty old antagonist, the head-wind. With the newly developed Minimal Flight Path, Air Force pilots now harness the wind currents going their way — speed up their time of arrival by as much as 20% in flights over 500 miles long.

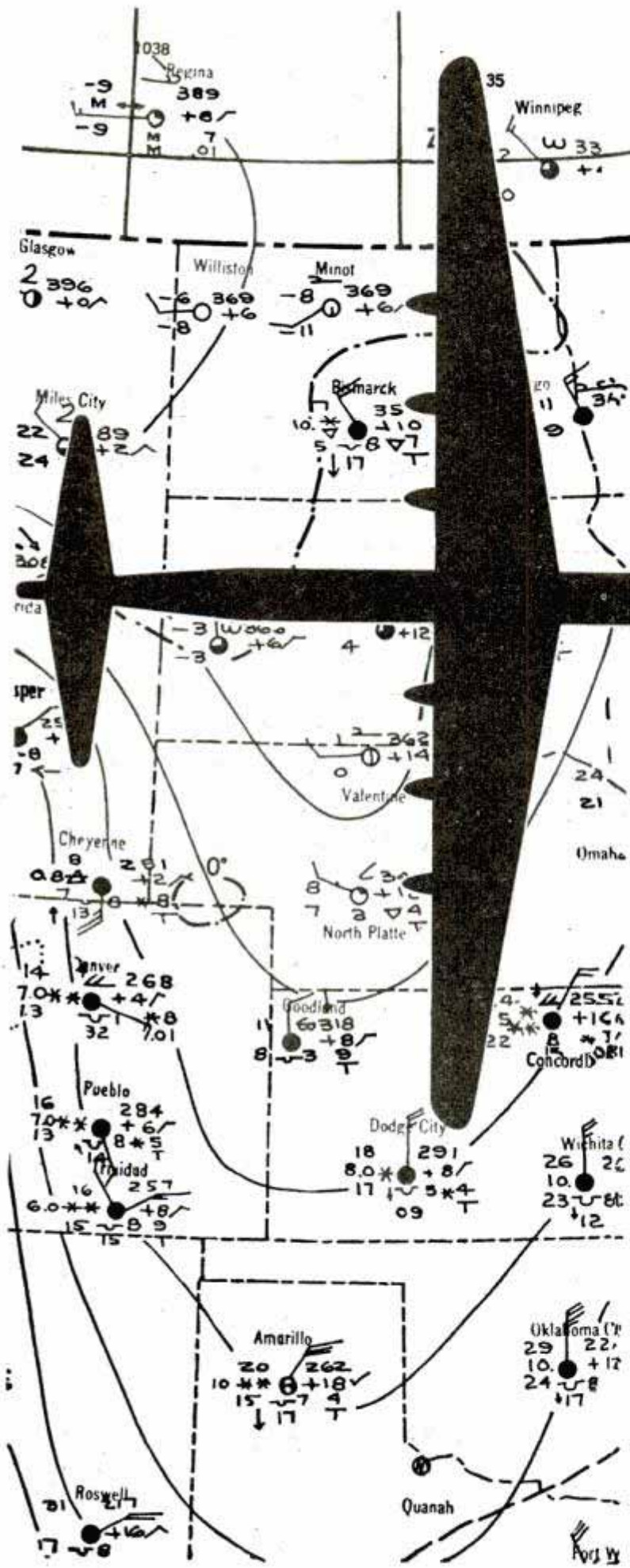
Use of the new system, which can be computed in 30 minutes or less by experienced weather men, frequently means leaving the Great Circle route — long recognized as the shortest distance between points on the earth's surface — but such deviations bring favorable tail-wind currents into the flight path and compensate for the added distance.

In terms of navigational progress, the Minimal Flight Path means substantial reductions in fuel loads with a corresponding increase in pay-loads. Later on, as seasonal and other fluctuations are determined, air routes the world over may be in for some drastic, time-saving revisions.

Such progress, typical of Air Force leadership in aviation, is made by men who believe in the future of this great new science. If you're interested in joining a pioneering organization, ask at your nearest U. S. Army and Air Force Recruiting Station for details on Air Force career opportunities today!

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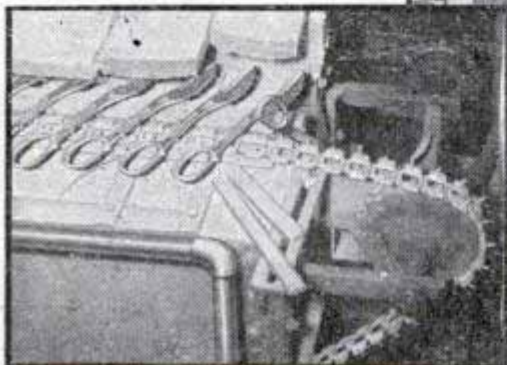
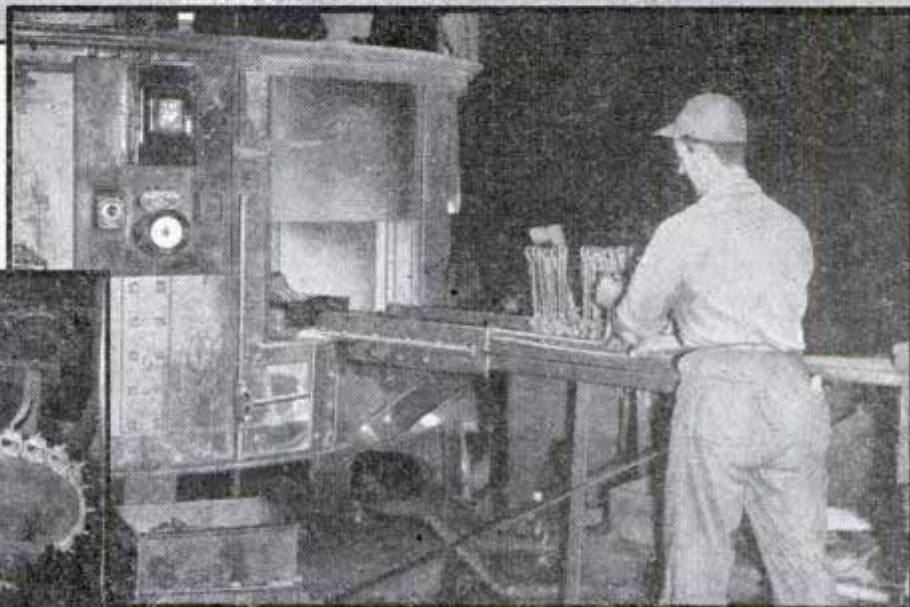
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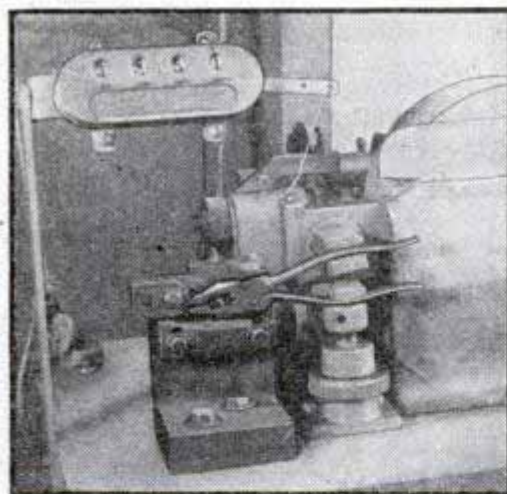
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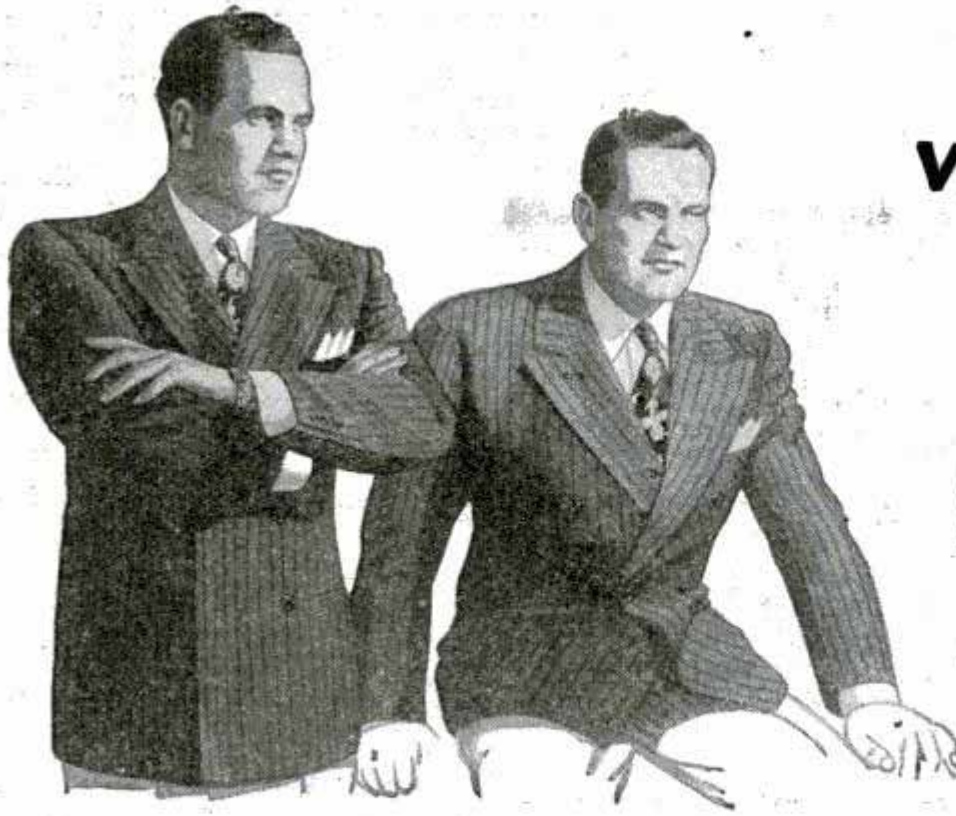
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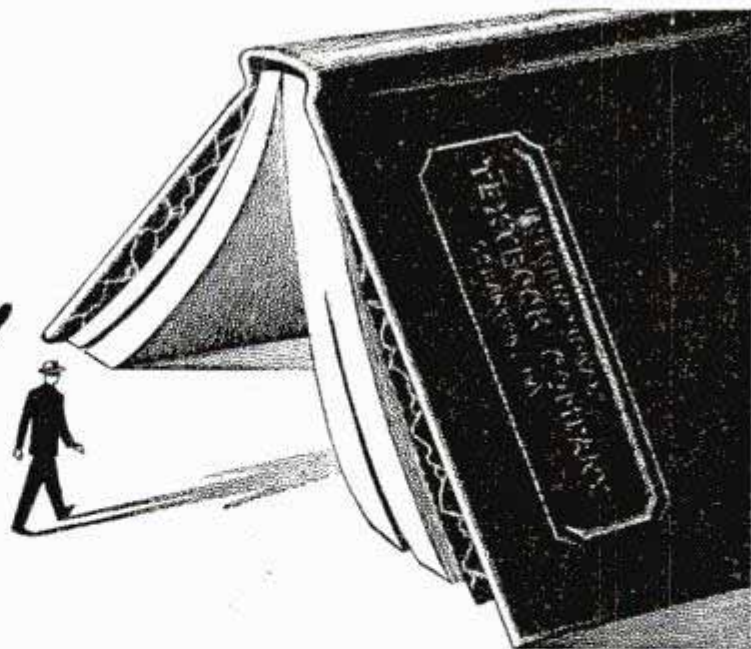


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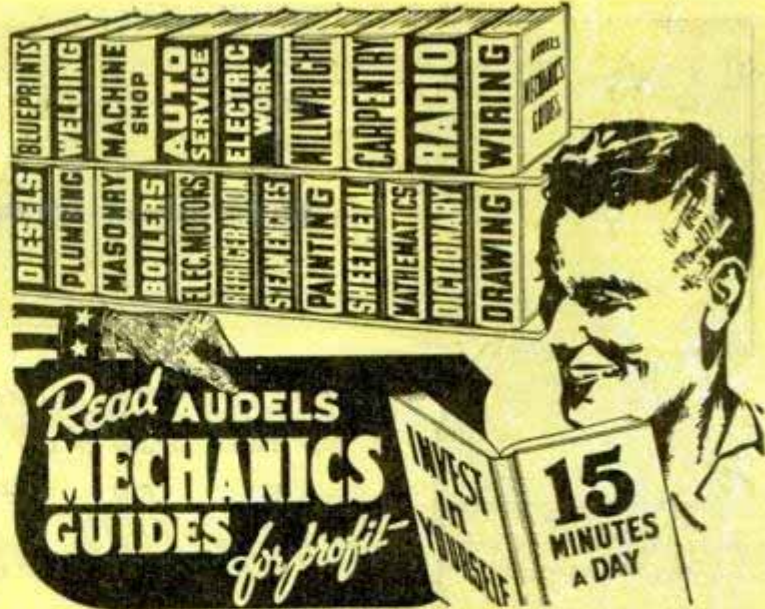
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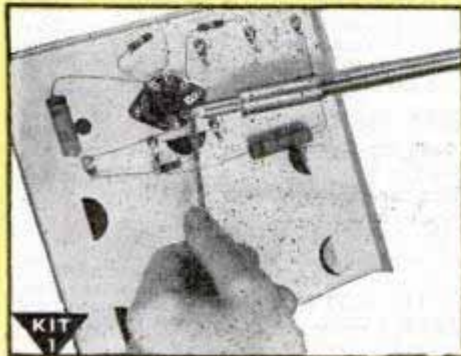
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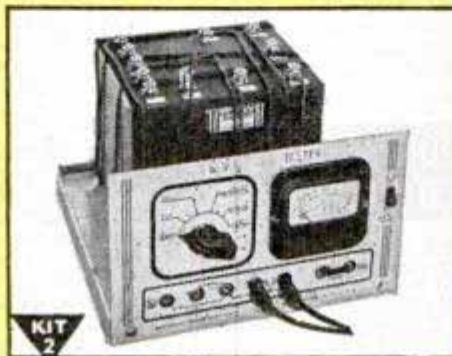
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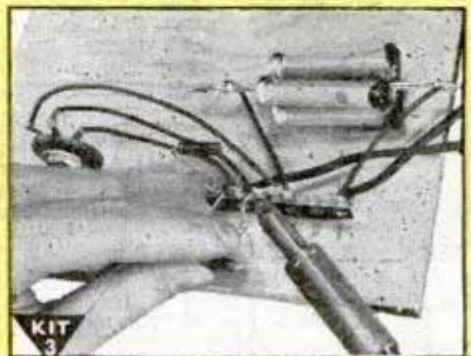
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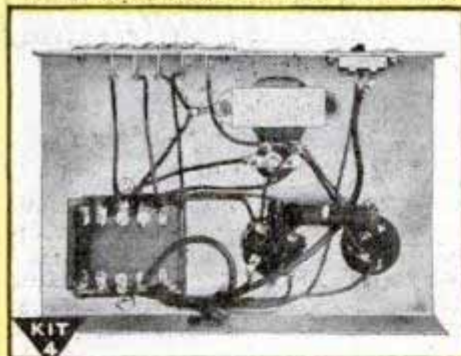
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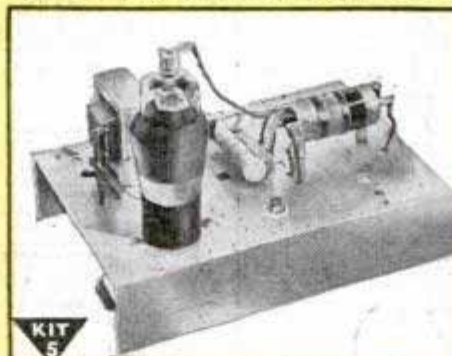
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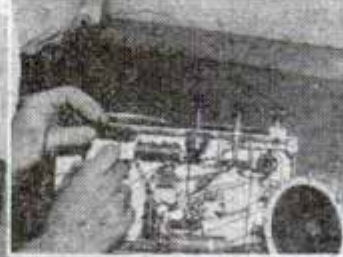
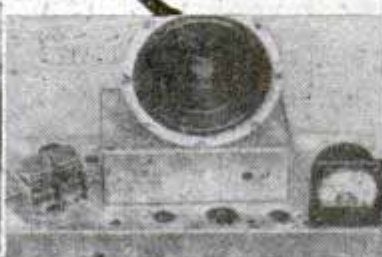
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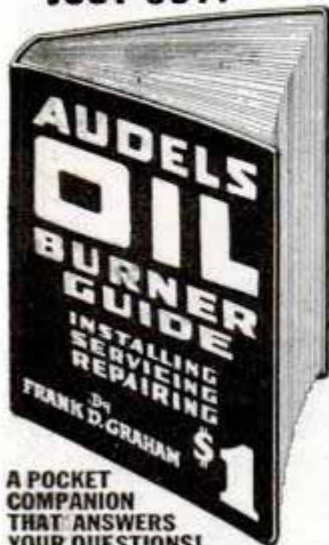
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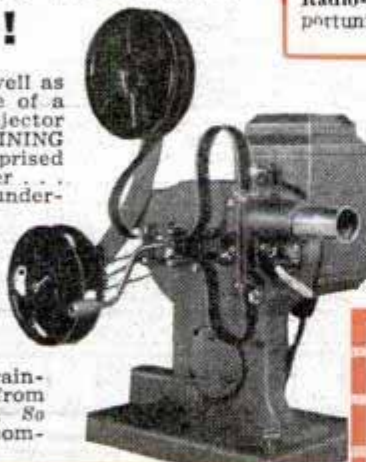
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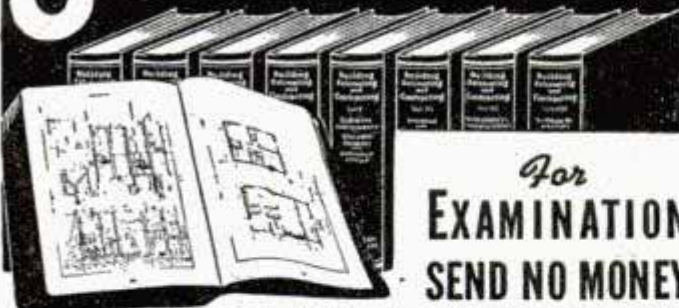
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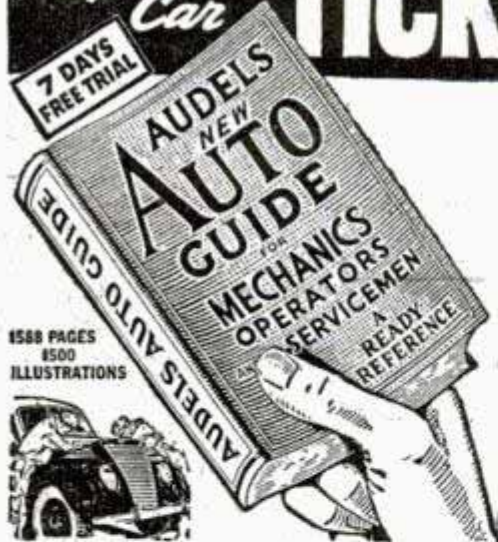
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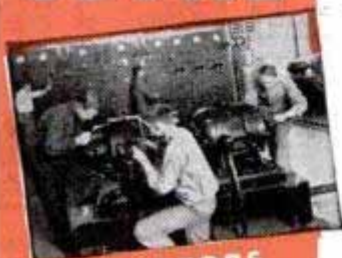
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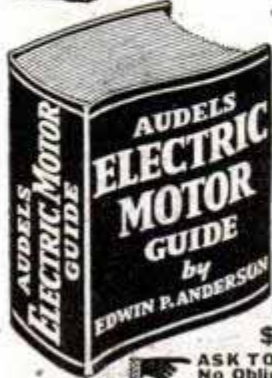
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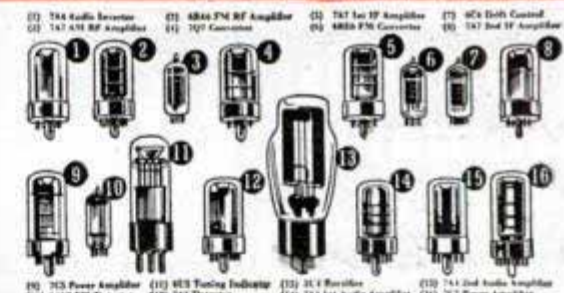
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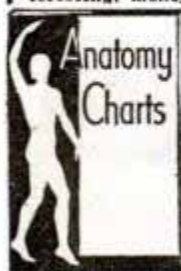
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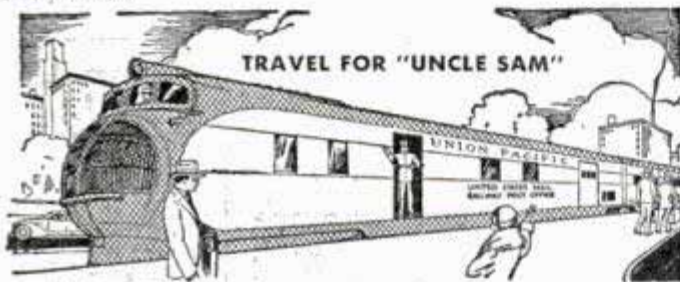
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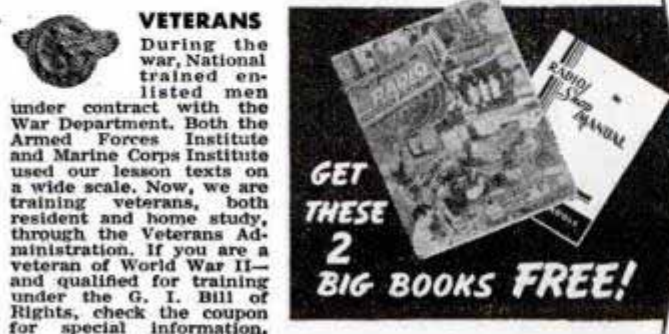
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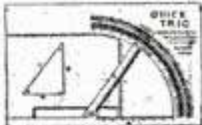
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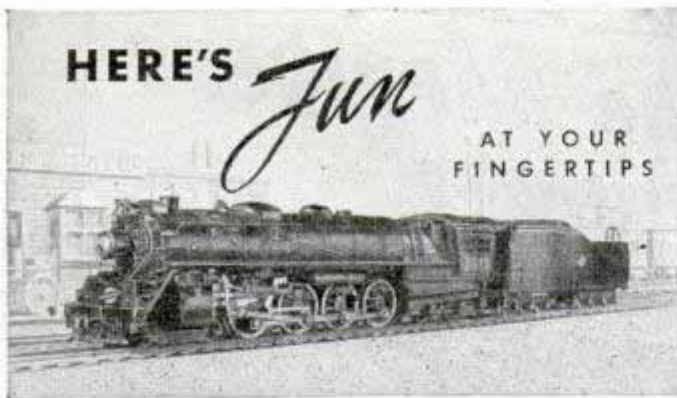
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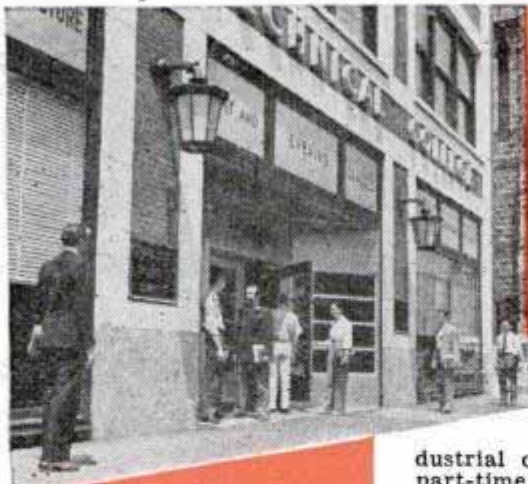
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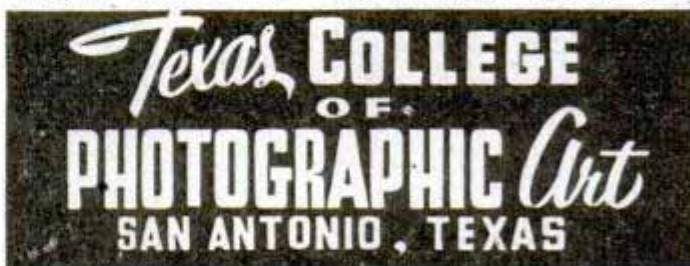
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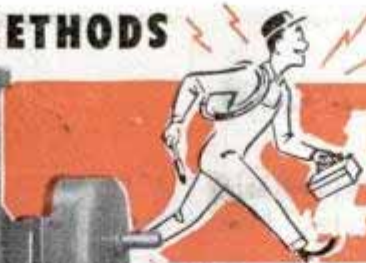
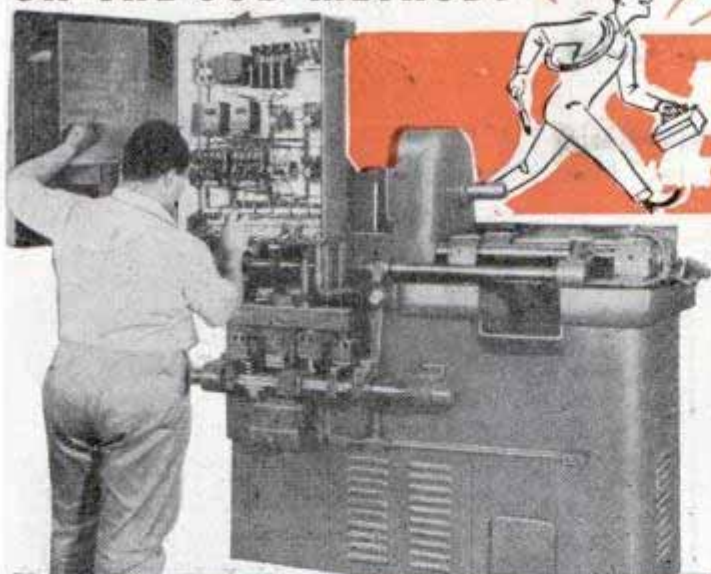
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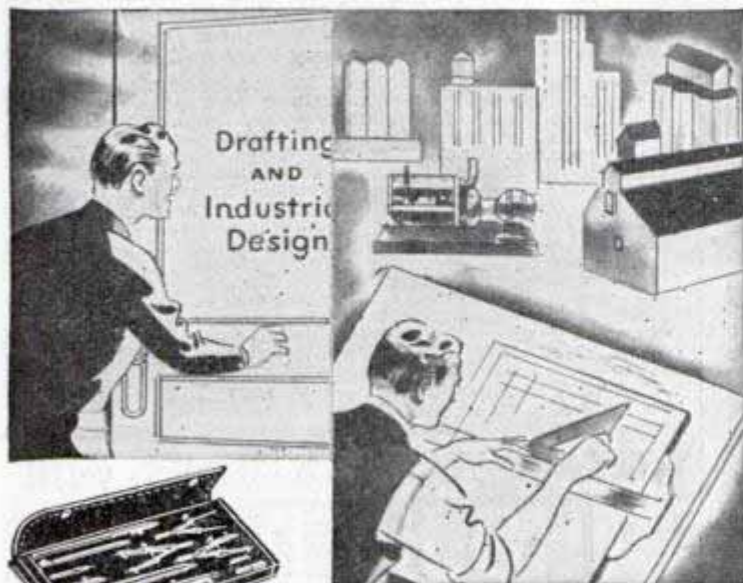
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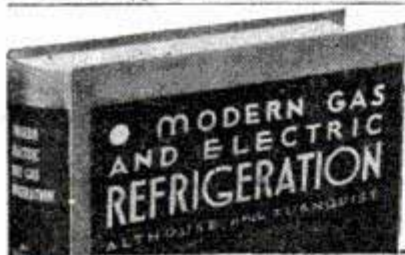


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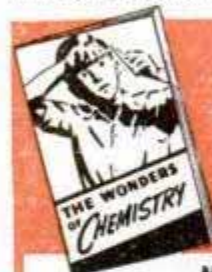
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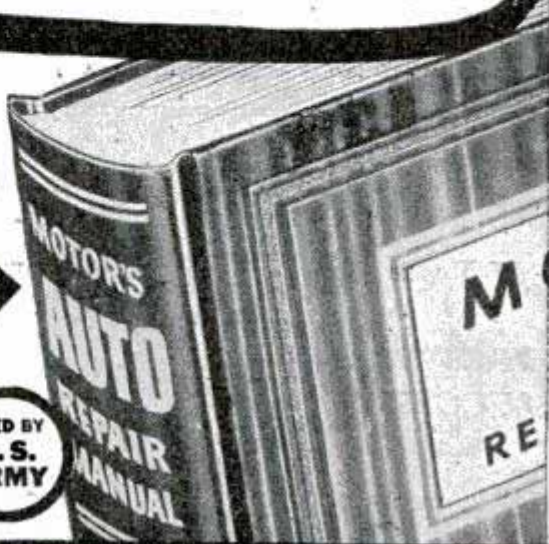
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CHROME Plating on all motorcycle parts. Doll up your bike. Free literature. Master Silverplaters, 2031 Caniff Ave., Detroit, Michigan.

BICYCLE Repairing, complete illustrated manual 65c. Robert Klausner, Shelbyville, Ill.

BICYCLE Supplies, wholesale, retail. List. 10c. Universal, 4713 Virginia, St. Louis, Mo.

MIDGET Racer less motor \$25; Midget car complete \$58; Factory built motor-scooters \$50 up complete; others \$25 up; German Sachs motorcycle \$50; 74 Harley \$25; Henderson motor \$5; others as low as \$3; plenty of brand new two horsepower gasoline engines in original crates; plenty new midget highway racers; plenty brand new motor-scooters; over 5,400 small tires \$1 up. (Mail Order Only). Send 25c for Big War-Bargain Catalogue Number 22, just out, listing the above and hundreds of other bargains in motor-scooters, midget cars, motorcycles, engines, parts, plans, etc. (35c by first class mail). Midget Motors Directory, Athens, Ohio.

T. T. RACING. New, exciting, accurate book of world famous English road racing history. Just printed. \$3.00 postpaid. (See our advertisements under auto.) Clymer, Dent, TT-1, 2125 W. Pico, Los Angeles 6, Calif.

FREE! Illustrated folder custom motorcycle accessories. New seat covers, bright colors, molded cushions, \$6.75. Leather jackets, \$36.95. Chrome muffler-loud-speaker, \$15. Pacific Cycles, Dept. A1, 1208 Pine, Seattle, Washington.

THREE - WHEELED Scooter, 1 HP. \$100.00. Jim Gills, Whitethorn, Bluefield, W. Va.

SCHWINN Bicycles for Christmas. Send dime for list. Wholesale, Retail, Century Cycle, 3447 Lawrence, Chicago 25, Illinois.

BICYCLE Repairing. Begin at once. Manual explains everything. Make money from start. Postpaid, one dollar. Cahill Cycle Shop, Centerville, Maryland.

MOTOR Scooters, bicycle engines. 120 miles gallon. Dime for catalog. Clymer, Dept. A115, 2125 W. Pico, Los Angeles 6, Calif.

JUST Out. Bulletin containing bargains in race cars, motorbikes, motorcycles and motors. Send 25c. Behnke's, 5721 Leland, Chicago 30, Ill.

HARLEY-DAVIDSON Parts, accessories, batteries, and tires, 24 hour service. Authorized factory dealer. Philadelphia Harley-Davidson Company, 657 North Broad Street, Philadelphia 23, Penna.

CUSHMAN Motorscooter \$15. Show bicycle motor \$15. Harley-Davidson motorcycle, \$35! Send 25c for bargain catalog #8 packed with money saving buys in motor-scooters, 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.

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 1682-CS, Toledo, Ohio.

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

CUSHMAN Motorscooter \$20 (includes motor and extra tires). Midget racer \$15! Send 25c for big catalog #938 listing these and scores of other sensational bargains in motors, wheels, motor-scooters, motor-bikes, servicycles, tires, etc. Associated, Box CS-1764, Toledo, Ohio.

AVIATION

JET Propulsion experiments. New design. Drive bicycle. Circular on plans. Rush name. Maupin, Tipp City 4, Ohio.

NEW Airplane tires, tubes and wheels, complete with bearings and spindle. For installation on harvesters, farm implements, low bed tractor trailers, etc. A size for every load. The world's largest stock. Send post card for details. Dept. B, Post Office Box 89, Merced, California.

LIGHT Plane blueprints, manuals. Circular illustrates designs, motors 10c. Craftsman Books, Box 1153, Milwaukee 1, Wisconsin.

PROPELLERS For ice-snow sleds, air boats. Catalog 10c. Banks-Maxwell, R.F.D. 12, Ft. Worth, Texas.

B-29 COMPUTERS, 400 Cycle dynamometers, 60VDC amplidyne and servo amplifiers, turret drives, bomb releases, starter solenoids, collector rings, etc. List. Eresco, 2912 Hewitt, Everett 1, Washington.

FREE Catalog describes world's most complete line of navigation instruments and texts. Includes famous Weems Mark II Plotters, Dalton E6B and Mark VII Computers, protractors, star charts, plotting boards, watches, celestial coordinators, charts, sextants, navigation notebooks, many more. Weems equipment standard with Army-Navy air forces, commercial airlines. Write Dept. 2, Weems System of Navigation, Annapolis, Md.

PROPELLERS—2 And 3 blade, designed for ice-snow sleds, boats. Literature. Standard Aircraft, Box 387, Ft. Worth, Texas.

SKI-TOWS. Portable, auto-powered. 500 ft. long. Pulls you both ways. Up, level or downhill. Set up in 20 minutes. Only \$125. Send card for particulars. Great-Northern Mart, North Adams, Mass.

4' 6" PUSHER Propellers, Three blade pusher propeller. Finest birch laminated construction, brass tipping. 50 to 85 h.p. for boats, sleds, etc. \$75.00. Same type as used on the famous CallAir SnowCar. CallAir, Afton, Wyoming.

GIANT Glider kites. Double. 14x10 ft. Lifts 100 lbs., tows car, etc. Cost government \$108. Yours for \$20. Satisfaction guaranteed. Great Northern Mart, North Adams, Mass.

WOOD Propellers, all types duplicated. Universal Aircraft Co., Box 2256, Fort Worth, Texas.

BATTERIES, GENERATORS

\$150.00 NEW Generators, only \$33.00. See Greer advertisement under "Welding."

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

ELECTRICAL SUPPLIES, EQUIPMENT

ELECTROPLATING Has a thousand and one uses when working with electrical supplies and equipment. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. ES-12, 1512 Jarvis Avenue, Chicago 26, Ill.

MOTORS. Blowers, oil burners, oil furnaces, gas burners, gas furnaces, pumps, Superior, Monrovia, Calif.

LAMP Parts—New 1948 illustrated catalog just out. Send 10c. Every part necessary to build, convert or repair lamps. Gyro Lamps, 5416P N. Clark, Chicago 40.

A NEW Lighted plastic sign or advertising clock. As low as \$24.75. Interstate Laboratories, 4049 Minnehaha Ave., Minneapolis, Minn.

LAMP Sockets, mogul sockets, three way switches, S.P. tumbler switches, duplex receptacles, cordsets, electrical repair parts, lamp parts, wires, etc. Catalog 10c. The Gearon Company, 6405 North Oakley, Chicago.

AMAZING New Pencilator. It gives you ohm's law, wire sizes and amperes to 500MCM, motor sizes and amperes to 60 h.p. a.c.-d.c. and 3 phase current. A guaranteed mechanical pencil for only \$1.50. H. E. Zarek Co., 317 W. Palm St., Compton, Calif.

BUY Wholesale quantities! Get wholesale price! Male rubber plugs 100 for \$5.00, cube taps 2 prongs, 3 outlets 50 for \$4.00, pullchain current taps 5 for \$2.00, pull-chain ceiling receptacles 5 for \$2.50, duplex flush receptacles 5 for \$1.00. Jarott Supply, Box 156, Woodside, N. Y.

TATTOOING Machines, outfits, world's finest. Free catalogue. Jensen, 120 West 83rd Street, Los Angeles 3.

NEW Surplus wire and cable, 200 sizes and types. Armored, Tlrex, lead. Free list. Ereco, 2912 Hewitt, Everett 1, Washington.

ELECTRIC Appliances—Our new booklet No. 111 gives hints on the care and repair of all electric appliances from clocks to washing machines. Also details for making simple time switches to control appliances. Only 25c. Popular Mechanics Press, 200 East Ontario Street, Chicago, 11, Ill.

NEON 75c per foot. Direct from factory. Interstate Laboratories, 4049 Minnehaha Ave., Minneapolis, Minn.

FLUORESCENT Lights. Make your own, ideal for home and shop. Complete electrical parts for 20-watt fixture with detailed instructions. Postpaid only \$2.00. Write Fluorokit, 332 E. Reservoir, Milwaukee, Wisconsin.

CHRISTMAS Tree light sets and bulbs. Jeannette Electric, 159 West 23rd St., New York 11, N.Y.

\$150.00 NEW Generators, only \$33.00. See Greer advertisement under "Welding."

MAGNET. "Alnico" 4 oz. horseshoe, powerful (lifts about 5 lb.) \$1.00, 8 oz. (lifts 10 lb.) \$1.50, 3 lb. (lifts 20 lb.) \$6.00; all postpaid. Ross, C88 West Broadway, New York, N. Y.

VOLTAGE Regulators. Autolite, silver contacts and large radio filter. Like new condition. Original cost \$140.90. Price \$5.95 prepaid. Also new Delco Remy regulators. Platinum contacts, \$8.95 prepaid. Both 24 volt, 50 amp. State Ignition, 2521 Indiana, Chicago 16, Ill.

FREE Catalog of welders, welding supplies, generators, fencers, electric lawn mowers, freezers, and other electrical items. LeJay Company, Minneapolis, Minn.

ELECTRIC Pencil—Writes, engraves all metals. Battery model \$1.00—110 volt model \$3.00. Complete. C.O.D.'s accepted. Reb Industries, Dept. 265-CC, Elmhurst, Illinois.

THERMAL Switches 22c. Bargains in war surplus motors, rheostats, Vickers hydraulic speed transmissions, gear reducers, flexible shafts, relays, etc. Delta Sales, 738 Kirby, Shreveport, Louisiana.

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

WELDING, SOLDERING, PLATING

D. C. WELDERS: New 300 ampere generators complete with accessories \$47.50. 200 ampere aircraft generators \$25.00. Blackhawk Distributors, Olathe, Kansas.

ELECTROPLATING Has a thousand and one uses. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. WS-12, 1512 Jarvis Avenue, Chicago 26, Ill.

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 MP12 Canal St., New York City.

MIRROR Silvering supplies; electro plating supplies. John Sprinkle, V66, Marion, Indiana.

WELDERS For all requirements. Free catalog. Write Hobartweld, Box M-1275, Troy, Ohio.

PORTABLE Arc welder, "build your own." Your engine plus Hobart welding generator saves \$350. Starts paying business. Free instruction book. Write Hobart Welders, Box M-1274, Troy, Ohio.

WELDERS, Automobile mechanics, body, fender, handy men, fixit shops become expert on white metal. Use own rod made from scrap. LaCombe, Oakland 6, Calif.

ATOMIC-VALUE—Porto electric welder—New 1948 model. Anyone can operate it. 115V a.c.-d.c. Welds all metals. Complete in sturdy fibre carrying case: 3 heat power unit, metallic arc and flame welding torches, full protection welder mask, arc cable and clamp, asbestos work block, generous supply of rods, flux, carbons, simple instruction manual. Will save you a hundred times its price of only \$19.95. Ideal Xmas gift. Money back guarantee. Order today! Universal Equipment Co., (Dept. PW 12), 24 W. 25th St., New York 10, N. Y.

OXY-ACETYLENE Welding outfit including: Full oxygen and acetylene cylinders. \$72.95 complete, f.o.b. Cleveland, Ohio. New, supply limited. Check or deposit with order, balance c.o.d. Cylinders can be refilled anywhere. Ideal for hobbyists, garages, repair shops, etc., includes supply of rod. The Burdett Oxy-Weld Equip. Co., 3399 Lakeside Avenue, Cleveland 14, Ohio.

SAVE 50%—A. C. Welders 110-220 volts. Holgeron's Service, Canton, Kans.

ACETYLENE Welding outfit approved by Underwriters and oxygen and acetylene cylinders I.C.C. inspected. All for \$75.00 complete. Best's Service, M8215 S. Honore St., Chicago 20, Ill.

OXY-ACETYLENE 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. Free literature. A-A Welding Supply Co., C9228 S. Ada St., Chicago 20, Ill.

NEW Aircraft lighting generators. War surplus. Only \$49.50. Original cost \$250.00. Can be used for lighting or converted for use as welder, electric plater, fast battery charger, auxiliary power unit, etc. Model R.2, manufactured by Jack & Heintz, 30 volts, 300 amp. d.c., shipping weight 68 lbs. Size 16"x7". Also new G.E. and Westinghouse P.I. generators, d.c., 200 amp., 28½ volts, cost \$150.00, price \$33.00 each. Immediate shipment. Check with order. Greer, 460 South State Street, Chicago, Illinois.

BUY Direct from factory. Welding outfit \$48.36; soldering outfits \$12.70 to \$9.70 complete prepaid. Box 331, Hamilton, Ohio.

NEW Portable champion special; transformer welder; 110/120 volt a.c.; 8 heat stages. Welds, brazes, solders, cuts all metals. Complete with electro holder, mask, rods, carbons, fluxes, cables, also special flame weld torch. Full directions, easy to use. Splendid for shop, farm and home repairs. Guaranteed 1 year. Only \$27.50. Magic Welder Mfg. Co., 241 NW Canal St., New York City.

30 AMP. Selenium plating rectifiers with Powerstat control, \$85.00. Lead lined tanks, geared motors for agitation. Complete line of bronzed baby shoe mounts. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

MACHINERY, TOOLS AND SUPPLIES

POLISHING And Buffing Kit for all metals. Compounds and buff wheels, \$1.95. Specify center hole size. 5" wheel special, 25c. Virginia Buffs, 1208 Hazel St., Charlottesville, Virginia.

WAR Surplus bargains! Special offer of tool kits consisting of 18 important tools for only \$7.75. Just what you need for home, shop or farm. Also a hardware unit of 18 pieces of necessary and useful items at the special bargain price of \$5.65. Ask today for our free war surplus bargains catalog listing scarce and hard-to-get items that you can use—all offered at bargain prices. Central Steel Supply Co., War Surplus, Dept. F, 294 Washington Street, Boston 8, Mass.

GEARS For inventors, experimenters, model makers, schools, work shops, laboratories, etc. Government surplus made of brass, bronze, dural steel and stainless steel. 12 matched pairs, 24 gears, bevel, spur and ratchet. List price \$12.00, our price \$2.50. 25 matched pairs; 50 gears, includes larger gears, also sets of worm gears. List price \$30.00, our price \$5.00. Limited quantity. Order now. Write for our bulletins on ball bearings, rectifiers, relays, selcons, horns and government surplus materials. Met Exchange, 323 Canal Street, New York.

SANDING Belts, 6"x54½", New, aluminum oxide, 60-240 grit, 45c. Raynix, 5736 Calmont, Ft. Worth 7, Texas.

ARC Welders, A.C. or D.C. 150-600 ampere. Portable, stationary. Prompt delivery. Reasonable terms. Also electrodes and accessories. Free catalogs. Write Hobart Welders, Box M-1276, Troy, Ohio.

MACHINE Tool castings for woodworking and metalworking tools. Machine them yourself, save up to 80%. Catalog describing 23 Lewis tools and projects sent for 10c. Lewis Machine Tool Co., 3217 Union Pacific Avenue, Dept. M, Los Angeles 23, California.

ELECTROPLATING Has a thousand and one uses when working with machinery, tools and supplies. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. MT-12, 1512 Jarvis Avenue, Chicago 26, Ill.

GENERATORS—War surplus, original crates. Westinghouse, Delco, D.C., 200 amps, 28.5 volts. \$39.50. Box 519, Warren, Mass.

CONCRETE Block machines \$39.50 up. Catalog free. Concrete Machine Company, 5466 Gravois, St. Louis 16, Missouri.

SALVAGE Tools, high speed steel, limited lot, new and used. Small drills, end mills, and cutters; tool bits; metric taps. Most items 2c to 50c, list 10c. Assortment 12 resharpened odd size small drills with list \$1.00 postpaid. J. Dickey, Newfield, New York.

BUILD 8" Tilt, adjustable bench saw. Kit furnished. Free circular. Cornelius Tools, 3629 Shady Court, Ft. Wayne 6, Indiana.

TILTING Arbor saw, no kits required, parts from neighborhood stores. Plan booklet \$1.00. Craftsman, Rowayton, Conn.

HARDWARE, Tools, drills, taps, dies, pattern, model supplies, electrical equipment, steel, brass, drill rod. Catalog 10c. Terek, 6304 Patterson, Chicago 34.

FARMERS, Garages, industries. Guaranteed, heavy-duty 110/220v arc welders. Lowest prices. ½" electric drill, Jacobs chuck, \$34.95. ¼" drill \$11.95. Electric bench grinder \$14.95 complete. Illustrated literature. Williams Sales, Box 4100, Portland 8, Oregon.

PRECISION V-Blocks to suit your needs. Low prices. Free literature. Miles Products, 2532 Wabash, Chicago 16.

BENCH Saws \$17.50, jig saws, sanders, etc. Circular 3c. Sunshine, Berkshire Heights, Penna.

THREAD Restorer! Eight sizes in one! Pays for itself by saving that worn bolt, shaft, or stud thread. #1 for 11, 12, 13, 14, 16, 18, 20, 24; #2 for 9, 10, 15, 16, 20, 26, 28, 32 threads per inch. Either tool \$2.00 postpaid. Bowers Hardware, Sta. A, 175A Canton, Ohio.

DRILL Press planer, rabbets, tenons, grooves, finishes wood and plastic rapidly and accurately. Price \$6.45. Free literature. Miles Products, 2532 Wabash, Chicago, 16.

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

METALS: Aluminum, brass and steel in all shapes. Write for free catalog. F & H, 87 Warren St., New York 7, N. Y.

CHUCKS, Independent, Universal, threaded 1½"-8 for South Bend, Atlas, Logan, Clausung, Craftsman lathes. Top value. Free literature. Westcott Chuck Co., 3600 Walnut, Oneida, N. Y.

COMPRESSORS, 100-1500 lbs./sq.in. \$32.50. New, portable. Details free. Hilker Products, 614 Jefferson Ave., Brooklyn 21.

ELECTRIC Sanders \$7.85 up. Circular 1948 models. Handy Tools, 255 Charles, Grand Rapids 6, Michigan.

ASSORTMENT, Aircraft small parts. Clamps, fasteners, terminals, rivets, nuts and bolts. All new. 3 lbs. postpaid anywhere in U. S. only \$1.00, cash with order. Satisfaction guaranteed. Limited supply. Conner Sales Co., 917 S. Main St., Fort Worth, Texas.

WOODWORKING Machine knives. Low prices. Also precision sharpening service. Free circular. Colman Tools, 204 North Buchanan, Amarillo, Texas.

DAYTON "V" belts and pulleys. All sizes for every need; prompt shipments. Free circular and prices. Hydraulic Products Co., East Main Street, Southold, N. Y., Box 206.

LATHE Milling attachment. Photograph for dime. Depoy Model Shop, Muncie, Ind.

12" BAND Saw, tilting table, Oilite bearings, \$35.00. 6" jointer, ball bearing, 43" long, \$59.50. Spindle shaper, ball bearing, 15x20 table, interchangeable spindles, \$49.50. 8" bench saw, large tilting table, ball bearing, complete, \$29.50. Immediate delivery. Dealers wanted. Write for catalog. Backus Machine Co., Boyd, Wis.

ELECTRIC Foot switch—For power tools. Leaves both hands free. Just plug it in. \$3.95 postpaid. C.O.D.'s accepted. Reb Industries, Dept. 265-CB, Elmhurst, Illinois.

DRILLS, High speed, 1-60 \$10.95. Send dime for sample and list. V-B Sales, Roselle, Illinois.

WE Offer 60 tons of new war surplus bolts, nuts, washers, screws, etc. All popular sizes. A good mixture for hobby shops, garages, machine shops and farms. A big 40 lb. box for only \$6.85. War Surplus Co., Morris and John Sts., New Brunswick, N. J.

SHEBEL Saw Filer files all saws. Circular. A. P. Shebel, 730B So. 2nd St., Milwaukee 4, Wis.

BALL Bearings one-fourth list price; gears, switches, rheostats. Free list. Burgess, Box 168, Ferguson, Mo.

HOME Shop owners attention.—Send for actual photograph and sample of the work our attachments will do. The photograph and sample speak for themselves. Have fun in your home shop. Cut gears, sprockets, ratchets, lay out holes accurately, cut keyways, build complete clocks and other interesting jobs. Build these attachments yourself from our reasonably priced blue prints. Don't limit your lathe to round work only. The Home Shop, 415 Raymond Avenue, Glendale 1, California.

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.

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NEW Lauson 4 cycle motors, ¾ H.P. Also 1½ to 2 H.P. Arthur Gershel, 51 Chambers St., New York 7.

"BUILD Your own" portable arc welder. Your engine plus Hobart welding generator saves \$350. Starts paying business. Free instruction book. Write Hobart Welders, Box M-1277, Troy, Ohio.

WELDERS For all requirements. Free catalog. Write Hobartweld, Box M-1278 Troy, Ohio.

¼ H.P. Rebuilt motors \$12.50, ½ h.p. \$30.00, sizes to 7½ h.p. A. C. Motors, 3101 N. 32nd, Philadelphia 32, Penna.

MOTOR Repair men, get our bulletins on stator winding tester and a.c. coil winder. Motor Industries, Quincy, Ill.

MOTORS—New, 1/150 HP. 110 V. a.c. 3200 r.p.m., capacitor type, complete \$3.75. No C.O.D. Nafco Products, 5258 Byron, Chicago 41, Ill.

A. C. REBUILT Motors, ¼ H.P. \$14.50. Other sizes; prompt shipment. EMSCO, 85 Reynolds, Rochester 8, New York.

\$150.00 NEW Generators, only \$33.00. See Greer advertisement under "Welding."

MIDGET Motors—4 r.p.m., 110 volts, 60 cycle a.c. Perfect for timing machines, displays, models. Price delivered \$5.00 each. McLaren Products Co., P.O. Box 1021, Riverside, California.

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

BOATS, OUTBOARD MOTORS, ETC.

CONVERT Your Ford motor (domestic and foreign) to marine use. Water-cooled manifolds, bronze gear pump, copper tubing and fittings. Complete for only \$89.50. Also marine reverse gears. Complete catalogue 25c. Arthur Gershel, 51 Chambers St., New York 7.

BUILD Your own boat now with Brooks Knock Down Kits, Simple and enjoyable. Outboards, inboards, sail and racing. Send 10c for literature. Brooks Boat Company, Dept. PM, Carrollton, Michigan.

NEW Marine reverse gears—open type (Borg Warner) \$45, suitable for Jeeps and any 60 to 80 H.P. engine. Arthur Gershel, 51 Chambers St., New York 7.

\$35 SEA Shell prefabricated 8' plywood rowboat. Free illustrated folder. Hagerty Company, Cohasset, Massachusetts.

CONVERT Your Jeep for marine use. Immediate delivery on kits and marine reverse gears. Complete catalogue 25c (domestic and foreign). Arthur Gershel, 51 Chambers St., New York 7.

COMPLETE Kayak kit. Nothing additional needed. Excellent present for dad, brother, son. Literature. Play-Yacks, Dedham, Mass.

BUILD Marine motors, Ford or jeep. Federal Marine Motors, 230 W. Superior St., Chicago 10, Ill.

BUILD Your own boat by the Welch System with knock down kits. Save 2/3 cost. Rowboats to cruisers. Send 25c for new complete illustrated catalog. Midwest Boat Company, Menomonee Falls, Wis.

SILVERTROL Streamlined electric trolling motor. Quiet as a whisper. Ample power for light craft on small lakes, etc., where strong currents don't exist. Uses six or twelve volt battery. Water cooled; full reverse steering; easy handling; lightweight, yet rugged for long service. Thousands sold at \$79.50. New low price \$49.50 warranted and shipped prepaid. Wonderful Christmas gift! Order today, check or money order. Send \$5.00 with C.O.D. orders. Silver Creek Precision Corp., Silver Creek, New York.

LATEST Manual on small boat construction, an excellent gift. December special \$1.00 postpaid. Build from our full size paper patterns, thirty designs, boats representing forty years careful designing. Send 10c for folders. Germain Boat Company, Dept. 3, Saginaw, W. S., Michigan.

OUTBOARD Motors—Good values, used motors. Also used parts for most makes and models. Crandall-Hicks Co., 911 Commonwealth, Boston, Mass.

FREE Catalog describes famous Weems line of navigation instruments and texts. Write Dept. 2, Weems System of Navigation, Annapolis, Md.

P-38 BELLY Tank speed boat. Complete plans, instructions \$1.00. Twintank Boat Company, 1032 62nd Street, Oakland, Calif.

CATALOGUE—Over 30 world's best plywood designs sent with Wm. Deed's book "Plywood Boats." Send \$1.00. Marine Mart, Buffalo 7, N. Y.

TWENTY Plywood boat plans \$1.00. 6 to 20 feet, sail, power. The Rudder, 15 Murray Street, New York.

MOLDED And sheet plywood boat kits, ready to assemble, 8 to 14 ft. \$40.00 up. Genuine weldwood marine type plywood in various thicknesses and lengths. Send 25c for literature. Marine Mart, Buffalo 7, N. Y.

MARINE Catalogue—15,000 deliverable items pictured that should be pictured at price. Send \$1.00. Marine Mart, Buffalo 7, N. Y.

MARINE Power—Easily convert any Jeep or Ford motor (domestic or foreign) with Convo parts and kits. Complete catalog 25c (coin). Osco Motors Corporation, 2020B East Orleans Street, Philadelphia 34, Penna.

P-38 BELLY Tanks, new, steel. 10 ft. 2 in. 165 gallon \$9.95. Anzio Boat Co., Box 89, Merced, California.

OUTBOARD Motor parts, new and used, for all makes. New pistons, standard and oversize. Cylinders rebored. Outboard Motor Mart, Inc., 309 Atlantic Ave., Boston 10, Mass.

NEW, Used, rebuilt marine motors. Marine conversions, fittings. Free catalog. Stokes Marine Supply, Dept. 24, Coldwa-

ALL Copper water jacketed exhaust manifolds for marine conversions of automobile and aviation engines and marine engine replacements; any make, model or age. Joseph Van Blerck & Son, 391 Woodcleft Ave., Freeport, N. Y.

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

BOATS And all about them. How to select, build, repair and operate. For 40 years the leading practical boating magazine. Half price trial subscription. 12 issues for \$1.00. Motor Boat, 62 Gold Street, New York 7.

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

ATHLETIC EQUIPMENT, BODY BUILDING COURSES

ELECTRIC Vibrator five applicators scalp body massage \$6.50. Schramm Company, 2755 Carmen, Chicago 25.

MUSCLES—Strength, Fast. Training with the New Jiffy Gym Exerciser. Courses and big pictured list and strength story. All for only \$1.50 postpaid. No C.O.D.s. Nat Berent, 1090 W. 43, Norfolk 8, Va.

PERSONAL Course—barbells. Massive proportions quickly, easily. EG, Elmsford, N. Y.

BARBELLS! Free course and catalog! 95 pound set \$9.80; extra plates 9c pound. Bur Barbell Co., Lyndhurst, N. J.

10 MINUTE Barbell course, amazing results. \$1.00. Texas Barbell, 201 Pine, Palestine, Texas.

DEADLY Judo—Fiercest fighting technique. Trick knockouts. (200 photographs—plus illustrations). Expert instructions. Three volumes. Complete \$2.25. Variety House, Box 46-BY Wall Station, New York 5.

HANDBALANCING—Acrobatics easily learned. Write. Power, 923a W. Vine, Kalamazoo, Michigan.

BARBELLS \$11.00 up. Stamp for folders. Jackson International Barbells, Springfield, N. J.

BARBELLS, Exercise equipment. Courses. Free booklet. Good Barbell Co., Reading, Penna.

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SNOW Shoes—our third car-load of government war surplus Army snow shoes. Sparkling brand new. Trail type models. Size 10 by 58 inches. Postpaid by insured mail for only \$6.95 per pair. A real bargain. Over twenty seven hundred trappers, hunters and sportsmen bought snowshoes from us. They also make fine wall ornaments for your den. Send money order. No c.o.d. please. Frank Smatlak, Rice Lake, Wisconsin.

GUN Grips, pearl. Jobber's price. Miracle Product, 44 N. Albany, Chicago.

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MOULD Keys—Outfit and metal for fifty keys, illustrated instructions, cooking heat only. \$2.00. H. H. Heard, 212 N. 7th St., Wilmington, N. C.

100 GENUINE Ways to success. Literature. Continental Publications, Elmhurst, New York.

300% PROFIT Selling repeat item by mail, local. Dade Products, Box 1720H, Cleveland, Ohio.

OWN A mail-order paper products business. Sell envelopes, tags, bags, boxes—wholesale. Tremendous demand. Steady profits. Omaha Envelope Service, Dept. 228, 4721 California, Omaha 3, Nebraska.

MAKE Strange plastic—1c pound. Makes durable, attractive floors, walls. Build with waste. Save half. Bays Laboratory, Oklahoma City 9.

RUBBER—Genuine "India" makes molds (one day) pint \$1.50, gallon \$7.00. Rubber Products, 3151R Southport, Chicago.

FROZEN Custard is sweeping the nation. Operate your own highly profitable drive-in. Save time and money with our "Know-how." Booklet, \$5.00. Penguin Enterprises, 21373 Stratford Ave., Cleveland 16, Ohio.

FINANCIAL Independence can be yours. Earnings \$150 week easy, everything furnished. Owen Kofod, 1030 Yale Station, New Haven, Conn.

WANTED Unused U. S. postage stamps, small discount. Advance Stamp Company, 24 East 23rd Street, New York.

MAKE Money selling "C-E Automatic Water Heaters." \$7.50 to \$26 on each sale. Write Crane Electric, Eugene 4e, Oregon.

STORM Windows. (Combination glass and screen interchangeable). Make them in your own shop—sell. Will furnish knock down stock. Territory still open. \$3000 required. Description and prices on request. Weather-Rex, 155 Genesee Street, Buffalo, New York.

INCORPORATE Your business. Delaware laws. Many advantages, free details. Tax Research Bureau, Inc., Delaware Trust Building, Wilmington, Delaware.

ACCOUNTING Practice—Twelve proven clientele building methods. Eight selected, powerful sales letters. Inquiries invited. Organization Consultants, Box 33, Forest Hills, N. Y.

OPERATE Home business that may mean the road to independence. Write Sunray, 4756 N. Bernard, Chicago, Illinois.

STOP Looking further. New combination two-way mail order business. Free information. United Mail Order Bureau, 1310 N. Wells, Chicago 10, Ill.

BUILD Your own mail order business. Beginner's fact-packed treatise, 25c. Satisfaction guaranteed. Homan, 1407-D North 33rd, Omaha 3, Nebr.

BASKETS, wholesale to the trade only. Hardware stores, general stores and etc., write for price list. Durham's Basket Market, North Branch, N. J.

OPERATE Simplified repair business. Locally or by mail. Large profits. Free! Literature. Cline-Porter, Box 6346PM, Pittsburgh 12, Penna.

BIG Money. Make novelties, plastics, formulas, etc. Instructions \$1. Circular stamp. Brooks, B120M, Arkansas, Wis.

"MAIL Order Magic"—Free monograph sent anyone interested in mail selling! Crompton, Box 2567-M, Hollywood 28, Calif.

SIMPLIFIED "Know How." Start your own electric motor repair shop. Electrical Engineering Consultation Service, 3013 East 6th St., Long Beach 14, California.

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A HIGHLY Profitable factory in your own home or garage! Amazing waterless hand cleaner. Formula and instructions free. Western Aircraft, Dept. D, Los Angeles 6.

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READ—"From Nothing To Independence." Descriptive literature free. Maciolek, 7738-A Dayton St., Detroit 10, Mich.

BE A tax consultant. Bookkeepers, etc. can qualify quickly. Details free. Edw. H. Smith, 17 Rockland Ave., Yonkers, N. Y.

ELECTRICALLY Inclined men. Amazing illustrated literature free, proving \$100-\$250 weekly possible installing, maintaining fluorescent lighting. Rebuild fixtures for excellent profits. Make beautiful lights for 50c each and less. Free sample materials. Write Willis Fluorescent Service, 101 York Street, Brooklyn 1, New York, Dept. C.

SEA Shells, plastics, metal findings, free catalog. "Secors," 238 Bradenton Beach, Florida.

WINDSHIELD Wiper rebuilding brings big profits. Free particulars. H & H Products, Box 430, East Akron 5, Ohio.

CONVERT Hand mowers to power mowers. Sell the handy-dandy lawn mower conversion kits. Easily installed on any make mower in 3 hours. Used with any small gasoline or electric motor (Maytag, Power Products engines) in stock. Quick delivery. Kits can be purchased with or without engines. Fits 16 to 20 inch mower. Dealers wanted. Write for details. Le Claire Manufacturing Co., Le Claire, Iowa.

1001 MONEYMAKING Ideas! Free details. Newway Institute, Box 5463-M, Chicago 80.

METALLIZE Baby shoes. Excellent profits. New system assures success. Free details. Treasures Forever, 89 Henry Ave., Lynn, Mass.

"MAILORDER Fundamentals" for mail-order beginners. \$1.00. Mecca, 30 West Washington, Chicago 2.

\$46 FROM Square foot plywood. Jigsaw necessary. Write. Woodarts, X-38, Bridge-water, Mass.

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FREE Literature describing many money making plans. Albert Pearson, Box 1182, Milwaukee, Wisconsin.

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READ "Advance"—The Voice of Mail Order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. American Mail Trade Association, 313 East 21st Street, Suite 45, New York 10, N. Y.

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RENEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 704 Land Bank, Kansas City, Missouri.

PLASTIC—Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2618 St. Louis Ave., St. Louis 6, Mo.

PLASTIC Costume jewelry, beautiful designs. Free catalogue. Howard Schultz, 115-83 229 St. St. Albans 11, N. Y.

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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.

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AGENTS WANTED

TOP Quality paint line available to established manufacturers' agents calling on contractors, builders, industrial accounts, stores, etc. Attractive discounts. Exclusive territory available. Write Lasting Products Company, Baltimore 23, Maryland.

AGENTS—Distributors. Manufacturer of nationally known razor blades desires agents, distributors to sell high quality blade. Generous profit. Excellent repeater. Small investment for stock. Write for samples, details. Columbia Razor Blade Corp., Mfrs., 517 East 9th St., Los Angeles 15, California.

NEW! Different! Use no water! Getzol Mechanics Hand Cleaner. Instantly removes dirt, grease, paint, tar, ink, etc., leaving hands smooth and soft. Constant repeat sales to garages, machine shops, plumbers, painters, printers, motorists, aviators, farmers, etc. Sample jar 50c postpaid with descriptive matter. Big discounts! Goetz Petro-Chemical Co., 34 Manitoba Street, Buffalo, N. Y.

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

ODOR "Mufflers" finest refrigerator deodorizer for ice boxes. Retail \$2.00. Sell consumer. Big profits, exclusive territory. Write L. A. Muffler, Continental Bldg., Los Angeles.

SELL Perfumes and toilet waters, large commission. Write Drams Company, 213 Tenth Avenue, N. Y. C.

NO Investment, throw rugs, big profits, good repeaters. Investigate this opportunity. Warren Rug Mills, Box 243K, Phillipsburg, New Jersey.

STRANGE "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 116, Akron, Ohio.

DOLL House furniture puzzle! Write Rickett, 2551 So. Wanamaker, Philadelphia 43, Penna.

AGENTS Show new hot \$1 item to stores. Sells-on-sight. Free sample proves deal. 100% profit. Write or wire. Presto Company, Dept. A-4, Glendale, Calif.

SILVER Plating liquid. Apply with cloth. Cleans, silverplates, polishes, one rubbing. Genuine silver. Renews silverplated ware. Also silverplates brass, copper and some other metals. Female and male selling representatives wanted. Part time or full. Splendid profits. Exclusive territory. Sells by showing and demonstrating. Retail and wholesale. NuProcess Products, Aurora, Illinois.

SCHOOL Seniors: Sell classmates superb Craftcards for super profits. Write Craftcards, Box 235(AK), Pittsburgh 30, Pennsylvania.

SELL Luminous paint (shines), sample bottle \$1.00 (refundable). Details, "Gem-lite," PM-345, Wilkes-Barre, Penna.

FINE Watches cheap for resale. Write Wodicka, 339 East 11th, New York, N. Y.

AGENTS—Make big money with low-priced plastic table covers. Saves on laundry bills. Over 100% profit. Samples free. Carwell, 330 So. Wells, Chicago.

MAKE Money stamping key protectors, etc. Stamping outfits. Sample check with name and address 25c. Rasco, 413 Pedretti Road, Cincinnati, Ohio.

SELL Ultra blue stock signs to stores, 1000 slogans, comedy, general, religious. 7x11, cost 6c, sells 35c. Make money. Sample free. Lowy, 8 West Broadway, Dept. 350, New York City 7.

SELL Jewelry. \$2.00 brings samples. Guaranteed value, \$6.00. George Sassen, 154 Nassau Street, New York 7.

YEAR End subscriptions, renewals offer you big money as magazine subscription representative. Send for free book. Get started quick, work full-spate time. McGregor Magazine Agency, Dept. PM-5, Mount Morris, Ill.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 4567, Cincinnati 3, Ohio.

50 DOLLARS Week easy. Sell new revolutionary rubber stamp ink to all businesses. We show you how. Hudson, 934-0 Lakeside, Chicago.

EXCLUSIVE Agents wrought iron house markers and weather vanes. Send 10c for catalog. Bartells, McAllen, Tex.

MEXICAN Feather pictures. Unusual novelty. \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P, Apartado 762, Mexico City.

MYSTERY Kit produces gold-silver raised lettering like engraving with common pen, women wild about it. Cost 25c, sells \$1.00. Sample writing free. Western Chemical, Salem, Oregon.

MAKE \$100.00 Month on your spare time. Everyone that carries keys is your customer. Sell an article for lost keys service. We will send directions how to get orders. Send us \$2.00 for samples, if you are unable to sell them, return them, we will refund your money. Write today. Lost Keys Service, 111 W. North Ave., Chicago 10, Ill.

MAKE More money selling personal initialed individualized belts, buckles, cap badges, tie holders. 2000 emblems to choose. Big profits, whole or part time. Write today special outfit offer. Hookfast Specialties, Box 1425, Dept. 6, Providence, R. I.

NO Money or experience needed. Spare or full time. Steady income writing orders guaranteed men's hose. Variety 20 styles. We deliver and collect. Liberal advance profit, 33% cash bonus. Write today for complete free sales outfit. Kentcraft, Dept. SM, 44 Court St., Brooklyn 2, N. Y.

AGENTS—America's finest shampoo. Laboratory Products, 5027 Maffitt, St. Louis, Mo.

CASH In now! Big profits selling new deluxe 24 karat gold plated watch bands. A bargain at \$2.50 retail. Sample only \$1.00. Robert Sales, Room 507, 727 Hennepin, Minneapolis, Minnesota.

BIG Profits. Gifts, etc. DeLuxe Sales, Blue Earth, Minn.

\$28-\$140. DAILY Possible, agents-distributors, domestic-foreign, Flo-Glo plastic linoleum-wood finishes. Acme, Box 404-pm, Mount Vernon, N. Y.

JOKERS Novelties. Hundred pieces dollar! Wholesaler Pauly, 2295 Concourse, Bronx 53, N. Y.

FREE Selling kit. "Print-o-press" stencil letter duplicators. World's lowest priced, \$9.95 up. Pays continuous profits with supplies. Rush name, address. No investment. Professional Products, 32 Madisonville, Cincinnati.

SENSATIONAL Seller. Tiny ball point pen, key chain attached. Send \$1.00 for sample set. Janss, Box 85, Irvington, N. J.

MAKE Christmas money quick selling sensational necklace and earring sets. Boxed. Low wholesale prices. Mission, 2328D West Pico, Los Angeles 6, Calif.

AGENTS. Big money for you selling our patented rubber base wet mops. Erases dirt and prolongs life of mop. Write. Burtz Fibre Broom Co., Columbia, Penna. Dept. A.

EARN Big money year 'round. Be a one-person-department-store. Take orders for shirts, ties, hosiery, lingerie, household linens, etc. For information. Cooperative Merchandisers, Dept. PM1, 110 West 34 Street, New York 1, N. Y.

ENTIRELY New household necessity. All homes prospects. Sample 35c. One dozen \$3.00. H. T. Brown, Box 502, Dayton, Ohio.

MAKE, Sell over 100 products at home without machinery or experience. Write. Kohen, 506 West 45th, Chicago 9

TREMENDOUS Profits selling specialties, household products. Renschler's, Carrollton (D-2), Kentucky.

JUST Take orders. We deliver. "Gadgets," 210 Fifth Ave., New York.

ARE You selling? If you're not earning at least \$25 a day, send for our proposition. Sell nationally advertised aluminum-ware, silverware, pressure cookers, and jewelry direct to consumer. Big profits, no investment. Write Continental Products, Dept. M, Box 210, Providence, R. I.

EXTRA Money. Send for new plan. Inspirational Books, Box 106 Old Chelsea Station, New York 11, N. Y.

LOCAL Representative appoint agents for manufacturer of America's newest gift sensation. Millions waiting to see amazing item that sells itself. Send for free details. Manufacturers, Suite 535, 1947 Broadway, New York 23.

MAKE Money with our line of beautiful, new heavy-quality, waterproof tablecloths. Needs no laundering. Saves time and money. Retail for \$1.89. Costs you only 62c each in dozen lots. Sample order of three assorted colors shipped to you for \$2.00 postpaid. We refund \$2.00 to you on first one dozen order. E. F. Bernhold, Inc., Box 128, Brookfield, Ill.

FREE Nylons given your customers if Kendex hosiery runs or snags within guarantee period! Sensational written guarantee amazes everybody. Three magic words: "Guaranteed Against Everything" enough to make sales. Earn wonderful income writing orders. We deliver and collect. Spare or full time. No money or experience needed. Liberal advance cash profit plus big cash bonus. Your name and address brings you complete free money-making sales outfit prepaid. Write today; start earnings next week! Kendex Co., Dept. 111, Babylon, N. Y.

NO Money or experience needed. Spare or full time. Steady income writing orders guaranteed men's hose. Variety 20 styles. We deliver and collect. Liberal advance profit, 33% cash bonus. Write today for complete free sales outfit. Kentcraft, Dept. WM, 44 Court St., Brooklyn 2, N. Y.

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

MAKE Money at home like I do! Write immediately. Duffy, Covington 4, Ky.

MAKE Money taking orders for "C-E Automatic Water Heaters." Write Crane Electric, Eugene 4b, Oregon.

EARN 40% Clear cash profit with fast-selling quality neckwear at \$1, \$1.50 and \$2. Finest, exclusive fabrics, latest patterns, expert workmanship assure many orders. Excellent side-line! Write Lomax Neckwear Co., Dept. A-13, 221 W. Lomax Place, Chicago, Illinois.

FREE. Wholesale catalogue profitable quality home products. Beebe Company, 40 Whittier Road, Wellesley Hills 82M, Massachusetts.

SELL Oil burners for kitchen stoves. Great demand; terrific profits. Oil Burner Supply, Box 327, Cambridge, Mass.

MAKE Money at home like we do. Free details. Phoenix, 493-G Northwest Sta., Detroit 4, Mich.

SAVE Your coal. Five fuel saving compounds 50c prepaid. Compounds on approval. Coalalite, Waterloo, Iowa.

100% PROFIT Or more. No investment. Handle top quality Foto Stamps. Amazing, glossy photographs year round. Free samples, and particulars. American Foto Stamp Co., 103 E. 125th St., Dept. 500, New York 35, N. Y.

\$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. Philip's Neckwear, 20 West 22nd St., Dept. K-17, New York 10.

DISTRIBUTORS—28% To 75% profit selling Reflex spark plugs (guaranteed) to garages, service stations, fleets, along with other lines, steady repeat business. Exclusive territory. Reflex Spark Plug Co., 10902 Madison Ave., Cleveland 2, Ohio.

DISTRIBUTORS Wanted for unusual household products. Levine's, 15-X Boulevard Station, New York 59, N. Y.

BIG Commissions. Boost income quickly. Sell stores, restaurants, bars. Plastic tickets, shelf moulding, menu covers, signs. Write today. Pricing Press, 124 White St., Dept. P.K., New York 13, N. Y.

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

NEW Sensational seat covers. Mono, 6545 Santa Monica Blvd., Hollywood 38, Calif.

AGENTS. Sell finest food products direct to homes. Successfully sold for 25 years. Big profits. Powerful combination sale plans make sales easy. Permanent repeat business. Samples furnished. Live territories open to distributors. Mother Hubbard Products Co., 4139 Grand, Dept. P.M., Chicago.

A NATURAL! Big money, selling new line one piece, lace plastic tablecloths! Sizes to 54x108. Also women's aprons; novel, embroidered cotton pillow cases. Free, "Interesting details." Royalty, Box 748-K, Passaic, N. J.

INFORMATION — Wholesale supply sources. Moneymaking plans. Increase your income! Write Reynard Service, Smithfield 3, Ohio.

BIG Money for Xmas. Sell beautiful plastic lace table covers, raincoats. Twenty other terrific gift items. Free swatches. Star, 261 Fifth Avenue, New York.

QUICK Sure money. Selling Annie Blain flavors. New Brunswick, New Jersey.

BIG Profits selling used clothing. Operate from home, auto or store. Men's suits \$4.00. Overcoats \$4.00. Field jackets \$2.00. Ladies' coats \$1.50. Army shirts \$1.50. Other big bargains. Catalog free. Kadet-sky & Son, 702 Barber Street, Dept. 14, Chicago 7, Ill.

AGENTS—Big line including food products. Fast selling premium and bargain deals. Low prices. Send card for big outfit offer with gift. Ho-Ro-Co, 2725 Dodier, St. Louis 7, Mo.

AMAZING New Glow in the dark house numbers, switch plates, decals, pictures, religious articles, etc. Factory representative wanted. Wonderful opportunity. Free samples. Madison Mills, 303 Fourth Avenue, New York, N. Y.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Send for free sample kit. Printcraft, 1425 E. Elm St., Scranton 5, Penna.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell Cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235(L), Pittsburgh 30, Pennsylvania.

100% PROFIT With new electric gas lighter, eliminates matches, pilot. Write Optical Research Products, Fairview, N. J.

LARGE Variety fast selling items from \$1. Manufacturers, 264-5th Ave., New York.

MAGIC Cleaner and laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 5007 Irving Park, Chicago.

EXCELLENT Sideline for printing and advertising salesmen. Decalomania 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.

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

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.

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.

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

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.

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SALESMEN Wanted. Excellent opportunity for progressive full or part time salesmen to solicit taverns, clubs and lodges. All steel modernistic bottle crushers. Federal laws compel breakage of whiskey bottles. Eliminates danger from flying glass. Holds sixty to seventy broken bottles. All taverns are good prospects. Nothing like it on the market. Retail for only \$39.50. Commission. Call or write for details. Wm. Carmel, 33 N. LaSalle St., Chicago 2, Ill.

BRAND New! "Circline" fluorescent sweeping country! Fabulous profits selling stores, offices, homes. Also exclusive fluorescent table lamp. Complete line modern fixtures. Rush name for free sales kit, sample offer. Rose Co., 529LC South Franklin, Chicago.

SOMETHING New in fire extinguishers. Red Comet Automatics. Company established 1931. All year job. Exclusive territory. Dealers earning up to \$10,000. Write 479 Red Comet Bldg., Littleton, Colorado.

AUTOMATIC Fire extinguishers. Free sales kit, 50% to 60% profit. Red Ball Co., Box 1552, Salt Lake City, Utah.

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. L-U-PPM, Freeport, Ill.

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

BIG Commissions selling post cards to hotels, resorts, business. Protected territories for producers. "Free sales kit." Beals, 215 East Third, Des Moines 9, Iowa.

JOBS Open in selling! Send name, address for free copy Opportunity Magazine, listing hundreds of companies who need men now, full or spare time. Experience not essential. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

SELL The new \$3.45 electric device everyone needs. To stores or individuals. Cash daily. We deliver. Sample kit \$2.00. Sibert Company, Newark 3, New Jersey.

BIG Profits daily taking every family's magazine subscriptions. Give wide choice of valuable books free. Publishers, 323-1 Hammond, Cincinnati 2, Ohio.

BIG First commissions, sensational automatic repeats, with new sales building plan for retailers. First since V-J Day. Customers get big value tableware; cost retailers nothing. Positively hottest deal in selling. Rush name for facts. Alco Sales Company, 215 West Ontario, Dept. C-615, Chicago 10, Illinois.

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-D12 Atlantic, Boston 10, Mass.

ADVERTISING Book matches—World's largest direct selling manufacturer of advertising book matches offers opportunity for profitable year 'round selling; every business a prospect. No experience needed to start; full or part time. Factory service. Low prices for high quality; repeats; sales kit furnished. Match Corp. of America, 3433-43 West 48th Place, Dept. E-13, Chicago 32, Illinois.

\$221.90 IN One week—Unusual? Not at all! Just look at one week's earnings of these representatives. SWB \$247.84, JRS \$252.80, HMT \$242.75, HC \$252.93, HET \$319.38, OP \$442.40. Direct mail campaign brings hot leads right into your home. Remarkable product does part of 10 men's work—a "natural" during these labor problem days. Has perfect sales story—sells year 'round. As modern as radar! Free equipment offer! We extend credit, deliver and collect. No capital required—no experience necessary. You make big profit on first sale and full credit on repeat business. Every business, store, home, factory, etc. are prospects. Write John Porter, 2433 Indiana, Dept. 302, Chicago 16, Ill.

MAKE Money taking orders for "C-E Automatic Water Heaters." Write Crane Electric, Eugene 4a, Oregon.

SALESMEN: Everybody buys from you. Radios, toys, gloves, advertising novelties, coin machines. Collect commission in advance. State your age, territory. Sales portfolio free. Diverso Products Corporation, Milwaukee, Wisconsin.

BIG Money taking orders. Shirts, ties, Sox, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

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. M127, 7530 Greenwood, Chicago.

BONUS Commissions selling photographic creations. Samples. Creative Photography, Box 315M, Cooper Station, New York City 3.

MONEY in your pocket. \$1.00 brings two plans telling how to sell by long distance telephone. Larger sales. Bigger commissions. R. L. Mackin, 1512 Roblyn, St. Paul 4, Minnesota.

NEW Auto accessory, \$8.50 seller. Big profits. Write Aero, 4836-M Joy, Detroit 4.

PHOTO-Salesmen-Agents. Sell beautiful hand colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait, 3329 North Ave., Chicago, Ill.

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 W. Kellogg, St. Paul 2, Minnesota.

AMAZING Profits selling personal initialed individualized buckles, belts, cap badges, tie holders, flexible cap bands, 2000 emblems to choose from. Repeats. Write today special outfit offer. Hook-Fast Company, Box 480-PM, Roanoke, Virginia.

WAGON Salesmen—Fast moving carded goods and 10c line. Long profits. Free facts. Peerless, 2720 Dodier, St. Louis 7, Mo.

AGENCIES WANTED

NEW Products and merchandise marketed. A. H. Whitcomb, 645 29th St., Newport News, Va.

ARGENTINE Engineer wishes to represent your new products in South America. Write David Lerner, Fabre 1190, Buenos Aires, Argentina.

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BIG Money training horses by circus methods. Trick, saddle and cow horses, mules, colts, cattle. Free book. Write: American Horse Training Institute, Box R-110, Columbus, Kansas.

WANT A Government job? \$1,756—\$3,021 year. Men-women. Veterans get preference. Prepare now for next examinations. Booklet, sample lessons free. Write today. Franklin Institute, Dept. R-24, Rochester, N. Y.

NOW You can have an office. Learn credit-collection business by new home study course. Many earn up to \$5000—\$15,000 annually. Free bulletin. Franklin Credit School, Dept. 202N, Roanoke 7, Va.

YOU Can master mathematics. Universal School of Mathematics, 623 Story Bldg., Los Angeles, Calif.

BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar A Week" bookkeeping and tax service. Full or spare time. Details free. No obligation. Ellis, Box 207-F, Cedar Grove, North Carolina.

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LEARN Photo-engraving at home or in oldest, largest school in America. Work for newspaper or establish own profitable business. New Tasope' Photo-Engraving equipment available soon. Write for information. Veterans ask about G.I. training. The Aurora School of Photo-Engraving, Tasope' Bldg., Aurora, Mo.

OIL Painting—Correspondence course. Write Carlos Art Academy, Correspondence Division, Watertown, N. Y.

GRADUATE Work in all subjects. Degrees available in one year. Resident and extension classes. Golden State University, Hollywood, Calif.

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PREPARE For Civil Service Examination. Pay for course after securing position. Write Free School, Kokomo, Ind.

GOOD Paying jobs, Hotel Transcript Clerk. Short course prepares you. Hotel Transcript School, P.O. Box 3915, Miami 24, Fla.

3800 LATEST Used correspondence courses, catalog 50c. EG, Elmsford, N. Y.

LEARN Piano tuning and repairing at home. Course by Dr. William Braid White. Write Karl Bartenbach, 1001-H Wells Street, Lafayette, Indiana.

READ "Inflation is Coming." New book informs you of what may happen. Be prepared. Protect your family. Price \$1.25 postpaid. Lucille Rasmus, Box 205, Station F, Buffalo 12, N. Y.

STAMMERING Corrected. Booklet gives full information. Write: William Dennison, 543-A Jarvis St., Toronto, Ont.

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CIVIL Service instructions. Free particulars. Baker, 5509-Z Winthrop, Chicago 40.

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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.

BECOME Sanitation supervisor. Seven easy lessons. Certificate, profits, promotion. Institute, 2385-A Edgewater, Los Angeles 26.

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INVESTIGATOR Training. Phillips Secret Service, 1917B North Kenneth, Chicago 39, Ill.

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NEW Writers needed. Nonfiction material demand is booming. Many magazine editors buy features and "fillers" from new writers. Our earn as you learn lessons prepare you to meet their requirements. Experience unnecessary. Reasonable price, unexcelled service. Details, sample lesson free on request. Use postcard. No obligation. Comfort Writer's Service, 200-PN S. 7th St., St. Louis 2, Mo.

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SHORTEST Complete bookkeeping and income tax system on market; copyrighted; merchant's time saver; bookkeeper's aid. Complete system \$1, tax bulletins free. Mixon Accounting Agency, 1412 Great Northern Building, Chicago.

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LOCATE Any article manufactured. \$1.00. Business Service, 1101 Kings Highway, Shreveport, Louisiana.

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CONFIDENTIAL New York mail-address. Your mail received, forwarded. Free details. Arlington, 131-H West 42nd, New York 18.

WASHINGTON, D. C., remail address. Your business, personal letters received, reforwarded, 10c each. Complete service, \$3.00 monthly. "Hawkins," 1300 Taylor-b N.W.

MAIL Forwarded. 25c each letter. Monthly \$2.00. Banas, Box 285-C, Syracuse 1, N. Y.

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BECOME A cartoonist and commercial artist quickly with our new, easy method. Free trial offer. National Artists, Box 4248, Dallas 8, Texas.

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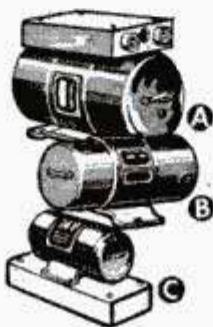
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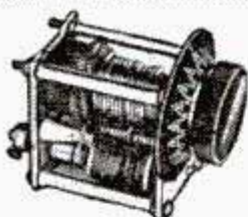
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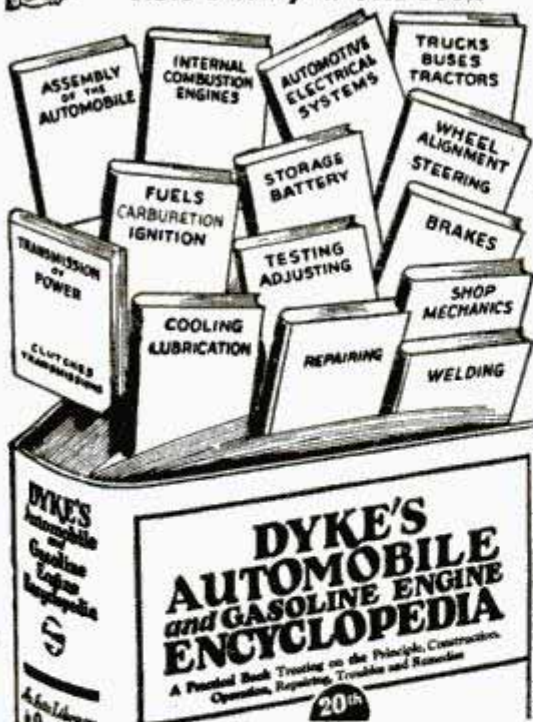
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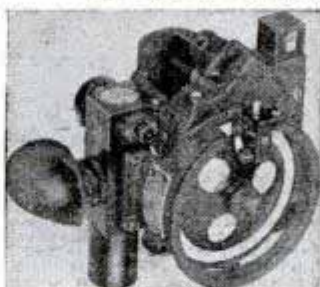
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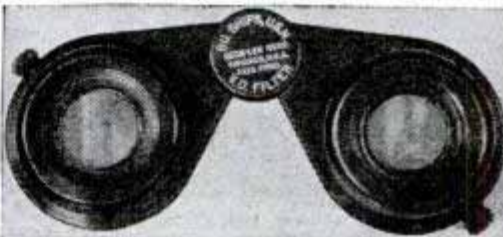
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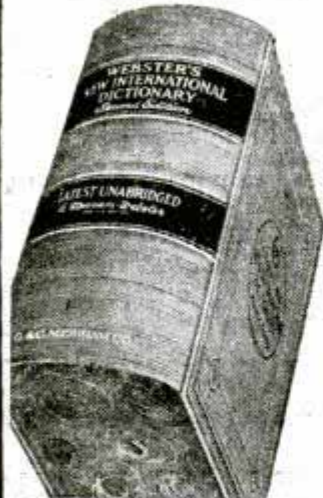
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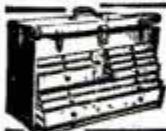
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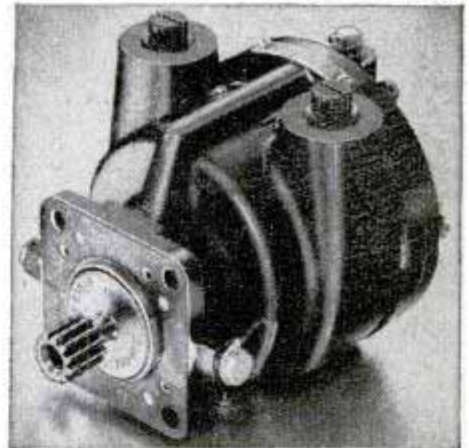
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You can cut at shoulder for heavy duty arm or elbow length full fingered rubber gloves. These heavy duty gloves alone are worth the price of the complete outfit.



A RAIN CAPE AND PARKA

Just cut off anywhere below the shoulder line and — presto — you have a valuable rain cape and parka. Wear it over your regular rain coat in stormy weather.



HIP HIGH WADERS

Just look at this value. Hip high waders, heavy duty type, too, for only \$4.95. Just cut off as shown, tape the edges and you have as fine a pair of hip high waders as you could find anywhere, and you can wear them right over your regular shoes.



TOP QUALITY WAIST HIGH WADERS

Here is a value for river and surf fishermen that defies competition. Waist high waders—even arm high waders if you want them. Use the suit as is—or cut it up as shown—any way you do it, it's a value you can't afford to pass. Get your order off today.

**Orig. Cost Approx. \$45.00
NOW**

\$4.95

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Rush Your Order Today

STARK'S BRING YOU THE BIG VALUES IN SURPLUS and other BARGAINS!

**15 JEWEL—ELGIN MOVEMENT
STOP WATCH**

Built to rigid U. S. Army Air Corps specifications by Elgin Watch Co. Guaranteed 15 jewel movement. Stem wind, stem start, stem stop and stem reset. Graduated in 1/10th seconds—10 seconds to one revolution. Use it for time study work, industrial timing, sporting events, racing—for everything that wants split second timing. Used but guaranteed perfect. Original cost was \$18.75. You save approximately one-half at this special price. Order today. Safe delivery guaranteed. **No. 200 EACH..... \$9.95**



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Stay toasty warm in the coldest weather! High pile, heavy nap genuine alpaca lining—heavy twill outer material and pockets everywhere, at knees, thigh, hips and back. All brand new. Use them for skiing, hunting, fishing. Use them for work, driving, farming, etc. Biggest bargain in warmth and comfort you ever bought. Large, medium, small sizes. Cost the Government approximately \$22.50. **\$4.88**
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MORE PIPES SMOKE PRINCE ALBERT THAN ANY OTHER TOBACCO



THE NATIONAL JOY SMOKE



How Fast Can Man FLY— and LIVE?

WHEN AN AIRPLANE travels at the speed of sound, what happens to the pilot? Is the shock wave painful to him? What is "supersonic sickness?"

Aviation needs to know the answers to such questions almost at once, for aircraft that may pierce the sound wall are under construction. Pilot safety is one of the unknowns in transsonic flight.

Some people suspect that vibrations from the shock wave, penetrating the cockpit, will sicken and nauseate the pilot. Others theorize that ultrasonic vibrations, such as are employed to homogenize liquids and to kill bacteria, will be set up and that they will disorganize the pilot's senses.

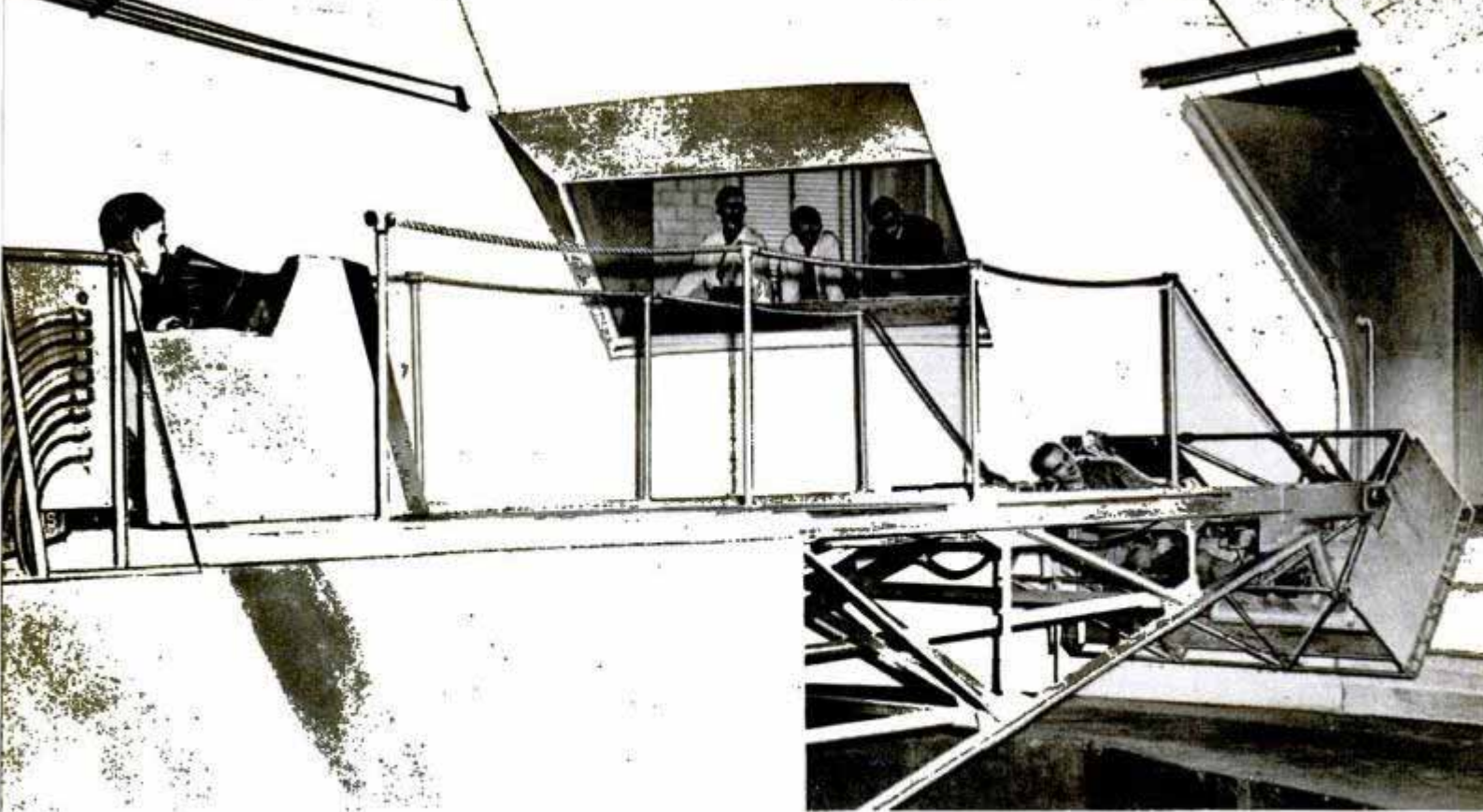
Aeromedical research men don't believe that either of these extremes is likely, but they are trying to anticipate all such possibilities so that preventive measures against harm to the pilot can be taken.

Already some curious things have happened to humans who fly fast. Pilots have landed with swollen

Pilots in the Skystreak, above, wear an energy absorbing helmet, special harness, G-suit and an oxygen mask



By Thomas E. Stimson, Jr.



To test their ability to stand high accelerations, pilots are whirled around in this huge human centrifuge

ears and their heads battered black and blue. Some have acquired high fevers in the air, others lost weight from dehydration.

Mysterious as these symptoms appear to be, they are easy to understand and prevent. Swollen ears and black and blue marks come from the pommeling that a pilot receives when he flies through rough air at high speed. A safety belt holds his body to the seat but his head is slammed from side to side and against the rear bulkhead. His ears and skull take a beating.

A new energy-absorbing helmet that contains a thick layer of cellular cellulose acetate is one possible remedy. The acetate crushes under impact of crashes and rebounds during milder impact instead of transmitting the blow. A cup-like depression in the rear bulkhead against which the pilot rests his head is another remedy.

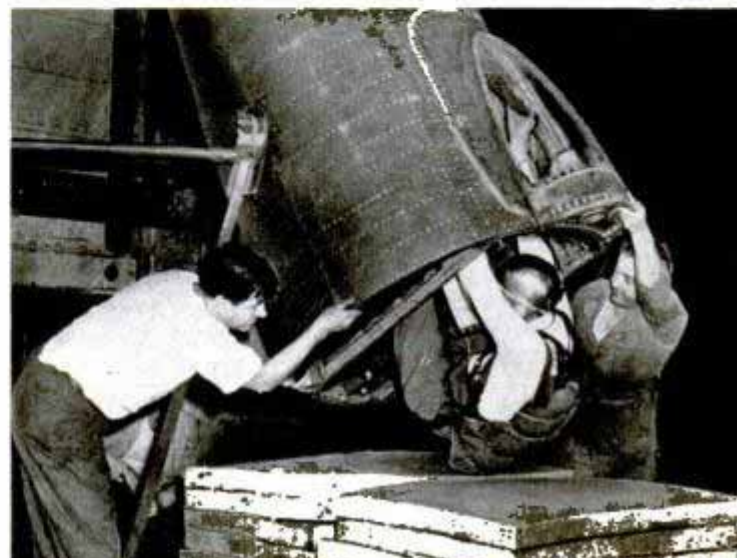
Pilots have had fevers as high as 105 degrees when their cockpits became superheated from friction with the air during speed runs. Similarly, dehydration has occurred in hot, dry weather when the incoming ventilation air sucked too much moisture from a pilot's body. Both conditions are avoided in today's fastest aircraft by means of air conditioners that hold cockpit temperature and humidity to comfortable levels.

Recently a pilot making a low altitude training run in the Navy's record-breaking Douglas Skystreak found his controls had become so hot that he could hardly touch them. The temperature had climbed to 170 degrees because he had accidentally

switched off the air conditioner. Of this heat, 80 degrees were contributed by the temperature of the outside air, 10 degrees by solar radiation, 10 degrees by indirect heat from the jet engine, and 70 degrees by the friction of the plane as it moved through the air.

Science knows that there is nothing harmful to humans in high speed itself; the dangers lie in excessive acceleration and deceleration and in the incidental energies created by the vehicle, mostly in the forms of heat, vibration and noise. A pilot can become incompetent or incapacitated if he absorbs too much of these forces for too long. Lumped together they produce the so-called "supersonic sickness." Even passengers on a medium-speed air liner become nervous and irritable if too much

In actual flight this pilot would be plunging into space instead of onto soft, sponge-rubber padding, as the nose breaks off to facilitate high-speed escape





What 6 Gs (six times the force of gravity) does to the pilot. Automatic camera records, right, how his lips and facial muscles are pulled down by the force. Tests were made in giant centrifuge at the University of Southern California

Plate glass replaced original plastic canopy of Skystreak because of frictional heat

noise and vibration are present in flight.

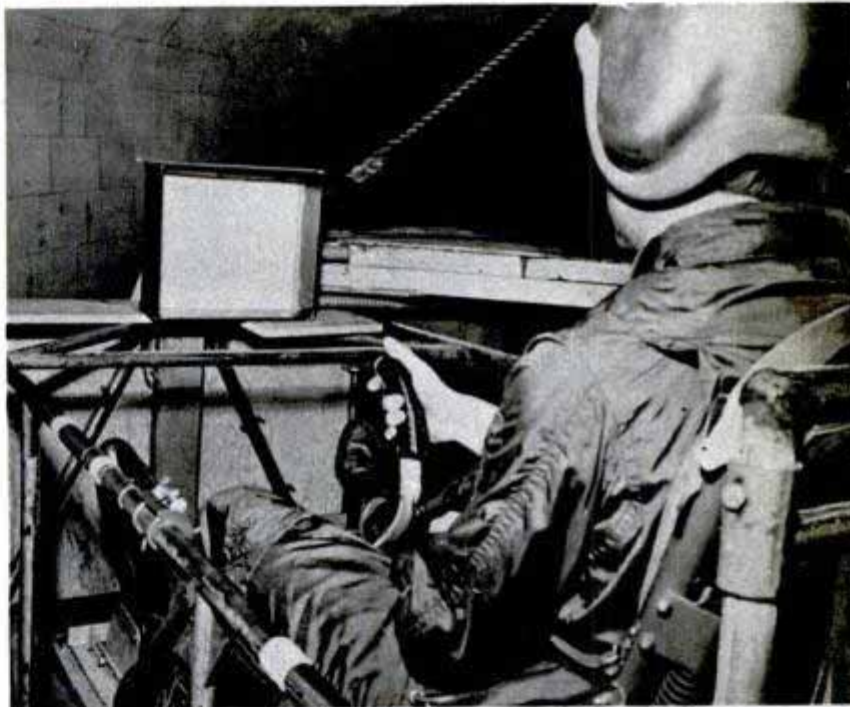
The engineers who design aircraft aren't able to remedy such conditions all by themselves; neither are the men who specialize in aviation medicine. But when the two groups collaborate they can expect to find practical answers to almost any such problems. Douglas Aircraft Company, as one instance of this, now retains Dr. Charles Lombard of the University of Southern California's division of aviation medicine as consultant in "human engineering."

How to protect fighter pilots from injury in a crash, how to avoid "explosive decompression" when a pilot must bail out of his pressurized cockpit at high altitude, how to augment the range of human vision for the high speeds now being anticipated, how to maintain pilot efficiency at extreme and abrupt high Gs—these are some of the most spectacular of the current problems.

In spite of all the research that has been done on acceleration, for instance, much more information is needed. The subject is complex. In addition to take-off acceleration and the deceleration, such as occurs in braking, there are also the so-called positive maneuver acceleration and negative maneuver acceleration. Positive maneuver acceleration is the force exerted on the pilot in such maneuvers as pull-outs and inside loops. These blackout the pilot by draining the blood away from his head.

Negative maneuver acceleration is the opposite, as in an outside loop, and causes the blood to rush toward the head and chest. One of the problems is how to protect a pilot against negative acceleration in the same way that one of the present G-suits guards against positive acceleration.

A pilot seated upright can tolerate considerable positive acceleration but comparatively little of the negative type. Lying



Pilot reaction time under extreme G stress is determined by speed with which he can respond to flight pictures flashed on screen in front of the cockpit

prone, he can tolerate large amounts of both positive and negative G, but has little resistance against the deceleration of slowing down from high speeds or crashes.

These studies are complicated by the time factor. High G that would kill or incapacitate a man when continued over a period of seconds may have little effect on him if it exists only for a fraction of a second. Tremendous deceleration, such as the impact of a crash, may impose a force of 40 or 50 Gs or even more on a pilot. But because this continues only for a few thousandths of a second a pilot who is protected by harness and helmet often is able to walk away from the wreck.

Basic data on all types of G are being



1. TAKE-OFF ACCELERATION



2. POSITIVE ACCELERATION (INSIDE LOOP)
BLOOD DRAINS FROM PILOT'S HEAD



3. NEGATIVE ACCELERATION (OUTSIDE LOOP)
BLOOD RUSHES TO PILOT'S HEAD



4. DECELERATION (BRAKING)

Amounts of acceleration that can be safely tolerated for 10 seconds (by an experienced test pilot wearing protective gear) in various altitudes. The G (gravity) capacities below are keyed to maneuvers shown above



SEATED UPRIGHT

1. 12 Gs
2. 7 "
3. 2½-3 "
4. 12 "



SEMI-SUPINE

1. 3 Gs
2. 8-9 "
3. 3-3½ "
4. 10 "



SUPINE

1. 2 Gs
2. 12 "
3. 12 "
4. 6-7 "



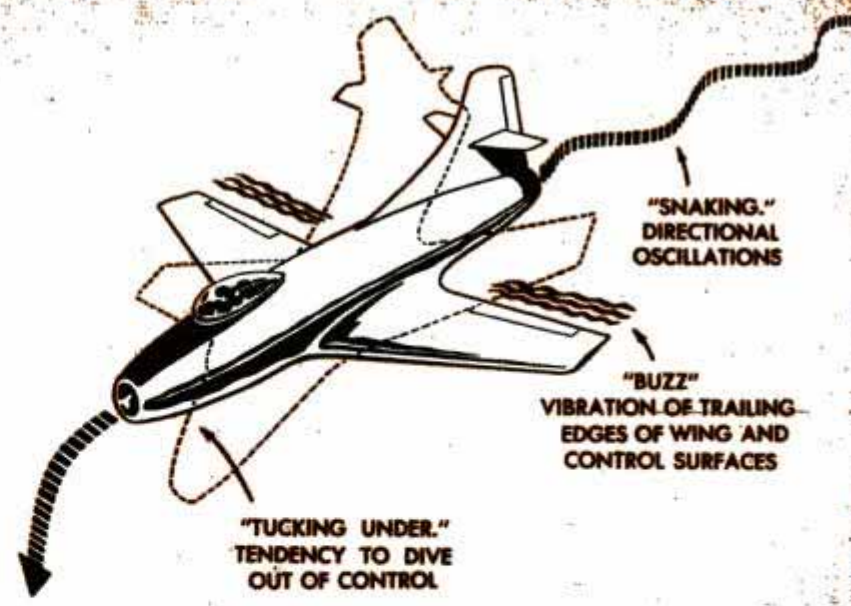
SEMI-PRONE

1. 8-9 Gs
2. 10 "
3. 3+ "
4. 10 "



PRONE

1. 7 Gs
2. 12 "
3. 12 "
4. 2½-3 "



Effects of compressibility on aircraft in the transonic range. These tendencies are believed to disappear at higher speeds

gathered by Dr. Lombard and his associates under contract with the Office of Naval Research, using the \$100,000 human centrifuge that was built at the University of Southern California during the war. Pilots are tested on the huge whirligig at different G levels for different lengths of time, in different positions and under various conditions. Blood pressures, X-rays, reaction time, reflexes and other measurements are automatically recorded during the tests. Included is the testing for new designs of G-suits and other anti-acceleration apparatus.

Some problems of safety and comfort can't be completely solved on the ground. These are to be studied by means of the Skystreak and its two identical sister planes that were built to serve as high-speed laboratories for testing men, materials and design.

When Douglas engineers designed the Skystreak, they incorporated in it all the latest ideas in pilot safety. Projections and protruding knobs in the cockpit were eliminated. The cockpit seat was shaped so that the pilot is close to the semi-supine, with his heels almost level with his hips, allowing him to take positive high G accelerations without blacking out.

Instead of the usual belt, he wears a retaining rig that consists of a combination shoulder harness, safety belt and leg straps. He wears a G-suit and an oxygen mask of the pressure-demand type for flying at altitudes up to 43,000 feet. His cockpit is both air conditioned and pressurized.

No one would be able to bail out of the Skystreak safely at high speed. So, if the pilot finds he must abandon the airplane, he trips a lever that breaks the entire nose section away from the plane. Then, when the nose slows down to a safe speed, he leaves it and descends by parachute.

At extremely high altitude the pilot would be subjected to explosive decompression at the instant that the nose breaks loose, allowing the pressurized atmosphere in the cockpit to escape. To avoid this, the release lever, when pulled, first operates a time-delay relief valve that releases the pressure in the cockpit. The delay is little more than a second in

length, after which the nose section drops off. Even this brief delay protects the pilot.

When the Skystreak set its world record of 650 miles per hour at Muroc Army Air Base in August, parts of its structure actually exceeded the speed of sound. That is, air was flowing over the cambered portions of its wing at about 800 miles per hour. Dangerous compressibility effects were not encountered and the pilot was not subjected to excessive vibration. He was, however, shaken by terrific jolts that were caused by passing through mildly turbulent air at record speed. Hardly rough enough to be noticeable in a low-speed airplane, the turbulence produced shocks of as high as 6 Gs at the speed flown. Spectators on the ground reported that the only noise from the passing of the Skystreak was a blast of sound comparable to the slam of a heavy door.

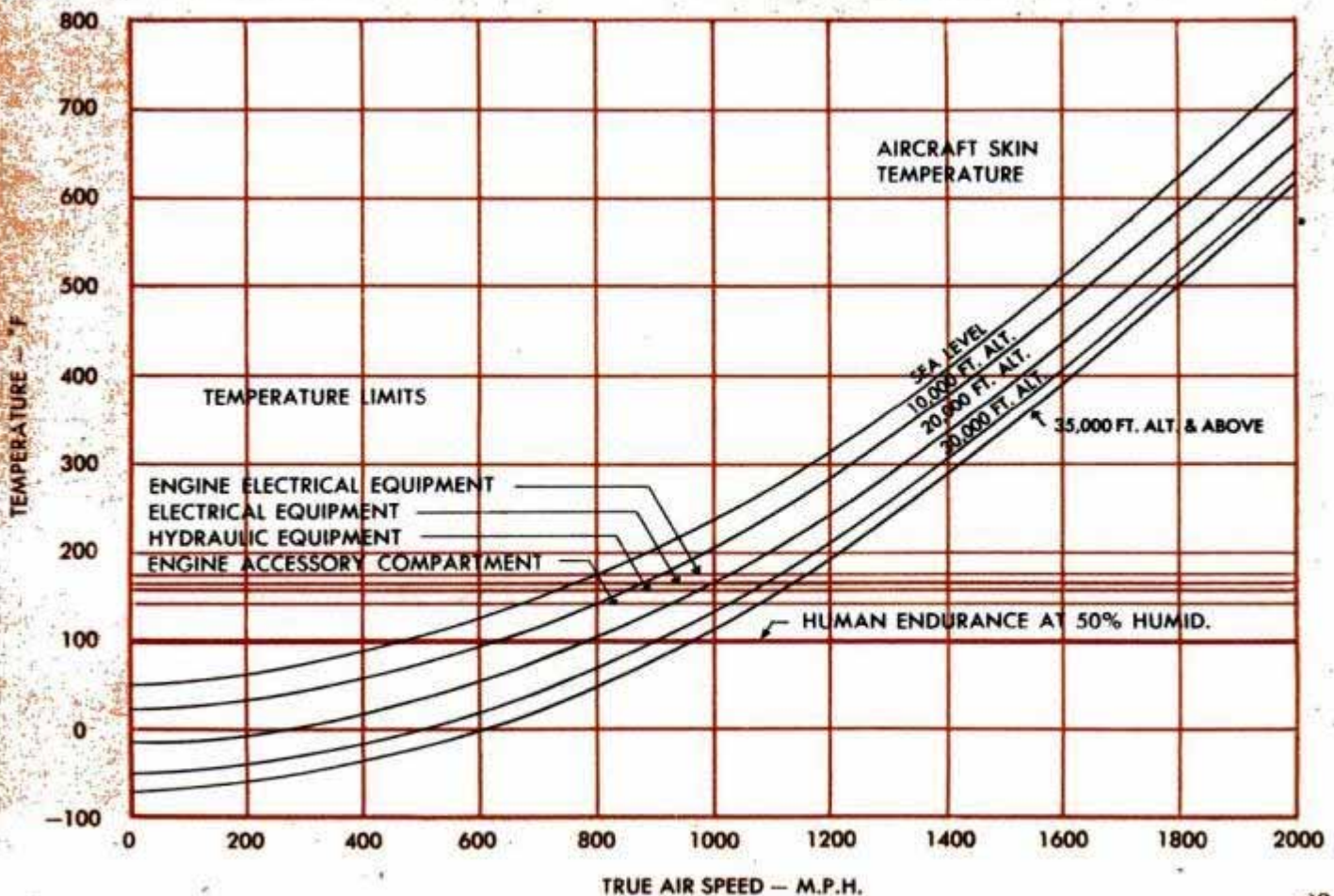
Setting records is incidental to the Skystreak's job of gathering information for safe high-speed flight, though the plane is expected to continue to set new marks when it is equipped with a more powerful motor and an after burner, and when it is flown wide open at high altitudes. Part of the research program with the plane will

(Continued to page 252)



Layers of cellular cellulose acetate inside new-type helmet absorb the shock instead of transmitting it. The helmet is painted gold to reflect the solar heat

AIRSPED LIMITATIONS DUE TO TEMPERATURE LIMITS OF COMPONENT SYSTEMS





Biggest European Flying Boat Will Carry 46

Biggest of Europe's flying boats, the 46-passenger Latecoere 631 can fly over 3500 miles nonstop. The six-engine French craft

has a wing span of 188 feet, is over 142 feet long and weighs 72 tons. It cruises 185 miles an hour. Ten of them will be built.



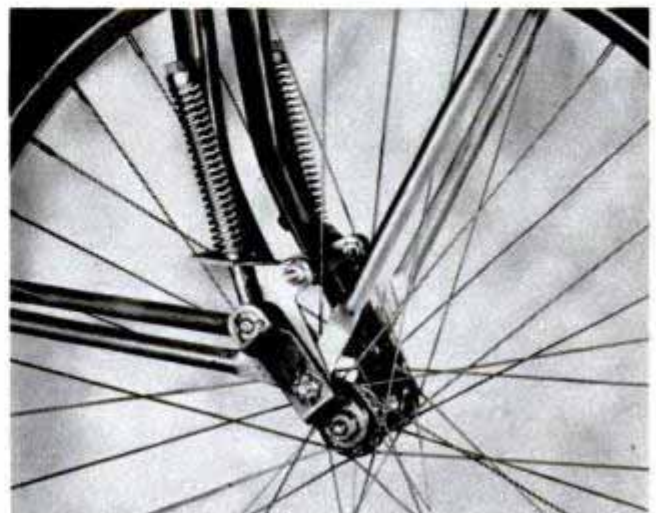
Electric Speedboats

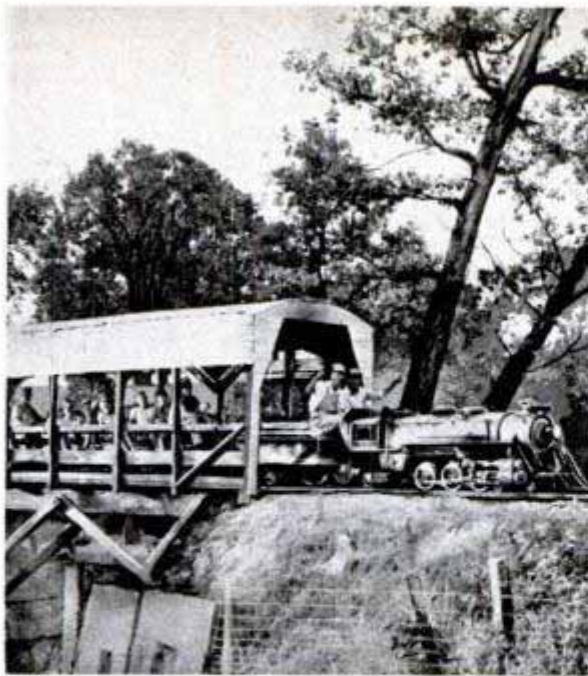
Toy speedboats molded of plastic run for several hours on the power of two standard flashlight batteries. A twist of the solid brass steering wheel starts the craft, and plastic flags and a transparent plastic windshield give a realistic appearance. The tiny electric motor requires no lubrication and all parts are plated to prevent rust. The boats are red and white with blue trim. They are demonstrated on a large table with a circular top designed to hold only a few inches of water.

Bicycle Shock Absorber

Bicycle riding is made safer and more comfortable by a front-wheel shock absorber that can be attached to any bicycle or small motor-bike. Two coiled springs cushion the jolts of rough roads that might cause riders to lose control at fast speeds. Easily attached to the front fork, the absorber permits the wheel to move up and down independent of the frame.

Rayon yarn used in hosiery, which formerly took 60 hours to manufacture, now can be turned out in 2 minutes and 15 seconds with an automatic machine developed in Germany.





Quarter-Mile Railroad Has Telegraph System

Complete even to the clatter of the telegraph, a Lilliputian railroad system in Texas uses a small-scale version of the Texas and Pacific Railway's Sunshine Special for an engine.

The Pacific-type locomotive, with a 160-pound steam capacity, rolls around the quarter-mile track at speeds up to 30 miles an hour. To make the trip more realistic, there are a 53-foot tunnel, a 22-foot-long trestle and a 40-gallon water tower. One grade crossing gives the engineer a legitimate excuse for tooting the whistle.

Built for Burke Campbell, a retired veteran of 38 years of railroading, the 18-horsepower locomotive cost \$9000. It required more than eight months to build. He uses it as an attraction at his amusement park near Longview, Tex.

The tiny Sunshine Special may show its big brothers something new in locomotive design—a steel cylinder saddle. Rough



Top left, pulling two passenger coaches, the baby Sunshine Special rolls over the 22-foot trestle. Top, a scale model of a Pacific-type locomotive, the tiny engine prepares to roll. Below, owner Campbell acts as system's station agent

roadbeds often crack conventional cast-iron saddles and at least two railroads are watching the experiment with an eye to using steel saddles on their engines.



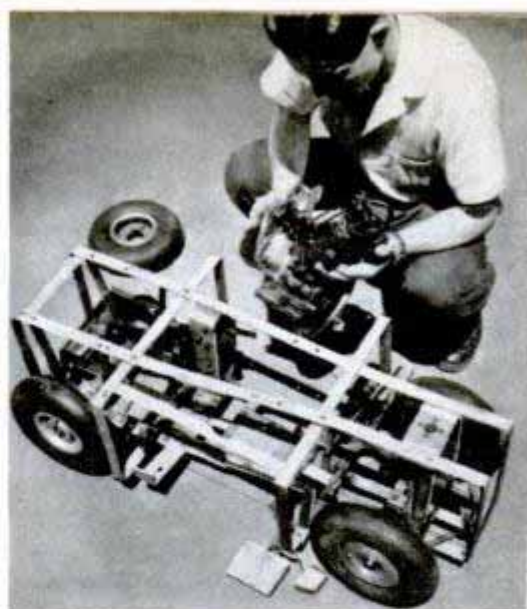
Cigarette Holder Permits Full Use of Both Hands

Handy for those who like to smoke while they work, a plastic cigarette holder with an attached ring enables the smoker to hold the cigarette without interfering with the use of the hands. After being softened in hot water, the plastic ring can be molded to fit the index finger snugly. The holder is especially useful for mechanics, artists and motorists. For ladies, the holders come in a variety of colors.

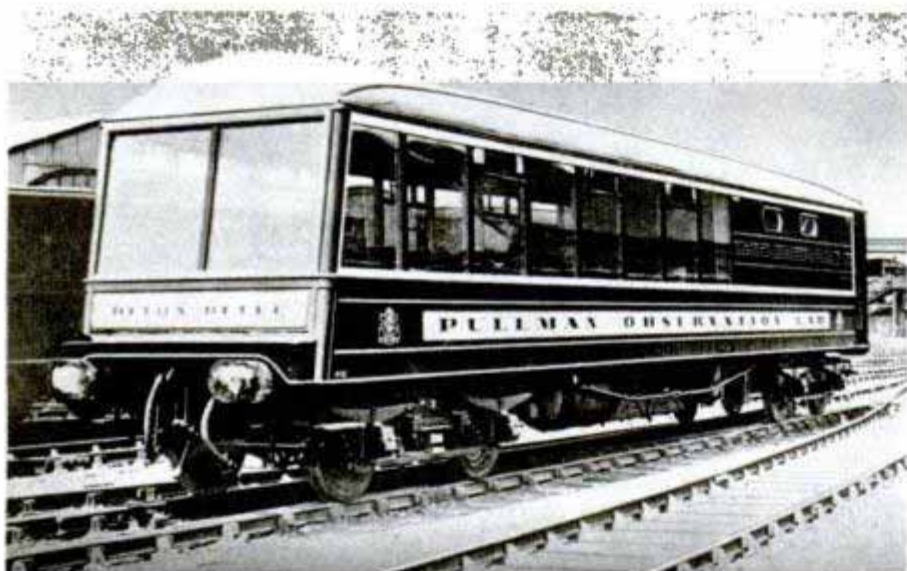


Midget Japanese Car

So light it can be carried like a suitcase, a midget automobile built in Japan has a 1/2-horsepower motor. Surplus airplane tail



wheels from Japan's wartime factories are used in the car. A tiller steers the front wheels. Only one car has been built, but the inventor hopes to mass-produce them to ease the transportation shortage.



Glass-Enclosed Car Rides British Rails

Glass panels enclose the sides and one end of the observation car on a new English train, giving passengers an excellent view while riding. The car is attached to the Devon Belle, the Southern Railway's crack holiday train made up of 12 sleeping cars. The observation car is equipped with a loud-speaker for broadcasting announcements to passengers.

Sliding Glass Panels Form Cold Frame

Cold frames developed in England have glass panels that can be inserted or detached with changes in the weather. The frames also give special protection where desired. The frame is made of metal and the glass panels slip into grooves.

☐ Fishing lures scented with natural odors to attract fish are being developed by a manufacturing chemist.



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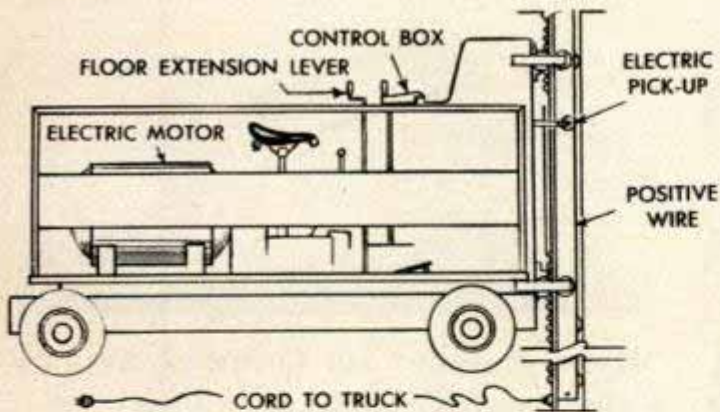
SEE
HERE-TO-FIND
INDEX



← Powered by a gasoline engine, the test model lifts inventor Bennett to the top of the vertical I-beam

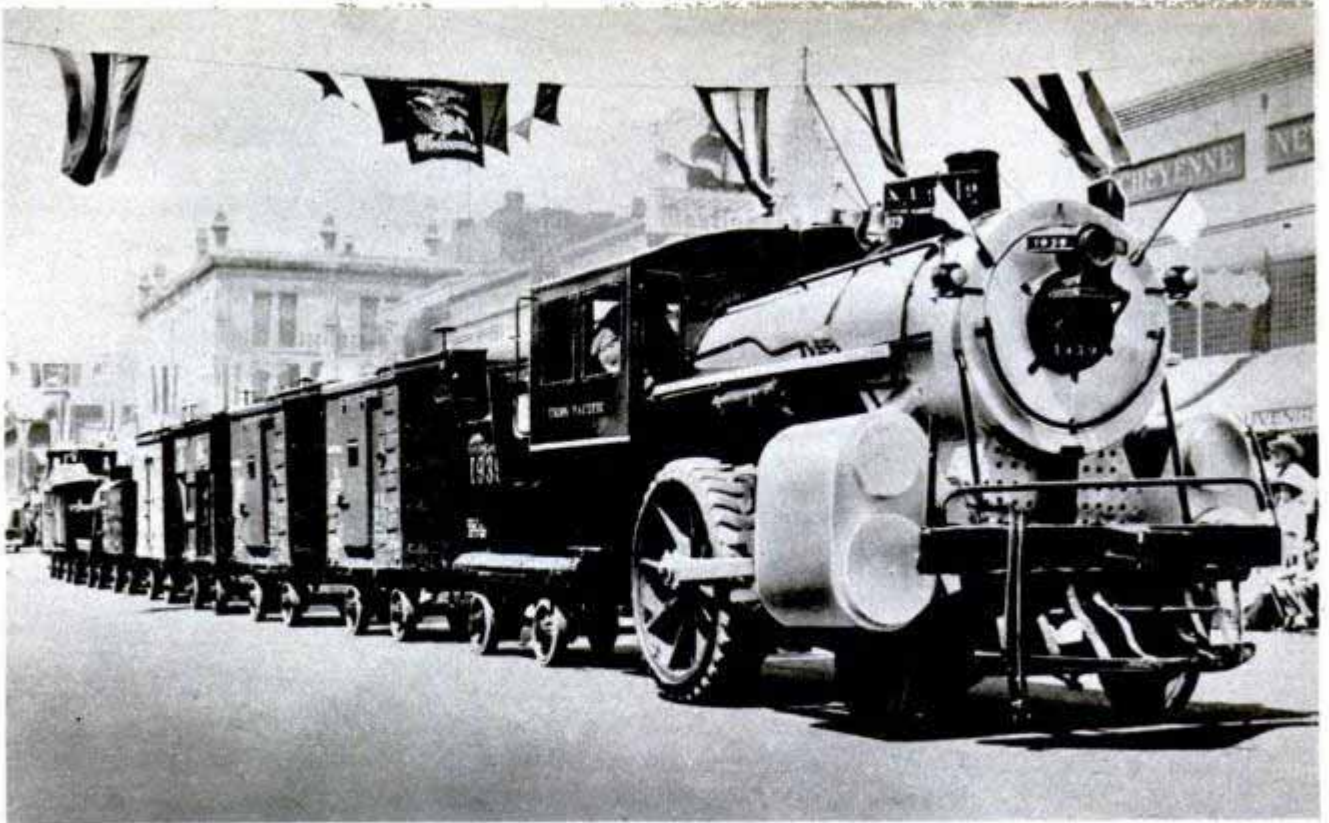
"MECHANICAL FLY"

People trapped in upper floors of burning buildings may soon be rescued by a "Mechanical Fly" invented by Willis J. Bennett of Kansas City, Mo. The rescue elevator, operating on the rack-and-pinion principle, is attached in seven seconds to an I-beam permanently mounted on the building. A two-cylinder gasoline motor drives a gear that engages a toothed rack on the vertical beam and raises the car at speeds up to 75 feet a minute. Descending, the car travels 150 feet a minute. Folding platforms open out to accommodate eight persons plus the operator. Bennett is working on an electric model that will climb and descend 300 feet a minute and will be powered by a generator that will be mounted on a truck built to haul the "Fly"



↑ Generator in truck will power fast electric model
 ↓ "Mechanical Fly" goes to fires under its own power





Train Travels 200,000 Miles Without Pay Load

In 25 years, one Union Pacific freight train has never hauled a pound of cargo. It's a miniature train consisting of a locomotive and seven cars. Built for use in parades, rodeos and other celebrations, the

locomotive is mounted on a tractor chassis and stands only six feet high. The train depends upon its big brothers for transportation between parades and has covered more than 200,000 miles in its travels.



Air Hammer Has Multi-Angle Head

Those hard-to-get-at spots are reached easily with an air hammer having a head adjustable through 180 degrees. Weighing less than 3½ pounds, the hammer uses only 5 cubic feet of air per minute at 90 pounds pressure. A needle valve permits choice of either light or heavy hammer action. More than 50 interchangeable tools made from shock-resisting steel, including a hackout chisel, can be used with the hammer.

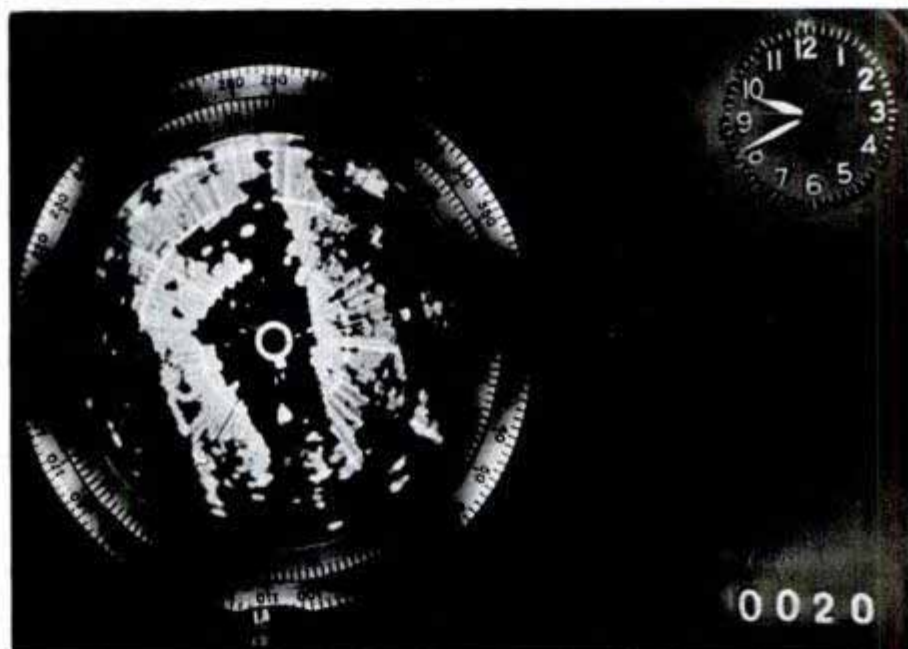
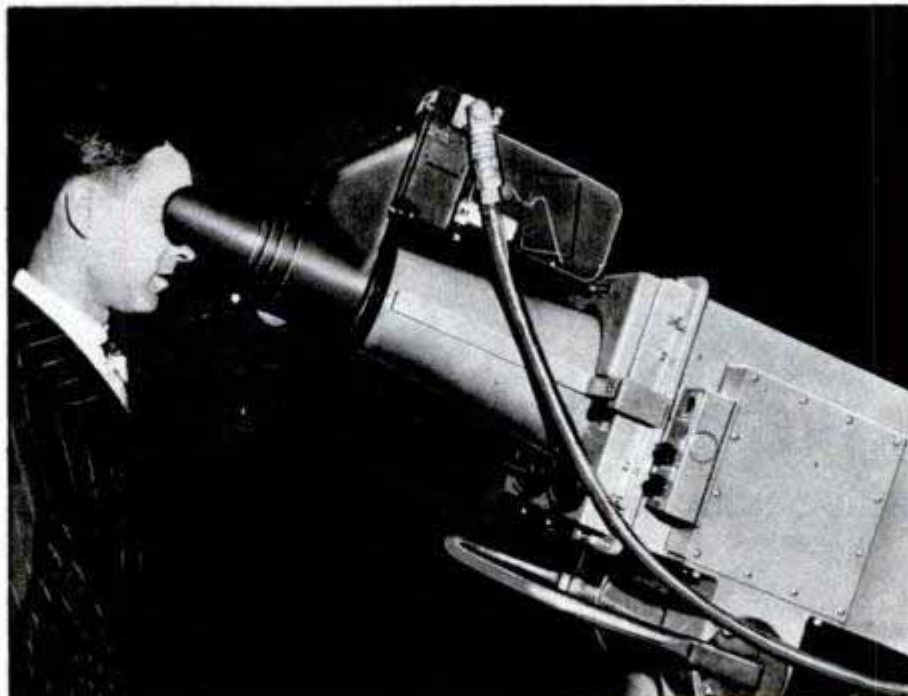


"Hypo Needle" for Grinding Wheel

Diamond compounds for grinding hard surfaces are applied to the grinding wheel by a dispenser resembling a hypodermic needle which controls the amount of compound ejected. The compounds, of different grain sizes, are available in cartridges which are slipped into the applicator. The stem of the applicator is pushed down to squeeze a portion of the compound onto the wheel. The hermetically sealed cartridges prevent contamination and are convenient to store. The compounds can be used to grind or polish steel, chrome-plate, tungsten carbides, sapphire, ruby and even diamonds. The particles are suspended in a water-soluble vehicle.

Rivermen Use Radar To Steer in Fog

River navigation by radar is being simplified with strip maps made from radar photographs. With them pilots can steer "blind" in bad weather by comparing images on the scope with radar photo-maps for the same section. The system, developed by Colonel Benjamin B. Talley of the Army Engineers, eliminates the need for keying radar images to conventional charts in determining position. Four to six exposures are made each mile with a Fairchild automatic camera and fitted into a mosaic. Engineers add indications of the sailing line, depth figures and short descriptions of important landmarks. The radar has a range up to eight miles, hugging the surface to pick up objects as small as a buoy. The technique has already been used in charting more than 100 miles of the Ohio River.



Compact Gas Storage

By converting natural gas into liquid form, chemists at Northwestern University have been able to store 800 cubic feet of gas in a space of one cubic foot. The temperature of the gas is reduced to 260 degrees below zero in the process. Refrigeration equipment and insulated

tanks will permit elimination of present large storage tanks. The liquid gas returns to its gaseous state when the temperature is raised. The process will enable cities to maintain adequate reserves economically.



Jet-Propelled Bicycle

William Tenney and Charles Marks of Dayton, Ohio, believe they have constructed the first jet-propelled bicycle. It is powered by three tiny jet engines developed for model planes. The jets are mounted on the rear fender, with their common fuel tank just below the rider's seat. This bike cruises at 30 to 35 miles an hour.

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario, Chicago 11.

AERIAL-NE CO.
DAYTON OHIO
J. W. W.



Used at Battelle to separate very fine particles of ore, each successive cone in the scale blows less air upward

YOUR NEW SMOKELESS coal stove and the ship-bottom paint that created a critical housing problem for barnacles have something in common. And both are related to your watch's new non-rusting, nonmagnetic mainspring and the electronic tuning fork that sings out a sweet and true "A" for the orchestra.

These and a thousand more crystallized ideas, some vitally important during the war and most of them contributing to your peacetime well-being and comfort, are the creations of the same coterie of brains at Columbus, Ohio.

All over America there are research institutions without a product to sell except scientific brains. Perhaps you own a small factory manufacturing a product that performs and sells well enough, but you think it could be improved. Better material, or a shortcut in production, might enhance the profit and the product. But your small company lacks a research organization. There are thousands of small industries like yours, and plenty of large corporations that need specialized assistance, which turn to the research laboratories operated by universities, the government or independent organizations.

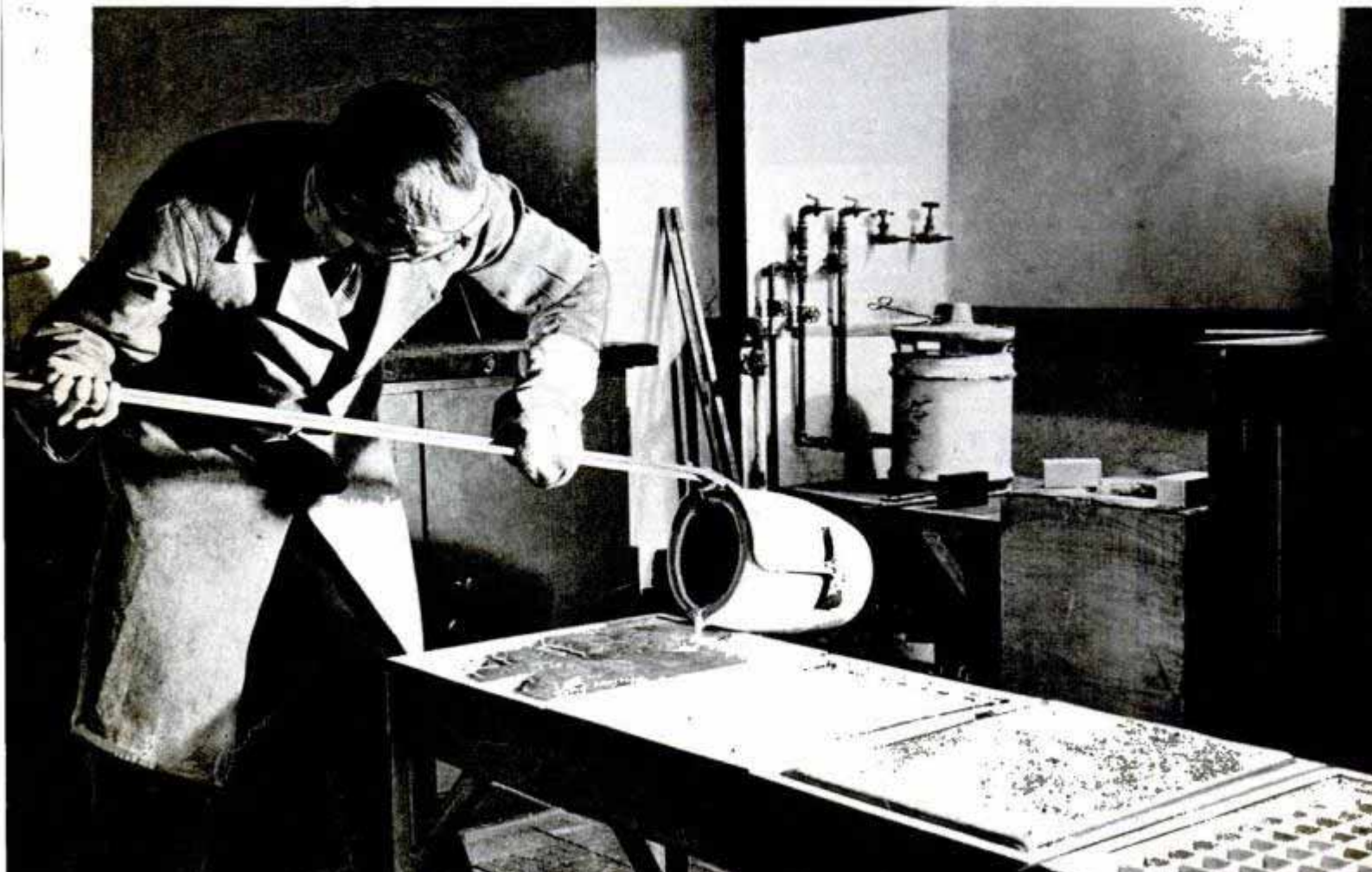
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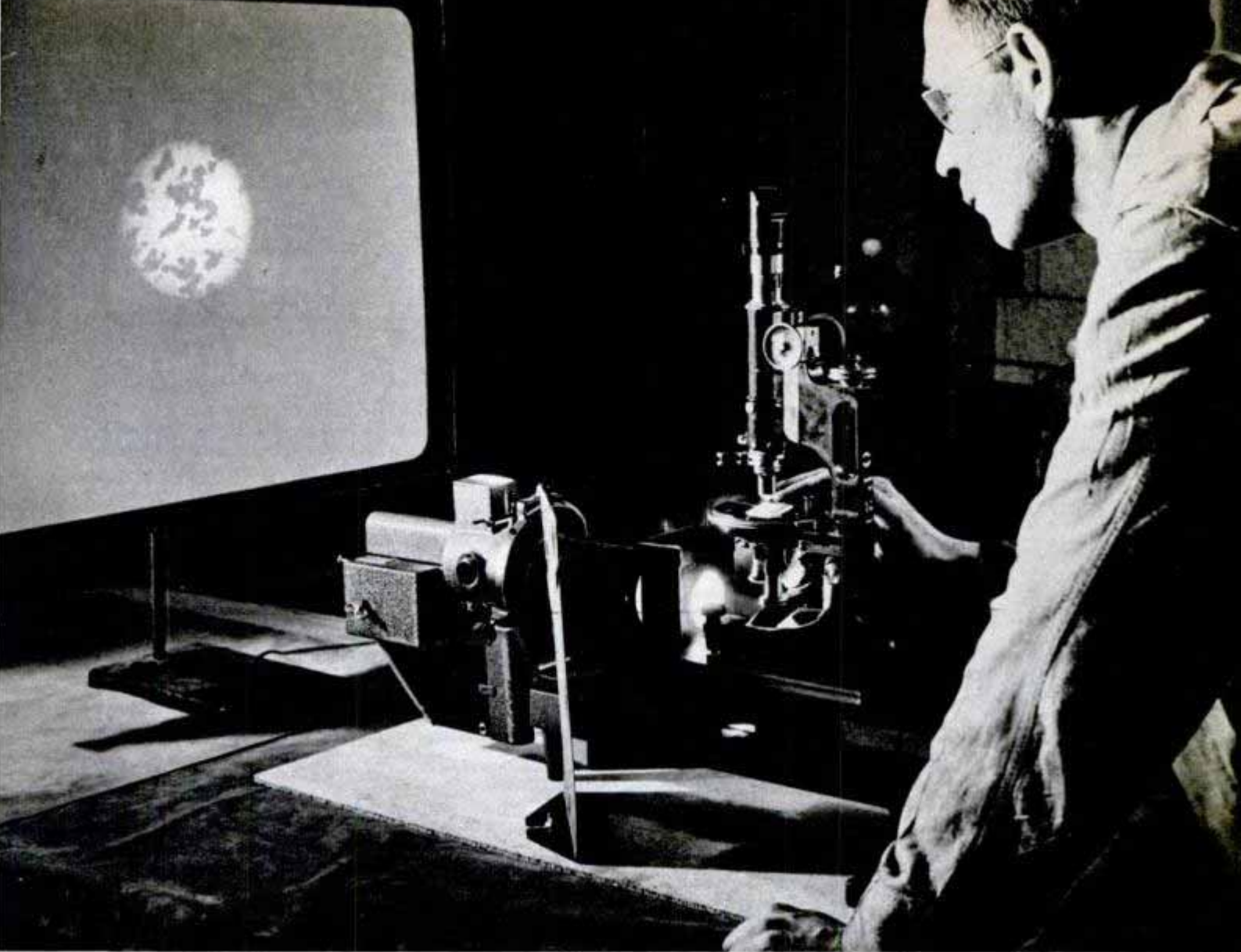
John R. Kinsey



RESEARCH BRAINS FOR HIRE

Projects at the institute are varied. Here a melt of aluminum alloy is being cast into small test ingots





By using a projecting microscope on a thin piece of ore, several experts can see and discuss it simultaneously

Battelle Memorial Institute at Columbus is a typical independent research laboratory. Its 990 scientists today are engaged on such widely different projects as a search for the best possible alloys for tomorrow's supersonic jet planes; for methods of producing dustless and smokeless coal, and for soil chemicals to grow crops and flowers that are disease-free and insect-repellent. Its services to all types of industry are on a nonprofit basis, in accordance with the dictate of the late Gordon Battelle, who left the bulk of his estate to endow the institution to "serve mankind through the making of discoveries and inventions." The laboratories started life in 1929 with 30 scientists. This year their research bill to industry on a strictly cost basis will be over \$4,000,000.

Not long ago announcement was made of a new tough alloy developed for watch mainsprings, hailed by some in the trade as one of the most important improvements in watchmaking for two centuries. This was the "baby" of a Battelle metallurgist, to whom the problem was put by George

Ensign, research director of Elgin National Watch Company. Ensign said the alloy mainspring comes closer to delivering constant power to watches than any previously known metal; it is nonmagnetic, prevents rust formation and is unaffected by humidity.

The revolutionary smokeless stove engineered at Battelle is already on its way to production by a group of stove manufacturers. So efficient is its combustion that the smoke is burned to colorless gas before it enters the flue.

Other Battelle developments from fuel studies include a radiant-tube furnace which burns pulverized coal and is used for heat-treating, annealing and enameling; special treatments to make coal dustless; discovery of causes for corrosion in coal stokers; and the engineering of a mechanical stoker which handles all grades of coal. Under investigation now are problems connected with the use of coal for air conditioning and refrigeration.

One of the strangest devices invented at the Columbus institute is the electronic



When the Columbus Symphony wanted a more accurate pitch standard than the oboe, researchers invented the "obotron," an electrically driven tuning fork

tuning instrument, which they call an "obotron." It is an electrically driven tuning fork with an amplification system which sounds a true "A" note. Battelle developed the obotron for the Columbus Philharmonic Orchestra to provide scientifically the pitch standard to which musical instruments could be tuned. Ordinarily, an oboe player sounds the "A" to which instruments are tuned.

However, of all the instruments in an

Demonstrating the insect-killing ability of sodium selenate; the plant at left had it, the other didn't



orchestra the oboe is the most difficult to tune, according to Izler Solomon, conductor of the Columbus Philharmonic. For that reason, it is customary for the oboe player to tune his instrument first, after which the other instruments are tuned to the oboe "A" note. The fidelity of the entire orchestra's pitch is only as good as the oboe player's reference note.

Mr. Solomon wanted a scientific instrument which would eliminate the human element. The obotron has a tuning fork which is carefully adjusted to a frequency of 440 vibrations per second, which creates a true "A" note.

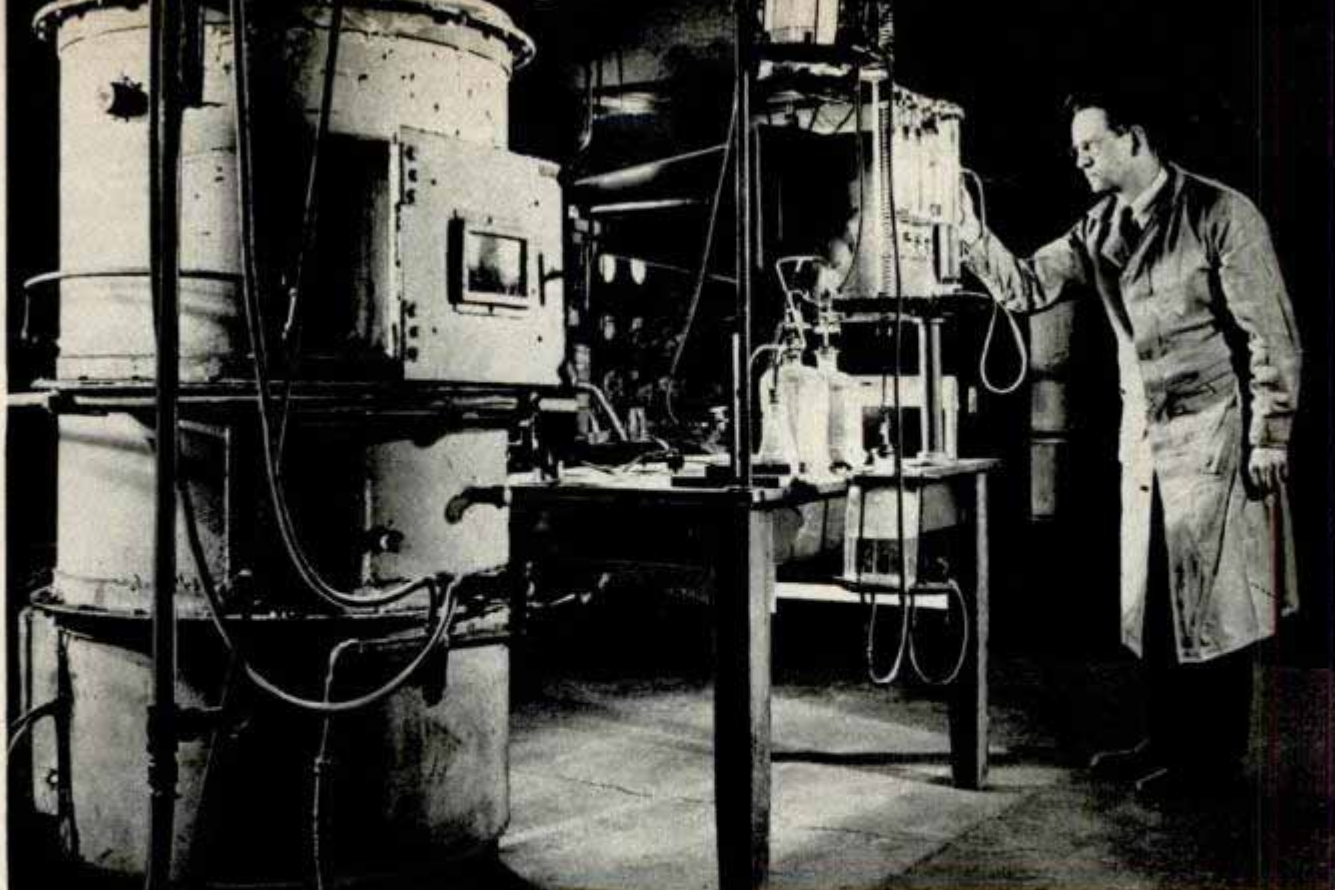
A few doors away from the birthplace of the obotron, Battelle horticulturists were experimenting with a soil chemical to kill plant insects. Extensive tests showed that sodium selenate added to the soil was absorbed by various plants, making them poisonous to pests which attack them. Successful results were reported for chrysanthemums, carnations and hydrangeas to combat red spider mites, aphids and thrips. In studying the effects of metals and chemicals on soil, Battelle men also found that small amounts of a metal compound introduced into the soil in southern tobacco fields increased the crop yields.

Another Battelle accomplishment in the field of chemistry is the paint that protects a ship bottom against barnacles and eliminates need of dockings to remove barnacles and other marine growth.

Developed after 3½ years of research, the paint owes its effectiveness to metallic copper which, in combination with other ingredients, makes the painted ship hull poisonous to marine-life attack. It has proved effective in preventing barnacle infestation for as long as two years. The paint may be applied to metal or wood surfaces with equal protection.

One of the most important projects at Battelle—and still shrouded in secrecy—is a search for more knowledge about heat-resistant alloys to speed the development of supersonic planes. The Navy, envisioning faster planes requiring higher operating temperatures, wants to learn more about the fundamental science of high-temperature alloys. If the "why" of these alloys can be learned, it may be possible to predict the compositions of new and better alloys that will withstand these higher temperatures.

Battelle aircraft research also has contributed to more efficient hydraulic systems to actuate landing gears, flaps and controls. A new "O-ring" packing to seal fluid in the system is being used in most new aircraft. It has been difficult to find the right material for this packing because of the high pressures of hydraulic systems



One tool in the program to improve furnaces, this apparatus is used to analyze gaseous combustion products

(up to 3000 pounds per square inch) and the wide range of operating temperatures (from 65 degrees below zero to 160 above). Synthetic rubber is being used rather successfully. Some failures still occur, Battelle reports, and experiments are continuing.

The developments described represent only a small fraction of the accomplishments at Battelle. Thousands of products made by more than 1000 corporations have been improved by Battelle scientists.

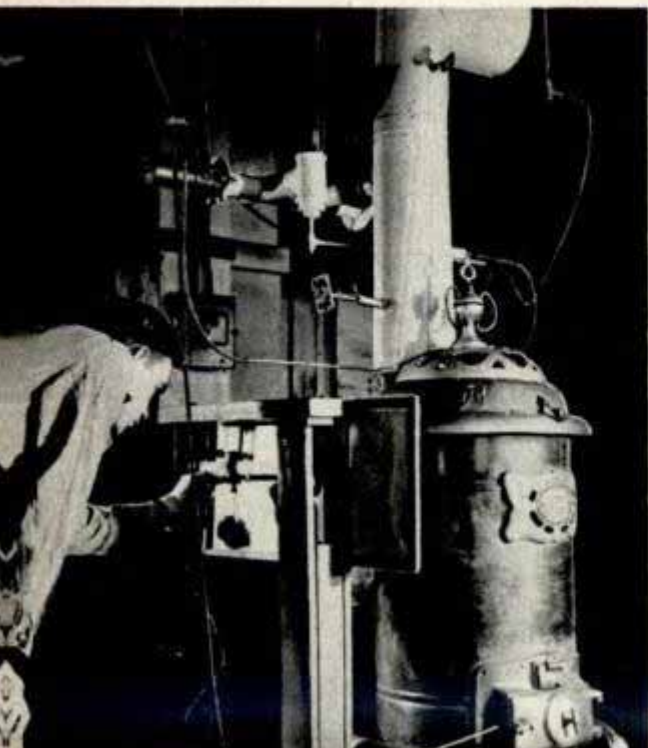
Regarding the institute's future, Clyde

Williams, the director, has this to say:

"Pessimists exclaim that technological progress cannot continue at its present rapid rate. To this I point out that technological developments during the past 50 years outweigh in significance those of all preceding history.

"Each succeeding decade has presented an increased rate in the development of new industries and the improvements of the old. Who has the courage to say that the end has come?"

Even old-fashioned heating stoves are studied carefully to learn ways of bettering new designs. Right, the smokeless stove is another Battelle contribution. Smoke is burned to colorless gases before entering the flue

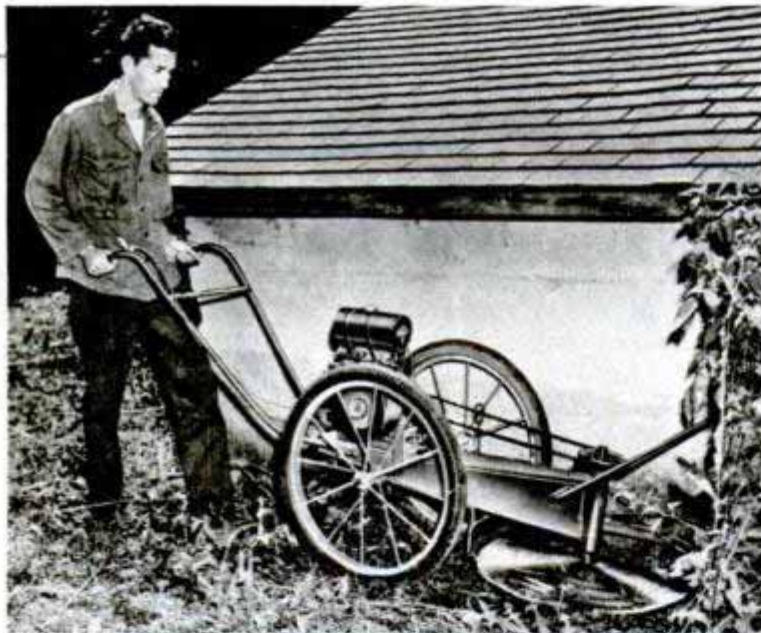




Bomb Debris Made Into Tile for Berlin Roofs

Bomb debris in the American sector of Berlin is tossed into a stone-smashing machine, ground into powder and converted

by hand into tile for roof repair. The work is done by German women who receive relatively high pay, plus increased rations.

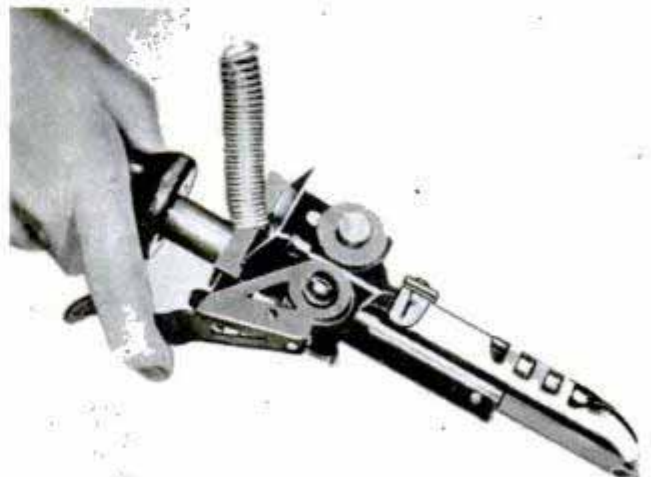


Adjustable Weed Cutter

Adjustable for mowing everything from the front lawn to tall, heavy weeds, a weed cutter has its 1½-horsepower gasoline motor mounted for easy removal for use separately to power emery grinders, feed grinders, pumps and other small equipment. The blade can be set to mow lawns as close as ½ inch from the ground and within ¼ inch of trees and other obstructions. A weed guard on the front of the cutter windrows weeds clear of the blade after cutting. The wheels can be moved up or down and in or out to compensate for uneven ground or to meet special mowing requirements.

"Third Hand" for Solderers Feeds Solder to Tip of Iron

Standard soldering irons are made semi-automatic by a feeding attachment that makes soldering a one-hand operation. By freeing one hand to manipulate parts and other tools, the attachment speeds soldering considerably. A feed lever near the handle of the iron moves the wire solder forward until it touches the tip of the iron. Solder in short lengths, in small coils or fed from spools up to 25 pounds can be handled by the attachment, which can be adjusted to feed up to ⅜ inch per stroke.



TEST YOUR SCIENCE

By Rex Taylor

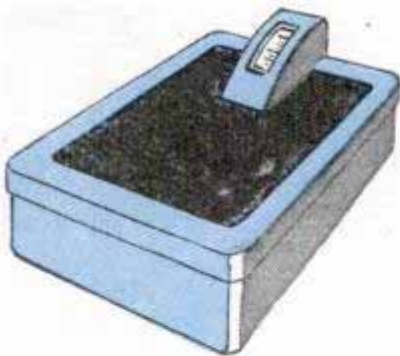
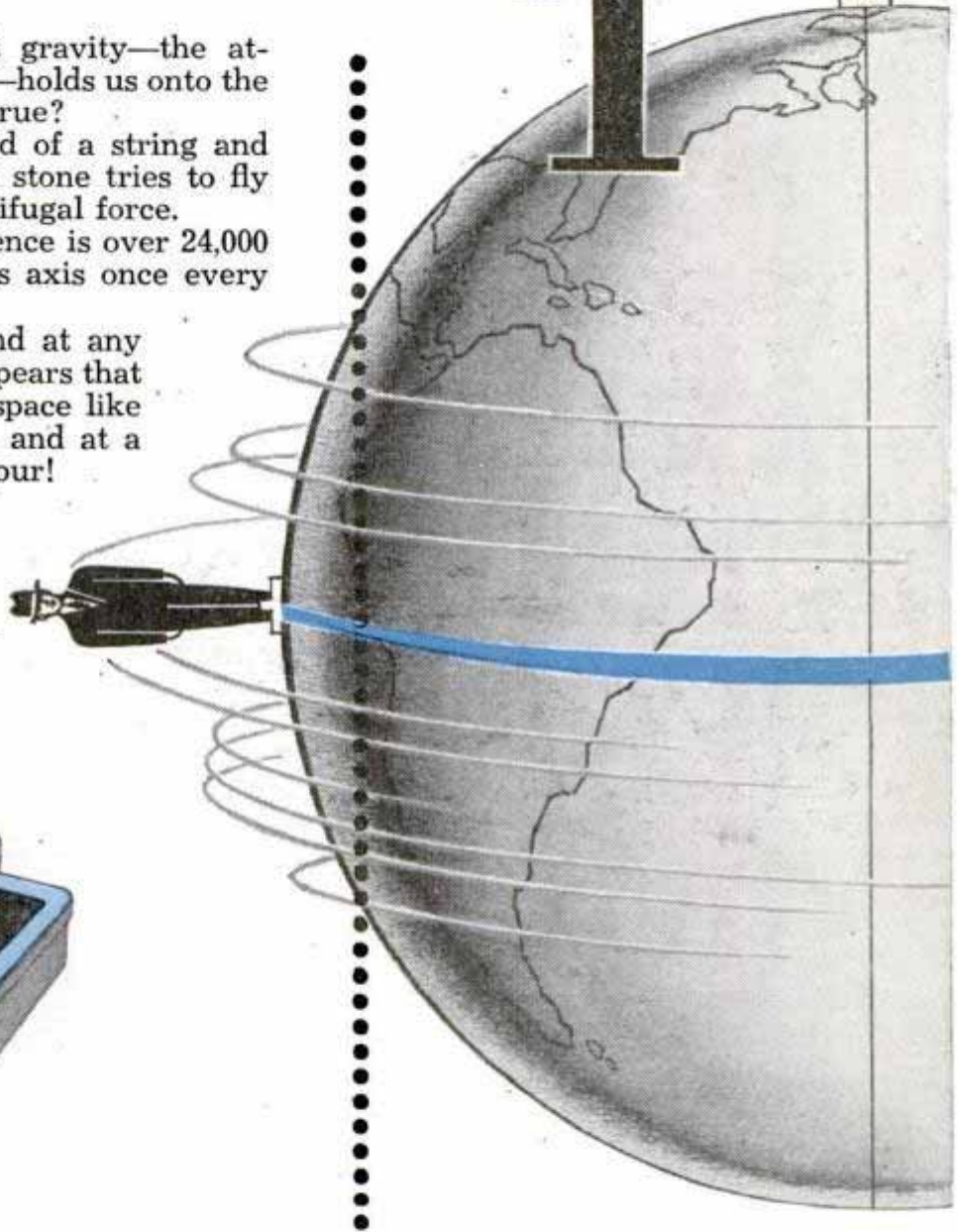
SCIENCE tells us that gravity—the attraction of mass to mass—holds us onto the earth's surface. Is this true?

Tie a stone to the end of a string and whirl it in a circle. The stone tries to fly into space. That is centrifugal force.

The earth's circumference is over 24,000 miles and it spins on its axis once every 24 hours.

Therefore, if you stand at any spot on the equator it appears that you would fly through space like the stone on the string, and at a speed of 1000 miles an hour!

i.q.



If you weigh yourself at the equator using a spring scale, gravity must be strong enough to overcome that centrifugal force, and in addition make the scale record your normal weight, say 150 pounds.

But if you take your scale to the North Pole you are on the axis and there is no centrifugal force. What do you weigh? Still 150 pounds! What has become of the gravity which was used at the equator to overcome the centrifugal force there? Was Newton wrong?

Answer on page 238



Foolproof Water Softener Has Single Control Lever

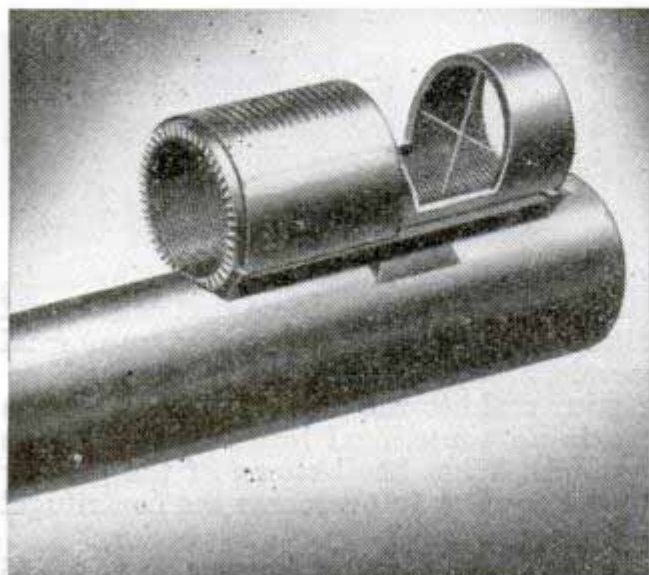
Operating a new water softener is made easy by a single control lever that is shifted like automobile gears. The four positions are numbered in the sequence of operation to make the regeneration process virtually foolproof. There are no extra valves to open and close as the control lever makes these unnecessary. The new softener also removes all insoluble sediment.

Deodorant for Garbage Dumps

Odors from garbage dumps, polluted streams and manufacturing plants are destroyed—not just concealed—by a new deodorant containing ammonia. Available in liquid or crystal form, the material is applied by sponging surfaces or spraying. It is effective against garlic, onions and spoiled potatoes. Known as Hyamine 1622, the deodorant also kills germs.

Invisible Christmas Cards

Persons receiving invisible Christmas messages will be puzzled to find a blank card inside the envelope. With the card is a piece of paper toweling with instructions to rub the card with plain water. The water “develops” a seasonal photograph in sepia tones and a greeting signed in invisible ink by the sender. After water has been applied to the card, the photograph and greeting become permanent. There are 12 different cards packed in each box. Invisible ink is supplied with the cards.



Cross-Wire Rifle Sight

Using the cross-hair feature of the telescopic sight without magnification, a new front sight for rifles consists of two cross-wires fitted into a tubular housing. Designed primarily for game shooting, the sight provides good vision and target definition. An adjustable “window” or cover slides over the opening behind the cross-wires to regulate the amount of light on the wires. The sight can be used with a receiver or open rear sight.

DDT sprayed on a 30-acre test tract killed insect pests, but reduced by 65 percent the five most common bird species, according to U. S. Fish and Wildlife Service.



Train Telephone Service

Making a telephone call from a train speeding between Washington and New York is as simple as using the telephone at home. A soundproof booth in the lounge car provides privacy during the call. The passenger's voice is radioed to one of four relay stations along the route and then transmitted over telephone lines anywhere in the world. The system uses two channels, one for sending and the other for receiving, so conversations may be carried on just as over regular telephones. Incoming calls are received by the stewardess at the switchboard and she pages the person being called. Although installed for the use of passengers, the telephone can be used by train crews when necessary.

Armrest Supports Driver's Right Arm

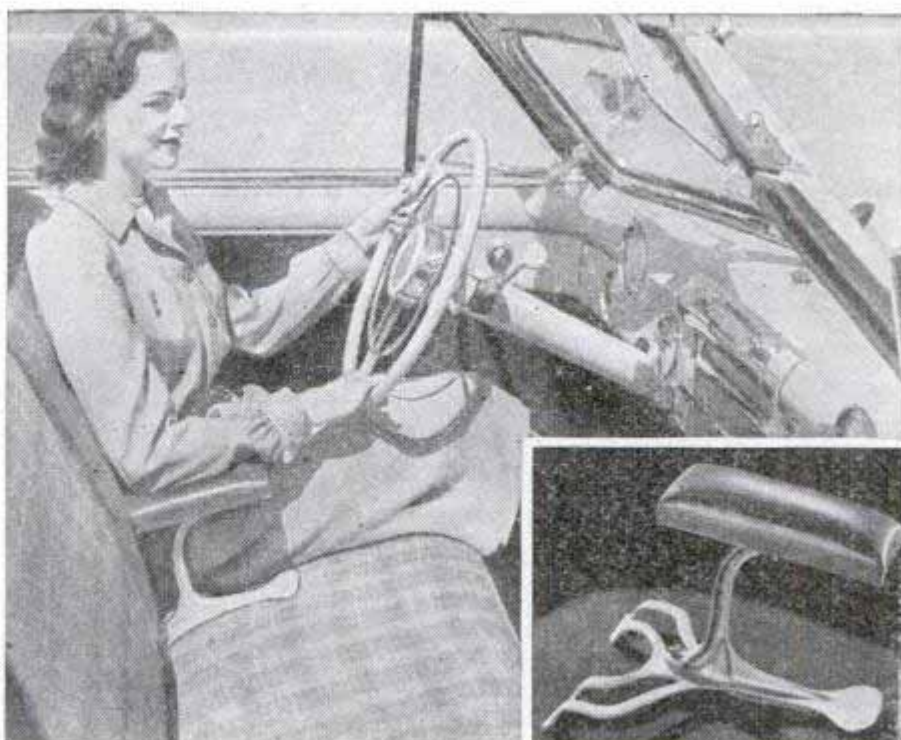
Drivers relax as they ride with a padded armrest that fits any car. The armrest, designed to support the right arm, is held in place by a base that wedges between the seat and back cushions. It is removed easily and can be used on either front or rear seats.

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.



Slingshot Sharpshooter

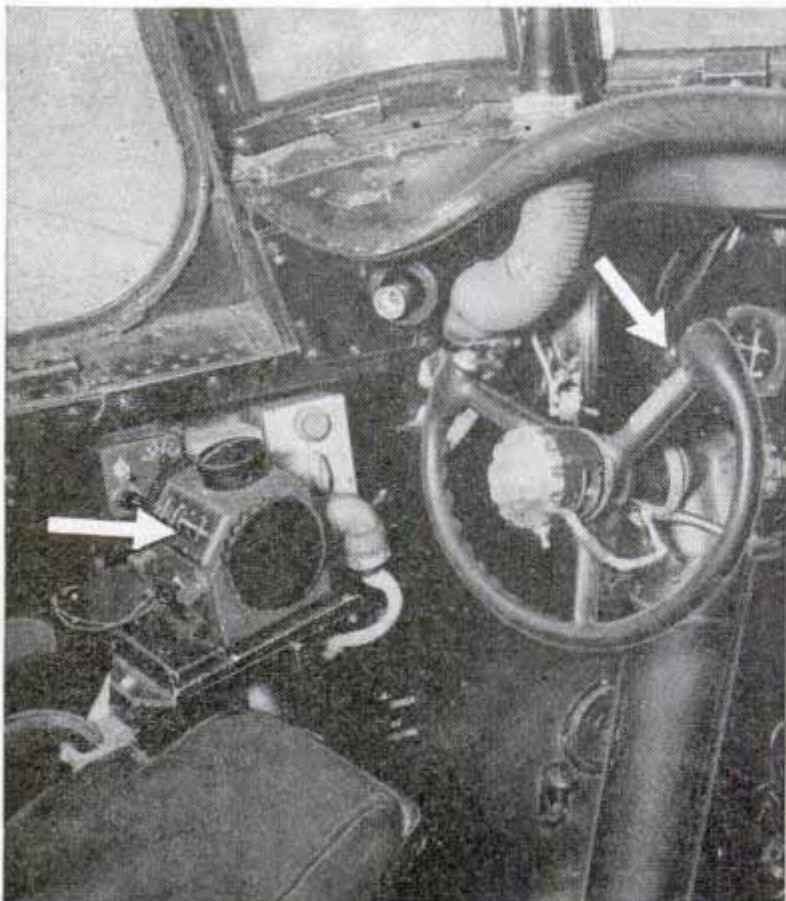
Practice makes perfect and after 52 years of practice, Homer H. Parker of Morris, Ill., can fire an ordinary slingshot with accuracy that is the envy of many pistol marksmen. At a distance of 20 feet, he bends pins and breaks cigarettes. Matchboxes and cigarette packages are easy targets at even greater distances. His slingshots are the same as boys have used for years: forked branches and inner tubing. For ammunition, he uses marbles.





U. S. Air Force photos

Pushing button, above, starts automatic flight. To regain control pilot presses button on wheel, right below. Left, automatic pilot



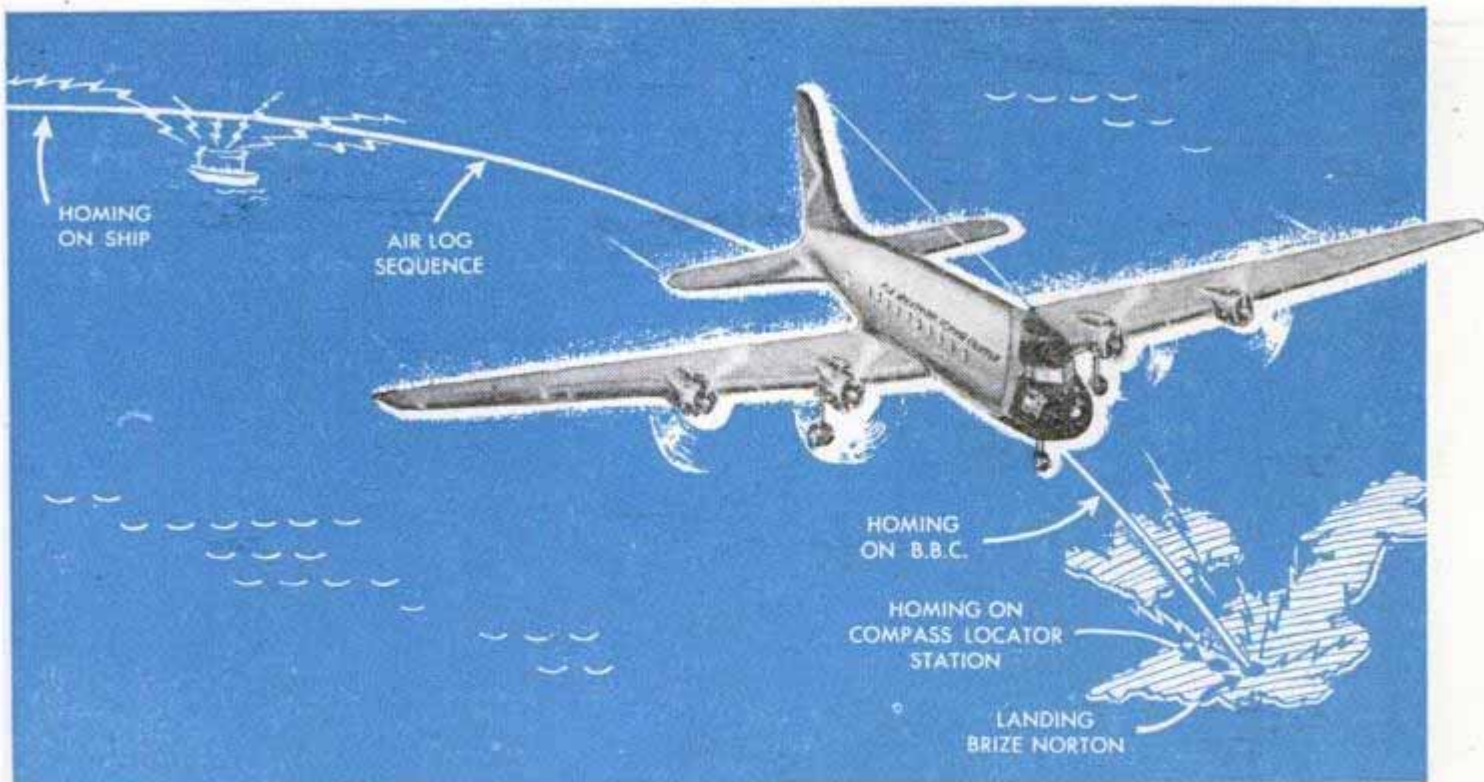
By Aubrey O. Cookman, Jr.

WHEN the push-button Robert E. Lee "kissed" earth at the end of an 8000-mile round trip to England, one of the biggest milestones in man's conquest of the skies was completed. For the plane's 700-pound mechanical "brain," controlling genius of its automatic flight, promises to make flying safer, more precise and less work for human crews.

From take-off at Newfoundland to touch down at Brize Norton, England, not a finger was laid on the controls by Col. James M. Gillespie and 13 other observers. Only on returning to Newfoundland, where no guiding beam was available, was there need for a human aboard. "We were just along for the ride," one of them put it.

The brain's performance points the way to virtual elimination of pilot error, by far the biggest cause of accidents, and brings us closer to all-weather flying on schedule. Though the flight ran through three storm "fronts" and two hours of rain and hail, at no time was the turbulence enough to take it off automatic control.

As planes have grown bigger, faster and more complicated, pilot responsibilities have mushroomed to unwieldy and, many think, dangerous proportions, with their attention scurrying



During the 2400 miles from Newfoundland to England, not a hand was laid on the plane's controls

among dozens of vital instruments. Using an automatic system that requires only monitoring, the pilot is free for any decision or emergency arising. All the while the "hands off" plane is rolling up mileage toward the destination.

Air Force leaders are quick to point out that fully automatic flight isn't an overnight phenomenon. There's nothing new in the whole system—except making all the parts work together from start to finish. Some of its elements were used 15 and 20 years ago, when Doolittle and Hegenberger pioneered blind flying, relying entirely on "coaching" from instrument panels. In 1934, at an Air Corps school, 18 pilots made 786 complete instrument flights in 58 days.

But credit for bringing the system to its present state of development belongs to the All-Weather Flying Division at Clinton County (Ohio) Air Base, home field of the Lee and a major element of the Air Materiel Command. Col. Gillespie, the ocean flight's commander, is its chief. Fittingly, one of Doolittle's assistants during the pioneering steps in '29, Col. Ben S. Kelsey, created the automatic flight branch.

The brain itself is a multi-channel, telephone-type rotary switch, the key factor in the Automatic Flight Controller. It is housed in a console the size and shape of an old-fashioned upright piano. In the test C-54 the whole unit is just forward of the cabin's midway point, on the right side.

There are mysterious goings-on in the deserted cockpit during automatic flight. Untouched pedals and levers move back and forth, with instrument needles flicker-

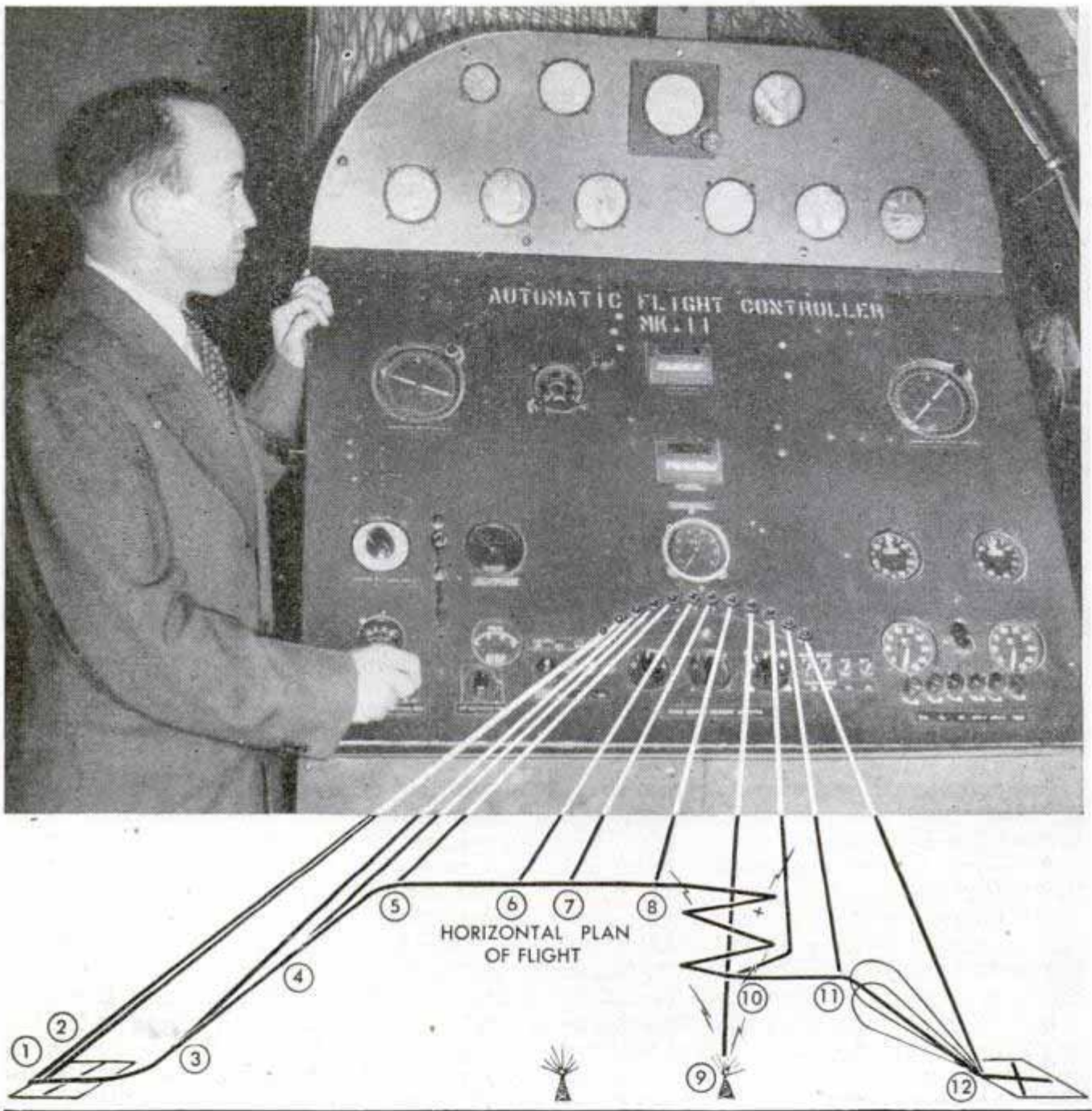
ing in answer, just as they would with a full crew at work. The unseen manipulators are scores of electric motors, responding to the brain's stream of commands.

Before take-off, dials on the controller's panel are fed a series of factors, such as distance, direction, desired cruising altitude and power, and specific en-route radio frequencies. All these factors are predetermined in relation to a particular flight.

As an added gesture to convince skeptics, neither Col. Gillespie nor the pilot was told where the plane was to be landed in England. Only an official observer, who made advance arrangements for the arrival, and the navigator, who "told" the brain before take-off where she'd land, were in on the secret.

Defined by function, the controller has two kinds of instruments. The "sensing" group reports to the brain the air miles flown, altitude and position, as determined by radio beams and bearings, radar and distance-measuring equipment. The others, the "doing" group, are those devices which actually operate the aircraft. In this class are the automatic pilot, engine controls and servos that trim the airplane. The brain gets advice from one group and, in accordance with directions "cranked" into it earlier, tells the other what to do.

Point-to-point flight is divided into 12 phases or positions: (1) pre-take-off, (2) take-off, (3) initial climb, (4) final climb, (5, 6, 7 and 8) navigational sequences, (9) descent, (10) initial approach, (11) final approach and (12) landing. All are indicated on the main panel as well as on a dial



Flashing amber lights show which stage of automatic flight the plane is in. Positions 1 and 2 indicate pre-take-off and take-off; 3, initial climb; 4, final climb; 5, first air-log sequence, with mileage counter clicking off predetermined distance to point where plane will begin to home; position 6, on first preselected radio station. Seven is a second air-log sequence, similar to 5, and 8 is a second homing sequence. At 9 descent begins in preparation for 10, the initial approach, when the landing gear goes down and contact is made with the landing beam. Position 11 is final approach, on the glide path, and 12 is the landing and roll

in the cockpit. As the brain or "sequence selector" steps from one position to another, a flashing light indicates which phase the plane is in. Any time the pilot wants to take control manually, he presses a button on his control wheel, instantly disengaging all automatic operation.

The brain first goes to work when the plane has been taxied to take-off position, brakes locked and engines idling. As soon as traffic clearance is granted the pilot reaches forward and pushes a button on a small, black box.

In response, the throttles are automatically advanced and the brakes unlocked

by the pilot eight seconds later, when the engines have revved up to take-off power. Position two is underway. With the automatic pilot steering more accurately than is humanly possible, the plane races down the runway until flying speed is reached. Veteran pilots can always spot automatic take-offs because they're letter perfect.

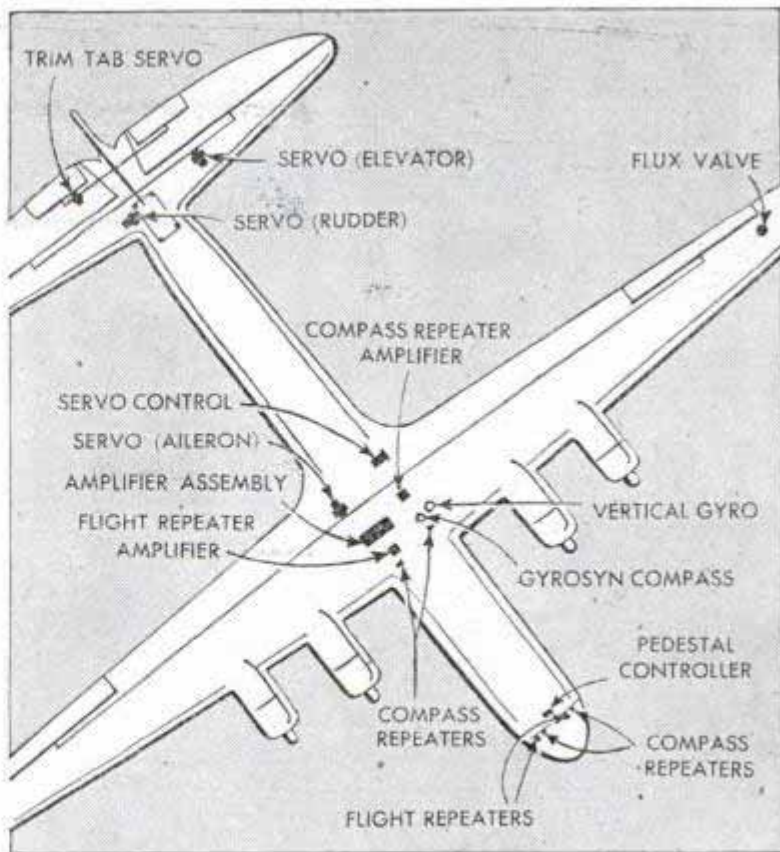
Fifty feet off the ground, the brain, advised this time by the absolute altimeter, directs the operation into initial climb, position three. Take-off power is reduced to climbing power and the landing gear retracted. At 1000 feet another altimeter-to-brain message signals the engines to climb

1000 feet a minute to the preselected cruising altitude, perhaps 9000 feet as it was for the Newfoundland-England crossing.

Barometric pressure next causes the selector or brain to readjust the throttles to cruise power, move propellers to proper settings and to trim the craft for increased speed. Preset magnetic control puts the plane on course and the air-mile counter begins clicking off the distance.

Since neither is a real problem to accomplish automatically, in-flight switching of gas tanks and cowl-flap operation are done manually on the experimental plane. No attempt is made to keep a critical balance of the gas load as it is used. Instead, the automatic pilot keeps the control surfaces trimmed to hold the plane in the correct flying attitude.

During position five, the automatic pilot, hooked through the radio, guides the plane to the first preselected transmitter, with barometric control holding it at the proper altitude. At the end of a set number of miles on the counter, the brain's activity is stepped to the next position and the aircraft homes on its first radio point. Flights of 3000 miles can be made with help from only one station.

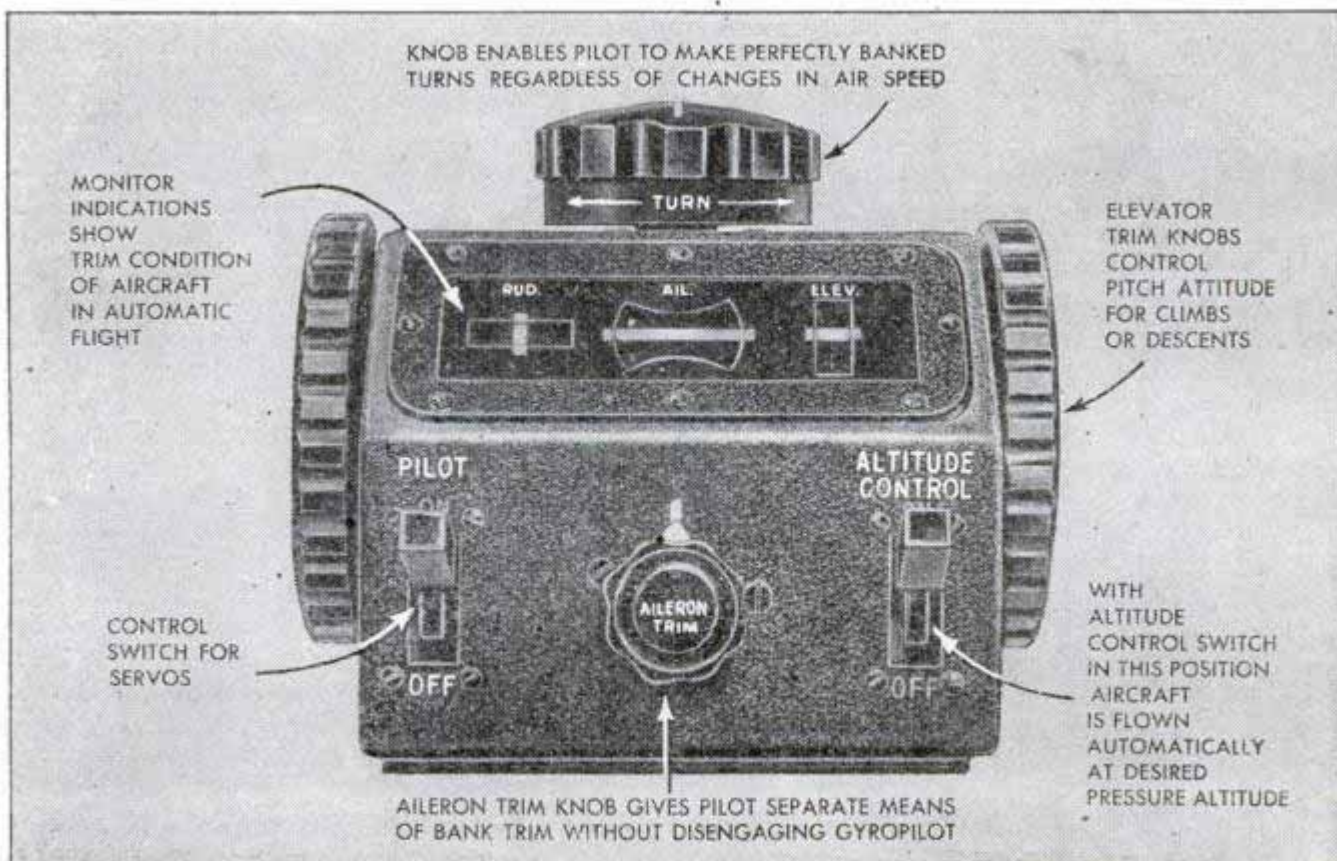


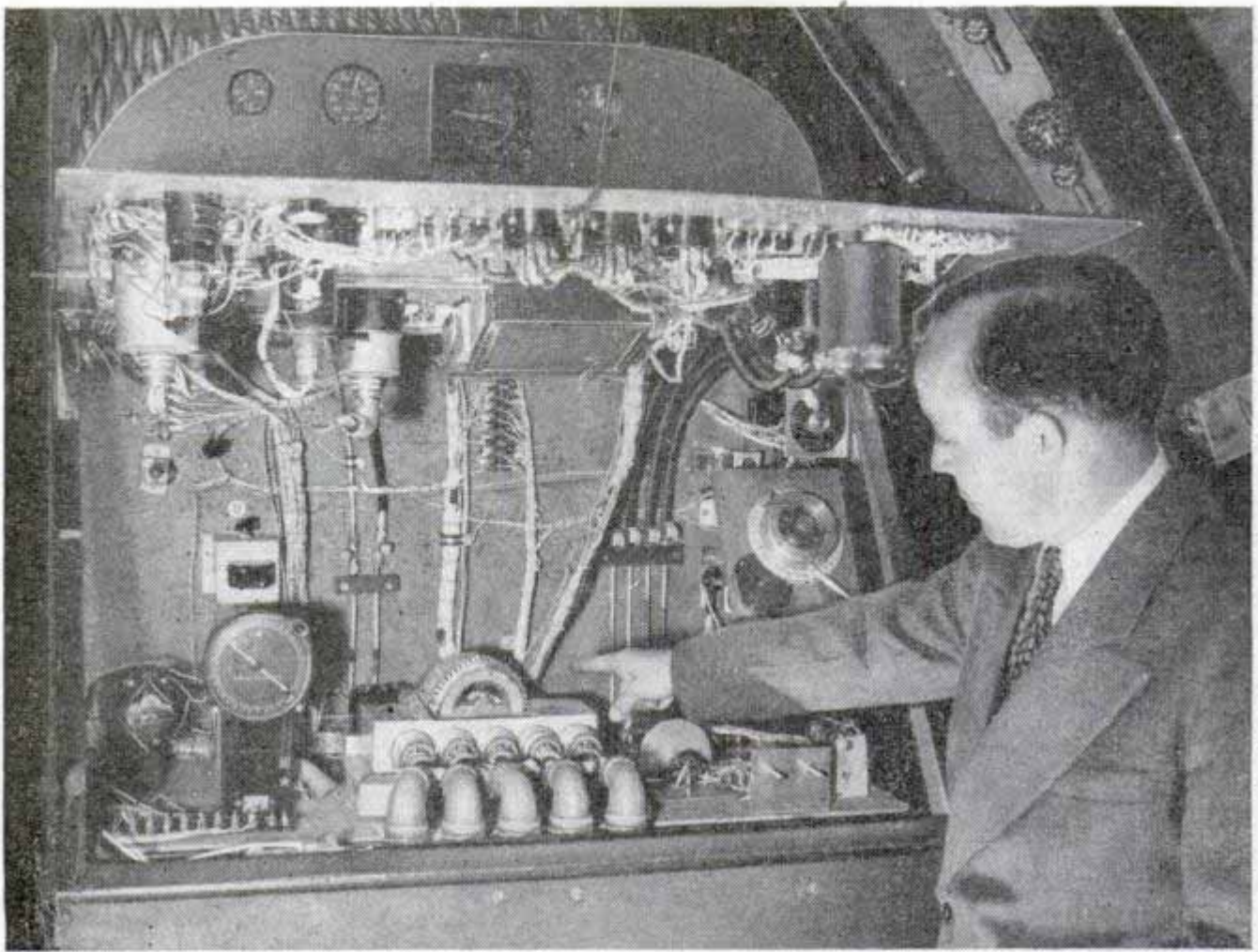
Sperry photo

Probably the most important single element in push-button flight is the Sperry E-4 automatic pilot. At the brain's prompting, it keeps plane straight and level and on the designated course

Where more than one radio check point is used, the landing sequence is fixed so that it can be tripped into action only by the frequency at the final one. As the plane passes through "cones of silence" above

Additional monitoring of the plane's flying attitude comes from the automatic pilot's pedestal controller





Project engineer points to telephone-type rotary switch, brain of the automatic flight controller

each of the transmitters en route, directional control instantly switches to the next station's frequency.

At position nine, the radio compass needle swings to 180 degrees and trips a brain signal for the plane to be trimmed for descent and power cut for dropping at a 500-foot-a-minute rate. Still directed by radio compass, the aircraft orbits the transmitter at five miles or less until it gets down to 2000 feet. There the altimeter signals the sequence selector to begin the approach, position 10.

Power is stepped up slightly and altitude control reintroduced to hold the plane at 2000 feet. As part of the same response, the landing gear begins to lower and separate motors start adjusting the flaps. Directional control, meanwhile, has switched from radio compass to the localizer beam.

During the eleventh phase the plane is kept in three-point attitude all the way down a radio beam to the runway. Power control flicks on and off to keep air speed at precisely the right landing-approach reading. The brain's teammates respond equally well to either the Air Force's instrument low-approach system, a localizer and glide path combination known as SCS-51, or the Sperry micro-wave landing system, whose four-inch wave lengths offer an even more

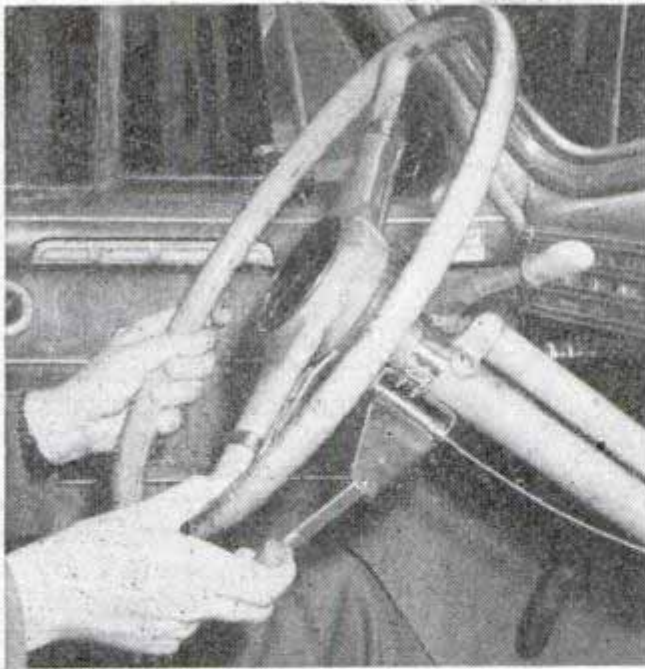
stable and concentrated beam. Both are used at the Lee's home field.

On touching down, position 12, a micro-switch on the landing gear is pushed upward, signaling the brain to close the throttles. Automatic landings are on the nose gear and the two main wheels, in contrast to the pilots' technique of making contact with the main wheels first and settling down on the nose wheel during the roll.

All this precise mechanical plotting and execution recalls the time, not so many years ago, when Post and Levine flew the Atlantic with the help of a copy of the New York Times. Levine got to the plane just in time for take-off, jumping aboard with a copy of the Times he'd been reading on the subway still clutched in his hand.

Part way across they were lost, with a lonely ship bobbing along on the waves as their only possible reference point. Levine, in a striking display of ingenuity, simply turned to the Times' listing of ship sailings while Post maneuvered down to where they could read the vessel's identification. Once deciphered and found in the listings, the pair figured out their own position over the vast Atlantic from the ship's destination and its scheduled arrival time.

And now you can fly the whole course by merely pressing a button!

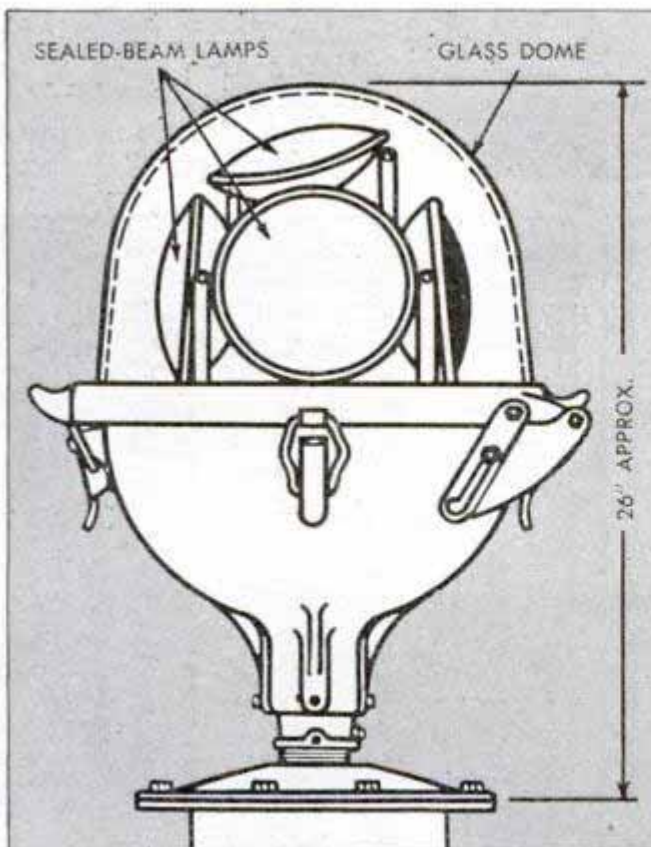


Gas Hand Feed for Cars

For the motorist who tires of holding his foot on the accelerator, a hand-operated gasoline control lever is available which fastens onto the steering column. When the lever is pushed upward, engine speed increases. When released, the engine idles.

Beacon Has Automatic "Spare"

Designed for smaller airports, a rotating beacon has extra sealed-beam lamps that switch on automatically if those in use burn out. Another beam shining at an angle 5 degrees from vertical acts as a locator and ceiling-height indicator.



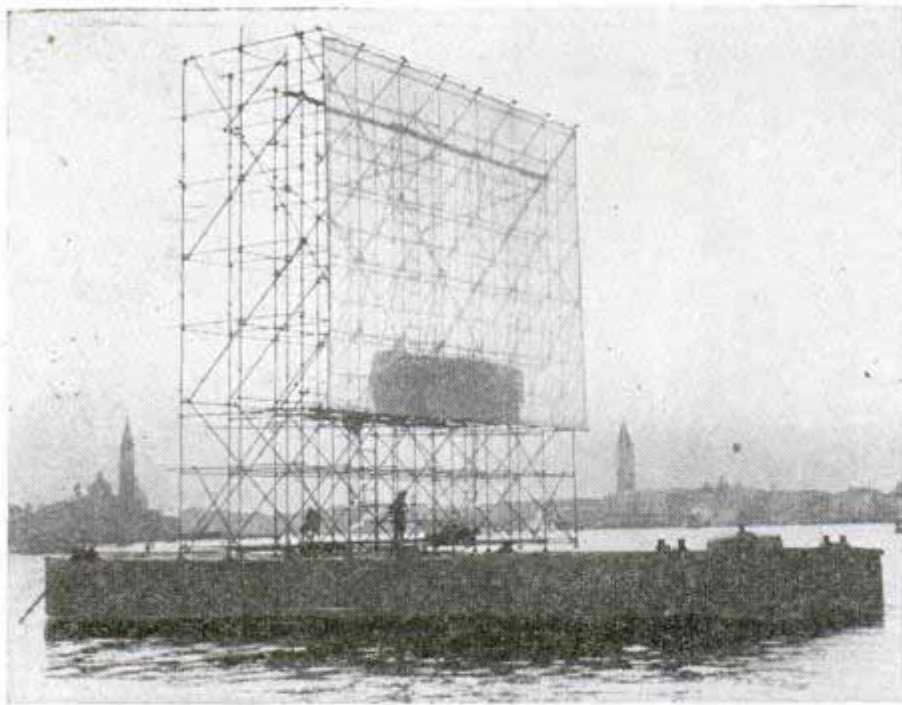
Infrared Lamp Treats Earaches

Infrared rays from a therapeutic lamp provide relief for certain types of earaches and inflammation. The lamp has a small radiant heat source, housed in Beetle plastic, which supplies warmth along the aural canal to the middle ear. An adjustable buckle and headband position and hold the lamp in place.

"Tape" Measures Brake Drums

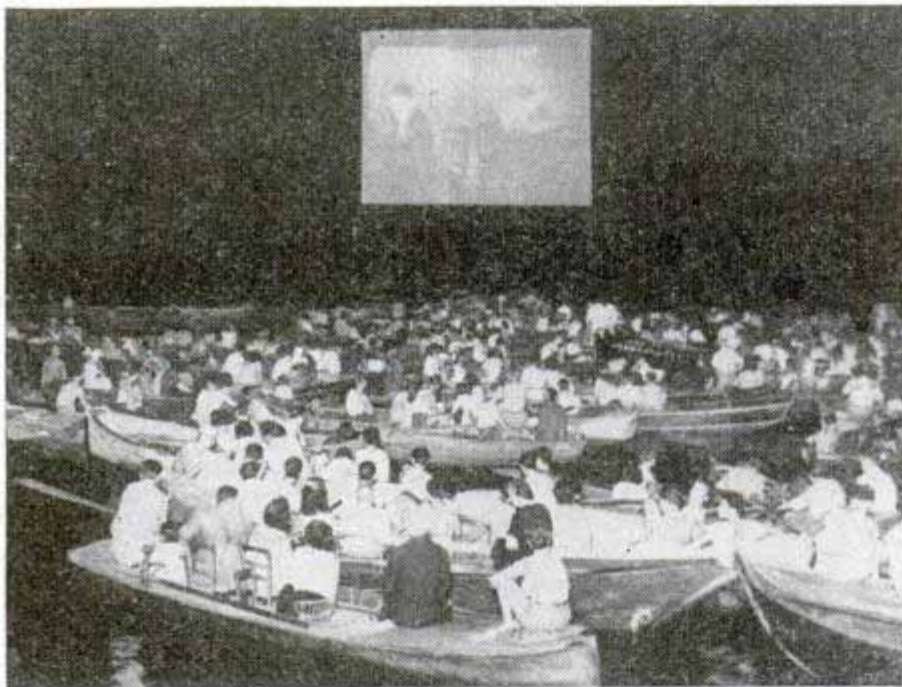
Brake shoes for trucks can be fitted accurately with a thin steel gauge that measures the inside diameter of the drum. The gauge is coiled inside the drum, the ends pressed to force it against the sides, and a reading taken from a scale which makes possible measurements to $\frac{1}{1000}$ inch. The gauge has a range of 9 to $16\frac{1}{2}$ inches and is read like a vernier. After a measurement, the brake-shoe burnishers are set to duplicate the drum's diameter.





Paddle-In Theater Has Screen on Raft

If ushers were employed in one movie theater in Venice, Italy, they would have to pass a swimming test and their uniforms would be bathing suits. It's a "paddle-in" theater and the movie fans come by boat. The huge screen is mounted upon an anchored raft and boatloads of people see their favorite films in the comfort of their own craft. Supported by a complex framework of metal tubing, the screen is placed high enough so that people in the back rows have an unobstructed view of the movie. The aquatic theater was designed as a feature of the 8th International Film Exhibition held recently in the city of canals.

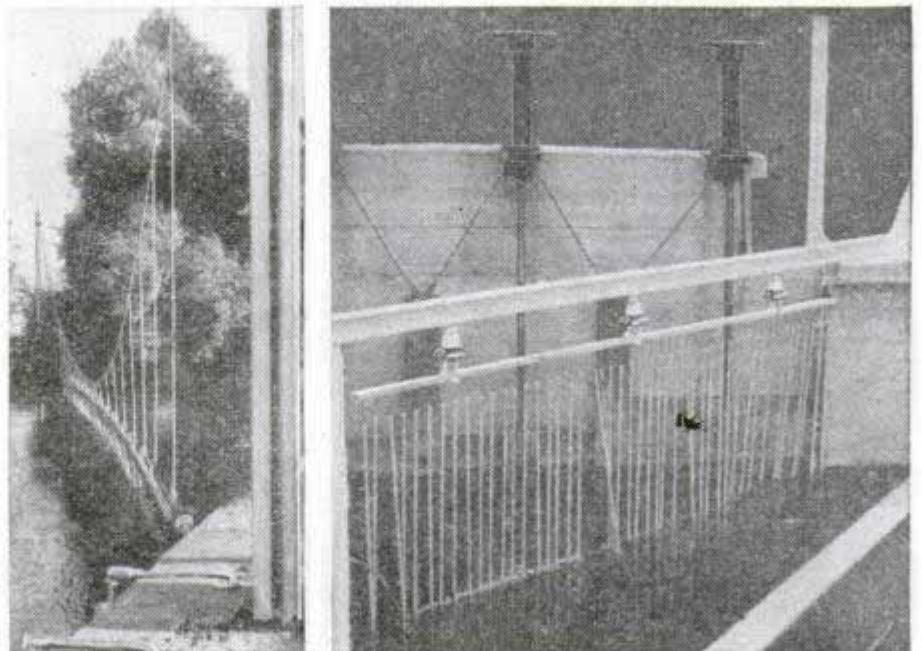


Model Plane Switch Cuts Motor in Dive

By cutting the motor whenever the plane noses over, a small mercury switch prevents model planes from power-diving into the ground. With the motor dead, the plane glides to earth. The switch, connected by wire to the motor, is mounted anywhere on the plane.

Electric "Fence" Safeguards Fish

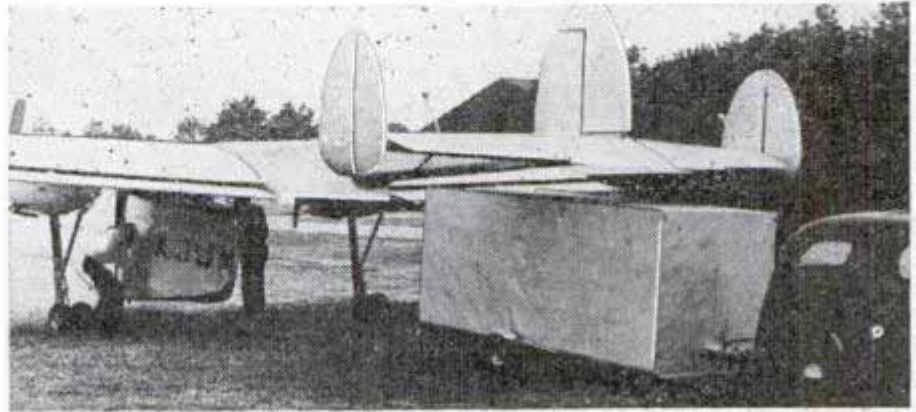
Electric "fences" steer fish safely past water intakes of irrigation canals, hydroelectric plants and industrial installations. The fences consist of one or more rows of electrodes swinging freely in a stream and suspended by an overhead support. Not only are fish prevented from destroying themselves in man-made water diversions, but they also can be successfully fenced within lakes and private fish preserves.



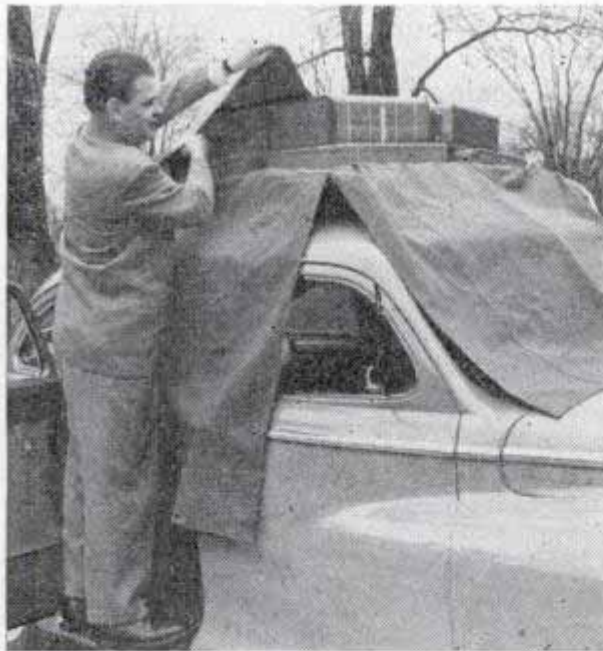


Flying "Semitrailer"

With a detachable freight compartment, the Miles M.68 airplane is expected to become the semitrailer of the air. The British transport flies with or without the freight container which has removable road wheels and a towing bar for quick coupling to an automobile or light truck. The freight compartment is loaded at the factory, towed to the airport



where it is attached to the plane and flown to its destination. Upon arrival, it is detached and towed away by car.

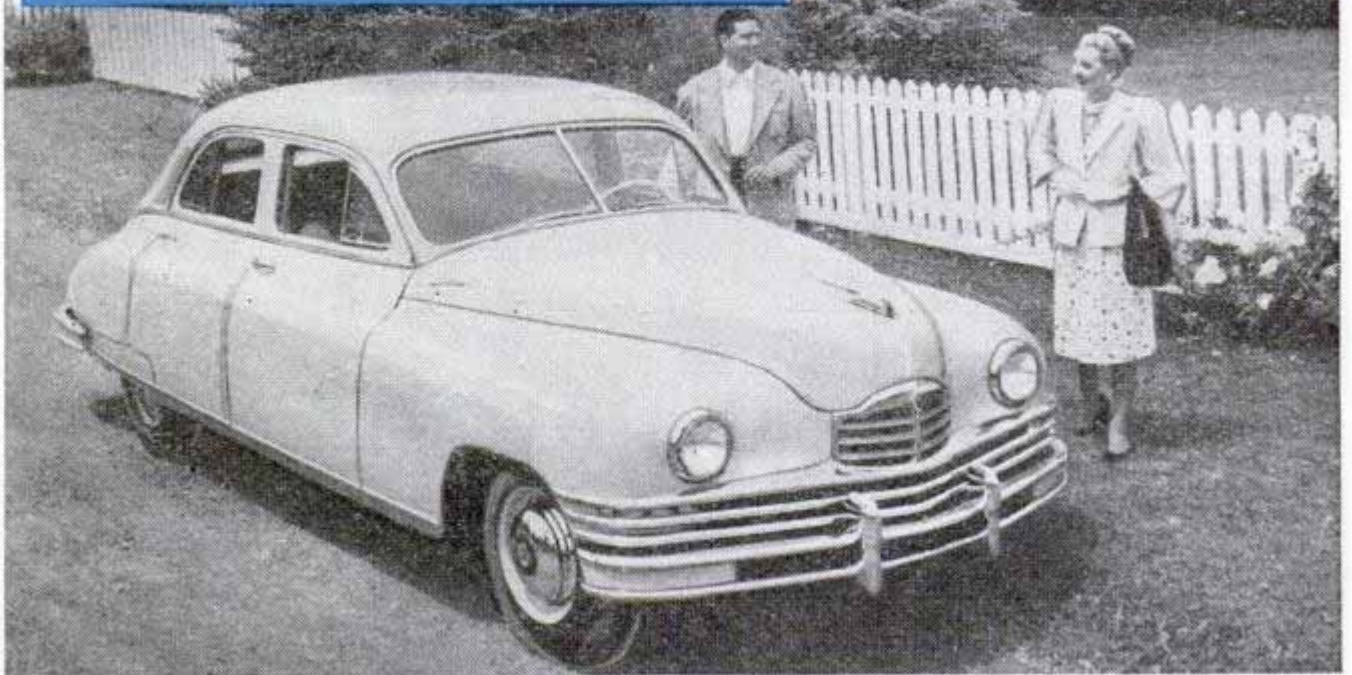


Waterproof Canopy Covers Luggage on Top of Car

For the family that wants a car with large luggage capacity, Chrysler is building the Traveler with a luggage canopy which fits into a luggage rack on the roof. The canopy is held firmly in place by eight elastic straps with swivel snaps. Made of heavy, water-repellent olive-drab duck, 46

inches wide, it folds over from all four sides to cover the luggage and protect it from rain, sun and dust. When not in use, the canopy is carried in a heavy duck bag, specially designed so that it can be stored in the car trunk. The Traveler is built on the regular Windsor chassis.

The '48 CARS Begin to Roll



The free-flow styling of the new 1948 Packard Touring Sedan preserves the car's traditional grille lines

WHEN the 1948 passenger cars begin to roll by the thousands from assembly lines, the automotiveminded American public will begin to cash in on a "changeover" investment well in excess of 100 million dollars.

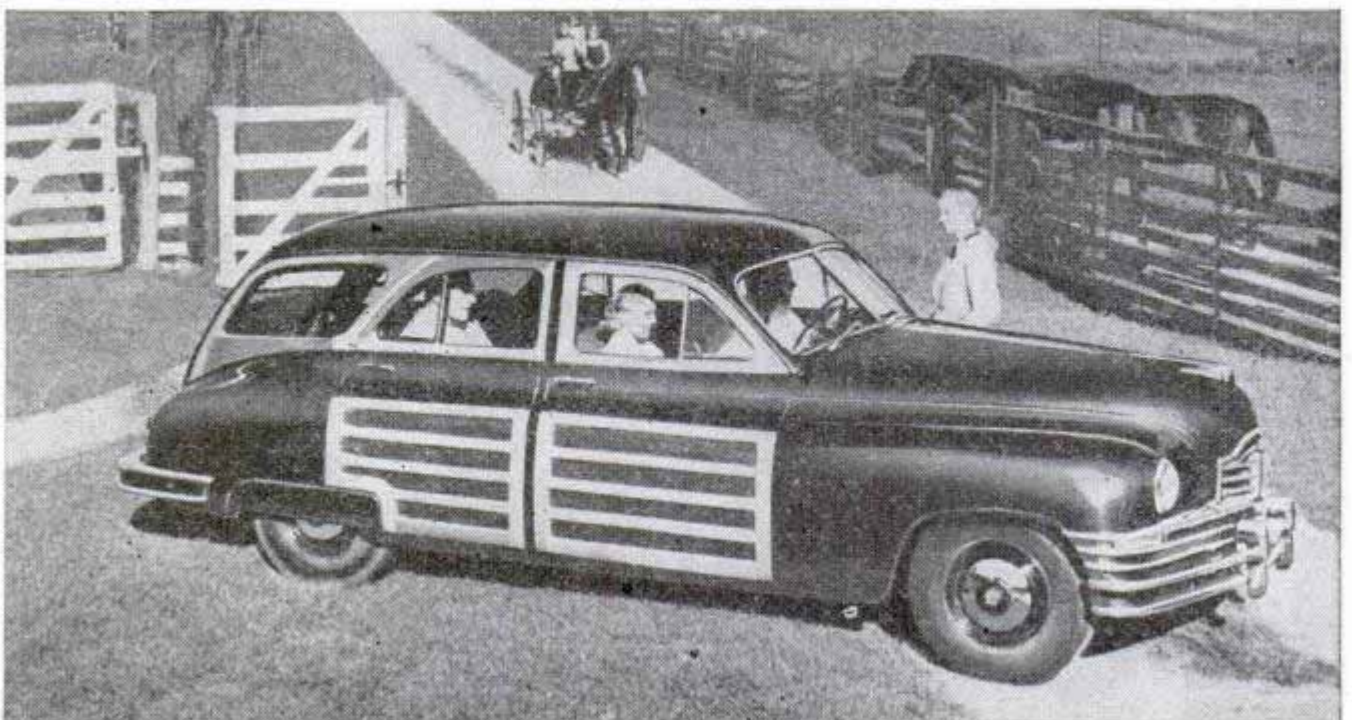
The Packard Motor Car Company spent between 20 and 21 million in bringing out the 17 new body types of its '48 lines. Hud-

By **Wayne Whittaker**

son expended 16 million to bring out its low-slung new models, and over in Dearborn, Mich., the Ford Motor Company is pouring 77 million into an all-out retooling job to produce completely modernized Fords, Mercurys and Lincolns.

That 100 million changeover figure will probably be tripled when General Motors

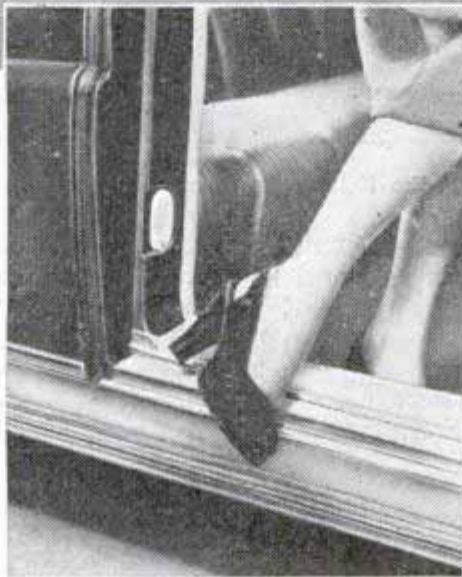
Don't call this car a wagon—it's Packard's '48 Station Sedan. The body and top are both built of steel





(Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet) and the Chrysler Corporation (Chrysler, DeSoto, Dodge and Plymouth) announce their retooling costs in bringing out new passenger cars. Some of the models, however, are not expected to roll until 1949 or late next year.

Since the war ended, the automobile manufacturers have operated under the every-man-for-himself system. Some have plunged ahead, like Studebaker and Kaiser-Frazer, into the realm of mod-



The 1948 Hudson is just five feet from ground to top of car. Passenger (left) steps down into car. Low floor gives extra headroom

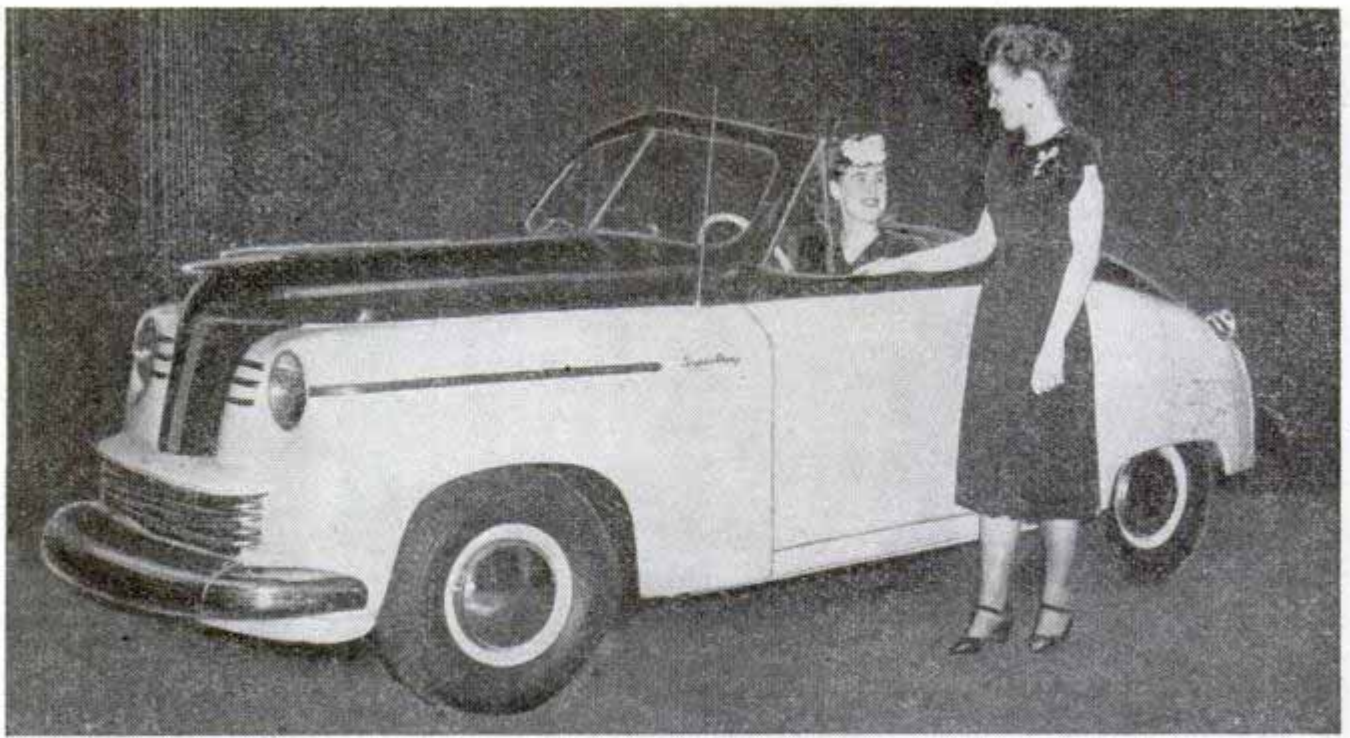
ernized styling. Others have held back, like timid youths on the edge of the old swimming hole, and watched the splashes made by the South Bend and Willow Run boys.

The other companies kept telling themselves there was no need to jump into the water when the sun (back orders by

the tens of thousands) was so warm there on the bank. While Studebaker proclaimed its "new look," the others, until

The 1948 jeep convertible has the four-cylinder jeep engine. It's painted a fire-engine red with gray canvas top





Newcomer in the lightweight class is the Keller. The convertible model has its engine in rear compartment

a few months ago, maintained a rather aloof attitude. That attitude is as dead in Detroit today as a dodo—particularly as far as the Big Three of Motordom (General Motors-Ford-Chrysler) are concerned. Behind a lot of intense activity there's a new spirit of: "We've got to jump sooner or later—maybe it better be sooner."

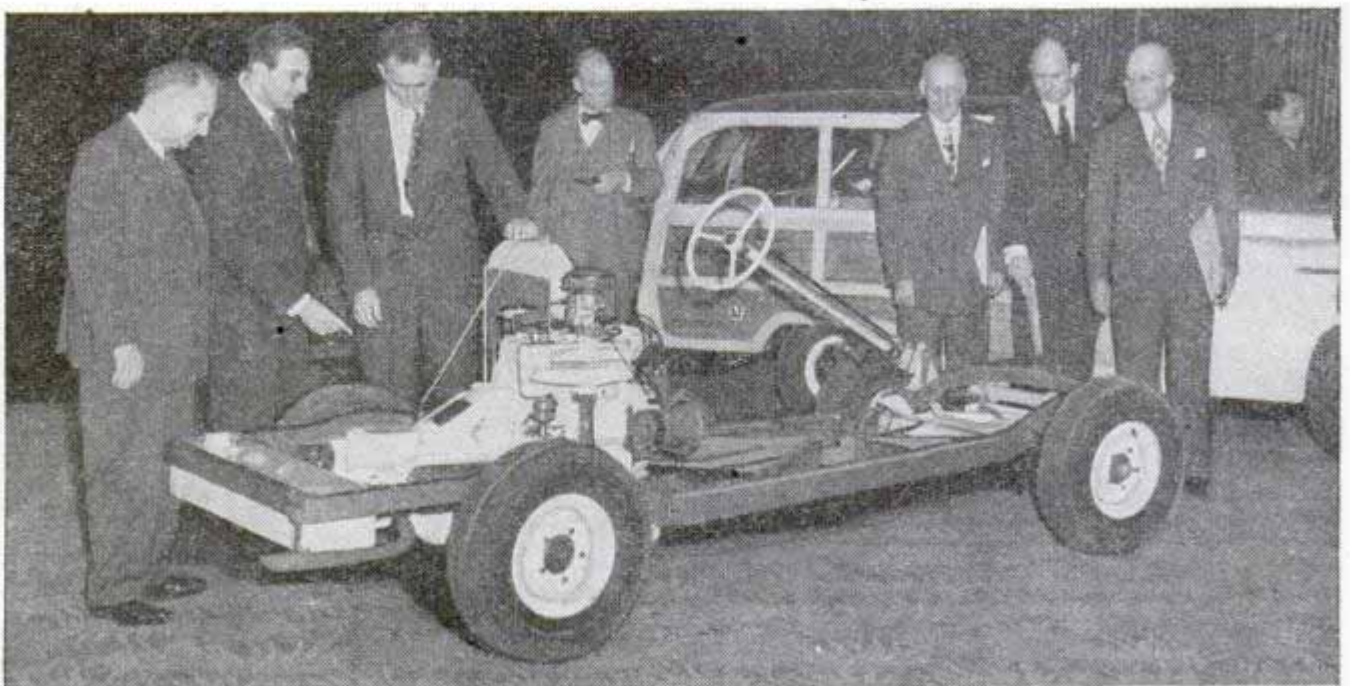
When several hundred thousand Chicagoans visited the five-day exhibition of the revolutionary rear-engine Tucker automobile, many a motor tycoon sat up and took notice. It did not require an Einstein I.Q. to deduct that the public is far ahead of the conservative automobile manufacturers in its tastes. A couple of years

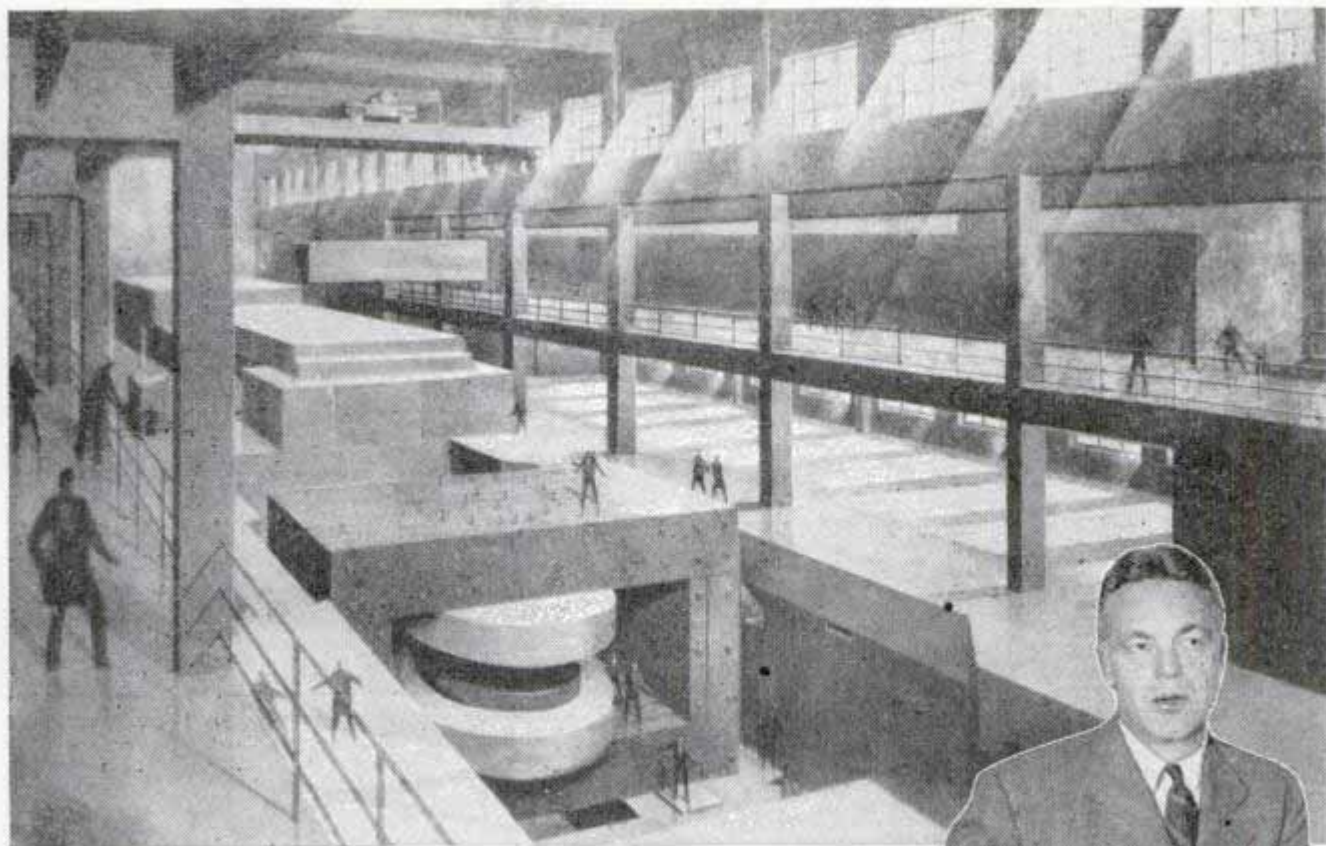
ago some Detroit engineers regarded automatic transmissions as a lazy man's way of getting from first to third. They now predict with positive emphasis that the entire industry will be turning out fully-automatic transmissions within five years. One official of a company that builds a luxury car said: "We are determined to have an automatic transmission by 1949. If we don't we might as well go out of business."

This new fire in the eye of the automotive industry is already paying off to the public. Exhibit A (first of the '48s) is the new Packard. Its body styles, in "free flow" styling without rear fenders, include club

(Continued to page 252)

Stripped model of the Keller convertible (shown at top) shows engine. Station-wagon model is in background





HOUSE OF THE CYCLOTRONS

Under construction at the University of Chicago is a building uniquely constructed to house three powerful instruments that will be used in nuclear research and the treatment of cancer. Called the "ion accelerator building," the structure will contain two cyclotrons and a 100,000,000-volt betatron. A 170-inch cyclotron, not yet completed, will be one of the largest in existence and will include an electromagnet built of 2500 tons of iron. Powerful beams from the cyclotron will be focused on cancerous tissue. University scientists have completed a table model of the machine and have determined the protection required because of the instrument's radioactivity. The cyclotron will be installed in a pit 20 feet below floor level covered by concrete seven feet thick. A feature of the building will be a crane capable of handling 70 tons of heavy equipment.



Top, cyclotron will be installed in a pit 20 feet deep. Overhead crane will run the length of the interior. Above, Chancellor Robert M. Hutchins with model of 170-inch cyclotron to be used in cancer research

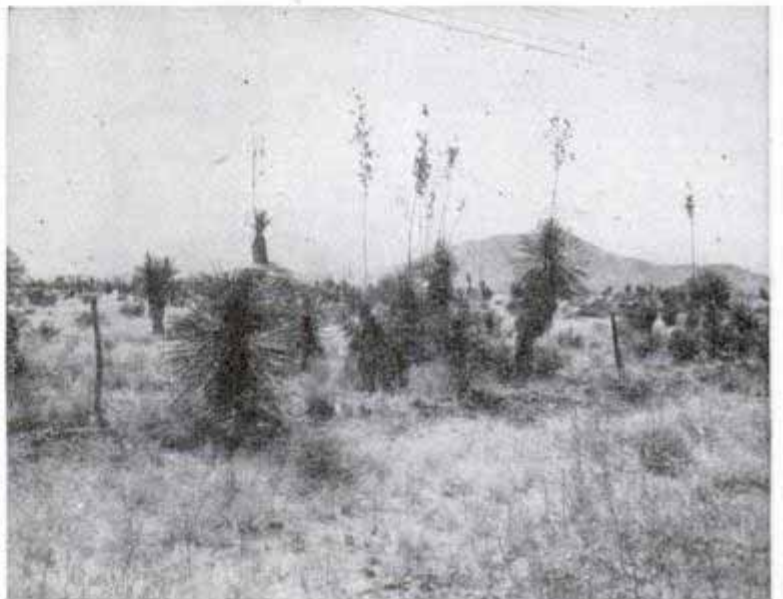
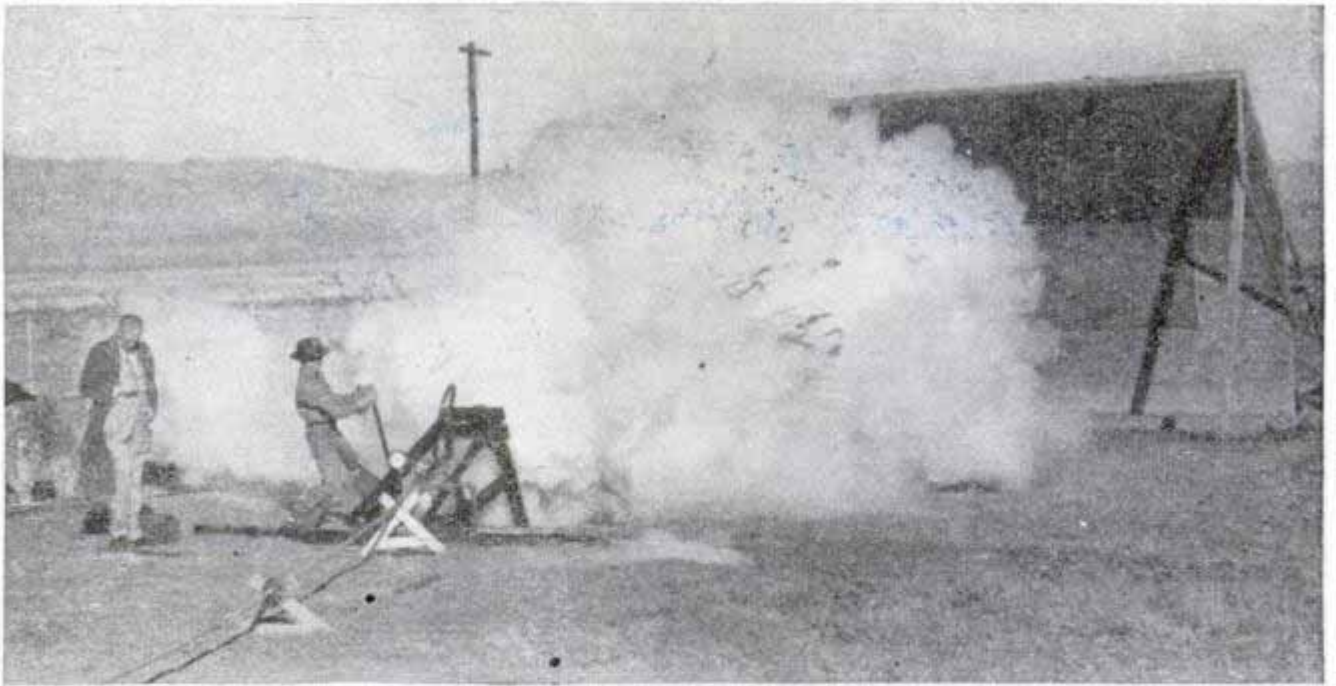
High-Speed Spinner Revolves at 187,000 R.P.M.

When he read the report in the September *Popular Mechanics* of a microtome that operates at 123,000 revolutions per minute, O. C. Brewster of Litchfield, Conn., an engineer, regarded it as a challenge. Having been working experimentally with a small laboratory centrifuge doing more than 93,000 r.p.m., he thought the 123,000-r.p.m. mark could be bettered. In two days his assistant, Herman P. Hermenau, built a small air-driven turbine which he reports attained a speed of approximately 187,000 r.p.m. The rotor shaft of the spinner is $\frac{1}{2}$ inch in diameter and about two inches long, running in $\frac{1}{2}$ -inch journal bearings

with special lubricants and means for overcoming bearing whip.

"I am very sure this speed of 187,000 r.p.m. could be greatly exceeded, if there were any need for such speed," says Mr. Brewster, "by giving a little more attention to details. This particular machine serves no purpose other than to demonstrate the possibilities of the type of bearing construction and method of lubrication used."

☐ Motorists in cars equipped with telephones can make and receive calls anywhere between Boston and Washington.



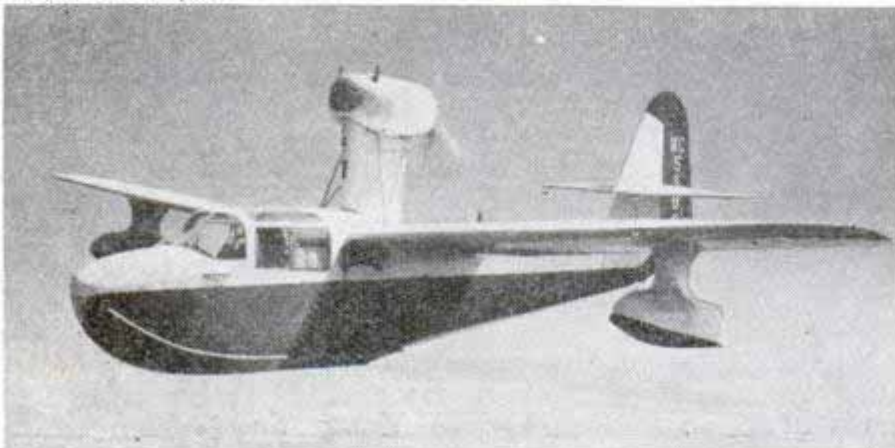
Top, after three minutes under steam pressure, the yucca leaves are shot from the gun. Left, tough and spiny, the leaves have long resisted inexpensive methods of fiber extraction. Right, yucca grows profusely in desert

Steam "Gun" Blasts Upholstery Fiber from Yucca Leaves

Southwestern desert yucca-plant leaves are converted into useful fiber in six minutes by an experimental steam "gun" which shoots the material against a back-

stop. After being washed, the fiber is used in upholstery or for rope. Previous methods of extracting fiber required brushing, boiling, steaming and chemical treatment.

Goodyear Aircraft photo



Duck Leaves Water In 1300 Feet

Among the smallest amphibians ever built, three-place Goodyear Ducks make water take-offs in 1300 feet and land at 50 m.p.h. Some models also pioneer a retractable cross-wind landing gear. Water operation is simplified by use of a retractable rudder.



**MUDDING
A SLED**
Eskimo Style

Photos by Ven. Donald B. Marsh, Archdeacon of Aklavik

This Eskimo youth is demonstrating the art of sled mudding which puts an ice-smooth edge on the runners. First he mixes mud with partly decayed moss

Working in below-freezing temperatures, he shapes the mud to the runner from the sides. This method is used on largest Eskimo sleds as well as the small ones



After the mud has frozen solid to the runners it is planed down. Planes were once made from wood or antlers; this young mechanic is using smoothing plane

Preparing to wet the planed surface of runner, boy holds water in mouth and squirts it into piece of bearskin which will not stick to mud as it is applied

With a quick gesture the water-filled bearskin is inverted and rapidly passed along runner from one end to the other. The thin film of water freezes instantly

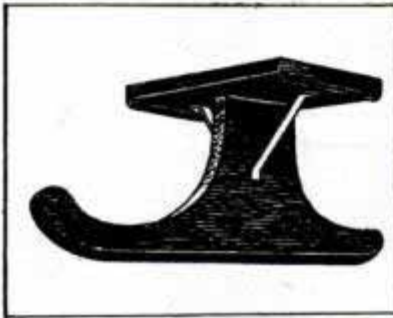
After many films of ice are applied to the mud surfaces, the slick runners are ready for a tryout. Big sleds often stop along the trail for quick re-icing





SOUND FOR 8-MM. MOVIES

Two synchronous motors operate an 8-mm. projector and a turntable with an electrical transcription to provide sound for home movies. Automatic synchronization is achieved by recording on the beginning of the transcription a short 1000-cycle tone. There is a synchronization mark printed in the beginning leader of the film, and the projector is threaded with this mark just above the aperture gate. The turntable then is started and the needle is set down on the revolving record. When the needle reaches the 1000-cycle tone, this tone operates a relay in the amplifier circuit, which automatically turns on the projector. This starts the picture in synchronization with the sound. The set uses $33\frac{1}{3}$ -revolution-per-minute electrical transcriptions.

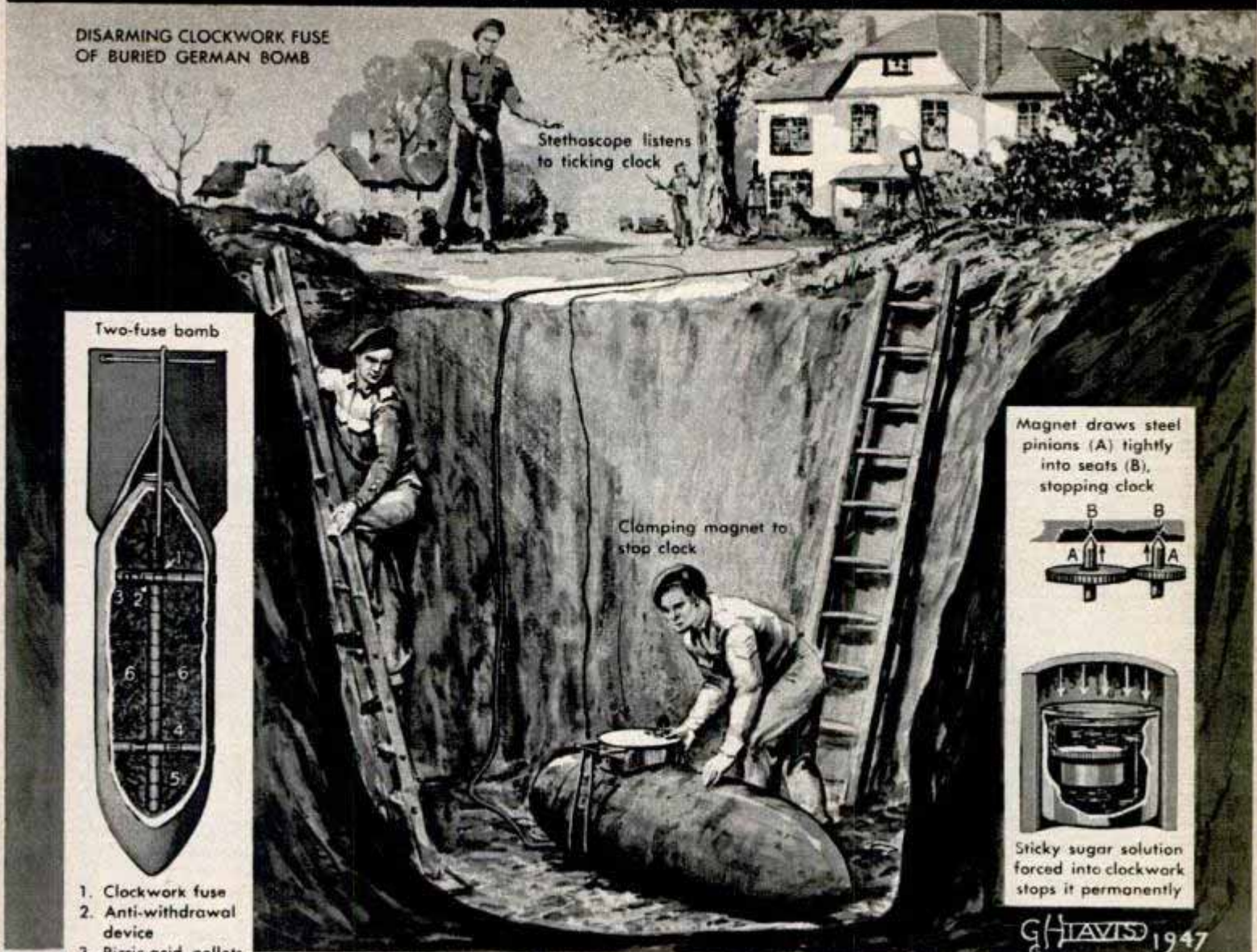


"JUMPER" SLED

Single-runner sleds called "jumpers" provide thrills in winter sports for young people at Petoskey, Mich. Holding onto the handles and with feet extended to the front, the jumper riders balance as they speed down snow-covered slopes, make sharp turns and sail through the air. The jumper base is a piece of 2-inch wood, 24 inches long and 10 inches high, covered with a metal runner $\frac{1}{8}$ inch thick. The seat, attached to the center of the base, is 15 inches long and 9 inches wide and made of $\frac{3}{4}$ -inch wood. Handles are attached at each side to the bottom of the seat.



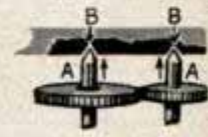
DISARMING CLOCKWORK FUSE OF BURIED GERMAN BOMB



Stethoscope listens to ticking clock

Clamping magnet to stop clock

Magnet draws steel pinions (A) tightly into seats (B), stopping clock



Sticky sugar solution forced into clockwork stops it permanently

G. HAVIS 1947

Two-fuse bomb

1. Clockwork fuse
2. Anti-withdrawal device
3. Picric-acid pellets
4. Sensitive fuse
5. TNT in paper tube
6. Main explosive



Pumping viscous fluid into bomb's clockwork

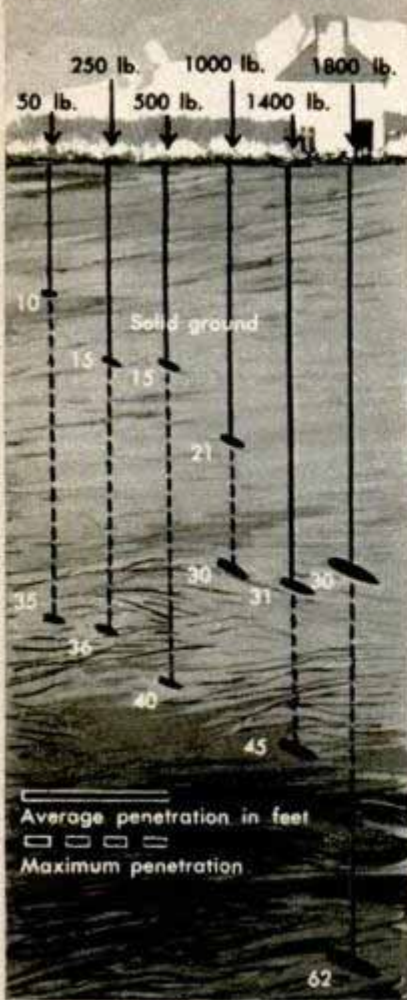


Pump evacuates air, then lets sugar solution flow into clock

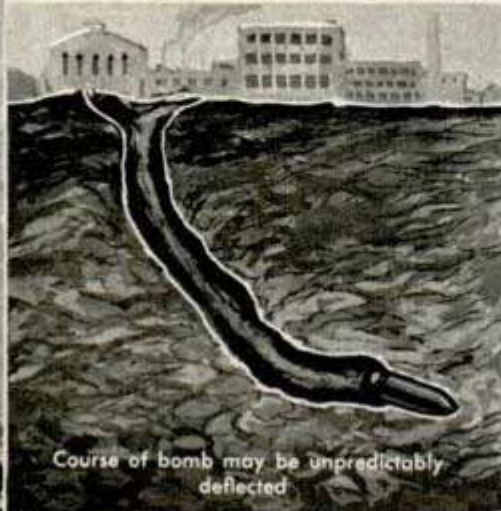
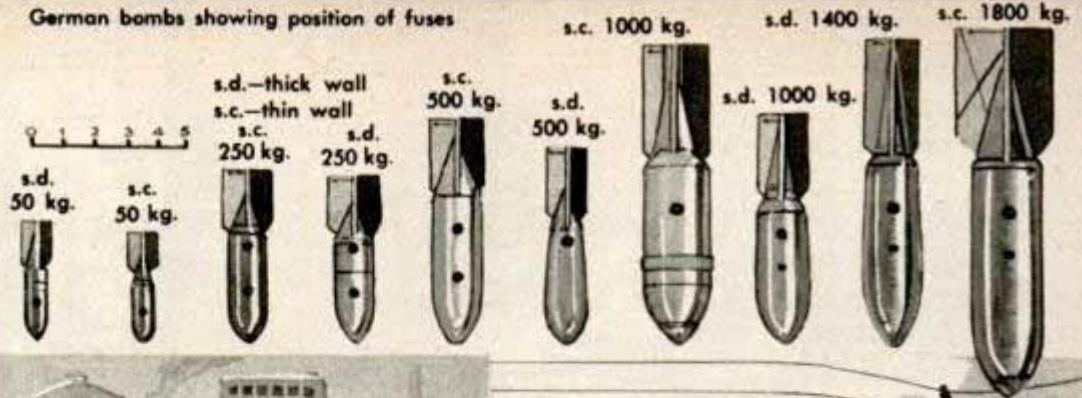
AN UNTOLD CHAPTER of World War II is the Battle of the Bombs waged between British bomb-disposal squads and German technicians. The Germans used great ingenuity in varying the type of fuses used on the bombs and trying to outwit the disposal experts. This cost the lives of many men, but the British succeeded in disposing of more than 50,000

high-explosive bombs during the war years alone. The cleanup operations are still going on. There are four general stages of bomb-disposal work: (1) locating the bomb; (2) identifying the types of fuses used; (3) disarming the fuse pockets; (4) drilling the casing and melting out the main explosive charge. One of the early types of German fuses could be disarmed

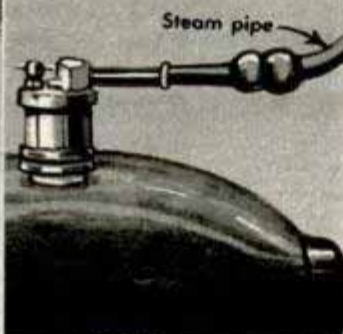
HOW FAR BOMBS PENETRATE



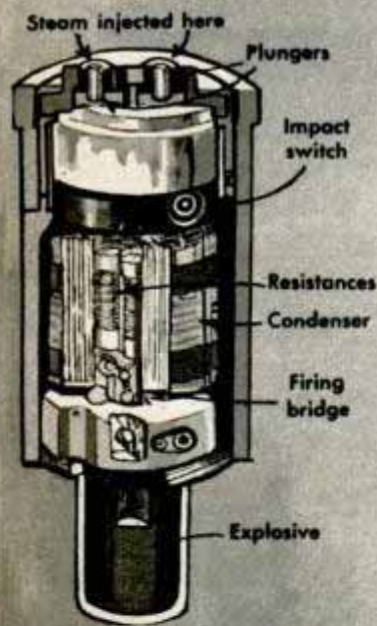
German bombs showing position of fuses



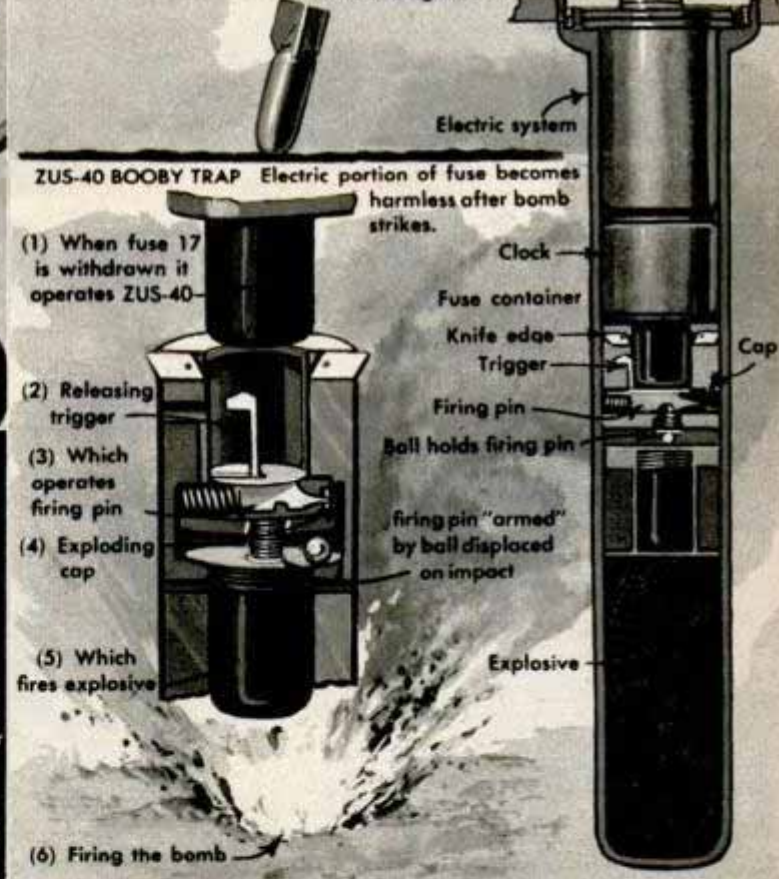
IMMUNIZING FUSE BY STEAM



GERMAN FUSE 15



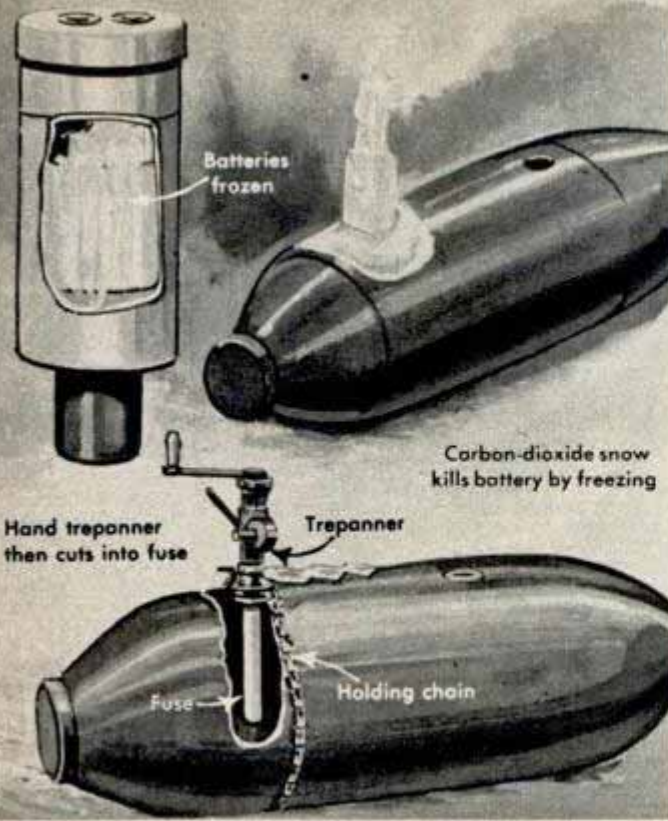
Immunizing fuse 17



by simply depressing the plungers. Then in 1940, bomb-disposal squads encountered a new fuse with very sensitive inertia switches. This was followed by a delayed-action fuse and an electrical device similar to that on the earlier fuses. Later the Germans introduced a fuse in which the electric gear ceased to function on impact but which had a clockwork fuse arranged to

operate over a period up to several days. Below this mechanism the Germans placed an ingenious booby trap which explodes as the fuse is withdrawn. The experts nullified the electrical device on the early bombs by directing steam into the top of the fuse. This penetrates between the condenser plates and causes the current to discharge slowly and safely. In the clock-

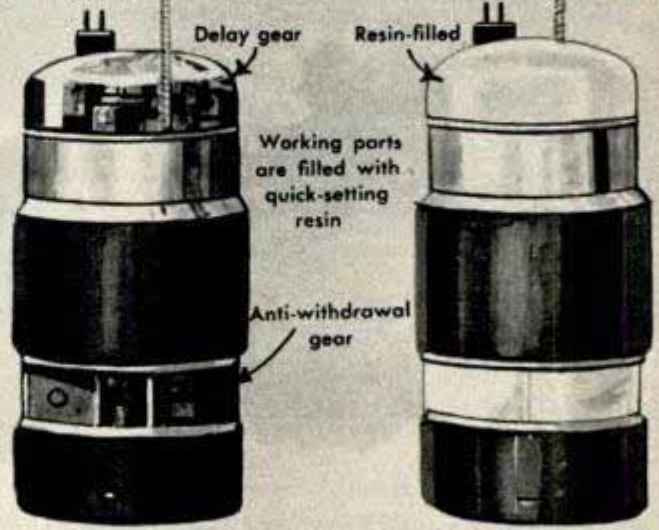
IMMUNIZING Y FUSES



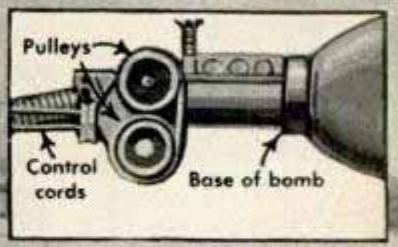
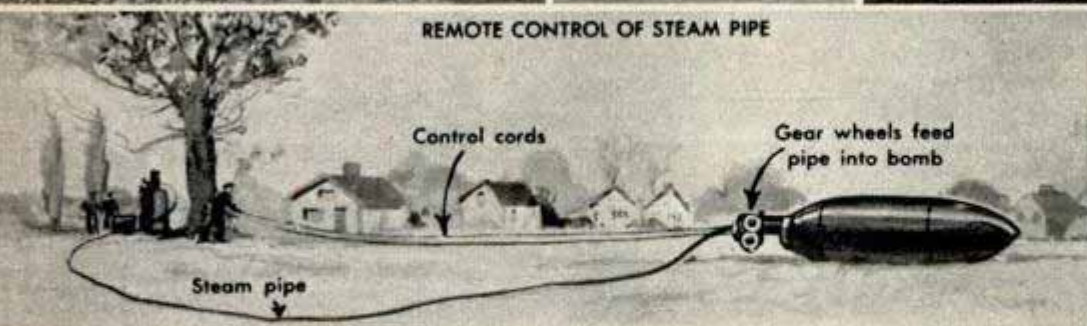
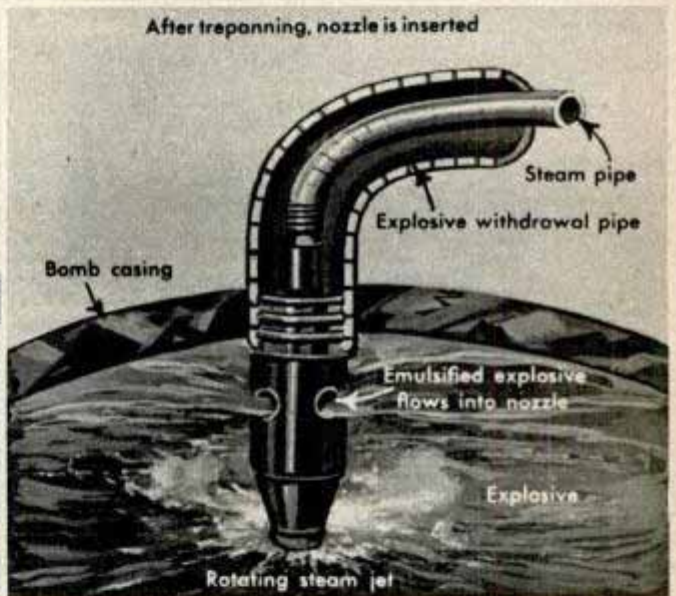
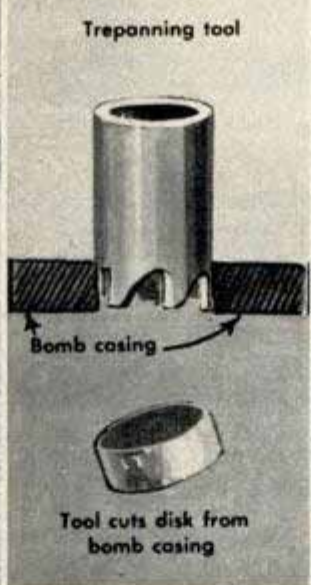
Immunizing the 57 fuse

LIVE 57 FUSE

IMMUNIZED



Any attempt to withdraw fuse explodes bomb



G. HAVIS 1947

work fuse, the bomb-disposal workers have discovered they can draw up the steel pinions into the bearing with a powerful magnet. This stops the mechanism and the next step is to fill the clockwork with a sticky compound. A quick-setting synthetic resin is used for this purpose in one type of fuse. After the clockwork is definitely stopped, the main explosive is

removed from the bombs and the empty casing covered with sandbags and blown up along with the booby-trap attachment. While the disposal work is in progress one member of the crew listens with an electric stethoscope to make sure the clockwork fuse does not start operating again. One type of fuse was immunized by freezing the batteries with dry ice.



Old Railway Car Makes Trestle for Irrigation Flume

Steel beams that once supported the bed of a railroad car now form a trestle to carry an irrigation flume across a stream near La Junta, Colo. The wooden trestle that

formerly crossed the ditch had to be replaced, so concrete piers were poured on both sides to support the new trestle, which was set in place by a portable derrick.



Portable Electroplater Built Into Small Case

Electroplating is simplified by a new plater with a built-in electrical circuit which operates on normal household current. The operator merely clips one wire to the article to be plated and dips it into the ready-made solution. In about 30 seconds, enough metal is deposited on the article for normal plating. Two beakers are equipped with stainless-steel anodes that complete the circuit. Gold, silver and copper plating solutions are available in small quantities for use with the plater.

20-Foot Sprayer Bar Covers Side of Road

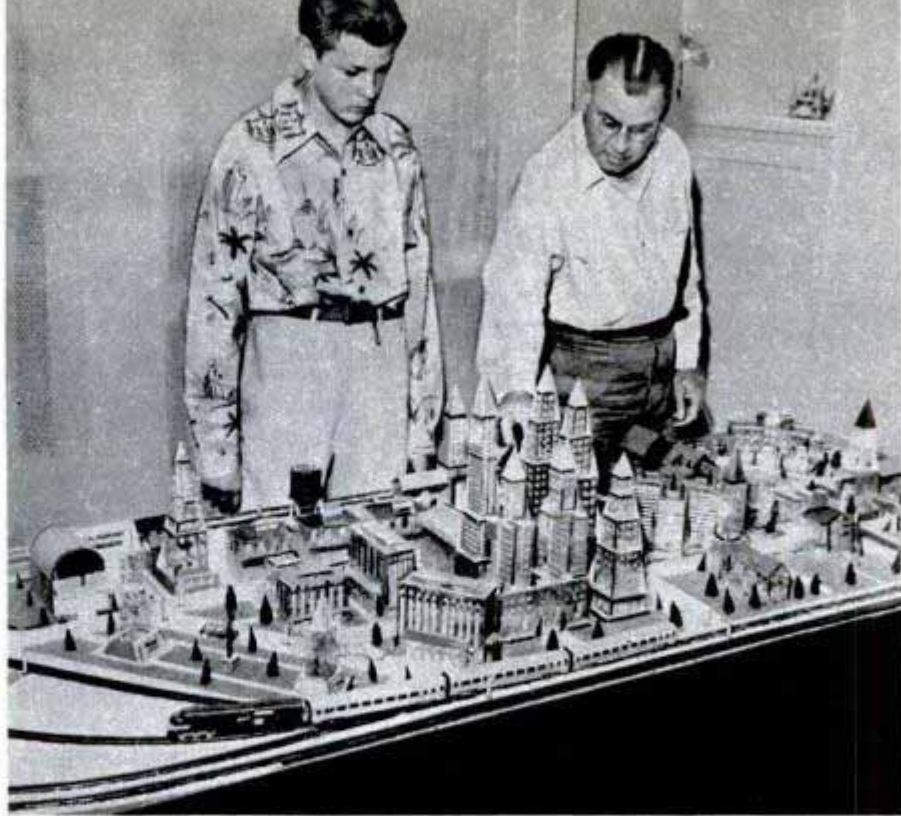
Weed-killing solutions are sprayed across highway shoulders by a bar sprayer that covers a strip 20 feet wide. The spray delivers an even concentration of solution at 30 to 40 pounds pressure. The bar, which is spring-mounted, may be raised or lowered when passing mailboxes and trees. Spray jets are spaced at 18-inch intervals along the bar and staggered in an offset of 10 degrees to insure complete cov-



erage of the weeds. A filter in the spray bar prevents foreign matter from collecting in the jets and plugging them.

All-Plastic City

With a pair of scissors and a pot of airplane glue, Clyde H. Johnson of Long Beach, Calif., built himself a city. Using thin sheets of cellulose acetate, he designed and constructed a city complete with apartment houses and department stores for use with his model railroad. Windows and roofs are painted aluminum and shine at night like those of a busy metropolis. Sponge-rubber shrubs "grow" in the parks. Johnson calls his model city, which required about 1000 hours to build, "Silver City."



Three-Wheeled Racing Car Has Clamshell Tail

Bumps and vibration at high speeds are reduced as much as 50 percent in a three-wheeled racing car, according to designer Edward J. Shermeister Jr., of Sheboygan, Wis. The front-wheel drive racer was designed for next year's 500-mile racing classic at the Indianapolis Speedway. The hydraulic airfoil tail opens like a clamshell to increase air resistance and prevent skidding on the turns. Opening and closing the tail is controlled from the driver's seat. Before the unusual car can compete in the race, the American Automobile Association contest board must approve the design. At present, the rules of the association define a racing car as "a vehicle of four or more wheels operated in contact with the ground." This definition will have to be changed if the three-wheeler is to compete.

Rolling "Bank" Brings Pay

Workers at the Ford Motor Company's Rouge plant get deluxe service on pay day. Armored "banks" on wheels roll from building to building to speed up the distribution of a payroll that adds up to \$1,500,000 a day. As the workers show their card stubs, the pay clerk slips the envelopes through an opening at the bottom of the bulletproof window.

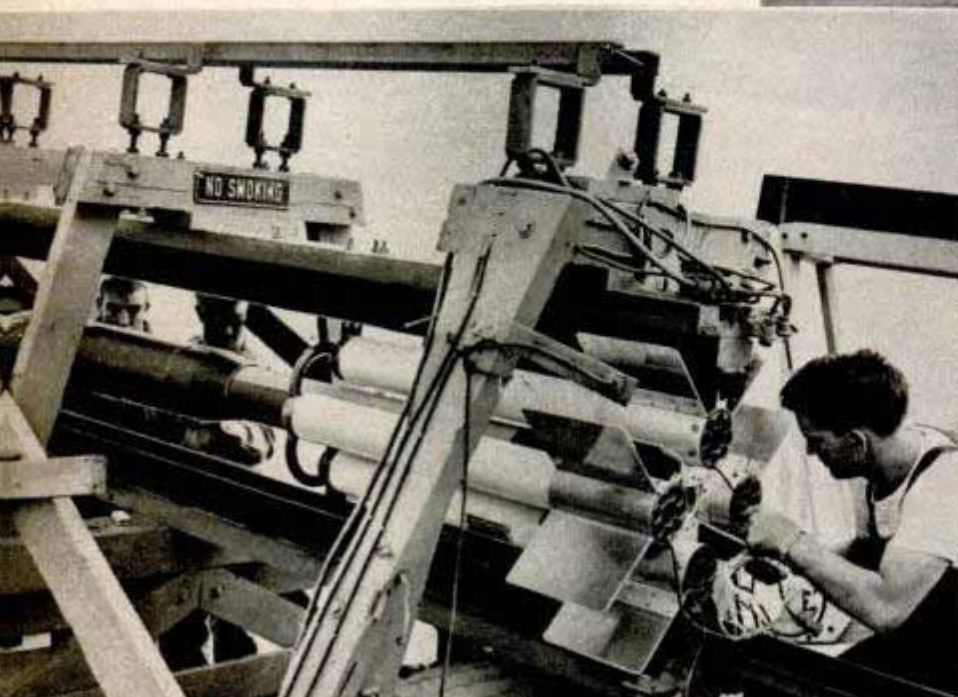
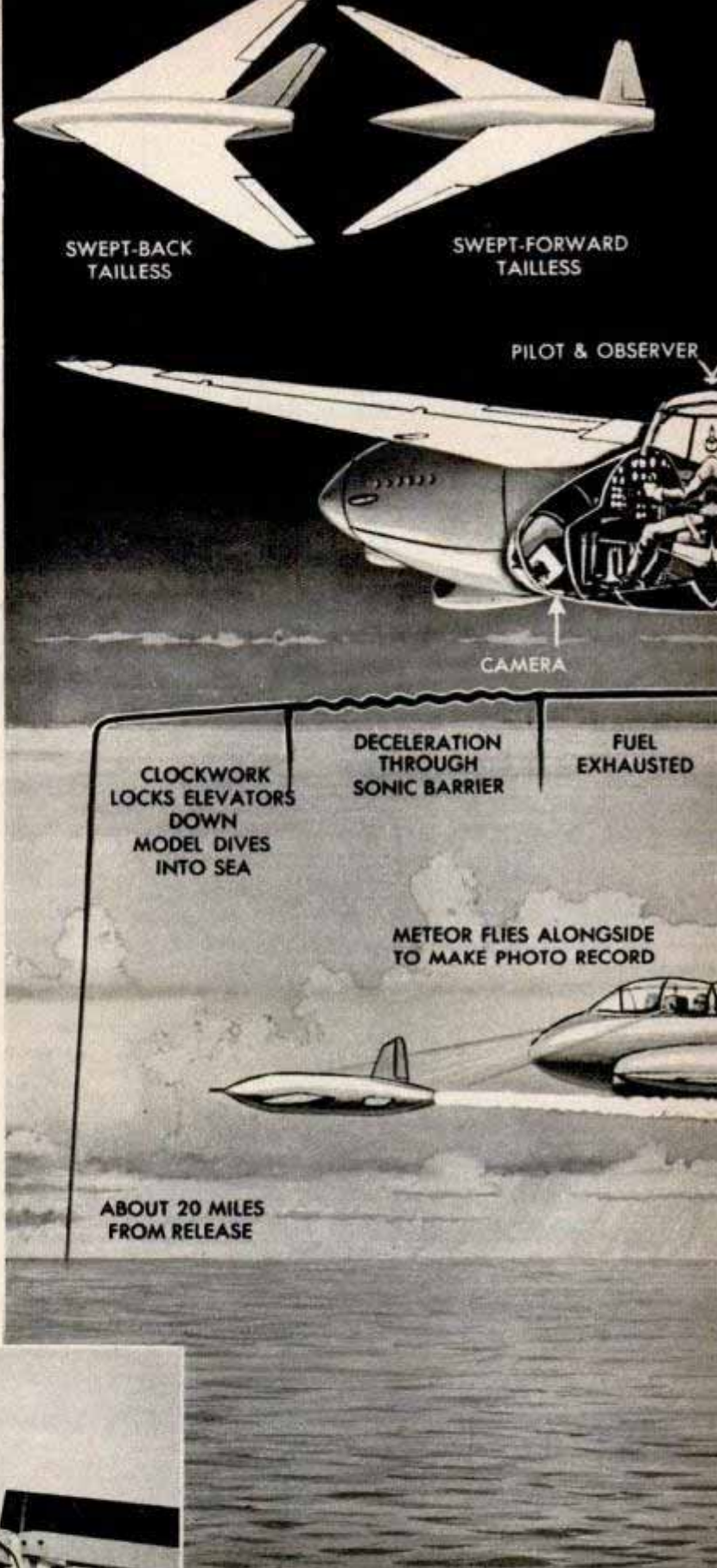


Robot Rockets Challenge Sonic Barrier

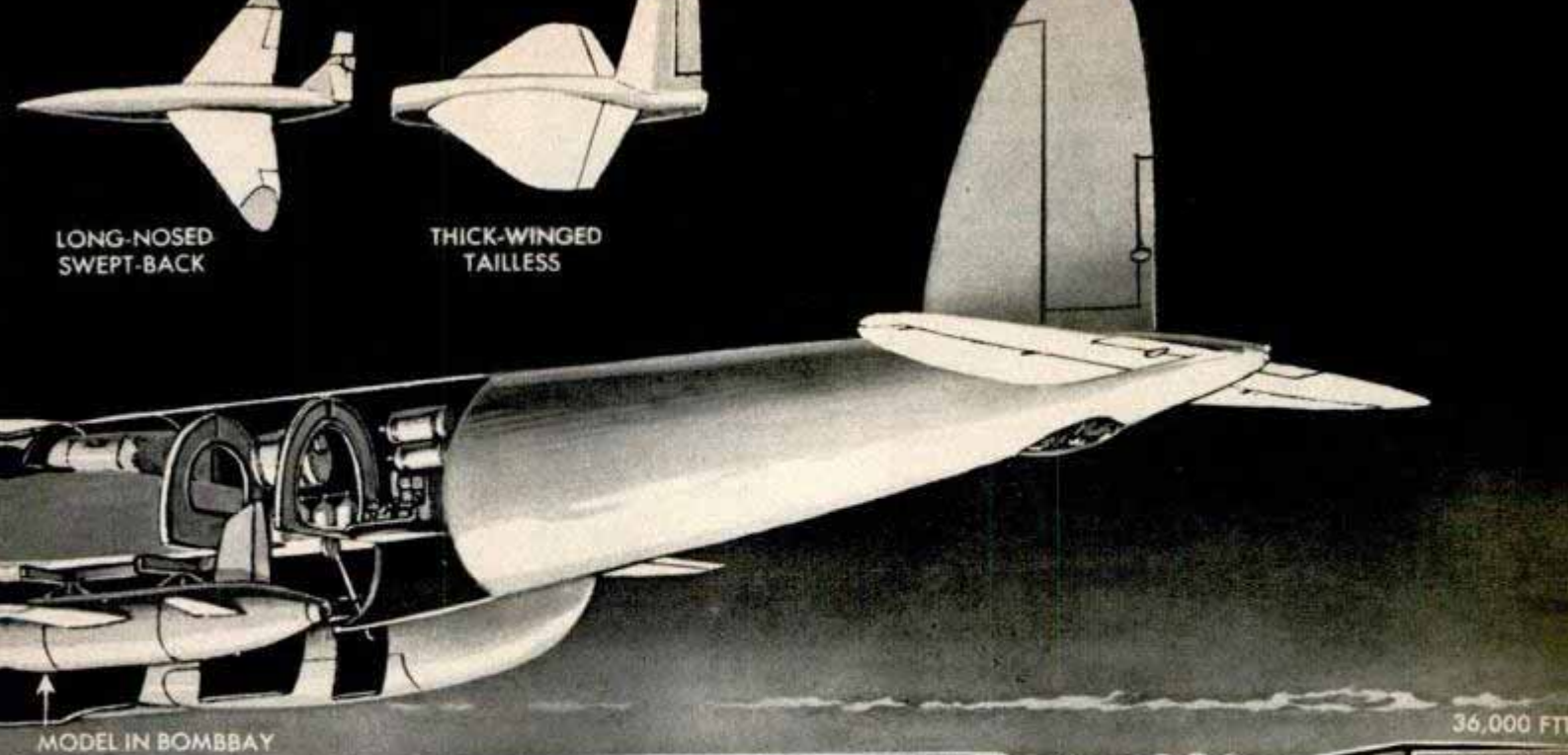
WHAT WILL HAPPEN when planes speed up and slow down on their way through the sonic barrier? To find the answers to one of the most critical problems of supersonic flight, Great Britain has started a six months' test program 14 miles off the Cornish coast. Most authorities are already agreed that aircraft will fly faster than sound successfully, once past the barrier.

Some 80 pilotless rocket models will be flown to probable destruction during the experiments, after brief bursts of blazing speed. They are being launched from beneath bombers flying about 400 miles an hour at 36,000 feet, gliding 15 seconds and losing about 1000 feet before their motors start. After one or two minutes level flying guided by an automatic pilot, the models crash into the sea to avoid danger to shipping.

During the run, batteries of automatic cameras in jet fighters patrolling the course shoot complete records of the test. In addition, each model carries a six-channel telemetering outfit that continuously radioes reports to the ground, where the flight is tracked on radar screens.



Cutaway diagrams, above, illustrate how the British experiments will be conducted. Speedy Mosquitoes will probably be used for the dropping assignments and 600-mile-an-hour jet Meteors for patrol duties. At the lower right is a typical rocket plane model. Left, in a U. S. test with supersonic projectiles, Navy technician adjusts fuses in rocket chambers of ramjet. One fired at Ft. Miles, Del., reached 1400 miles an hour



LONG-NOSED SWEEP-BACK

THICK-WINGED TAILLESS

MODEL IN BOMBAY

36,000 FT

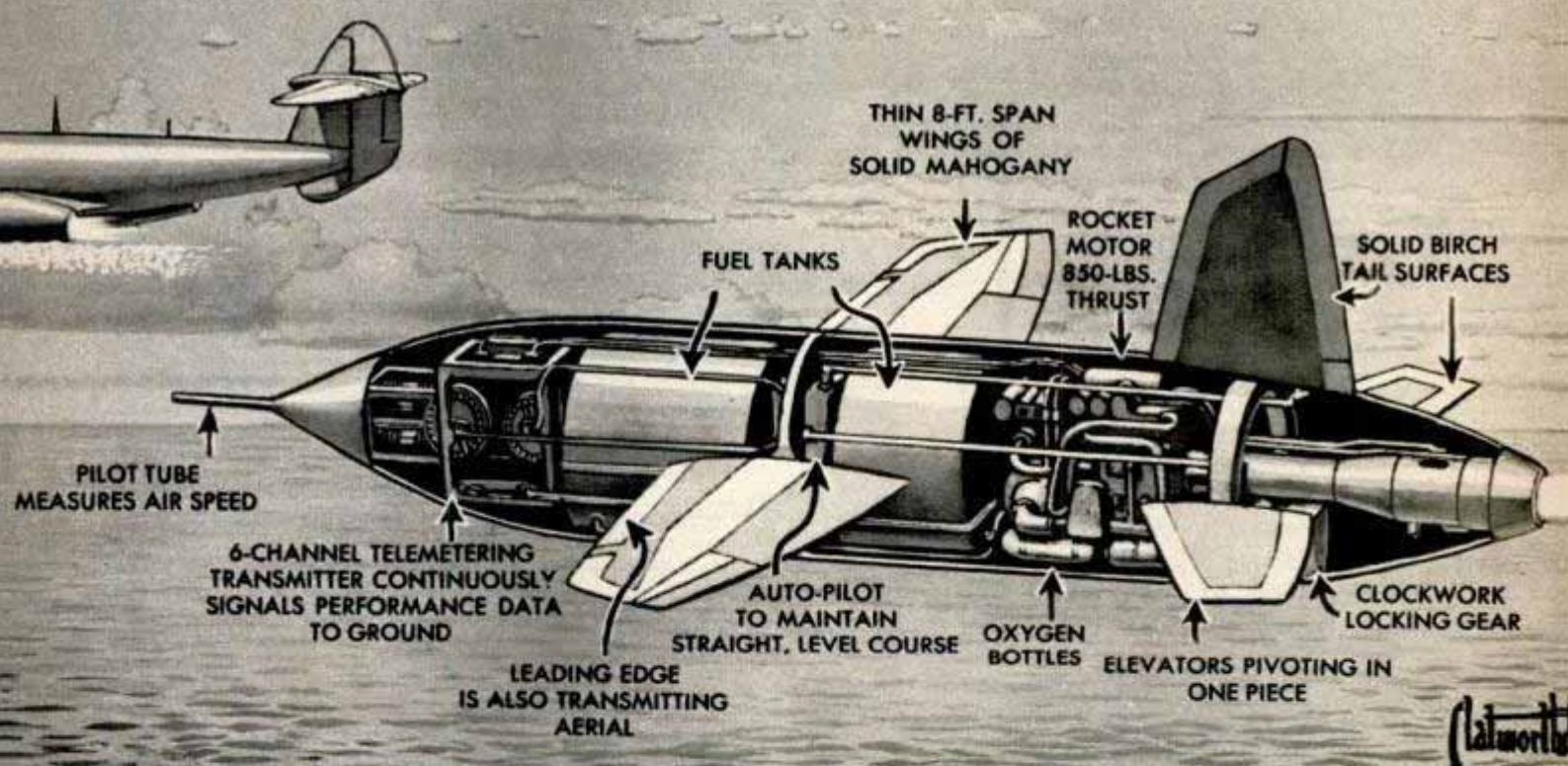
35,000 FT

1 MINUTE AT 880 M.P.H.

15 SECS. ACCELERATION THROUGH SONIC BARRIER

ROCKET IGNITES

MODEL RELEASED



Clatworthy

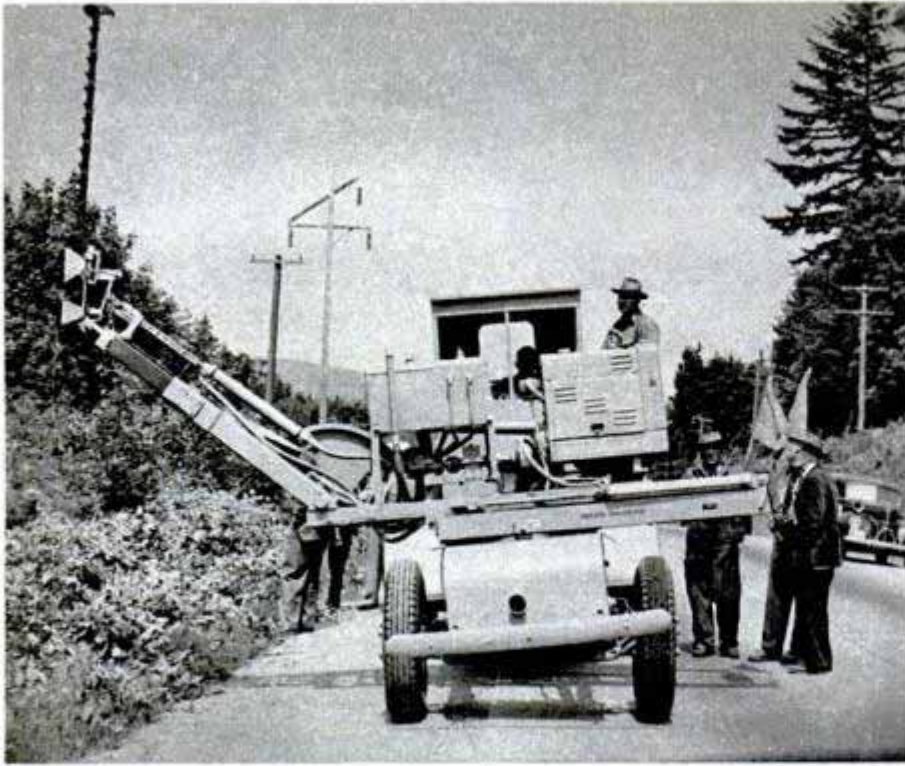
Copyright by S. W. Clatworthy

The test planes are built to scale. One of the first flown weighed approximately 900 pounds, had a highly polished mahogany skin and a 2000-horsepower alcohol-burning motor. It was close to 12 feet long and had an eight-foot wing span.

Models were decided on, instead of full-size planes, for the experiments because they are quicker and easier to build, permit quicker analysis of results, are simpler

to modify and do not endanger pilots' lives. Flights are necessary because wind-tunnel research is limited at transsonic speeds.

In tunnels, at speeds near sound, shock waves set up by the wing's leading edge are reflected from the walls back onto the rear of the wing, distorting the results. Once the speed of sound is exceeded, the waves move back toward the trailing edge and the reflection no longer affects the wing.



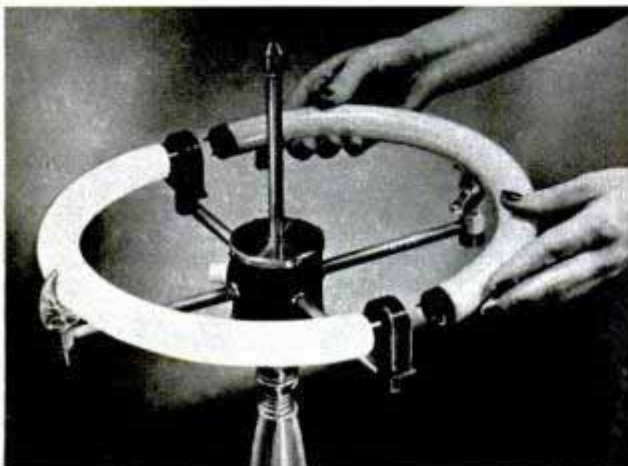
Roadside Trimmer Mows Steep Banks

Capable of cutting at almost any angle, a roadside brush cutter trims gullies and banks easily. Its five-foot blade mounted on a long, adjustable arm, the cutter trims brush and small trees up to four inches thick. In a recent test, the cutter in 15 minutes trimmed a stretch of brush that would have taken three men a full day to cut by hand. A smaller model, designed for use with a tractor, enables farmers to trim brush along irrigation ditches quickly.

Once Barber Chair, Now an X-Ray Table

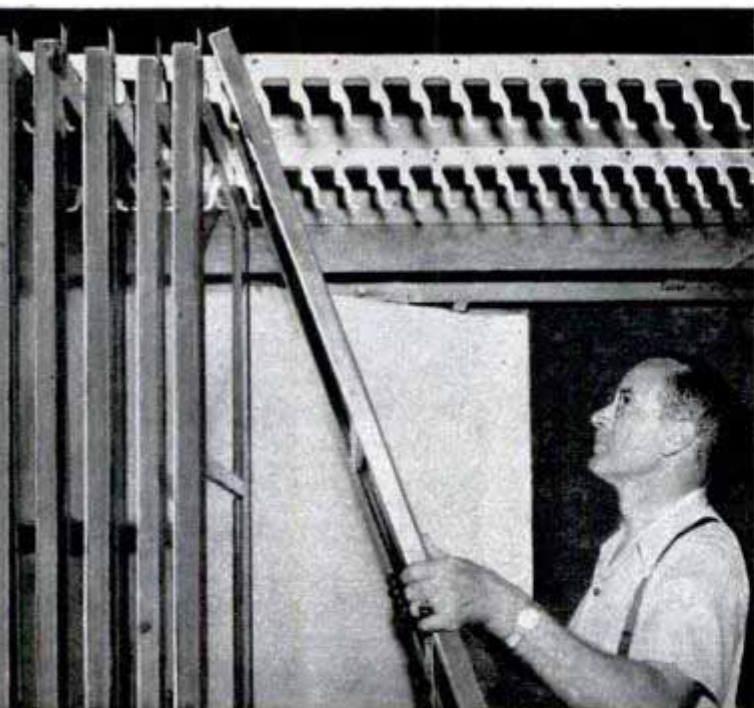
By using ingenuity and \$25 worth of new materials, shop workmen at Colorado State Hospital in Pueblo converted an old barber chair into a combination X-ray and operating table. The hydraulic unit of the barber chair serves to adjust the height of the table.

ⓂNails in regular production range in size from 15-inch boat spikes, weighing 1 pound 10 ounces each, to the barely visible escutcheon pins, which are only $\frac{3}{16}$ inch long and so light that it takes 95,000 of them to weigh one pound.



Half-Circle Fluorescent Lamps Can Be Used Singly or in Pairs

Because of its shape, a semicircular fluorescent lamp has greater flexibility of uses than the full-circle fluorescent type. Used in pairs, the lamps provide shadowless light for desk and table lamps. Singly, the crescent-shaped tube fits neatly into bed lamps or wall lamps. It provides more light than a 50-watt incandescent bulb, but consumes only one third the electricity. Two-pin plastic bases at each end of the tube make it easy to replace lamps.



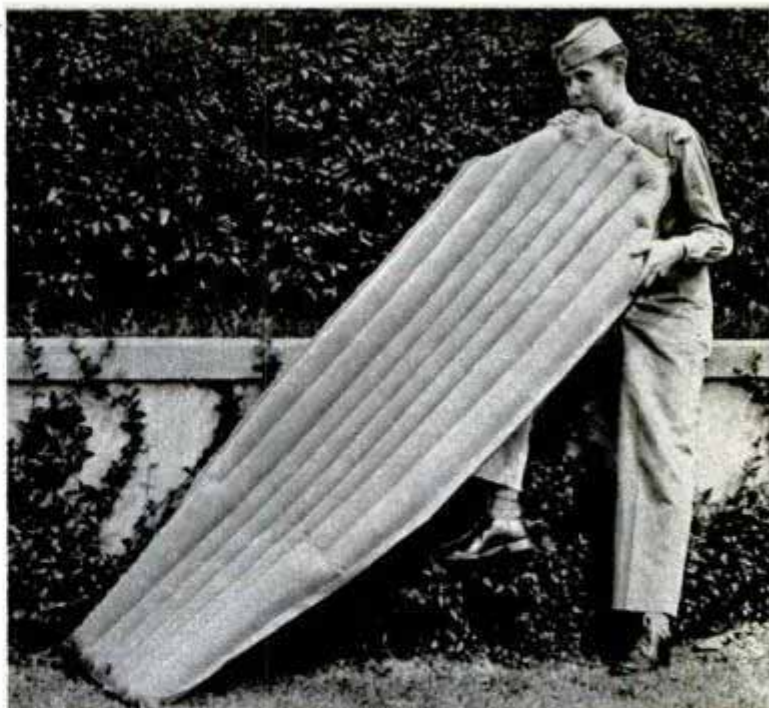
Storm Windows Stored Safely

Storm windows and screens are stored safely with a set of metal brackets attached to the basement ceiling. The sashes are inserted between the fingers of the brackets on an angle and when lowered to a vertical position are held securely. Each set of brackets holds 21 windows or screens. Two or more sets can be arranged in tandem to increase the capacity.

"Disk-Whirler" Tests Metal Alloys

To test the strength of jet-engine alloys, red-hot metal disks are whirled at 35,000 revolutions a minute in a "bombproof" dugout—until they explode. The dugout at Westinghouse Research Laboratories is ringed with heavy sandbags and sunk 10 feet below floor level. Weighing 32 pounds, a foot in diameter and an inch thick, the disks are turned by a shaft from a high-speed motor another 10 feet below the dugout. They are heated to 1400 degrees Fahrenheit by coils. During tests the whirling disks are covered by a thin steel hood from which air has been evacuated to reduce friction. It has purposely been made of very light steel so that flying fragments from the disks penetrate its thin skin undamaged enough to be studied. The disk's increasing diameter is also measured periodically to learn how much the metal "creeps" under stress and temperature.

Popular Mechanics is always ready to supply further information to readers about various products described in any issue. Just write to Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, for a prompt reply



Signal Corps photo

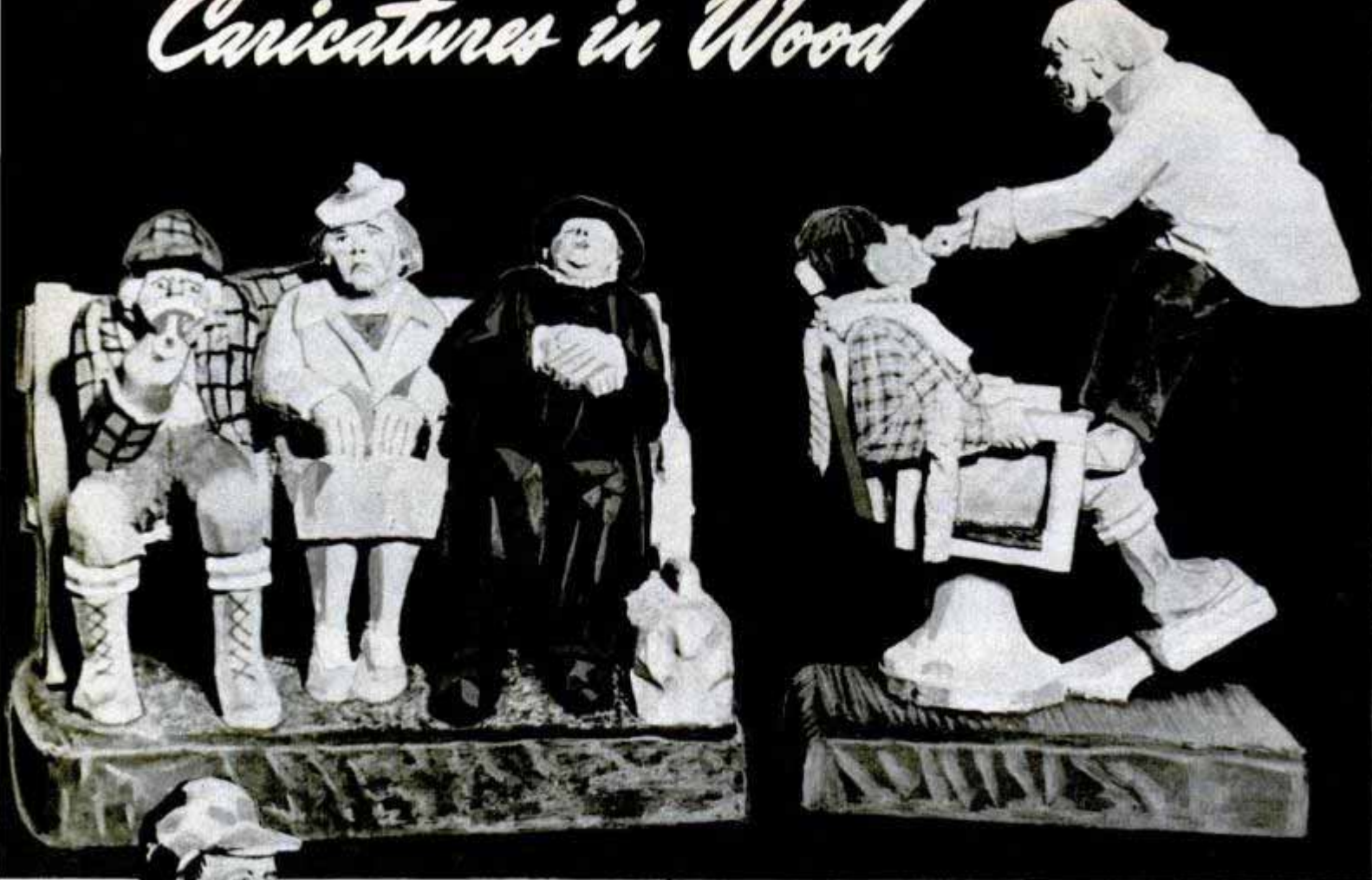
Cradle-Shaped Air Mattress

Soldiers who toss in their sleep won't roll off a new air-filled mattress, according to the Army. The mattress has a concave surface that overcomes the tendency of sleepers to roll off ordinary air mattresses. Weighing less than four pounds, the mattress is designed to fit inside the Army cold-weather sleeping bag. It is made of Nylon cloth coated with butyl rubber.

Westinghouse photo



Caricatures in Wood



Above left, three weary people waiting for the bus. Right, carving of a dentist yanking a stubborn tooth. Below, Just's friend, the blacksmith

AFTER POUNDING out rough chunks of metal on a huge forge hammer all day, Abel Just of Beloit, Wis., turns to another medium for relaxation when he goes home. Instead of a heavy forge, he uses small wood-carving tools, and instead of pounding metal, he carves caricatures in soft wood.

Wood-carver Just has a photographic memory and he reproduces the features and characteristics of people he meets during the day in wooden caricatures. Once when having some work done on his teeth, he accused the dentist of being too rough on him. That night, after returning home, he carved his impression of the visit.

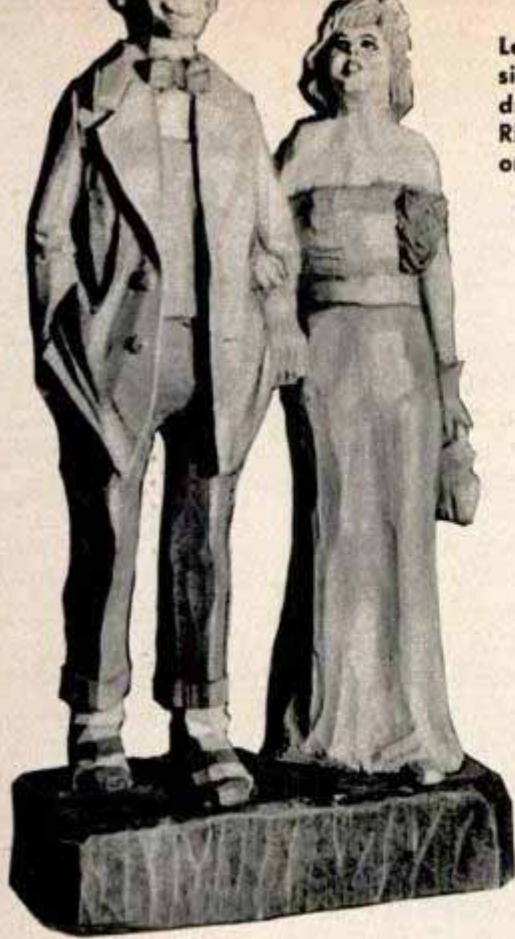
The caricature shows the dentist standing on the patient's knees and tugging at the stubborn tooth with a pair of huge forceps. The suffering patient is tied to the chair with huge ropes. When Just presented the carving to the dentist, it caused such amusement that the wood carver was besieged with requests from other dentists for copies for their offices.

He doesn't sell his carvings, but gives them away or adds them to his collection of more than 300 figures. He studies the men who work with him at the forge shop and at night carves them from memory. One of his favorite carvings shows an old millwright sitting on a toolbox getting ready to eat his lunch. He's taking a sandwich from the lunch box and holding a Thermos bottle in his other hand. In the box are a banana and an orange.

Although he has never studied art, Just is able to reproduce, in wood, excellent likenesses without any apparent effort. He works without drawings and relies upon his memory for such details as clothing and facial expressions. After the carving is done, he paints the figures in lifelike colors.



Left, the wood carver's version of a pair of teen-agers dressed for an evening date. Right, an old millwright sits on his toolbox eating lunch

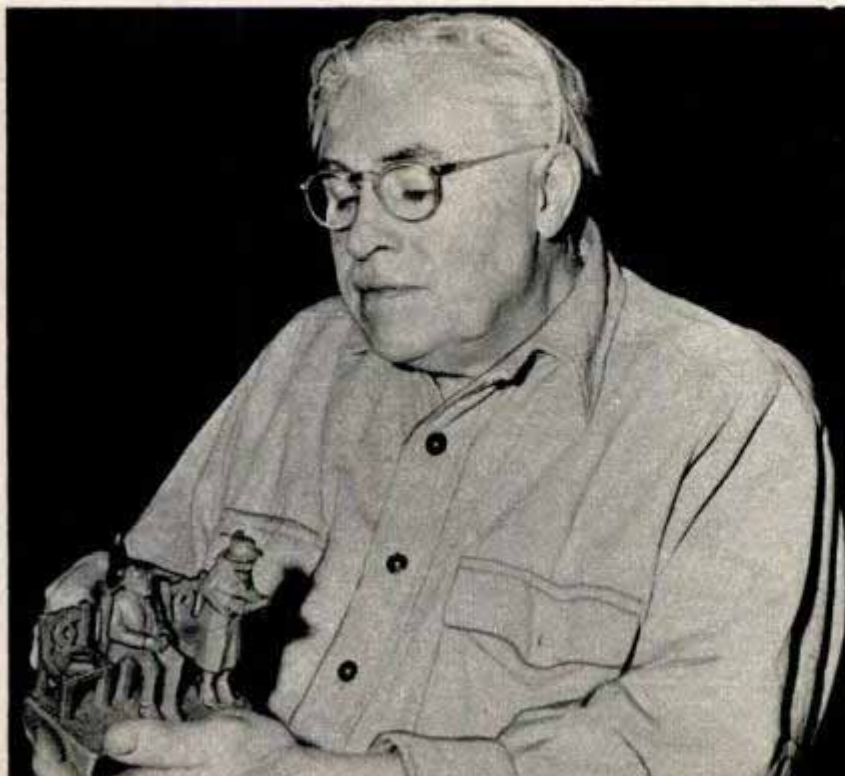


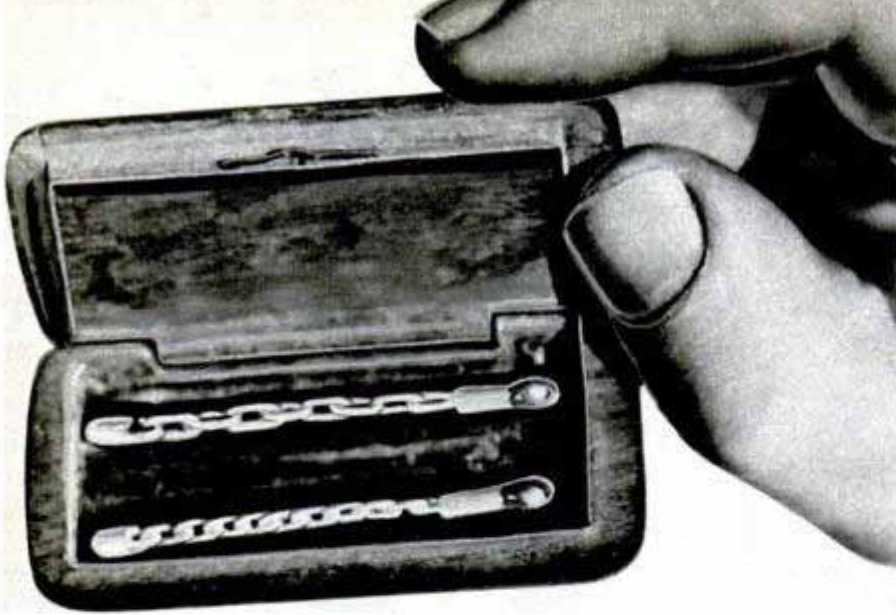
By Frank Reichstein

He has an acute sense of humor and his carvings show the comic side of his characters. He is able to inject humor into the wooden figures by a deft cut or two. Even the most complicated carving requires only a few hours' work. He uses quick, sure strokes and, in a short time, the wood begins to assume the shape of the model.

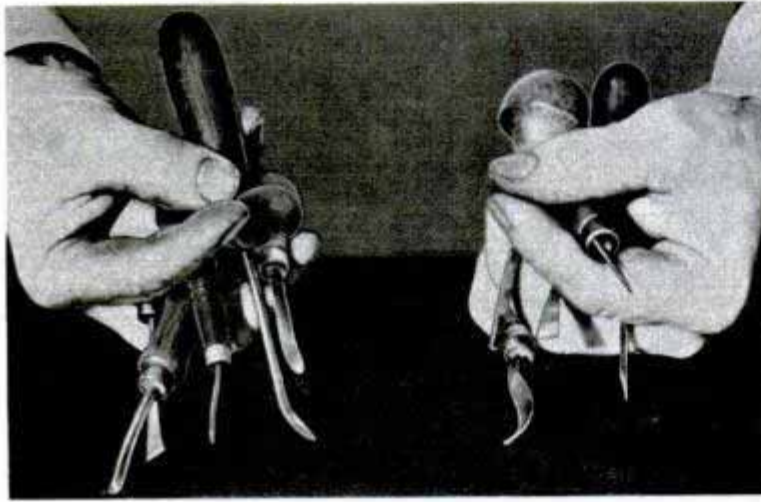
His tools are the ordinary wood-carving tools used

Below, Just uses his handiest tool an ordinary paring knife on a new carving. Right, another forge worker, the blacksmith's helper





Two chains carved from ordinary household matches. Top chain was Just's first attempt. Bottom is more complex spiral type



Above, Just holds the tools used in carving his caricatures. Some of these he made himself. Below, western scene shows plenty of action. Cowboy ropes a mustang as another waits with the halter



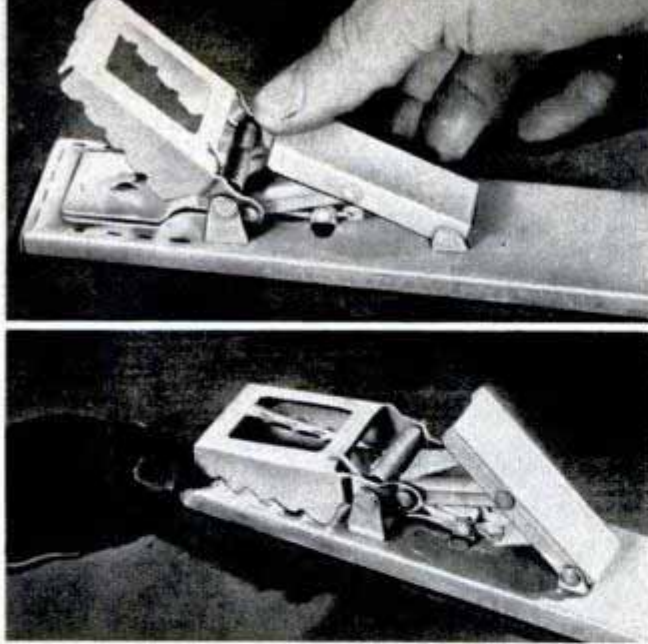
by furniture makers. They come in sets of six to eight cutters, providing a variety of sizes. He also uses a hand power tool with interchangeable heads for routing. His other power tool is an electric drill used at low speeds only. He also uses it for cutting holes to permit entry of a coping-saw blade when removing large pieces.

For delicate carving such as the tiny chain made from an ordinary match, he grinds down a hacksaw blade to half its original thickness and then sharpens it to a point. Other cutting tools include a shoemaker's tool he sharpened for use in cutting fine lines in facial features and some small chisels he made from discarded machine tools. But, he says, the most important of his tools is an ordinary kitchen paring knife that has been sharpened so many times it is now less than an inch long.

One of the reasons why his carvings are so attractive is that, although they show important details, they also carry the marks of hand carving. The "bites" of the knife blades are plainly visible on every piece, but they don't destroy any of the detail in the likeness.

When asked why he didn't sand his carvings to remove the tool markings, Just answered, "If I sand them down, I'll have something that doesn't look like wood."

His carvings look like wood, and they also look like people—lively folks, with character.

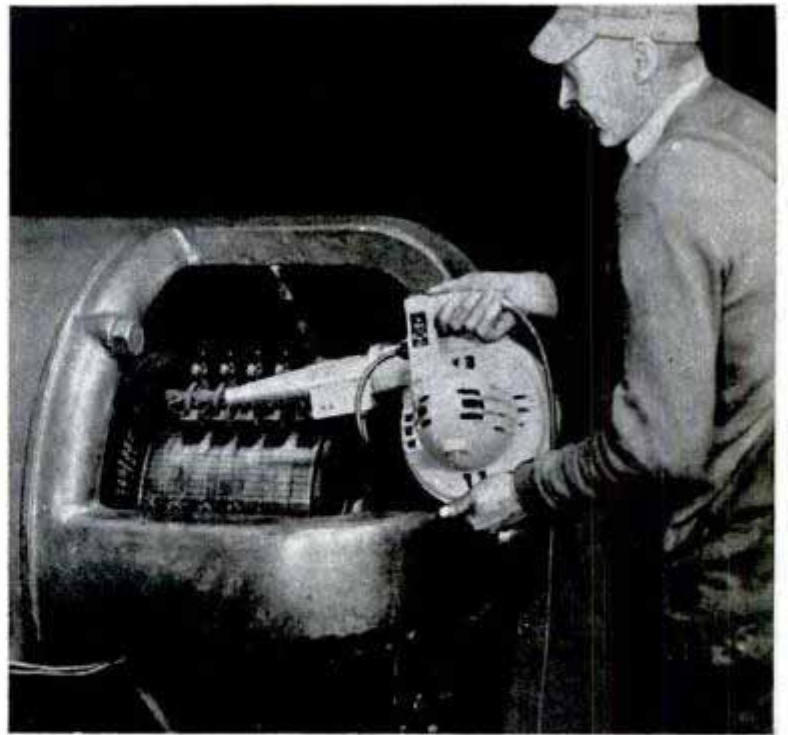
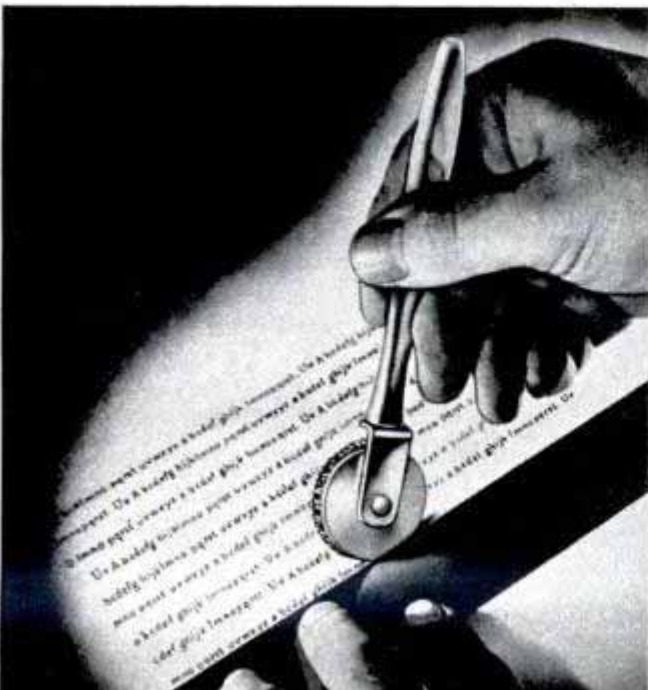


Here's That Better Mousetrap

Bruised fingers are less likely with a safety mousetrap that has an automatic setting bar. Pressing the bar sets the trap or releases the trapped mouse. The tapered jaw, released by a sensitive trigger, kills mice at any angle. Made of aluminum, the safety trap is durable and easy to clean.

Lettering Device for Layouts

To give the layout man a preview of how an advertisement will look when printed, a wheeled lettering device can be used. As easy to use as a ruling pen, the unit consists of a handle and a set of interchangeable wheels for various type faces. The complete alphabet is stamped on each wheel, but the letters are spaced at intervals to resemble words. By rolling the wheel along a straightedge, the layout man can insert letters of the desired type face in the space the copy will occupy in the printed advertisement. The wheel is inked by rolling it on an ink pad.



Blower Dries Paint Quickly

Newly painted surfaces are dried quickly by a heating attachment that fits on the end of a portable blower. The element's temperature is regulated by a switch.

Lightweight Japanese Bicycle

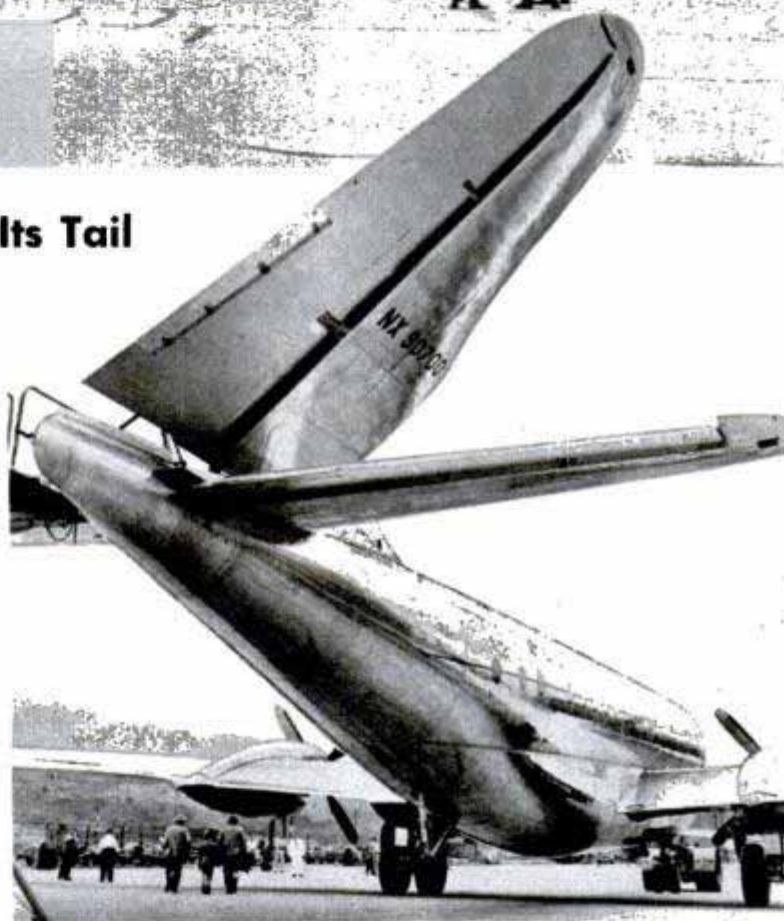
Lightweight bicycles made of duralumin are being manufactured at the Mitsubishi airplane factory in Japan. The bicycles can be taken apart easily for storage in a small space. Present production of approximately 600 bicycles a month will be increased as soon as more rubber for the tires is available.



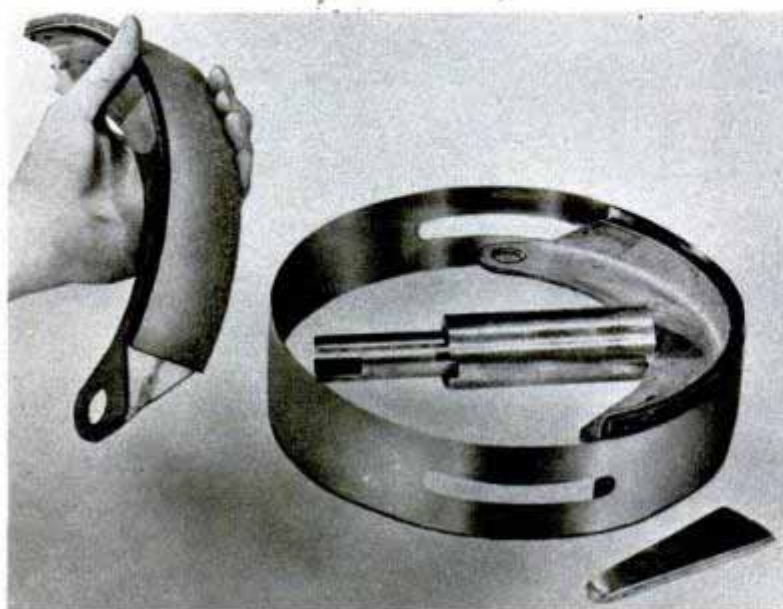


Boeing Stratocruiser Folds Its Tail

With a hinge system that folds the tail, nearly 12 feet is cut from the height of Boeing Stratocruisers, enough to allow them to use standard hangars. After four bolts holding it in place are disconnected, the fin is automatically lowered by a jack hinged at its other end to the tail's horizontal surface. Controls and other installations leading to the tail are extended without being disconnected. The folding system, which is also being installed on Air Force B-50s and C-97s, lowers the fin from 38 feet 3 inches to 26 feet 7 inches. That is lower than any other single-tail four-engine plane and makes it easier to service the tail assembly.



Boeing Aircraft photos



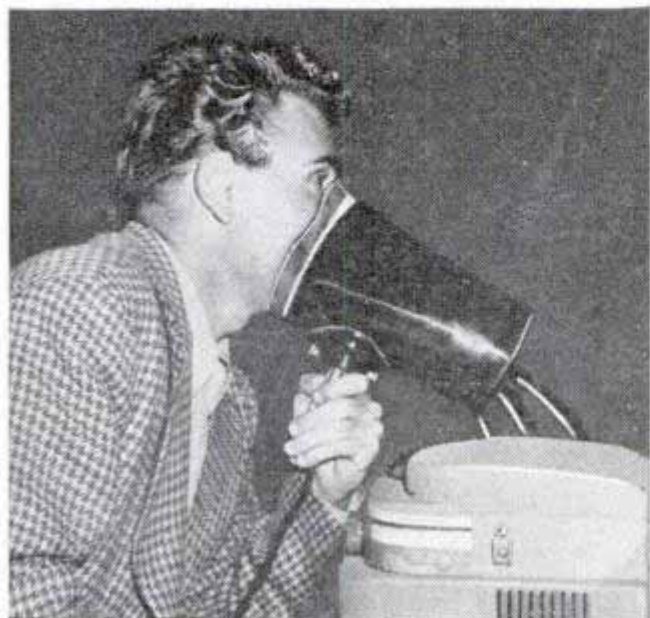
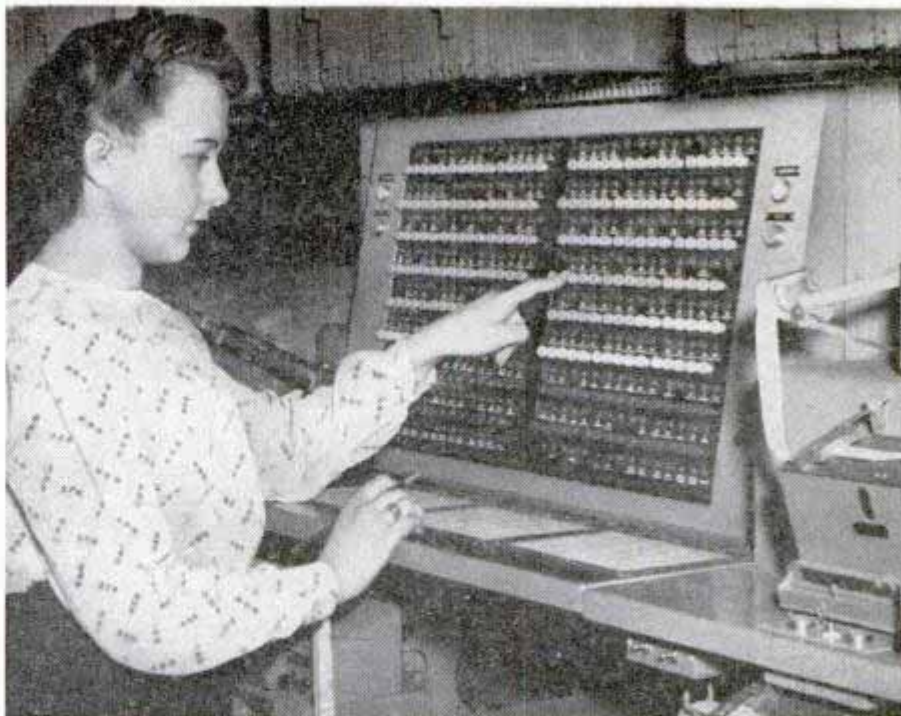
Adhesive Makes Linings Easy to Apply

With its bonding agent applied to the lining at the factory, rivetless brake lining is installed easily by the garage mechanic. Installation is quick and requires no complex machinery. The brake shoes are cleaned and the lining clamped around them with a steel band. The unit is then placed in a curing oven where the bonding is completed.

After removal from the curing oven, the brake shoes are released from the steel clamping band. The smooth lining is now bonded firmly to the shoe without rivets.

Push-Button Panel Sends Telegrams

Push-button switching of telegrams from a tri-state area to any part of the country is accomplished by a complicated switching center installed by Western Union in Philadelphia. The message, typed at the point of origin, is received at the switching center on a machine that prints the message and punches a combination of holes in a paper tape. A clerk then reads the destination from the tape, pushes a button to alert a transmitter and presses another button which sends the message to the proper destination. The transmitter automatically sends the message across the room at 150 words per minute to a circuit transmitter which sends it to its destination in its proper turn. This transmitter prevents telegrams from being sent out in the wrong order. An elaborate monitor system guards against mechanical lapses in the system, which has in its 200 circuits more than 3000 miles of wire. The system replaces a series of manual operations requiring at least four persons.

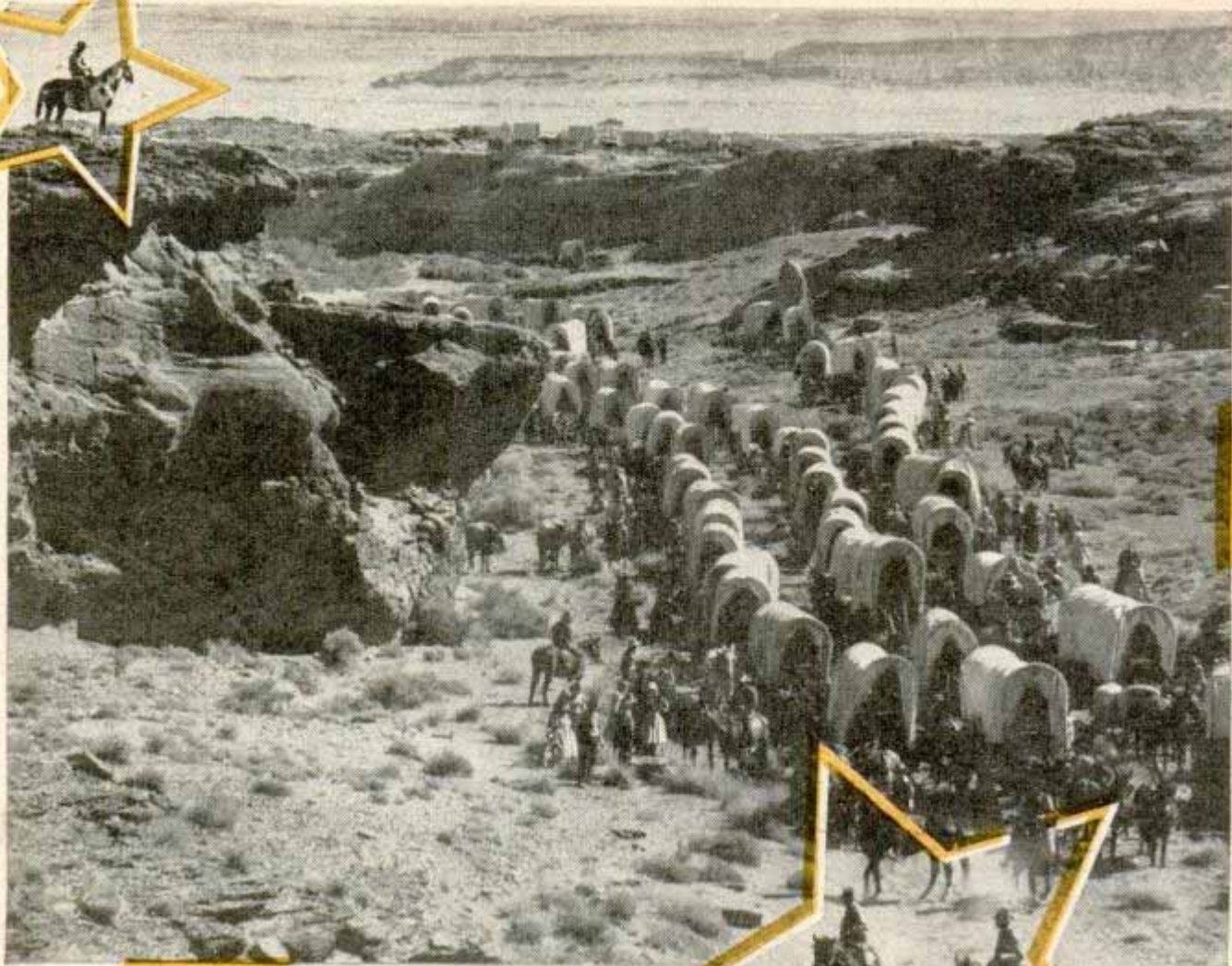


Testimony Recorder

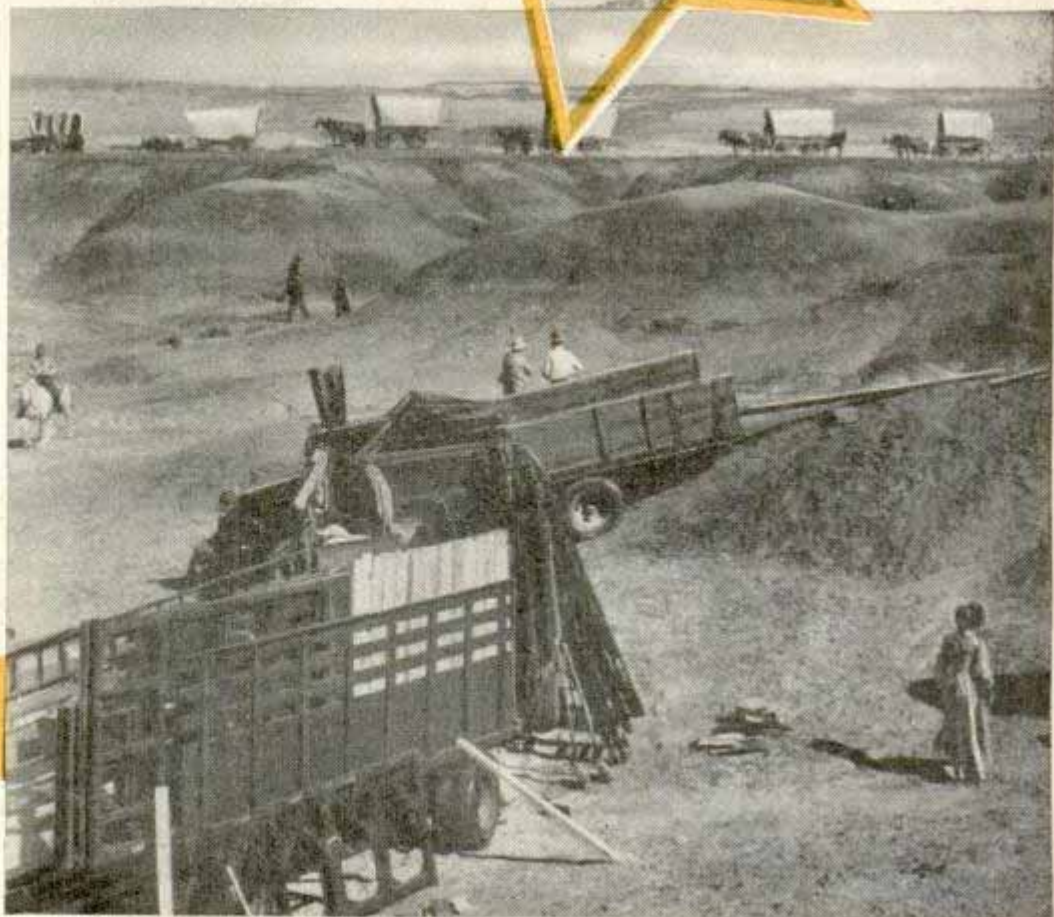
Testimony by witnesses during Senate investigations is being recorded by an instrument with a megaphone-shaped mouthpiece. The machine permits testimony to be played back in case of question. Already in use by the small business committee, it is scheduled to be used by all committees at the next session of Congress.

Plastic-Coated Wallpaper

By means of a war-time technique for weatherproofing maps, wallpaper is now coated with an acetate film only .00088 inch thick. The film is laminated to the paper and protects it from stains. The laminated product has no sheen and cleans easily with soap and water or carbon tetrachloride.

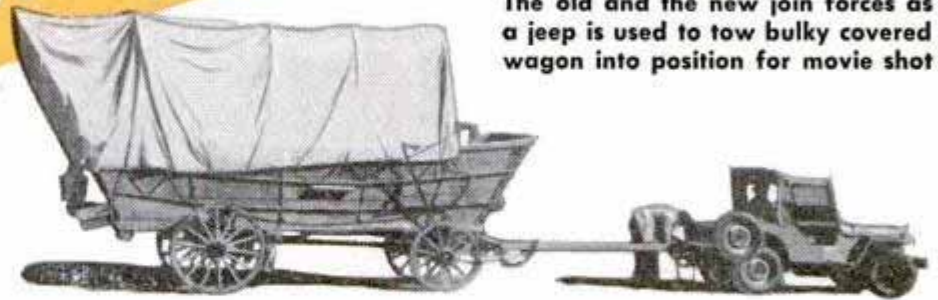


Above, these movie "pioneers" look as though they're roughing it, but at night they sleep in solid comfort. Below, camera, in star at right, is wheeled down the wooden tracks as it films covered wagons on location



HOLLYWOOD ON THE MOVE

The old and the new join forces as a jeep is used to tow bulky covered wagon into position for movie shot



HOLLYWOOD CAMPS OUT in style when it goes on location. Stars and stagehands all expect, and get, hot showers and steak dinners even when working 100 miles beyond the last outpost in some uninhabited part of the West. Clean sheets and electric lights go with them on location even in rugged mountain country.

They enjoy most of the comforts of a first-class hotel no matter whether they camp for a few weeks in an Idaho forest or

spend two months in the sand and sagebrush of a New Mexican desert.

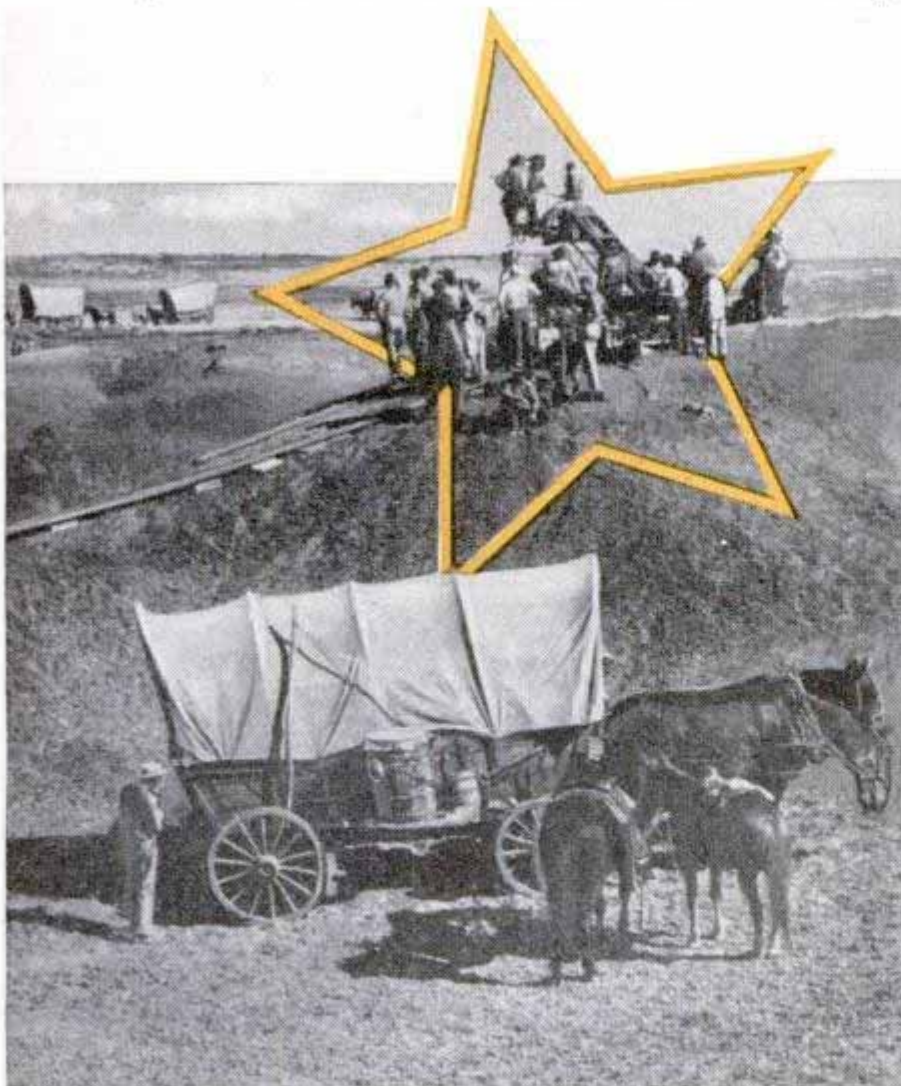
Specialists at producing luxury in the wilderness, Anderson Boarding and Supply Company of Hollywood builds a temporary city in any spot on 10 days' notice, then takes it apart when the shooting is finished, and moves it to another location possibly 1000 miles away.

Big outdoor pictures are a current rage in Hollywood after the long wartime shortage

of spectacular scenic backgrounds. Picture companies go as far as Canada and Mexico to get the scenery they desire.

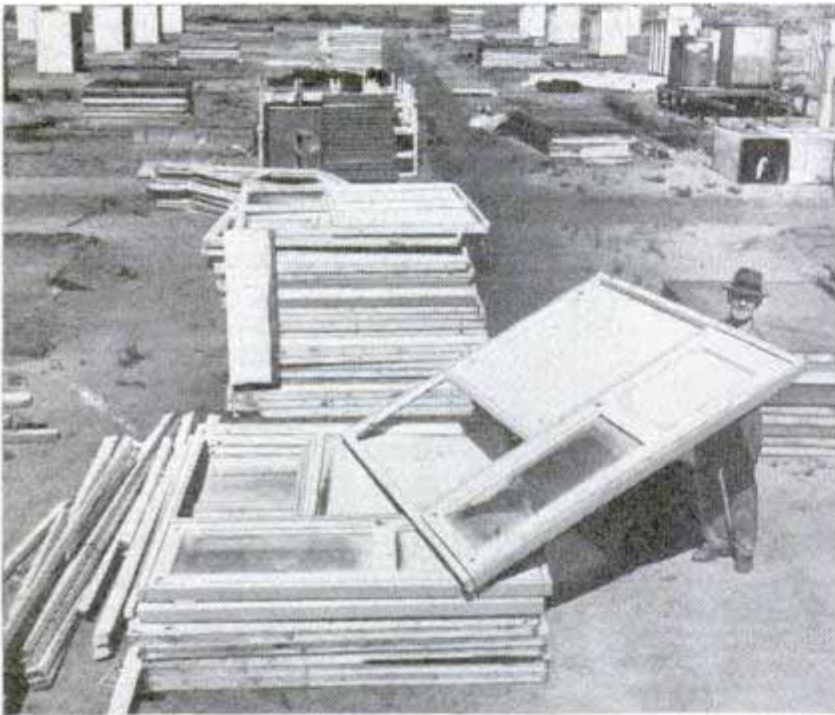
That means much more than simply transporting the actors to the site that the director selects. Camera crews, sound men, hairdressers, make-up artists, script girls, and set builders who prepare or modify the close-up scenery, all are as necessary as the actors themselves. Radio technicians go along to service the walkie-talkies and for long distance communication with the studio itself. Even an airplane pilot who flies the daily film production to Hollywood for processing and brings back the rushes for the director's viewing may be included in a location group. A big outdoor production may require 200 or 300 people who will be on location from several weeks to several months.

To house and feed such groups, the Anderson subsistence company has its own prefabricated, portable communities that can be erected anywhere trucks can be driven. Where there are no roads the





Workman unpacks fireproof canvas roofs for two-room sleeping tents



Above, village is torn down for shipment to new location. Bathroom units are still up. Below, sleeping tents with canvas roofs removed



company has to build its own. Two hundred people need about 60 buildings spread over some 15 acres of ground. After the brush has been cleared away and the ground leveled and surveyed the knockdown village arrives on a fleet of trucks.

Interchangeable plywood floor sections of large two-room sleeping tents are assembled on the site. Wall sections are attached and prefabricated bathroom units, complete with showers, are installed. Fireproof canvas roofing is tied over preassembled rafter systems. Beds, chairs, rugs and other furnishings are moved in and the tents are ready for use.

Office tents, make-up tents and other special-purpose units go up just as rapidly. Combination kitchens and mess halls, also prefabricated, are erected in a day.

Water is one of the big problems because a motion-picture camp uses 100 gallons of water per person daily. When there is a stream nearby, water is piped from it through a purifier to an overhead tank. Otherwise tank trucks must haul water from the nearest source.

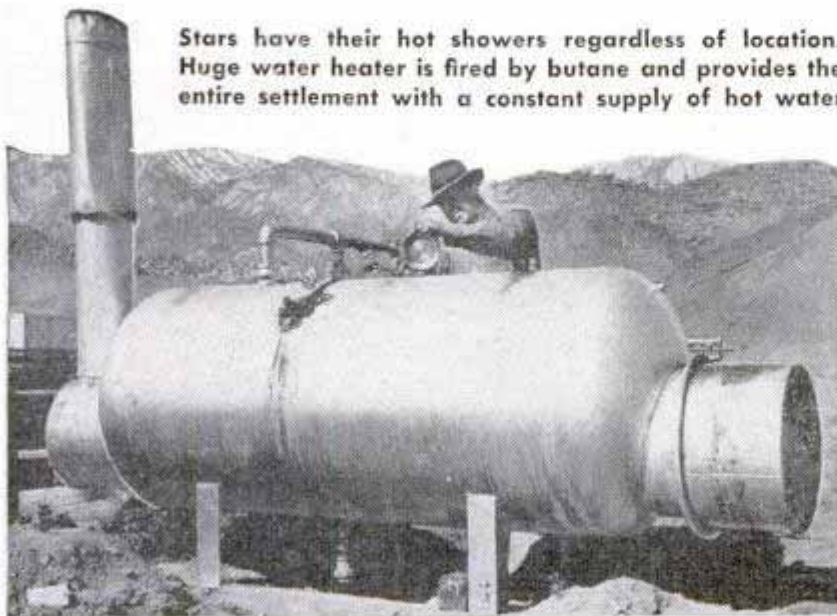
Huge butane-fired water heaters are installed on concrete foundations. Trenches are dug and preassembled hot and cold water systems and sewer lines are connected to each bathroom unit. Fire hoses are attached to the wa-



Windstorm damaged movie "mountain" revealing its flimsy wood framework covered with burlap and plaster



Stars have their hot showers regardless of location. Huge water heater is fired by butane and provides the entire settlement with a constant supply of hot water



ter system. A lighting plant is placed in operation and wire strung to the buildings. Circulation pumps for the walk-in refrigerators are tested and put to work. There are a thousand details in putting the town together, each done according to plan.

From the first day on, trucks make daily trips to the nearest town to pick up fresh food supplies, clean linen and the constant stream of incidentals the camp needs. Ice cream, trout, fresh fruits and berries, and similar perishables often are flown to the camp. Anderson keeps an airplane under almost continuous charter for this purpose.

In the Monument Valley country of northern Arizona, a movie camp may be plagued by cloudbursts every few days, necessitating constant repair of the roads. On some high-altitude locations, the weather may be so cold that the tanks of liquefied butane



Lunches are the same for all. Stars and "grips" alike line up for hot chow

would freeze solid, requiring a crew to work all night keeping the tanks warm by pouring hot water over them. Humidity is a source of trouble when a movie group is on location in the Bahamas and costumes acquire a coating of mildew overnight. Perishables like motion-picture film and Nylon stockings for the stars must be kept in the iceboxes.

A master at solving these and other problems, Oscar F. Giles, in charge of the location towns for the Anderson concern, has his hands full running as many as three or four towns at a time, usually each in a different state. His inventory of knock-down buildings amounts to 250 units.

A portable city is suitable only for a

large studio group, but frequently the studios have to send small crews to a distant location for only a few days. To house these groups, the Anderson company is now building a village on wheels that travels 50 miles an hour on the highway. Complete living facilities for as many as 80 people are being constructed on a fleet of 35-foot semitrailers that can be towed to almost any location on or off the pavement. One trailer is a kitchen with stoves and refrigerators. Others are for recreation, bathroom units and sleeping.

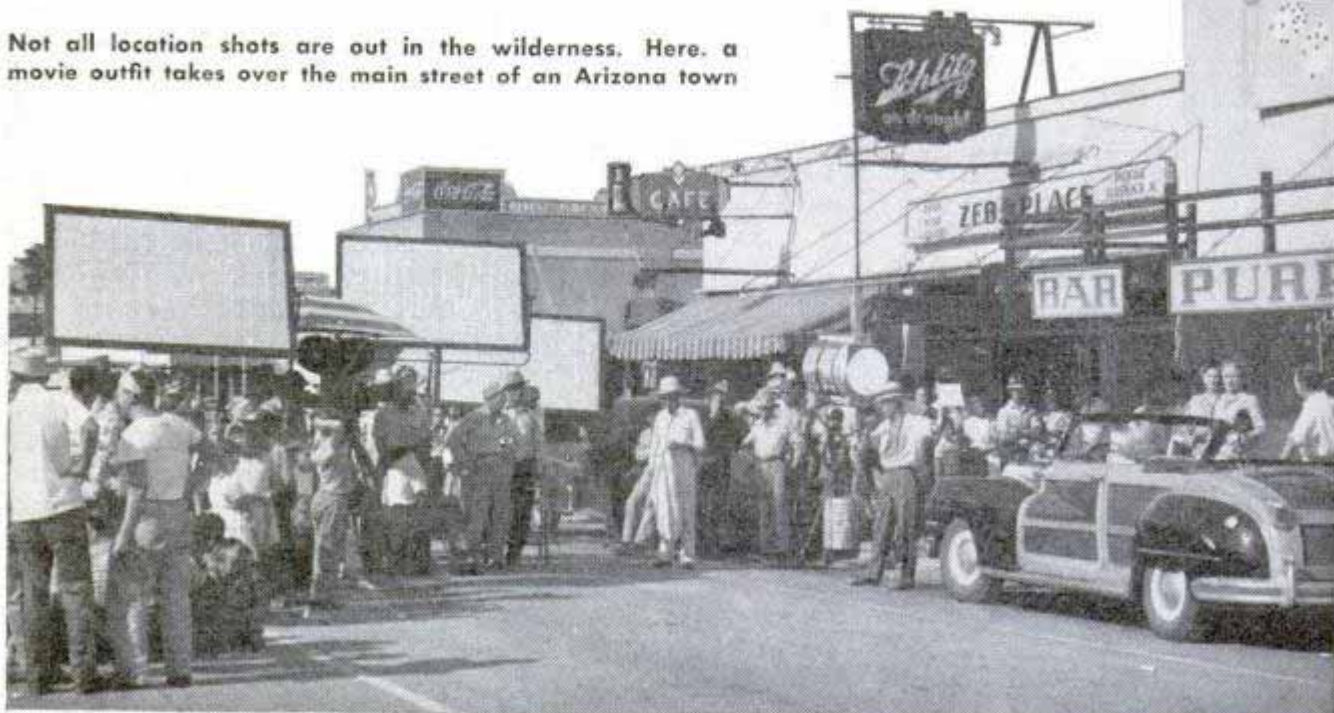
In use, the four walls of the kitchen trailer are removed and a dining trailer is then backed against each side. Forming a cross, the four dining trailers are served by one kitchen. A similar arrangement allows one bathroom trailer to serve four sleeping units.

In addition to its use by small motion-picture companies, the mobile hamlet may also be used by pipe-line, telephone and power-line crews.

Catering to the movies is a big business but actually this is a mere sideline with the Anderson concern. Largest subsistence firm in the country, Anderson Boarding and Supply Company contracts the housing and feeding of

(Continued to page 234)

Not all location shots are out in the wilderness. Here, a movie outfit takes over the main street of an Arizona town

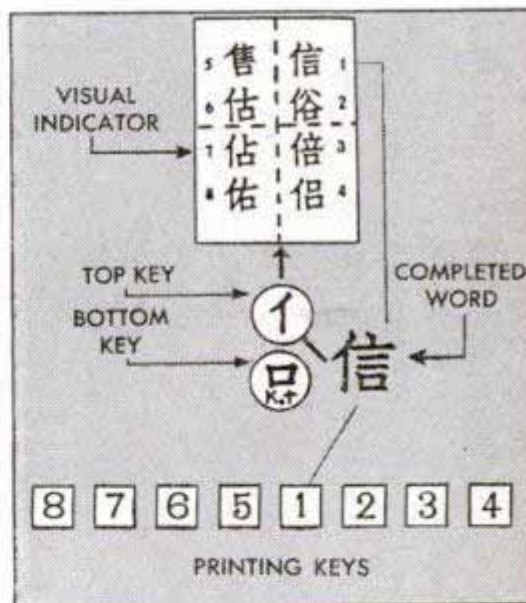


CHINESE TYPEWRITER CAN PRINT 90,000 CHARACTERS



Left, typewriter uses system of combinations. Typist presses keys representing basic parts of word, then selects desired symbol from eight combinations appearing on indicator screen on top of machine (see insert). Right, white rollers flash combinations on screen. The 36 long printing bars in rear contain 8000 symbols

No larger than the conventional size, a Chinese typewriter prints 90,000 characters and will write in an hour what it takes a Chinese copyist a day to do. In addition, the typewriter, called the Mingkwai ("clear and quick"), will type English, Japanese and Russian. As almost all Chinese offices use hand copyists, the machine, invented by Lin Yutang, noted Chinese author, is expected to revolutionize writing in that country. Chinese writing is not made up of letters in an alphabet; instead, each word is an individual symbol. The new typewriter prints every known Chinese word and can be operated at 50 words a minute. To type a word, the typist selects the two basic parts of the symbol by pressing two keys—one for the top part, the other for the bottom. On a screen on the machine are flashed eight Chinese characters using combinations of these two basic parts. The operator then selects the symbol he wants by pressing the corresponding key on the bottom row of the keyboard. Typing is in vertical columns and from right to left. An electric motor performs the printing operation and moves paper and carriage. A spring motor model will be made for places where no electricity is available.



Three steps in typing are (1) typist hits top and bottom keys representing the basic parts of word, (2) eight combinations of these basic parts flash on indicator, (3) typist presses printing key at bottom of keyboard corresponding to desired word

Chemical Capsule Changes Water to Strong Antiseptic Solution

Dissolving secret chemical contents of a capsule in tap water creates a powerful antiseptic which sanitizes eating and cooking utensils, bathroom equipment and floors, telephones, dishwashers, waste food receptacles and other objects exposed to disease germs. Despite its high germicidal power,

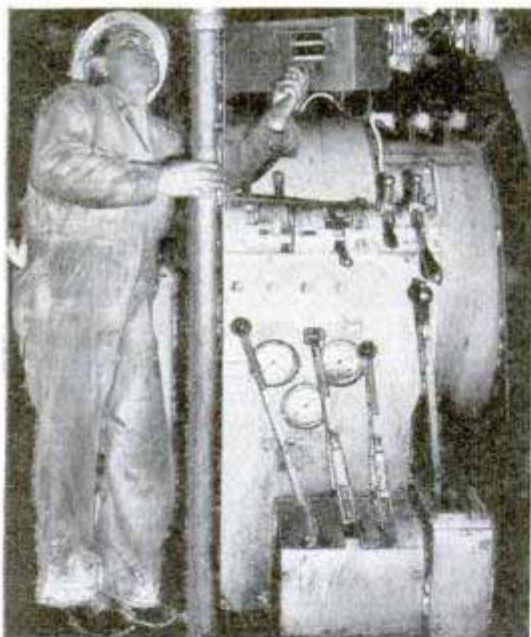
the colorless solution is noninjurious to a person's hands. It deodorizes, yet it leaves no odor or taste. The chemical also is used in the manufacture of industrial products which require a preservative, such as casein paints and adhesives, animal glue and starch pastes.

Talking on the

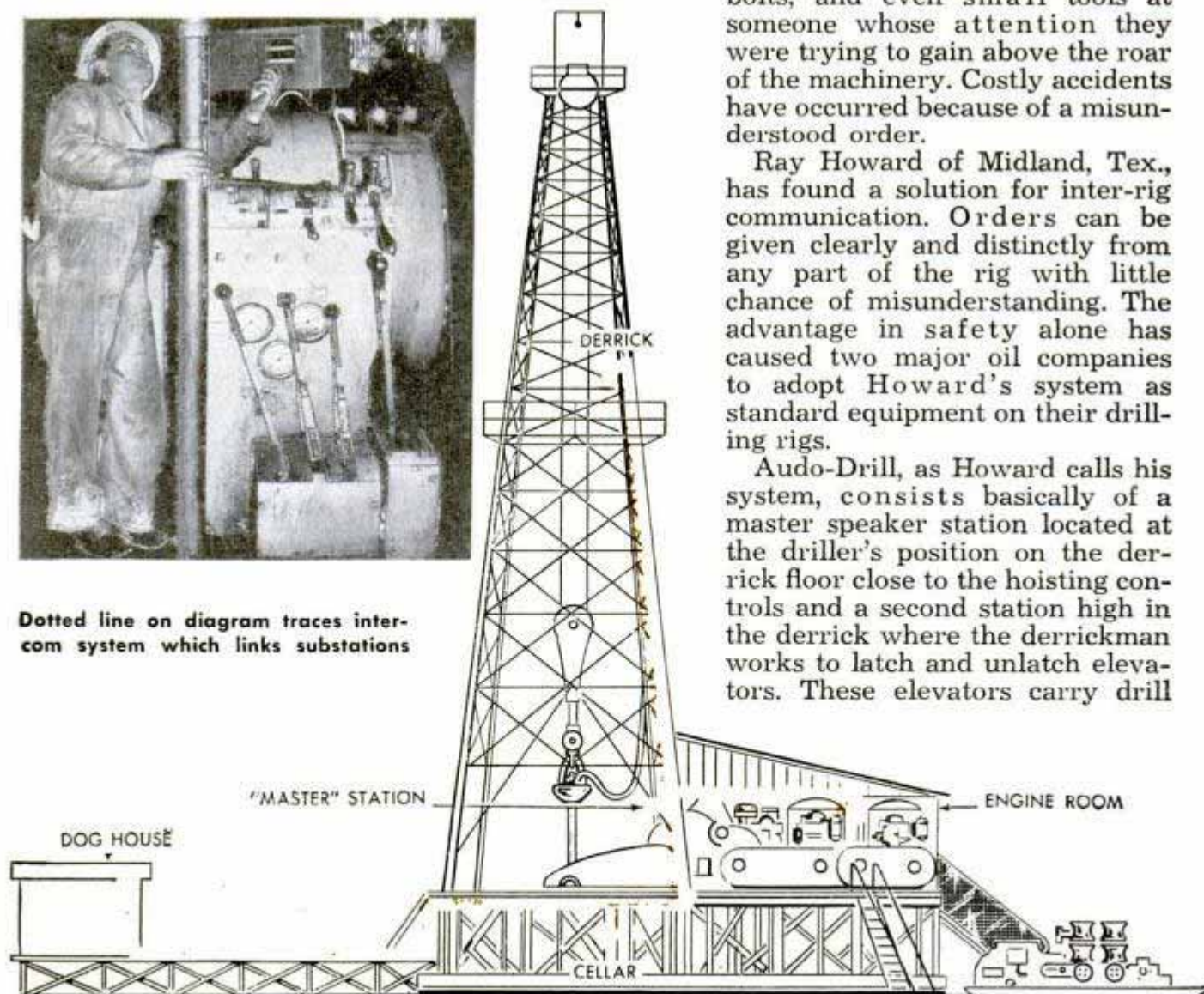
By W. J. Davis



Despite the noise, a derrickman on his lofty perch can use the inter-com system to talk to the driller (below) who is shown flipping switch to give order



Dotted line on diagram traces inter-com system which links substations



WITH modern-day drilling equipment growing taller, heavier and noisier, the problem of communication between driller and crew members, known to the trade as "roughnecks," has become complicated.

Much of the noise can be traced to the increasing demand for more horsepower to bore deeper and deeper into the earth's surface in search of the liquid that, paradoxically enough, cushions and quiets the wheels of industry and transportation. The resulting increase in the sizes of gears, pinions and chains connected to the sweating Diesels have boosted both efficiency and noise.

In the past, drillers have depended upon shouting, arm signals and pantomime to convey their wishes to old and new roughnecks on the job. Drillers have been known to toss nuts, bolts, and even small tools at someone whose attention they were trying to gain above the roar of the machinery. Costly accidents have occurred because of a misunderstood order.

Ray Howard of Midland, Tex., has found a solution for inter-rig communication. Orders can be given clearly and distinctly from any part of the rig with little chance of misunderstanding. The advantage in safety alone has caused two major oil companies to adopt Howard's system as standard equipment on their drilling rigs.

Audo-Drill, as Howard calls his system, consists basically of a master speaker station located at the driller's position on the derrick floor close to the hoisting controls and a second station high in the derrick where the derrickman works to latch and unlatch elevators. These elevators carry drill

Drill Rig

pipe during a "round trip," the term used when drill pipe is removed and returned to the drill hole, usually to replace a worn bit. Eighty percent of rig communication would normally occur between these two workers, the driller and derrickman.

If the driller wishes to give instructions to the derrickman, he merely pushes the switch for that station on his master set and talks in a normal tone of voice into the speaker. The derrickman gets the message instantly through the speaker located near his working platform. He can reply to the driller through the same speaker without



The engineman's speaker is on a long cord so it can be kept handy to receive driller's instructions. Below, speaker in cellar helps prevent many accidents



opening or closing any switches. However, if he initiates a call to the driller, he must use the switch at his station.

Substations may be added to the two basic stations and located at strategic points about the rig such as the engine room, beneath the derrick floor in the "cellar," and in the "dog house," favorite gathering place of crewmen for eating, keeping records and changing clothes.

Howard found in his early experiments that areas of high noise had to be dealt with along special lines. The result was a micro-substation which filters out the noise from that area when a crewman answers the master station.

For example, in the engine room the driller's remarks issue from a speaker located in that area with sufficient volume to be heard above the roar of the engines. The crewman, rather than compete with the noise at his location by attempting to answer using the speaker as a microphone, can pick up a small directional mike located near the inter-com speaker and converse with the driller in a normal tone of voice over the same line.

Amplification is such that anything said in the rig is clearly audible throughout the rig when all channels are opened by a single switch at the master station. Power for the unit is taken from either utility lines or the rig's own power plant, regardless of whether it is a.c. or d.c.

Crew members and foremen alike have recognized in Audo-Drill many safety possibilities as well as added efficiency and the saving of unnecessary steps in a day's work about the rig.

Spray to Tenderize Meat

Meat is tenderized and "cured" at the same time by spraying with needle-fine jets of edible matter. The spray exerts up to 7000 pounds pressure per square inch and comes from openings as small as .0001 inch. Fluids, like liquid fats or fiber softening milk acids, or solids in liquid suspension can be shot through the jets. The penetration technique makes it possible to salt and pepper meat in advance, if desired.

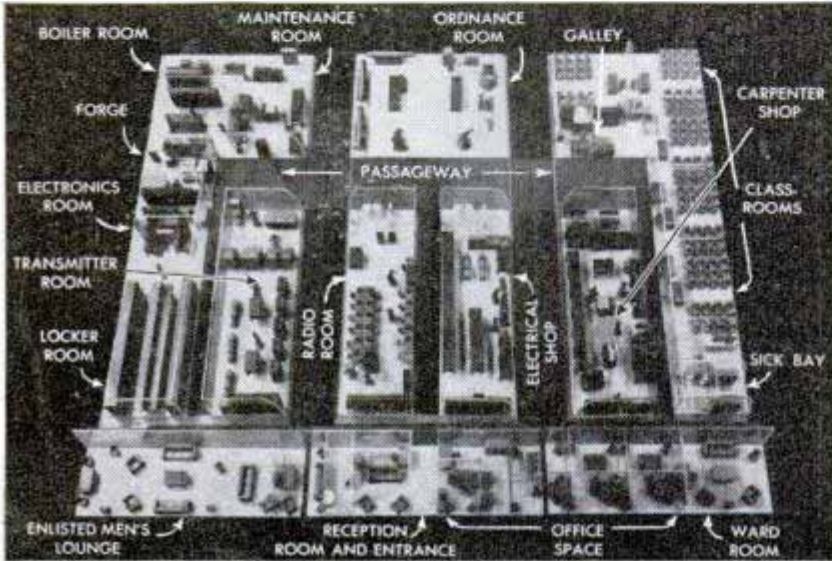
Daylight Movies

Based on the reflection principle, movies that can be seen clearly in bright sunshine have been invented in Russia. The pictures are projected upon a small screen concealed under a canopy of dark material. Reflected from the screen along a directed channel, the pictures show up clearly in a large mirror even though the room is brightly lighted by the sun or other form of illumination.

DRY-LAND "WARSHIPS" FOR TRAINING NAVAL RESERVISTS



Sailors use model to demonstrate how armories are adjustable in size to meet requirements of the local Naval unit

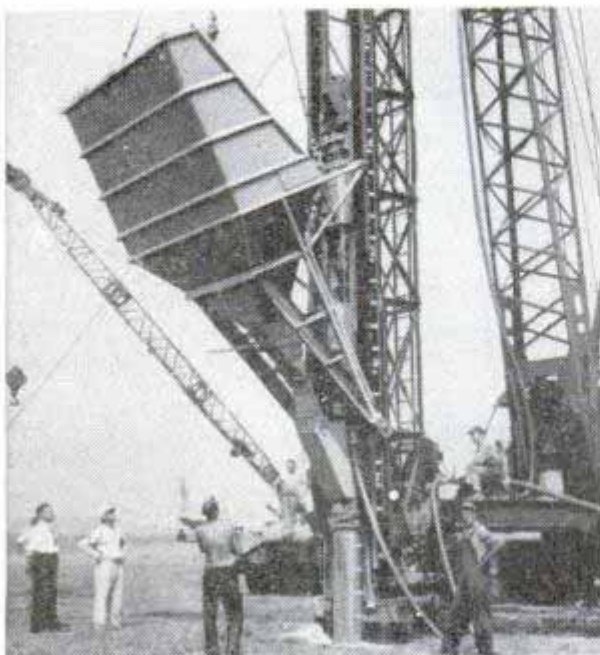


Official U. S. Navy photo

Above, reserve officer removes plastic top of scale model to show layout of "packaged" training center. Left, detailed photograph of the model with each room an interchangeable unit, making it possible for the local group to select the departments in which it will receive its training

"Packaged" training centers for Naval reservists provide everything a ship does except ocean spray and pitching decks. The armories, available to cities requesting them, are designed so facilities can be varied to fit the interests of the local unit without changing the building design. Three Quonset huts, forming the rear of

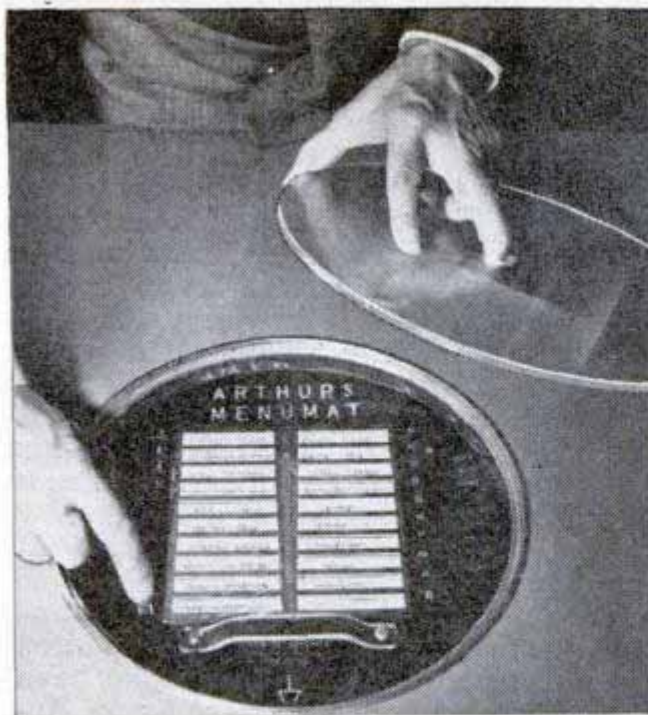
the armory, contain training rooms designed as separate, interchangeable units. Office and recreational space is provided in a modern-design front section that connects the three Quonsets. Equipment used for training is from surplus seaboard stock. Weekly training periods keep reservists up to date on the latest techniques.



Sand Shafts "Dry Out" Airport

Tons of sand poured down an 18-inch-wide pipe are helping squeeze water from beneath the sinking surface of LaGuardia Field. Fifty-six sand columns are being sunk at intervals 14 feet apart. The hollow pipe, covered at the bottom, is driven down 75 feet by an air hammer before being filled with sand. Compressed air pushes the sand from the pipe and raises the tube out of the ground. The columns, aided by pressure from sand spread several feet thick over the area, act as a "wick" to draw moisture upward for drainage.

Names and addresses of manufacturers of products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois



Push-Button Menu

Diners at a Hollywood restaurant can't find fault with the waiter for bringing the wrong order. A push-button menu is set slightly beneath the table surface and protected by a removable plastic cover. Any of four persons seated at the table can order by rotating the menu. He indicates his choice by pushing a button beside each item. As each button is pushed, an illuminated figure lights up on an indicator in the kitchen, where a checker notes the desired dishes and location of table.

Roller Grooves Rims for Safety →

Ordinary automobile wheels are converted into safety wheels by a rolling machine that forces grooves into the rims. The grooves, placed near the outside edges of the wheel, hold the tire bead securely, preventing the tire from being thrown off by a blowout. At high speeds, centrifugal force on the tire gives the effect of air pressure and prevents loss of control. Tests at 65 miles an hour showed the car could be controlled easily after a blowout.

Microscopically Thin Wire

Tungsten wire so thin that a single strand is invisible to the unaided eye is manufactured for use in amplifying tubes. The wire, produced by the Westinghouse Lamp Division, is .00018 inch in diameter. Twenty layers of the wire equal the thickness of a single page from a newspaper. Since the wire is too thin to be measured mechanically, inspectors weigh an eight-inch strip on a scale balance so sensitive it can record the weight of a pencil dot on a piece of paper.



Plastic Balloon Kit

Plastic balloons of many sizes can be blown like bubbles with a kit that contains a tube of Vinylite plastic and a blowing straw. The plastic is molded into a ball on the end of the straw, then the balloon is formed by blowing into the straw. When inflated, the balloon is sealed by pinching the plastic as the straw is removed. Punctures and tears are repaired by the same method. The balloons, which will last for a week or more, can be blown in various shapes and painted, if desired.



AN AUTOMOBILE driven by a wild-eyed young man skidded to a stop at the U. S.-Mexican border in Tijuana.

"Anything from Mexico?" asked the customs inspector.

"For the love of heaven, man, hurry!" gasped the driver. "My wife is going to have a baby. I've got to get her to a doctor in San Diego!"

The inspector looked at the woman in the back seat who apparently was in great distress. He couldn't be sure, but he thought he'd seen the same couple earlier in the day crossing the border in the opposite direction. At that time there were no signs of impending maternity.

The customs man played a hunch.

"We have maternity facilities here," he said. "We'll take care of your wife."

The customs matron found that the woman's voluminous dress contained diamonds, jewelry and watches on which the government collects duty.

OUTSMARTING THE SMUGGLERS

By Andrew Hamilton

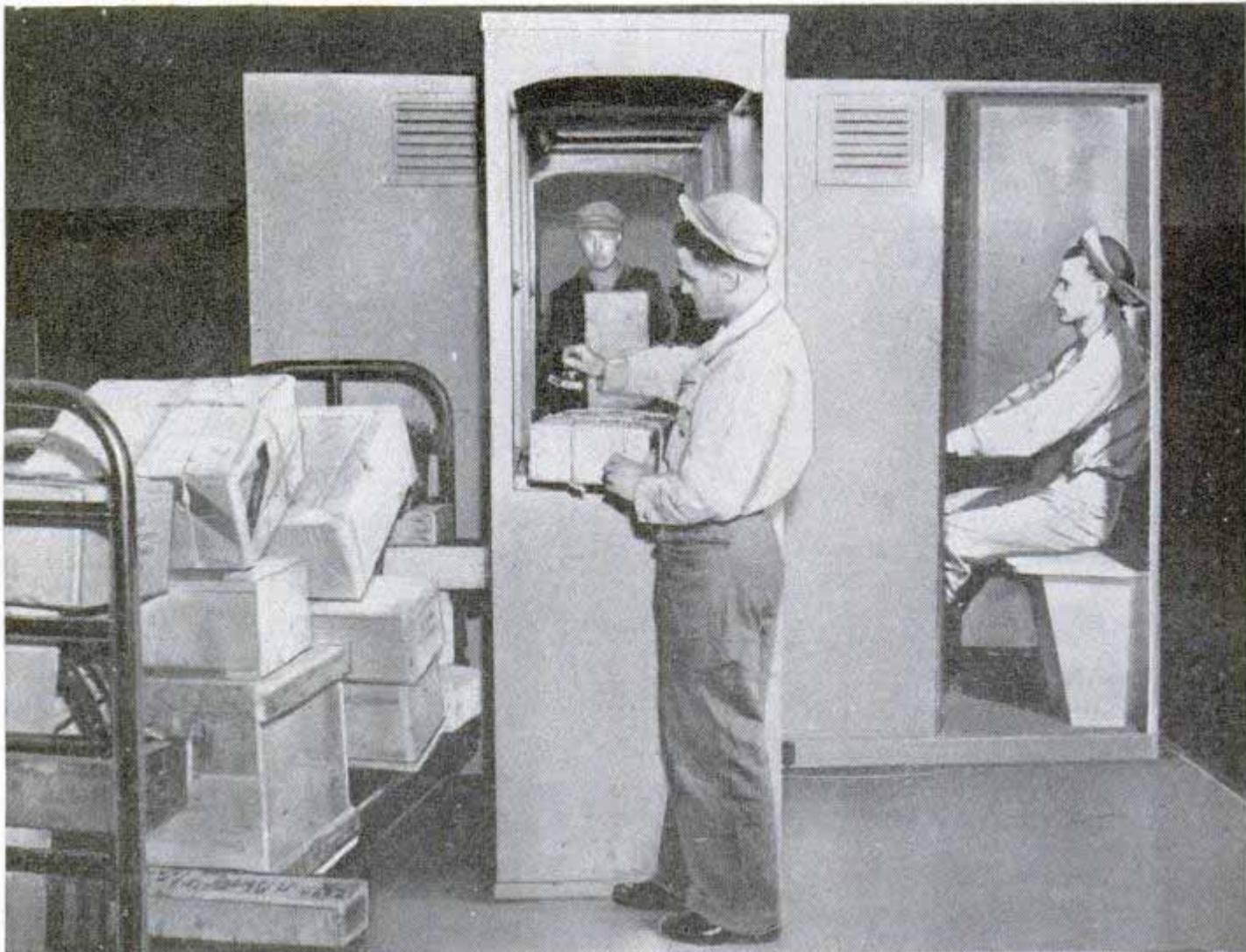
of opium inside a religious shrine.


Since the war the smuggling of contraband goods and narcotics into the United States has increased. Federal seizures have almost doubled from a wartime low of 10,215 in 1944 to 20,000 in 1946. This year's figures are expected to be even higher.

Travelers are allowed to bring in \$100 worth of stuff duty-free. Commercial articles valued at \$100 or more are required to have certificates signed by American consuls. All personal luggage is examined

This is just one example of current smuggling. In recent months a traveler at the Canadian border attempted to smuggle \$23,000 in gold into the United States by carrying it in his luggage as buttons. On an incoming plane from Mexico City an entertainer was found to have \$19,000 worth of diamonds sewed into the lining of his clothes. In Los Angeles a member of a ship's crew tried to smuggle a load

Parcel-post packages pass inspectoscope's X-ray eyes. If no irregularities are found they are stamped approved





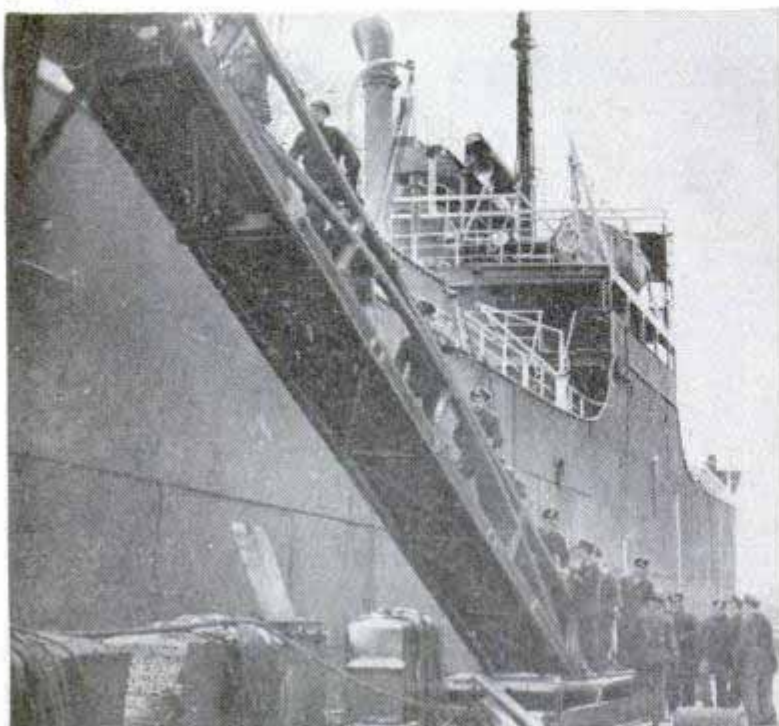
Smugglers' ingenuity is matched by wits of customs men. Diamonds were found in false tops of shoe brushes, behind lid of safety-razor box, in cotton wadding of aspirin bottle and in container buried in cake of soap. Tins of smoking opium were found in built-up heels of shoes



No nook is beyond the prying eyes of an inspector. Here the interior of a tanker's huge valve is checked for narcotics



↑ Homemade snowmobile patrols Canadian-Minnesota border
↓ Inspectors board an incoming ship in search of contraband



at ports and border stations. A 10 percent sample of all commercial shipments is inspected.

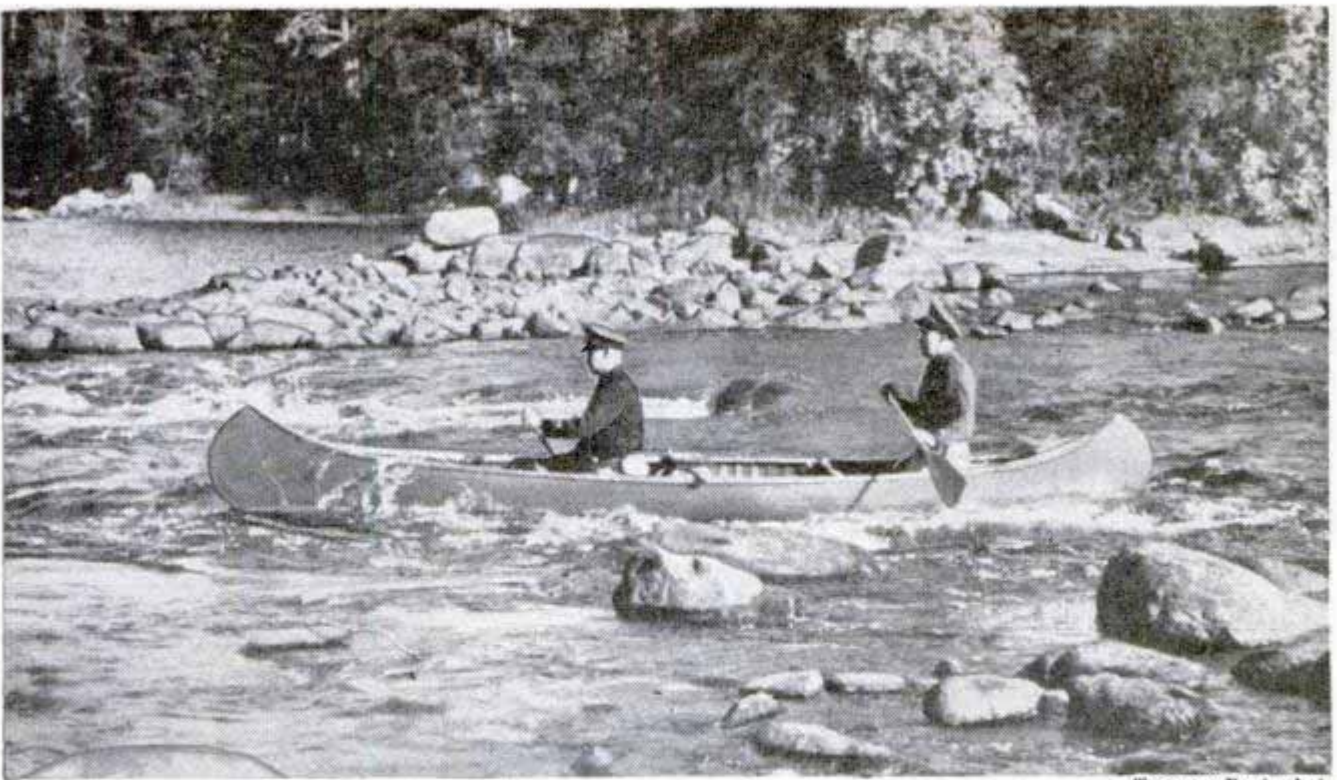
Protecting Uncle Sam against the loss of millions of dollars annually in revenue and guarding the health of American citizens is a small but efficient force of 8900 inspectors, patrolmen, guards and agents of the U. S. Customs Service. They are stationed at ports, railroad stations, highways and airfields; they patrol America's borders with automobiles, airplanes, revenue cutters, speedboats, horses, skis and snowshoes. About 2000 items are taxable and the Customs Service collects more than \$500,000,000 annually.

In general, there are two types of smugglers that customs officials have to cope with: Big-time gangs whose criminal operations are million-dollar enterprises; and petty smugglers—persons who return from a foreign country and fail to declare dutiable articles.

Narcotics smuggling has proved profitable for organized international gangs and before the war was a billion-dollar business on a world-wide basis. Opium and its derivatives, heroin and morphine, are smuggled to the East Coast of the United States from Persia and India, to the West Coast from China and Japan. Cocaine is brought in from South America and Java.

Early this year an electrician re-wiring an old house in San Francisco uncovered a narcotics cache worth \$338,000. Customs men found that the house belonged to the infamous Ezra brothers who were convicted of smuggling 14 years ago and sentenced to McNeil's Island Penitentiary.

Several gangs of alien Japanese were active in narcotics smuggling on the West Coast before World War II. In many cases they were found to have connections with Japanese consuls and shipping officials in Seattle, San Francisco and Los Angeles. Customs men believe that this type of smuggling, apparently carried on with the blessing of the old Japanese government, had a twofold aim: first, to flood the West Coast with narcotics and thus break down the health of U. S. citizens; and second, to extend the Japa-



Treasury Dept. photo

Transportation for patrolmen must fit the terrain. Canoes are used for patrols in virtually impassable areas. Horses, airplanes, skis and snowshoes are regular equipment along the border

nese spy network in ports and industries.

As a result of efficient work by the U. S. Customs Service and other law-enforcement agencies most of the gangs were apprehended. Known Japanese spies, smugglers, criminals and other alien suspects were jailed within 48 hours after Pearl Harbor. Because of this quick roundup, no act of sabotage was committed on the West Coast or in the Hawaiian Islands.

Even though the war broke up the large smuggling gangs, the Customs Service is fully aware that they may be reorganized.

Meanwhile, petty smuggling is on the rise now that **passenger-ship traffic has been resumed.**

Before the war this type of **small-time chiseling reached an all-time high.** In the port of New York alone, where 500,000 passengers are inspected annually, 4500 violators were caught. And **customs officials estimate** that many more violators went through undetected.

This type of smuggling is indulged in even by wealthy persons wellable to pay the duty. A few years ago customs agents arrested the widow of a distinguished New York doctor who had brought in \$26,000 worth of Paris

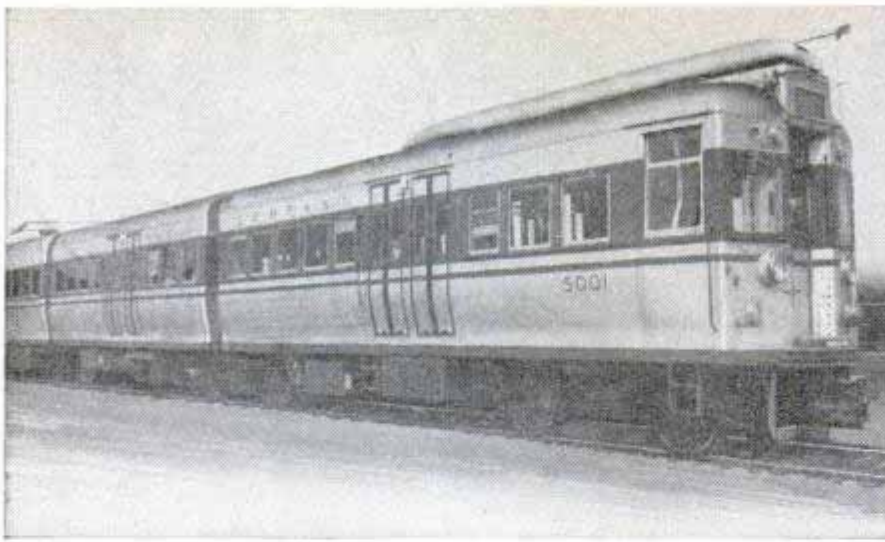
finery without declaring it. In another case, the wife of a New York Supreme Court judge was charged with similar customs violations for bringing in thousands of dollars worth of undeclared jewelry.

During the war when steamship travel was discontinued, smuggling across the Mexican and Canadian borders increased. But hard-to-get items such as automobile tires, steaks, shoes, silk stockings and sugar were favored rather than gold, jewelry and narcotics.

(Continued to page 240)

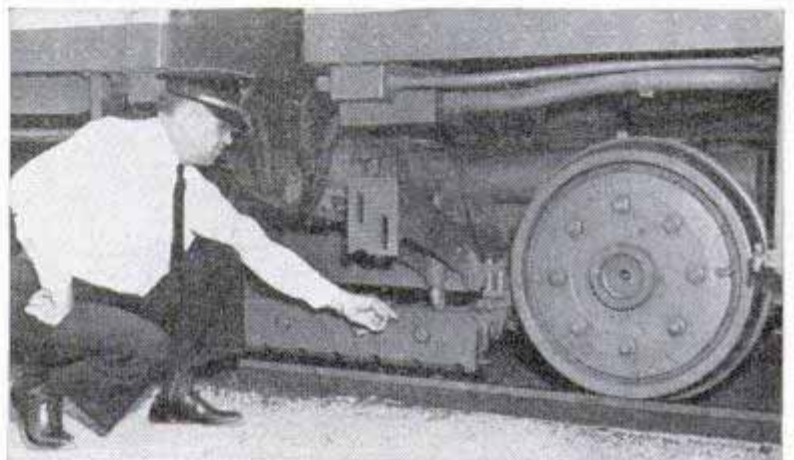
They're cowhands, too! Customs patrol inspector cuts a bull from a Mexican border roundup. Cattle smuggling can be big business along boundary





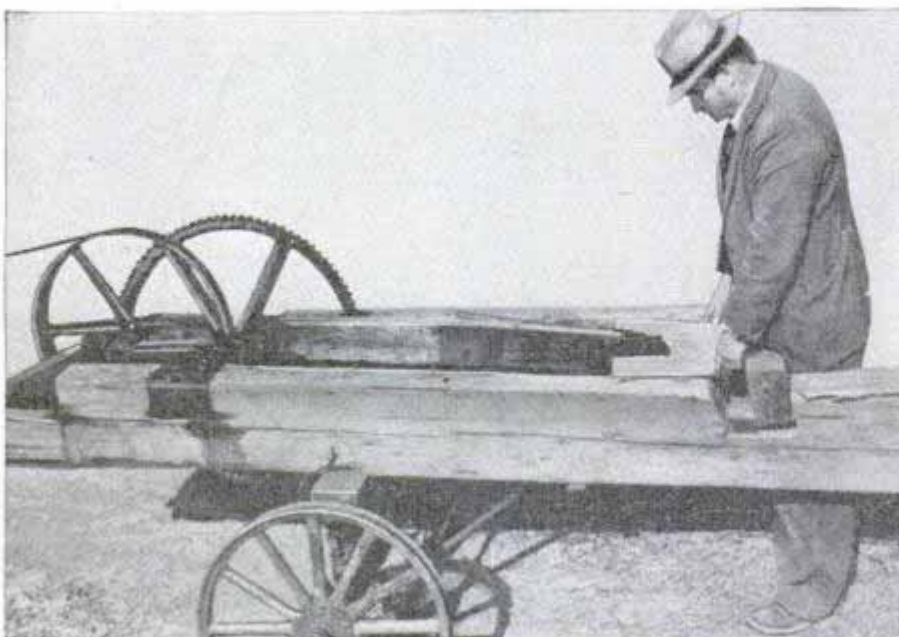
COACH "BENDS" AROUND CURVES

Straphanging commuters ride in luxury on the articulated cars being placed in service by the Chicago Elevated Lines. Nearly twice the length of old cars, the coaches are jointed in two places to permit the sharp turns required on elevated tracks. Seating capacity of 96 passengers is about double that of older cars. Three sets of brakes are provided and any one of them will stop the car quickly. In addition to drum-type wheel brakes and the braking power of the motors when converted to generators, there are powerful magnetic track brakes used for emergency stops. Each car has eight traction motors totaling 400 horsepower and all motors are synchronized for smoother action. Rubber and steel coil springs plus rubber wheel inserts make the ride smooth and quiet. A forced-



Top left, three-section car is articulated to "bend" around sharp curves. Right, all doors can be operated by master control. Above, flat magnetic brake grips rail for sudden stops

air ventilation system keeps inside air pressure slightly higher than outside to prevent entrance of dirt and dust. The heating system is automatic.



Fast Wood Splitter Made From Scrap

Firewood is cut at the rate of 30 strokes per minute by a homemade wood splitter put together by Carl L. Spearman of Seneca, S. C. The machine is mounted on a model-T Ford front axle assembly and powered by a tractor engine. Wood is split by a road scraper blade, beaten into shape, and attached to the end of a wood shaft mounted eccentrically on a wheel to drive back and forth on a horizontal level.



Land of the Scooter and Cycle

By Thomas E. Stimson, Jr.

IF THE RISING COSTS of driving an automobile are making you stop, look and worry, take a budget-wise look at the handy two and three-wheeled "personal" vehicles that are pouring out of a score of factories.

Lightweight motorcycles, pint-sized motorcycles, powered bicycles and motor scooters make up an important class of transportation that is picking up as fast as a motorcycle on a downhill grade. Not counting the owners of full-sized motorcycles, there are about 250,000 people in this country who ride to work or do their errands on the various kinds of lightweight vehicles. Motor scooters alone today have a registration conservatively estimated at more than 150,000 units. Eight years ago there were fewer than 10,000 such vehicles on the road.

Two reasons explain this tremendous growth—the low initial cost and the low cost of maintenance. You can equip your bicycle with a motor for about \$100 or, for several times that amount, you can buy a motor scooter. Top prices in the motor scooter lines are around \$500.

As for operation and main-

tenance, the costs depend upon the type of vehicle used. Gasoline mileage for motor scooters and motor bikes ranges from 70 to 150 miles per gallon. With one of the personal vehicles you'll have a top speed of 35 miles an hour and hill-climbing performance at least equal to that of a car in high gear. While performance figures vary



Top, a scooter club rides in formation along a western coastal highway. Right, boy rides his scooter to school



With its large package compartment above the front wheels, this scooter is popular with delivery boys

with the type and make of the vehicle, these are conservative averages.

Motor scooters were mass-produced first about 1935 and for several years were turned out in relatively small numbers. To the American automobile owner, the new, midget-sized vehicles were just playthings—something for the children, perhaps, but not for a grown man. The companies manufacturing motor scooters tried unsuccessfully to convince the motoring public that their vehicles were safe and economical

and that there was a place for them in the average family. But the people had to be shown—and it took a war to show them!

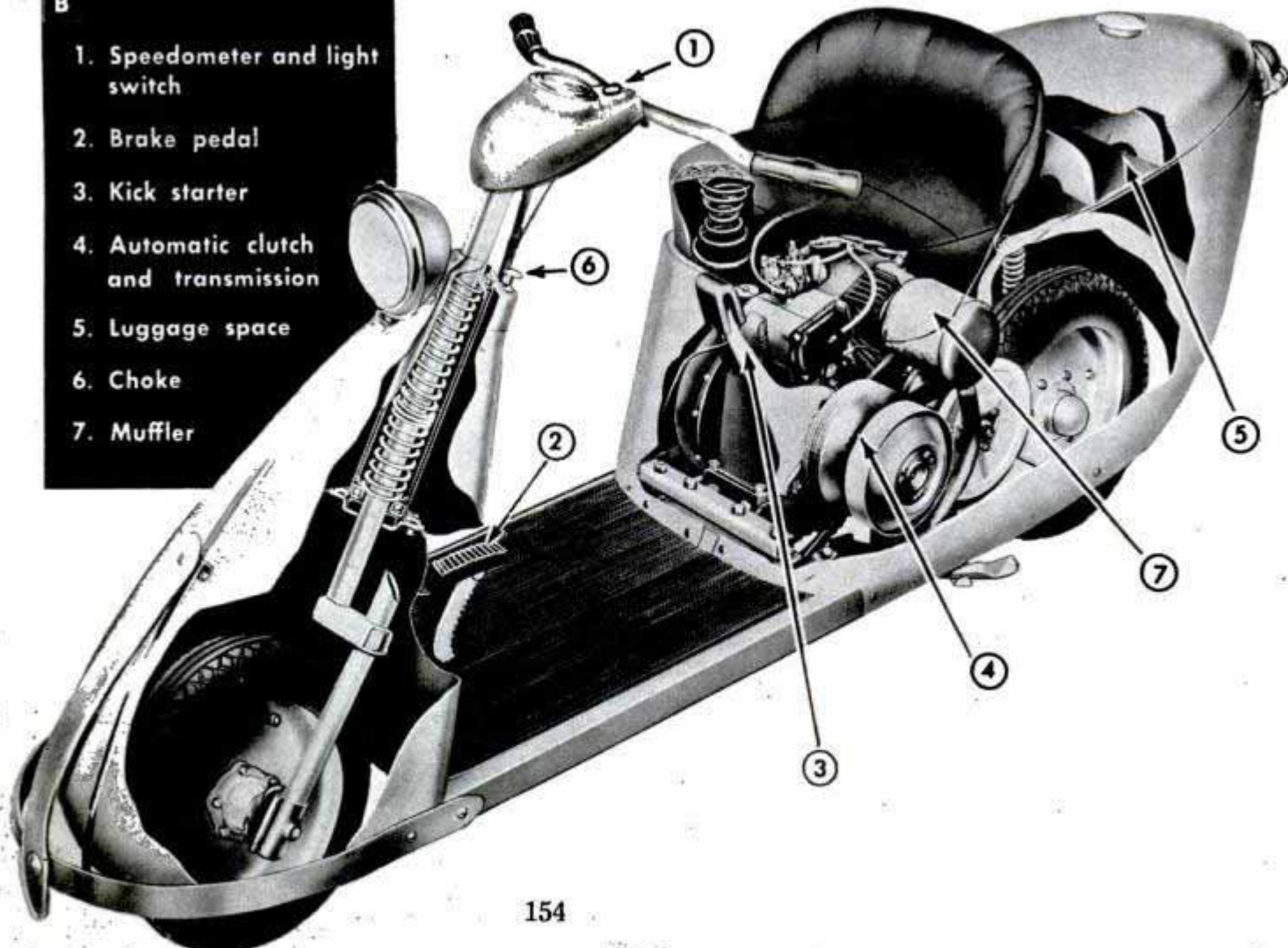
The Army and Navy purchased large numbers of these scooters for use in large training camps. They were the answer to the problem of rapid delivery of messages and forms in rambling supply depots. The scooters were drafted into our war plants to deliver small parts between buildings. Sidecars were added to convert them into mobile soda fountains for carrying refreshments to production-line workers. Other sidecar combinations were equipped for ambulance duty and fire-fighting.

Thousands of servicemen saw how practical the tiny vehicles were. They saw them used in training camps and advance bases under all kinds of conditions. They saw how easy it was to load the scooters into transport planes for use in getting from airports to headquarters. One extremely lightweight model, stripped down to the barest essentials, was built for use by paratroopers. The seat and handle bars folded down to make a compact unit that provided airborne fighters with quick transportation when they hit the ground.

Today, the demand for scooters is still increasing. They have become the second "car" in many families. Less expensive to buy and operate than a standard automob-

B

1. Speedometer and light switch
2. Brake pedal
3. Kick starter
4. Automatic clutch and transmission
5. Luggage space
6. Choke
7. Muffler



bile, the scooter has the additional advantage of requiring no extra garage space. It can be stored alongside the family automobile in an ordinary one-car garage.

Its ease of parking makes the scooter an ideal vehicle for quick trips to the store. Its low cost of operation means it can be used for commuting to work daily at about the same expense as streetcar riding. Neighborhood stores find the scooter ideal for delivering packages and, in some cities, even the telegram messenger has deserted his bicycle for a motorized scooter. Farmers like them for riding out to the fields; it means that the family car is free for other use. The scooters are comparatively safe and are popular with teen-agers both for fun and for transportation to school.

One Pacific Coast scooter club has 20 members who think nothing of making a 100 or 200-mile excursion in a day. They ride in a neat formation along the highways and stop for lunch alongside the road. A western enthusiast on vacation rode his scooter from California to Florida. Another, who had used his scooter while on police patrol duty, traveled from Glendale, Calif., to New York City via New Orleans. Scooters have invaded the sporting world and "scooter polo" has been played as a stunt to large crowds. Some Americans traveling abroad have taken scooters with them for use as sightseeing vehicles.

Generally, motor scooters are powered by a one-cylinder air-cooled engine that delivers from four to seven horsepower, depending on the weight of the vehicle, and use a chain drive to the rear wheel. Most of them are equipped with a kick-type starter, magneto ignition and a generator that provides current for front and rear lights. Depending upon the size of its motor a scooter can carry from 150 to 300 pounds in addition to the driver. Most of the personal vehicles weigh between 250 and 300 pounds without a load.

Some scooters are equipped with an automatic clutch coupled with a two-speed sliding transmission and a reverse gear (see Photo A). One make combines an automatic clutch with a fully automatic transmission that has a gear ratio varying from 14 to 1 at the low end to 3 to 1 at the high end (see Photo B). With this automatic set-up, clutching and shifting are completely eliminated. The only controls



Motorized bicycle is belt-driven by a 2½-horsepower motor. The small trailer can be used for carrying camping equipment on week-end trips



Above, rear wheel is replaced by the power unit at left to motorize the bicycle. Below, lightweight vehicle gets up to 125 miles on a gallon of gasoline





Above, scooter enthusiast traveled from California to Florida in only two weeks on his economical vehicle

Right, the scooter is useful around the farm. One farmer uses his bike when inspecting irrigation ditches



save space and to reduce weight. Some scooter designs include large luggage compartments behind the seat, roomy enough to hold the spare wheel and tire plus a load of groceries or enough camping equipment for a week end in the woods (see Photo B). Nearly all models can be equipped with a sidecar for an extra passenger or for hauling a load of merchandise. Some scooters have two wheels in front to support a roomy box that holds up to eight cubic feet of supplies. With this extra space, the scooter becomes a bantam-sized delivery truck that can be used to deliver merchandise in crowded city streets quickly and economically.

One manufacturer is producing a sturdy three-wheeled scooter with one wheel in front and two in the rear that is called a

used are the accelerator and brake pedal, both foot operated, plus the steering apparatus. Other designs that use an automatic clutch have a motorcycle-type hand throttle that clears the floor board of all controls except a foot brake.

Many of the latest improvements in automotive and aircraft design have been adapted to scooter construction and the manufacturers are proud of such features as aluminum-alloy crankcases, molybdenum alloy or Stellite-faced valve faces and seats, fuel strainers and sediment traps, sealed wheel bearings, Plexiglas windshields, all-welded steel frames and bodies, knee-action springs and small aircraft-type rubber tires that range from 4.00x8 to 6.00x6 in size.

The power plant is under the seat in most models. In fact, one manufacturer bolts the driver's seat directly to the cylinder head by means of extension rods to

three-wheel ½-ton truck. The flat, two-cylinder motor is an air-cooled valve-in-head model and it develops 8½ horsepower. It has twin carburetors and a built-in cooling fan. This model has a battery and an electric starter similar to those used in automobiles. Another unusual feature is the separate hydraulic drive for each rear wheel that takes the place of a transmission and differential. The entire body can be covered with a lightweight top when the weather requires it. A station-wagon body, capable of carrying six people in addition to the driver, is being tested by the manufacturer.

Motorized bicycles are not new, but recently designers have been busy planning new and more efficient models. One bicycle motor, built to narrow dimensions so it won't interfere with the movement of the driver's legs, is mounted inside the bicycle frame above the sprocket wheel (see Photo

C). Its five-quart fuel tank is attached to the crossbar in front of the seat. The engine has one cylinder, is air-cooled, uses magneto ignition and develops $2\frac{1}{2}$ horsepower. It is rubber-mounted to reduce vibration and noise and drives the rear wheel by means of a rubber belt.

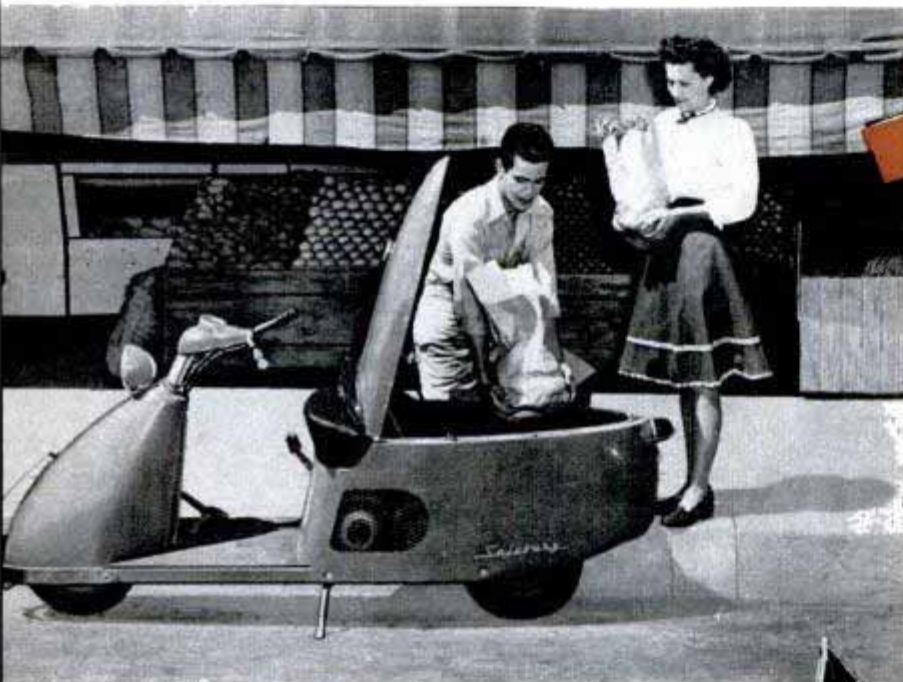
Compression of the tiny motor may be used for braking purposes in addition to the usual coaster brake. When the clutch is released, the bicycle can be pedaled in the usual manner. A miniature generator is friction-driven by the front wheel and provides the current for operating the lights. If desired, a little two-wheeled trailer can be towed behind the bicycle.

Another bike motor that can be used on any type of bicycle is mounted above and on one side of the rear wheel. Complete

with its small fuel tank and controls it weighs only 32 pounds. The inverted one-cylinder engine develops $2\frac{1}{2}$ horsepower at 3000 r.p.m. and drives the rear wheel by means of a roller drive that is "geared" to the edge of the tire. The manufacturer states that tire wear is not increased by the drive wheel.

Still another type of power unit consists of a small engine attached to a special airplane-type wheel and tire (see Photo D). Installation of this motor and drive wheel is easy. You simply remove the rear wheel of the bicycle, substitute the new unit and connect the controls.

Several vehicles are being manufactured that can be classified somewhere between a powered bicycle and an ordinary motorcycle. One of these, actually a full-sized,



SHOPPER

← As the family's second "car," the scooter makes shopping a pleasure for the housewife. Parking space is no problem and the groceries are piled in the rear

↓ Even the fast-flying airplane has to rely on the lowly scooter when taxiing into a parking area at the airport. The attendant directs the pilot safely along the taxi strip



AIRPORT JOCKEY



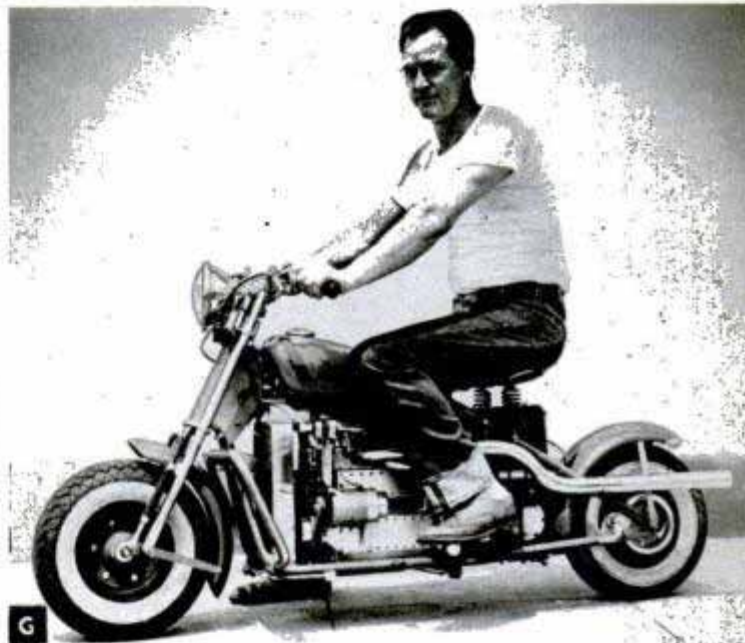
Two rear wheels add stability to this motor scooter built for two

had a top speed of 40 miles an hour. Now, this company makes a slightly larger type that hits 70 miles an hour. Low-priced, it has a $9\frac{1}{2}$ -horsepower, one-cylinder motor and weighs only 208 pounds.

Some users build their own cycles. One machinist rebuilt a stock scooter into a small motorcycle-type vehicle. The motor, restroked and rebored, has twice its old power and the bike hits 70 easily.

Another owner, Howard Forrest of Glendale, Calif., designed a powerful motorcycle-type vehicle, about half normal size, that has a four-cylinder, water-cooled engine he built (see Photo G). The 12-horsepower, overhead-valve motor gives the cycle plenty of speed.

So, if you're looking for a cheaper way to get places, follow the lead of the scooter crowd—it may not be so comfortable, but it is less expensive.



Above left, two small motorcycles are shown beside a full-sized model. Right, built entirely by the owner, this small cycle has a four-cylinder, water-cooled engine. Below, tiny motorcycle used by British paratroops

but extremely lightweight motorcycle, is powered by a one-cylinder air-cooled engine that delivers a top speed of about 35 miles an hour on a gasoline consumption of as low as 125 miles per gallon (see Photo E). The engine is of the two-cycle type and is rated at $2\frac{1}{2}$ horsepower. The rear wheel is driven by a steel-stranded V-belt. The complete machine weighs only 148 pounds.

Another in-between cycle is the miniature motorcycle. One company that makes this type fabricated a small motorcycle fitted with a four-horsepower air-cooled British engine before it designed and built its own power unit (see Photo F). The machine



Sand-Slinger Rides High

Taking the place of hand shoveling, a revolving machine called a sand-slinger deposits sand in molds at the Pittsburgh foundry of the Westinghouse Electric Corp. The operator rides through the air as the device collects sand from an overhead bin and dumps it into molds at the rate of 1000 pounds a minute. The sand feeds through an eight-inch pipe and is hurled out of the machine by the centrifugal force of a 40-horsepower motor.



Air-Line Ticket Vending Machine

Air-line tickets to any destination can be printed, audited and issued in less than five seconds by a mechanical vendor. Introduced by American Airlines, the machine's three-step operation begins when an agent inserts a pencil-like key bearing his personal number and sets a knob indicating the type of sale. Then, from matrices racked alphabetically in nearby cases, the agent selects one, slides it into a slot and the fully printed ticket pops out. Only the time, date and number of the passenger's flight have to be written in. All data on the

transaction is recorded on an auditing tape in the machine. It prints tickets from New York to 65 cities. Another ticket-vending device for high-density routes operates on the meal-check principle. After the prescribed fare is paid, the seller puts a round, slotted disk into the machine, which then issues a preprinted flight coupon with a passenger coupon attached. Space confirmation is written on the latter.



Power Line on Wheels

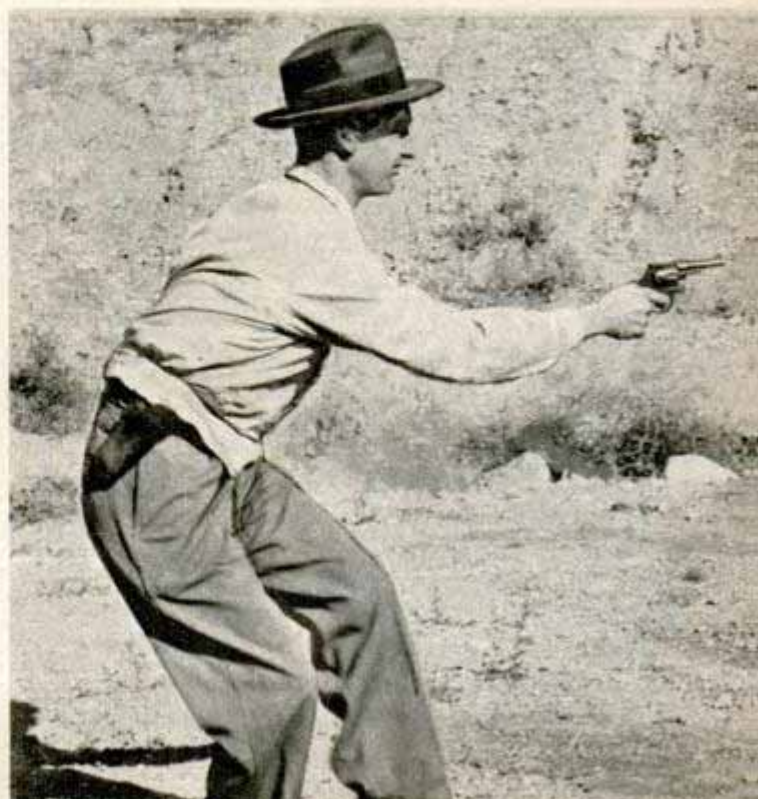
Functions of electric distribution systems are demonstrated by a mobile power unit now touring the nation. In one stunt (shown in picture), a 15,000-volt disconnect switch on an overhead line is opened to extinguish a flaming arc in a fraction of a second. To show how power lines defend themselves against lightning, the unit is bombarded with 100,000-volt thunderbolts created by a surge generator. Power fuses, line reclosers, fused cutouts and arresters go into action to prevent damage and interruption of service. The "power line on wheels" was designed by Westinghouse for demonstrating modern distribution equipment to utility companies, municipal engineers and rural electrification agencies.



QUICK-TRIGGER FBI AGENTS, aware of the sharpshooter's advantage in a gun duel, demonstrate their firing technique in police training classes held throughout the country every year. Safety, accuracy and rapid firing are the qualities stressed. "Alumni" of the schools are well-trained in the deadly science of shooting quicker and more accurately than the public enemies they may meet. Above, FBI instructor Bill Burke demonstrates how to shoot from the sitting position, elbows braced against knees and revolver gripped vise-like in both hands to provide stability



Right, long-range shooting may be made from cover requiring a left-hand shot. The gun is held against the board and steadied with finger and thumb. Below, crouching low and moving fast, Burke demonstrates rapid-firing at close range. For safety, finger remains clear of trigger guard until revolver is aimed





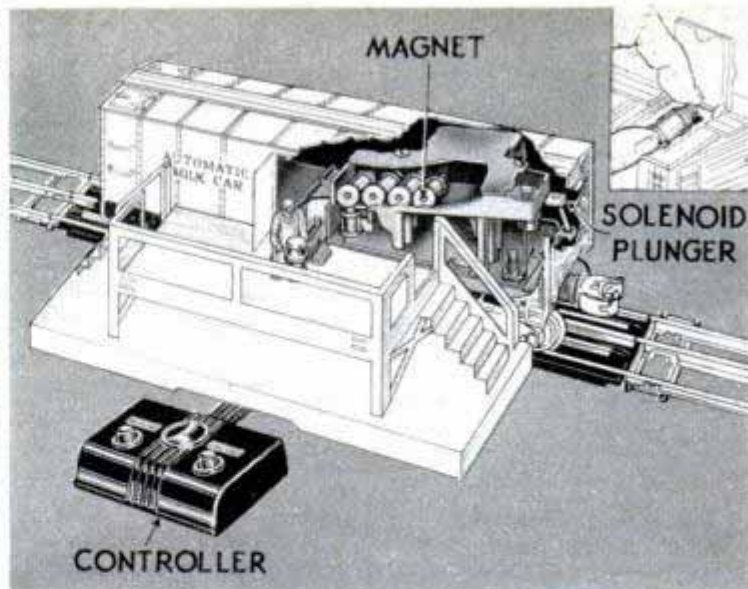
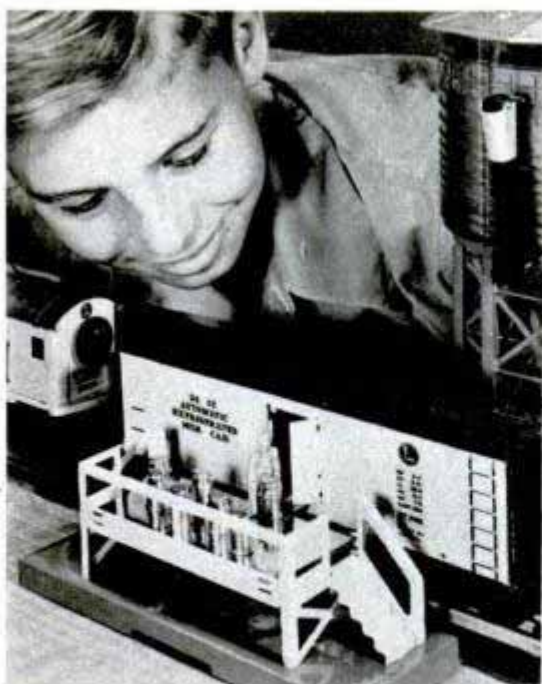
FBI School for Sharpshooters

Above, police officers watch as Burke blasts away with a submachine gun in a demonstration of hip shooting. The gun is held solidly and aimed by pivoting from the hips. Above right, in criticism of his own shooting, Burke says shots are slightly high and indicates target spot where group should be centered. Yet 43 of 50 shots in target would have killed a man

Right, sharpshooter shows how the thumb can be used to steady the revolver. The instructor emphasizes that any weapon always should be held as solidly as possible. "Use a vise if you have one," says Burke

Prone position with feet together and chin almost touching the ground gives maximum stability for long-range shooting while presenting the smallest target to the enemy. The revolver is gripped in both hands with the ground providing a platform for revolver butt





TOY MILK CAR UNLOADS CANS

Electric-train enthusiasts can equip their railroads with a self-unloading milk car. Tiny milk cans are loaded through a door in the car roof and when a remote-control

button is pushed, the car doors open and a workman pushes eight cans, one by one, onto the platform. Magnets on the cans keep them upright during unloading.



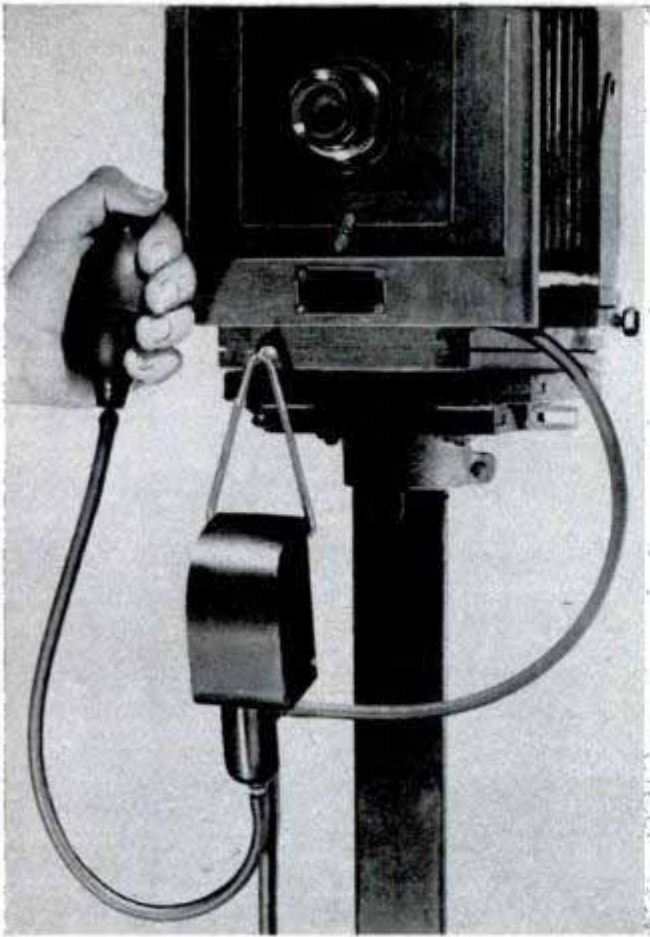
"Hot Dog" Roaster for Car

"Hot dogs" can be cooked inside a car with a heater that operates through the automobile battery. The heater is an aluminum tube lined with insulation so that the inside diameter is slightly larger than a wiener. Two hot dogs are placed on a sliding arm which is pushed into the tube. The cooker thoroughly heats two wieners in five minutes. A wire lead is provided for connection with the battery and a plug for installation near the dash. Inserting an electric cord in the plug starts the heater, which is designed to fit into the glove compartment of most automobiles.

Flexible Molds Easy to Make

Flexible molds for the production of plaster-of-paris novelties are produced easily and at little cost with a molding compound that contains natural rubber. To make the mold, the compound, in liquid form, is brushed on the model and permitted to dry. Then, a putty-like form of the same compound is applied. When this is dry, it is peeled off and used as a mold.





Synchronizer Dims Photofloods

By eliminating the need for posing subjects under bright lights, a photo flood synchronizer makes portrait work less tiring on both the model and the photographer. While the photographer arranges the lights and poses the subject, the lamps burn at a low intensity. Squeezing the bulb operates the synchronizer which turns the lamps on full and releases the shutter. After the exposure, the lamps are dimmed automatically. Any number of photo flood lamps can be used with the synchronizer.

Hangers Hook on Car Door →

Seven loaded clothes hangers can be hung from a metal holder that hooks on the inside rim of an automobile door. Resting on the door frame, it doesn't interfere with the opening and closing of doors and windows. The holder is 7¼ inches long and made of aluminum alloy.

Fire Shutters Seal Escalator

Aluminum shutters that operate automatically seal Escalator openings in case of fire, thus retarding the rapid spread of flame and smoke through the building. Previously, such openings were sealed by hand-cranked shutters. Thermostats and electric eyes are used to actuate the motor-driven fire stops. In case of power failure, the shutters can be closed by hand.



Television on Full-Size Screen Projected by Huge Mirror

Ground to the precision of a fine telescope lens, a huge magnifying mirror has been developed for projecting television programs on large screens. The 42-inch spherical mirror weighs 350 pounds and provides clear-cut magnification. Built by RCA, it will be used by Warner Brothers Studios in a cooperative research program for large-screen television.



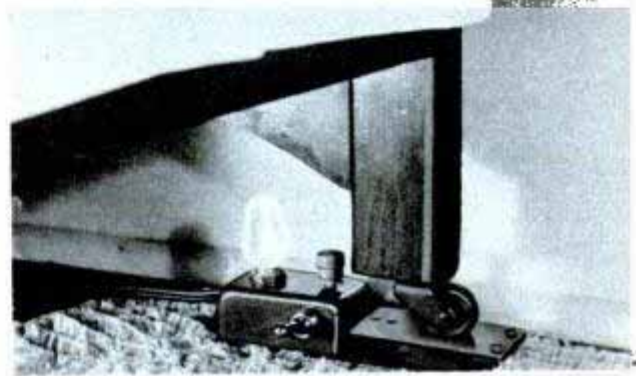


Singeing a fowl (left) is only one of a score of jobs that can be performed with the high-temperature heating coil above. It's handy for defrosting the refrigerator, thawing frozen pipes or removing paint

The automatic night light for the bedroom (below) will save many a stubbed toe. It turns on when you get out of bed and off again when the weight of your body depresses the springs. The fixture fits any bed

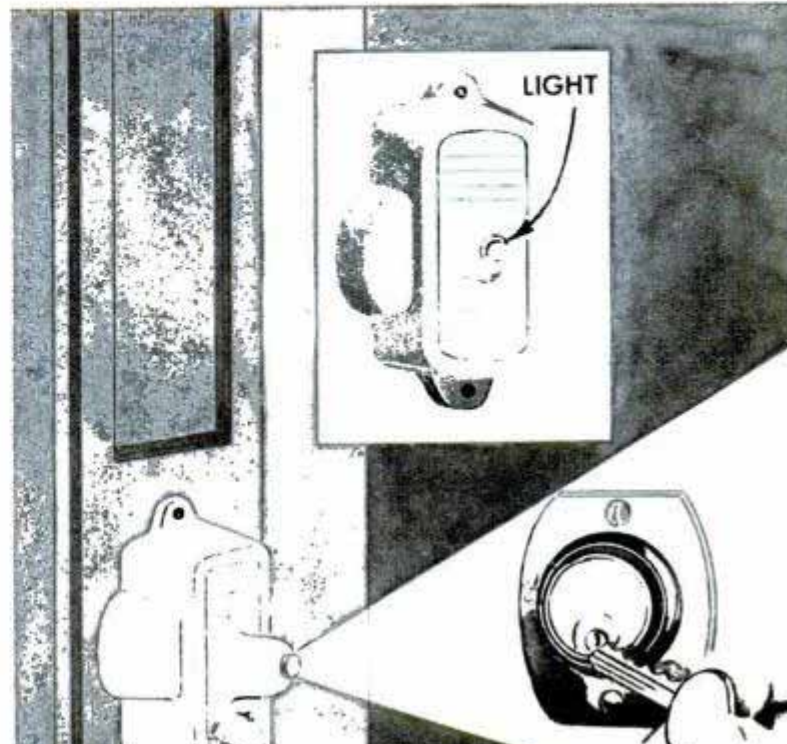
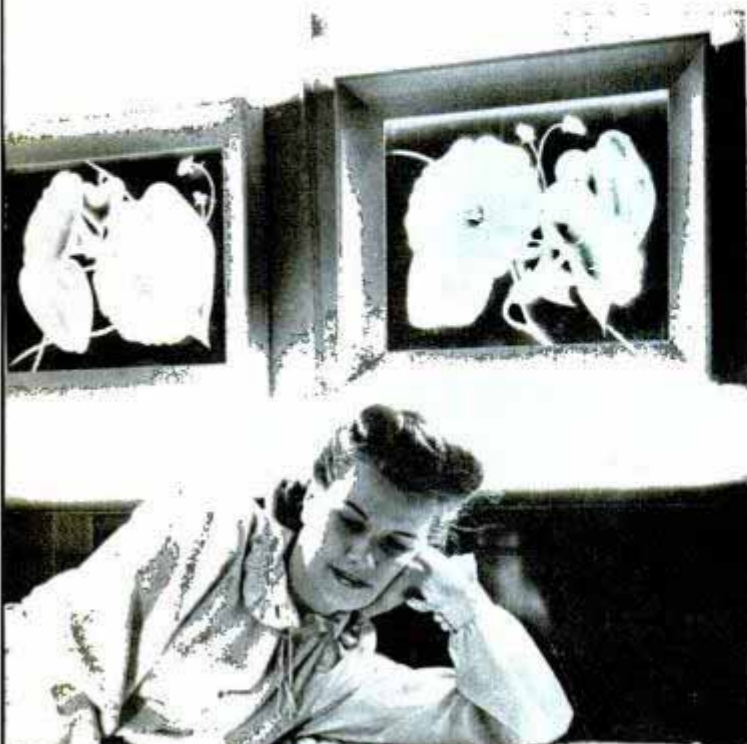
WHAT'S NEW *For Your Home*

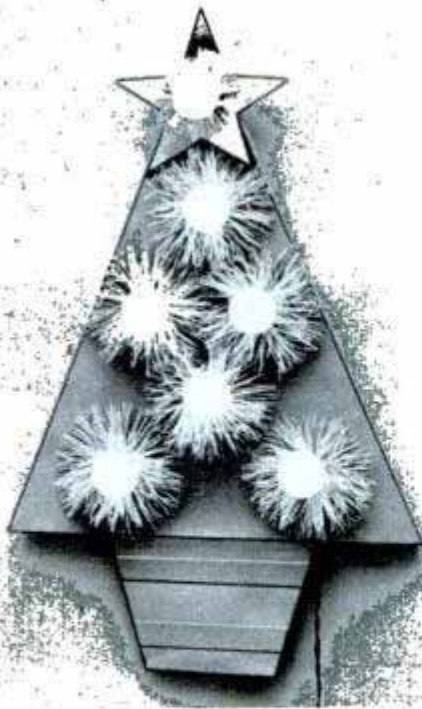
A four-page "shopping section" dedicated to modern homemakers



"Picture" lamps hung on the wall below provide light for reading in bed. They are made of panels of decorated glass framed in enameled shadow boxes. Incandescent tubes are at top and bottom of the frame and cast a soft light into the room

The double-fumble of trying to find the right key in the dark and then finding the key hole is eliminated with the small fixture below. It requires no wiring as it contains a long-lasting midget mercury cell. The light is handy in cupboards or over fuse boxes





Cool-burning fluorescent bulbs and fringed paper can be used to make this door ornament for Christmas. It is made of heavy paper with holes for the lights

Lazy Susan closet for milady (below) has three hanger rods arranged in a triangle about a center pole that revolves on ball-bearing parts so clothing is within easy reach. Base consists of shoe platform



This serving tray is easily converted into a table by pressing two levers which release its retractable legs. The levers are mounted on top of the table and operated by thumbs of the holder. It is made of plastic and aluminum and weighs 5 pounds

Transparent wall protector below is available in sheets 30 by 40 inches and can be fastened in place with cellulose tape. It is useful in kitchen or bathroom. As a substitute for glass the material can be used for desk tops, dressers and picture frames



WHAT'S NEW *For Your Home*

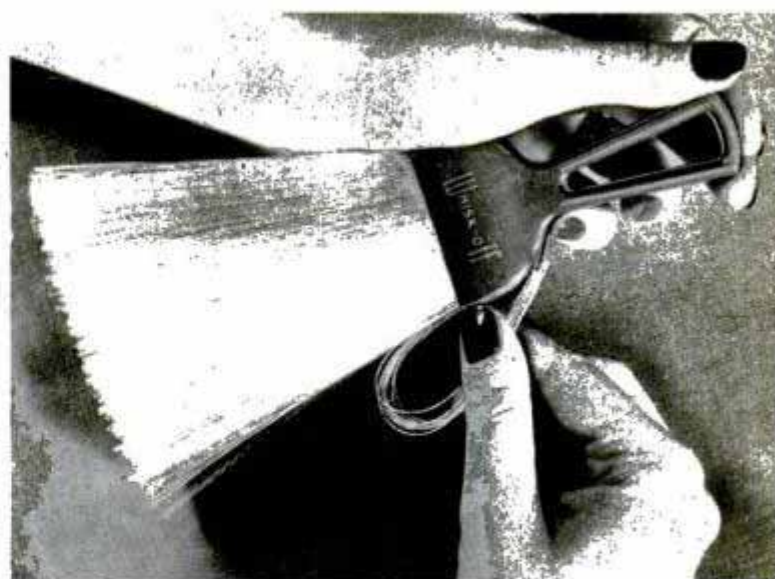
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Made of aluminum foil, the disposable "panette" fits in pie pan or frying pan; it also serves as a plate



Above, sliding removable heating unit into the top section of electric range which plugs into any appliance circuit. Interchangeable unit can be used for either cooking or broiling. The oven is large enough to hold a 22-pound turkey and the range is suitable for use in small apartments or trailers



↑ Magnetic reaction in all-plastic whisk broom is used to help draw dirt from minute crevices. This reaction is created from movement of plastic bristles over fabric

Left, browning cover gives just the right crust to fried chicken, fish or other foods. It allows moisture to escape but prevents flying grease; cover serves as colander

POPULAR MECHANICS



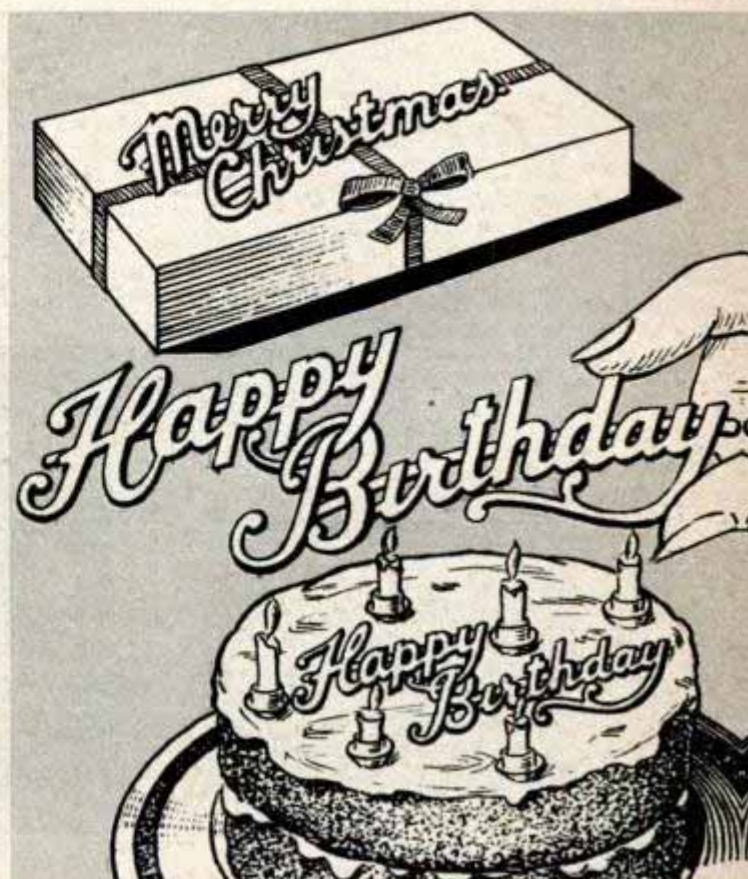
Lamb's wool covers Tenite plastic prongs of vacuum-cleaner attachment for dusting venetian blinds. Dust collected by the wool is sucked into slots inside of each prong. This lightweight attachment is easy to hold

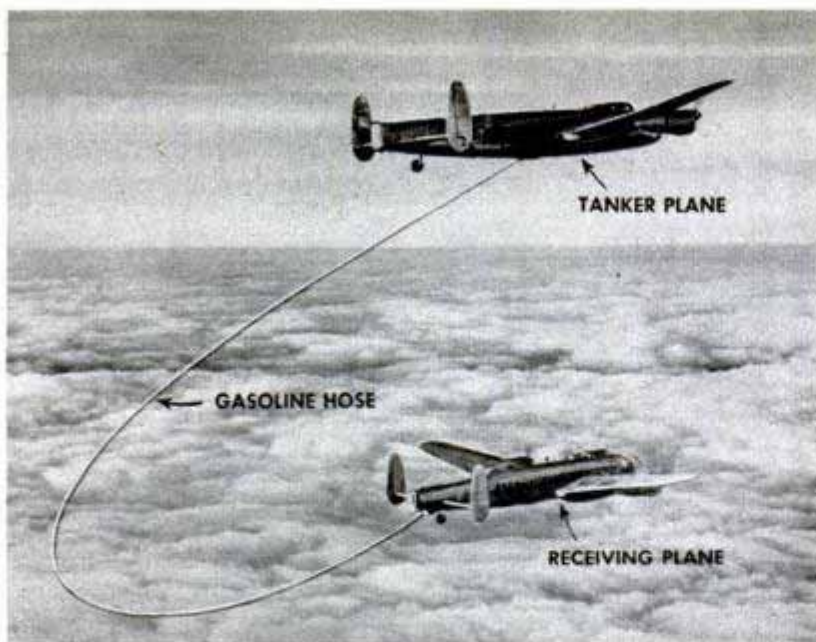
Right, new curtain rod with the five tubular forms attached gives the draperies professional-looking cartridge pleats. The material is pinned around forms and adjustable slots are used to slide the draperies



Swirl washer for hosiery, gloves or any delicate material such as fine lace is operated like a cocktail shaker. For washing hose, one teaspoonful of soap flakes is put into shaker and luke warm water added. This miniature plastic washing machine is handy either for travel or in the home

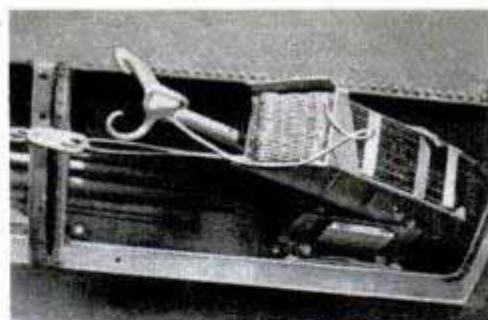
Plastic "greeting" decorations for gift packages, birthday cakes and other items are made in various colors and can be applied with ease. Inscriptions for cakes resemble icing, but are unbreakable and can be washed and used hundreds of times



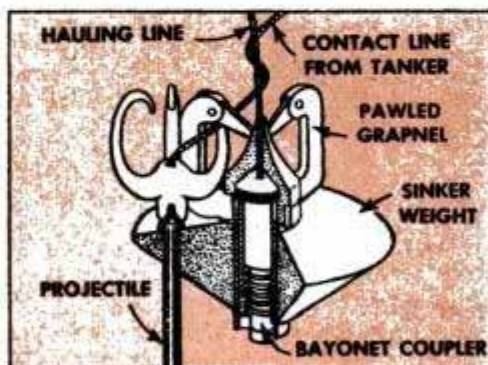


"Tanker" Refuels Planes in Flight

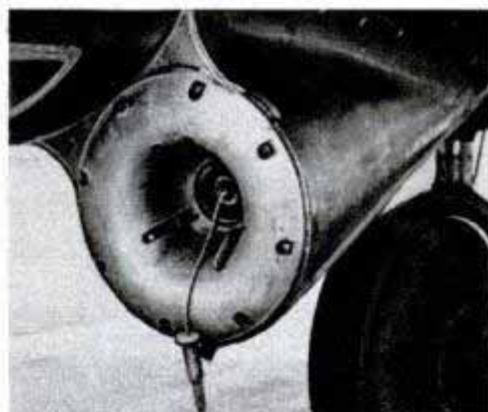
Transocean runs for medium-range planes are the object of refueling experiments conducted by the British government. In one test 3400 gallons of gasoline were piped from a tanker plane to a receiving plane in 20 minutes. Contact is made by firing a claw-tipped projectile, linked to a line, which engages a line trailing from the receiving plane. A gasoline hose attached to the first line is drawn up beneath the receiving plane and a coupling completed to take on the fuel. After transfer, the hose is reeled into the tanker. In one experiment a Lancaster bomber made a non-stop flight from London to Bermuda and back, covering 8000 miles in just over 35 hours. Winter tests are being made over the North Atlantic. Flight refueling eliminates time lost on the ground and in landing, increases pay load and makes possible a lighter and safer take-off.



Above, claw-tipped projectile and line fired from tanker to receiving air liner



Below, receiving plane's reception coupling, through which trailing line passes



"Drop-Tank" Glider In Midget Class

What was once a P-38 drop tank is now the fuselage of an all-metal glider, believed to be the smallest ever built. It was designed by Irving Prue of Burbank, Calif. The butterfly tail allows the craft to land without becoming entangled in weeds or brush.

Some of the Army's finest antiaircraft artillery is being "packaged" for possible future use in Fiberglas-lined steel tanks resembling those used for gasoline storage.



Two-Car Diner-Kitchen Seats 91 Passengers

Dining car accommodations for 64 railway passengers and lounge seats for 27 are provided in a two-car unit with one car a full-length diner and the other a combined lounge-kitchen. The unit, recently placed in operation by the New York Central System, also has a waiting lounge where passengers may be seated until dining accommodations are available. The dining car, which connects with the kitchen through an electrically operated door, is divided by glass partitions into three compartments. The forward compartment has tables for 22 passengers. In the center section passengers are seated along couches with their backs to the walls. The rear section is sim-

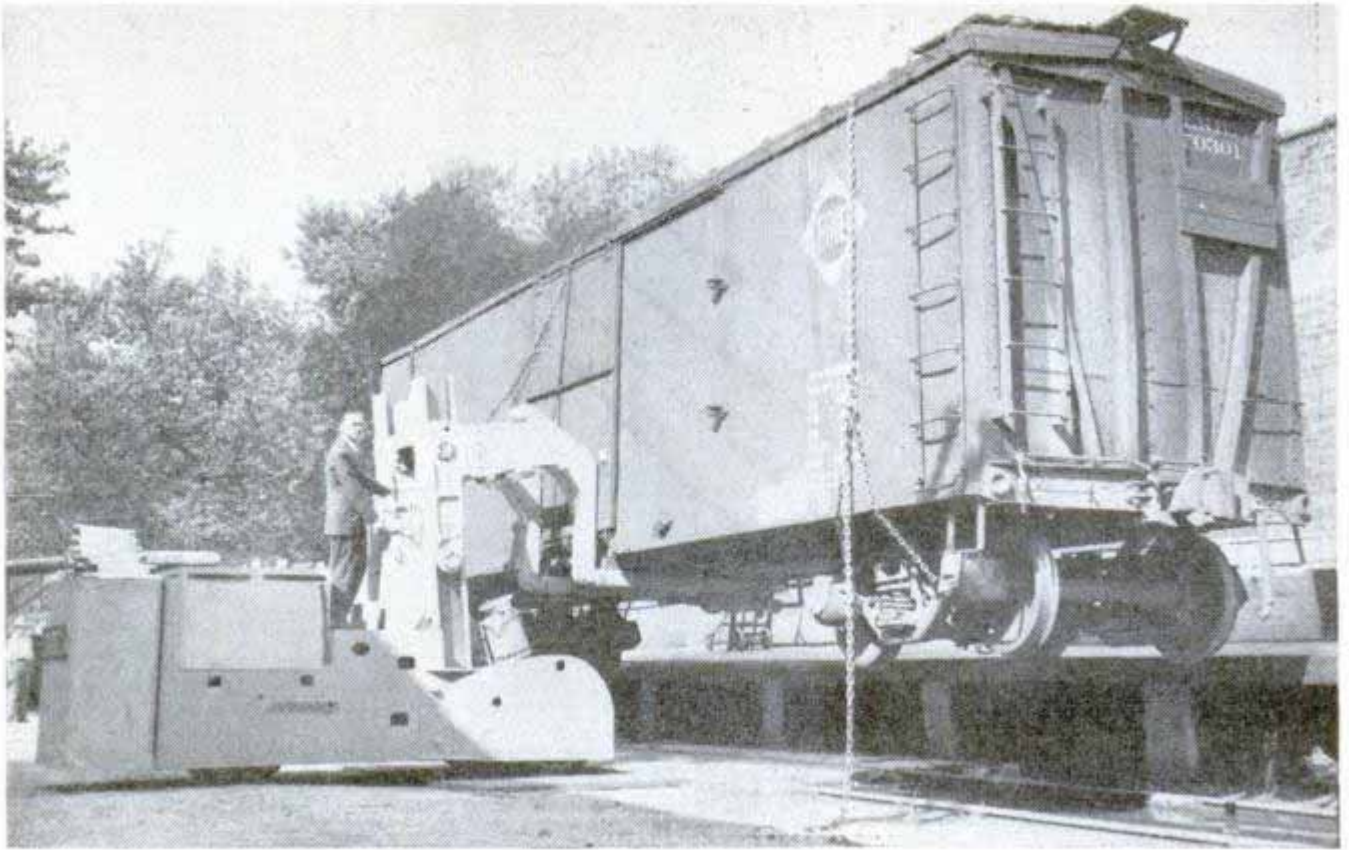


ilar to the forward compartment. The kitchen has stainless-steel fittings which include complete electro-mechanical refrigeration, automatic dishwashers, a double range and a folding washbasin.



Indicators on Portable Lamp Show Need for Recharging

Throwing a 2500-foot beam, a portable rechargeable hand lamp has windows in the side of the case which indicate when each cell of the battery needs recharging. Behind the transparent windows are three specific gravity ball indicators, one green, one white and one red. When the green ball is down, the battery is five percent discharged; when the white ball is down, it is 50 percent discharged; and the red ball indicates it is 95 percent discharged. The shelf life of the battery is about 90 days. The lamp is designed primarily for police and fire departments.

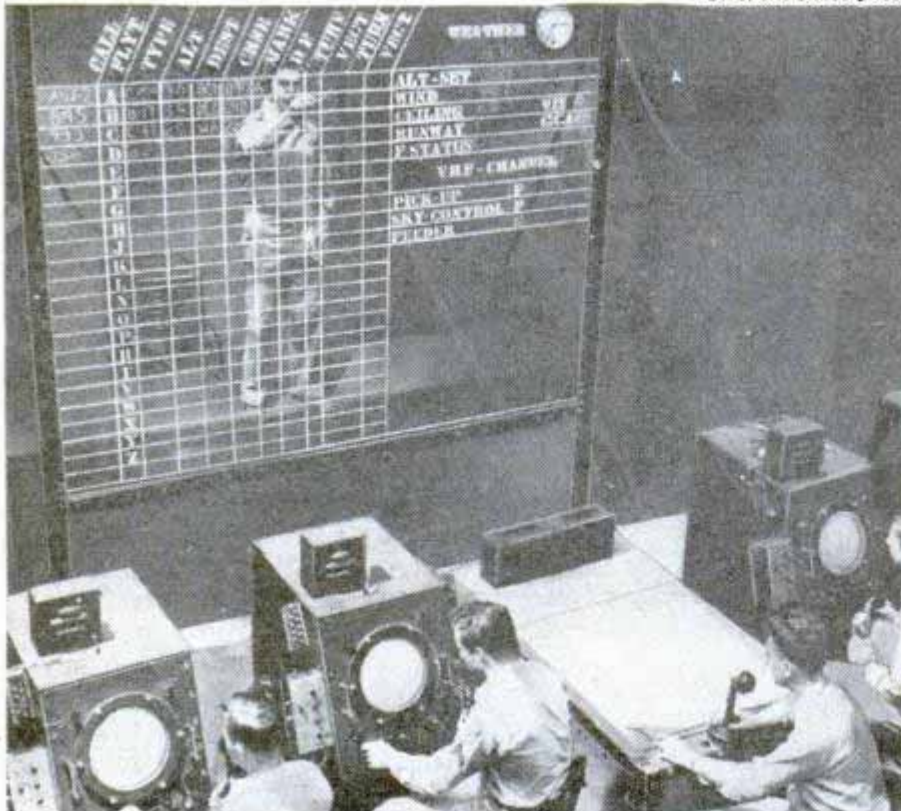


Fork Truck Lifts 45,000-Pound Freight Car

Lifting a 45,000-pound freight car is easy work for a powerful fork truck that was designed for use in steel mills. The truck itself weighs 30,000 pounds and has a capacity of 60,000 pounds. Designed and built by the Automatic Transportation Company of Chicago, the truck is powered by a four-wheel front drive assembly, with twin-

drive units for the two pairs of wheels. The high-pressure hydraulic lift operates through a multiple-action three-cylinder ram which pushes directly against the cantilever. This design eliminates chains and sprockets. Though primarily designed for steel mills, the lift can be used for die-handling in the automotive industry.

U. S. Air Force photo

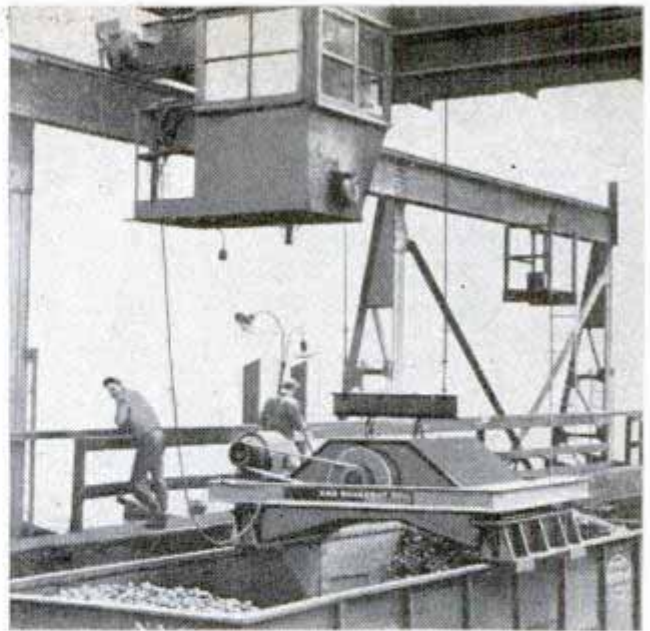


All Planes in Area Show on One 'Scope'

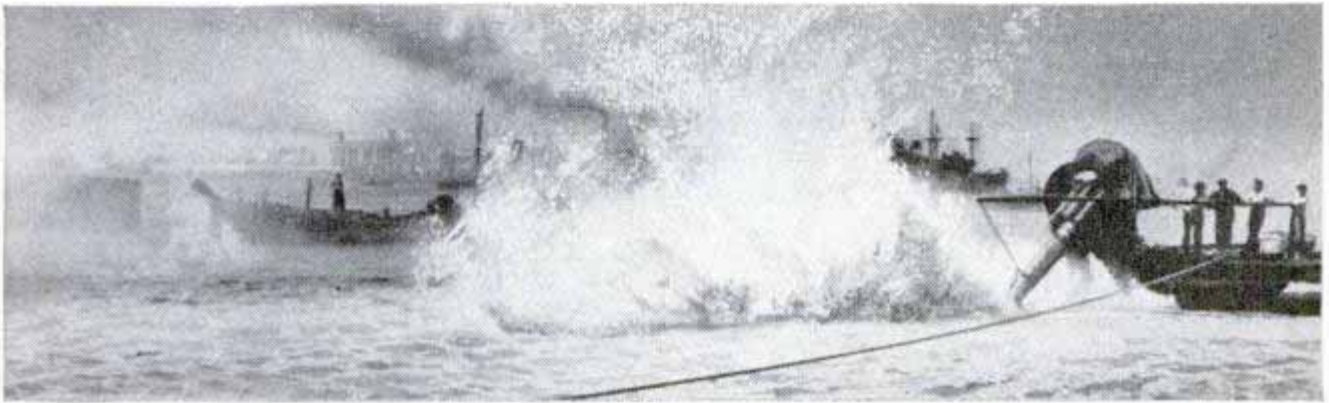
Radar traffic control of all planes within 40 miles of Andrews Field, Md., is centered on a "scope" the size of a kitchen table. Called a Skiatron, it has a white frosted surface and is about twice the size of the usual viewing scope. A controller, watching markers indicating plane positions, "talks" each pilot down to within a few feet of the runway. Smaller radar units follow specific planes. An operator hooked in to all ground-air channels keeps a running account of all landing instructions and information.



HOMEMADE MOWER uses a specially designed tractor to push five ordinary lawn mowers mounted so they cut an eight-foot swath. Mowing unit is easily removed



CAR SHAKER, placed on top of hopper-bottom railroad cars, vibrates 1000 times per minute to shake coal loose and cut the unloading time to 90 seconds



POWER JETS have more uses than just propelling airplanes. A new British adaptation of the jet is used to remove sediment that settles near wharves and obstructs shipping. The jet engine, mounted on a barge, fires a blast of compressed air against the river bottom, stirring up the mud so that it's carried away by the current

AUXILIARY GAS TANKS, mounted on old bomb trailers, are used as drain tanks in changing airplane-engine oil. A flexible tubing carries the old oil from the engine drain cock into the 150-gallon portable tank

SWAYBACK CABIN deliberately violates building principles. With doors hanging askew and stove-pipe slanting, the unusual house was built by a Seattle policeman for use during fishing trips



His Tripod Is a Plane

"YOU JUST CIRCLE around, look down until you find a good angle, then sit back and shoot." That's how Oakley T. Wayman, who makes his living snapping bird's-eye views, sums up the art of aerial photography.

Wayman has been a camera and flying enthusiast for many years. Not long ago he decided to try to make both these avocations pay off, and quit his job at a plant in Linden, N. J., to earn a living with a Fairchild K-20 camera and a Piper Cub.

Factories, private estates, cemeteries, churches, golf courses and even entire cities are all grist for his photographic mill. And customers willingly pay an average of \$75 to have him take a picture of their property from the air.

Although he handles any job that comes along, manufacturing plants and real estate constitute the bulk of his work. Firms use pictures of their factories in house organs, advertising, and in stockholders' reports, to show physical improvements.

Owners of private farms and estates



By Edward J. Linehan

usually frame these photos of their grounds and buildings and sometimes use them for letterheads and greeting cards. The wide range he can cover makes his aerial shots valuable to owners of golf courses and housing developments.

The price depends on the size and number of pictures his customers want, the altitude at which they want them taken, and the distance of the job from Wayman's South Bound Brook, N. J., home. He has ranged as far north as Albany, N. Y., and as far south as Richmond, Va., in his Cub, fulfilling assignments.

Although he has often taken pictures while flying the plane himself, Wayman found that an experienced pilot at the stick is a great asset. His present "asset" is Wilmer H. Atkinson, a veteran. "We work as a team," says Wayman. "Good aerial photographs depend on perfect coordination between pilot and cameraman."

After taking off from Somerset Hills Airport, near Basking Ridge, N. J., where Wayman keeps his plane, the pair flies to the site to be photographed. Once over the



Aerials of sporting events, like this Rutgers-Princeton game, are always in demand by participants

spot, Atkinson levels off at the prescribed altitude (anywhere from treetop level to 11,000 feet), and circles, cutting his speed to about 65 miles per hour.

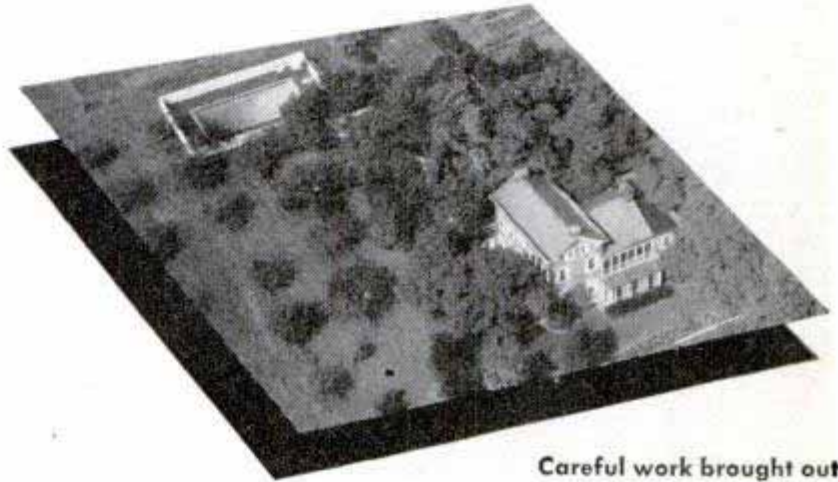
Wayman folds back the plane's doors and watches the panorama below, waiting for just the right angle, aiming through the cross-hair and bead sight. When he catches the right view he pulls the trigger on the big-bored K-20, taking the picture and automatically winding fresh film into place for another exposure.

Since the Cub's doors are on the pilot's right, Atkinson must fly clockwise. The necessity for this led to tense moments while covering the Rutgers-Princeton football game in 1946. Three or four other pilots, either snapping pictures or taking advantage of a free aerial ticket to the game, insisted on circling in the opposite direction, with relatively few feet difference in altitude. Atkinson had to be constantly alert to prevent a spectacle which would have surpassed that on the grid-iron below.

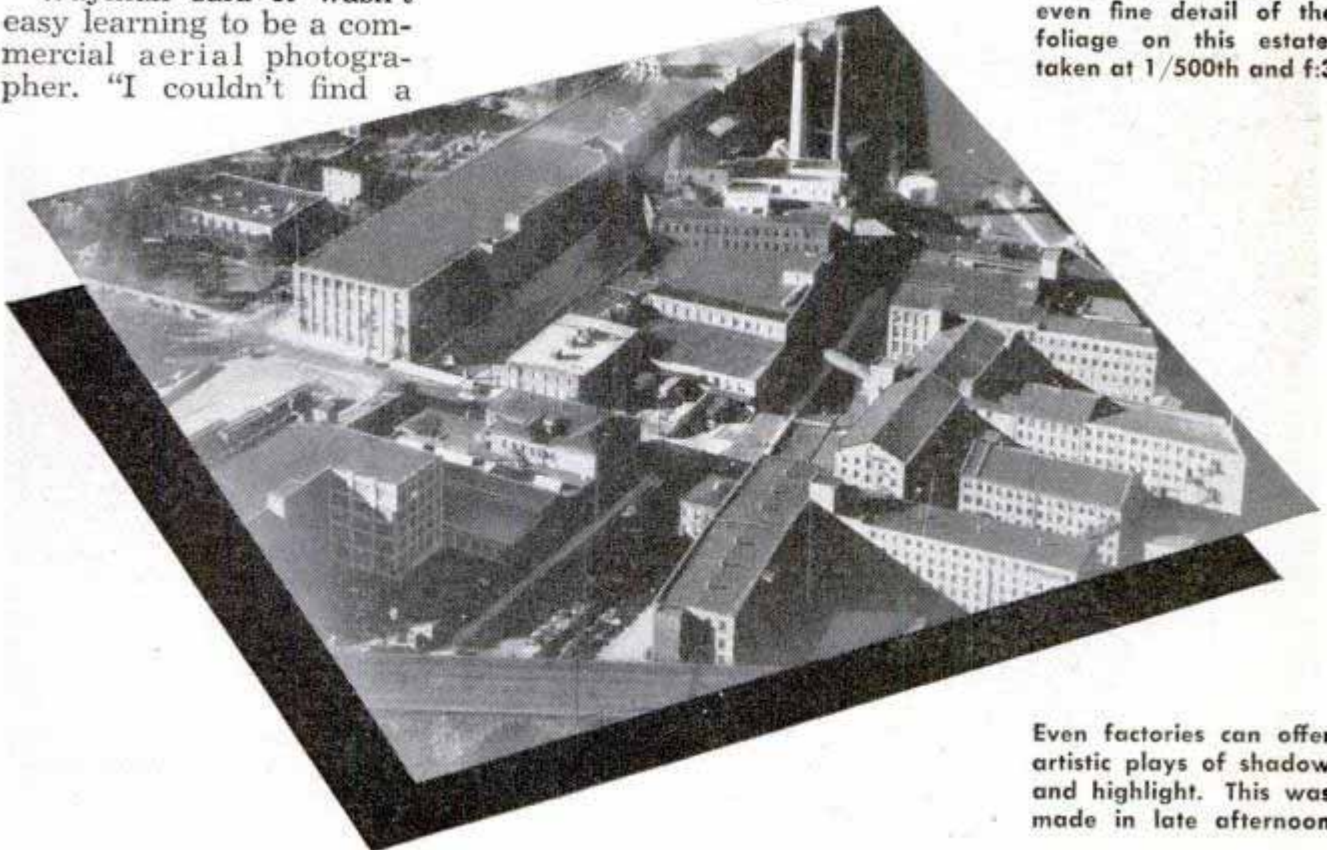
Wayman said it wasn't easy learning to be a commercial aerial photographer. "I couldn't find a



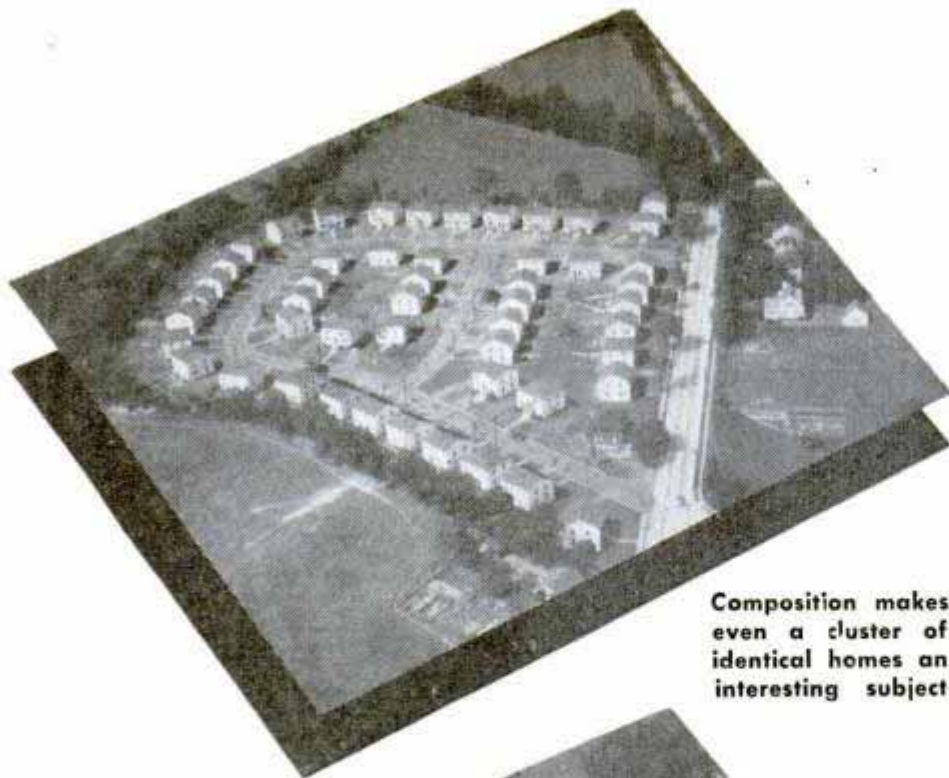
As Pilot Atkinson flies the ship into position, Wayman sights a target with K-20 aerial camera



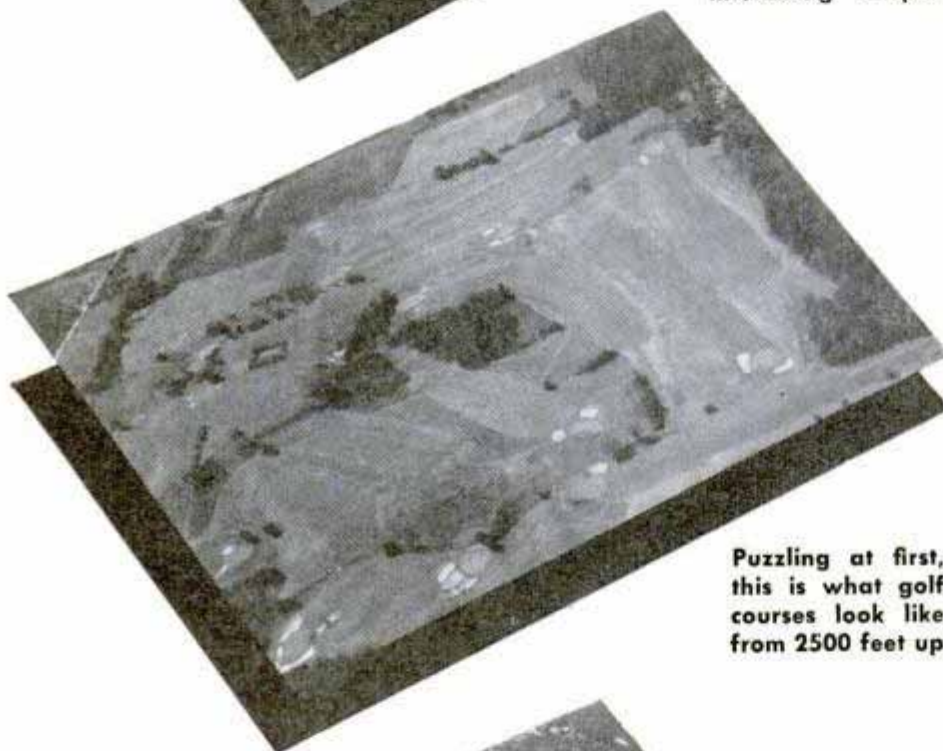
Careful work brought out even fine detail of the foliage on this estate, taken at 1/500th and f:3



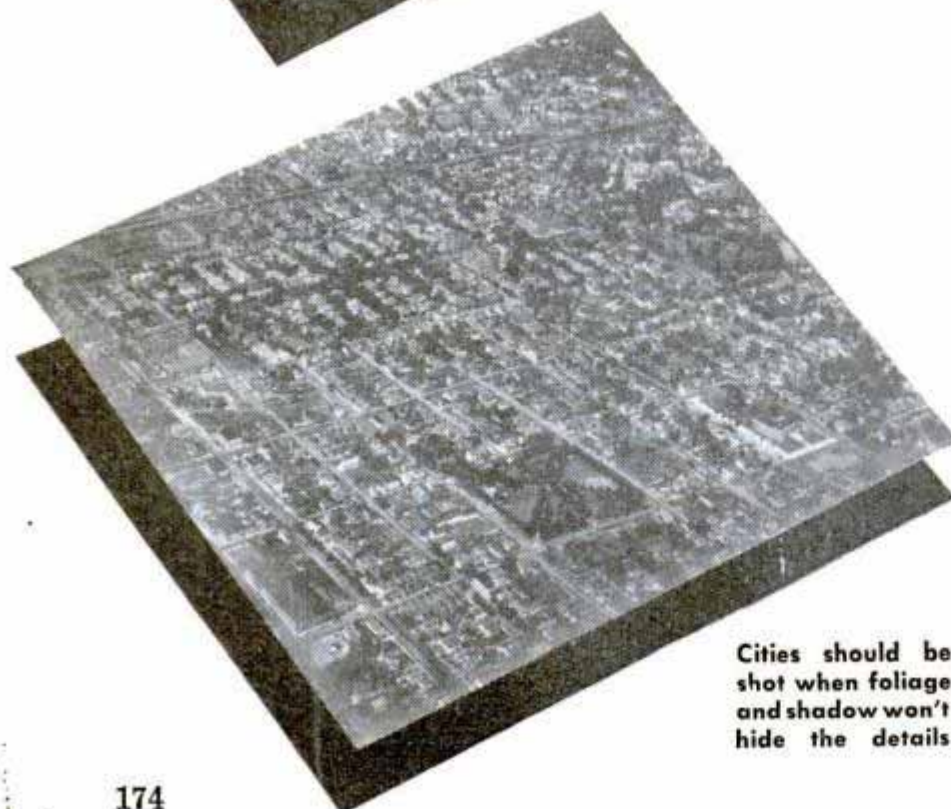
Even factories can offer artistic plays of shadow and highlight. This was made in late afternoon



Composition makes even a cluster of identical homes an interesting subject



Puzzling at first, this is what golf courses look like from 2500 feet up



Cities should be shot when foliage and shadow won't hide the details

book explaining all the techniques, so I learned the hard way. It cost me a lot of money through mistakes. I began by snapping pictures hit-or-miss, and then studied the results. It was months before I got anything that satisfied me. You don't learn this business overnight."

Most of his shots are taken at a 45-degree angle. Experience proved that this angle usually gives broad enough coverage for his purposes, still showing something more than just rooftops. Light-streaked negatives taught him that reloading the camera in the air is risky. Now he lands and reloads in a darkroom or closet. "Something else I learned the hard way," he confesses.

Weather, which plagues every outdoor photographer at times, is the bane of Wayman's existence. Sometimes he has to sit on the ground for weeks, awaiting not only good flying weather, but good picture-taking conditions, too.

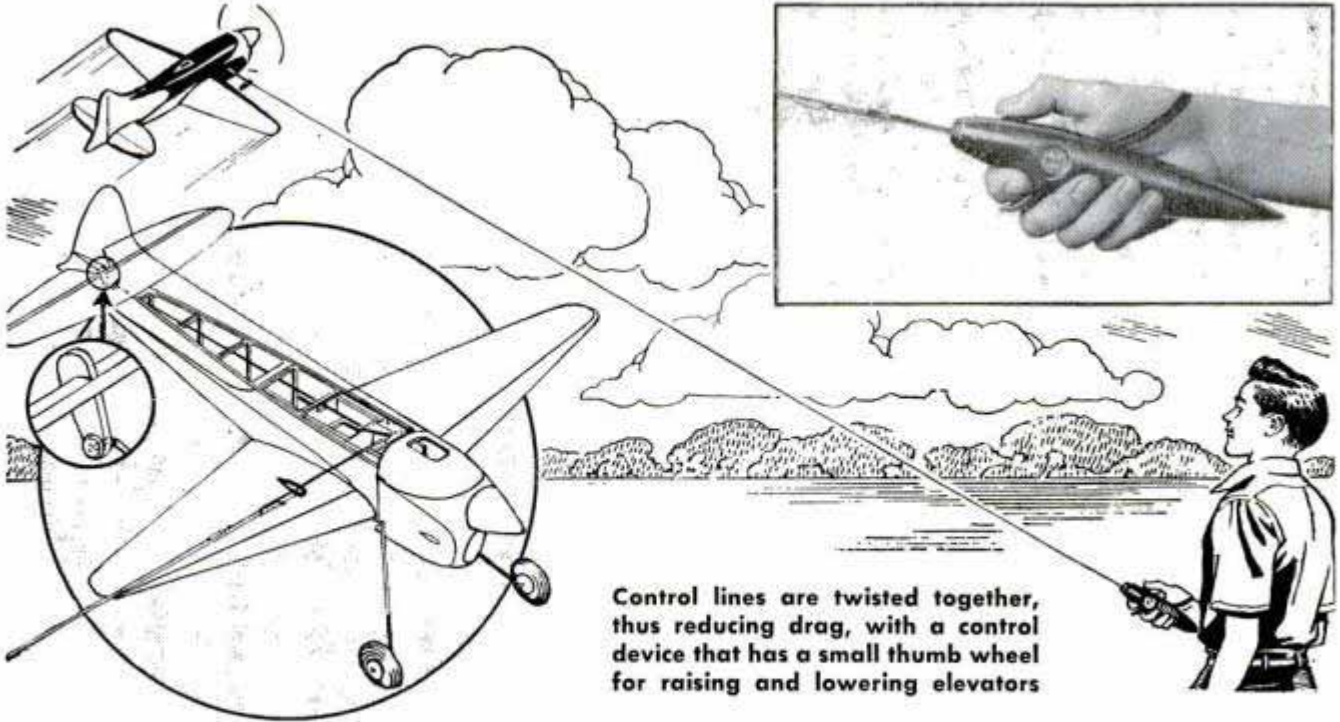
Wayman says the best shots are made on sunny days after a heavy rainfall. The downpour cuts the atmospheric haze, which, though not obvious to the naked eye, shows up clearly on the negative. He seldom uses a filter to cut the haze because of the sacrifice to camera speed. "I prefer to wait for a bright, clear day," he says.

Although engine failure has never forced him down, darkness has caused Wayman to land in bumpy cow pastures on several of his longer trips. Perhaps the closest call came one day after he and his pilot had been flying seven hours, landing only to refuel.

Circling around a factory, the last job of the day, he was busy snapping pictures from the rear seat of the tandem-control plane. Concentrating all his attention on the camera, he didn't notice that they were spiraling slowly downward. When a scant 250 feet of altitude remained between them and the ground, the pilot suddenly started, looked

(Continued to page 240)

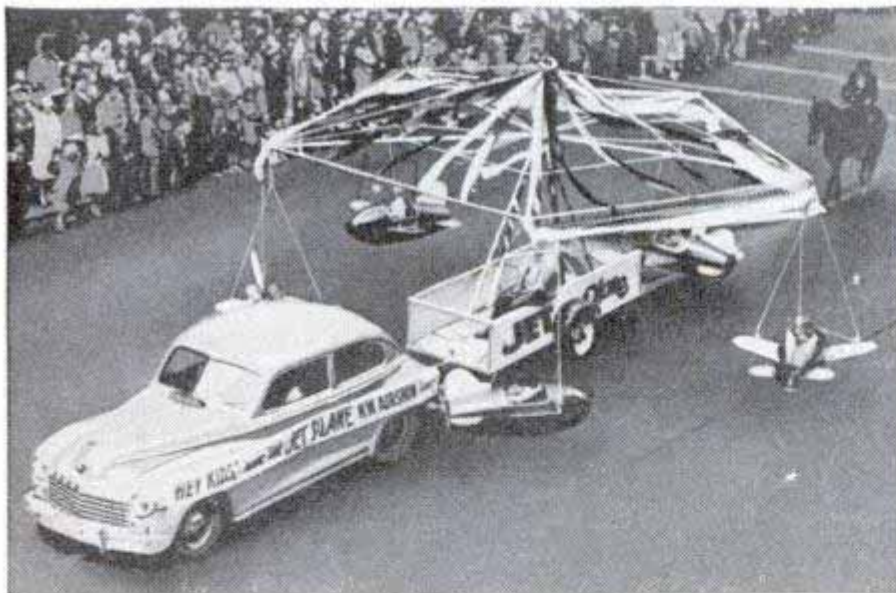
CONTROL FOR MODEL PLANES HAS THUMB-WHEEL OPERATION



Control lines are twisted together, thus reducing drag, with a control device that has a small thumb wheel for raising and lowering elevators

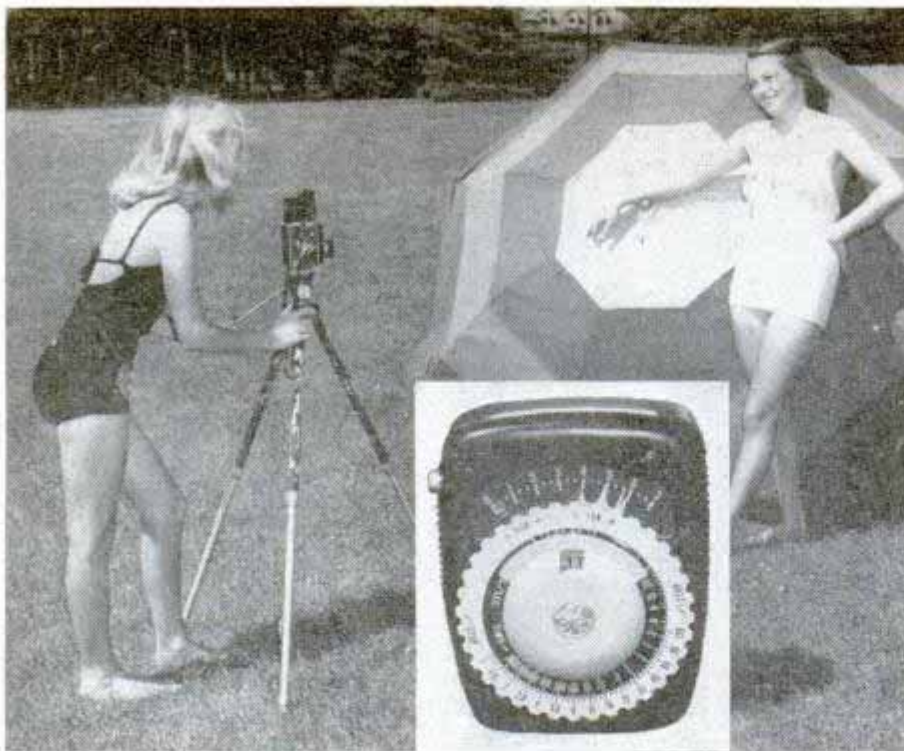
Twisted control cables do not interfere with the sensitive operation of a new model-plane control unit. In fact, by twisting the two cables, it is possible to reduce line drag enough to increase speed up to 10 per cent without any loss in control. The control consists of a streamlined hand unit and an elevator-control linkage that will fit any

type of model airplane. When using the control, the operator raises or lowers the elevators by turning a knurled thumb wheel on the hand device. It is not necessary to follow plane maneuvers with the hand as with other controls because the elevator position is regulated entirely by the position of the thumb wheel.



Junior "Jets"

So compactly designed it can be loaded in a two-wheeled automobile trailer, a mobile amusement ride has "jet planes" made of airplane auxiliary gasoline tanks. The trailer forms the base for the rotating device during operation. An electric blower in each plane provides sufficient thrust to revolve the unit at speeds up to 20 miles per hour. The cockpits are roomy enough for children up to 14 years of age. Each plane can be maneuvered by the rider by means of a control stick that lengthens or shortens the supporting cables. Climbs, banks, dives and skids are possible. Assembling and disassembling takes only 30 minutes. The trailer base permits towing the erected unit in parades.

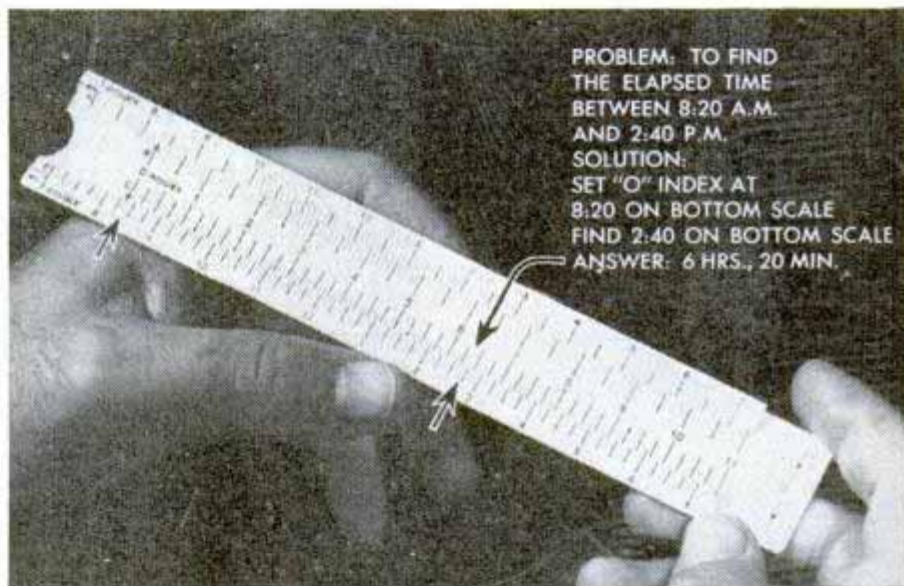


Meter "Remembers" Exposure Reading

By matching pointers on a new photo-electric exposure meter, the photographer reads the proper shutter speed and aperture directly. Called the meter with a "memory," the new device, made by General Electric, has a pointer lock button that holds the needle at the correct reading. The photographer then aligns a second pointer with the light-scale pointer to get the correct exposure. The meter can be used for both still and motion-picture photography.

Rule Totals Hours, Minutes Rapidly

Operated like a slide rule, a time computer converts clock time to work time in one simple operation. The zero arrow on the rule is set opposite the mark representing the time work began, and the elapsed time is read above the point representing the hour work ended. Designed for timekeepers, the computer makes easy work of adding hours.



PROBLEM: TO FIND THE ELAPSED TIME BETWEEN 8:20 A.M. AND 2:40 P.M.
SOLUTION:
SET "O" INDEX AT 8:20 ON BOTTOM SCALE
FIND 2:40 ON BOTTOM SCALE
ANSWER: 6 HRS., 20 MIN.



Pistol-Grip Tripod

For use with either movie or still cameras, a dual-purpose accessory provides a pistol grip for hand shooting and a short tripod, which can be set on a rock or log, for use when the conventional tripod is not available. Made of aluminum, it attaches to the tripod socket. The two legs swing up when not in use making it easy to carry in the case or pocket.

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

The CRAFTSMAN

★ Where there's a daughter, there's a dollhouse — or no Christmas is complete. So we've done an architectural job for harassed dads; on page 188 are plans for a big, two-story dollhouse with eight rooms, and electric lights in every room. Construction is simple and easy, for walls and partitions are plywood

★ Home laboratory scientists will find, on page 194, several spectacular experiments to try with common gases—hydrogen and oxygen

★ For bold detail, character and expression, and soft portrait backgrounds, try shooting your album photos close-up. Any focusing camera either with or without a ground glass will do the trick. There's good advice for you on page 204

★ If you like to build your own tools, you'll turn first to the shop story on page 224, telling how to build two sizes of brazing torches that operate on illuminating gas



DOLLHOUSE



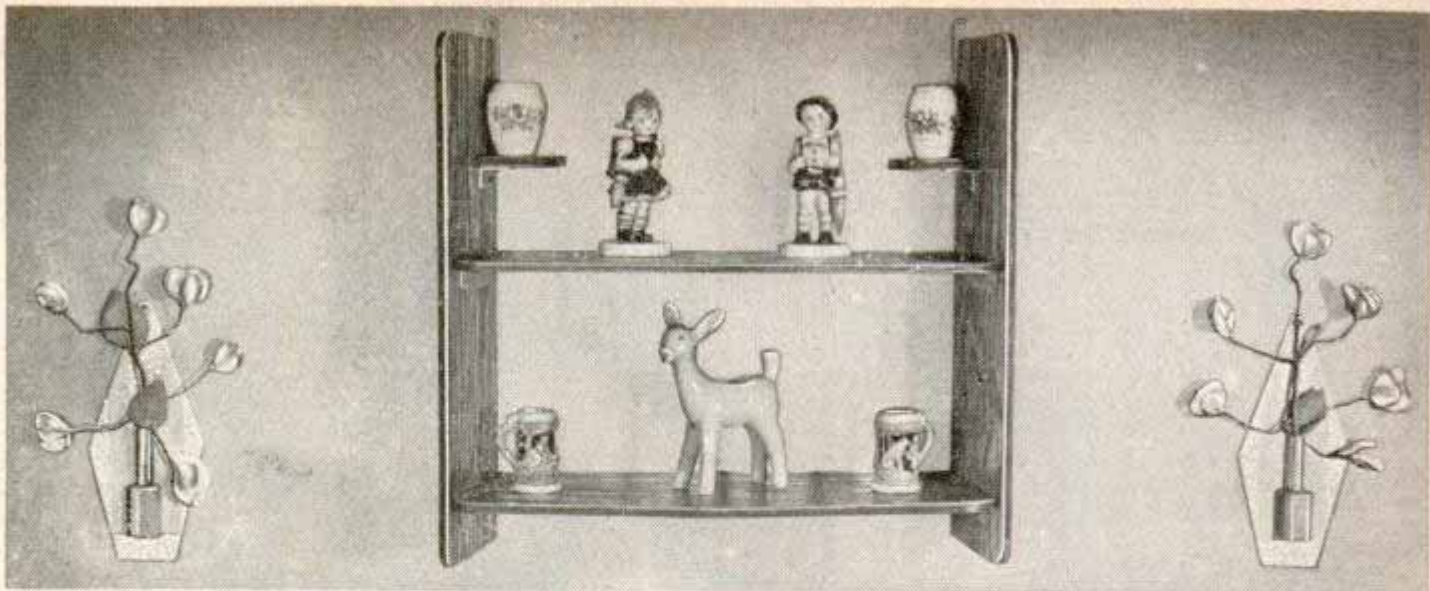
HOMEMADE TORCHES



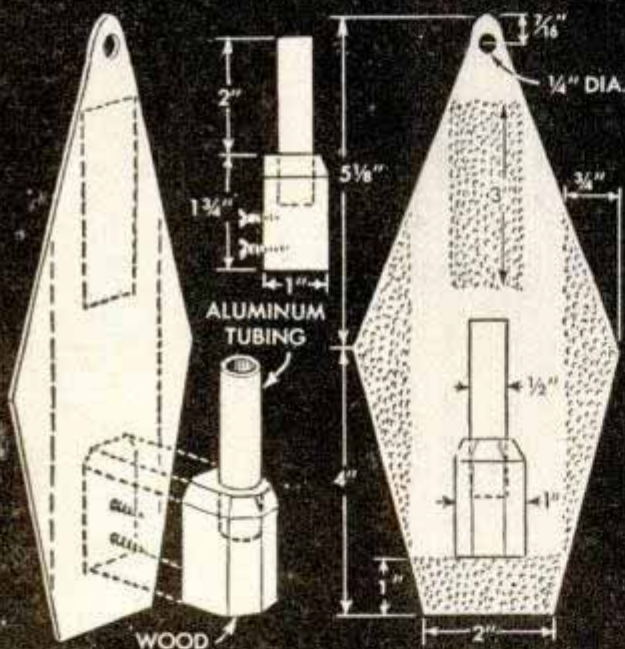
TAKING CLOSE-UP PHOTOS



FUN WITH GASES



3-piece WALL ENSEMBLE

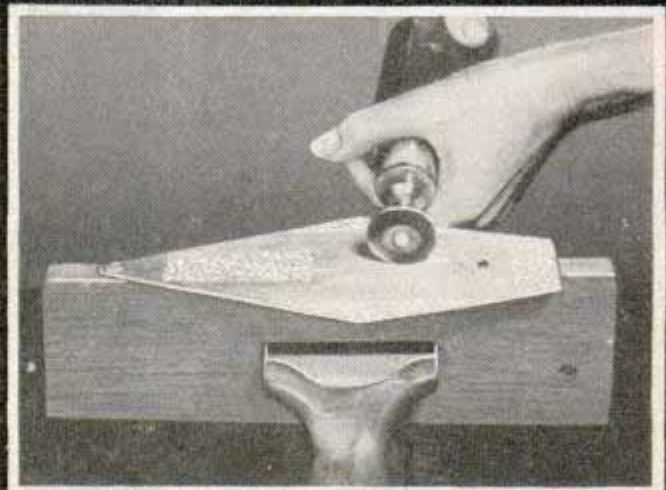


IF YOU WANT something different from mere pictures to break up a bare expanse of wall, then this little wall ensemble may be just the thing. This unusual trio—the knickknack shelf and the hammered-aluminum bud vases—lends a pleasing and balanced treatment if grouped as shown.

To make the vases: The wall plate of the vase is cut from .064-ga. sheet aluminum, following the dimensions and pattern given at the left. Mark the areas which are to have a hammered finish and then peen them lightly with a ball-peen hammer. After this, chamfer the entire edge of the plate slightly by tapping with the face of the hammer as shown in the photo below. Surfaces that are not hammered are given a satin finish by polishing with a wire scratch wheel or rubbing with fine steel wool. A 3-in. length of $\frac{1}{2}$ -in. aluminum tubing serves as a flower holder and is inserted in a wood base attached to the plate.



After hammer-finishing the areas indicated in the drawing, the entire edge of the plate is chamfered by tapping lightly with the flat face of a hammer

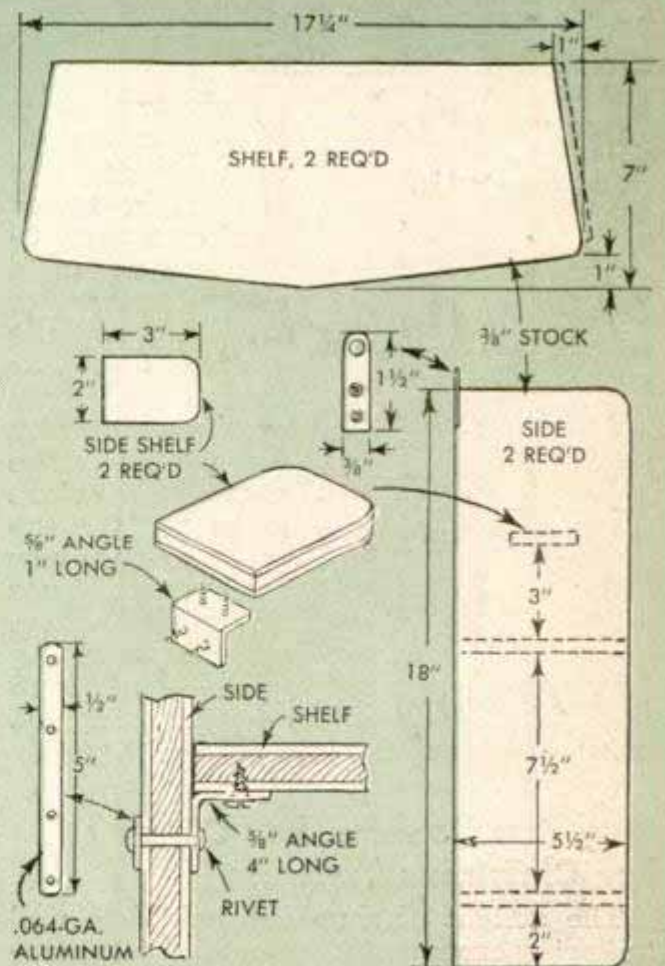


Areas which are not hammered are given a scratch-brush finish by polishing with a fine-wire wheel. This is done with the plate fastened to a board



To make the shelf: The knickknack shelf differs from the usual type of wall shelf in that the sides flare outward. Make two of each part required, cutting them from $\frac{3}{8}$ -in. plywood, according to the patterns given at the right. In the original, pieces of aluminum angle were used to attach the large shelves to the sides, although brass or copper can be combined with light or dark wood. The metal angles are attached to the underside of the shelves first, using short screws so as not to pierce through. Then they are riveted to the side pieces. Note in the sectional detail that a $\frac{1}{2}$ -in. strip of the same metal is used to back the rivet heads on the outside. This method of assembly gives exceptional rigidity. If you prefer a concealed type of fastening instead of the metal angles, the shelves can be set in dados cut in the side pieces and nailed and glued. A piece of fancy molding will cover the nailheads, or the heads can be sunk and puttied. The two little shelves are fastened with angles and screws, and are mounted one on each side, 3 in. above the top shelf. Finally, a metal hanger is recessed at the top of each side.

By R. J. DeCristoforo



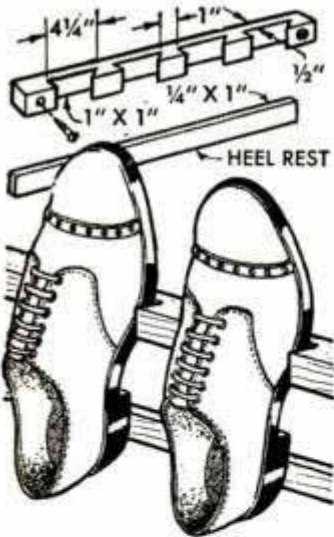
Folded Envelope Corners in Album Keep Records From Falling Out



Many times, when handling a phonograph-record album, a record will slip out of its envelope, drop and break. This will be prevented if the top outside corner of the envelope is creased and pushed inward, as shown in the detail. To keep the paper from tearing along the creases, reinforce them with mending tape.

Mrs. Joyce Tomlinson, Brockton, Mass.

Closet-Door Shoe Rack



Only two strips of wood are needed to make this shoe rack, which can be fastened to the inside of a closet door. Size of the rack, and the number of shoes that it will hold are determined by the width of the door. Dimensions given for the top piece are for average-size men's shoes. The bottom piece merely

serves as a buffer strip to keep heels from resting against the door and marring the finish.—George M. Singer, Erie, Pa.

Play Pen Doubles As "Corral" For Christmas Tree

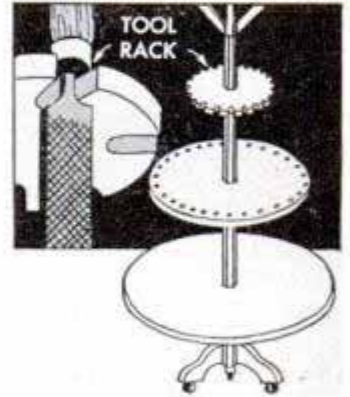
The delight of a toddling child to pull glittering ornaments from a Christmas tree is well known to every parent. To prevent

our baby from possibly upsetting the tree, I formed a fence around it by placing the tree in the baby's play pen. This was done the first few years with small trees and was found to save ornament breakage and a lot of worry.

Anthony J. Mueller, St. Louis, Mo.

Costumer Converted to Hold Tools

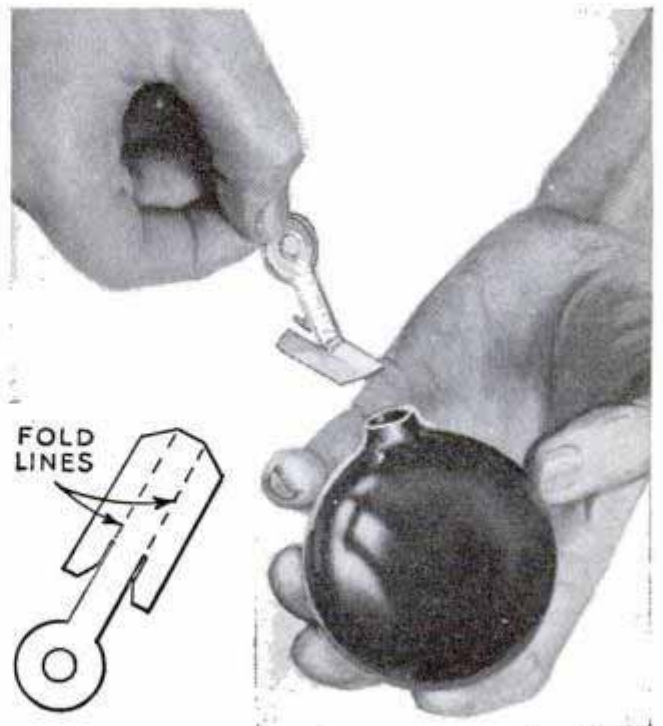
By adding three round "trays" or shelves to the standard of an old costumer it can be converted into a handy tool rack for your workshop. The top tray is the smallest, the others increasing in size toward the base. Notches are made in the edges of the trays for some



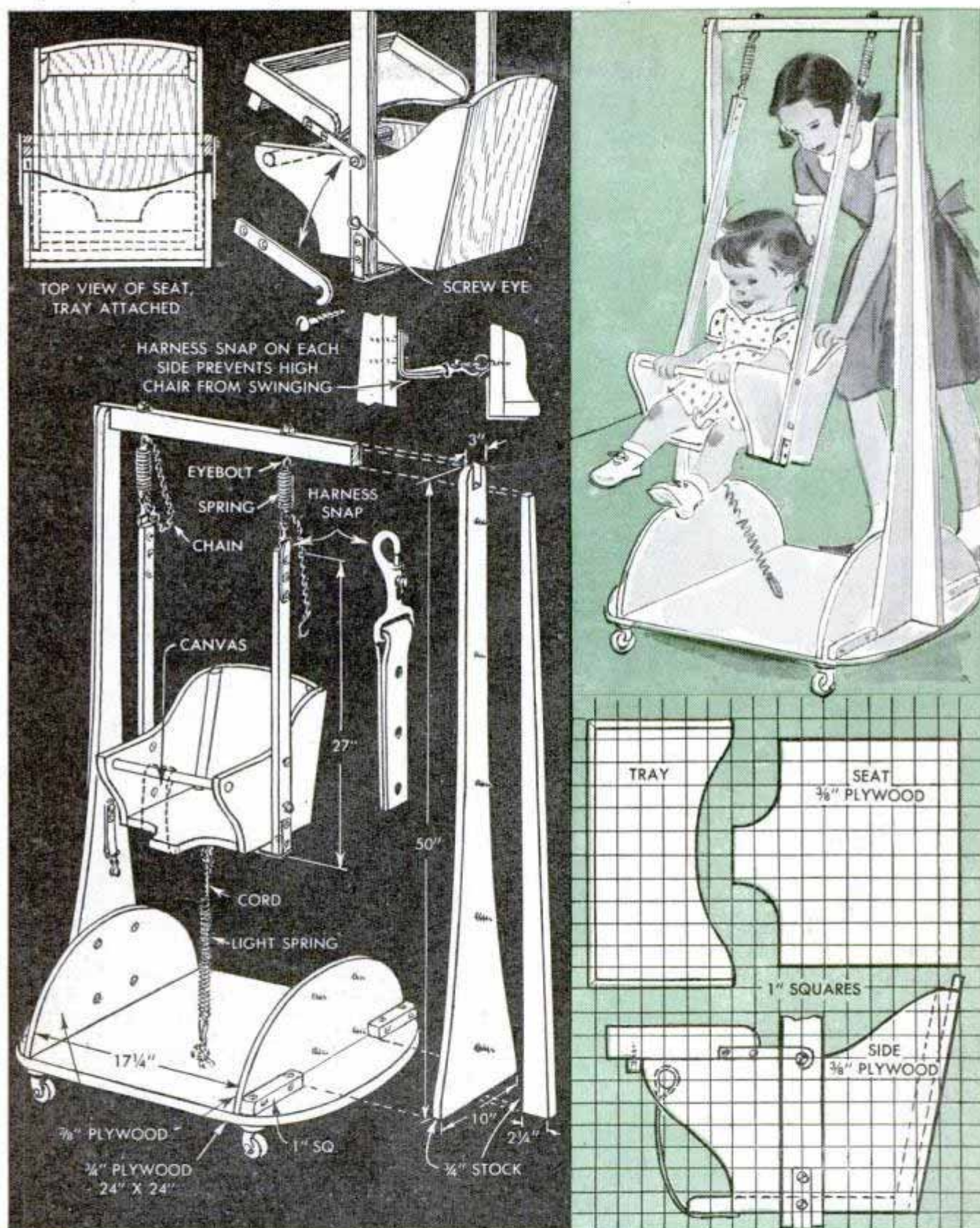
tools and holes are drilled near the edges for others. There's also plenty of space on the shelves to lay tools, such as planes, that can't be hung up conveniently.

Substitute Ornament Hangers

If the hangers on Christmas-tree ornaments become lost, replacements can be made from lightweight cardboard. Cut and fold the material as indicated in the detail and then insert the hanger in the ornament. Pass wire or string through the eye of the hanger to fasten it to the tree. Cardboard with a waxed finish is best for this purpose. Strengthen the eyes with notebook reinforcements.—Benj. Nielsen, Aurora, Nebr.

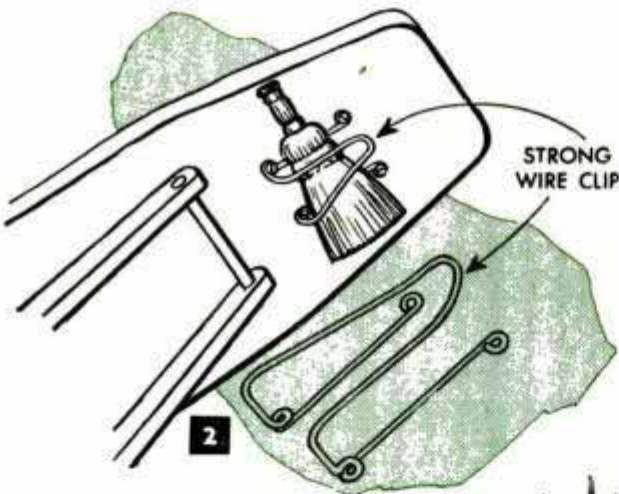
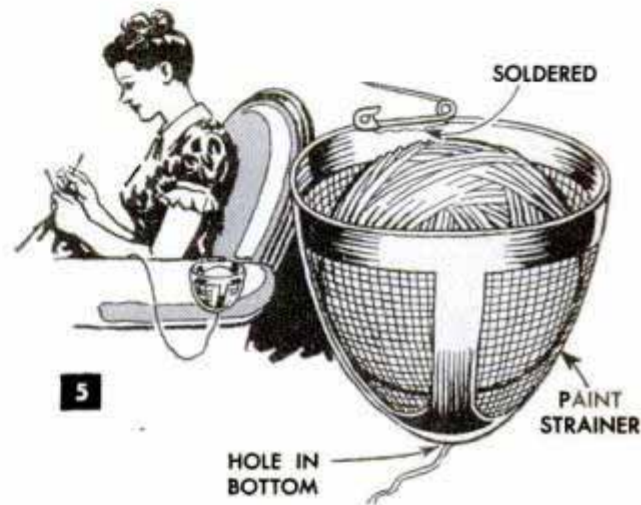
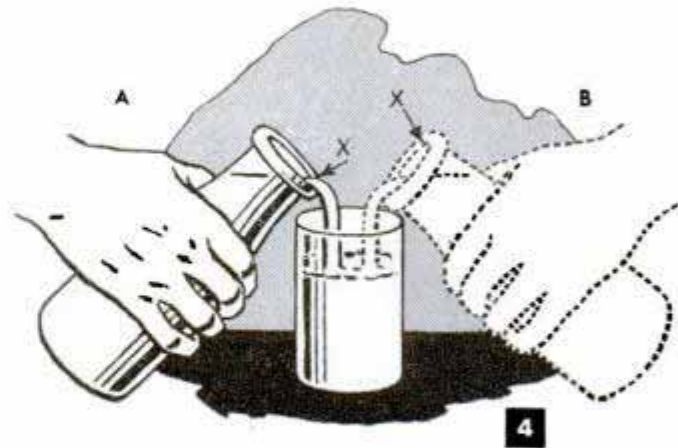


Baby's Swing Doubles As Safe High Chair



This novel high chair-swing combination is mounted on casters so that it can be rolled from room to room. Harness snaps and leather straps attach the seat to the frame and prevent it from swinging. Add the detachable tray and there's the high chair. To use as a swing, just release the snaps and remove the tray. As a swing the unit has three unusual safety features—

rigid vertical seat hangers, which prevent spinning, a spring-and-cord arrangement connecting the seat to the base, thus limiting the amount of swing. There also are two safety chains which prevent the seat from falling should one of the supporting springs break. Make the frame parts from hardwood and the seat and base from plywood. Finish in the natural-wood color.



1 Use greased muffin pans as molds when baking stuffed peppers so they will hold their shape. To keep the peppers from drying out, set the muffin pan in another pan containing water and then cover it to retain the moisture

2 When pressing clothes, a whisk broom is convenient for removing lint. To have one always at hand, keep it in a wire clip fastened to the underside of an ironing board. The detail shows how broom clip is made and attached

3 Much of the damage that is caused by youngsters pushing kitchen chairs or other furniture against the walls will be prevented if two or three rubber-headed tacks are driven into the backs of the chairs to act as "bumpers"

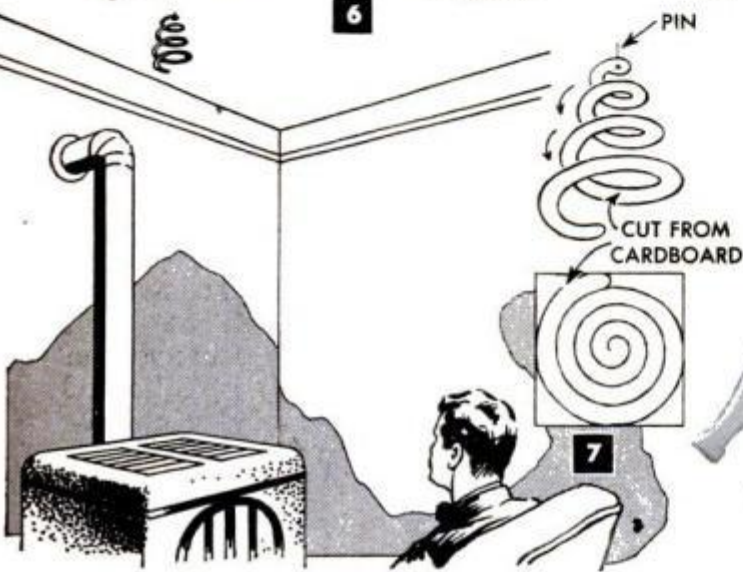
4 To pour cream from a bottle of milk, hold the bottle as in detail A-X; then, without rotating it, pour off the rest of the cream by holding the bottle as shown in detail B-X. This prevents the cream from mixing with the milk

5 A metal strainer similar to the one illustrated is handy for holding yarn when knitting. Solder a safety pin to the rim of the strainer so it can be attached to the arm of a chair. Pull yarn out through a small hole drilled in the bottom

HOME PROBLEMS



6



7



8

6 If working from drawings or plans in a magazine, hold it open by clamping a trousers hanger to the top of the pages. Hang the magazine in a convenient location by means of the hanger hook. Any books that are not too bulky will clamp in the hanger also

7 Cut a spiral from a piece of cardboard and fasten it to the ceiling over a stove to serve as a "heat" indicator. The spiral pivots loosely on a pin. Rapidity of motion indicates the degree of heat from the stove

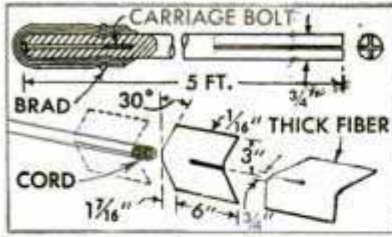
8 This hand truck is used to move radiators over polished floors without marring the surface. Instead of casters, a discarded wringer roll is used. Fasten two L-shaped lengths of flat iron to the bottom cross-piece of the frame to hold the radiators

9 Soldering a large hole in any metal container is easy, and a better job will result if a thumbtack is used as a "patch" to cover the hole. Before soldering the tack in place, cut off the point so that it will not project into the container. Center the head of the tack over the hole and apply solder to both sides



9

Safe "Javelin" for Young Boys Has Padded Head

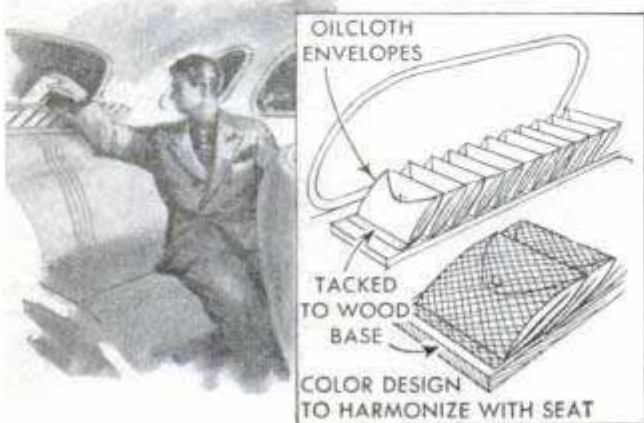


Neatly balanced and provided with a padded head, this javelin is safe for young boys, and it can be thrown accurately at targets some distance away. The shaft is about 5 ft. long and $\frac{3}{4}$ in. in dia. Notch one end for the fiber "feathers" that stabilize flight, and insert a carriage bolt into the other end to provide sufficient weight for the head. The padding covering the bolt is held with brads.

C. L. Meehan, Lakeview, Ont., Can.

Oilcloth Envelopes Behind Seat Make Convenient Carryall

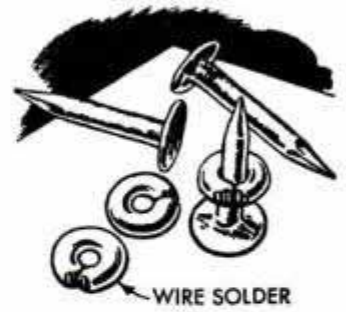
The ledge behind the back seat on many cars often becomes a "catch all" for odds and ends because it is a convenient place to leave papers and other objects. One way to take care of these objects is to make oilcloth envelopes with snap fasteners and



attach them to a board that fits the ledge. The oilcloth should be chosen to harmonize with the upholstery.

Improved Lead-Headed Nails

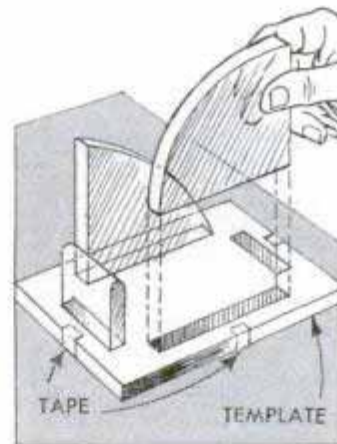
If only a few lead-headed nails are needed to repair a metal roof and none are available, you can improvise a substitute by using galvanized roofing nails and some wire solder.



Form rings of the wire to slip snugly over the nails. When driven in place, the nailheads will flatten the solder and seal the nail holes effectively. Do not use an acid-core solder.

Template Guide to Cement Plastics

A template or pattern to position vertical pieces while cementing them to a plastic base will make it unnecessary to scribe locating lines. The template is a sheet of



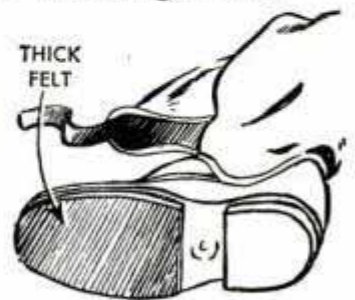
paper the same size as the base, having the outline and the position of the pieces clearly indicated on it. For transparent plastics, the paper is taped to the underside of the base, which makes it a simple matter to see where to cement the uprights. For colored and opaque plastics,

cut out the portions of the pattern where the vertical pieces join the base, tape the pattern to the top of the base and proceed to cement the pieces as before.

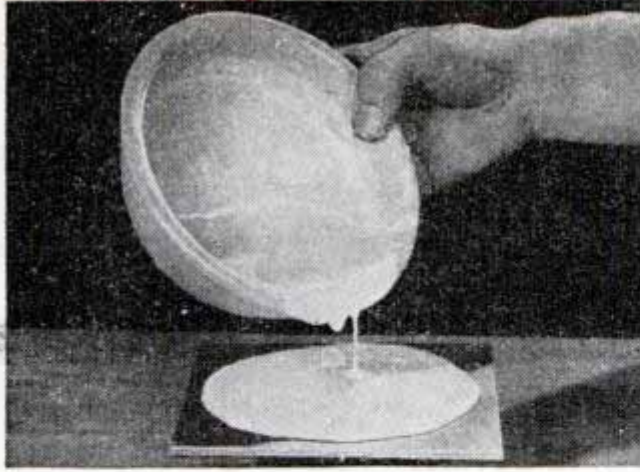
Leslie K. Prescott, Newport, N. H.

Nonslip Soles on Wading Boots

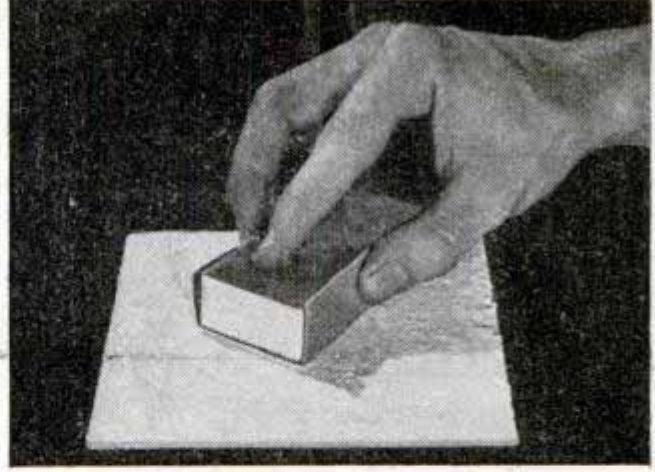
To prevent slipping when fishing a stream that has a rocky bottom, cover the soles of rubber boots with thick felt. Typewriter pads, obtainable from a stationery store,



are ideal for this purpose. Outline the sole of the boot on the pad, cut out with a safety-razor blade and cement it to the boot with waterproof adhesive.



First, mix powdered chalk and water to a consistency of thick cream and pour it onto a sheet of aluminum. Tap edge of metal to level mixture to uniform depth, slightly greater than the desired depth of the design. Use a blotter at the edges to draw off excess water and let the chalk mixture stand until thoroughly hard



When the chalk is hard, the surface is sanded lightly to remove irregularities and produce a flat surface. This is important. Use fine-grade sandpaper wrapped around a small wooden block. Plaster of paris can be used instead of chalk, although it is somewhat more difficult to tool, and air pockets form in mixture

Matrix casting offers an interesting method of decorating craftwork of sheet metal. By a direct-casting process, you can apply designs in low bas-relief to any flat, metal surface to which stereotype metal or solder will adhere. The design can be a monogram or a simple carving, which is tooled in a chalk-coated aluminum plate and filled with bits of stereotype metal. The metal is heated in the design by placing the matrix on a hot plate. Then the craftwork is placed face down on the matrix. When the casting cools, the work is lifted from the matrix, and the casting will be affixed to it. It is important that the matrix surface be perfectly flat so that the molten metal will contact the work at all points.

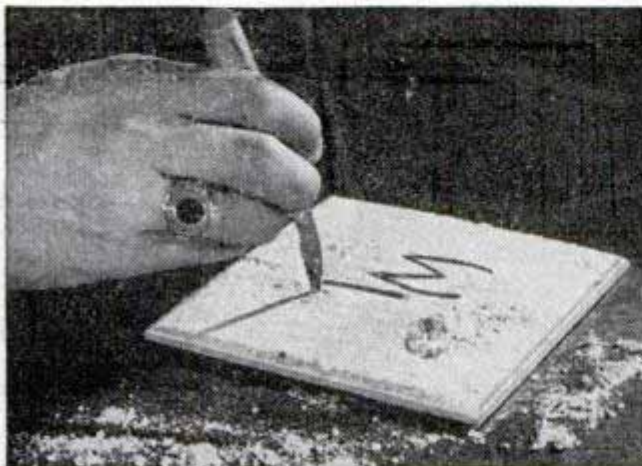
The design is traced or drawn directly on the chalk surface. Remember that an initial must be reversed. Tooling is done by scraping the chalk down to the aluminum plate with the point of a pocket knife. The design should not be undercut. Tool it to give a slight draft so that the casting can be withdrawn



MATRIX CASTING

By Kenneth Murray

Stereotype metal and linotype metal are best for casting. Place matrix on a hot plate and fill design with bits of the metal. Add enough to bring it level with surface when molten. Craftwork to receive design is tinned and placed face down on matrix. Upon cooling, work is lifted from matrix with casting affixed



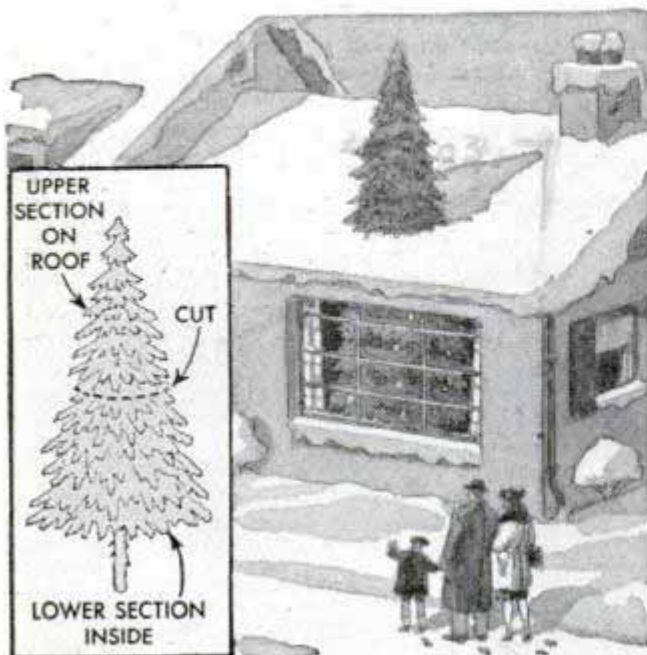
Yarn Dyed With Knitted Garment Assures Match When Mending



When dyeing a knitted garment, dip several yards of yarn in the dye at the same time so that you will have an exact match when it's necessary to mend the garment. When the yarn is dry, wrap it around an empty spool and label it. Thread for sewing on buttons and making buttonholes can be treated in the same manner when dyeing or tinting a garment.

Christmas Tree "Growing" Through Roof Makes Novel Attraction

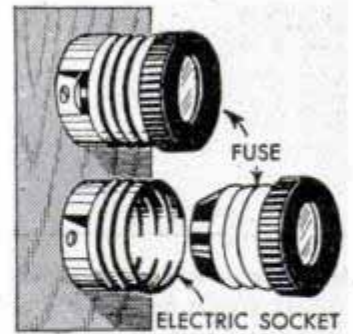
A Christmas tree that has apparently "grown" through the roof of a house will attract attention during the holiday season. The illusion is created by selecting a tall tree and cutting it into two parts, mounting the lower one inside the house so it will extend to the ceiling and the upper



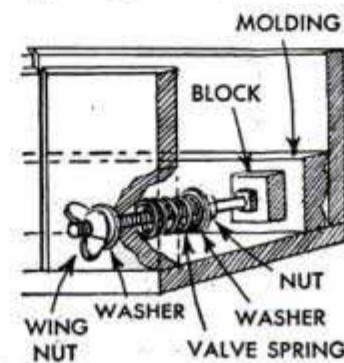
part on top of the roof. The trunk must be kept in line. Place the lower section of the tree in a room where the windows will permit it to be seen from the outside.

Fuses Stored in Light Sockets

Threaded shells removed from discarded electric-light sockets provide ideal receptacles for spare fuses. Fasten several shells to a wooden panel and mount it near the fuse box. Beneath each socket, letter the size of the fuse it contains so proper replacements will be made.—H. D. Hatch, Wollaston, Mass.



Spring Holds Molding in Miter Box

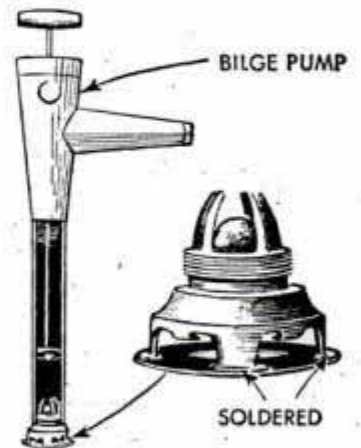


To keep molding from slipping or chattering while cutting it in a miter box, use a spring clamp like this one. The spring, such as one taken from an auto-engine valve, is held in position by washers, nuts

and a bolt. Adjustment of the tension is provided by means of a wing nut, which is located outside the box. A wood block on the end of the bolt serves as a pad to keep the end from marring the molding.

Disk Soldered to Bilge Pump Prevents Marring Boat

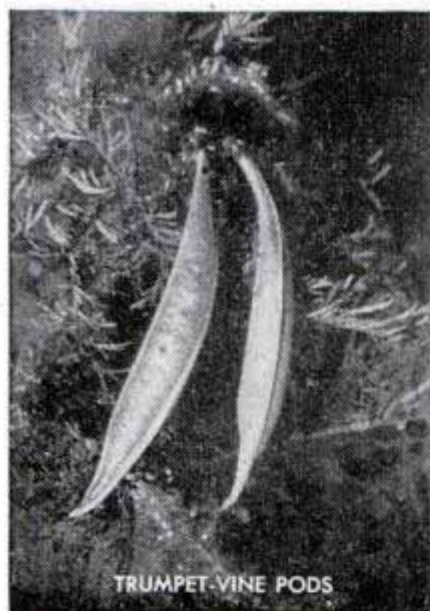
Because most bilge pumps used on small boats have bases with sharply projecting feet, they mar the bottom planking when being used. However, if a metal disk with a large hole in the center is soldered to the feet, it will prevent damage, and will not obstruct the flow of water because of the center hole and the space between the feet. A brass disk is preferred as it will not rust, nor will the action of salt water damage it.



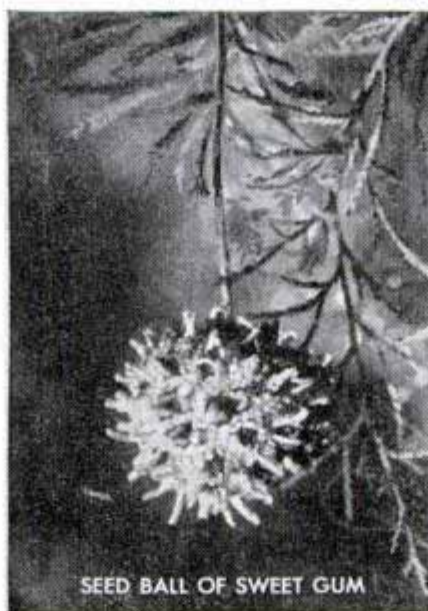
Inexpensive Tree Ornaments Made of Seed Pods

Something novel and distinctly different in tree ornaments are ones made of common seed pods. They're just the thing to supplement ball ornaments, and furthermore, they can be made for practically nothing, except for the cost of a little paint. The three examples shown in the photos below picture what the pods of a trumpet vine, and the spherical seed pods of the sweet gum and sycamore tree look like when gilded with either bronze or silver paint. Gilded, they reflect the light from tree lamps, but they can be painted in bright colors, also. Seed pods of the sweet gum and sycamore, due to their circular shape and rough surface, are decorated easily by spraying. A small insect sprayer will do for this, or the pods can be dipped and hung to dry. Pods of the trumpet vine are painted with a brush. Attach a colored ribbon to each for hanging.

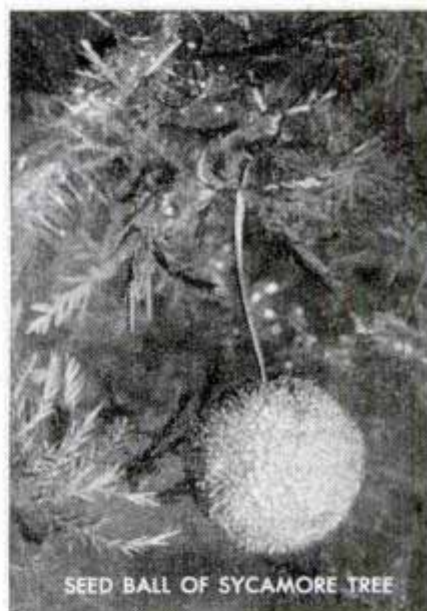
Paul Hadley, Philadelphia, Pa.



TRUMPET-VINE PODS



SEED BALL OF SWEET GUM

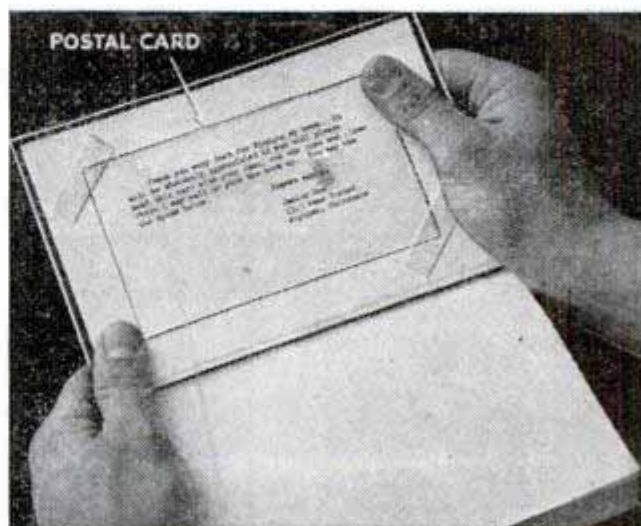


SEED BALL OF SYCAMORE TREE

Postal Card Pasted Inside Cover Assures Return of Book If Lost

Children's school books—if lost—are more apt to be returned if the method devised by one parent is followed. A penny postal card bearing the owner's name and address is taped to the inside front cover. On the card there is a brief note of thanks and a request that the finder mail the card to the owner stating a time and place where the book can be picked up. Of course, the name and address of the finder is requested also.—Jack Wilson, Los Angeles, Calif.

¶If the bottoms of wooden buckets and barrels are covered with several inches of water when not in use, it will keep the wood from drying out and causing cracks.

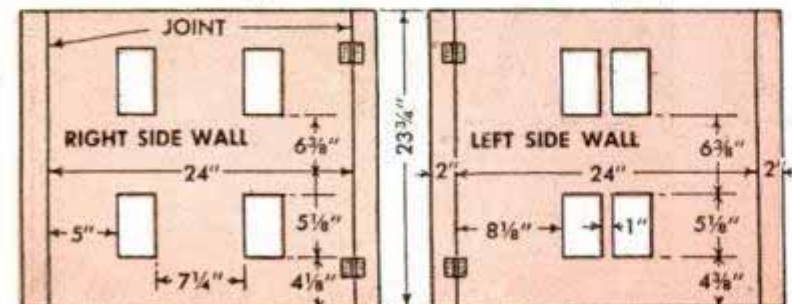
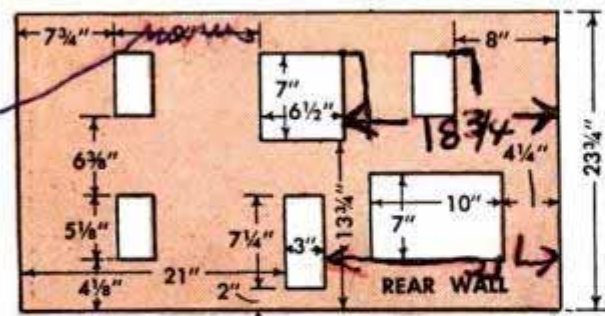
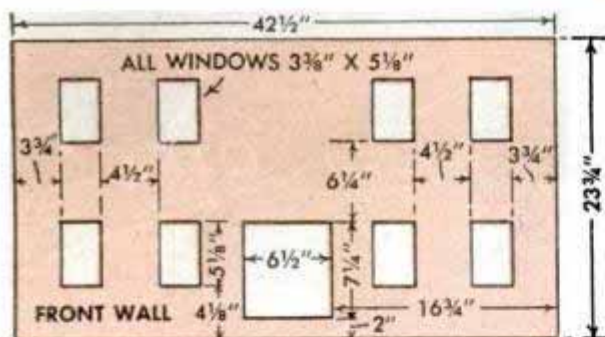




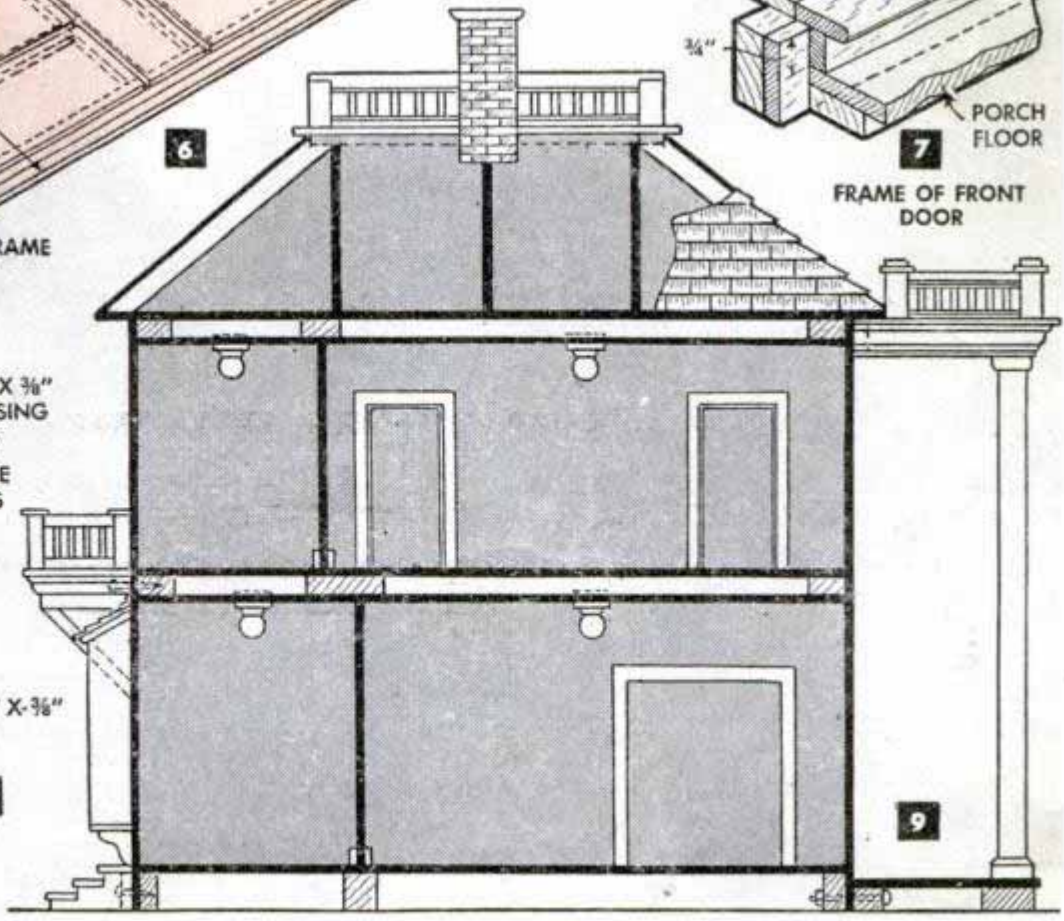
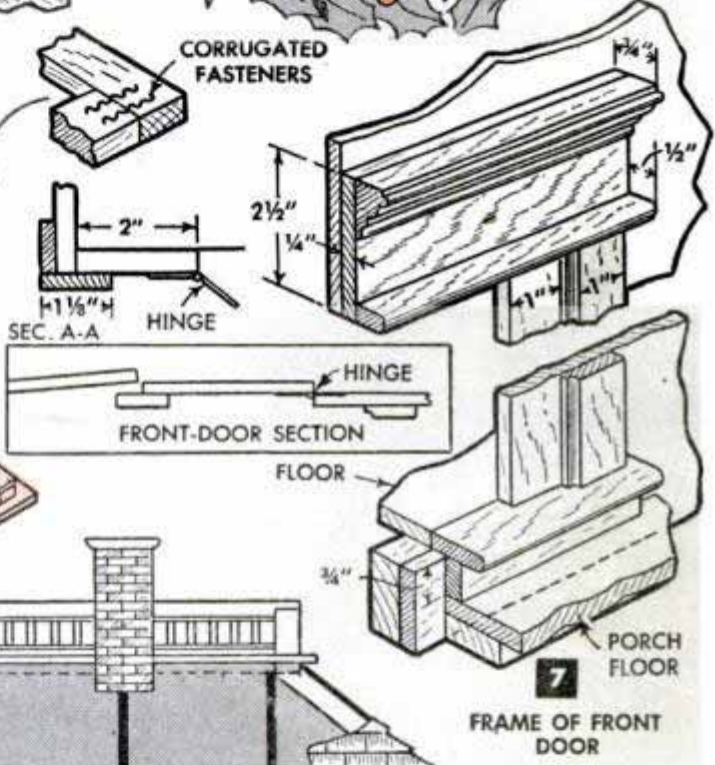
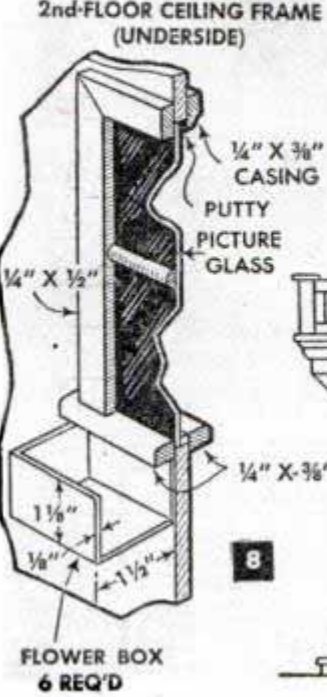
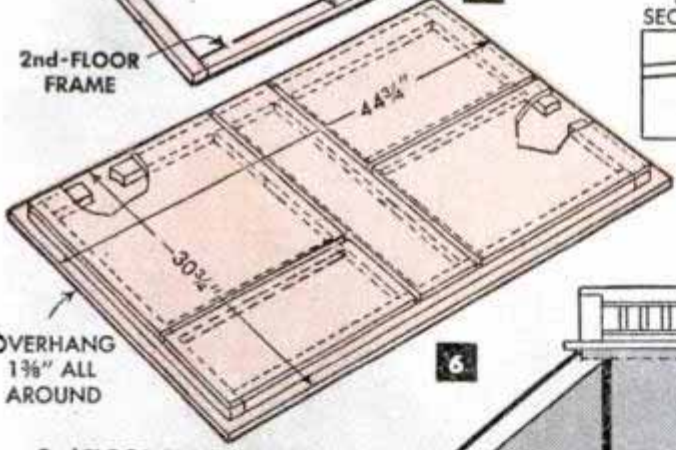
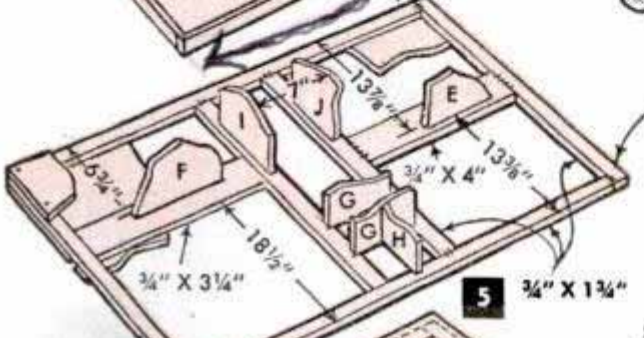
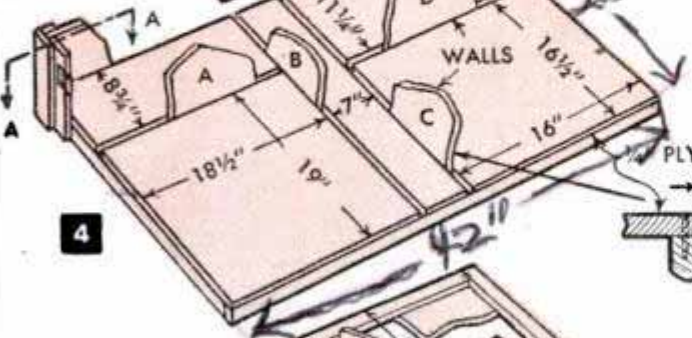
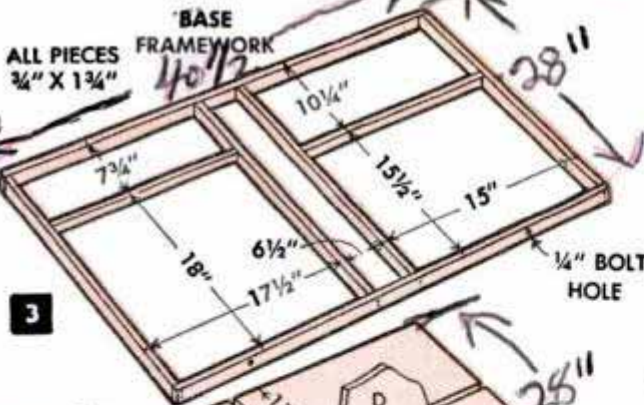
By Adam Trieschmann

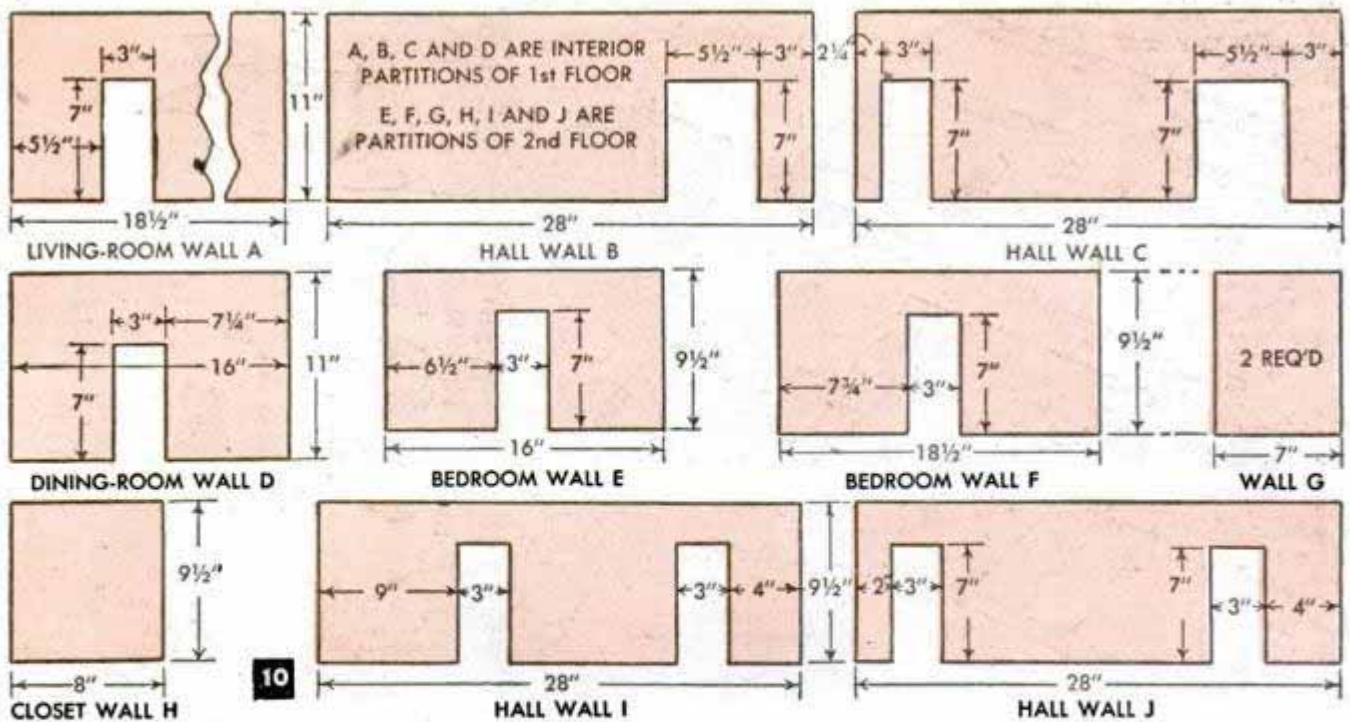
MAKE THIS a Christmas some little girl will always remember by giving her this beautiful eight-room dollhouse. It's a replica of a colonial mansion complete with electric lights, fireplace and an open stairway. Both ends swing open for access to rooms upstairs and down as shown in Fig. 1. Made of plywood, the house measures $31\frac{1}{2}$ by $44\frac{3}{4}$ in., exclusive of porches and balcony. The rear stoop and front porch are detachable to permit the house to be carried through a 32-in. opening. If it is to be carried through a doorway of smaller width, the dollhouse must be reduced.

The first step is to make the base framework, Fig. 3. Pieces of solid stock, $\frac{3}{4}$ by $1\frac{3}{4}$ in., are used and are assembled with the pieces set on edge. Then the frame is floored with five pieces of $\frac{1}{4}$ -in. plywood, spaced as shown in Fig. 4 to form $\frac{1}{4}$ -in. grooves into which the interior walls are fitted. The second-floor frame, Fig. 5, is built-up similarly, except that the frame members are placed flatwise, and wider cross members are installed for walls E and F. Both sides of this frame are covered after first installing electrical wires for the

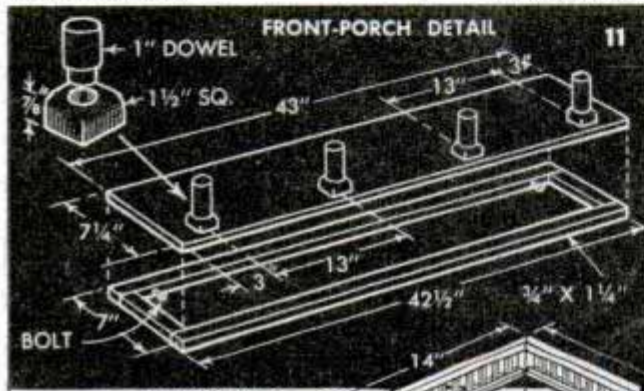


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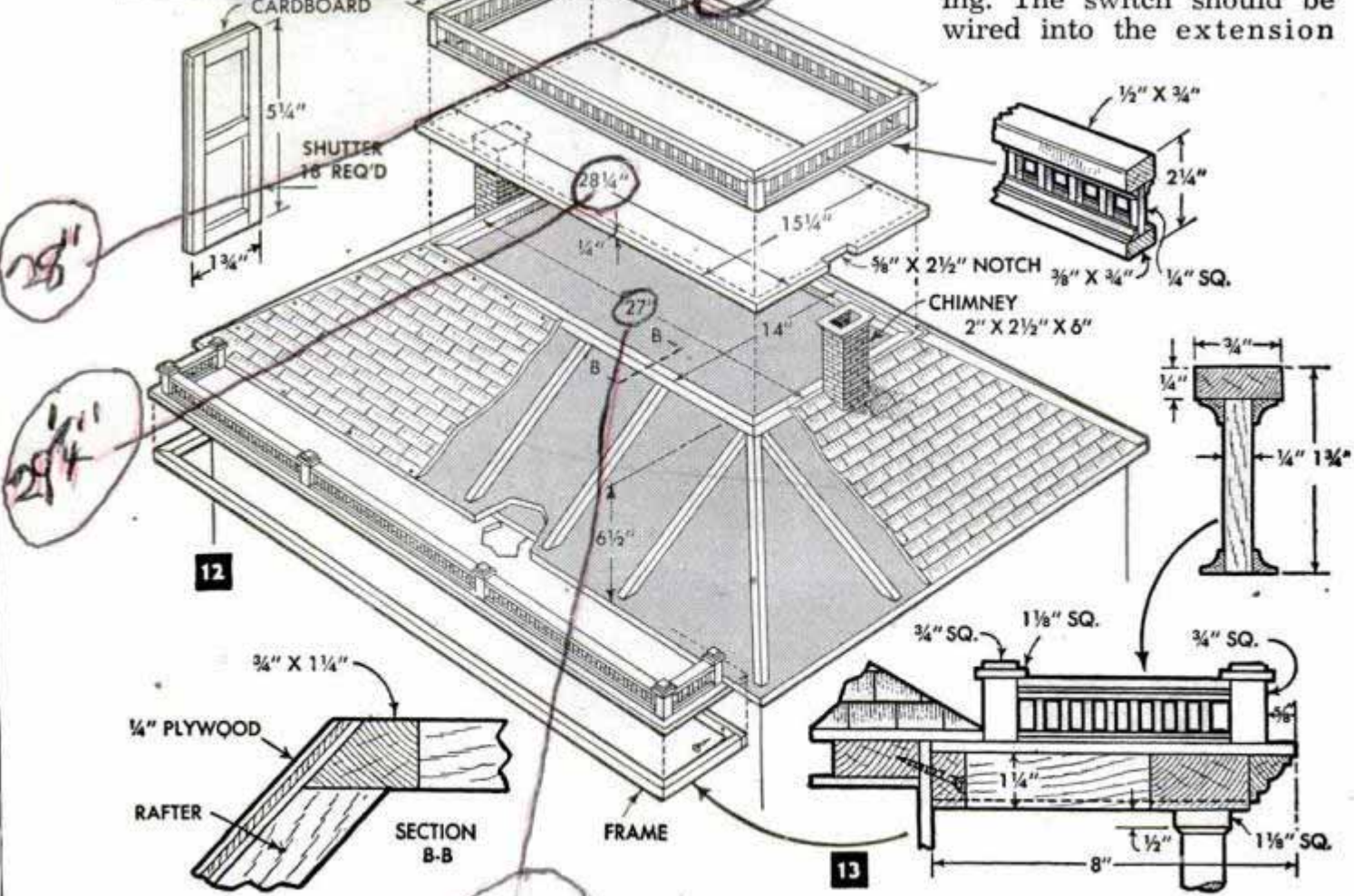




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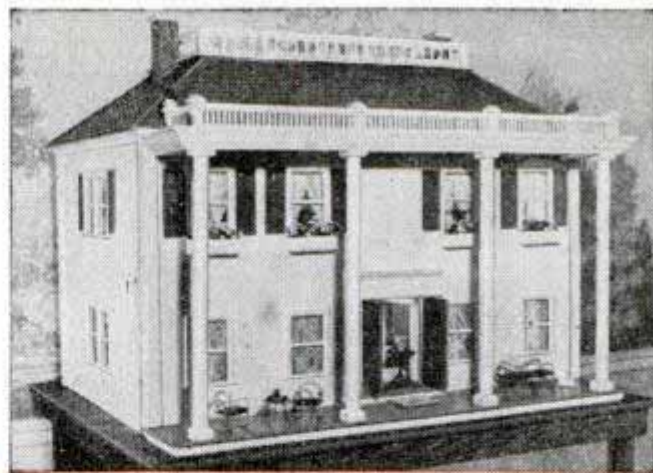
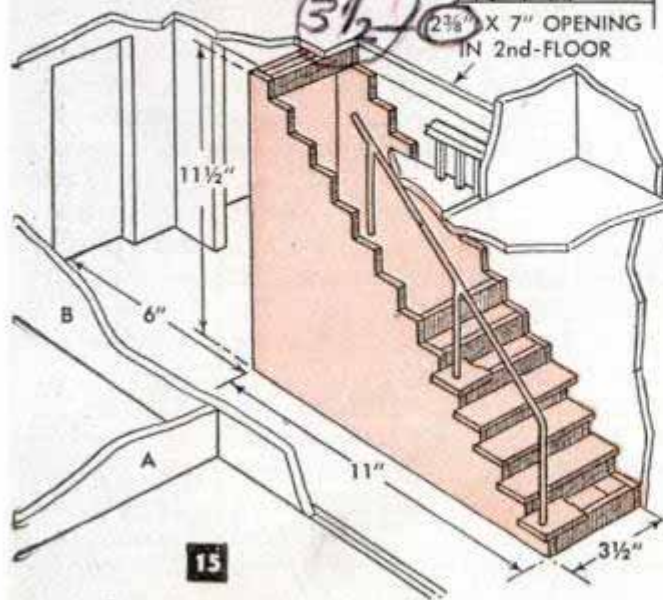
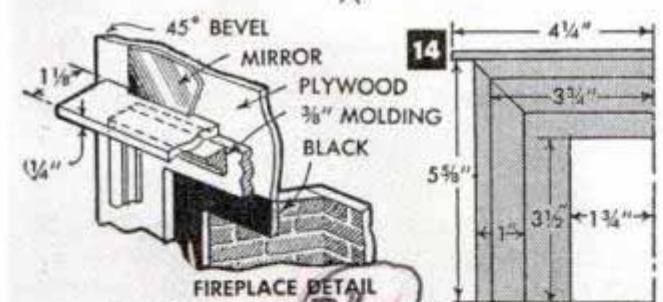
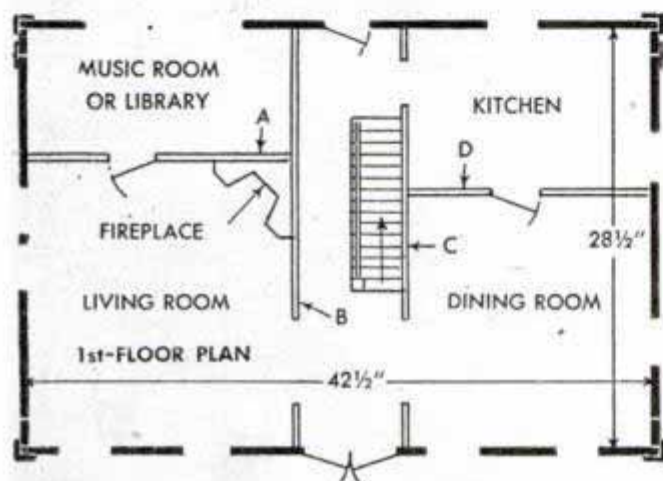


lights. Heavily insulated lamp cord will do for connecting the sockets, and all wiring is brought to a central terminal in the attic. A toy-train or bell-ringing transformer, which can be mounted in the attic or placed remotely from the house, is used to light 6-volt bulbs. Use a well insulated, rubber-covered extension cord from the 110-volt line to the transformer. A toggle switch to control the transformer is mounted in a corner of the bathroom ceiling. The switch should be wired into the extension



cord ahead of the transformer. Be sure that all connections are soldered and taped. Realistic light fixtures can be made by cutting off the base of 7½-watt frosted bulbs and using the top parts as globes. Or, an indirect lighting effect can be had by covering the hole for the bulb with a piece of frosted glass and mounting the bulb behind it. The ceiling frame for the second floor, Fig. 6, is shown ceiling side up. Note that the partition grooves must be spaced to match those in the top side of the second-floor frame. The top of the ceiling frame is covered with ¼-in. plywood, letting it project 1⅜ in. all around. Remember to include wiring here for second-floor lights.

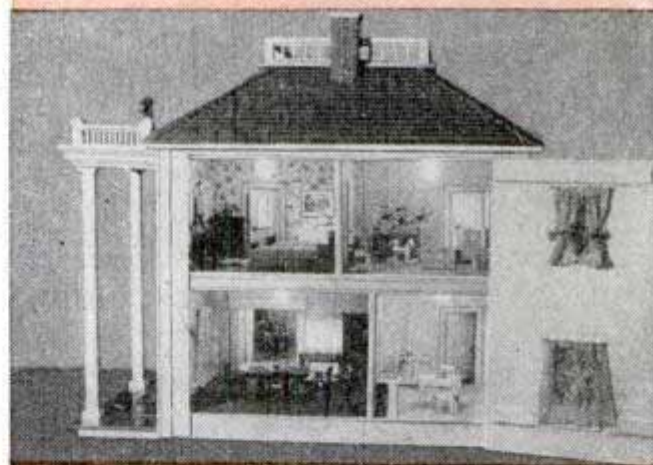
Cut the partitions, Fig. 10, next. Note that these are keyed with the floor plans to show where each one goes. The waste pieces from the door openings are saved and used as doors. These can be hinged to



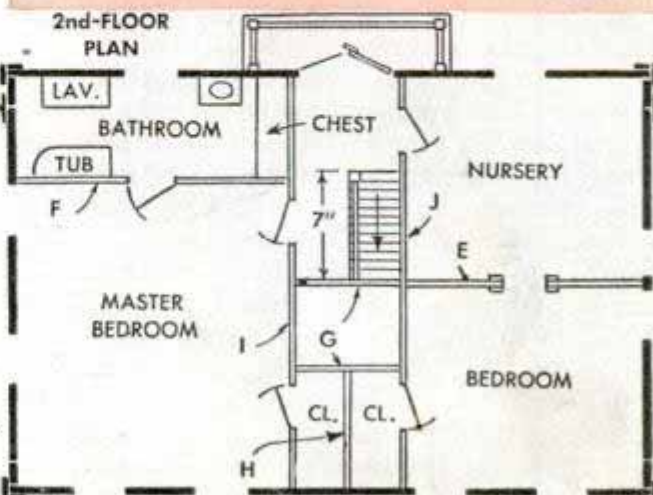
It's patterned after a modified Georgian mansion

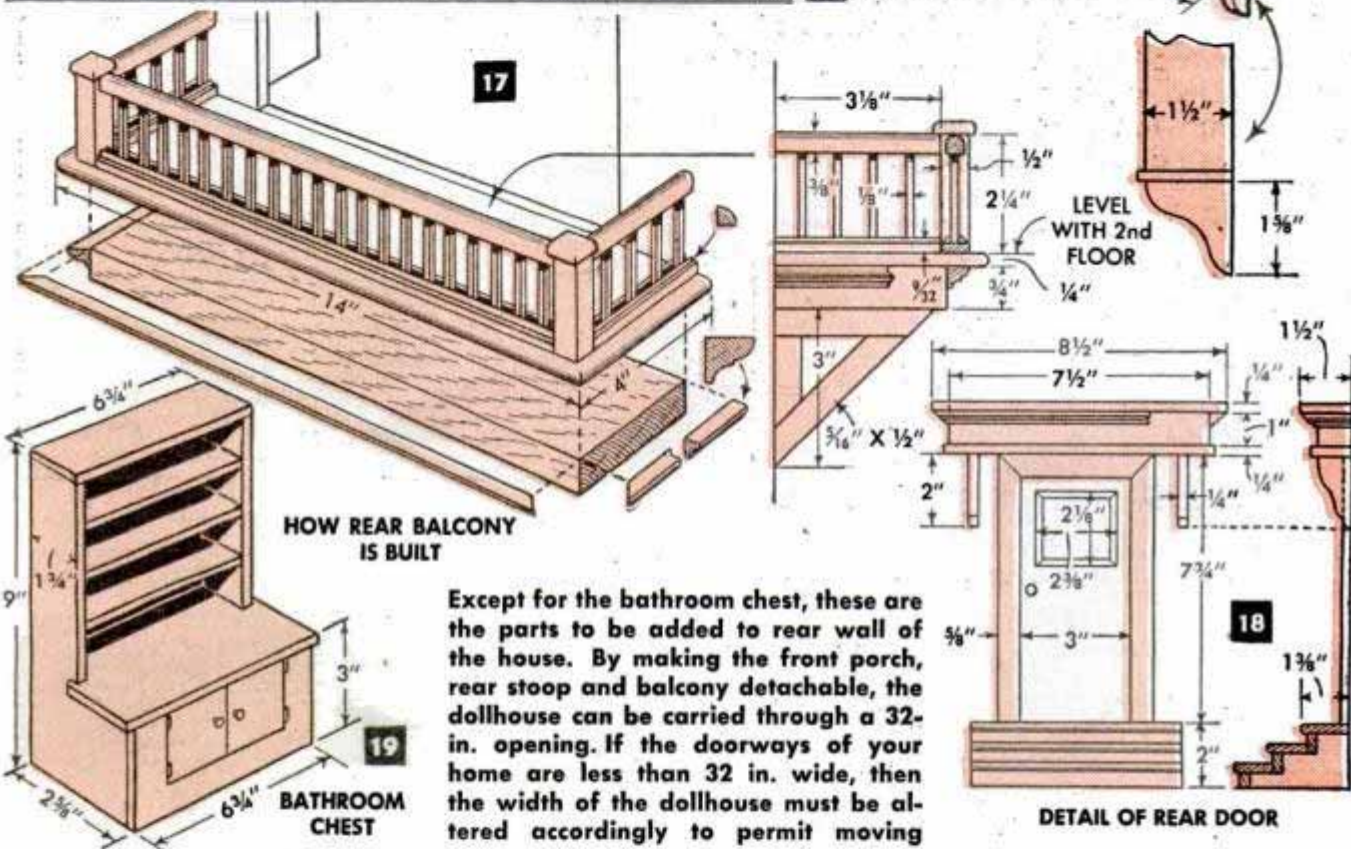
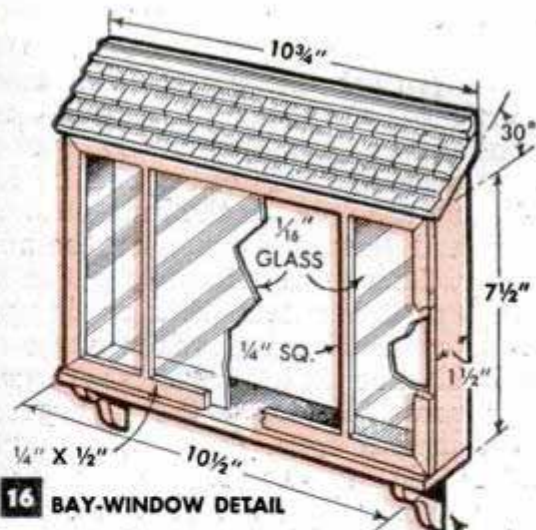


Each side gives access to rooms upstairs and down



Side walls are hinged to opposite corners of house





Except for the bathroom chest, these are the parts to be added to rear wall of the house. By making the front porch, rear stoop and balcony detachable, the dollhouse can be carried through a 32-in. opening. If the doorways of your home are less than 32 in. wide, then the width of the dollhouse must be altered accordingly to permit moving

actually swing, or they can be left ajar in a fixed position. Interior casing and baseboard are $\frac{1}{2}$ -in. strips of cigar-box wood. Let the casing on one side of each opening extend $\frac{1}{8}$ in. to form stops for the door, and insert a fill-in piece in the exposed groove. It will be somewhat more convenient to decorate the interior if the partitions are painted or papered before they are glued in place. The open stairway, Fig. 15, must be installed as you go. This fits against wall C and requires cutting away a portion of a cross member in the second-floor framing to make it fit flush. The fireplace, Fig. 14, should be installed at this time, too. A piece of plywood, 10 in. square and having the edges beveled 45 deg., is fitted in a corner of the living room as indicated in the first-floor plan. An opening is cut in it first for a fire pit and then the lower half is faced with a mantel, the upper half with a mirror.

Exterior walls are dimensioned in Fig.

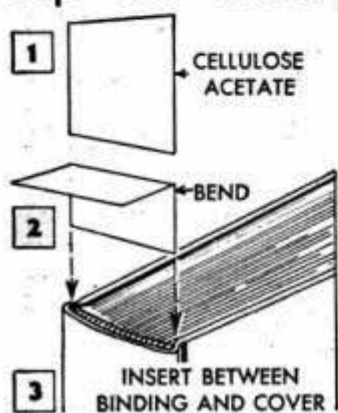
2. These also are of $\frac{1}{4}$ -in. plywood. The front and rear walls are fastened to the edge of the frames with flat-headed screws, letting them extend $\frac{1}{4}$ in. at each end and butting the top edge of the plywood against the roof overhang. A 2-in. strip is added to each corner, to which the side walls are hinged, and then each corner is finished with corner boards. See the sectional view to the right of Fig. 5. Small turn buttons can be used to keep the sidewalls closed. All windows are trimmed, inside and out, according to Fig. 8, and the front door is framed as in Fig. 7. Shutters are added to second-floor windows.

The hip roof is framed next. A 14 by 27-in. beveled frame is supported 6½ in. above the plywood attic floor by $\frac{3}{4}$ -in. rafters and is roofed with plywood as in Fig. 12. Shingles can be of cardboard or wood, laid individually or in strips. Finally, the center of the roof is covered with a removable

panel as shown, the railing fitted and the two chimneys added. Red paper ruled in a brick pattern with white ink can be pasted to the four sides of the chimney. Shingles likewise can be cut from colored cardboard, or painted later to suit. By first coating the shingled roof with a thin application of glue and then sprinkling fine sand on it when the glue is tacky, you can simulate real shingles. Where the shingles meet at the hip line, cover the joint with a strip of cardboard folded in the center as shown.

Figs. 11 and 13 detail the porch and Fig. 9 shows how the porch floor is bolted to the house. This leaves the balcony, bay window and stoop to be added to the rear side of the house. These are detailed in Figs. 16, 17 and 18. The bathroom chest, Fig. 19, is located according to the second-floor plan.

Top "Tab" Saves Book Binding



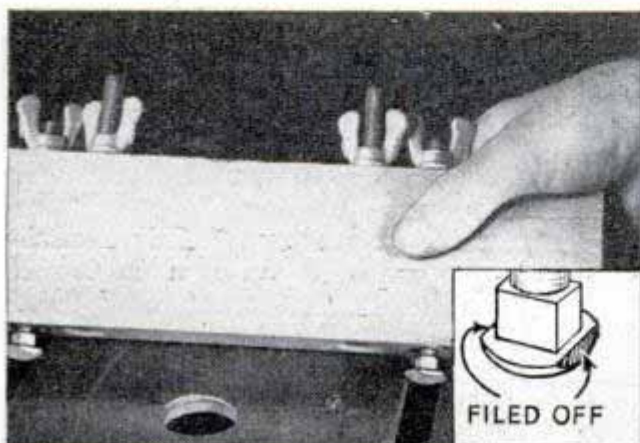
It's a simple matter to protect the top edge of book bindings—which are always being torn when handled—if this "tab" is inserted in the backbone. Fig. 1 shows how a piece of cellulose acetate is cut; Fig. 2 shows the bend

and Fig. 3, the method of insertion. This will keep the binding from being torn and it will help to keep the book clean also.

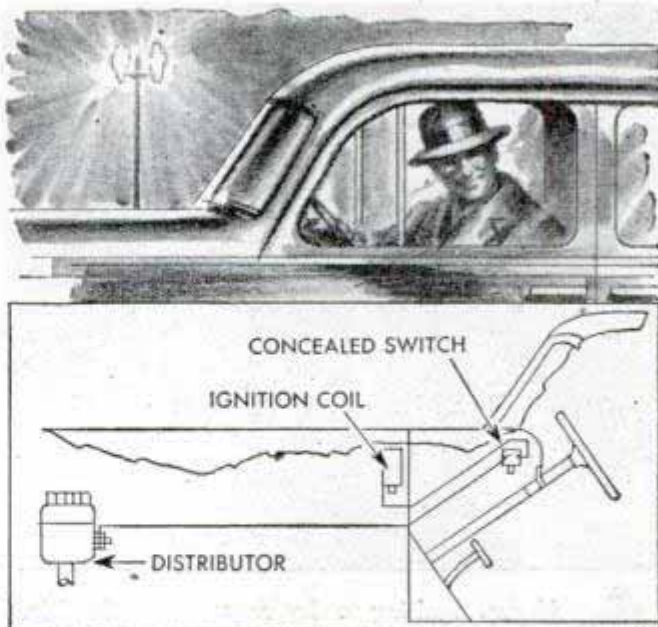
George Kapitan, Los Angeles, Calif.

Drill-Press Fence Removed Quickly

Less time will be spent attaching or removing the fence on a drill-press table if the sides of the carriage-bolt heads are filed off as indicated in the lower right-hand detail. When the straight sides are turned to parallel the slots in the table, the fence can be removed without screwing off the wing nuts.



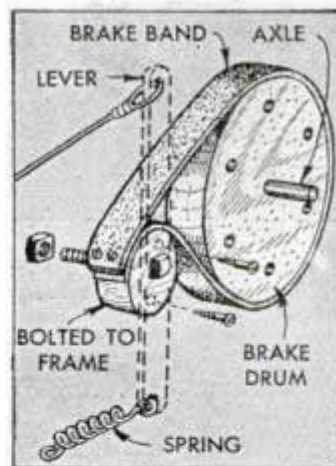
Concealed Switch Foils Car Thief



A single-pole toggle switch concealed under the dash and connected into the primary-current wire leading from the coil to the distributor will fool a car thief. The wiring is shown in the diagram. When you leave the car, simply snap the switch to the "off" position. Even though the ignition switch is turned on the engine will not start until the secret switch is closed.

Self-Adjusting Scooter Brakes

This simple brake will solve the problem of adequate braking on homemade motor scooters and midget cars. The brake drum may be made from either metal or hardwood. Usually, the drum is bolted directly to the wheel, but in some cases it may



be necessary to bolt it to a flange keyed to the axle of the scooter or car. Turn another disk from hardwood the same thickness as the drum and mount this on the car frame so that it lines up with the drum. Attach a control lever, return spring and brake band as shown. Connect the lever to a pedal with flexible cable. Light pressure on the pedal exerts a powerful braking action on the drum.—Wm. P. Houser, Organ, N. M.

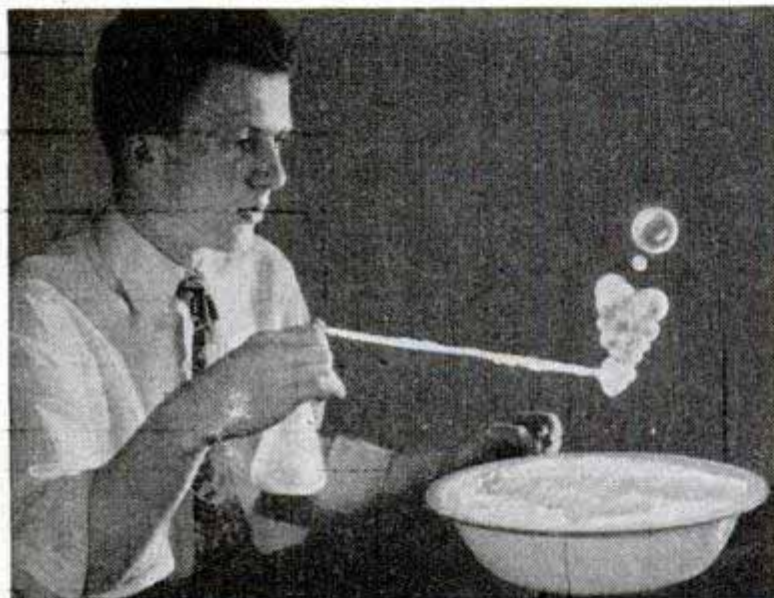
☞ When a felt hat becomes spotted by rain, rub the surface with steel wool until the nap is raised, and you will find that the spots have disappeared.

FUN WITH COMMON GASES

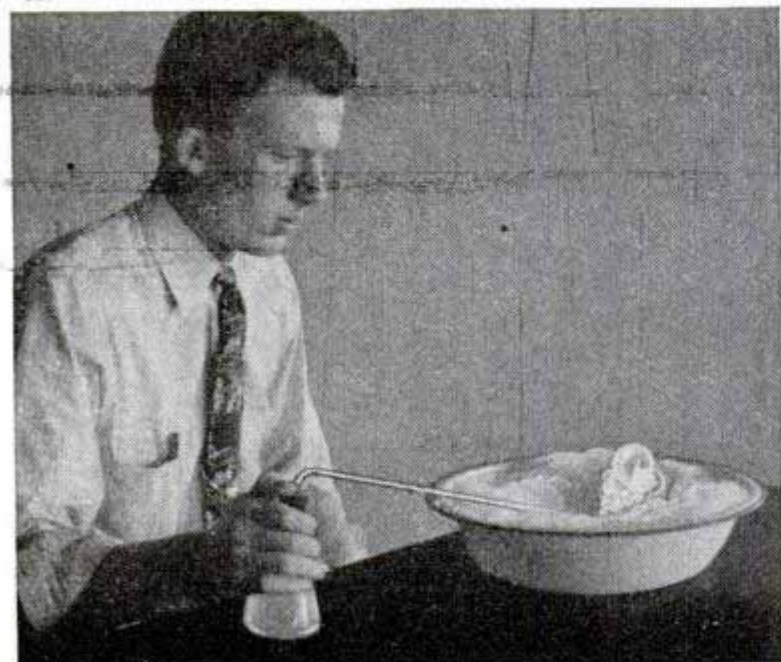
By William A. Hensley



↑ Above, igniting a hydrogen soap bubble. Because hydrogen is lighter than air, the bubbles will rise



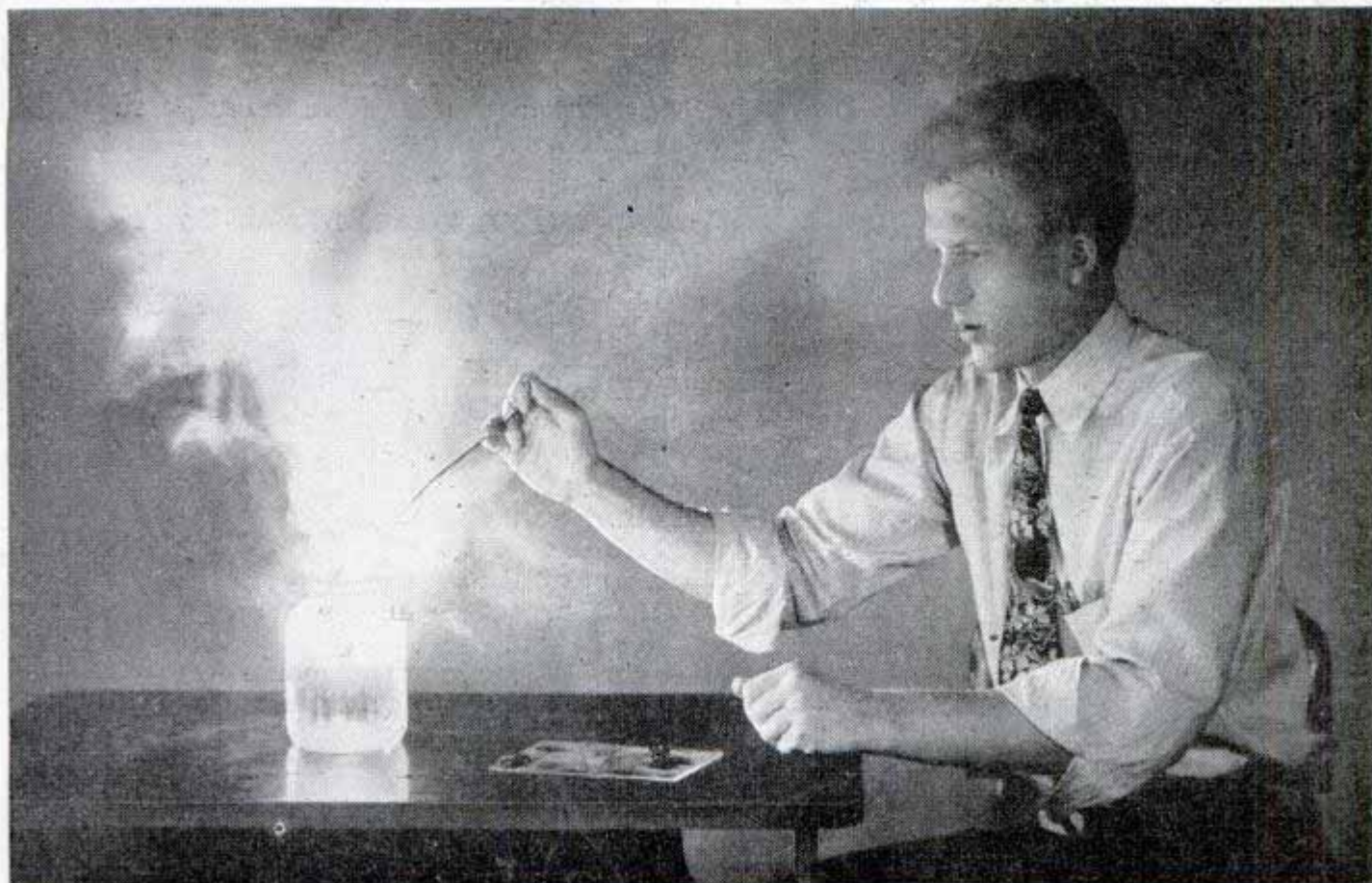
↑ Above, blowing hydrogen bubbles. Below, outlet tube has been immersed in soap solution to make bubbles



BOTH hydrogen and oxygen are part of the air you breathe and, for that reason, generally are referred to as "common" gases. As a part of the mixture called "air," they exist in abundance and show no unusual properties, but when isolated, these common gases can be used to obtain novel effects.

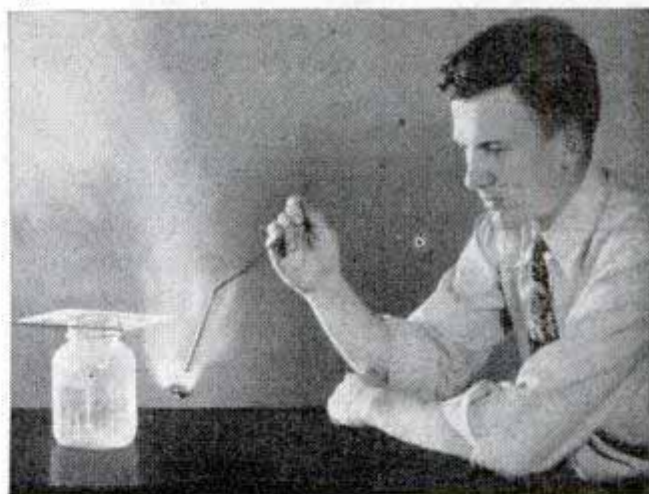
Flaming soap bubbles: The pictures in the left-hand column show how hydrogen soap bubbles are blown (arrows indicate the progressive steps), the top picture showing one of the bubbles being ignited. To generate hydrogen, place a small amount of zinc in an Erlenmeyer flask or similar container and pour in enough muriatic acid to cover the metal. Insert a one-hole rubber stopper with a glass outlet tube into the flask. This tube should have a short-radius bend in each end as shown. Allow time for air to escape from the container so that only hydrogen is discharging. Then place the open end of the tube in a soapy solution of glycerine, water and granulated soap. The bubbles formed by the hydrogen, being lighter than air, will float upward and, when ignited, produce a sudden flash. When generating hydrogen, always remember that it is a combustible gas and should not be handled in large volume. Also, do not attempt to confine it under pressure.

Phosphorus "sun:" This experiment requires oxygen and red phosphorus. The right-hand page illustrations show the steps to follow in obtaining the sun effect. To make oxygen, prepare a mixture of sodium perborate, 2 table-

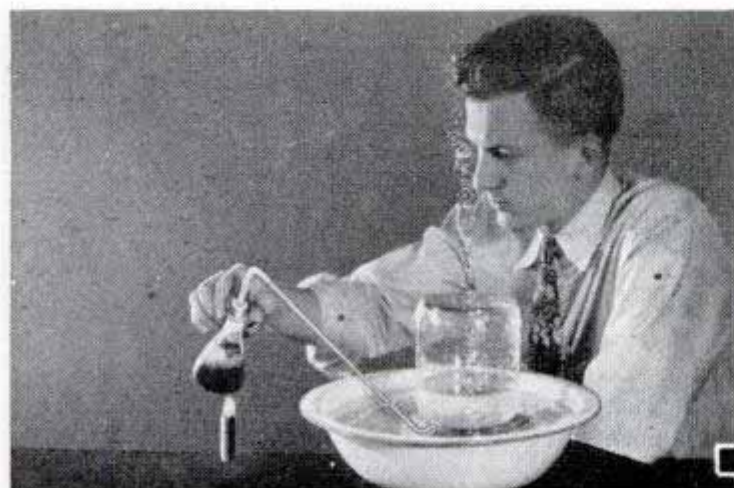


spoonfuls, and manganese dioxide, $\frac{1}{8}$ teaspoonful. Mix these ingredients thoroughly and pour into an Erlenmeyer flask. Add enough vinegar to soak the mixture and heat the contents of the flask over a flame. Then use a stopper and outlet tube to discharge the oxygen into an inverted 2-quart jar that is filled with water. The jar is placed in a wash basin that is partially filled with water. When the oxygen has displaced the water in the jar, slide a glass cover over the mouth and stand it right side up on a table. Then place a small piece of red phosphorus in a spoon, which has a long wire handle. When ignited and burning in air, the phosphorus has a pale yellow flame, but when introduced into the jar of oxygen, it burns vigorously to produce a brilliant "sun." Be careful not to get too close to the burning phosphorus.

Above, "sun" produced by burning phosphorus in oxygen, and below, burning it in air



Lower left, generating oxygen and collecting it over water. Below, igniting phosphorus



Xylophone Produces Novel Effects When Played With Double Hammer



By altering the frame of a toy xylophone and using a double hammer, professional musical effects can be obtained after a little practice. The circular detail shows construction of the hammer. Two strips of lightweight spring steel are bolted to the handle and wooden balls are attached to the free ends. Bend the steel strips so that, when the hammer is used, one ball strikes the top of the key and the other strikes the bottom. It will only be necessary to alter the frame so that the hammer will slip over the keyboard.

Gaily Decorated Window Shades Add Holiday Touch

Pasted or taped to the outside of window shades, Christmas designs such as are printed on tissue wrapping paper will add a novel holiday touch to the appearance of a house. Since blinds usually are raised during the day, only the lower half will



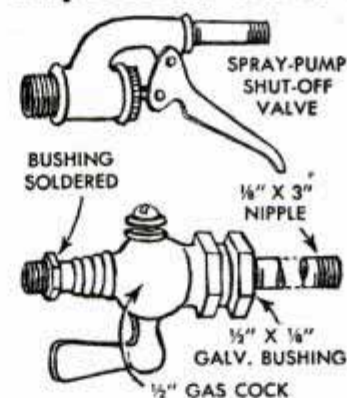
show, and this must be taken into consideration when pasting the decoration in place. However, if the outside of the house has any illumination at night, the full area of the shade can be used.

Waterproofing Paper Match Book

Here's an easy way to waterproof paper safety-match books. Apply nail polish to the heads, waxed portions of the sticks and the striking surface on the cover. When you want to strike a match, scrape the polish off part of the striking surface, uncovering only a small portion at a time, and use in the regular manner.



Improved Valve for Insect Sprayer

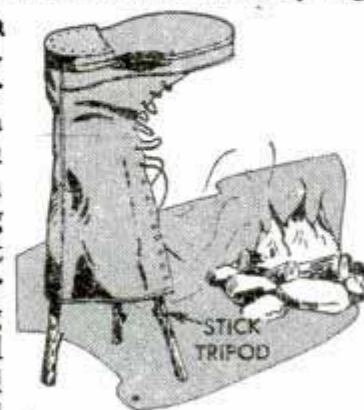


If the shut-off valve, upper detail, on a knapsack-type sprayer doesn't work, a substitute can be made by using a 1/2-in. gas cock and several galvanized pipe fittings. Solder a bushing to the gas-cock outlet that will fit the spray nozzle and screw a reducing bushing and nipple into the inlet for the hose; then clamp the latter in place. A gas cock, being a plug-type valve, will not clog easily.

Miss Helen M. Douglas, Commerce, Tex.

Tripod Supports Boots While Drying

When high-top boots or shoes become soaked after a hike through rain or snow, you can dry them at a campfire by using stick tripods. Cut three sticks for each boot, forming a tripod that will keep the inverted footwear several inches off the ground. Do not place the boots so near the fire that the leather gets hot as this will shrink the "grain" and cause cracking.



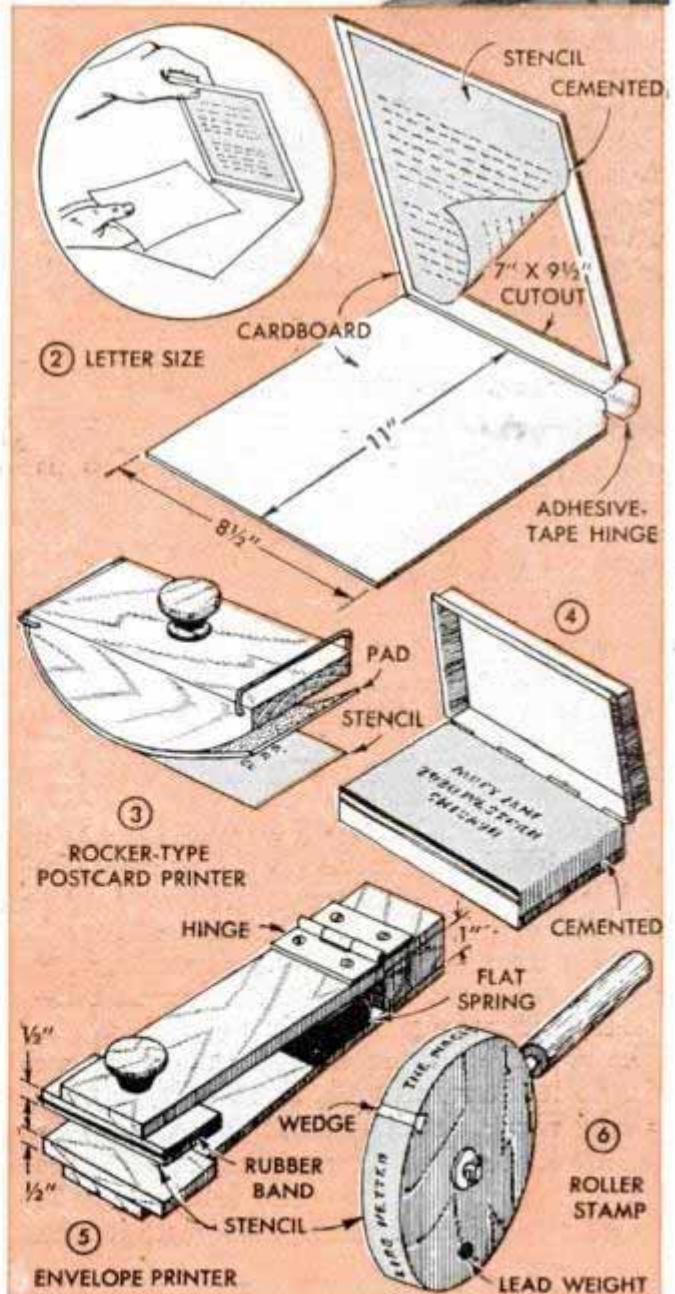


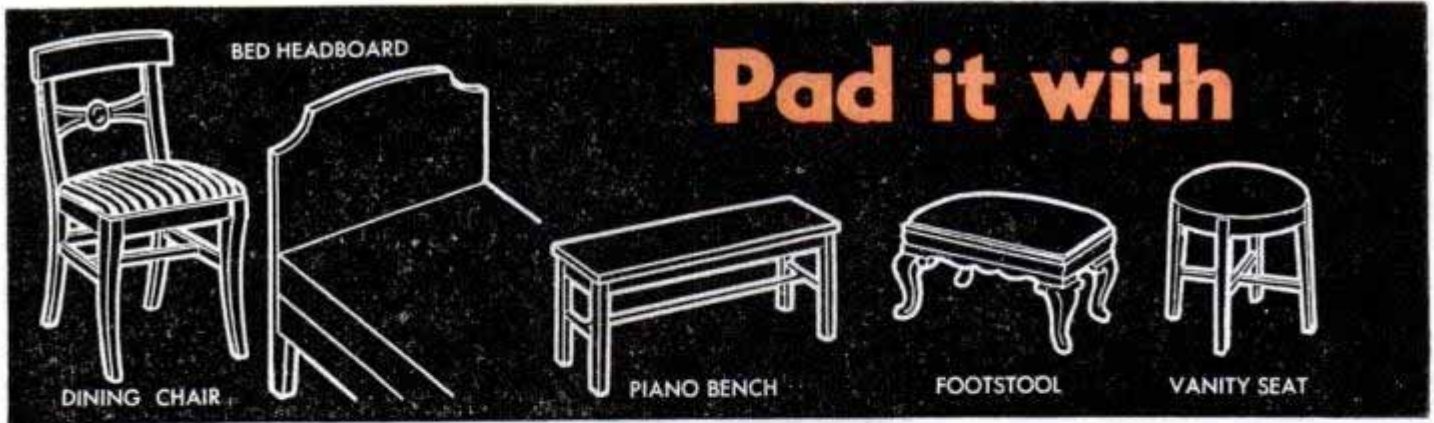
Lack of a stencil duplicator need not prevent you from taking advantage of this simple method of printing. The duplicators shown cover a range from letter size down to one of vest-pocket size.

For the letter-size job in Fig. 2, hinge together with adhesive tape, two 8½ by 11-in. sheets of stiff cardboard or fiber, first cutting a 7 by 9½-in. piece from the center to form a frame. After cutting the stencil, cement it to the underside of the frame, with the face of the stencil up. Inking is done with a roller of the type used for applying wall paints, Fig. 1. Cover the roller with a single thickness of flannel, nap side out, and ink by passing it over a piece of glass on which mimeograph ink has been spread.

Fig. 3 shows a postcard printer which is made from a rocker-type desk blotter. The blotter paper is replaced with two thicknesses of flannel, which are inked with a small brush. A stamp pad, Fig. 4, makes a good printer for address cards. The pad is charged with mimeograph ink and the stencil is held in place with shellac. Turn it upside down and use it as you would a rubber stamp. The printer in Fig. 5 works much like a desk stapler. Two thicknesses of flannel and the stencil are held on the platen or upper jaw with a rubber band.

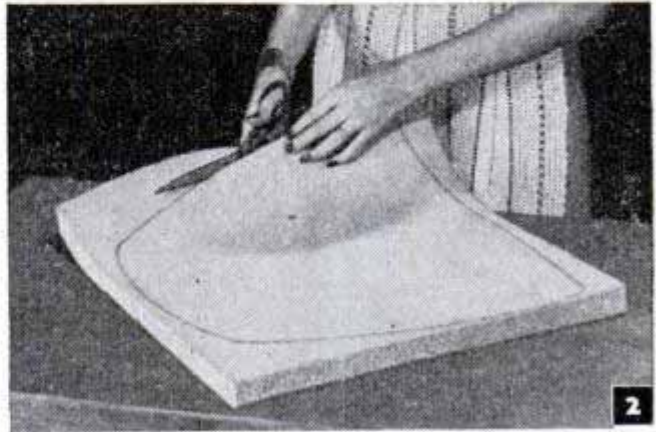
A handy roller-type duplicator, that will imprint advertising, addresses and similar matter on cartons or other large surfaces, is detailed in Fig. 6. After turning a wooden disk to the required size, cut a dovetail slot in the edge and drill a ⅜-in. hole in the face for a lead weight, which returns the disk to the starting position each time it is lifted. The disk, or roller, is held on the shaft with a washer on each side and a single cotter pin as shown. The stencil and the flannel ink pad are held in place with a dovetail wedge which fits into a groove in the edge of the roller.



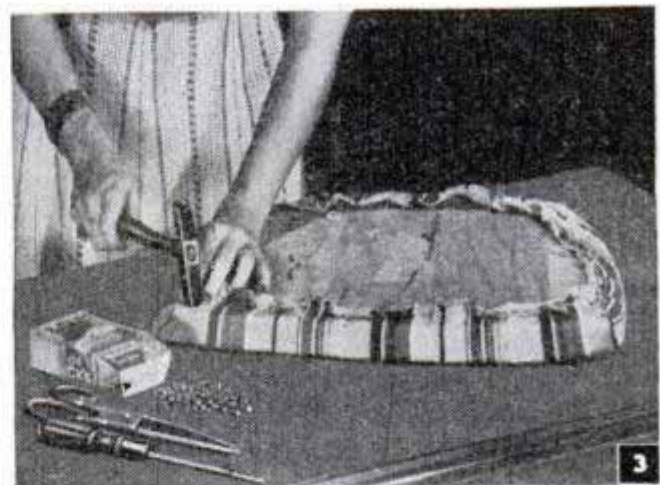


Photos courtesy United States Rubber Co.

First, the old chair seat is removed. Usually a screw on the underside holds each corner. Then seat board is stripped of old padding and all tacks are removed



Using the seat board as a pattern, place it on the rubber and mark around it. Then cut with scissors as above. With foam rubber in place, outer fabric is pulled firmly and tacked to seat board as below

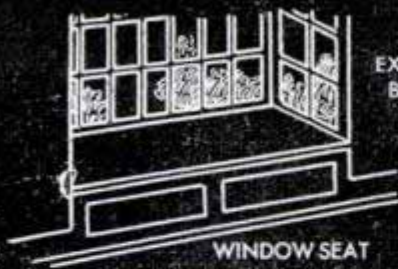


THANKS TO FOAM RUBBER, home upholstery takes on the ultimate in simplicity. This new cushioning material eliminates the use of cotton or other loose-type padding over springs or seat boards—you simply cut the rubber to fit the particular job and cover it with the finish fabric. That's all there is to it. Furthermore, foam-rubber padding retains its shape. It cannot mat or shift like regular loose padding and its resiliency keeps the outer fabric smooth and free from wrinkles, and produces an

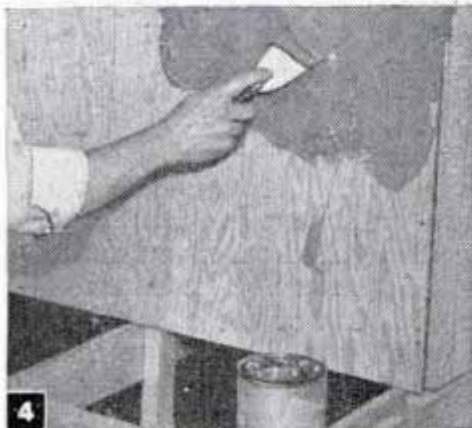
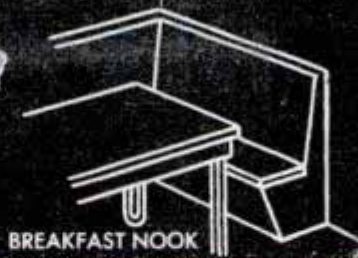
exceptionally soft, comfortable cushion. Foam rubber, of pure latex, is marketed in sheet form and is available in the following sizes: 36 by 62 in., 17 by 21 in., and 16 by 16 in., the latter size being suitable for padding the seat of a dining chair. It can be had in $\frac{1}{2}$, $\frac{3}{4}$ and 1-in. thicknesses and three densities, soft, medium and firm. The 36 by 62-in. sheet also is sold in $\frac{1}{4}$ -in. thickness.

Generally used for padding chair seats, foam rubber can be used wherever a cushioned surface is desired. You can use it to pad the headboard of a bed or the bench of

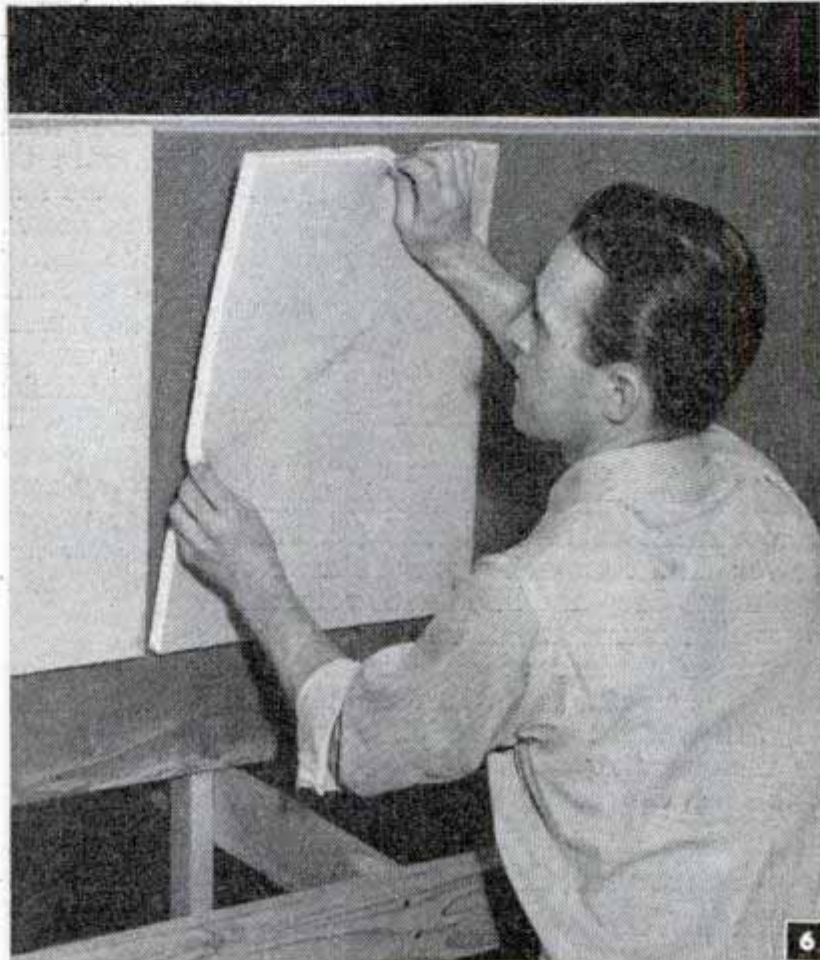
FOAM RUBBER



EXERCISE BOARD



Above, foam rubber is held in place on vertical surfaces with linoleum cement. Abutting edges of sheets are held with 1-in. adhesive tape as shown below. This permits small pieces to be used



Here foam rubber is being applied to the back board of a breakfast-nook seat. The cement-coated surface is allowed to become tacky, then the individual sheets of rubber are pressed in place, butting the edges. This makes it convenient to apply the covering

a breakfast nook, and to cushion the top of a footstool or vanity bench. It can be used as filling in a removable pad for a piano bench, window seat or lawn furniture. These are just a few of the many practical purposes to which foam rubber can be adapted.

The simplicity of padding a dining chair is pictured in Figs. 1, 2 and 3. First, remove the old seat and strip it of the padding. Then, using the original seat board as a pattern, lay it on the rubber, trace around it and cut to shape with a pair of

By **Wayne C. Lecky**

scissors. Finally, apply the new covering by pulling it over the foam-rubber padding and tacking to the bottom of the seat board. In applying foam rubber to a vertical surface, such as the bench of a breakfast nook, coat the surface with linoleum cement to hold the sheets in position, Fig. 4. Then, when the cement is tacky, press the rubber onto it as in Fig. 6. The joints of all the pieces are held together with adhesive tape as shown in Fig. 5. Taping also permits small pieces to be utilized.

False Bottom for Dresser Drawer Conceals Valuable Articles



Jewelry and other small articles of value will be well concealed if kept in a hidden compartment in the bottom of a dresser drawer. The compartment should be several inches deep and lined with velvet. The lid, which forms the false bottom of the drawer, is a piece of plywood cut to fit closely. A small strap will serve as a handle with which to lift the lid. To complete the illusion that the lid is the real bottom of the drawer, cover it with paper lining.

Ball-Ornament Centerpiece for Yuletide Table

Here's a way of making a novel table centerpiece that is sure to intrigue holiday guests. Representing a miniature Christmas tree, it consists of ball tree ornaments stacked on top of each other, and poses the question of what holds the balls together. The answer is a hidden knitting needle on which the balls are held by their supporting rings. Insert the needle through a wooden base and begin building-up the tree by using large balls at the base

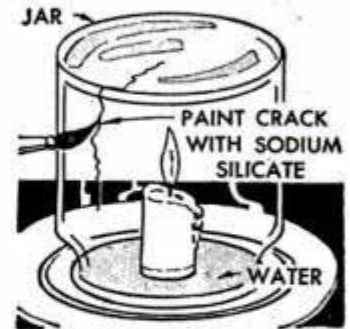


and smaller ones of graduating size from there to the top. For the finial, the metal cap and ring are removed from a ball so that it can be placed over the tip of the needle.

and smaller ones of graduating size from there to the top. For the finial, the metal cap and ring are removed from a ball so that it can be placed over the tip of the needle.

Repairing Cracked Glass Jar

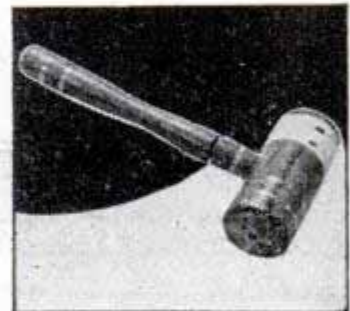
All that's needed to repair a cracked glass jar or other glass container are a saucer, candle, water-color paintbrush and a small quantity of sodium silicate (water glass). Fasten the candle



to the saucer by setting it in melted wax, and pour a little water into the dish. Invert the glass over the lighted candle and allow it to burn until it goes out. Then, immediately paint the outside of the crack in the jar with sodium silicate. The vacuum created inside the container as the heated air cools will draw water glass into the crack and make the repair leakproof. Purpose of the water is to keep air from entering the jar through the space between it and the saucer and breaking the vacuum.—S. Leonard Bastin, Christchurch, Hants, Eng.

Decorative Inlay Bands Cast in Gavel

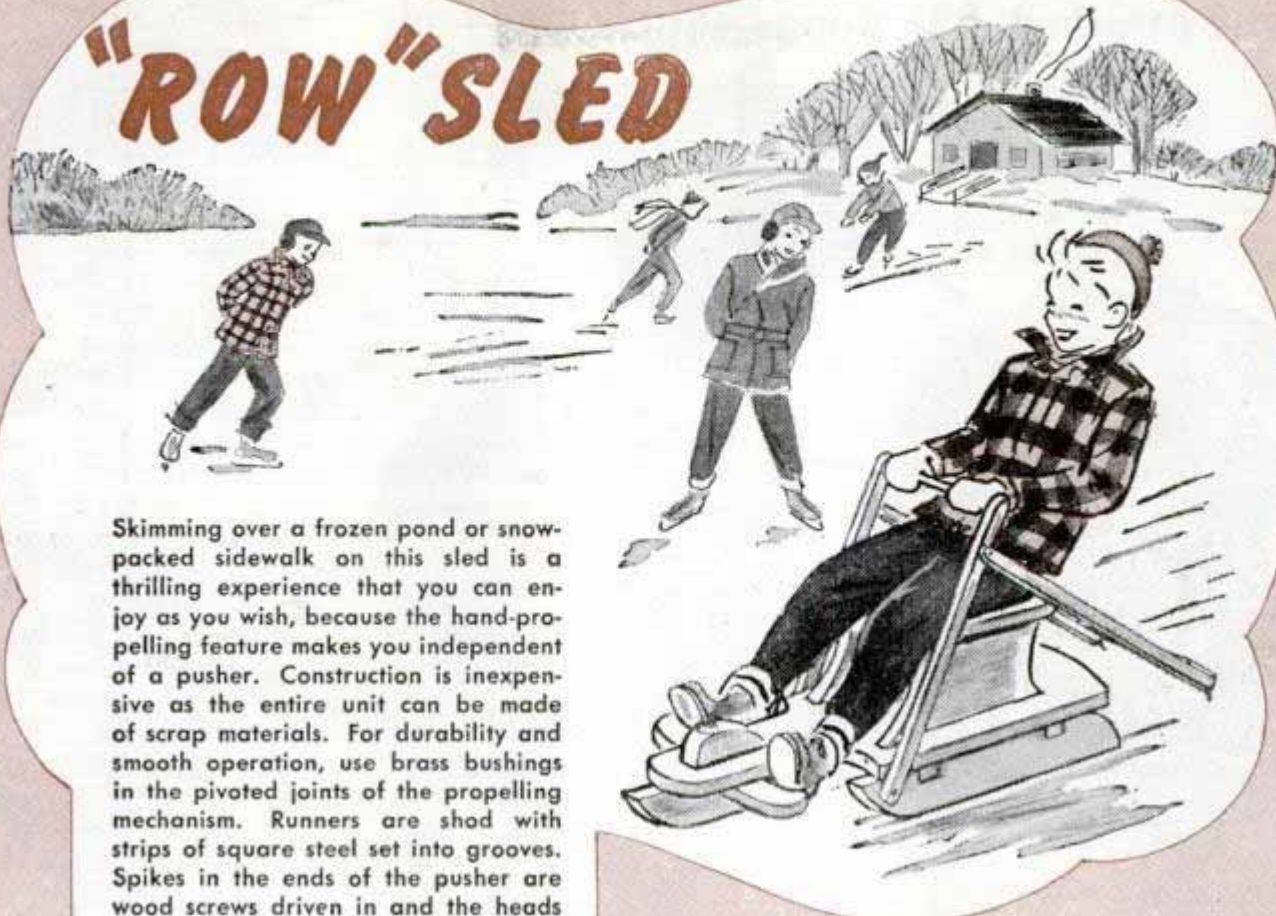
To add a decorative touch to an ornamental wooden gavel, and, at the same time, prevent the wood from splitting, inlay metal rings around the head and handle. Babbitt metal, which is used for the rings, is poured as follows: After the inlay grooves have been turned, wrap heavy paper—not waxed—over them and cut holes in the paper through which the metal can be poured. After pouring, let the babbitt harden, remove the paper and turn or sand the rings flush.—Oscar R. Briggs, Sidney, Ohio.



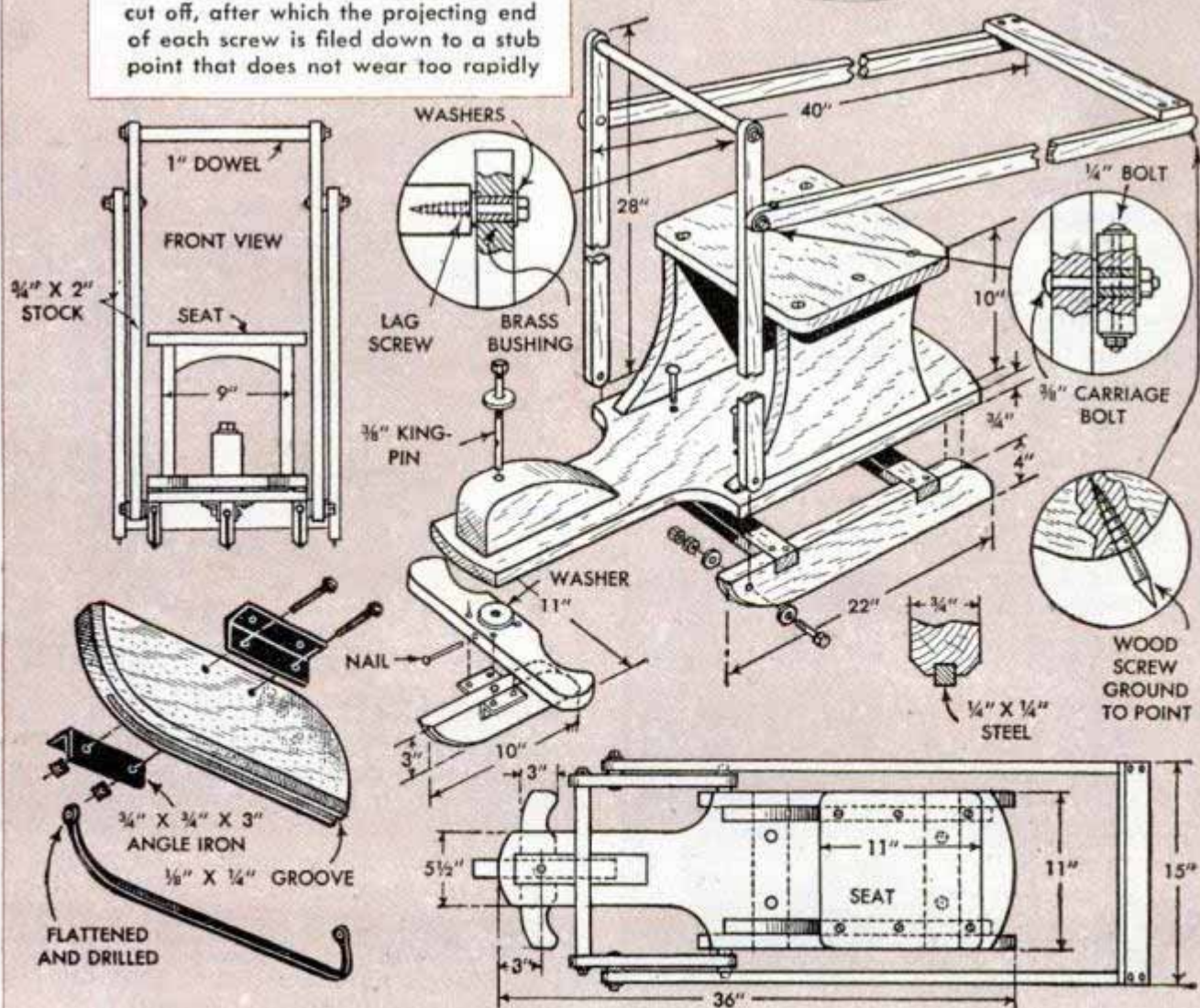
Extending Life of Christmas Bulbs

Christmas-tree bulbs will last much longer if two or more sockets and bulbs are added to each string of lights of the series type. By increasing the number of bulbs from eight to ten, the brilliancy of each bulb will be reduced slightly, but the element will last longer.

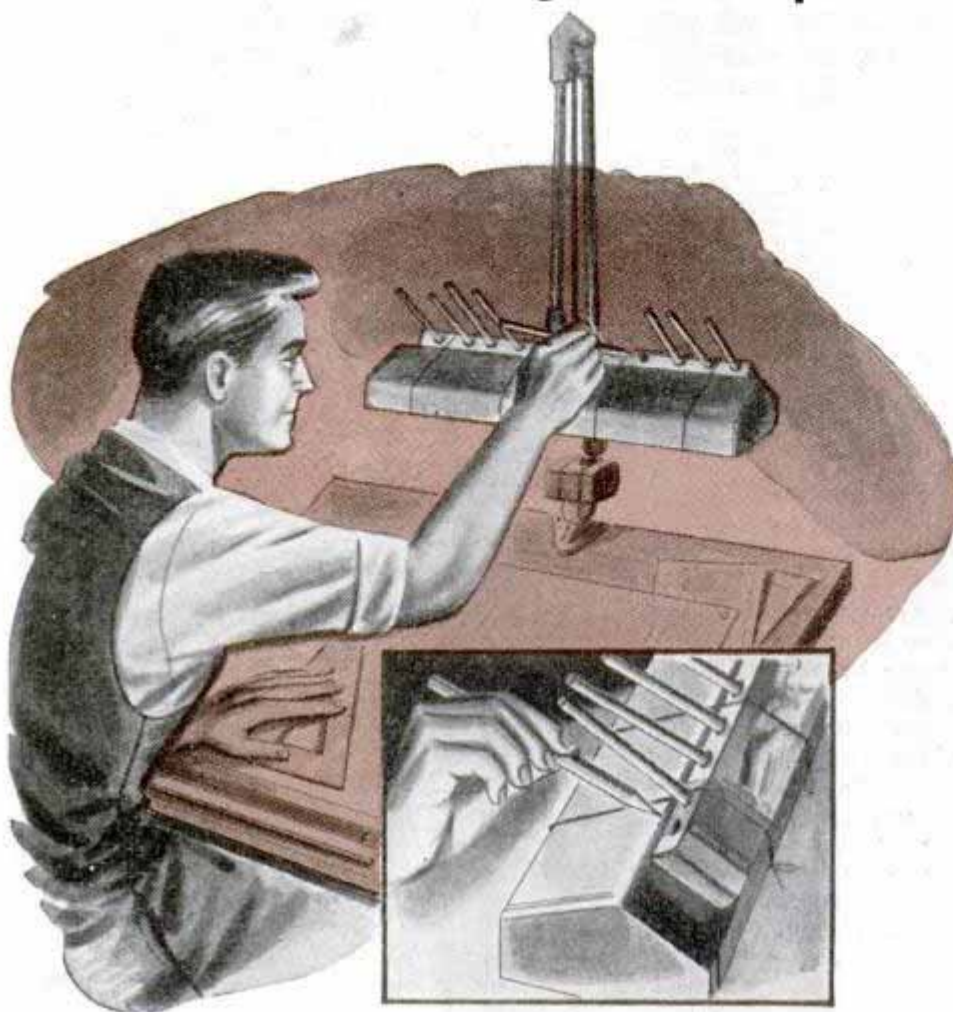
"ROW" SLED



Skimming over a frozen pond or snow-packed sidewalk on this sled is a thrilling experience that you can enjoy as you wish, because the hand-propelling feature makes you independent of a pusher. Construction is inexpensive as the entire unit can be made of scrap materials. For durability and smooth operation, use brass bushings in the pivoted joints of the propelling mechanism. Runners are shod with strips of square steel set into grooves. Spikes in the ends of the pusher are wood screws driven in and the heads cut off, after which the projecting end of each screw is filed down to a stub point that does not wear too rapidly



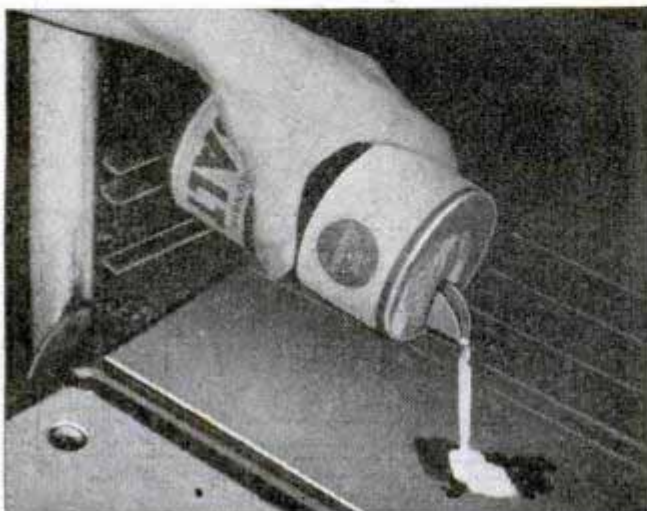
Holder for Assortment of Drawing Pencils Is Attached to Drafting-Board Lamp Shade



This drawing-pencil holder keeps pencils arranged in an orderly manner off the drawing board, leaving more free space on which to work and, since the holder is shifted with the lamp, the pencils are always within reach. Making the holder is easy; only materials needed are several boxes of the kind that drawing pencils come in and some cord or drafting tape. Holes for the pencils are cut in one side of each box, spacing them about 1 in. on centers. Then the boxes are tied or taped to the rear side of the shade at an angle. If tape is used, do not pass it all the way around the shade as it will obstruct the light. Arrange the pencils according to degree of hardness for easy selection. — H. Drouyn, Ottawa, Ont., Can.

Salt Poured Over Soiled Spot Cleans Baking Oven

When juices from a pie boil over onto the bottom of an oven, pour salt over the soiled spot and keep the heat turned on. In a short time the juices will dry and char without the formation of objectionable odors, and the spot can be brushed away easily by using a brush with stiff bristles. Removing the spot in this manner eliminates time lost scraping and scouring to get the oven clean.



Springboard Fastened Onto Wall Amuses Young Children

Safe for small children, this springboard will provide many hours of entertainment. The board can be of a suitable size, constructed of fairly flexible hardwood. Note that the fixed end is hinged to a garage or other convenient building so that it can be folded up out of the way. Support for the board is provided by a post to which a crosspiece is nailed. Be sure that the post is driven solidly into the ground.

Playroom Furniture Of Bowling Pins

For the bowling enthusiast who likes mementos of the game, this bowling-pin coffee table and floor lamp will lend authentic atmosphere to a playroom or den. Discarded pins serve as legs for both pieces of furniture. However, unless fairly new pins are available, it will be necessary to turn them down in a lathe so the wood will be free from marks and blemishes. As shown, the coffee-table top is of contrasting woods, such as walnut and maple. One way to fasten the legs to the table is to use a wedged tenon joint. This is made by drilling $\frac{3}{4}$ -in. holes, 2 in. deep, in the top of the pins. Drill the same size holes through the table top at a 10-deg. slant. Then insert $\frac{3}{4}$ -in. dowels slotted at the top end and drive wedges into them to make the joints tight. The legs of the lamp are joined to the



"shelf" in the same manner and the column, which is of walnut, is turned on a lathe. Use standard electrical fittings.

Lyle Mussetter, Richmond, Calif.

"Salty Sam" Twine Holder of Plywood Has Handy Razor-Blade Cutter

Sam sits on the ball of twine, which represents rope, and he is always holding the free end of the twine for your convenience. In his duffel bag he keeps a razor blade

handy to cut twine to whatever length you need. Sam and the duffel bag are cutouts, and the cross-hatched detail gives sizes and contours. Plywood, $\frac{1}{2}$ in. thick, is best, but white pine will do. Cut slots in the duffel bag at right angles for a razor blade and the twine, sawing in from the top and bottom as shown. Two brads, fitted in loose holes, hold the razor blade in place. Although a turned base is shown, it can be square or octagonal.

Ralph S. Wilks, Elbridge, N. Y.

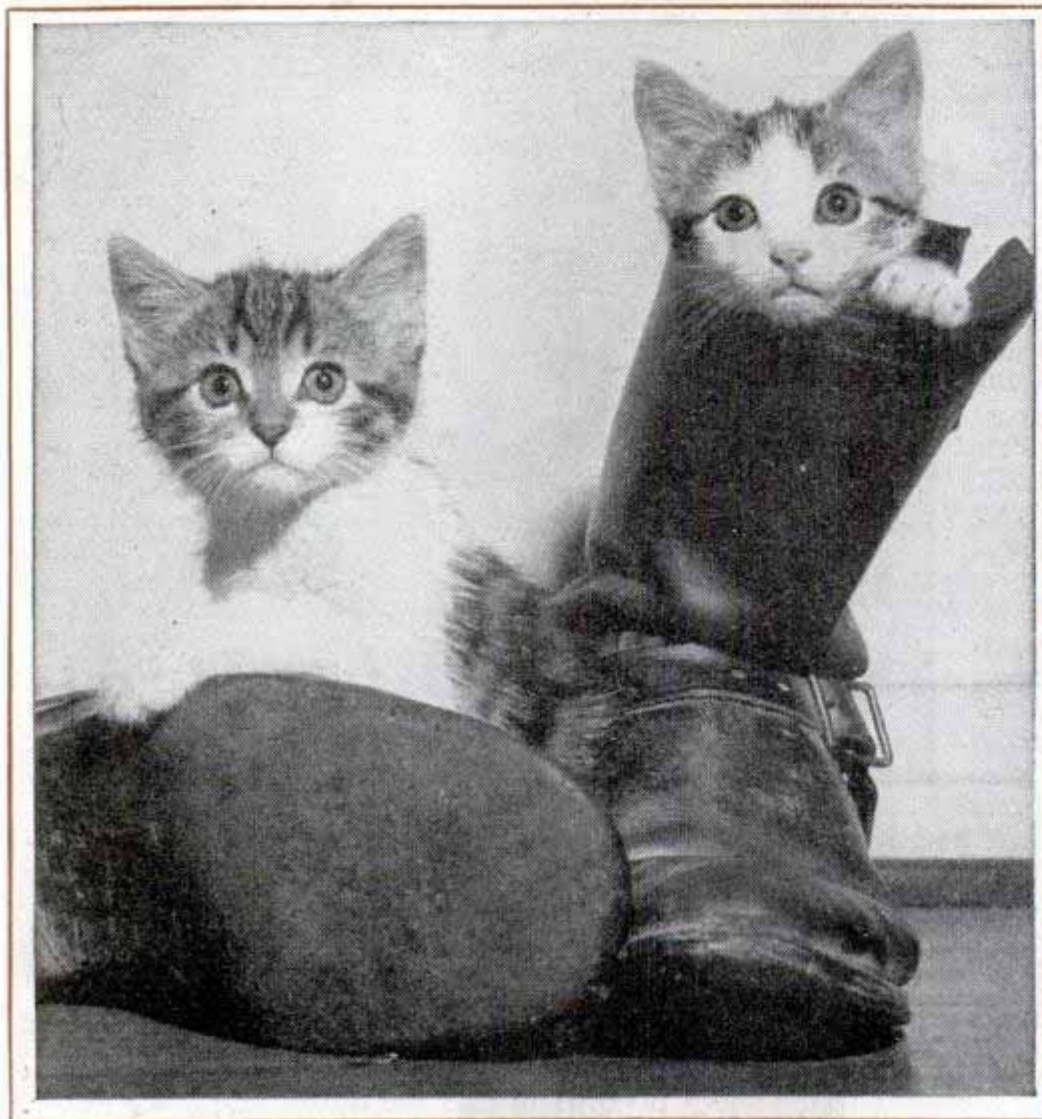


Insulation Packed Around Chimney Keeps Fire From Spreading

A source of danger frequently overlooked when fire-proofing a home is the space between a brick chimney and the adjoining floor or ceiling. Fire originating in the basement or first floor will travel through this vent and soon become difficult to control. A good preventive for this is to pack the space with a fill-type insulation. Not only will this stop the draft action of a fire, but it will seal off each floor during the winter and aid in conserving heat.

Francis J. Govoni, Beverly, Mass.

SHOOT 'EM CLOSE-UP



By
Richard W. Emery

Photos by
R. O. Ritchie

LOOK FOR A MOMENT at the close-up above. It's so boldly real that you will feel a sudden impulse to reach out and stroke the kittens. Prints reproduced on the opposite page have the same characteristic—you actually forget for an instant that you are looking at pictures. In each instance, the subject is definitely identified and individually characterized.

Working with the camera close to the subject results in prints having soft, subdued backgrounds and bold, realistic portraiture of the subject. Any good camera will do this work, although a camera not equipped with a double-extension bellows will require an inexpensive supplementary portrait lens. This accessory slips over the barrel of the regular lens and has the effect of shortening its focal length, thereby enabling the photographer to get much closer to his subject. A data table giving lens-to-subject distances is supplied with the portrait lens. As an example in using such a table, set the camera to work at 6 ft. Then, from the table, determine the distance at

which the lens is to work with the supplementary portrait lens in place. This usually will be given as 2 ft., 6 in. Locate the camera exactly 2 ft., 6 in. from the subject, or from that part of it which you want in sharp focus. Measure this distance with a rule just to be sure.

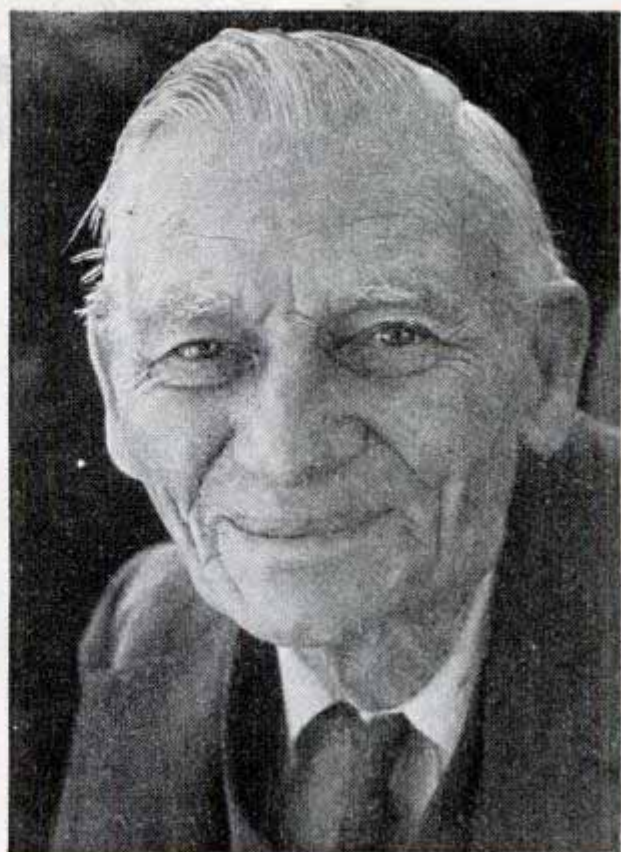
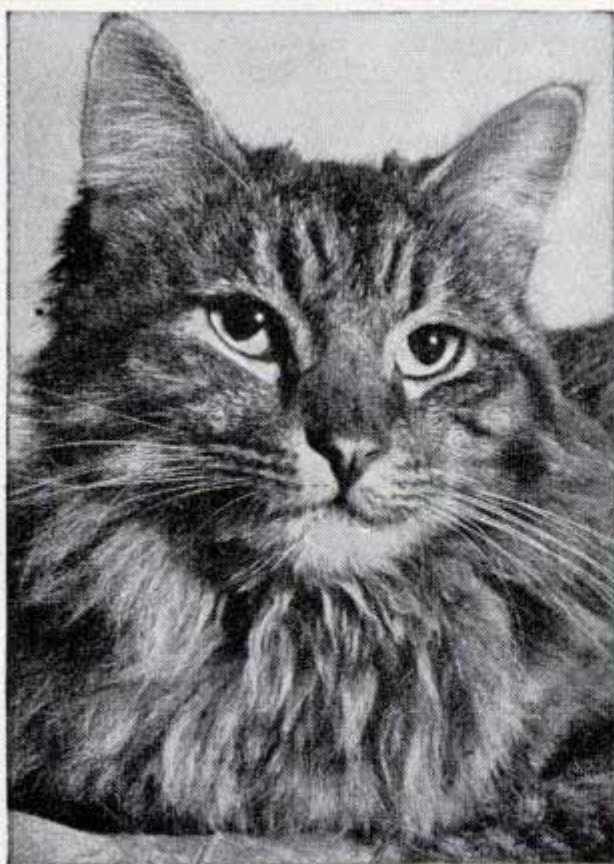
Most folding cameras not fitted with a ground glass are supplied with a reflecting-type view finder which is accurate at distances of about 6 ft. or over. But when you get closer, some displacement of the image occurs because of uncorrected parallax. Also, on many of the older-type cameras, the image will be off-center due to the position of the view finder with relation to the camera lens. In most cases, this is compensated for by sighting over the camera and centering it on the subject.

Combining a supplementary lens with the regular lens has the effect of shortening the depth of focus and changing the speed ratings. The lens must be stopped down to gain maximum depth of field and the exposure must be lengthened correspondingly.



"Immobilize" lively child subjects by giving them something to do. Then pose the hands near the face so that all lie in a plane parallel with the film in the camera. Distance, 4 ft.

In shooting extreme close-ups of persons or animals, focus sharply on the eyes. One flash bulb lighted this close-up of Tabby. Notice the excellent portrait quality. Distance, 2 ft.



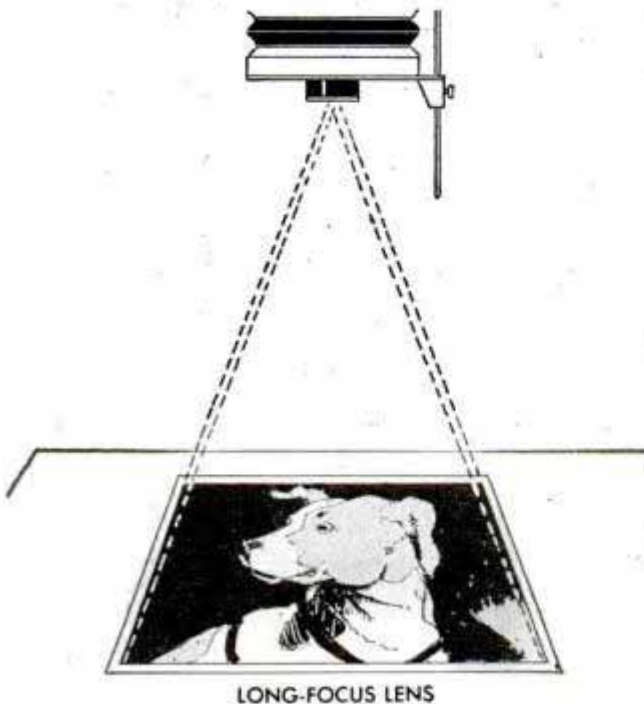
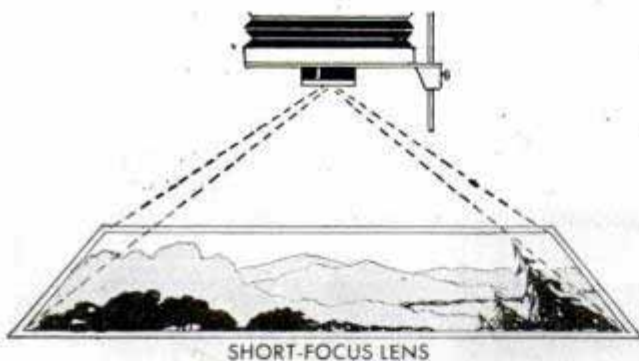
There is no artificial lighting on this informal portrait — only the late-afternoon sunlight. Two reflectors direct fill-in light to the face. Distance, 4 ft.

This shot was taken with prearranged camera and synchronized flash. Nuts were used as bait, and long, patient waiting got this shot of a well-known "park citizen." Distance, 3 ft.





Above, you see Whiskers, the family pet, posing for his picture and doing a very good job of it. Below, the enlarging lens should have a focal length equal to the diagonal of the largest negative the enlarger will take



In photographing persons or animals, arrange the subject, or the camera, so that the eyes of the subject will be in sharp focus. Study of the photos on these pages will show that the photographer has focused his lens on the eyes, and that he has chosen subjects with limited depth of field. Also, it will be noted that regardless of the angle from which the picture is taken—three-quarter, front or profile—the main features of the subject and the film are in parallel planes. This is an important point to remember when shooting close-ups. The broadside view of Rover, on the last page, the three-quarter view of the squirrel and the front view of the kittens are examples.

The subject should be brilliantly lighted so that some variation in exposure is permitted. Sometimes it will be necessary to use a shutter speed fast enough to stop action, and where a tripod cannot be used, the shutter speed must be fast enough to minimize slight camera movement. It's a safe rule always to use fast film for extreme close-up work. Use a tripod or a suitable substitute wherever possible. A good rule is to give extreme close-ups about twice the normal exposure. Instead of lengthening the time by opening the lens aperture or reducing shutter speed, simply provide approximately twice the amount of light. On cameras so equipped, synchronized flash lighting, with one of the units



Here is Whisker's portrait, taken as shown at the top of the opposite page. See how intently he was watching the antics of his master in focusing the camera only 2 ft. from his nose. Note also how camera has been focused sharply on the eyes and that area in sharp focus is only a few inches deep



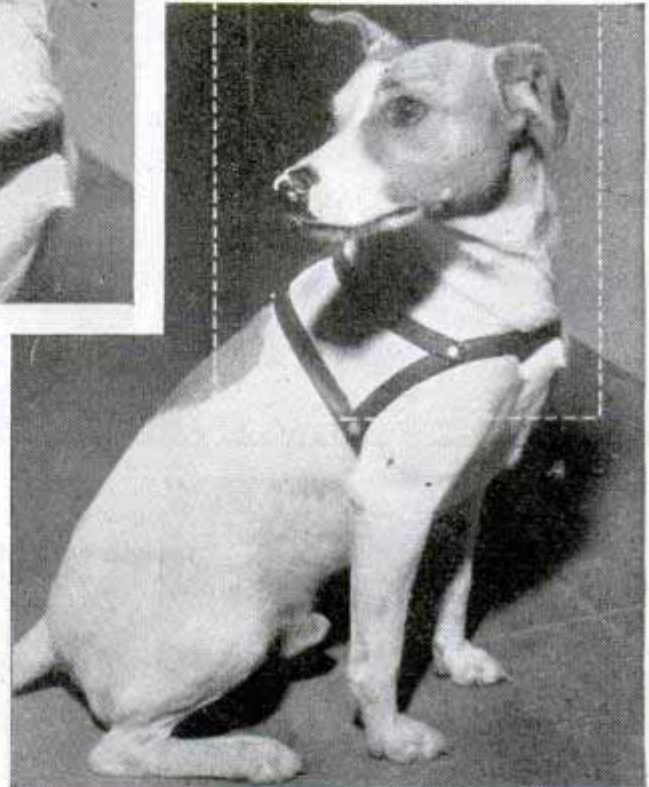
Right, for informal child portraits like that above, use a tripod to hold the camera steady for an indefinite time. As you see here, the photographer waits with flash gun poised while he directs the little lady in the high chair to take just the pose that he wants. Distance, 4 ft.





The enlargement, made from part of the original negative, brings Rover a lot closer

The camera gets close, but usually the enlarger can get even closer. Here's an example. It's what professional photographers call a "grab shot," a quick snap taken when pose, action, lighting and general composition seem to be just right. What resulted from use of this method on Rover, who would not hold a pose, you see in the contact print below. Then the negative was masked to get the projection print reproduced at the left. Also, the original print could be cropped as indicated by the dotted lines



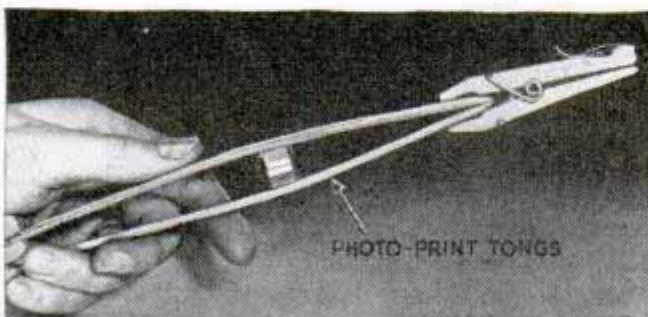
held in the hand, can give quite consistent results on close work. Flood and spotlighting give better control on some subjects and, when shooting outdoors, reflected sunlight is very effective in softening sharp shadows.

Clever scheming often is necessary to induce animal or child subjects to remain still long enough for the exposure. For example, the kittens were temporarily "immobilized" by placing each one in a boot as shown, after which the photographer, by a simple antic, caught and held the close attention of both subjects. In this case the camera was placed on two books on the floor with the lens 30 in. from the subjects. The exposure time was $\frac{1}{200}$ th sec. at f:22. One flash bulb, held above and to the right gave proper lighting.

When shooting close-ups, keep in mind

the possibilities of making enlargements of all or a part of the close-up negative. Rover, already referred to, is a good example of how the enlarger can, in effect, get even closer than the camera. The original full-size close-up of Rover was taken at 4 ft. with synchronized flash, $\frac{1}{200}$ th sec. exposure at f:22, and the enlargement was made from that section of the original enclosed by dotted lines.

Wooden Print Tongs Held by Spring-Type Clothespins to Prevent Warping

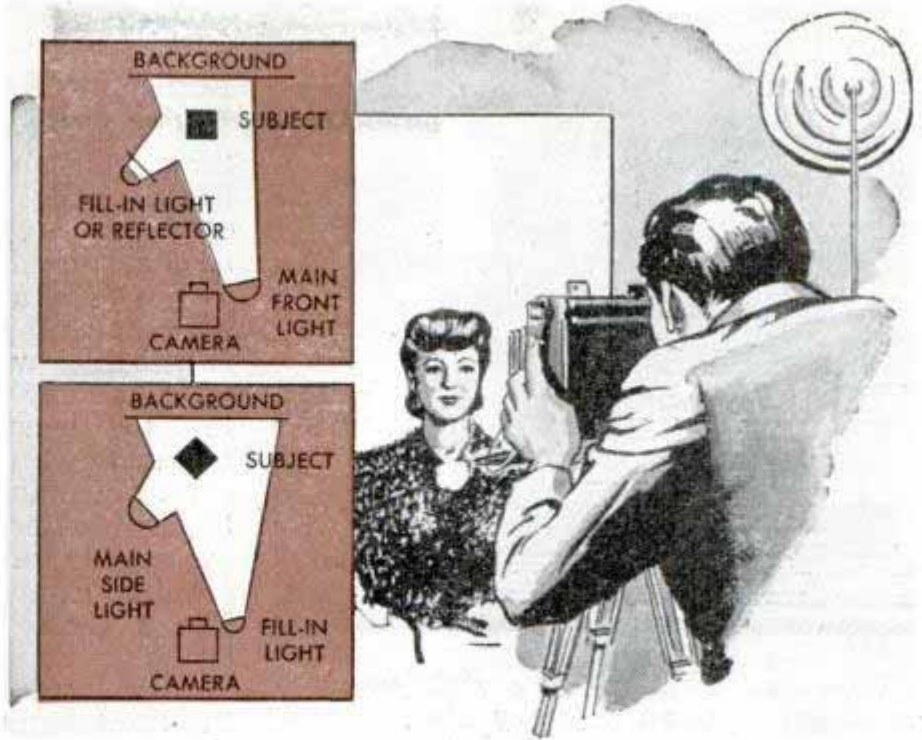


Often photo-print tongs must be discarded because they have become warped and lost their grip. With a little care, however, this can be prevented and tongs can be made to last much longer. After use, insert a spring-type clothespin between the legs of the tongs and use another pin to clip the ends. Leave them this way until they are ready to be used again.

Portrait Lighting for Slender and Stout Subjects

Arrangement of lights, camera angles, composition—these, and many other factors must be considered carefully by the portrait photographer in order to present his subjects in the most complimentary manner. To simplify taking portraits—and produce flattering results—here are two lighting setups, one for slender and one for stout subjects. Neither requires extensive equipment. The top detail suggests an arrangement for lights, camera and subject if the person you are photographing is slender. The bottom detail is for stout persons. When using

the first setup, have the camera above eye level. Use a diffused main front light and have the subject face the camera. The head should be tilted down slightly and the body should be relaxed, sitting in a chair. Generally, a light background is better. To photograph stout persons, have the camera below eye level and use a sharp main side light. Take a three-quarter view with the subject leaning forward slightly. Here a



dark background usually produces better results. To modify features, bear in mind the following suggestions: A long nose will photograph better if the head is tilted up and the reverse is true for a person having a short nose. Conspicuous ears are less noticeable if the head is turned slightly. Have the eyes looking in the same direction that the head is turned.

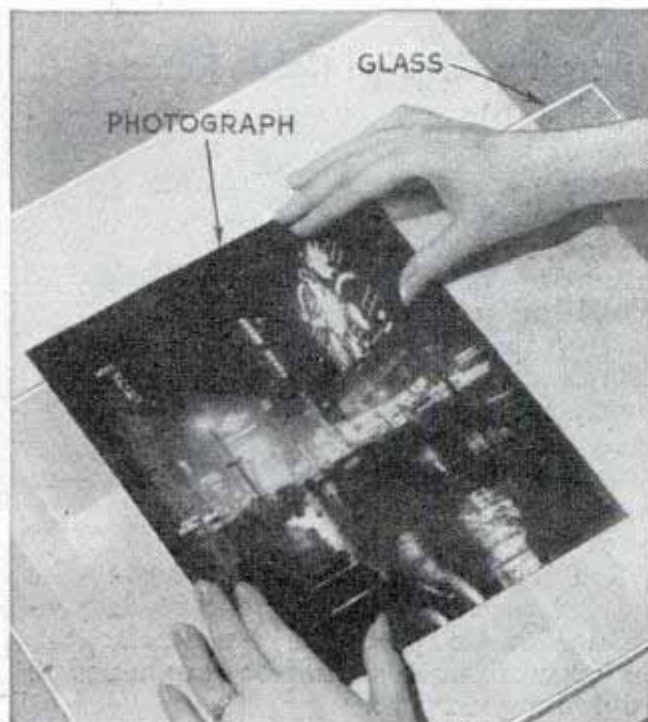
Max Navis, New York City.

Glass "Carrier" Simplifies Centering Prints on Mounting Board

Locating a photograph squarely when mounting it with rubber cement is a simple job if a sheet of glass, somewhat larger

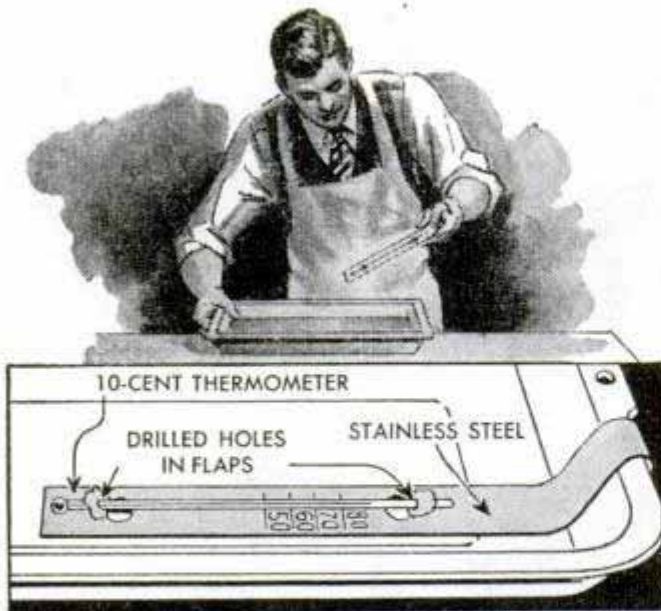
than the print, is used as a "carrier." First, apply cement to the mount and to the back of the print along the top edge in the usual manner. Then place the print, face up, on the glass, letting the cement-coated edge of the print overhang the edge of the glass an inch or so at the top. Next, place glass and print on top of the mounting board and shift it around until the print is centered squarely in the desired position. Then press down the cement-coated edge. This anchors the top of the print after which the glass is removed and the mounting completed. Cleaning the mount of excess cement can be done with an artist's 'pickup,' which consists of a ball of dried rubber cement. This is worked as similar to an eraser and is kneaded as it is used.

R. F. Donovan, Jersey City, N. J.



☞ Mechanics who use reference books in the course of their work will find that the pages can be kept clean if a coat of shellac or clear nail polish is applied to the margins. This also keeps the edges of the pages from being torn easily.

Ordinary Thermometer Converted For Use in Darkroom

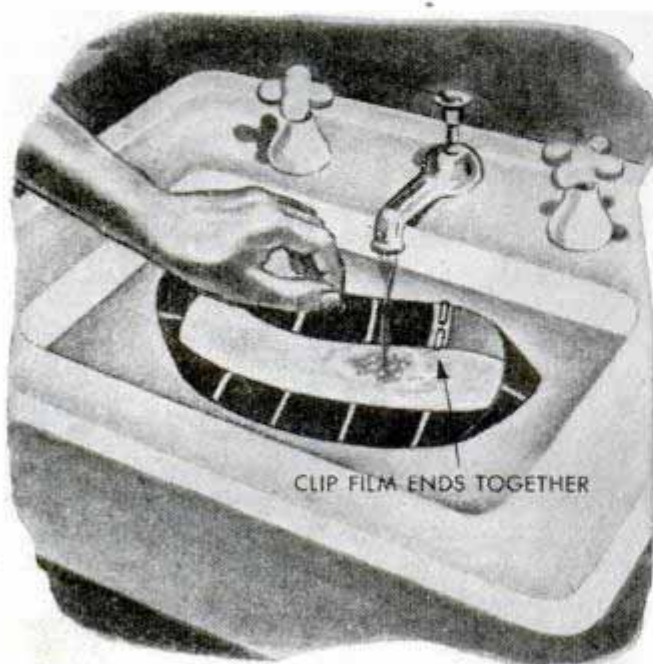


With the addition of a stainless-steel mounting strip, an ordinary 10-cent thermometer can be converted for use in the darkroom. Form the strip to fit the inside of a developing tray, and cut and bend two flaps to hold the thermometer in place. Temperature markings are stamped into the metal strip for easy reading.

H. Klein, Pittsburgh, Pa.

Safe Way to Wash Roll Film

For the photographer who does not have the required tanks or trays, washing roll film often is difficult because the emulsion—at this stage of the processing—is soft and scratches easily. Here's a way I found to safeguard film that does not require special equipment. Clip the ends of the roll together with the emulsion side inward and place it in a wash bowl. Adjust the

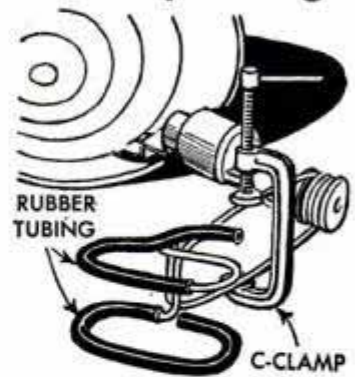


faucet so the water level will remain constant when fresh water is flowing in.

Bob Hurst, Chicago.

Replacing Reflector-Clamp Tubing

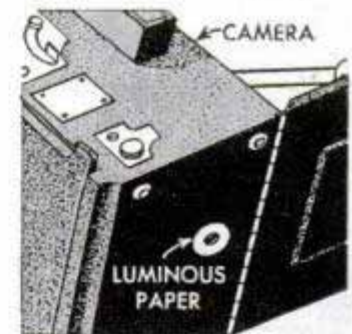
If the rubber tubing on photo-flood reflector clamps wears through or dries out, the clamp loses its grip and the bare wire scratches any object the lamp is fastened to. To replace worn tubing,



buy several feet of the kind used to connect automobile windshield wipers. Cut it to the required length and slip it over the clamp. Use a C-clamp to spread the reflector clamp while performing this operation. The rubber tubing will go on easier if a little petroleum jelly is applied to the wire.

Locating Tripod Hole in Dim Light

When attaching a camera to a tripod indoors, or wherever the light is dim, it is difficult to see the mounting hole when holding the camera close to the tripod head. If a ring made of luminous paper is pasted around the hole, it will be easy to locate the hole and attach the camera. Also, this will prevent tearing the leather or damaging the tripod screw.



Enlarging Grip on Cable Release

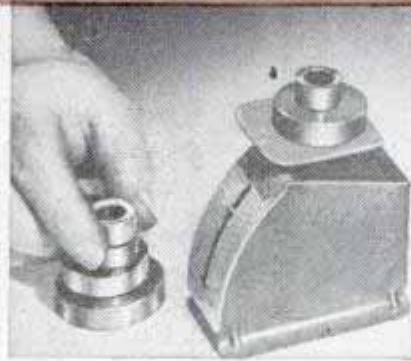
The cable release of a camera can be removed and attached without effort if the threaded end is provided with a fitting that has enough surface so it can be turned easily. The fitting shown is a small piece of $\frac{3}{8}$ -in. wooden dowel drilled through the center to fit over the knurled part and leave the threads projecting. Plastic rod could be used also, but the circumference should be roughened to provide a good grip.



CRAFT QUIZ



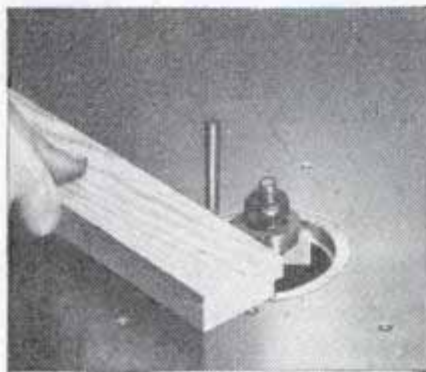
1. She is painting with—
 (a) Oil paint (c) Shellac
 (b) Water paint (d) Lacquer



2. Steel is lighter than—
 (a) Brass (c) Aluminum
 (b) Tin (d) Cast iron



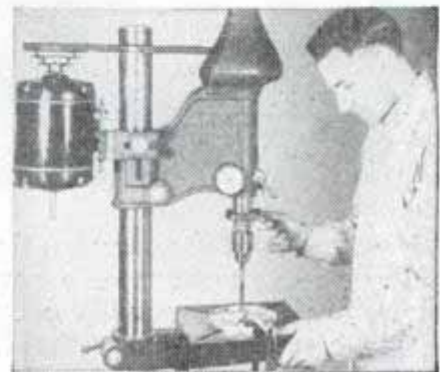
3. With these you make—
 (a) Turnings (c) Handles
 (b) Mortises (d) Joints



4. It would be safer with a—
 (a) Splitter (c) Fence
 (b) Wheel guard (d) Push block



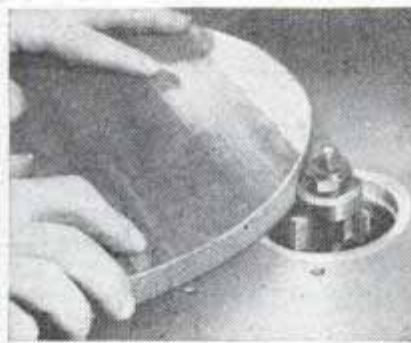
5. Good work shows no—
 (a) Back-up (c) Cut-off
 (b) Mark-down (d) Mark-off



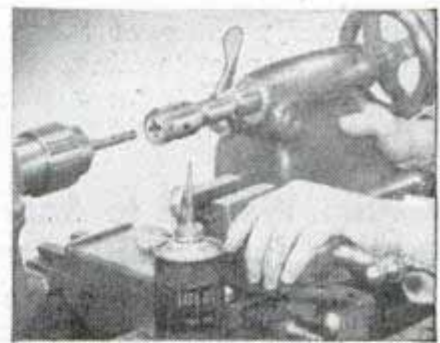
6. Best reaming speed is—
 (a) 1/2 drill speed (c) 1/4 drill speed
 (b) 2/3 drill speed (d) drill speed



7. Heat over 60-w. lamp is—
 (a) 150° (c) 250°
 (b) 200° (d) 400°

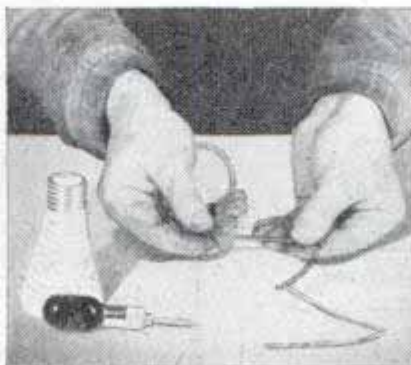


8. Something missing here—
 (a) Fence (c) Starting pin
 (b) Spindle nut (d) Stop



9. Threading die is—
 (a) Acorn (c) Spring
 (b) Button (d) Rethreading

ANSWERS: 1—b (others are not applied with roller); 2—c; 3—d (picture shows dowels); 4—c (straight work, like this, should always be worked with fence); 5—d (pressure marks on plastic); 6—b; 7—c; 8—c (starting pin is always used when shaping curved work); 9—b (button or round); 10—d; 11—c



10. This wire is—
 (a) Copper (c) Galvanized
 (b) Piano wire (d) Nichrome



11. Blade for general work is—
 (a) 32 teeth (c) 18 teeth
 (b) 14 teeth (d) 24 teeth

Masking Tape Covers Rusted Holes In Auto Body or Fender

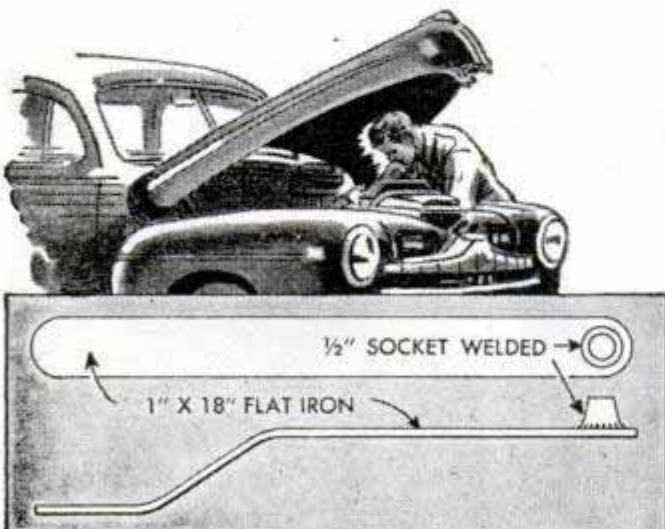


If rusted spots have worn through a door edge or fender seam of a car, and this is where such spots usually occur, a suitable repair can be made with cloth masking tape. First clean the area to be patched, removing dirt and scale from the outside and inside surfaces. Then apply the tape in strips and overlap it like house siding. Finally, brush or spray several coats of waterproof paint over the area. This results in a neat-looking, semipermanent repair that is fairly inconspicuous.

Sherwin Murphy, Chicago.

Handle Welded to Socket Wrench Reaches Inaccessible Parts

Parts of a car that are inaccessible with ordinary wrenches can be reached easily with this tool, which consists of a socket wrench welded to an 18-in. length of flat

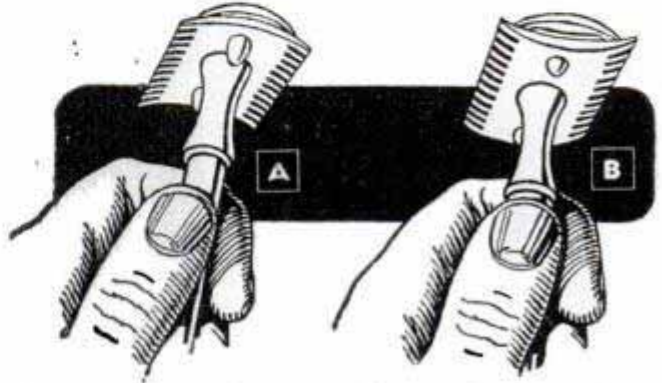


iron that is offset slightly. Since this is a somewhat specialized tool, the size of the socket, length of handle and degree of offset will be determined by the work for which it is intended.

D. W. Brentlinger, Richmond, Calif.

Reversed Guard on Safety Razor Protects Edges of Blade

When a safety razor is kept loose in a medicine cabinet, frequently the edges of the blade become dulled by scraping against the surface of the shelf or against articles in the cabinet. To prevent this, after the razor has been cleaned, reverse



the guard and reassemble as indicated in detail B. Detail A shows the normal assembly of the razor, which leaves blade edges unprotected by the guard.

J. B. Wallace, Armstrong, B. C., Can.

Windshield Wiper Spreads Glue



Should you have a large surface to cover evenly with liquid glue, try using the blade from a windshield wiper as a spreader. No glue is wasted and an even coat is obtained over the entire surface. This method is ideal for cloth, sandpaper, sheet rubber or other materials that are to be mounted on a stiff surface.



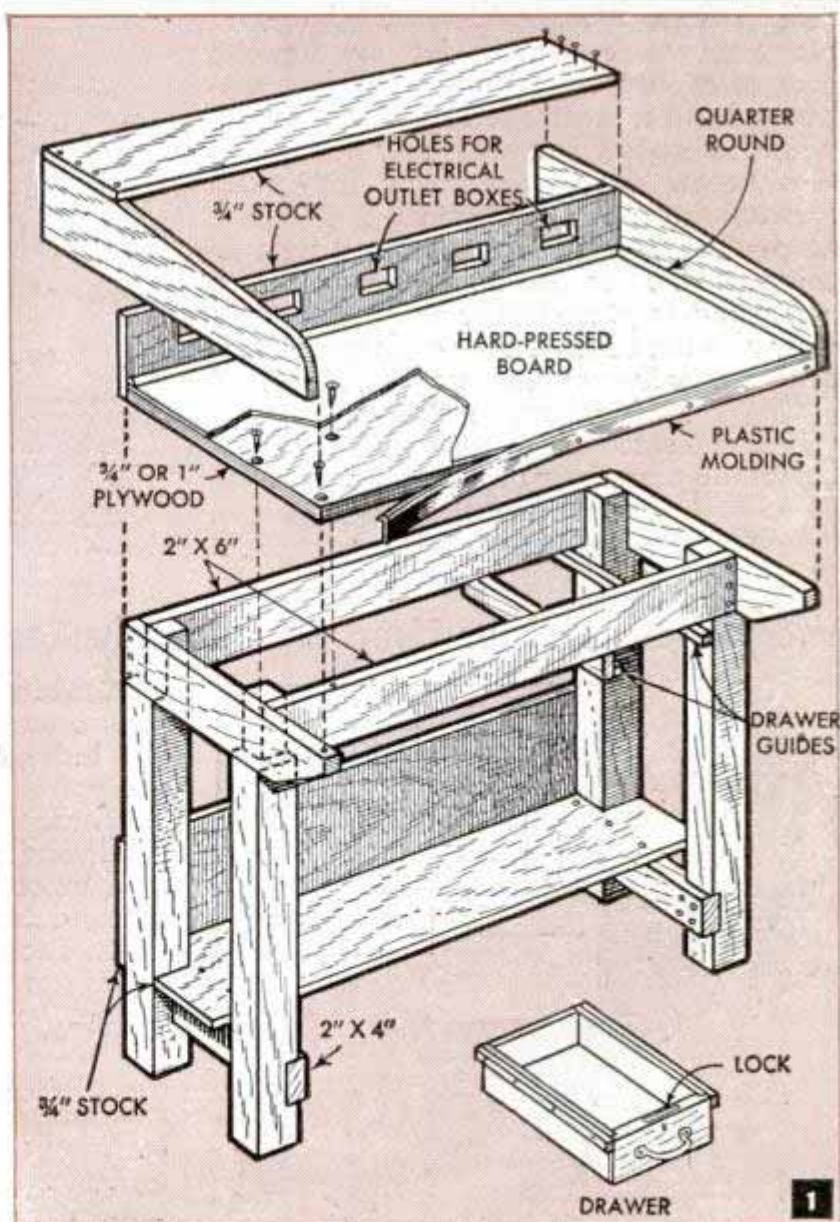
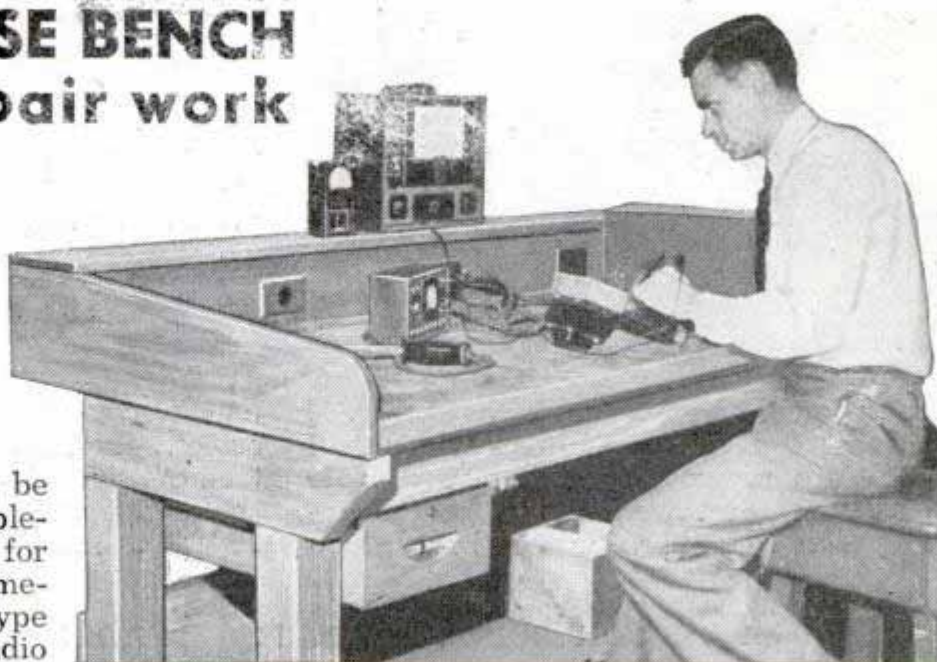
ALL-PURPOSE BENCH for light repair work

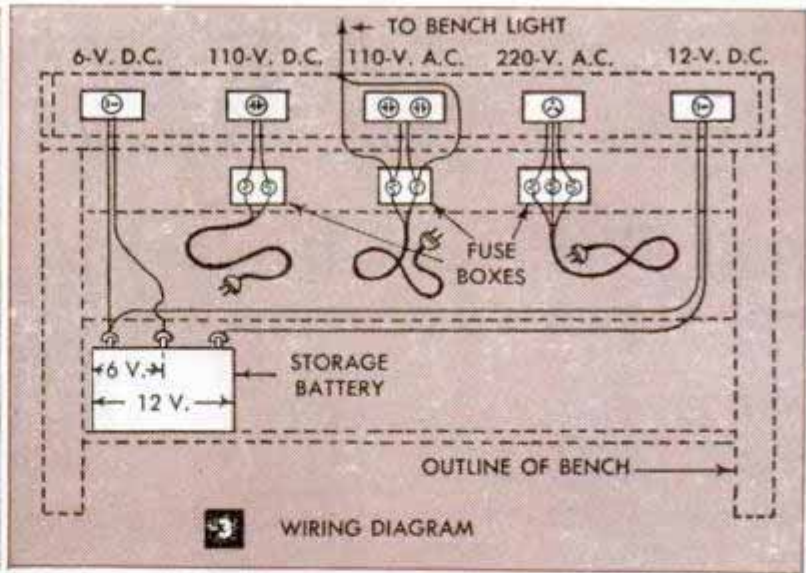
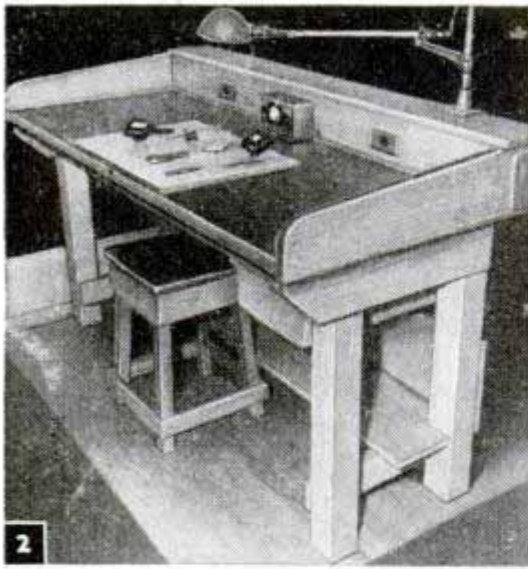
Ideal for appliance or radio trouble-shooting. Multiple current outlets bring five different voltages within easy reach

By Wm. B. Swindells

THIS sturdy bench can be fitted with a full complement of electrical outlets for testing and repairing meters, telephones and teletype machines, as well as radio equipment. As in the wiring diagram, Fig. 3, outlets are arranged on the back panel to provide 6 and 12-volt d.c., 110 and 220-volt a.c., and 110-volt d.c. The 6 and 12-volt d.c. is supplied to the outlets by storage batteries. One 12-volt battery can be used to supply 12-volt current. When you want 6 volts, simply clamp one lead to the negative terminal post and the other to the connecting strap between the third and fourth cells. Or, use two 6-volt batteries connected in series for 12-volt current, and one for 6-volt current when required.

The heavy bench frame, Figs. 1 and 2, is made from yellow pine in 2 by 4, 4 by 4 and 2 by 6-in. sectional sizes. Side and end rails are joined to the top ends of the 4 by 4-in. legs as in Fig. 1. The bottom rails are mortised into the legs to a depth of one-half the thickness of the rail. Parts are joined with waterproof glue and 3½-in. No. 14 flat-headed screws. A shelf can be provided as shown, with or without a backing board, or arranged in any other manner that suits the needs of the user. Neither the top nor the frame are dimensioned for length and width as the bench can be made any convenient





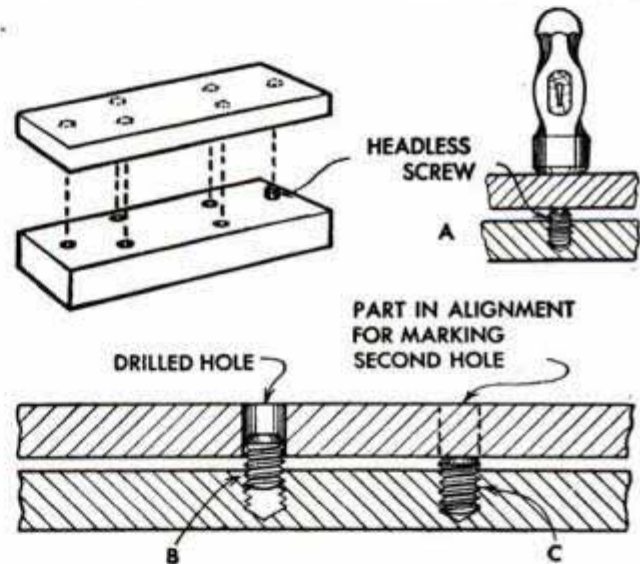
size, using the same plan of assembly. If the top is longer than 60 in. or wider than 24 in., 1-in. plywood should be used. Note that the top is screwed in place before covering with $\frac{1}{4}$ -in. hard-pressed board. Fas-

ten the covering to the top with linoleum cement, then trim the edges square and attach the side wings, the back panel and top shelf. Openings for the outlets are arranged to suit the convenience of the user.

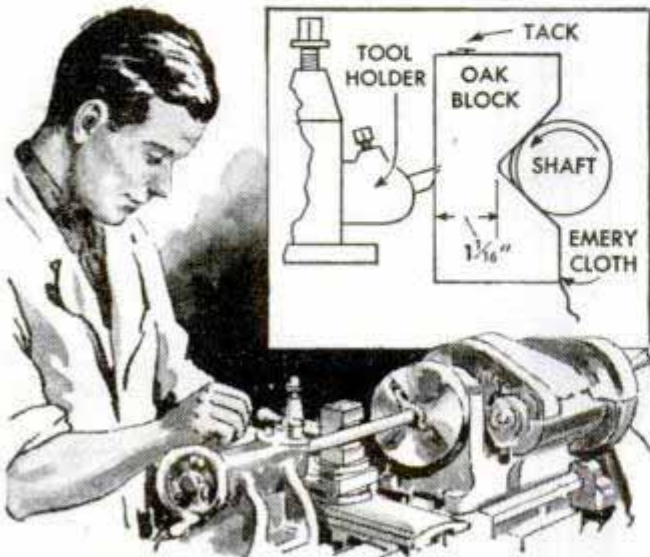
Position of Blind Holes Transferred With Socket-Head Setscrew

Transferring the position of blind stud holes from one piece of work to another can be done accurately with socket-head setscrews. Drill a master hole in the work to be marked to register with any one of the blind holes. Turn a setscrew into each blind hole to the depth indicated at C. Let one project to engage the master hole as shown at B. Then the hole in the piece to be marked is placed over the master setscrew and the surface over each of the other setscrews is struck sharply as shown at A. The blow will cause the cup-shaped head of the setscrew to cut a clear impression on the underside of the work. Spot the center of impression with a prick punch.

Charles E. Pilon, Newport, R. I.



Emery-Cloth Holder Used Like Steady Rest to Polish Turned Work

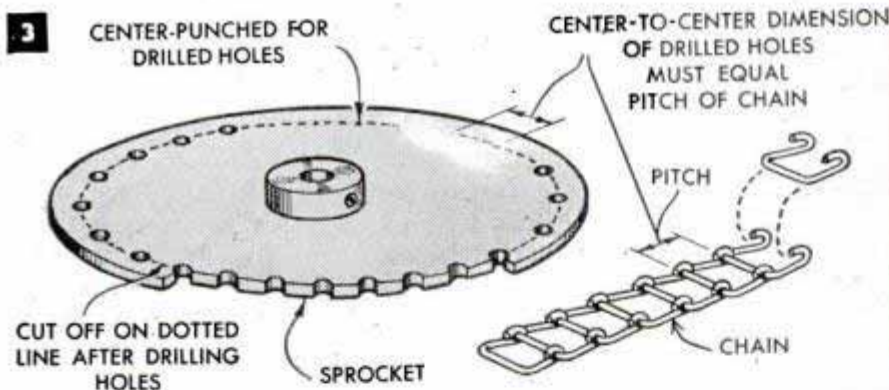
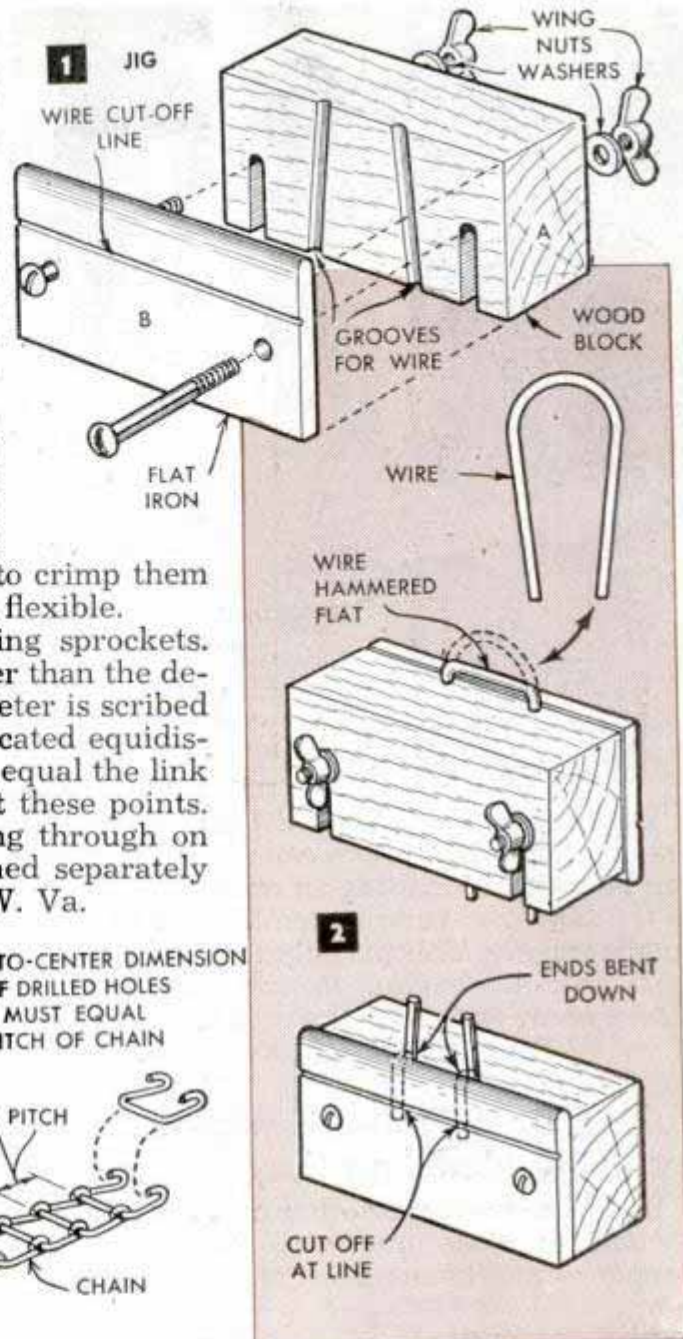


Polishing a shaft with emery cloth is a slow and tedious job when done by hand in a lathe, but with this holder much effort is eliminated and a finished job will result. The holder, which is a block of oak or other hardwood, has a V-notch cut in one side to fit against the shaft, the size of the notch being determined by the diameter of the shaft. Tack the strip of emery cloth to the top of the block only so that it will be loose enough to adjust to the curvature of the work. The block rests on the compound slide and is pressed against the work by the tool and holder. The carriage may be fed by hand or by automatic feed. Some additional hand polishing may be necessary to put the final finish on the shaft.

Wire Chain Produced Quickly With Simple Jig

Custom-made wire chain, suitable for operating small experimental models and other devices equipped with sprockets, is produced in a jiffy with this little bending jig. It consists of a hardwood block, A, grooved and slotted as shown in Fig. 1, and faced with a metal jaw, B. The thickness of the jaw should be slightly greater than the wire. Each link is shaped like a hairpin by bending it over a 1/2-in. rod. Then it is clamped in the jig and the rounded end is flattened as indicated in Fig. 2. After this, the jig is turned upside down and the ends of the wire are bent over the rounded edge of the metal jaw and cut off. In joining the links, the hook ends are closed over the preceding link with pliers. Be careful not to crimp them too tightly, as the completed chain must be flexible.

Fig. 3 shows a simple method of making sprockets. First, a metal disk is turned somewhat larger than the desired sprocket, after which the actual diameter is scribed on the face of the disk. Next, points are located equidistantly around the circumference, spaced to equal the link pitch of the chain, and holes are drilled at these points. Finally, teeth are formed by simply cutting through on the scribed line. The sprocket hub is turned separately and riveted.—T. W. Cleaveland, Weston, W. Va.

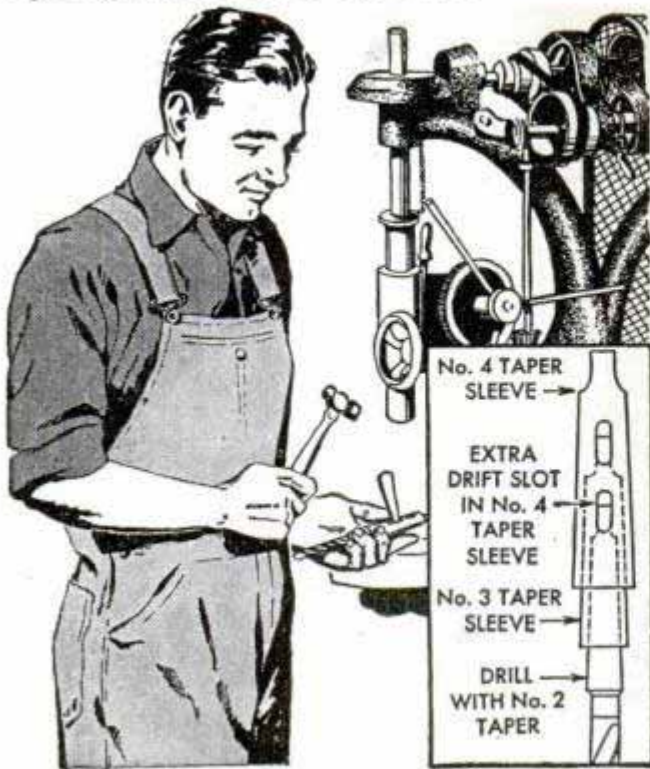


Adjustable Stop Attached to Handsaw Regulates Depth of Sawcut



Handsawing the sides of a dado to uniform depth is a simple operation if the saw is fitted with this adjustable depth stop. Simply set it for the depth you want and keep sawing until the stop contacts the work. The stop is especially handy when cutting dados in wide boards as it assures the cut of being the same depth the entire distance. The stop is made of three pieces of flat iron riveted together for a friction fit, and is attached to the back of the saw with screws and wing nuts. The important thing in fitting the stop to the saw is to see that it is parallel with the cutting edge. To assure this, drill both end links of the stop at one time, and clamp the assembled unit to the saw, even with the teeth, to locate the holes for attaching.

Extra Drift Slot for Taper Sleeve Speeds Removal of Drill

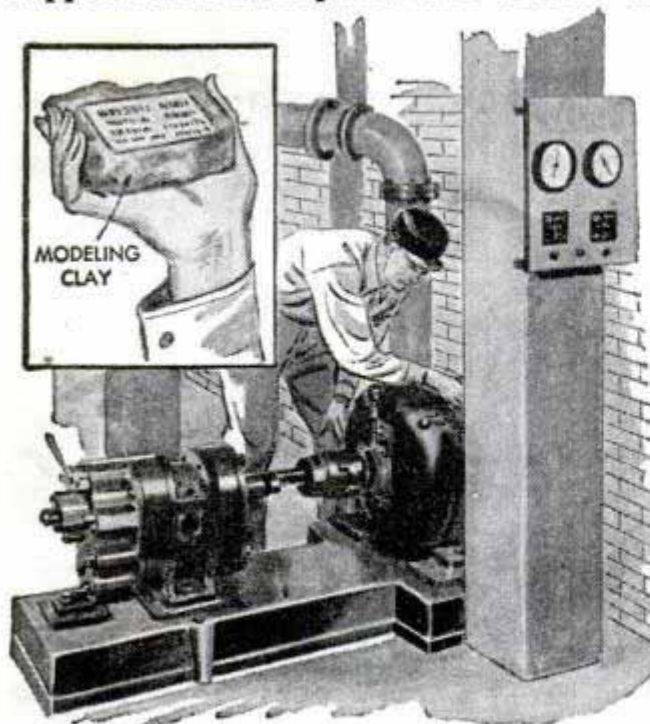


When using small taper drills and reamers in a large drill press, considerable time can be saved by cutting an extra drift hole in the large sleeve to match the one in the smaller sleeve. This permits removal of the drill without having to take the taper sleeve apart each time the drill is changed.

Alvin O. Nelson, Fargo, N. Dak.

Taking Data From Nameplates By Using Modeling Clay

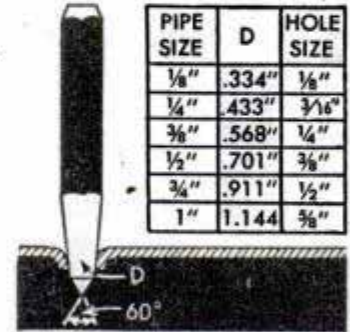
If electric motors or other machinery are located in close quarters, sometimes it happens that nameplates are difficult to



read because they are against a wall or other obstruction. If necessary data, such as current characteristics, horsepower, etc., must be obtained, this can be done by pressing a piece of modeling clay against the nameplate. Although the impression shows the letters in reverse, it can be read by holding the clay up to a mirror.

Better Way to Tap Thin Metal

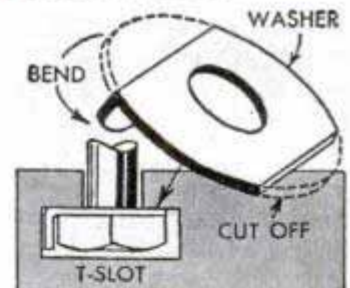
To obtain greater depth of thread when tapping thin sheet metal, drill an undersize hole and enlarge it to the proper diameter with a tapered punch. A small line scribed around the punch



will serve as a guide in determining how far to drive the punch for any particular size of hole. For pipe threads, the taper on the punch should be the same as the taper on the thread. The table shows the size hole to drill, and the enlargement to make with the punch, D, for the pipe sizes indicated in the left-hand column.

Bolt Head Can't Turn in T-Slot If Fitted With Special Washer

Should a T-slot in a machine table be too large for the bolts on hand, so that the heads turn in the slot when being tightened or loosened, a standard washer can be cut and

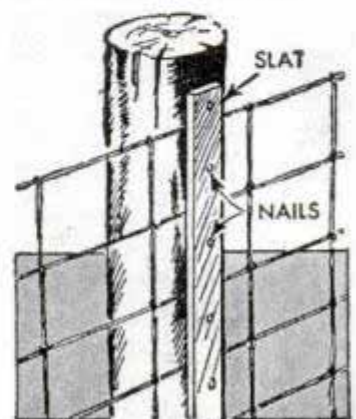


bent to prevent this. The upper detail indicates the method of cutting and bending, and the lower one shows how the washer is placed on the bolt and set in the table.

Earl R. Goddard, Denver, Colo.

Slats Fasten Temporary Fencing

Putting up fencing for temporary use is easy when slats and nails are used instead of staples. The job is done quickly and, when the fence is to be taken down, all that you have to do is remove the slats by pulling out the nails.



10-in. TABLE SAW HAS TILTING ARBOR

Power Tools

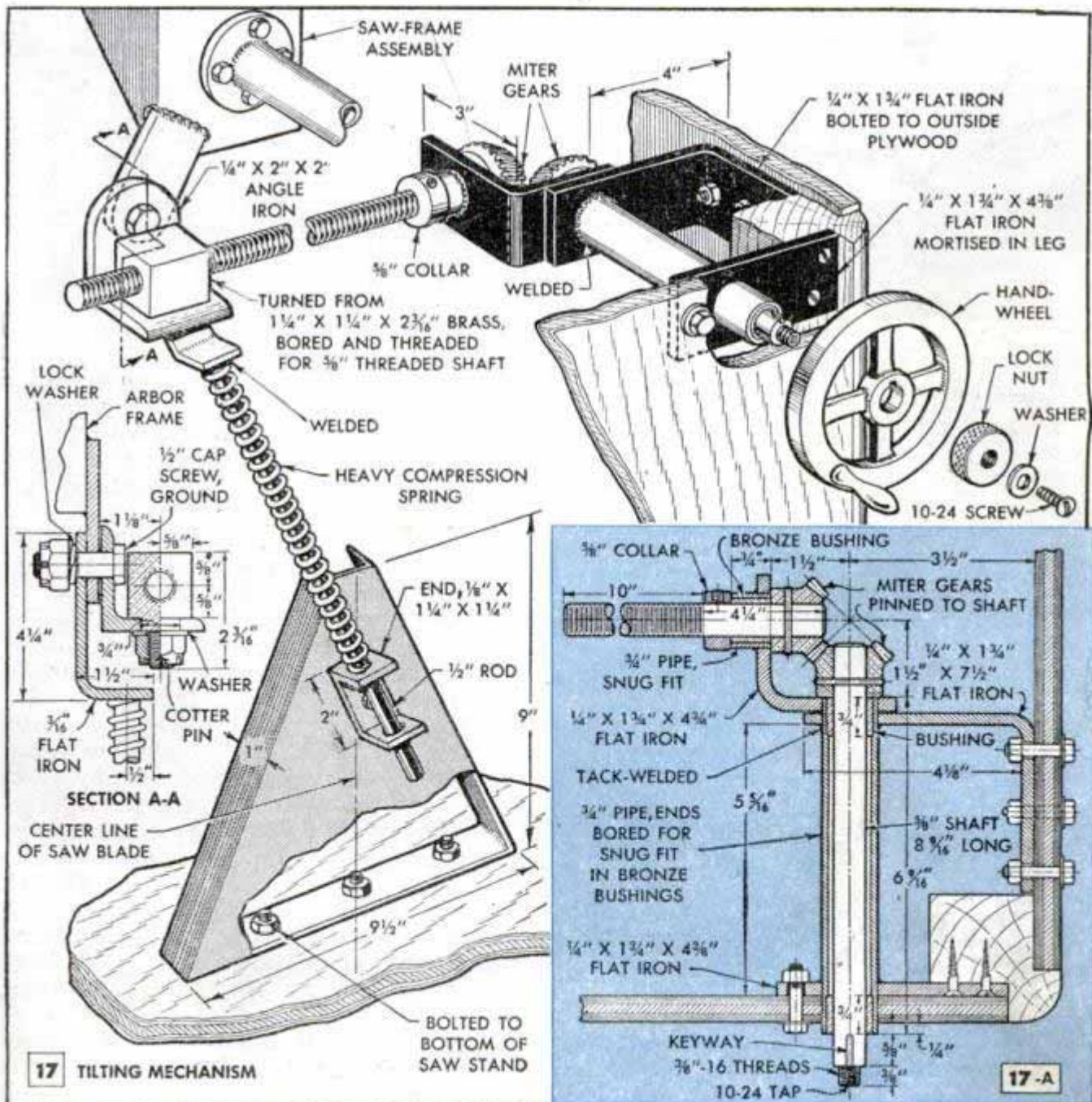
WITH THE SAW completed to the stage described in Part I, the assembly is ready for installation of the arbor-tilting mechanism, Fig. 17. Here the handwheel drives the tilting screw through miter gears which are $1\frac{1}{2}$ pitch diameter, 12 pitch, 18 teeth with a $\frac{7}{16}$ -in. face. A frame, assembled from flat iron, supports the handwheel-shaft housing and the miter-gear drive. As will be seen from Fig. 17-A, this frame consists of two angle brackets and one straight support piece, the latter mortised into the leg of the frame. Both the

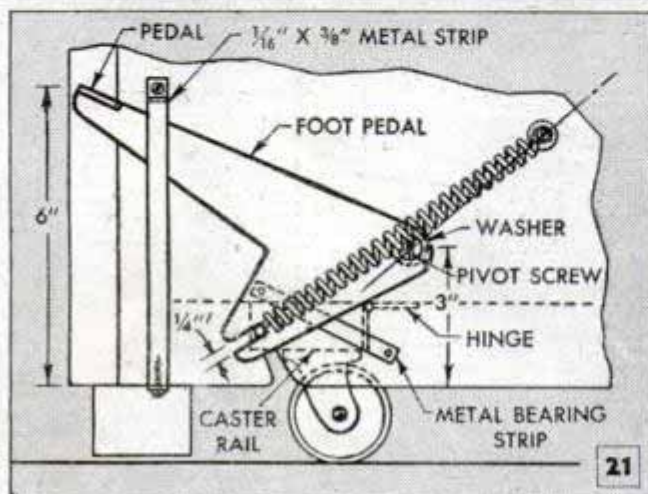
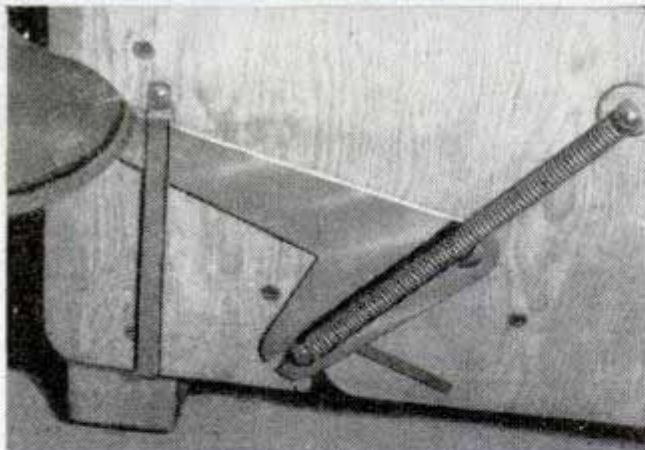
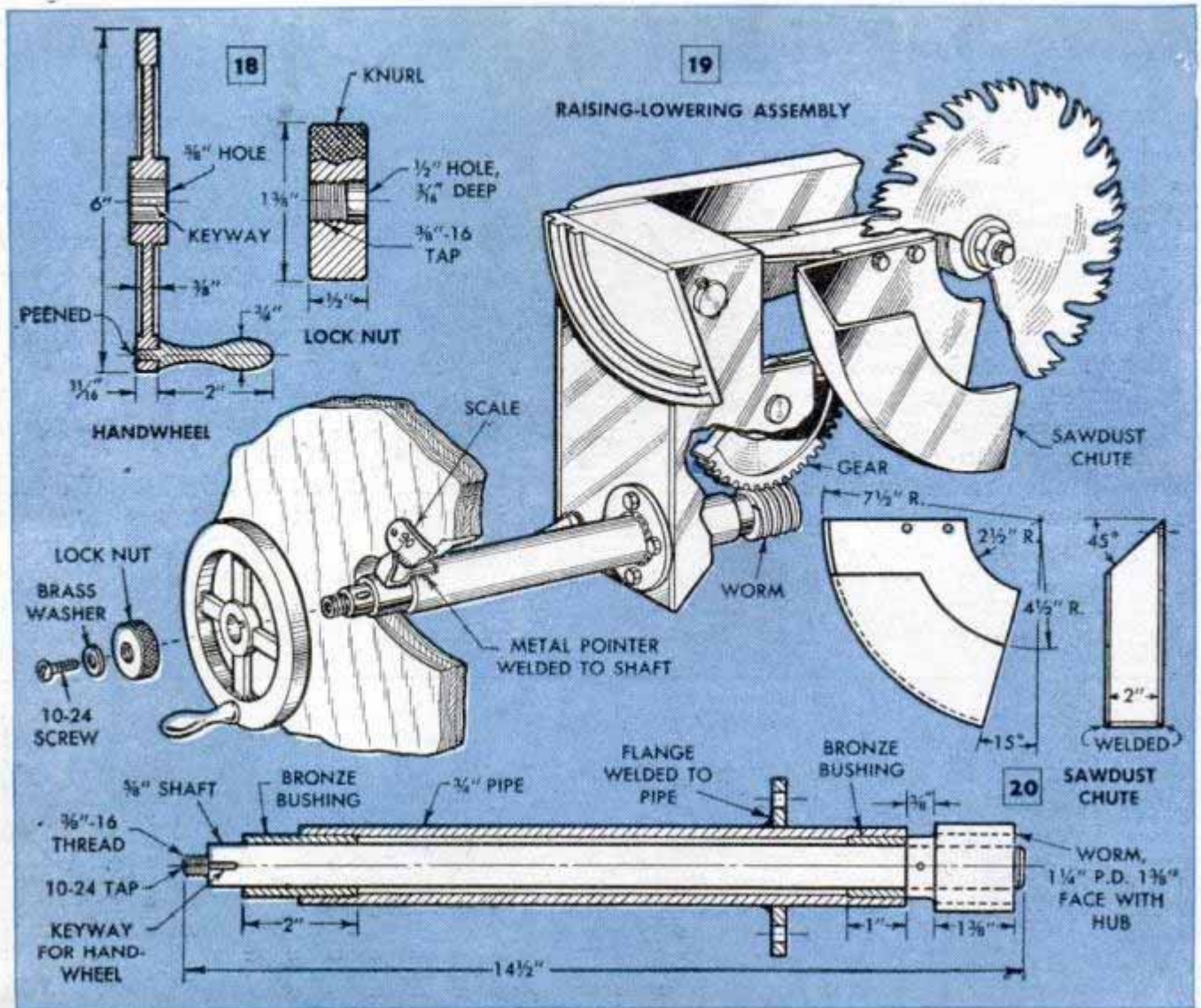
Part II



By Elman Wood

larger angle bracket and the flat support are slipped over the ends of the handwheel-shaft housing, bolted temporarily in place and checked for alignment. Then the pipe housings are tack welded to the brackets in the positions shown in the sectional view, Fig. 17-A. Bolts and screws hold these two parts in place when the assembly is made. Notice that the second angle bracket forms a frame for positioning the miter gears and that it pivots on the projecting end of the handwheel-shaft housing, Fig. 17-A. It is held in place by the driving miter gear,

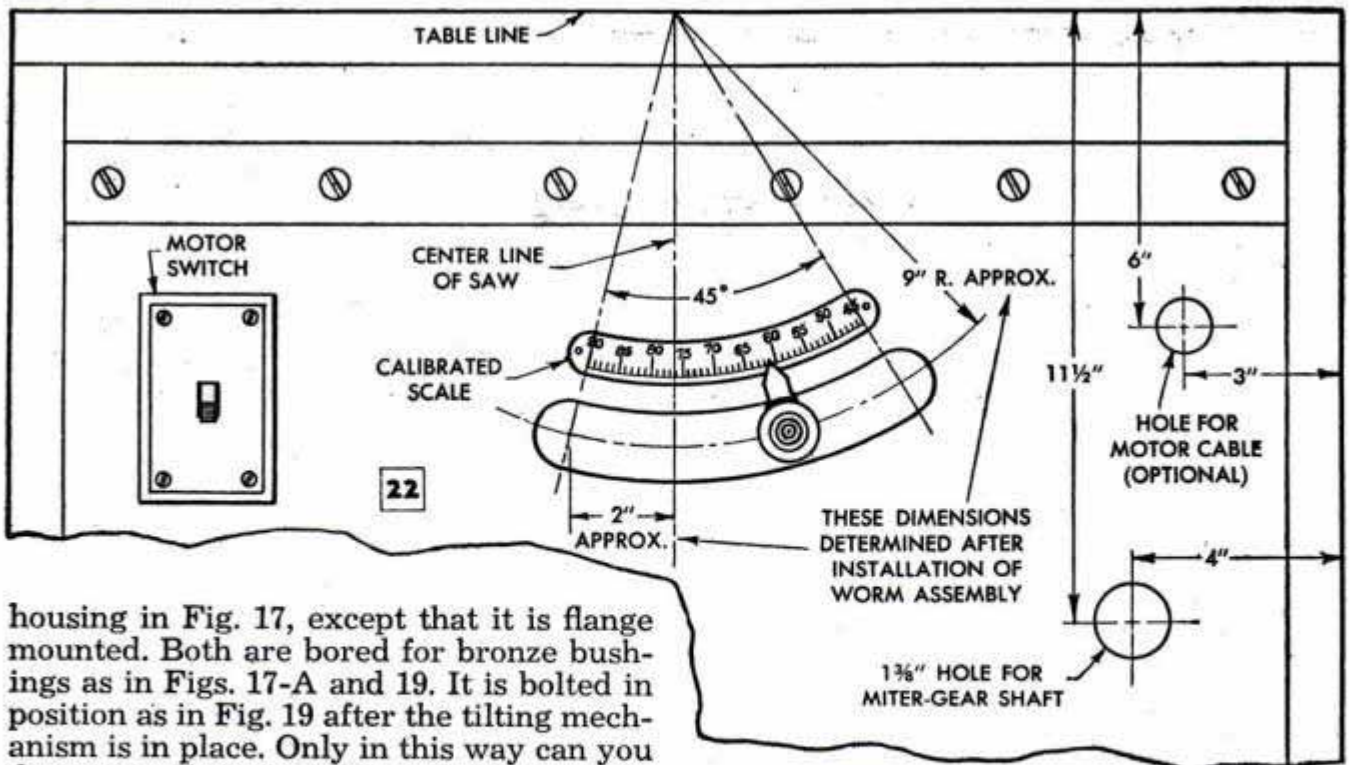




which is pinned to the handwheel shaft. Likewise, the driven gear is pinned to a threaded tilting shaft. Pivoted in this way the shaft and gears can swivel with the arbor frame when it is tilted to any angle up to 45 deg. The tilting shaft is threaded with a 5/8-11 thread.

The tapped block, into which the threaded tilting shaft turns, is bolted to an angle bracket that pivots on the tilting lug welded to the arbor frame. This end of the tilting assembly is carried on a spring-loaded toggle supported by a triangular metal bracket bolted to the bottom of the saw stand as in Fig. 17. The toggle partially supports the weight of the motor and arbor through the 45-deg. tilt and thereby eases the load on the tilting handwheel. The toggle-spring guide rod is welded to an angle bracket bent from flat iron and bolted to the tilting lug as in section A-A, Fig. 17. Handwheels and knurled lock nuts for both the raising-and-lowering and the tilting mechanisms are detailed in Fig. 18. Both are keyed to the shaft in the same way, Figs. 17 and 19.

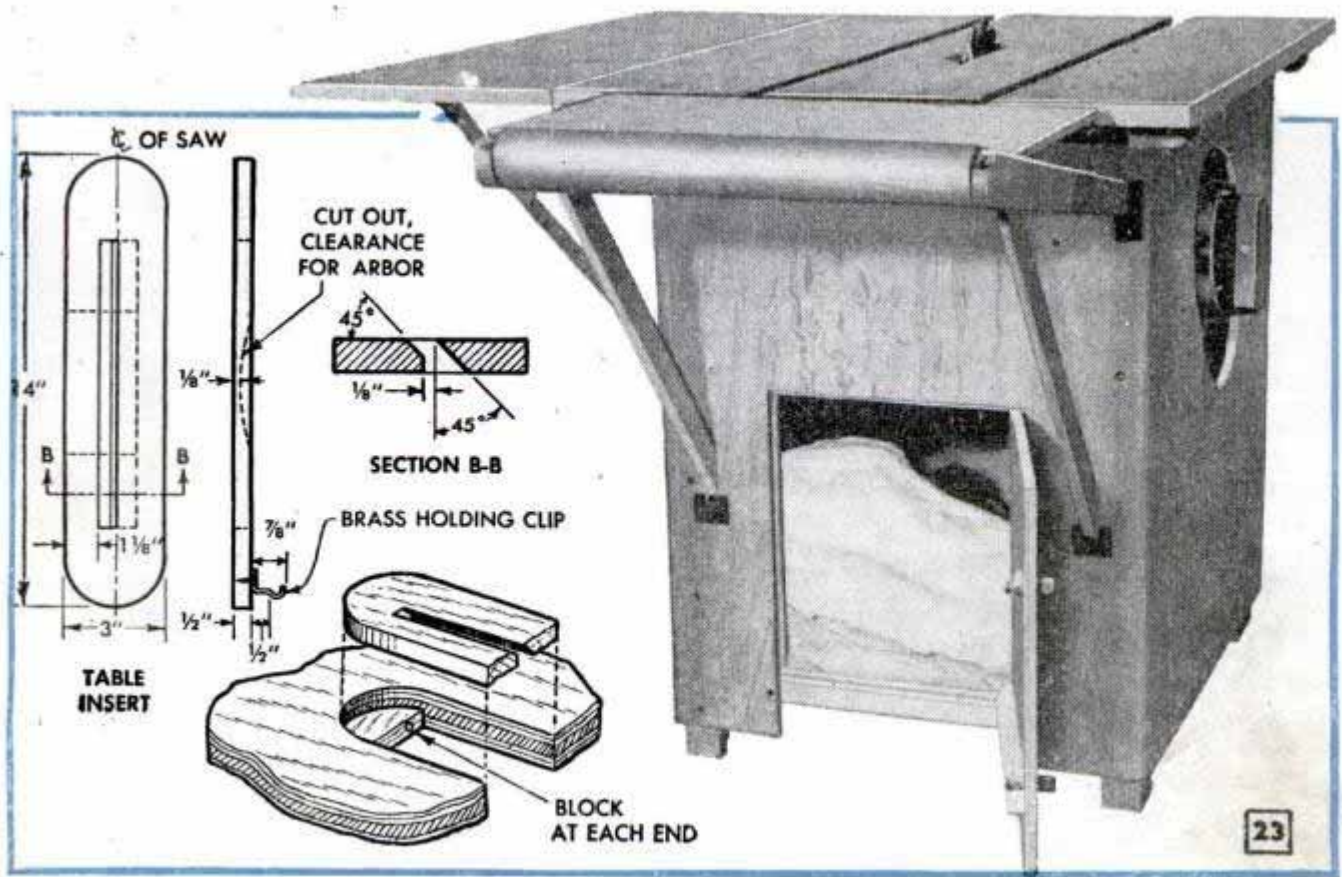
The worm shaft and housing, not fully described in Part I, is detailed in Fig. 19. It is similar to the tilting-gear shaft and

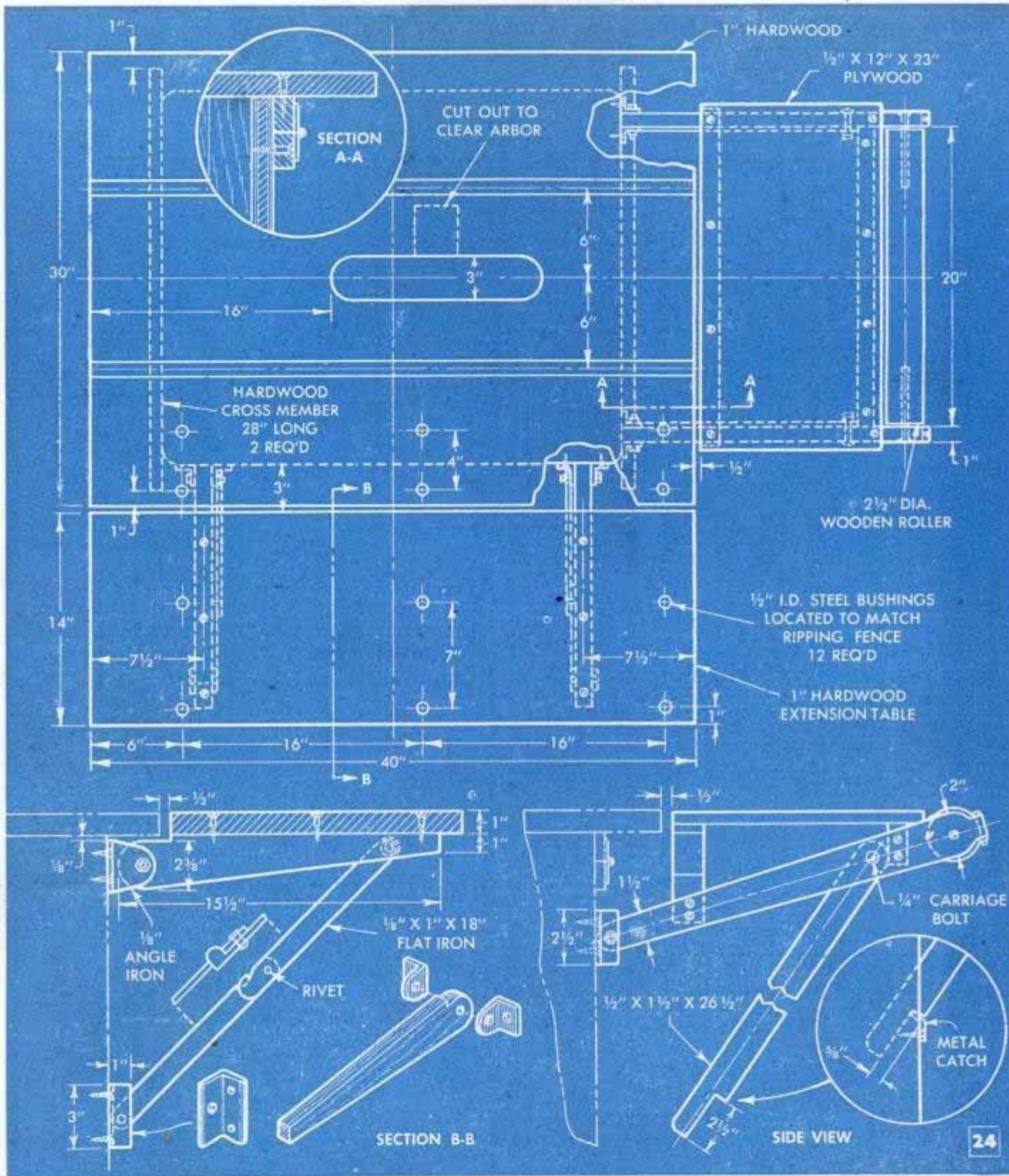


housing in Fig. 17, except that it is flange mounted. Both are bored for bronze bushings as in Figs. 17-A and 19. It is bolted in position as in Fig. 19 after the tilting mechanism is in place. Only in this way can you determine the exact dimensions and location of the curved clearance slot in the front panel of the saw base, Fig. 22.* The best way to determine the exact location of the curved slot and the location of the hole for the miter-gear shaft in the front plywood panel, is first to assemble the tilting mechanism, as in Fig. 17, with the flat support plate attached to the leg with screws, as shown. This will support the completely assembled mechanism in place. Then it is easy to determine the location of these openings in the front panel. After the

slot has been located and cut and the hole for the miter-gear shaft has been bored, the panel is screwed permanently in place.

The calibrated scale, Fig. 22, can be made from thin sheet metal with figures and divisions stamped into the metal by hand with a numeral stamp of the type used for stamping numerals on tools. For stamping the divisions, a 1/4-in. lathe bit ground to a blunt chisel edge will do. The degree scale must be laid out very accurately, and care should be taken when stamping not to cut





the numerals or divisions through the metal. To make the scale easy to read, coat the face with black enamel and allow to dry. Then follow with a thin coat of white. Wipe this off immediately with a single quick sweep of a dry cloth. This will remove all the white enamel except that in the indentations. After the enamel has dried, locate the 45 and 90-deg. positions of the saw blade and position the scale accordingly. Attach it to the panel with small screws. Cut a pointer from heavy-gauge sheet metal and weld it to the worm-shaft housing as

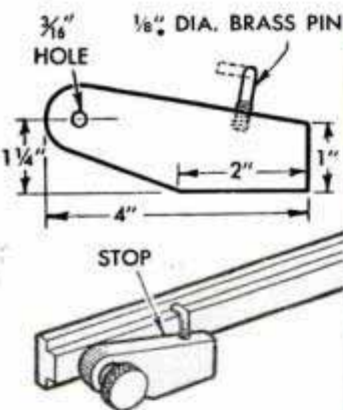
in Figs. 19 and 22. The sawdust chute, detailed in Fig. 20, is optional, its only purpose being to direct dust and chips to the rear of the enclosed base. If you do include the chute, make it from heavy sheet metal, welding where indicated in Fig. 20. Bolt it to the arbor frame in the position shown in Fig. 19 and be sure to allow for ample clearance when the saw is tilted 45 deg.

The table can be made from 1-in. plywood, but it is better to build it from strips of 1-in. hardwood doweled and glued. The most attractive job is made by gluing up

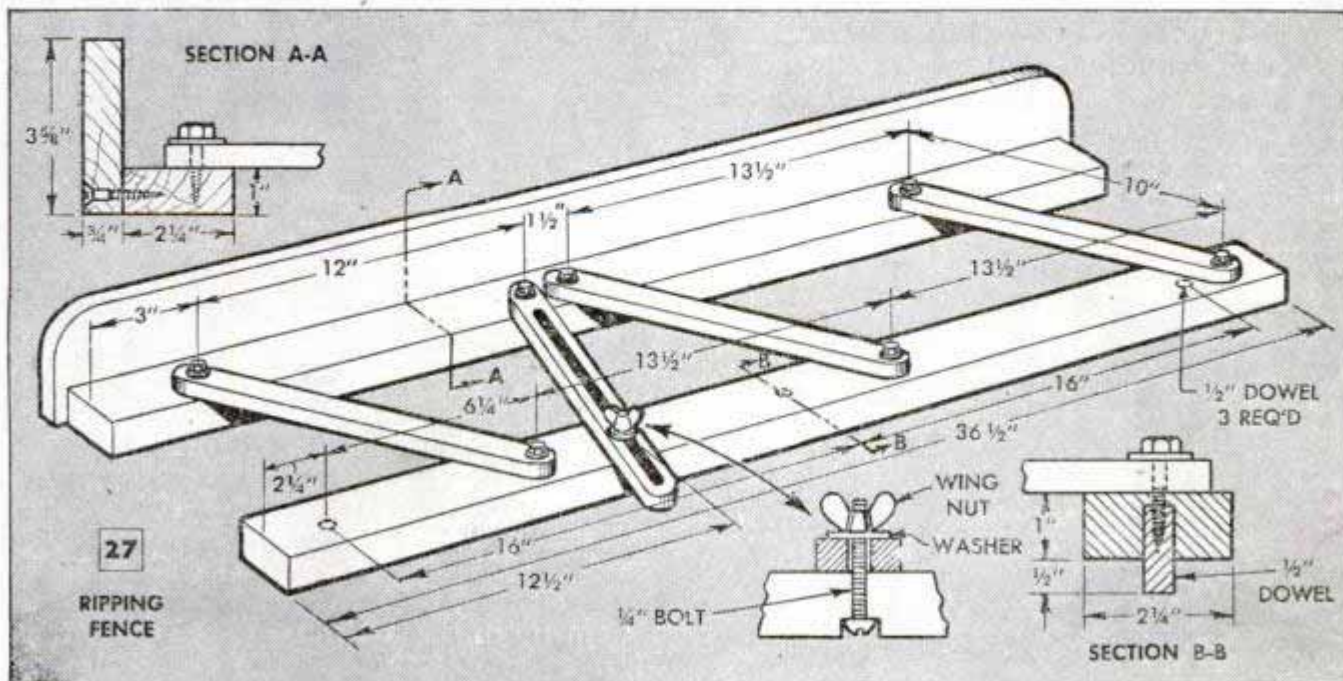
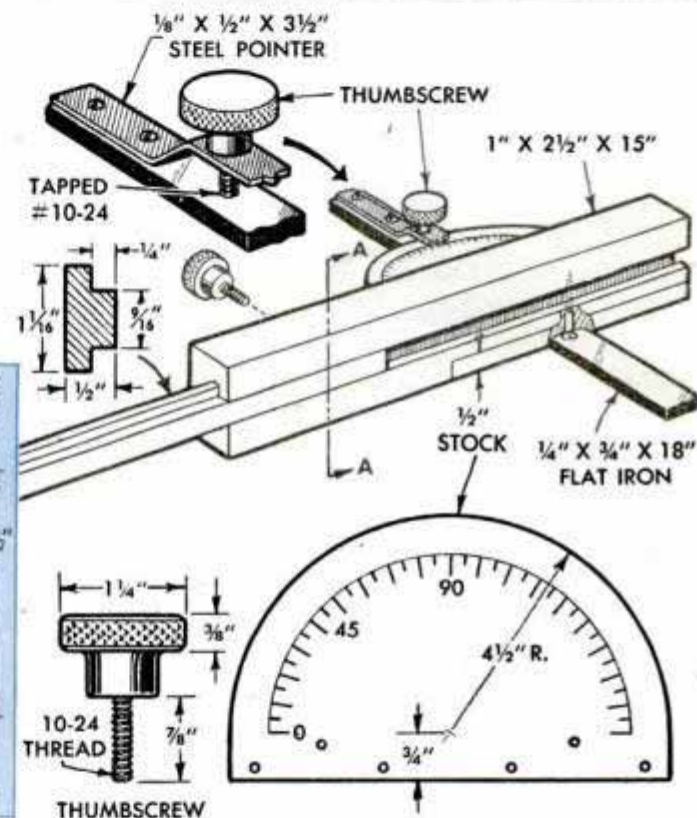
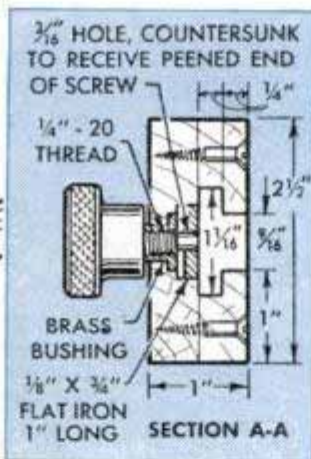
alternate 1 by 1-in. strips ripped from hardwoods of a contrasting color. Otherwise, using one wood such as maple, dowel and glue together 1-in. strips, each no wider than 2 in., to make the required table width as given in Fig. 24. Make the extension drop leaf in the same way and of the same material. After gluing, run grooves for the crosscut guide and cut an opening for the blade insert as in Fig. 24. Make and fit the insert as detailed in Fig. 23. Attach the table to the base as in Fig. 24, section A-A, checking to assure that the crosscut-guide grooves are aligned with the blade. Fig. 24, section B-B, shows how the side extension is mounted on the saw base. The back extension, Fig. 24, is optional equipment.

Use a regular crosscut guide or make one as in Figs. 25 and 26. Details on the hardwood ripping fence, Fig. 27, are self explanatory. Casters detailed in Fig. 21 also are optional. The lifting mechanism for each set of casters is fitted on diagonal corners of the base.

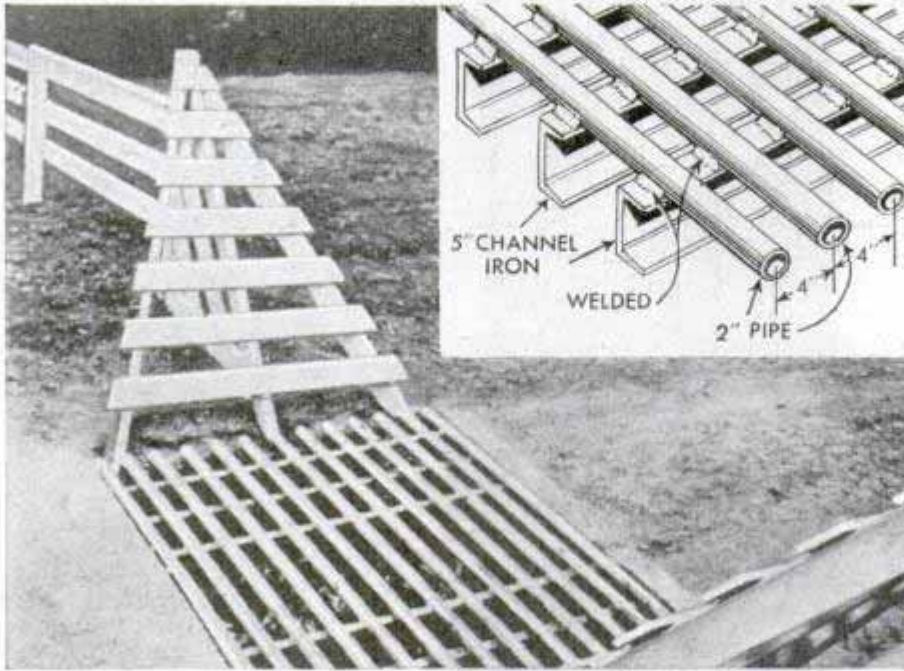
(The End)



26 CROSSCUT GUIDE WITH STOP



Cattle Guard Eliminates Need for Gate On Road Running Through Pasture



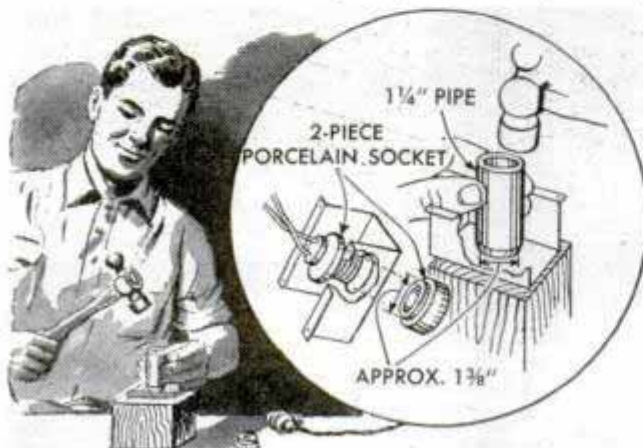
On large farms and ranches, where private roads and little-traveled highways run through pasture or grazing land, this guard will keep cattle confined to fenced-in fields. It will save a lot of time for farmers and ranchers who, otherwise, would have to open and close gates when driving or walking from one field to another. To make and install the guard, dig a trench approximately 6 ft. wide, long enough to extend across the road and several feet deep. Line this with concrete slabs or blocks and embed the ends of six 5-in. channel irons to serve as cross members. Space the channels so they will bear

Locating Cracks in Machinery

Often it's difficult to find small cracks in machinery castings and, although invisible to the naked eye, in time they can cause serious breakdowns or accidents in the shop. To detect minute cracks, a thin mixture of gasoline and red lead will be helpful. Wipe clean the surface to be tested and apply the solution. After the mixture has evaporated, go over the machine with a clean rag. If any cracks are present, they will be marked by a thin line of red lead.

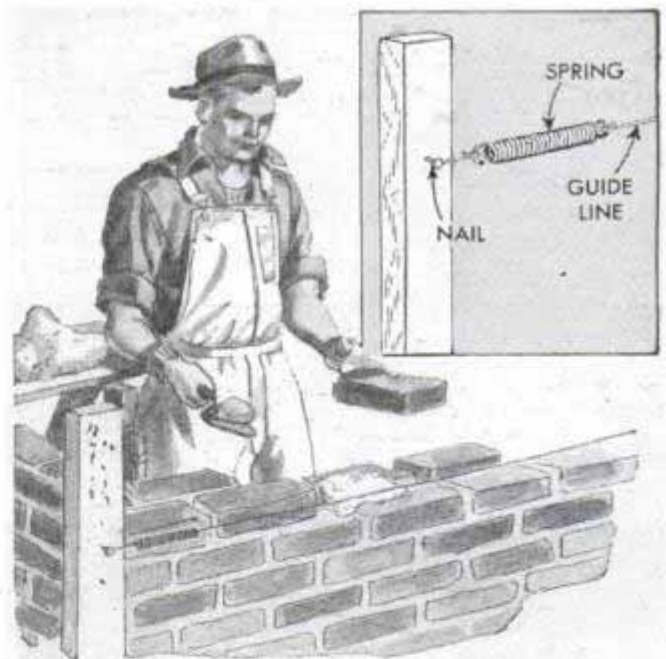
Installation of Porcelain Sockets Speeded With Hole Punch

Having the job of installing a number of 2-piece porcelain sockets in a sheet-metal trough to be used as a lighting fixture, one workman made a punch to cut the holes and speed the job. For these particular sockets, 1¼-in. steel pipe was used for the punch, one end being ground to a sharp cutting edge.—J. Modroch, Danbury, Conn.



equally the weight of vehicles crossing the guard. Then cut 13 lengths of 2-in. pipe and weld them to the tops of the channels, spacing them on 4-in. centers. The base of the fence should extend to ends of the guard.

Springs at End of Guide Line Serve to Keep it Taut

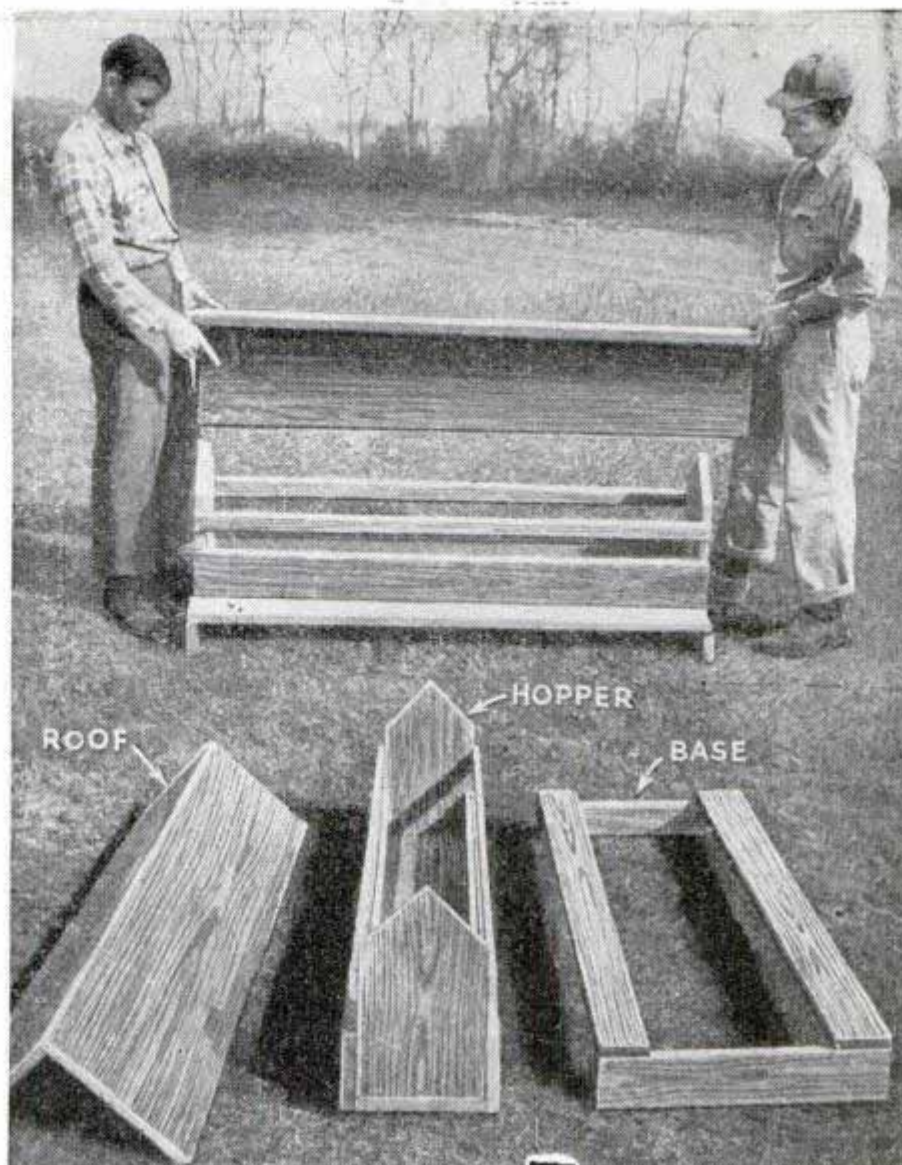


Small coil springs attached to the ends of a guide line and fastened to wooden uprights, will keep the line tight when laying bricks or concrete blocks. Without the springs the line will sag and stretch.

☐ If the tip of a screwdriver is coated with valve-grinding compound, it is less apt to slip when being used.

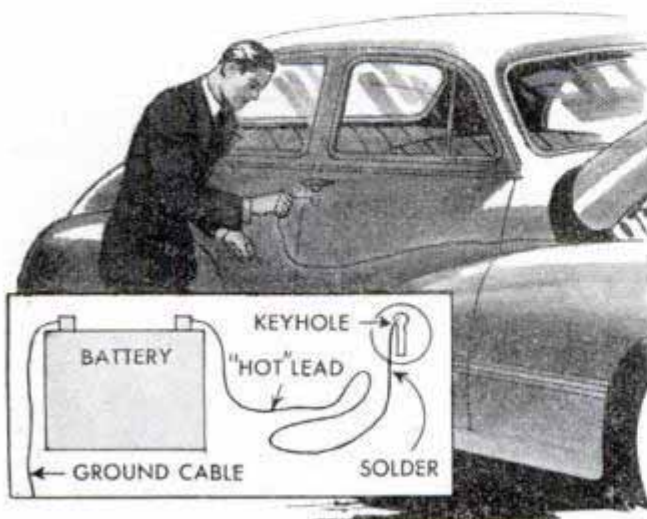
Feeder for Pullets On Range

Two outstanding features of this range feeder for pullets are the overhanging roof, which will keep feed fairly dry, even in a driving rain, and the base, which supports the hopper off the ground and provides perches from which the birds can feed. Because the feeder comes in several sections, it is easy to dismantle for cleaning. No construction dimensions are given, but the unit shown is 5 ft. long and will hold a day's supply of feed for about fifty growing pullets. Note that the base should be about 3 or 4 in. high to keep the hopper far enough off the ground. Allow sufficient roof overhang, but do not make it so low that it will interfere with feeding. When used with a 9 by 12-ft. shelter, three feeders accommodate 125 to 150 birds. — Norman R. Clizer, Columbia, Mo.



"Hot" Wire Removes Broken Key From Car Lock

If you have ever "fished" unsuccessfully for a broken ignition key, either in the door or the ignition lock, you can appreciate any simple method of removal. Here is the way one mechanic does it in a matter of seconds: Bare the ends of a piece of heavy insulated wire which is long enough to reach from the car battery to the lock. Attach a



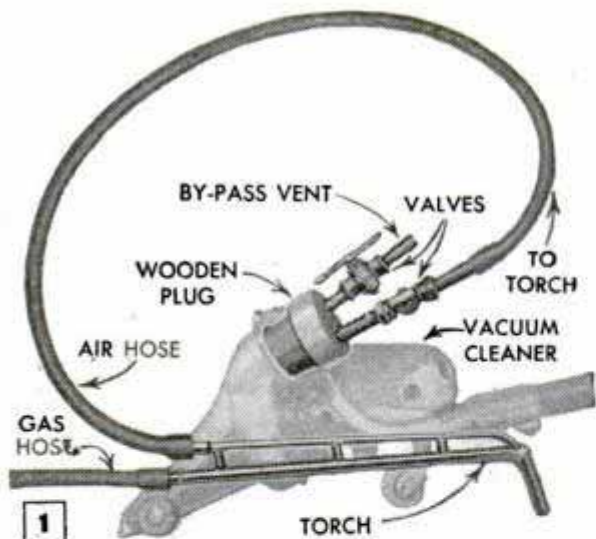
short length of wire solder to one end of the insulated wire. Trim the free end of the solder to a long point and wrap with friction tape, leaving only about $\frac{1}{8}$ in. of the pointed end exposed. Have a helper hold the other end of the wire on the ungrounded post of the battery by pressing it against the post with a piece of wood to make good contact. Then insert the solder tip into the keyhole, being careful not to let it touch any part of the lock. The instant the solder tip touches the end of the broken key, a "dead" short will melt the solder and "tack" it to the key. At the same time the helper must release the wire from the battery post, otherwise heat from the short will continue to melt the solder and may cause it to flow into other parts and "freeze" the operation of the lock. Care must be taken to avoid this possibility.

Frederick W. Jenchen, Englewood, N. J.

☐ To clean and oil a metal straightedge used for trimming wallpaper, use steel wool and petroleum jelly. This is better than using oil, which may stain the paper if the straightedge is not cleaned thoroughly before it is used.

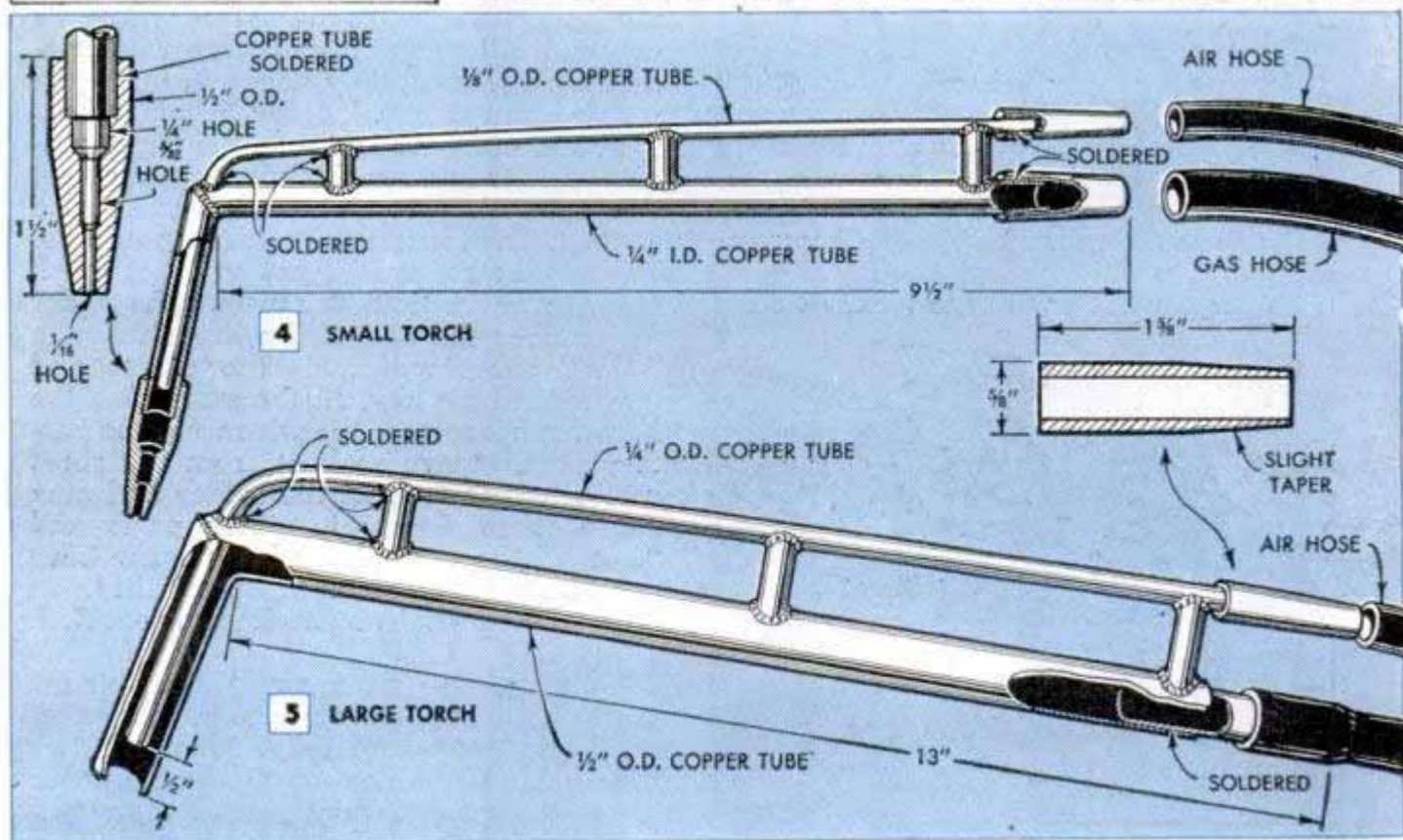
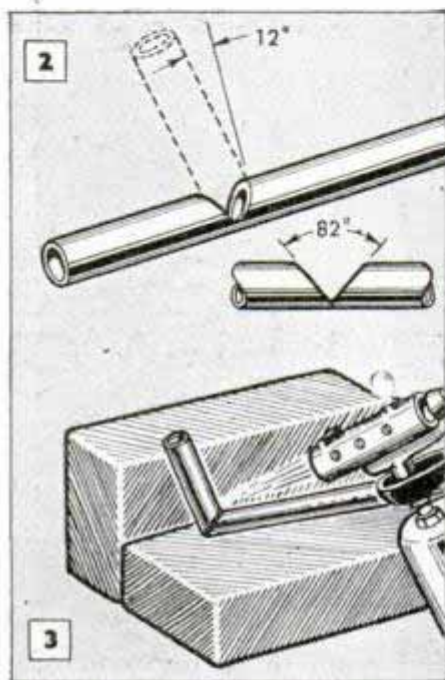
BRAZING TORCHES USE

A vacuum cleaner supplies air for operating these simple gas torches, which are designed in two sizes to cover the widest range of light brazing, silver soldering, soft soldering, annealing and hardening



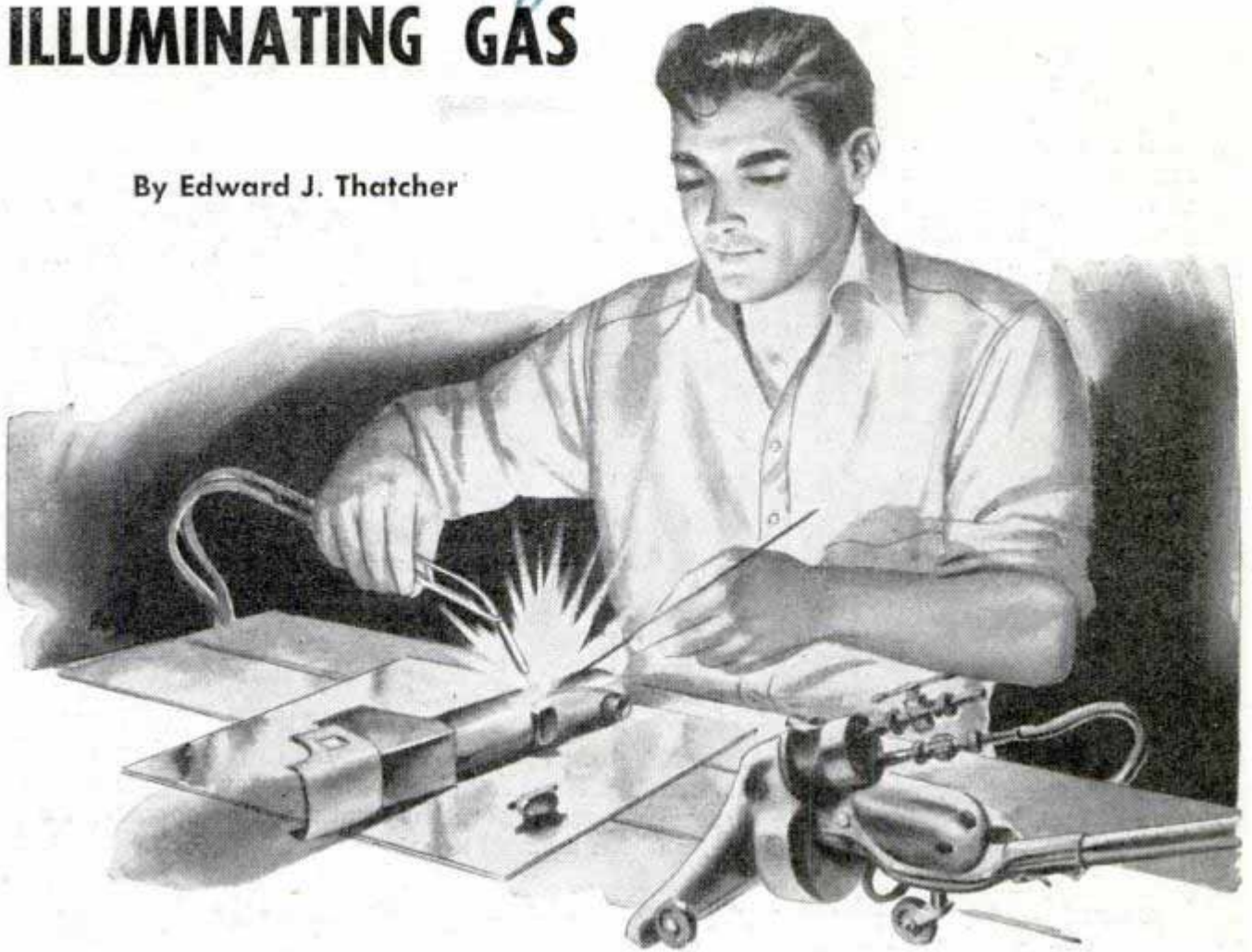
CONNECTED to any source of illuminating gas and supplied with air from a vacuum cleaner, these torches give sufficient heat to handle any ordinary brazing job. Silver soldering, soft soldering, annealing, hardening and tempering also can be done with either size. The torches will not operate on acetylene gas or "bottled" gas.

Both torches are very similar in construction, the only essential difference being in the size of copper tubing used to conduct air and gas to the tips. Figs. 4 and 5 detail the construction. It is impractical to bend tubing to the sharp radius required to form the torch tip, so to save time simply cut an 82-deg. notch in the tube as in Fig. 2. Be careful not to cut into the wall of the tubing at the bottom of the notch. Leave the wall full thickness at this point. Then bend to the position shown by the dotted lines in Fig. 2, and silver solder the joint as in Fig. 3, using a gasoline blowtorch. Place the work on a couple of bricks while heating the joint. The air tubes can be bent by hand to the required radius. Drill a hole just back of the joint in the gas tube for insertion of the air tube. It is important that the air tube project into the tip of the large torch the distance shown in Fig. 5 and that it be exactly centered in the larger gas tube. Wedge it in place before silver soldering the joint at the point where it is inserted



ILLUMINATING GAS

By Edward J. Thatcher

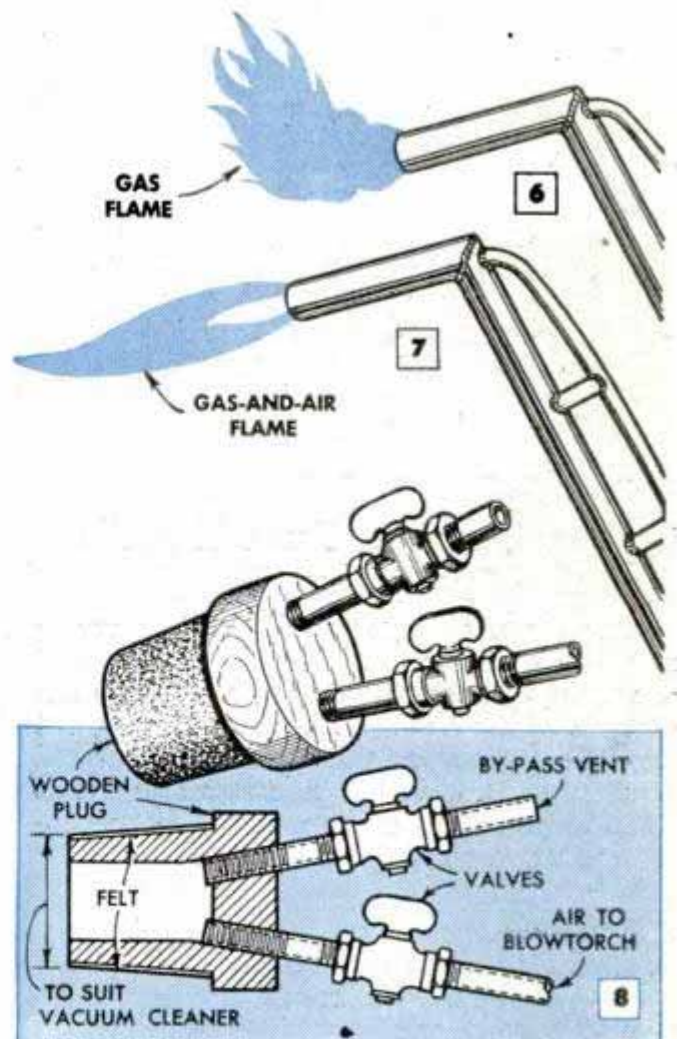


in the gas tube. Joint should be gas-tight.

The three spacers along the length of each torch between the air and gas tubes are short lengths of tubing, silver soldered to both tubes to hold them securely in position. The small torch, Fig. 4, has a separate tip counterbored in four steps as shown in the sectional view. This tip is silver soldered to the gas tube after the latter has been formed.

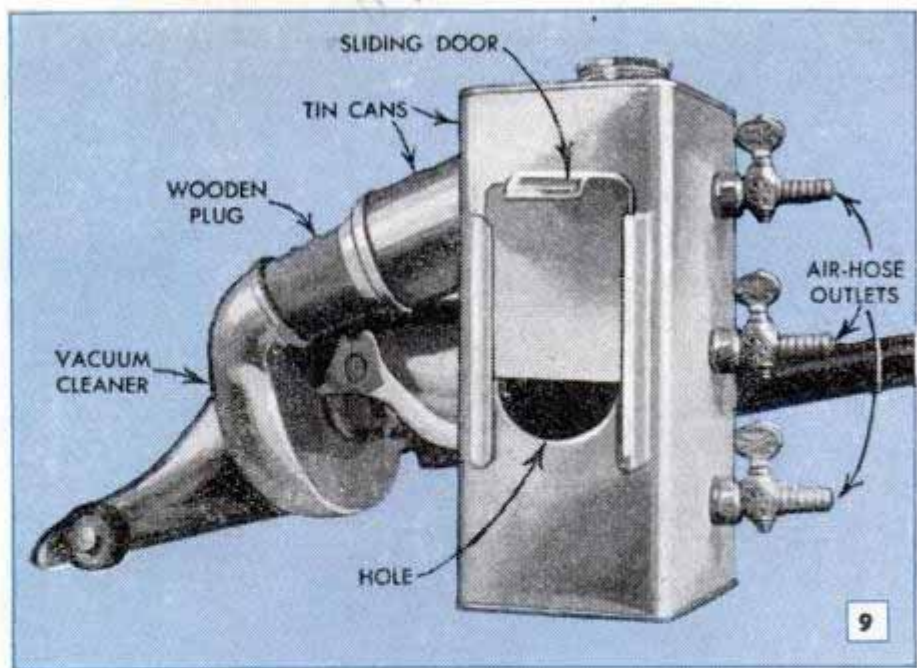
The air and gas tubes on both the large and small torches are fitted with tapered sleeves turned from thick-walled brass or copper tubing. These are silver soldered to the tubes as in Figs. 4 and 5. Note that one sleeve fits inside the gas tube, Fig. 5. Tapered ends of the sleeves make it easier to connect the lengths of rubber hose which bring gas and air to the torch.

The vacuum cleaner is used without any alteration except for the removal of the dust bag. A wooden plug is turned to fit into the outlet for the dust bag as in Figs. 1 and 8. The tapered end of the plug is covered with felt to prevent air leaks. Two air outlets, each consisting of a pipe nipple, a short length of pipe threaded at one end, and a valve, are turned into holes drilled in the outer end of the plug as in Fig. 8. One serves as a by-pass for excess air. The air hose from the torch is connected to the other. Where more than one torch is to



be operated from the same vacuum cleaner, make an air regulator from a gallon can as in Fig. 9. The sliding door in the regulator provides a means of controlling the volume of air supplied to the torches, by-passing the excess through the opening cut in the can.

To use the torches, connect the respective lines to the gas and air, close the air valve at the cleaner and open the by-pass valve. Turn the gas on and light it at the tip, Fig. 6. Turn down until a fairly small flame is produced. Then slowly turn on the air, with the by-pass valve on the cleaner open. Close the by-pass valve slowly, stopping when the pointed flame turns blue as in Fig. 7. Too much air will reduce the heat of the flame and may cause it to "pop" out. It will take some experimenting to produce the proper flame, as



the air pressures are likely to vary with different cleaners.

With proper adjustment, the smaller torch gives a fine, needle-point flame that is ideal for close work on jewelry or model parts where the heat must be concentrated in a small area.



Numbered Strip Pasted on Ruler Helps Check Invoices

Checking invoices or bills can be speeded by using an indicating ruler that will show at a glance the number of items on the bill. Type a vertical row of numbers, 1, 2, 3, etc., on a strip of paper or cloth tape, having them coincide with the spacing of the lines on the invoice to be checked. Then paste the paper on the ruler so that it will not cover the regular markings. Place the ruler as shown in the detail to read the number of items contained in the invoices.

J. G. Schad, Pittsburgh, Pa.

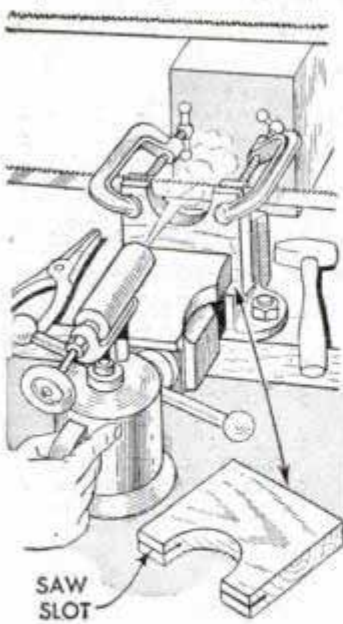
Carbon Removed From Threads By Using Spark Plug

When spark plugs are difficult to screw into the cylinder head and will not seat properly, this may be due to carbon on the threads of the opening. To correct this, cut two V-slots across the threads of an old spark plug, remove the insulator and use as a tap to clean out carbon. It will be necessary to use a wrench on the tap.

☐ If you want to store turpentine for any length of time, keep it in a glass jar. Otherwise, particles of rust from a metal container may become mixed with the turpentine.



Bandsaw Blades Are Brazed By Using Slotted Jig



To prevent rapid dissipation of heat, braze bandsaw blades in a wooden jig. Cut a hardwood piece 4 in. wide and about 6 in. long and slot one edge to a depth equal to $1\frac{1}{2}$ times the width of the blade. Then cut a semicircular opening in the grooved edge, centering the opening between the ends of the piece. Bevel the ends of the blade so that they

lap. Place the blade in the jig as shown, centering it in the opening and hold in place with small C-clamps as indicated.

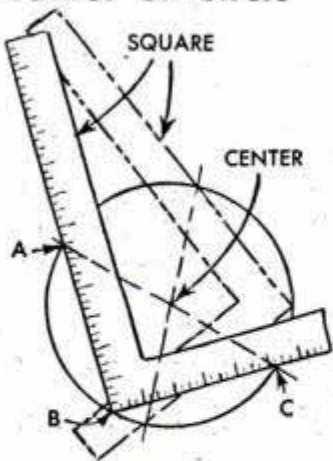
Geo. T. Hewitt, Salem, Ore.

Crochet Hook Handy Tool for Kit

To get at small, intricate parts of an automobile, keep a crochet hook in your tool kit. It will come in handy when removing clips that hold a distributor cap in place or it may be used to "hook" small springs that are part of lightweight rod and lever mechanisms.

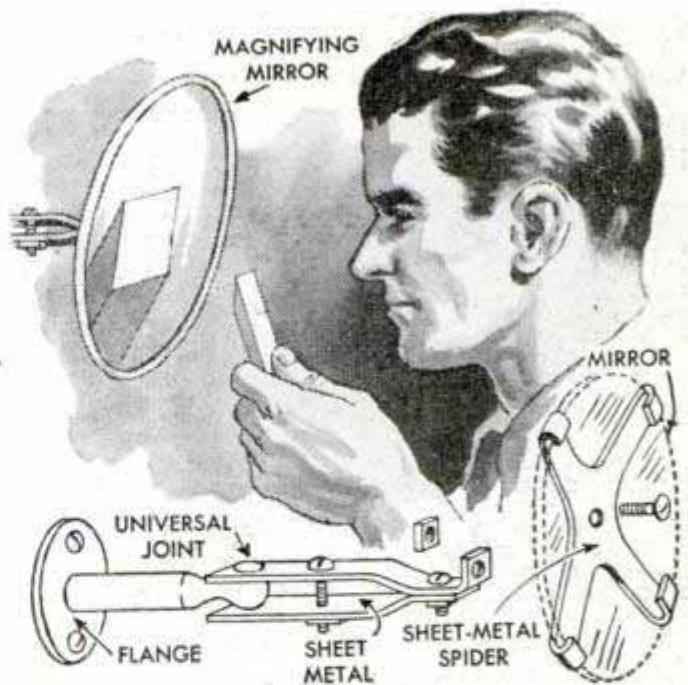
Fred R. Brewer, Colorado Springs, Colo.

Carpenter's Steel Square Locates Center of Circle



It is easy to locate the center of a circle with a carpenter's square—any circle that the tongue and blade of the square will span. Place the square over the circle in the first position as shown by the solid lines in the detail, with the outside angle or "heel" of the square touching the circle at B. Then mark the points A and C. Turn the square over and place it in the second position shown by the dotted lines. Mark as before and join with pencil lines the points where the tongue and blade of the square bisect the circle. The point where these lines intersect will be the center of the circle.

square touching the circle at B. Then mark the points A and C. Turn the square over and place it in the second position shown by the dotted lines. Mark as before and join with pencil lines the points where the tongue and blade of the square bisect the circle. The point where these lines intersect will be the center of the circle.



Cutting-Tool Edge Examined With Magnifying Mirror

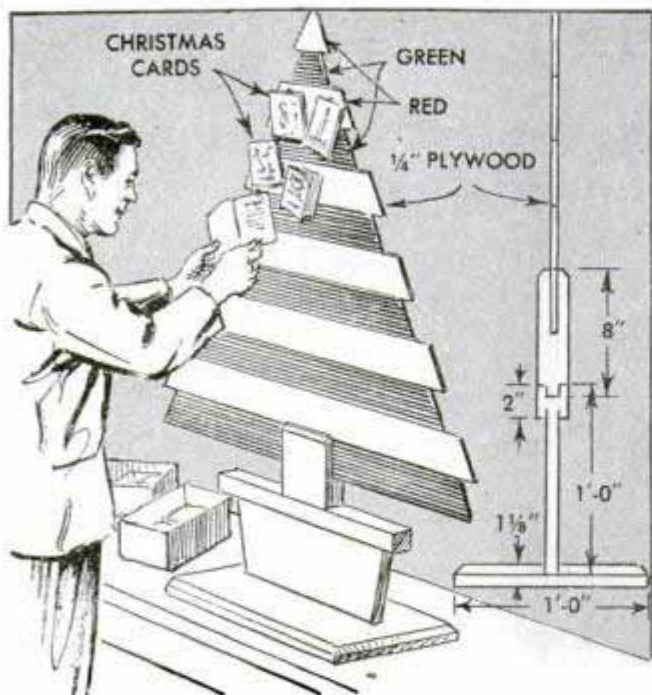
Determining whether a cutting tool has a fine edge is easier if the tool is examined in a magnifying mirror. In one shop, mirrors are mounted near grinding wheels for the use of machinists. To make the unit adjustable, it is mounted on a bracket having a universal joint and held by a sheet-metal clip.—Jack Bronte, Colfax, Calif.

Barbed Wire Unrolled Safely

Here's a safe and handy method of unrolling barbed wire when working alone. All you need are two 2 by 4-in. handles joined together with an "X" brace and drilled at one end for a pipe axle which passes through the spool of wire. Shaping the ends of the handles for a convenient grip, or fitting a broomstick across the ends, will permit the roll to be pushed or pulled to unroll the wire.



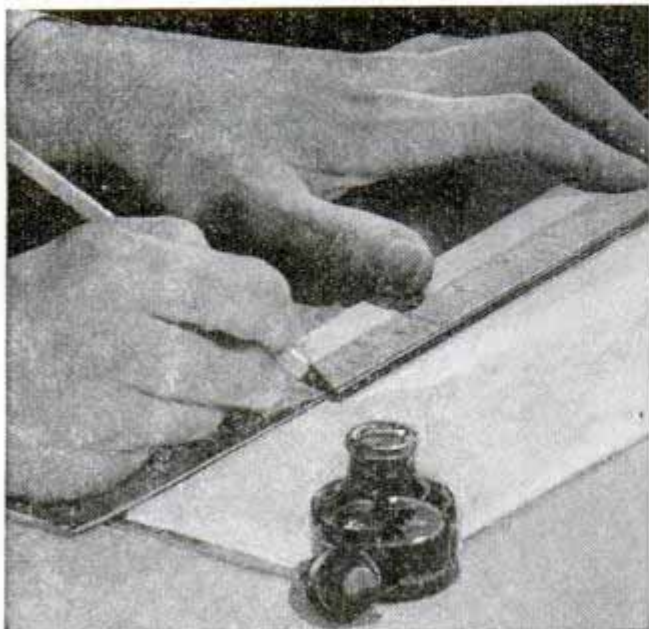
Greeting Cards Displayed Neatly On Plywood Christmas Tree



Instead of displaying greeting cards in the usual way, one merchant uses a number of decorative Christmas-tree cutouts on which the cards are mounted attractively as shown. A sample of each card on sale is thumbtacked to the tree so that it can be opened and read easily, and those selected are ordered by number. The trees are of $\frac{1}{4}$ -in. plywood, cut as indicated, and are supported by slotted trunks attached to wooden "flowerpots." Painted red and green, the trees are in keeping with the season and besides providing novel display racks, they add appropriate decoration.

Pointed Dowel Serves as Scriber

If the dimensions aren't too critical, a pointed dowel dipped in red ink can be used to scribe lines on aluminum and light-



colored alloy sheets. Of course, if the work must be exact, a metal scribe would be required, but once the line is drawn, it cannot be erased.

"Figure-Eight" Trigger Holder Keeps Safety-Can Lids Open

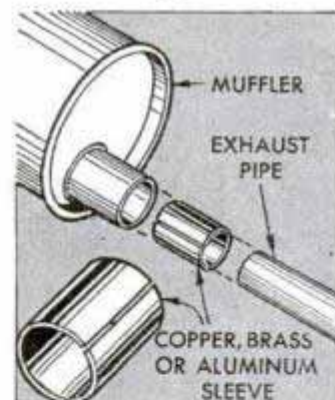
In one large paint department the problem of holding the lids of safety cans open for refilling was solved by using a simple holder bent from $\frac{1}{4}$ -in. steel rod to the rough figure-eight shape shown in the detail. The holder is slipped around one leg of the handle



used to open and close the spring-hinged lid by hand. The holder hook is shaped to keep the lid open when in this position. A slight twist of the holder releases the trigger and allows the safety lid to snap shut.

Sleeves for Muffler Connections Keep Pipes From "Freezing"

A manager of a truck fleet, who had considerable trouble replacing mufflers because of rusted connections at the exhaust and intake ports, found that by using sleeves of copper or other nonferrous metals, this trouble



could be avoided. The sleeves, which must be of very thin material, are formed to fit inside the projecting muffler connection at the intake end and outside the connection at the exhaust end. This prevents direct contact of steel to steel so that the parts cannot rust together.

John Krill, Youngstown, Ohio.

Fluid Saves Weather Stripping

To prevent weather stripping on auto doors and trunks from peeling off during cold weather, spread hydraulic brake fluid over the rubber strips with a small paint brush. Repeat the treatment whenever the rubber gives indication of becoming brittle.

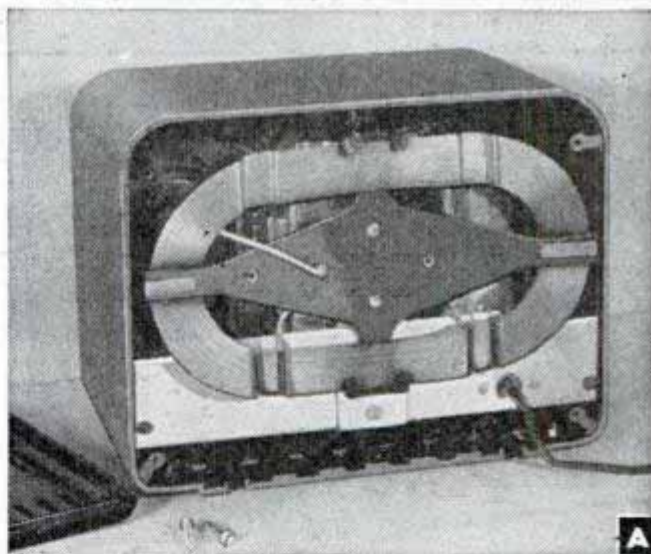
Russell L. Card, Tweed, Ont., Can.



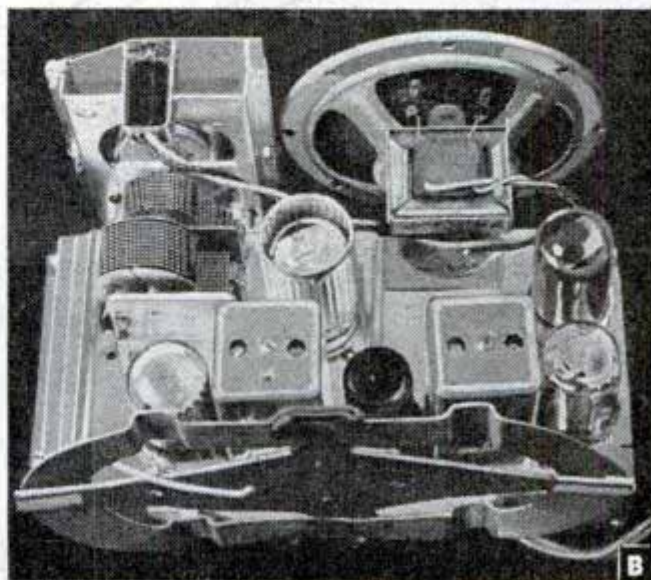
FIVE-TUBE A.C.-D.C. RECEIVER KIT FOR STUDENTS

AMONG the special features included in this new superheterodyne kit receiver for students and experimenters, there is an automatic volume control which reduces "blasting" on powerful local broadcast programs, and helps to prevent fading on weak distant stations. It employs a built-in loop antenna, and the illuminated dial is marked in kilocycles. Although the circuit is simple, it includes beam-power output and covers a frequency range of from 535 to 1620 kilocycles. The set is designed to operate efficiently on any 115-volt, 50-60 cycle a.c. line, or d.c. line of the same voltage. The line voltage is not critical and can vary from 100 to 125 volts; the power drain is claimed to be only 27 watts.

With all necessary parts, from plastic cabinet and speaker down to every screw and nut, it offers the student an excellent construction model in complete kit form. Photos A and B show rear and top chassis views of the completed receiver; a front view is shown in the top photo. Construction begins with the mounting of the tuning condenser and dial assembly on the chassis base. In diagram Fig. 1 the method of shock-mounting the tuning condenser is detailed at lower left; a 2 1/4 in. piece of flexible braided wire is soldered to the tuning condenser and to the sheet-metal chassis to provide a good ground. The "exploded" view shows all details for assembling the tuning dial; other circuit and pictorial wiring diagrams are included with the kit. As with all table-model receivers that employ a loop antenna, the loop is directional. If your favorite station is not as loud as desired, turn the receiver slowly until it comes in with maximum volume.



A



B

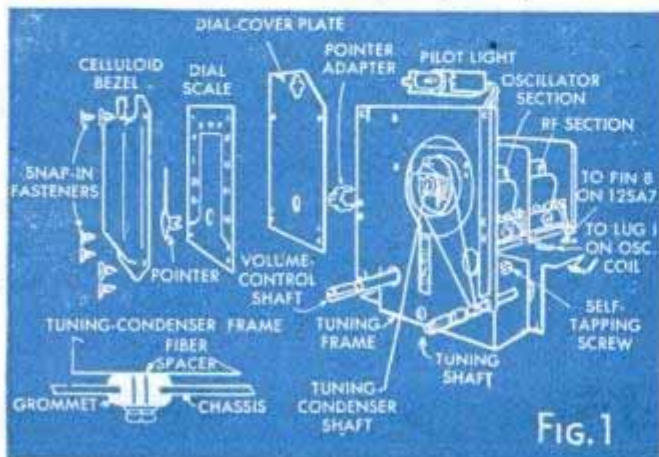
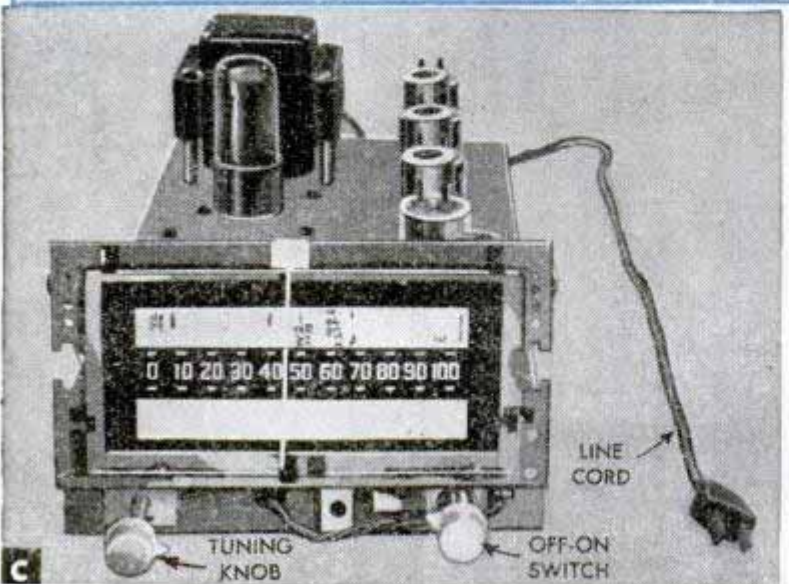
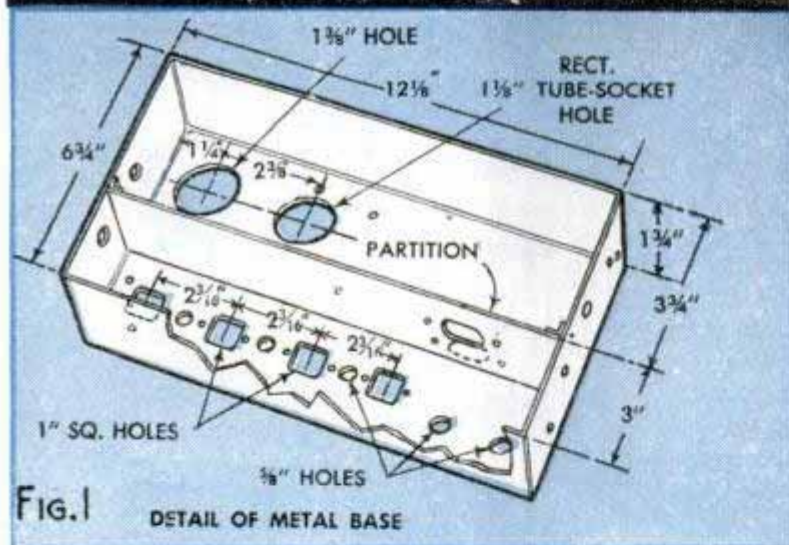
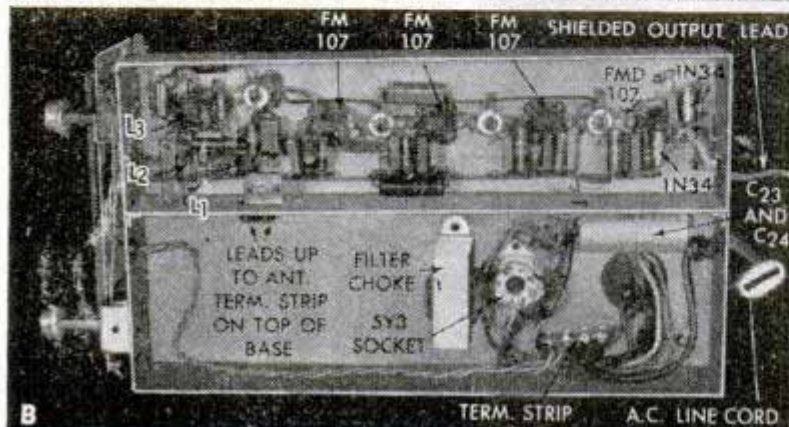
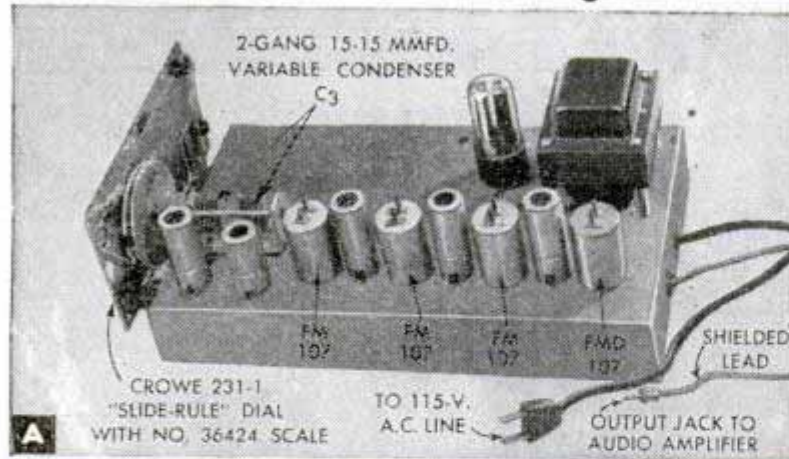


FIG. 1

High-Fidelity Self-Contained

By M. P. Langendorf



MINIATURE transformers designed for the new high-frequency FM band are now available to students and experimenters. Four of these tiny transformers are employed in this self-powered tuner, which provides excellent fidelity and sensitive reception on the new FM band from 88 to 108 megacycles. The completed tuner can be installed in the average console broadcast receiver, or it may be housed in a separate cabinet. It is merely plugged into the phono channel of the broadcast receiver in the same manner as you would use a separate record player.

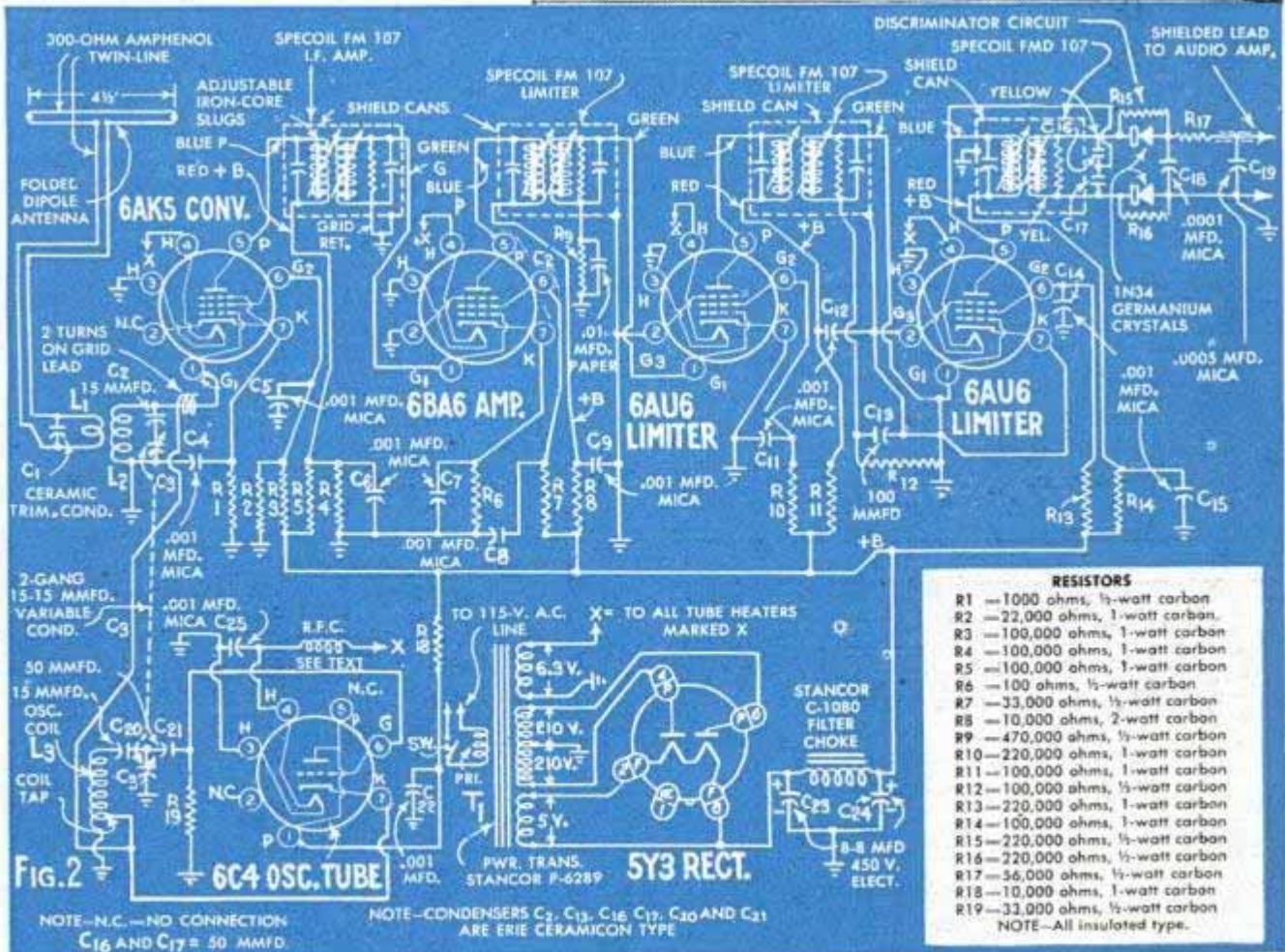
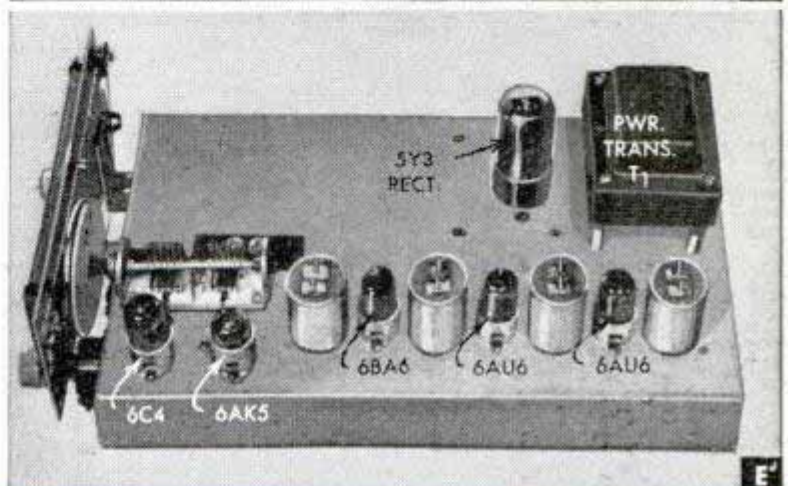
The small size of the Specoil FM transformers permits the necessary space saving where a number of them are used. The builder can place them close together, thus eliminating undesirable long leads. They are of the double-tuning type and employ adjustable powdered iron cores that tend to eliminate capacity effects when aligning. The frequency of these transformers is 10.7 megacycles. Although definitely not intended for beginners, there is nothing difficult about the circuit except that special care must be taken in winding coils L1 and L2, and the oscillator coil L3. These are hand-wound as follows: The R. F. tuning coil L2 consists of 5 turns of No. 14 copper wire, spaced the diameter of the wire, on a 3/8 by 2-in. polystyrene form, or a form of similar low-loss material; the self-supporting antenna coil L1 consists of one turn of No. 14 copper wire and is 5/8 in. in diameter with the coil ends and leads spaced 1/4 inch apart. Coil L1 is placed over coil L2 at about the center of L2, and the leads continue down the side and through the form near the end. The oscillator coil L3 has 7 turns of No. 14 copper wire; it is 3/8 in. in diameter and the winding is spaced the diameter of the wire. Oscillator coil L3 is wound on a 3/8-in. form and the form is removed as the coil must be self-supporting. Extreme care should be taken in winding these coils. Mount the coils directly under the 2-gang tuning condenser C3 and

Tuner for the New FM Band

the 6C4 tube socket so that the leads will be as short as possible. Photo B shows the coils in position on the underside of the chassis, the top view of which appears in photo A above. Please note that the oscillator coil L3 is mounted at an angle of 90 degrees with respect to coil L2. Photos C and E show other views of the completed FM tuner with the controls, miniature tubes and rectifier tube identified. The sheet-metal chassis base is detailed in Fig. 1 and the complete schematic circuit diagram appears in Fig. 2.

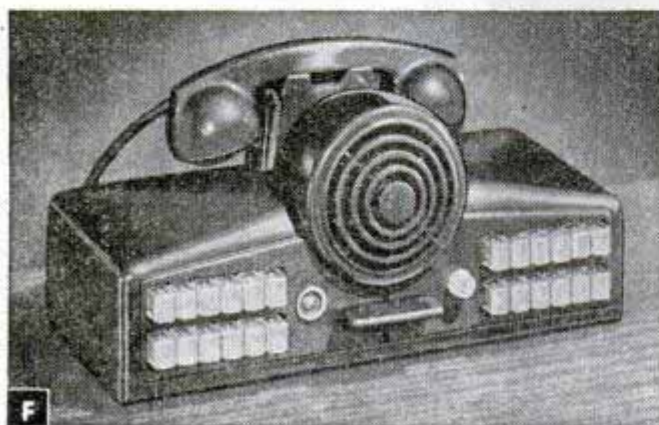
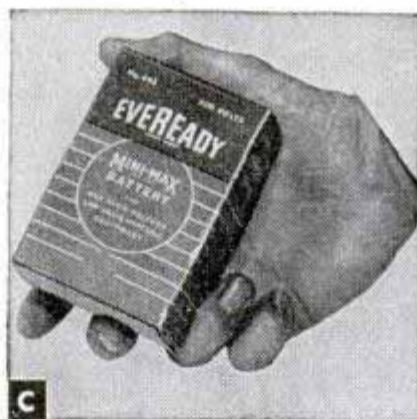
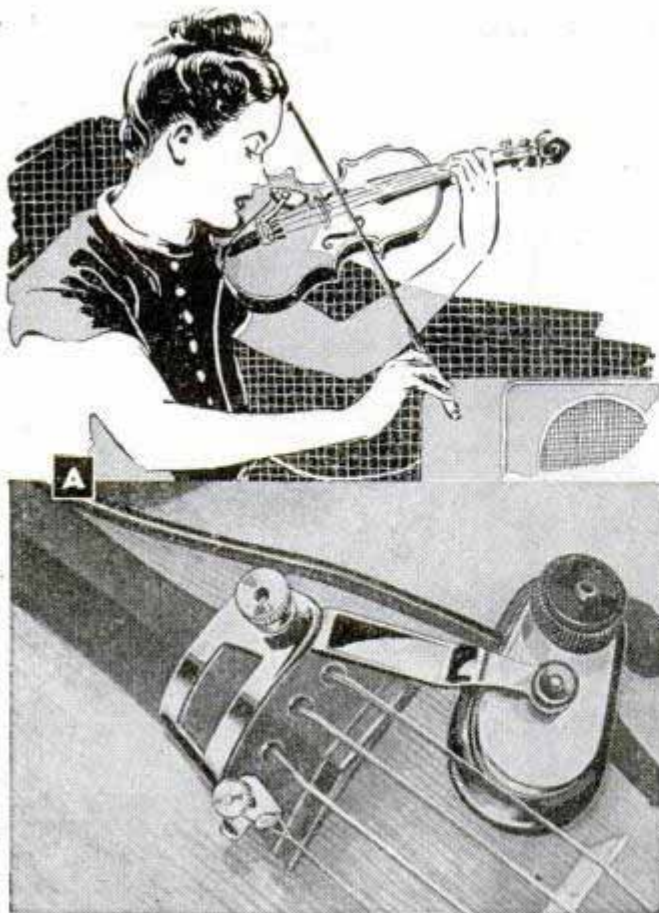
In order to insure absolute static-free reception, the I. F. amplifier has two limiter stages. The R. F. end of the tuner has separate oscillator and converter stages so as to provide stable operation at the ultra-high frequencies used in the new FM band. A Hartley-type circuit is employed with a 6C4 miniature triode tube; the R. F. amplification and mixing is provided by a 6AK5 miniature pentode tube. In the discriminator

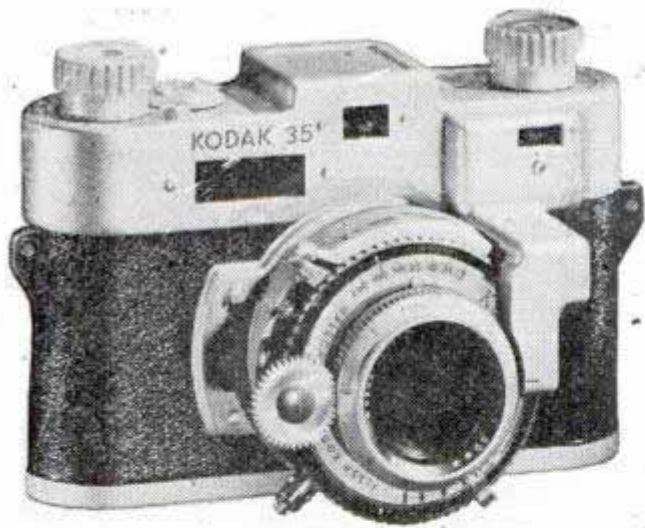
(Continued to page 234)



RADIO-ELECTRONIC HINTS

A—Pickup microphone clamps to tail-piece of violin without marring the instrument. It may be used with any audio amplifier; a miniature volume control enables the musician to adjust from light shadings to crescendos. **B**—Low-power inverter for operating a.c. phonographs and other small a.c. devices from d.c. voltage sources; available for various d.c. input voltages, for 110-volt a.c. output at 60 cycles. **C**—Tiny 300-volt dry battery for powering Geiger counters and portable photoflash devices. Six or seven may be connected in series to supply 1800 or 2100 volts. **D**—Frequency standard for mounting in communications-type receivers enables licensed radio amateurs to accurately check their band limits. **E**—Polystyrene stand-off insulators for installing Amphenol 300-ohm transmission lines, and television receiving lead-ins. **F**—Electronic business intercommunication system features visual busy signal and individual push buttons for station selection. **G**—Compact console phonoradio combination; "lift out" radio unit may be removed and used in other rooms.





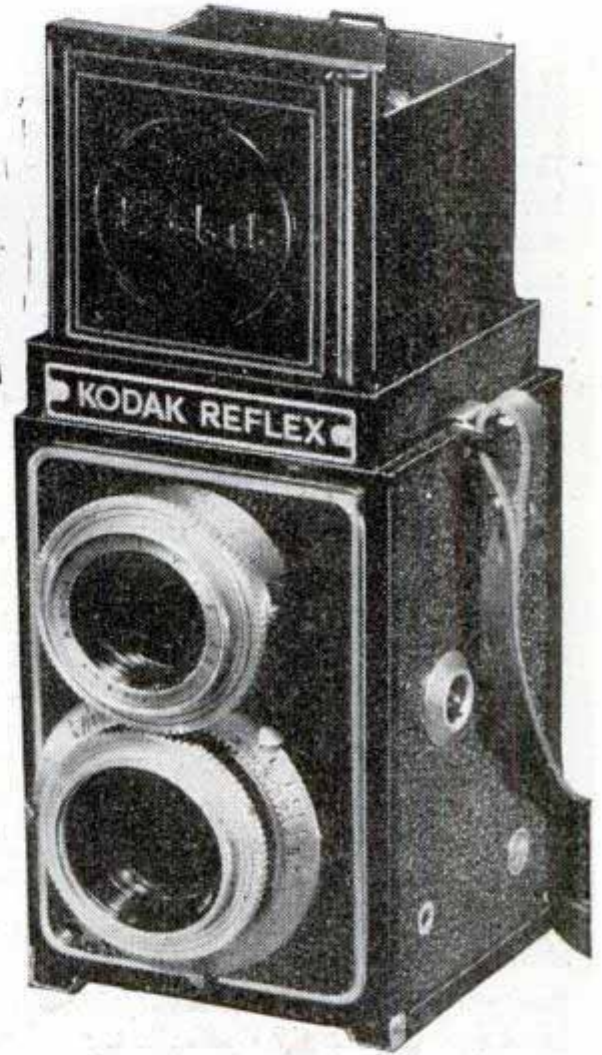
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A KODAK 35 CAMERA WITH RANGE FINDER. Brilliant 4-element $f/3.5$ lens, *Lumenized* to block ghost images; 1/200-second Kodamatic Shutter; built-in flash synchronization. Modern refinements include double-exposure prevention, automatic film stop and shutter-setting. Moderately priced.

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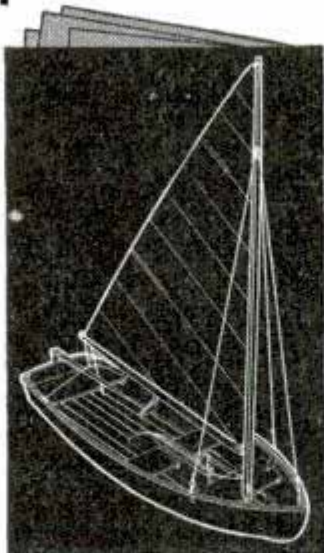


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She can be rowed, sailed, or powered with a light outboard. She's 12' long, 4'5 1/2" beam, seats 2 to 4.

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Please send me a complete set of plans for the "Sea Pup" at the regular retail price of \$2.50.

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CASCOPHEN

Durable Resin Glues for Boats

High-Fidelity Self-Contained Tuner For the New FM Band

(Continued from page 231)

circuit, two Sylvania 1N34 germanium-crystal diodes have been used instead of the conventional vacuum-tube diode. By using crystals as discriminators, a tube and socket are eliminated; also the possibility of hum pickup from the filaments of a vacuum-tube diode. These crystal diodes are tiny tubular-type units about the size of a small carbon resistor and are provided with pigtailed wire connections. They give superior performance at ultra-high frequencies and were developed for use in radar equipment during the war. All parts specified are available from radio parts houses, with exception of the chassis and hand-wound coils L1, L2 and L3.

The Specoil transformers are all pre-tuned and any slight aligning that might be necessary can be done with the screws on the tops of each transformer. These screws should be moved very slightly and then only after a station is tuned in. Beginning with the I. F. amplifier, adjust each coil for clarity and maximum volume; in most cases this should not be necessary if care has been taken in wiring to keep all grid and plate leads short. All filament leads should be dressed into position and lined down one side of the chassis. Positive B leads should also be dressed into position and lined down the opposite side of the chassis from the filament leads. Cathode bias resistors and by-pass condensers should be grounded as closely as possible to the cathode terminals on the tube sockets. The same precaution should be observed with the screen by-pass condensers, screen-voltage-dropping resistors, and plate-load resistors. If these precautions are taken, very little aligning is necessary. Detailed student material list R-361 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Hollywood on the Move

(Continued from page 142)

large groups of people in many industries. During the war it fed the 17,000 employees of Lockheed as well as supplying the meals at five Navy shore establishments. It keeps \$250,000 worth of food on hand in its Hollywood warehouses.

In the past few years Arizona has become a leading location state. The picture "California" was filmed almost entirely within

(Continued to page 236)

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A new set of dependable Champion Spark Plugs is just the thing to make your car start like the proverbial scared rabbit. Quick starts, faster warm-up, and all 'round better engine performance result in substantial gas savings. In addition, they'll reduce excessive drain on the battery, and minimize the danger of crankcase dilution. Now is the time to have your Champion dealer check your spark plugs. Be sure to get dependable Champions if you need new ones. Champion Spark Plug Company, Toledo 1, Ohio.

FOLLOW THE EXPERTS

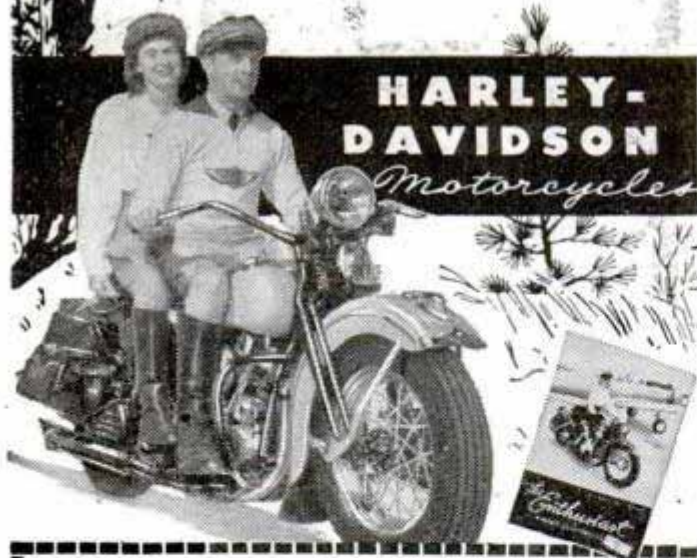
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its borders. In Arizona, too, practically all of "Red River," a \$2,000,000 picture story of the early Texas cattle drives, was filmed.

The studios do not deliberately choose substitute backgrounds; often it isn't practical to use the real setting of an historical story. For example, Texas didn't have a location suitable for the picture about itself and Arizona did have such a site.

The script called for a river similar to the Red River in Texas, some badlands like those of Texas, and some plains that could double for those of Kansas, and all three must be close together. In addition, a water supply of 80,000 gallons a day was required—20,000 gallons for the picture company and 35,000 gallons for the cattle that appeared in the film. The other 25,000 gallons were needed to settle the dust.

Movie scouts first went to Texas and flew hundreds of miles along the Red River itself, hunting for such a site. Then they tried Oklahoma and New Mexico without success, then portions of Sonora and Chihuahua. Eventually they found the ideal location near Elgin, Ariz., 60 miles south of Tucson. The nearby San Pedro River was a virtual duplicate of the Red, and the other needed backgrounds were less than 50 miles away.

Practically dry, the river was held back by five dams until sufficient water for the flood scenes was in storage, then the water was released to produce the high-flowing river needed for the picture.

The scenery around Sedona, 30 miles south of Flagstaff, in the northern part of Arizona, is so spectacular that one or more picture companies almost always are to be found in the area. The Anderson company kept one of its large portable camps there for a while, then decided to build a permanent motion-picture town in the area.

Normally accommodating up to 350 people, this "little Hollywood" already has housing shortages. Temporary picture populations of up to 450 people have strained its capacity and now the town is being enlarged. Beside pine sleeping cabins, central dining rooms and other facilities, the movie town has its own western trading post and other permanent sets that are modified for different pictures. A sound stage is included in its more than 100 permanent buildings. Parts of "The Angel and the Outlaw," "Desert Fury," "Cheyenne," and other recent western pictures were filmed there.

☐ An Australian scientist has found in edible mushrooms a penicillin-like drug which kills tuberculosis germs in a test tube, and experimental treatment of tuberculosis-infected animals is planned.

HOW TO PAINT

without "holidays" or thin spots

When you paint, do you look at your work when you've finished and say, "Gosh, there's a bad spot!" — or "How did I miss that?"

No matter how good your lighting, reflections and shadows can trick you into leaving "holidays" that *only a moving beam* of light will reveal. Here's how to avoid them:

- 1 With your left hand, point your flashlight at what your right hand is painting so that no shadowy corners can escape.



- 2 When a section is finished—and again after you finish the whole job—inspect the work with your flashlight, powered with "Eveready" batteries (they outlast all other brands)!



Proof! . . . in the laboratory . . . in your own flashlight . . .

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TEST YOUR SCIENCE

i.q.



PEBBLE

MILE-LONG STRING

Answer to problem on page 105

Of course Newton was not wrong. The centrifugal force at the equator is computed using these factors: Mass of man, 150 pounds; radius, 4000 miles; speed, 1000 miles per hour. Divide each of these factors by 4000. Now picture yourself standing on a little hill with a stone, which weighs just over half an ounce, tied to the end of a string one mile long which you would try to whirl about in a circle at the speed of $\frac{1}{4}$ mile per hour. The centrifugal force at the equator is so slight that it could not be measured on an ordinary spring scale.—By Rex Taylor

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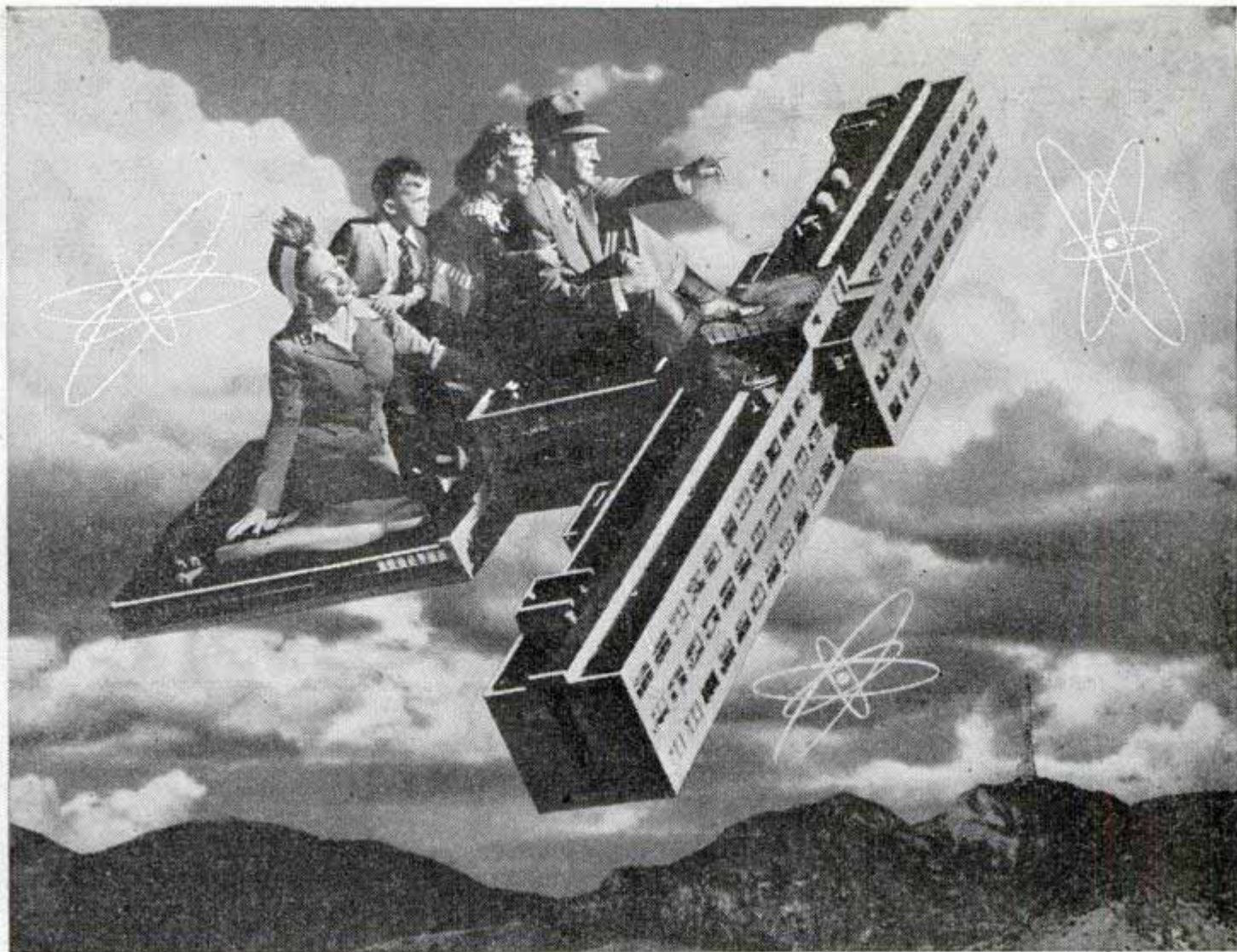
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Your enjoyment climbs to new altitudes through radio and television achievements of RCA Laboratories.

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More and more people will go sight-seeing by television as the number of stations and home receivers increases. Eventually, television networks will serve homes from coast to coast . . . bringing you the news as it happens . . . sports events . . . drama . . . vaudeville.

Many of the scientific advances which have made possible these extended services of radio-electronics, in sound and sight, originated in research conducted by RCA Laboratories.

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Trade Mark Reg. U. S. Pat. Off.

- WRITES ON STEEL
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Whether you work with metal, wood, glass, plastics or leather, your shop is not complete without a Burgess Vibro-Tool. Totally unlike anything else on the market! Writes like a pencil on hardest steel! Engraves, carves, hammers and cuts. Only \$7.50 at your dealer. If he cannot supply you, write to us and we will arrange for shipment.

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- Vibro-Tool De Luxe Kit Accessories Enclosed find remittance Ship C.O.D.

{ Please list parts wanted by number }

NAME.....

ADDRESS.....

His Tripod Is a Plane

(Continued from page 174)

back and asked blankly: "Are you flying this thing?"

Wayman had been busy with his camera, the pilot had been asleep, and each thought the other was flying the plane.

Wayman sympathizes with private flyers who find themselves lost over unfamiliar territory, having been the victim of such an experience several times himself. As an incentive to better air marking, he has offered to present every factory owner who paints the name of his plant and its location on the roof with a free aerial photograph of the building. So far he has had no takers.

Eventually he expects to fly north in the summer and south in the winter, taking pictures of vacation resorts.

Wayman is already planning for a bigger, faster plane, with a built-in darkroom. "Sometimes, when I come back from a job 300 miles away, my heart is in my mouth all the way home. The way it is now, I never know until I land whether or not the pictures are any good.

"Now if I had a plane that would cruise at 110 miles an hour, with facilities to develop my shots in flight . . ."

Outsmarting the Smugglers

(Continued from page 151)

An important wartime job of the Customs Service was the "security watch" of incoming and outgoing troopships. Working in close conjunction with the Coast Guard, customs men seized a wide variety of objects that could have caused injury and death.

In most cases of wartime smuggling by troops, the confiscated material was turned over to the branch of the service to which the man belonged. Military authorities disposed of the case. Bigger game, however, required special efforts by the Customs Service.

The Chicago office of the Service, for example, helped crack the famous Hesse jewelry case in which several Army officers were charged with bringing into the United States some \$1,500,000 in precious stones and jewelry taken from the Hesse family estate in Germany.

On the West Coast, the San Francisco customs office put the finger on an Army colonel when two diamonds, worth \$10,000, were found in his watch pocket as he disembarked. Further investigation showed that he had brought more than 500 Japanese diamonds, worth \$200,000 into the

(Continued to page 244)



HELLO BOYS!

Erector is the world's greatest toy... crammed with real engineering features.

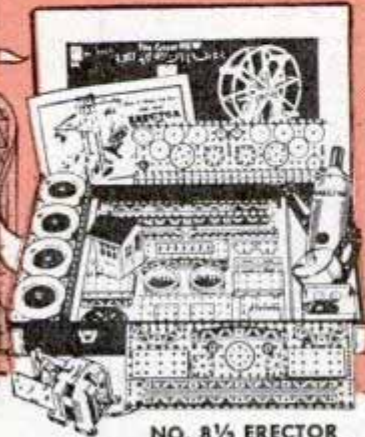
A.C. Gilbert

Founder, Gilbert Hall of Science

Famous

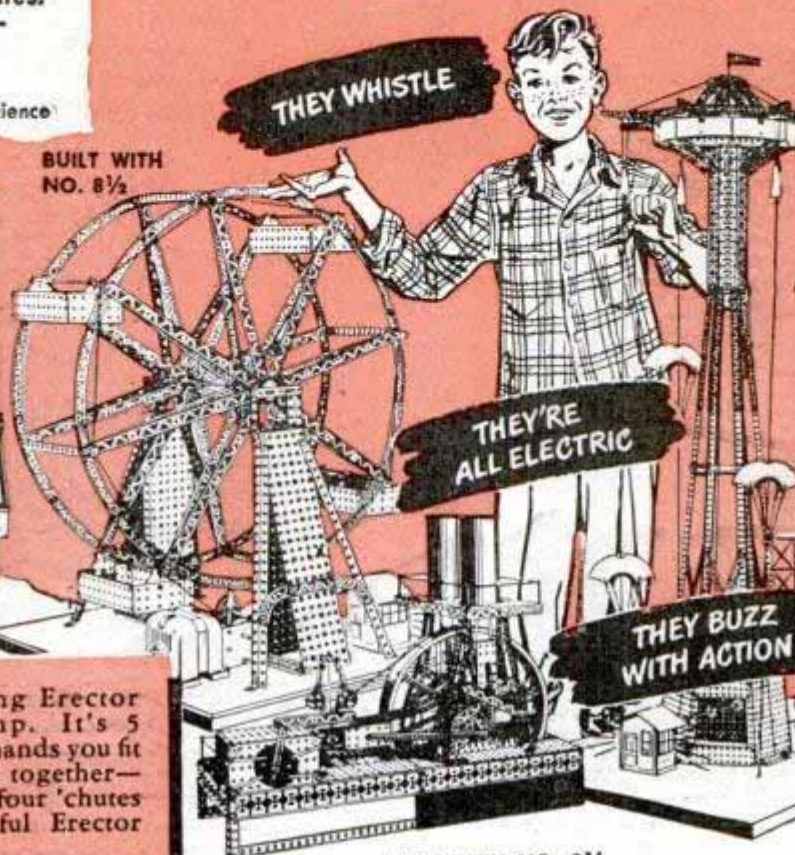
ERECTOR

BUILT WITH NO. 8 1/2



NO. 8 1/2 ERECTOR

THEY WHISTLE



THEY'RE ALL ELECTRIC

Made of STEEL to Build Like REAL

IMPORTANT The U. S. Patent Office has issued over 100 patents covering special Erector features.

BUILT WITH NO. 9 1/2

THEY BUZZ WITH ACTION

BUILT WITH NO. 9 1/2 ERECTOR

LOOK at that towering Erector parachute jump. It's 5 feet high! With your own hands you fit the gleaming steel girders together—attach the rigging for the four 'chutes—and install the powerful Erector reversing engine.

Now for a sensational sight! Throw the engine into gear... and your parachutes are hoisted up and up until they strike the release mechanism. Then, like a flash, they plummet down—unfold—and lazily float to the ground.

Now get a load of that mighty Ferris wheel. It operates in either direction at high or low speed.

Think of the fun of building and running that giant power plant—with boilers, 12-inch flywheel and other parts all made of genuine steel.

You can build hundreds of spectacular mechanical marvels with one Erector set. No other construction set contains so many different parts. And how the Erector reversing engine makes them buzz with action!

FUN with Erector starts the moment you start to assemble girders, wheels, gears and other parts. No blueprints are needed. Erector parts have equi-distant holes, so that you only have to count the holes to put them together.

OTHER GILBERT SCIENTIFIC TOYS

- ★ AMERICAN FLYER TRAINS
Watch 'em puff smoke—hear 'em choo-choo
- ★ GILBERT CHEMISTRY LABORATORIES
The kind that bring boys fame and big awards!
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- ★ GILBERT ELECTRICAL SETS
- ★ GILBERT TOOL CHESTS

ONLY ERECTOR HAS ALL THESE FEATURES

- ★ Builds the square girder with interlocking edges
- ★ Erector girder is a structural girder—not just a perforated strip
- ★ Curved, straight and giant structural steel girders for realism
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- ★ Metal base plates with every set
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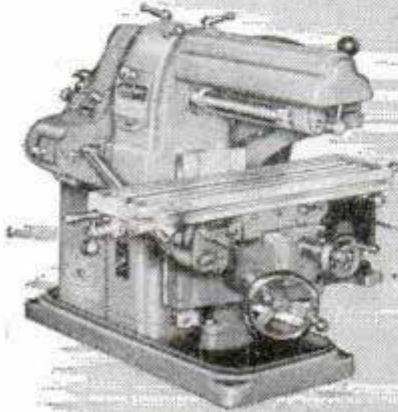
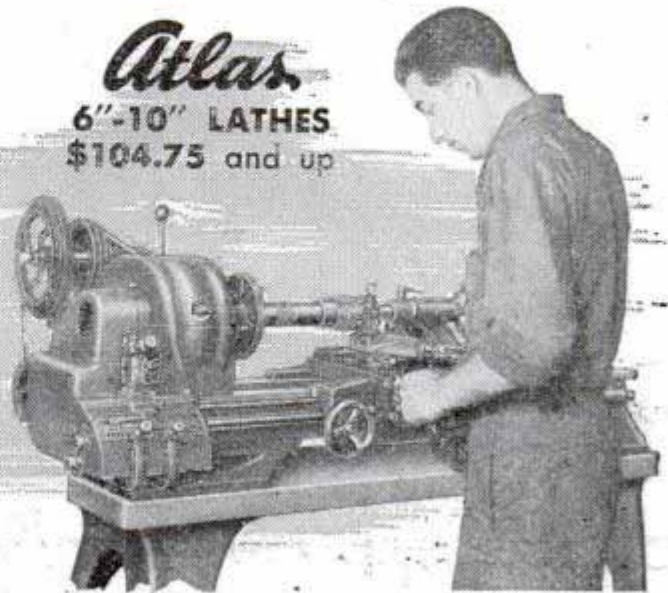
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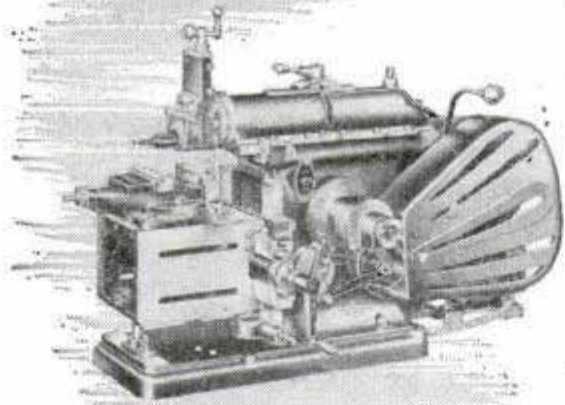


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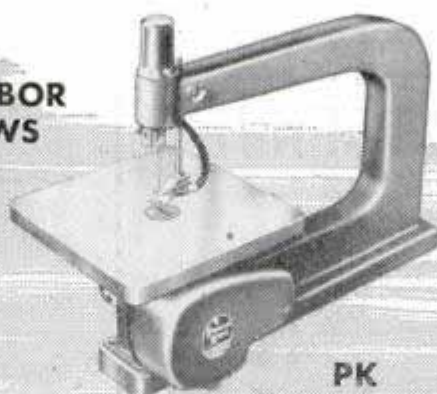
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A New Idea for Home Shops

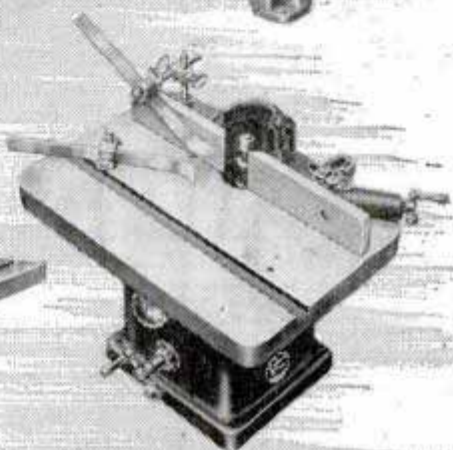
PK tools are designed for men who enjoy their home shop as a hobby... but are practical about it, too. They give you the basic ruggedness, accuracy, and capacity you need for your various projects... yet are priced so you can equip with the full range of Power King tools within the cost formerly required for but two or three machines.

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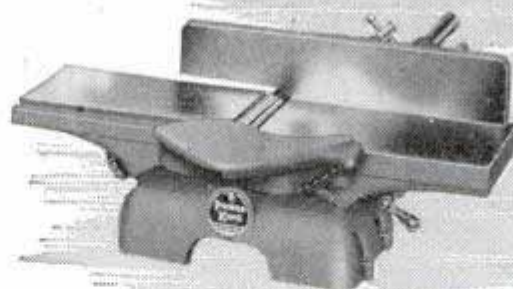
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\$75.00



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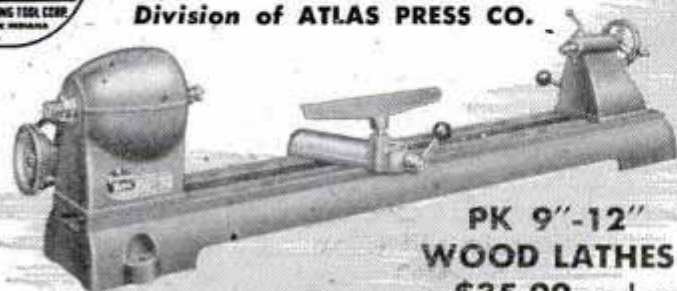


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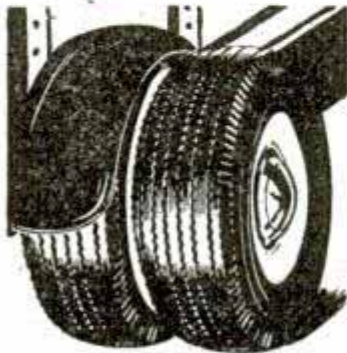
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**It's EASY
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No changing required.
No drilling necessary.
Rim-wrench does the job.

1. Mount the first wheel.
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- THAT'S ALL!**

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FORD CHEV DODGE-PLYM JEEP
Also Fits Farm Wagons Using Above Type Hubs

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ATTENTION DEALERS: Many fine territories open.

United States on previous trips. He called them souvenirs of war.

The tricks of the smugglers are infinite. False bottoms in trunks and boxes are well known. Contraband has been hidden in false teeth, bars of soap, fountain pens, tooth paste, ear trumpets, beards, nursing bottles, heels of shoes, the tops of hair brushes and in the cotton in aspirin bottles.

A jewel smuggler entered the Port of New York 26 times as a hunchback. On the 27th try, customs men dug into his false hump and removed diamonds, jewelry and watches. A Chinese importer in Seattle was suspected of smuggling opium, but was not caught until customs inspectors found that it was concealed in the tubs of soya sauce which he received from China. Special vests, which can carry several thousand dollars worth of gold or as many as 1000 Swiss-watch movements, are sometimes used. Border smugglers have hidden contraband behind automobile headlights, within the spare tire and inside the gasoline tank.

The Customs Service works in close cooperation with the Federal Bureau of Investigation, the Bureau of Narcotics, the Coast Guard and city and state police. Nine customs laboratories in large cities employ the tools of science to detect law-breaking. In recent years the X-ray, fluoroscope and new detectoscope at ports and border stations have been successful in discovering contraband hidden in clothes, luggage and automobiles.

Because informers receive 25 percent of the duties and penalties of confiscated merchandise, many seizures result from tip-offs—sometimes by acquaintances of the guilty persons. In addition, the Customs Service has contacts overseas which supply them with tips.

But the customs man still depends upon his wits and his judgment of human nature to outsmart smugglers. An evasive, nervous or abusive passenger instantly puts the inspector on the alert.

One successful inspector declares that you always can spot a guilty person by the look in his eyes. Another says: "I figure out where I would hide something I wanted to smuggle in—and then I look in those places."

Along the 6000 miles of U. S. boundary, where narcotics, cattle and wool smuggling are the chief problems, the 351 men of the border patrol rely upon woodsman's lore. A fresh fire or a few blades of grass bent in a certain direction may offer a clue that leads to the smugglers.

In the postwar world the one problem

(Continued to page 248)



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SEE 'EM PUFF SMOKE!

HEAR 'EM "CHOO-CHOO"



Lower train—No. 4607 Pennsylvania Freight. 21 pieces. 40 1/4" long. Remote Control. Complete with 14 sections of track, making 140" oval—

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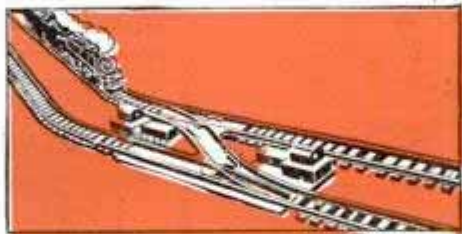
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form 3-16" scale, so that your train looks like real—hugs the track like real. Cars have automatic couplers that couple anywhere. Uncouple by remote control. Die-cast locomotives have superpower worm drive that assures smooth, steady pull at all speeds from a crawl to 120 scale miles per hour. See and hear the sensational American Flyers at your nearest department or toy store.



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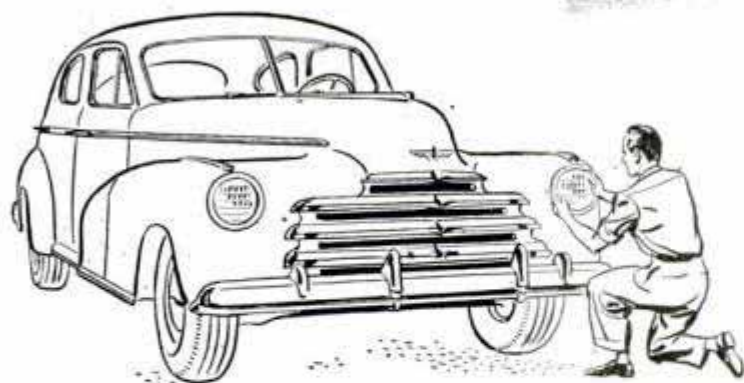
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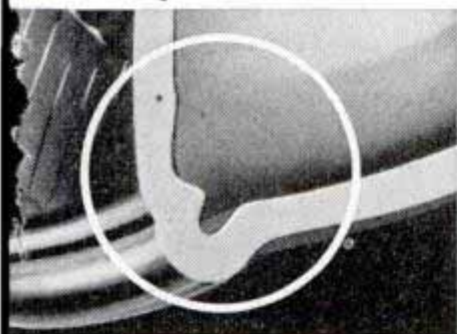
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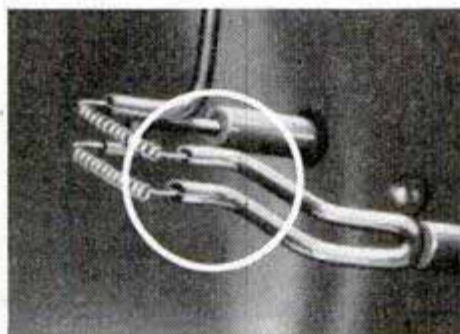


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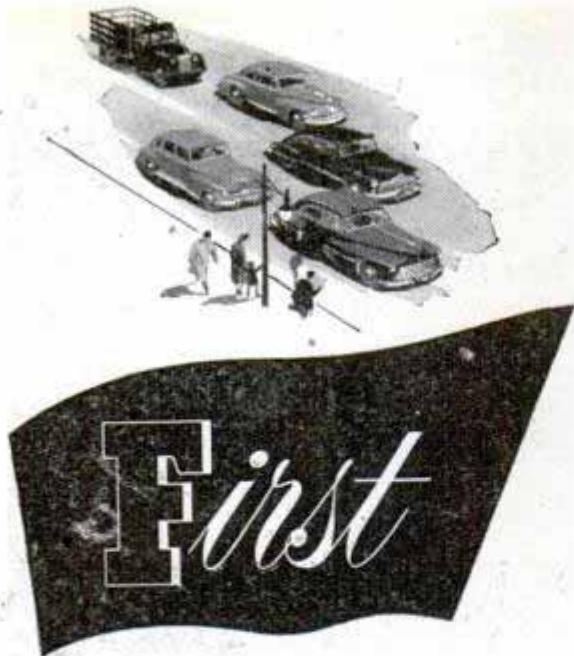
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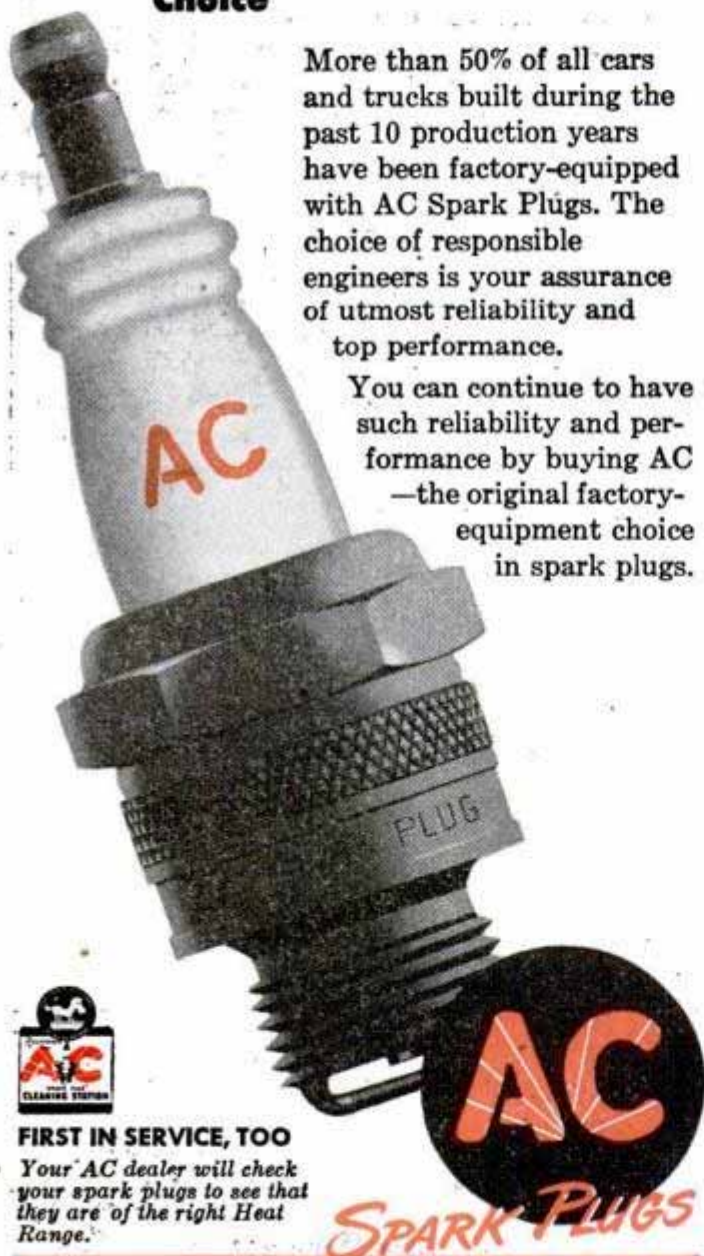
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Your AC dealer will check your spark plugs to see that they are of the right Heat Range.

AC SPARK PLUGS

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that worries customs men most is the airplane. Thousands of surplus warplanes are being sold. What is to prevent these planes from being flown across the border, loaded with contraband goods, flown back to the United States and landed on lonely fields?

The penalties for smuggling are stiff—up to two years in jail and \$5000 fine. Members of large smuggling rings or individuals who engage in smuggling with deliberate intent to defraud the U. S. government often pay the full penalty. Where no intent can be shown, the individual pays a fine equal to the value of the smuggled articles, and those articles are confiscated.

Though smuggling may increase for the next few years, the U. S. Customs Service is making it tougher than ever for the lawbreaker. The individual who sees in smuggling a quick road to riches will find that he is wrong and it is more certainly a direct path to the penitentiary.

Hospitals May Establish Vein Banks

Vein banks may some day take their place alongside blood and bone banks. Dr. Charles A. Hufnagel of the Harvard Medical School reports that veins have been transplanted successfully in experiments with animals. He also reveals that a rapid-freezing technique makes it possible to preserve veins. Therefore, he predicts the day will come when human veins are preserved and kept ready for use in persons suffering from vein injury or disease.

Vitamin A Produced Synthetically

Vitamin A, which is essential for proper growth and vision, is now being produced in synthetic form for the first time. Distillation Products, Inc., which developed the process, has not revealed how it is accomplished or what materials are used. The synthetic vitamin A concentrates are light yellow, viscous oils which have no fish odor. Previously, the only commercial source of vitamin A was the oil extracted from the livers of such fish as the cod, dogfish and soup-fin shark.

Electronic "Ear" Detects Gases

Dangerous gases escaping in mines and factories are detected by an electronic "ear" which sets off a signal. Developed at Iowa State College, the instrument consists of a brass tube which collects the gas and an audio frequency oscillator which sends high-frequency sound waves through the gas. A microphone picks up the sound waves and analyzes them to discover type and concentration of the gas.



Blade guide aids close following of a line or pattern.



Steel universal chuck holds all blades, files, and sanding attachments.



Because spring hold-down tilts with table to hold work firmly, you enjoy smooth operation always.



V-jaws of universal chuck hold files with 1/8" or 1/4" shanks.



Using sanding attachment, you finish exterior and interior surfaces easily.

HM-54

Furnished with 4-inch pulley, pulley guard, removable table insert, 3 saw blades, blade guard, dust blower tube, 2 wrenches.



Saws wood up to 2 inches thick — cuts light metals, and plastics. Cuts to center of 32-inch panel.

New! HOMECRAFT® 16" SCROLL SAW built expressly for the hobbyist

Only \$29.95 (Less lamp attachment and motor)

It's now available at your dealer's store, at surprisingly low cost — this good-looking Homecraft 16" Scroll Saw.

With its speed of 1275 cutting strokes per minute, you can do fast, accurate scroll-sawing of all types: fret work, inlay work and marquetry, jig saw puzzles, etc.

Made by a Leading Tool Builder!

Behind the Homecraft 16" Scroll Saw is the engineering skill of the men who make Delta Power Tools. In schools and factories, as well as home shops, Delta tools have long been recognized as outstanding for safety, accuracy, and dependability.

Having a home shop equipped with Delta Power Tools some day is the dream of practically every craftsman who wants the very best!

Worthwhile Features!

With the Homecraft 16" Scroll Saw, Delta answers the demand for a good, popular-priced tool that is adequate for the average limit-



Catalog Sheets! — Show all Homecraft Power Tools and accessories. Sent to you free. Use coupon, for your copies.

ed needs of the hobbyist who "putters around" with woodworking.

Delta engineers have included features that make it a real value for the money — a tool you've every right to be proud to own:

Bearings are constantly lubricated from the splash system in the crankcase. . . . Universal blade chuck fits all types of blades, files, and sanding attachments. . . . Pump in head supplies continuous air flow, to keep cutting line free from sawdust. . . . 11" x 11" table tilts 45 degrees to the right and 15 degrees to the left, for angle-cutting. . . . Guides are fully adjustable. . . . Upper and lower chucks rotate 90 degrees, for unlimited-length side cuts. . . . Accurately-machined one-piece casting forms base and arm. . . . Pulley guard provides safety.

See It At Your Dealer!

Ask your Homecraft dealer to show this scroll saw, and his complete display of Homecraft Power Tools that range in price from \$29.95 to \$39.95.

Visit your Homecraft dealer now!

Tear out coupon and mail today!

DELTA MANUFACTURING DIVISION
Rockwell Manufacturing Company
680N E. Vienna Ave., Milwaukee 1, Wis.
Please send free catalog sheets on Homecraft Power Tools.

Name.....
Address.....
City..... State.....



General Sales Office • Chicago 2, Illinois

"Dave ought to know better than that"



AL: Yeah, I wouldn't take that set of drills if they gave it to me.

PHIL: Just junk—that's all they are. And Dave's bragging about the bargain he got.

AL: You'd think he'd know by this time that you can't save money buying "no-name" tools.

PHIL: Sure, it's plain as day that when a well-known manufacturer puts his name on tools, those tools have *got* to be good. And when you buy tools *without* known brand names, you're just throwing money

away.

AL: Well, I guess we all have to learn it the hard way.

PHIL: Yeah. I made some bad buys before I got wise. Now I stay away from bargain counters and do all my tool buying at the hardware store.

AL: Same here—and the first thing I look for is the brand name.

**Your HARDWARE DEALER sells QUALITY tools
and hardware... Buy from HIM**



POPULAR MECHANICS



Choose EVINRUDE
 for tops in outboard performance — thrilling power for biggest boats and fastest runabout speeds



Choose EVINRUDE
 for matchless 4-cylinder smoothness in 3 great models . . . "Speedifour", "Lightfour" and the famous "Zephyr"



Choose EVINRUDE
 for the right power for every boat . . . with revolutionary new WEEDLESS DRIVE on two popular light models

Choose Evinrude . . . for the certainty of fine performance that means utmost satisfaction and enjoyment for years and years ahead.

See your Evinrude dealer—look for his name in your classified phone directory under "Outboard Motors". For free catalog of the complete Evinrude line write, EVINRUDE MOTORS, 5656 North 27th Street, Milwaukee 9, Wis.

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Speed Sweep

THE BRUSH WITH
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*Sweeps
cleaner, faster—
Out lasts ordinary
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Mail Coupon Today

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530 N. 22nd St., Milwaukee 3, Wis.

Please send me complete information about
Speed Sweep brushes.

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Street Address _____

City, State _____

How Fast Can Man Fly — and Live?

(Continued from page 93)

likely determine whether or not transsonic pilots need to be shock-mounted against vibration similar to the way that flight instruments are protected.

Studies in aerodynamic heat already have led to the substitution of strong plate-glass windows for the original transparent plastic canopy on the Skystreak. The plastic, it was found, would heat up and fail even at the speeds already flown. Other materials commonly used in aircraft lose part of their strength from the frictional heat of high speed and present information about this phenomenon will be checked with the aid of the plane.

Instruments on the Skystreak include devices that measure the pressures at 400 different points on the wing and tail surfaces. Temperature-recording instruments are placed at critical points and the plane carries strain gauges that measure total air loads on the wing and tail surfaces. Even from the comparatively few flights that the Skystreak has made enough new information about transsonic flight has been obtained to influence the design of the faster aircraft now under construction. Truly the plane is a test tube.

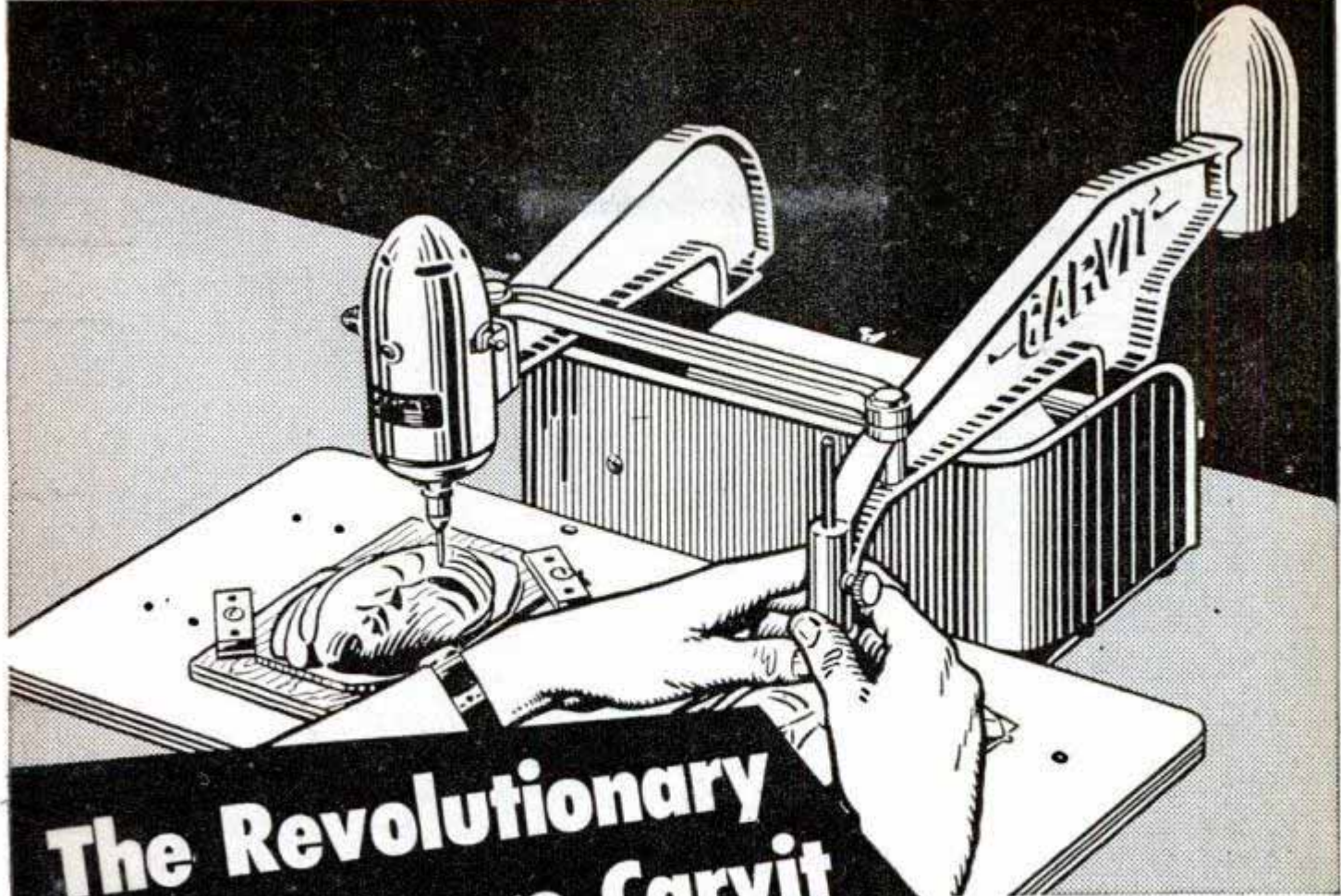
The '48 Cars Begin to Roll

(Continued from page 118)

sedan, touring sedan, seven-passenger sedan, limousine and convertible. The bodies extend over the rear wheels. Stout bumpers, designed as integral parts of the car, reduce over-all length about four inches without changing wheelbase length. Three new straight-eight engines have 130, 145 and 160 horsepower. Compression ratio of these engines has been stepped up to seven to one compared with 6.58 to one in the '47 engines. Many parts of the new engines are interchangeable which will make for easier servicing. The crankshaft is larger and heavier and a new hardened crankshaft sprocket, combined with a roller-pin timing chain, is said to assure smoother operation and longer life. A ground-level manifold, with no pockets where raw gasoline can accumulate, provides easy starting and good idling. Although the straight-eight will be standard on the passenger cars, Packard will continue to build sixes for taxicabs and for export.

The '48 Packards require 150 pounds more steel than the '47s. Even the new "station sedan"—Packard refuses to call it a wagon—has an all-steel body and top. All

(Continued to page 256)



The Revolutionary New Dumore Carvit

makes you a skilled wood-carver in 20 minutes!

Here's a fascinating new hobby — complete in one tool. Making fine wood carvings with the Carvit is so simple a child can do it! The unbelievable perfection of your first carving amazes your friends! Experienced craftsmen use the Carvit to give their woodworking projects that *real* professional touch.

With the Carvit, you make beautiful replicas of inexpensive objects you can find in any dime store or gift shop — reproducing them in mahogany, walnut, and other fine woods. Your carvings are many times more beautiful and valuable than your original models!

You're an expert at once — with a Carvit!

Here's how the easy-to-use Carvit works: You clamp a model to the table below the tracer, and a wood block below the cutter. Then you switch on the motor and guide the tracer over the raised contours of your model. The cutter moves with the tracer to carve an

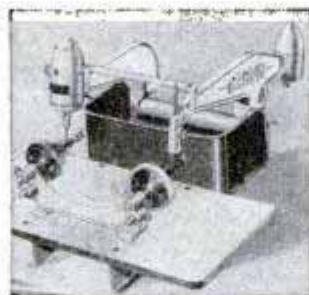
exact duplicate of the model.

Carving with the Carvit is fascinating fun for everyone. The Carvit is *the ideal gift for your sweetheart, husband, or son!* See the Carvit at your local hardware store today — or mail us the coupon below!



No skill or training needed to do work like this

Carve useful ornaments for the home — distinctive gifts — fine carvings that *sell!*



With an index attachment, the Carvit reproduces objects in the round — statuettes, and busts.

**Tear out coupon
and mail today!**

The Dumore Company, Dept. M-51, Racine, Wisconsin

- Please send complete information on the Carvit.
- Please send one Carvit. \$48.50 enclosed.
- Please send one Carvit with index attachment. \$58.25 enclosed. Shipping charges C.O.D.

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City..... (.....) State.....

**Satisfaction
guaranteed or
your money back
in 10 days!**

See the **Amazing Difference**

...the **NEW RADIANT** Screens
make in your pictures

Ordinary projection screen surface... **DULL**, lacking brilliance and contrast



Radiant Glass Beaded Surface... **BRIGHT**, brilliant and contrasty

Your pictures look *twice as bright* when projected on the new 1948 Radiant Projection Screens. They have added brilliance, extra sharpness, more authentic colors. The Special Radiant glass-beaded screen surface with millions of tiny glass beads imbedded in pure white plastic—reflects light instead of absorbing it. Radiant gives you more new features that make for quicker set-up and easier adjustment. These new Radiant Projection Screens make every picture a better picture!

Send for **FREE** Screen Guide Today!

"Secrets of Good Projection," a 32-page booklet, gives proper screen sizes, correct projection lenses, tips for improving projection and many other valuable facts. Mail coupon for your **FREE** copy.



RADIANT MANUFACTURING CORP
1257 S. Tolman Ave., Chicago 8, Ill.
Send me **FREE** Screen Guide—also latest Circular showing complete line of Portable, Wall, Ceiling and Table Screens.

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PROJECTION SCREENS

Exclusive New Radiant Screen Features

- 1 Self-Opening Tripod Legs*
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- 6 Built-In Shock Absorbers*
- 7 Automatic Leg-Lock
- 8 Rubber-Ball Tripod Feet
- 9 Triangular Steel Tube Construction
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- 12 Streamlined Design
- 13 Automatic Leg Closing
- 14 Complete Range of Screen Heights
- 15 Unconditional Guarantee

The complete Radiant line includes Wall, Ceiling and Table Models in sizes 22 inches x 30 inches to 20 feet x 20 feet and larger

*Pat Pending



"I've pensioned off my reindeer to ride a **WHIZZER**, too, a Merry **WHIZZER** Christmas to every one of you!"

Complete with all necessary attachments. Fits any man's balloon tire bike. If no Whizzer Dealer in your community yet, send to Whizzer Motor Co., Pontiac, Mich., Dept. 5212, for your Christmas Whizzer.

Ride one and you'll buy one!

\$97⁵⁵

plus tax, F. O. B. Pontiac, Mich.

WHIZZER
AMERICA'S FINEST BIKE MOTOR

SENSATIONALLY PRICED

ELECTRIC TORCH

Now only

\$12

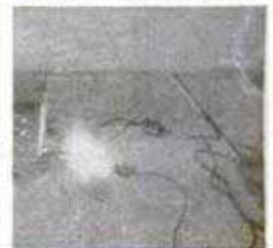
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Just plug into nearest socket. Arc furnishes up to 10,000 degrees Fahrenheit. Welds metal up to 3/16" thickness, uses up to 3/32" rod. Cuts all steel including hard tungsten. Complete equipment includes unit plus carbon tipped dual copper electrode Cutting Torch and single electrode Welding Torch with attached alligator clip. Generous supply of welding materials. One welding job may more than pay cost of entire unit. Ideal for home workshop. Invaluable for body and fender shops, garages, repair and machine shops, etc. C.O.D. \$12 plus postage (wt. 4 lbs.) or send \$12 and we pay postage. Money back guarantee. Free Folder on request.

CALIFORNIA TECHNICAL PRODUCTS CO.

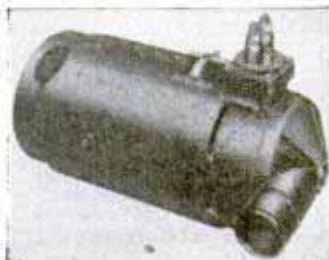
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WAR SURPLUS!

New B-24 Aircraft Lighting

GENERATORS



30 Volts
300 Amp. D. C.

\$49⁵⁰

Original cost \$250

MODEL R. 2, BUILT BY JACK & HEINTZ, CLEVELAND, O.

Can be used for lighting or converted for use as welder, electric plater, fast battery charger, auxiliary power unit, etc. Small but mighty. Size 16"x7". Air cooled. Shipping weight 68 lbs. Immediate shipment. Original crates. Send check with order to save time. We also offer new 200 Amp. G.E. and Westinghouse Lighting Generators, 30 Volts D.C. Model P. 1 at \$33.00. (Cost \$150.00.)

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Uses 1/4 Hp. Motor

Ideal Christmas gift! Sprays paint, varnish, lacquer, disinfectants. Paint anything—do it better—five times faster! Generate compressed air, inflate tires, other uses. Delivered (less motor) with sturdy base, compressor, "V" belt, motor pulley, 15 feet high test air hose, trigger-type spray gun, one-quart cup. No. 112—\$24.95.

SPECIAL! No. 414 Master twin-eyl Sprayer (less motor) \$47.50. Handles biggest jobs!

ELECTRIC MOTORS—ball bearing, capacitor, 110/220 V, 1725 rpm, 1/4 HP—\$24.75, 1/2 HP—\$37.50.

IMMEDIATE DELIVERY on above. Add 5% west of Mississippi. Prepaid if check or M. O. enclosed. C.O.D. receipt of 25% deposit. Write for **FREE** Catalog; Power Tools, Radios, Toys. Address:

INDIANA APPLIANCE CO.

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\$6.95

POSTPAID
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Two Arrows



CROSS-BOW SPORTING GUN

Compact powerful pistol grip gun. 35-lb. bow pull—ideal for small game hunting, frog spearing, target shooting, etc. Non-corrosion construction throughout.

Extra arrows \$3.50 per doz.—45c ea. Special harpoon arrow for underwater goggle fishermen, \$1.40 ea. All C.O.D. orders 30c extra.

JERED ENGINEERING & MFG. COMPANY

1024 S. Washington St. Royal Oak, Mich.

A GIFT SUGGESTION TO FOLLOW FAMOUS HULL COMPASSES



FOR CAR OWNERS (FIELDMASTER) \$5.95



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STAY HOME AND MAKE MONEY!

—Men! Women! Get into profitable, uncrowded profession you can operate from your home or small office after short home training course. No capital required. No goods to buy. No age limit. Others earn \$50.00 to \$100.00 per week making famous Stephenson corrective foot devices to order. Foot sufferers everywhere pay gladly for relief. Send today for **FREE** BOOKLET. **STEPHENSON METHOD**, Established 1894, 12-28 S. Market St., Boston, Mass.

Sand Casting—Forging—Heat Treating—Case Hardening

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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 1 1/2, 3, and 6 pounds weight, aluminum, copper, brass, etc. Domestic gas supply and 110 volt AC or DC energy required for operation.

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See These New JACOBS CHUCKS for the HOME SHOP



HEX-KEY Model for drill presses, lathes and motor shafts

★ 4 models, capacities up to 1/2"

★ straight hole design to fit 1/2" or 5/8" shafts

★ fits plain end drill press spindles, motor shafts, and other powered shafts

★ special arbors for Morse Taper spindles



Easily fitted to the shaft, makes a motor tool of many uses.

Holds drills, grinding wheels, sanding drums and other accessories.

For chucking jobs on small work, chuck can be held in lathe spindles.

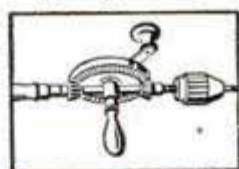
HAND-TITE Model

for hand drills, flexible shafts, polishing heads.



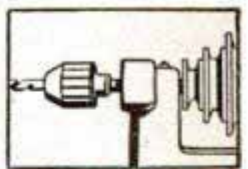
★ 3 sizes for tools with spindles up to 1/2" dia.

★ 2 diameters to fit 3/8" or 1/2" spindles.



Greater gripping power and dead-center accuracy for drills.

On a bench grinder, this chuck gives a horizontal drilling set-up.



RUBBER-FLEX Jaw Assembly

One-piece construction . . . hardened alloy steel jaws bonded together by oil-proof synthetic rubber . . . no loose jaws or springs. Tremendous gripping power. Accuracy not previously possible in popular priced chuck.



SEE these 2 new Jacobs Chucks at your hardware dealers.

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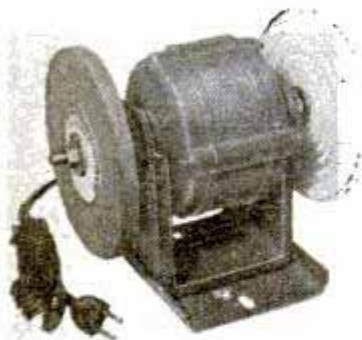
Please send your new illustrated folder on the Jacobs Rubber-Flex Hex-Key and Hand-Tite Chucks.

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FULL YEAR GUARANTEE

A WORKSHOP GRINDER OF YOUR OWN for only **\$14⁹⁵**

(\$15.95 West of Denver)

Just what you've been waiting for—this sturdy new, grinder-buffer-polisher. Designed and built especially for the home and hobby shop . . . Perfect for small industrial jobs.

HAS COUNTLESS USES

You will need this amazing home workshop grinder to sharpen knives, scissors, screwdrivers, small tools, lathe bits and many other around-the-house items . . . polish silverware, jewelry, golf clubs and keys.

NOTE THESE FEATURES

Safe operating speeds of 1725 rpm—will withstand stalling for 20 minutes without injury to motor. Oversized rubber cushions make it whisper-quiet—a must for home workshops and offices. Low cost operation—uses same current as 100 watt bulb. Will not interfere with radio. It is light enough to be carried to place of work.

NOTHING EXTRA TO BUY

Comes fully equipped—ready to go to work. Includes rugged six foot cord set, dura-hard, silicon carbide grinding wheel, polishing wheel. Has famous Victron motor mounted on resilient, non-vibration base. Finished in gray baked enamel—equipped with oil reservoirs and felt seals to last for the lifetime of the grinder. Weighs approximately 12 pounds. Can be clamped or bolted to table or work bench. Designed specifically for hobbyist, handyman, housewife, mechanic, doctor, dentist, optician, watch maker and jeweler. Send check or money order today. Postpaid in U. S. A.

VICTOR ELECTRIC PRODUCTS, INC.
2950 Robertson Ave. Cincinnati 9, Ohio



models of their line are "luxury finished" throughout with new fabrics, color combinations, trim styles, upholstery with foam-rubber cushions, and even black-light illumination of the instrument panel. This lighting is the same as that used on bombers to relieve air crews of eyestrain on night missions.

Packard does not have an automatic transmission on its '48s, but company officials report they have such a transmission and that its appearance will be delayed from six to nine months by a shortage of materials.

The big surprise of the '48 season so far is the new Hudson. It's as different from its predecessor as was the streamlined Studebaker. This "car of tomorrow," as the '48 Hudson is called by its makers, has a lower center of gravity than any other American automobile. It is only five feet from the ground to its top and when you get in it you step down several inches to the floor level. This unusual feature is said to provide more headroom than any other mass-produced car. Sitting "within the frame of the car" provides the passenger not only with a smoother ride, but with additional protection in case of accident, according to Hudson engineers. Rear-seat passengers are cradled between the axles, and the seat is actually ahead of the rear wheel. This back seat is 63 inches wide while the car itself is only 75 inches wide at the rear wheels. One prewar type of sedan (not a Hudson) had an 80-inch width at the rear wheels and a rear seat only 53 inches wide.

The '48 Hudson has a completely new Super-Six engine and an improved Super-Eight. The Hudson automatic transmission, Drive-Master, is optional equipment at extra cost on all cars.

Studebaker, with a big backlog of orders and a car of postwar design that has won general acceptance by the public and enthusiasm on the part of owners, has elected to coast in 1948 with a program of "still higher standards of style and comfort." There will be a slight face-lifting in the matter of redesigned grilles, front bumpers and bumper guards, black-light instrument illumination, repositioned rear shock absorbers on the Commander, Nylon upholstery in the Land Cruiser, and auxiliary spring coils to insert in the cushions.

Studebaker will continue to turn out its Champion, Commander and Land Cruiser models in increasing numbers and push the smart Champion and Commander convertibles in 1948. Hitherto, only a limited number of convertibles have been made at South Bend. Bidding for major attention

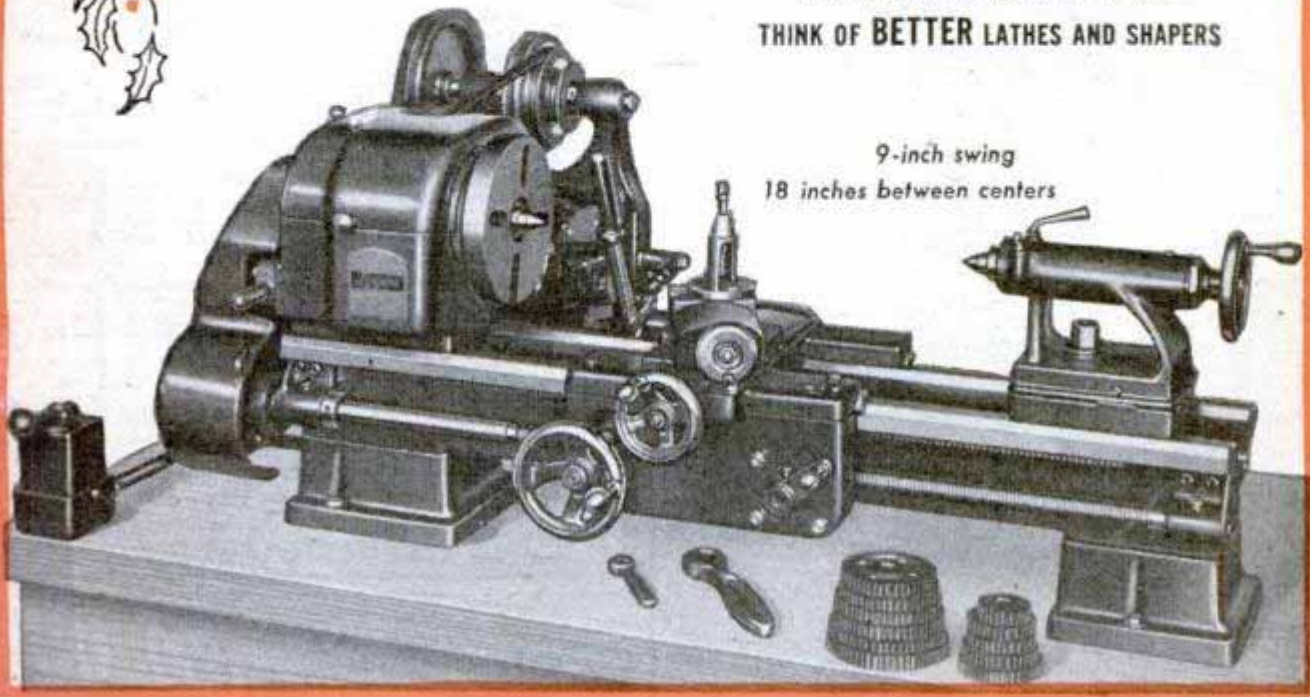
(Continued to page 260)

Christmas Suggestion . . .

for the man who owns, or plans to own a workshop, no gift could bring more pleasure.

Logan

A NAME TO REMEMBER WHEN YOU
THINK OF BETTER LATHES AND SHAPERS



9-inch swing
18 inches between centers

**A LATHE TO
DEPEND ON**

Logan Ruggedness
and Lasting Accuracy
. . . at \$159⁵⁰

This compact Logan 9-inch Lathe handles manufacturing operations with the same speeds and precision that make the larger Logan Lathes outstanding in industry. For general machine shop and tool room work, farm equipment maintenance, and home workshop projects, it is equally effective. The ball bearing spindle mounting, the self-lubricating bronze bearings at other vital points, and the V and flat bed ways precision ground to within .0005" of parallelism are typical of Logan advanced design. Rugged, rigid construction makes it steady on heavy cuts. See this outstanding 9-inch lathe at your Logan Lathe dealer's or write for information.

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Simoniz Your New Car... From the Start!



Simoniz Keeps Colors from Fading ... Protects and Makes the Finish Last Longer

The sooner you SIMONIZ your new car the better! Your new car needs finish protection now ... to "build up" the beauty ... to give it brilliant beauty from first mile to last. SIMONIZ protects the finish from road grime and grit that scar ... against corrosive airborne chemicals that dull and destroy. SIMONIZ saves car washings, too. Dust and dirt wipe off easily with a cloth. Remember, you can SIMONIZ your car only with genuine SIMONIZ and Simoniz Kleener. Insist on them always!

LIQUID SIMONIZ KLEENER is wonderful for cleaning quickly new cars or those with finishes in average condition. Paste Simoniz Kleener cleans, restores lustre and makes dull cars look new again. Then apply SIMONIZ to make that restored beauty last years longer.

THE SIMONIZ COMPANY, CHICAGO 16, ILLINOIS



Motorists Wise

SIMONIZ

TRADE MARK REG.

KEEPS NEW CARS ... NEW LOOKING

in the open-car field, the '48 Studebaker convertibles feature automatic top control, weatherproof upholstery, full-vision windshields and attractive colors including new iridescent hues.

Although the '48 Studebakers will have the conventional transmissions of the '47s, the company has been conducting extensive tests on several automatic types and is expected to make one of them available as optional equipment on the higher priced models in 1949.

Ford is also intensely interested in automatic transmissions. In fact, 50 test cars were equipped with a new torque-converter type of transmission. This particular transmission has been shelved by the Dearborn engineers, but some form of automatic transmission may make an appearance late in 1948. The new so-called postwar Ford is expected to make its bow sometime next spring. The 1948 car will have a new engine and body, probably low, wide and fenderless. Radical changes in design also are said to be in store for the Mercury and Lincoln. The '48 Mercury is reported to be a larger car intended for competition in a higher price class. Although the Ford Company is making no pre-season announcements, both Mercury and Lincoln are said to have individual suspension of all four wheels, possibly with a torsion-bar springing system using rubber to cushion road shocks. The first '48 models off the assembly lines may not have automatic transmissions, but such equipment may be added during the year and by 1949 at the latest.

The first General Motors division to make a 1948 announcement is Pontiac. This changeover will be made in one day early in the year, indicating that the '48 will be a face-lifting job. The big feature of the '48 Pontiac will be a Hydra-Matic transmission which will be offered as optional equipment. The company expects 50 percent of the buyers to order automatic transmissions. These will be available on both the six and eight-cylinder Torpedo and Streamliner models.

The biggest changes in the General Motors cars will be in the Cadillac, Buick and Oldsmobile divisions. New body lines are reported to be in store for these cars which have always had a basic resemblance. These new '48 lines probably will be in the popular trend of free flow and minus rear fenders. The Buick Roadmaster, largest of that line, is reported coming out with a Buick-developed torque-converter type of automatic transmission. This transmission is said to be more fully automatic than the Hydra-Matic or Fluid Drive. Of course,

(Continued to page 264)



MOTO-TOOL ★ The "Pocket-Size Machine Shop"



PRE-WAR PRICES STILL PREVAIL

Moto-Tool Kit No. 2 about \$30.00; you with 23 accessories (high speed steel cutters, grinding wheels, polishing accessories) and heavy-duty professional Model 2 Moto-Tool in natural-finish, hardwood case... \$23.50 (Items purchased separately would cost

Moto-Tool No. 2 with one emery point \$16.50.

Moto-Tool Kit No. 1 with 34 accessories and Model 1 Moto-Tool in wood case \$17.50

Model 1 Moto-Tool with one wheel point \$9.85.

A TOOL THAT PACKS EXTRA YEARS OF PLEASURE

... LOOK AT THE REST, THEN BUY THE BEST

Here's a tool to please a man's heart... one that holds promise of endless creative hours. Dremel Moto-Tool is a "war-veteran"... used by all branches of the Armed Forces in far-flung repair bases... helped to set production records at General Electric, Westinghouse, Remington Arms, Ford and others. Hobbyist or expert craftsman, first choice is Model 2 Moto-Tool Kit with its handsome felt-lined, highly finished wood case with rows of tools begging to be put to work. Write for FREE catalog of Moto-Tool attachments and accessories.

14 REASONS WHY MOTO-TOOL'S A BETTER BUY

- Housing has "pencil-type" finger grip ● Instant-action, wrenchless chuck ● Oil-less (sealed) trouble-proof bearings
- Patented automatic chuck-lock pin ● Over-size armature shaft, hardened, ground and polished ● 110 volt, universal type (AC-DC) motor ● Easily replaced commutator brushes ● About 27,000 R.P.M. cuts cleaner... saves cutters ● Sliding snap-type switch ● Handy hanger hook;
- Sturdy, shockproof bakelite housing ● Dust filtered, air-cooling system ● Weighs only 13 oz. ... shaped to fit the hand ● Dynamically balanced for vibration-less operation.

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Buy Dremel Moto-Tool from your Dealer. If he cannot supply you, order direct from factory on 10 day trial. Shipped postpaid for payment in full (send check or money order); or send only \$2.00, we will ship C.O.D. You pay balance plus postage.

DREMEL MFG. CO. DEPT. 117-M
RACINE, WISCONSIN



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Moto-Tool Shaping Table \$2.50. (Shown with stand, right). Aids accuracy in routing, grinding.



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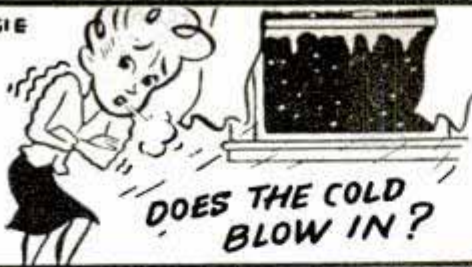
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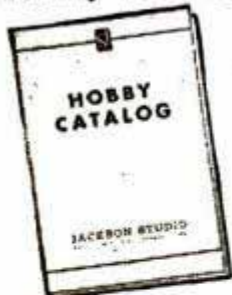
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Cadillac and Oldsmobile will continue with their optional Hydra-Matic systems in the 1948 models. Only the largest Oldsmobile, the "98," will have the new '48 body; changes in the smaller models will be limited to face-lifting.

Chevrolet, biggest seller in the country today, will rest on a backlog of 1,500,000 orders and come out early in 1948 after a slight face-lifting operation. No major change in the Chevrolet is expected until 1949.

The Chrysler Corporation is reported to have dies ready for a quick changeover should sales conditions demand it. This is said to be especially true in the case of the Plymouth. No announcements have been made, but the chances are that if Ford offers an optional automatic transmission the Plymouth will be equipped with Fluid Drive.

The 1948 Kaisers and Frazers will be much like the '47s, according to reports, with the possibility of a slight lowering of the cars (in height). No extreme mechanical changes, such as a rear-engine or front-wheel drive, are predicted. The same applies to the '48 Nash models with some restyling in both the "600" and Ambassador line. There will be no production shut-down during the changeover.

Over in Toledo, known in automotive circles as Jeepville, Willys-Overland is introducing a new jeep "station sedan" this month and a sporty convertible-type car in March. The convertible is mounted on the jeep station wagon chassis with a reinforced frame and has the jeep engine and front end. It will have a gray canvas top. The station sedan has an interior that resembles a conventional passenger car with upholstered seats.

Much has been written about the Tucker '48 (*Popular Mechanics*, September, 1947). Despite many harassments, the company still plans to get into production early in 1948 and hopes to be building 1000 cars a day before the end of the year.

Many U. S. automobile owners, possibly prompted by the rising costs of living, are showing an increasing interest in the mid-gt-car field. They may be able to take a choice of four such U. S.-built cars in 1948. These include the Crosley, most firmly established car in its field with some 700 dealers and a growing organization, the Playboy, Keller and Davis.

The Playboy, which is manufactured in Buffalo, N. Y., features an all-steel disappearing convertible top. The car is powered by a four-cylinder, 40-horsepower engine, has hydraulic brakes, travels 35 miles

(Continued to page 268)

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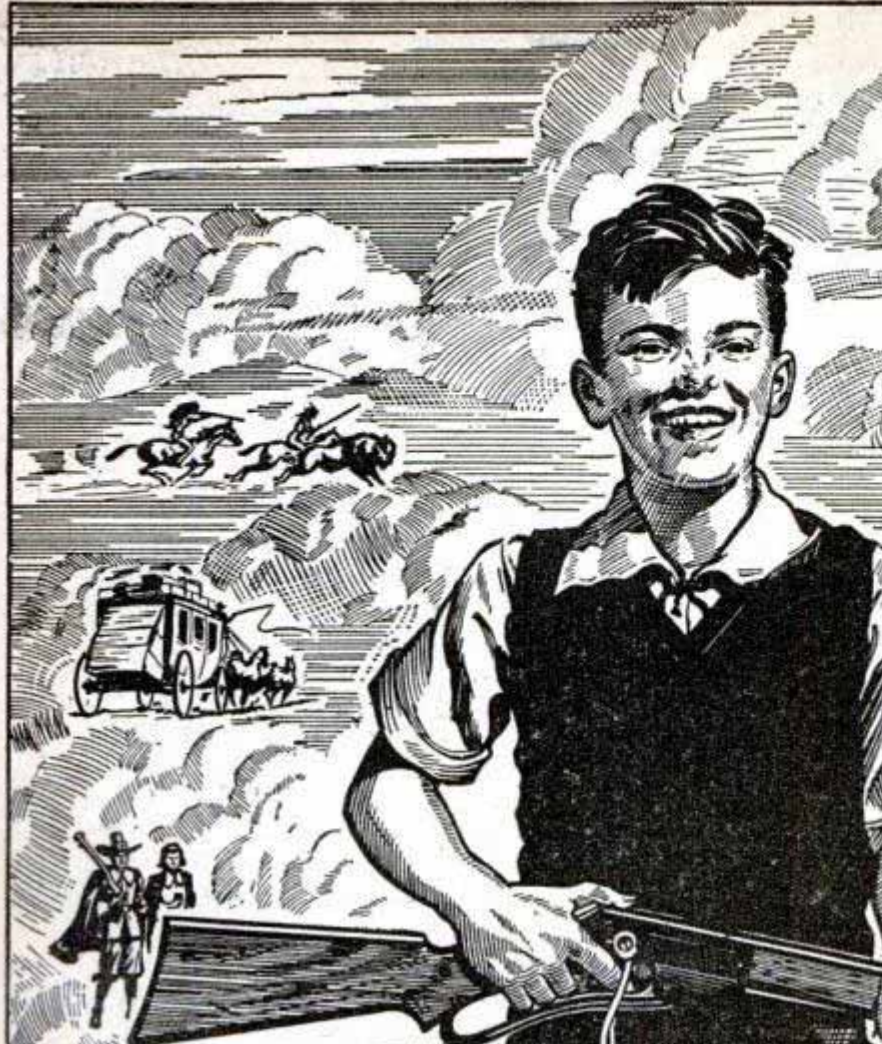


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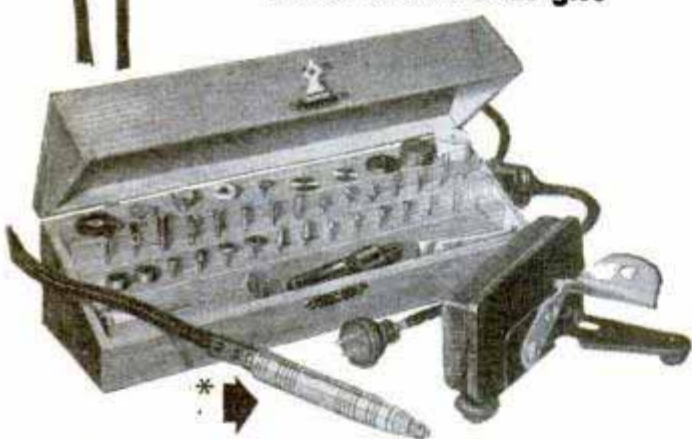


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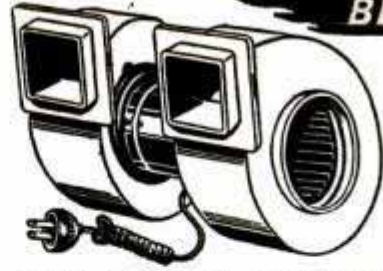
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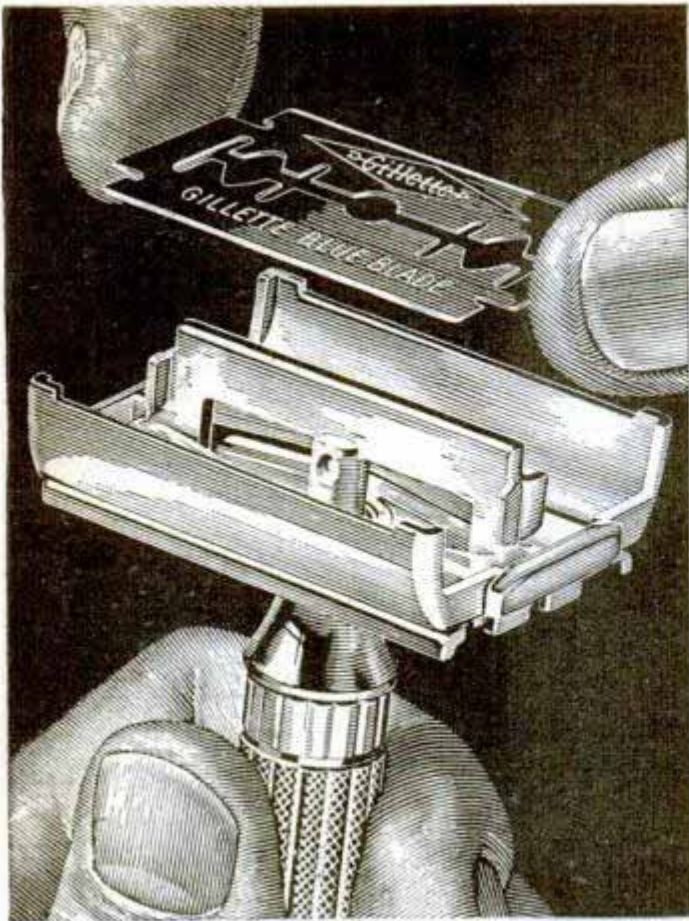
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SHAVING is mighty quick and easy when you use a modern Gillette One-Piece Razor. There's nothing to take apart or put together. You change blades in jig time. Twist . . . the razor opens. Twist again . . . your blade's locked in position. For cleaning both razor and blade just loosen the holder, rinse and shake.

Enjoy utmost shaving comfort and convenience. Get a Gillette One-Piece Razor. The Gillette Aristocrat, gold-plated, with case and 10 Gillette Blue Blades, \$3.79. The Gillette Milord, gold-plated, with case and five blades, \$2.50. Either will give you years of shaving satisfaction.

Gillette Safety Razor Co.,
Boston 6, Mass.

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look SHARP! feel SHARP! be SHARP!
use
Gillette Blue Blades

WITH THE SHARPEST EDGES EVER HONED



on a gallon of gasoline, and has a maximum speed of 70 miles an hour. The Playboy is 13 feet from bumper to bumper, 54 inches high and weighs 2035 pounds.

The Keller, the product of Keller Motors in Huntsville, Ala., has a four-cylinder engine that can be located in the front or rear. Three models are planned, a station wagon, convertible (featuring a rear-engine chassis) and a delivery car. The company expects to get into production with the station wagon early in 1948.

Another newcomer to the midget class is the Davis. This is a three-wheel coupe with a removable top now being built at Van Nuys, Calif. The Davis has a wheelbase of 108 inches and is powered by a 68-horsepower engine.

Since the war ended U. S. manufacturers have produced about 5,500,000 cars. The experts figure there is still a deficit of 9,000,000 passenger cars. At that rate it will be 1950 or 1951 at the earliest before you can walk into a showroom and say:

"I'll drive that one home."

Plastic Coating Protects Metal

Metal surfaces are weatherproofed by a special plastic coating less than $\frac{1}{1000}$ inch thick. The coating gives temporary protection before painting, and it makes the paint stick to the surface better. In a test conducted by the Bakelite Corporation, the metal bottom of a boat was coated with the plastic and painted. After six months' service the boat ran aground and some of the paint film was torn off. After 18 months in salt water, there was no corrosion from water getting into the coating despite the break in the paint film. The coating produces effective results in temperatures from below zero to midsummer heat.

Brown Light Prevents Night Blindness

Units of the Swedish Navy are preventing night blindness of lookouts and deck officers with brown light. Formerly, men who had been in lighted rooms were almost blind when they stepped into the dark and nearly a half hour passed before their eyes were satisfactorily adjusted to night vision. On new Swedish ships two systems of lighting are being installed, one that gives ordinary white light and an emergency system that illuminates with tempered brown light. Chart cases and navigation instruments will be lighted by brown lamps equipped with rheostats for adjusting the intensity of the light. Brown is used because other colors remain practically unchanged in such light. Red and blue light both proved unsatisfactory in experiments.

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(1) World's safest saw. (2) Portable. (3) No rotating motor needed as self-contained magnetic power unit transmits A.C. magnetic impulses to armature diaphragm—power transferred to blade. (4) No rotating parts to wear out. (5) 14,400 magnetic strokes per minute. (6) Never needs oiling. (7) Large 10"x10" table top. (8) Cross section engraved

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SAW!**

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**FOB
FACTORY**
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18 lbs.
Slightly higher in
Foreign Countries.

**NO MOTOR
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JUST PLUG IN!
CUTS CLEAN
AND SMOOTH!**

GET YOURS NOW!

Here's the perfect, lasting family Christmas gift to get or give . . . SYNCRO . . . the remarkable, safe, patented magnetic jig saw . . . ready for immediate shipment! SYNCRO needs no belt, no gears, no oiling. No motor to buy. Just plug in any 50 or 60 cycle (A.C. only) 110-120 volt wall outlet—in kitchen, attic, basement—set on kitchen table, floor, anywhere—and saw! The high-speed, short Magnetic Safety Stroke Action, and freedom from belts, makes SYNCRO so safe small boys and girls may use it. Cuts intricate designs on 5/8" soft wood, 1/2" medium hard plywood and thinner hardwoods, plastics, thin metals. Leaves no ragged undersides on plywood, cardboard. Cuts to center of 27" circle! Get, enjoy this safe, educational, practical quality tool for making models, displays, puzzles, inlays, silhouettes, toys, what-nots, etc. Limited supply—so hurry!

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DECEMBER 1947

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3 Blades

No. 2000

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When you receive your SYNCRO, plug it into any 50 or 60 cycle (A. C. only) 110-120 volt wall outlet and saw, according to instructions. THEN . . . if it does not saw cleaner, better than any other jig saw you ever used and with more safety . . . if it does not satisfy YOU . . . return it undamaged, postpaid and postmarked within 10 days of its delivery date . . . and then your \$17.50 will be refunded promptly without question.

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Rochester, Michigan
Export address: 120 Wall St., New York City

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Express charges collect or Parcel Post charges collect.

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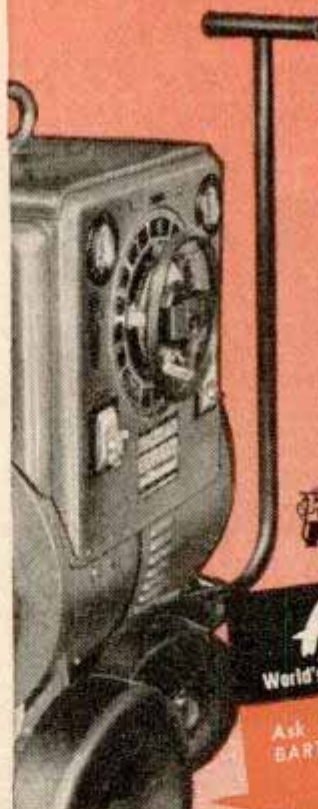
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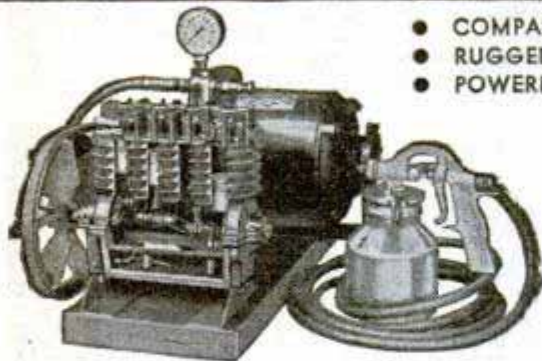
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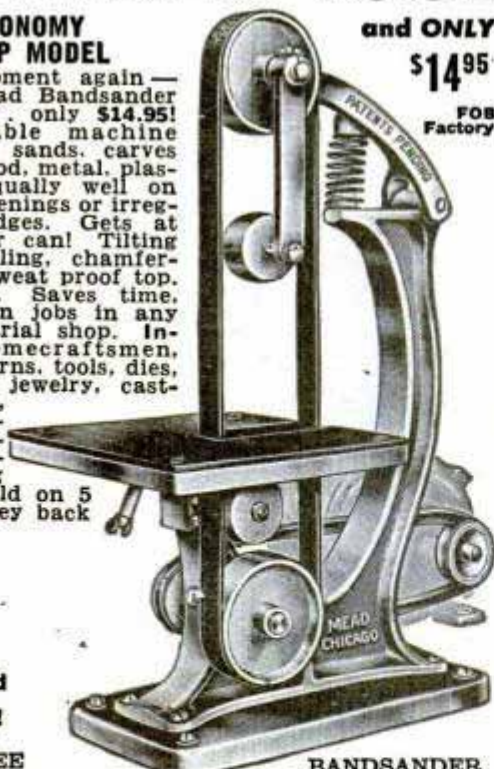
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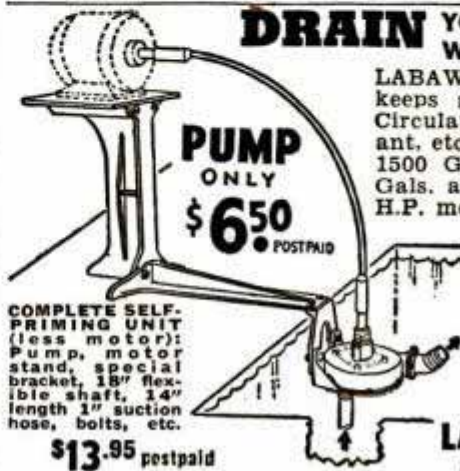


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Will lend prestige wherever used. With a Whipco Clamp and a little glue that broken piece of furniture will be back in use.

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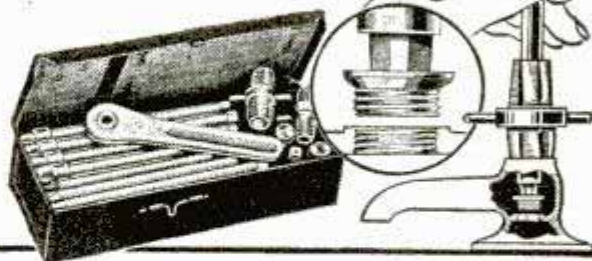


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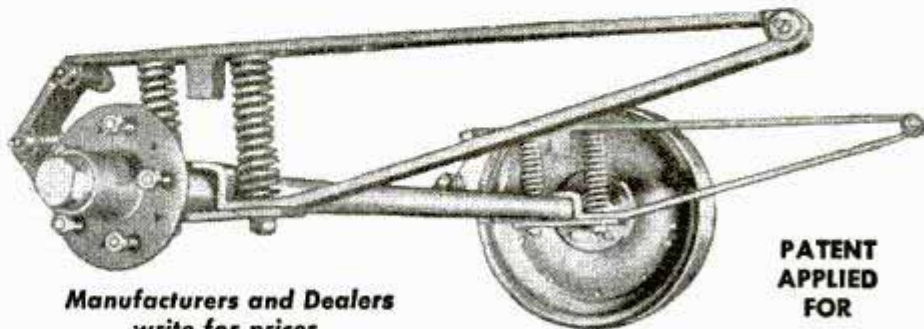
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Axle only, \$6.50—With Springs, \$22.00; Axle, wheels and hubs, \$30.50; Axle, wheels, hubs and springs, \$43.70.

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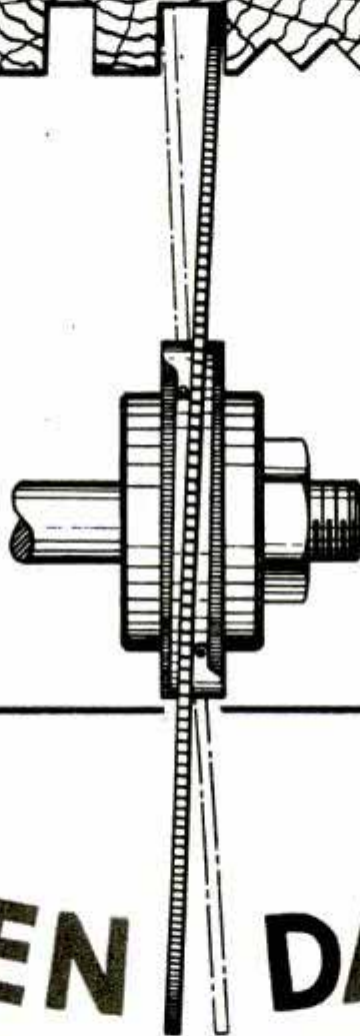
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Specify exact year, make and model when ordering. Send for catalog on motors not listed.

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Year	Type	Outright	Exch.
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Bolts to clutch housing on the Jeep engine. Has a spline shaft to engage with clutch and extending from rear is a keyed shaft on

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Each.....

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Vented for
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Self-locking
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Size of can,
18" high, 6 1/4"
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COMPLETE with . . . Generator, Starter, Distributor, Coil, Fan and Fan Belt, Water Pump, Fuel Pump, Intake and Exhaust Manifolds, Carburetor, Oil Filter, Spark Plugs, Flywheel, Clutch and Pressure Plate, Wiring.

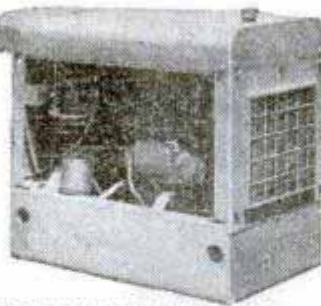
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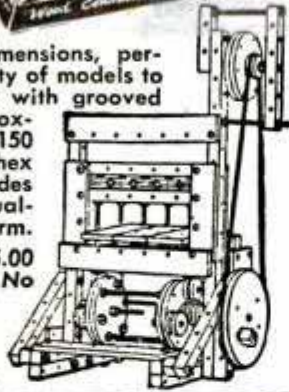
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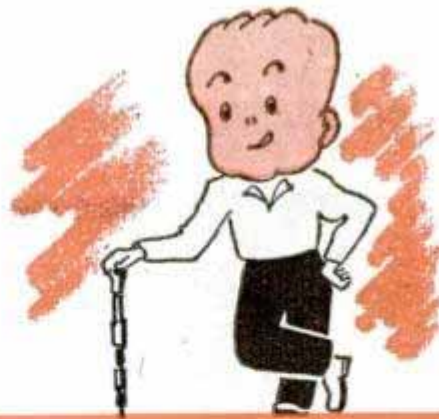
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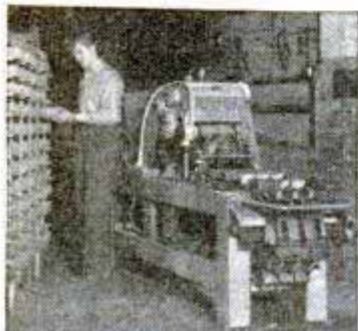
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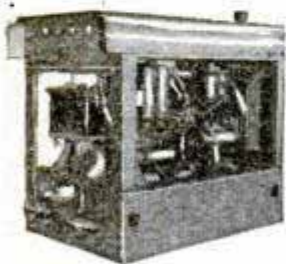
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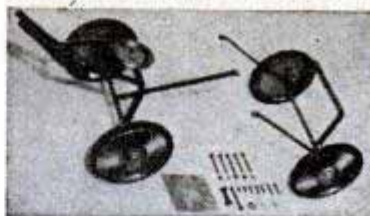
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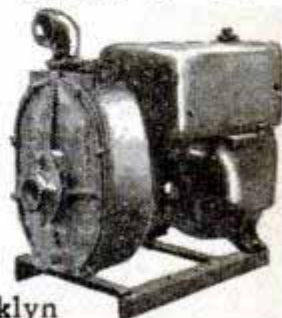
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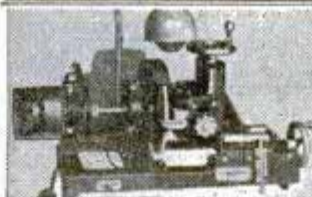
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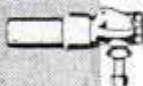


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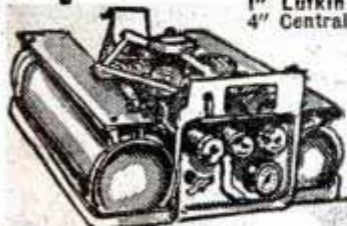
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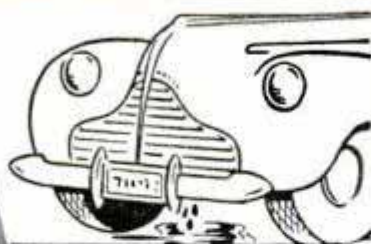


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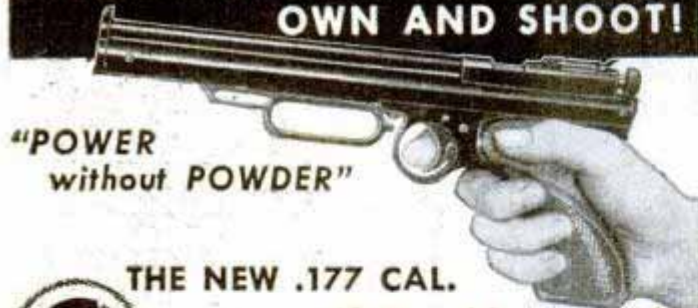
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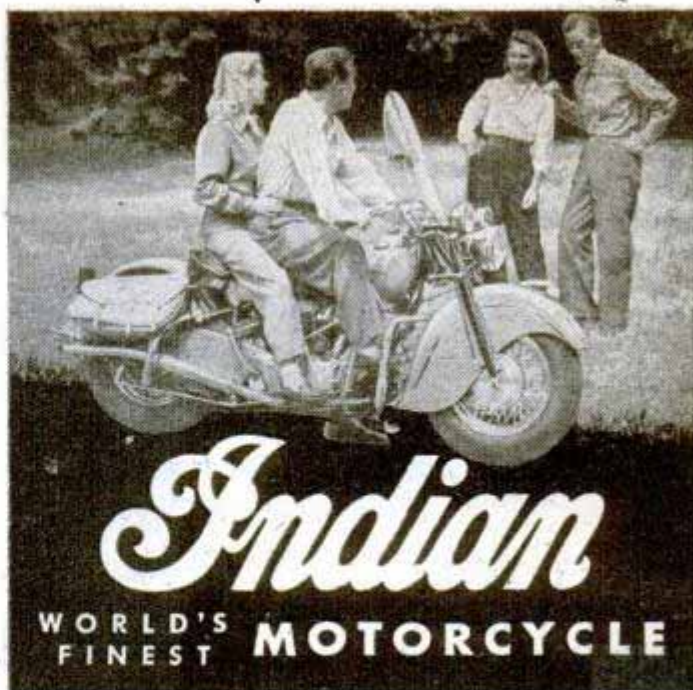
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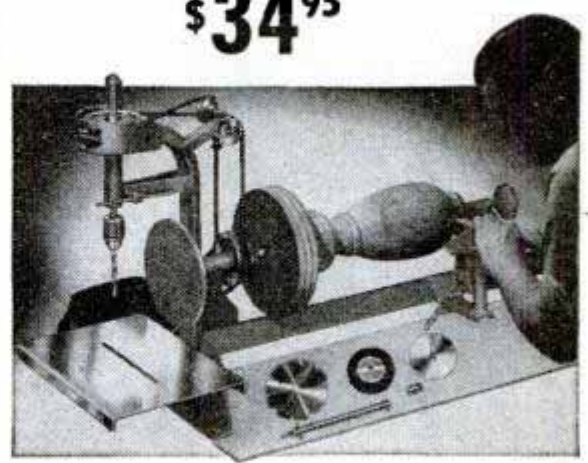


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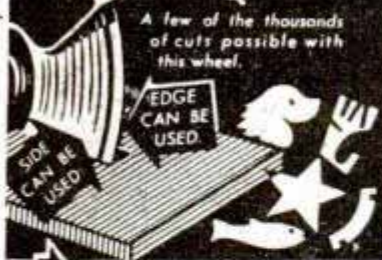
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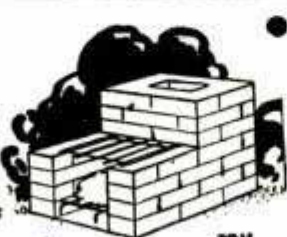
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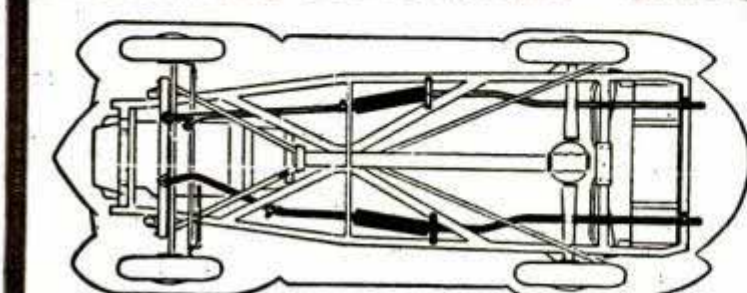
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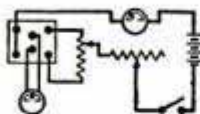
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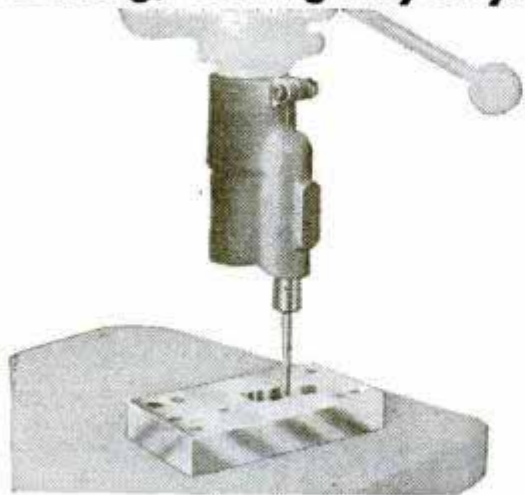
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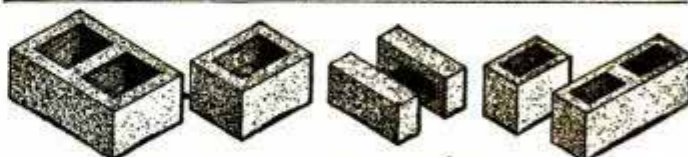


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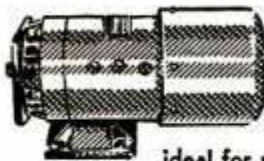
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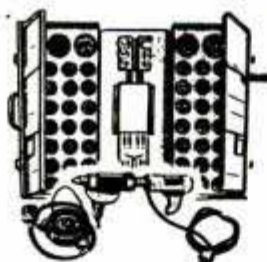


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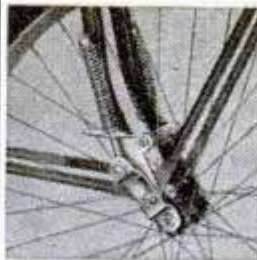
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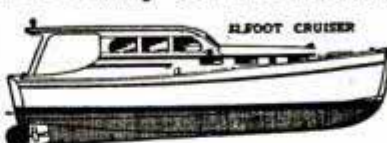
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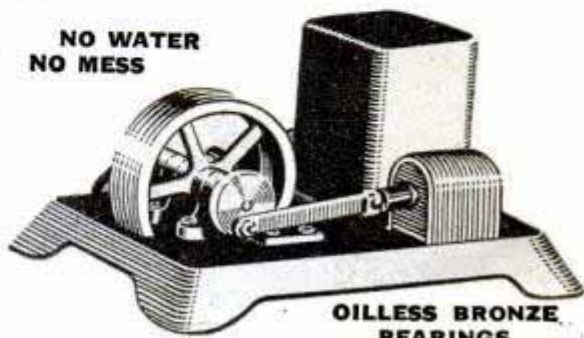
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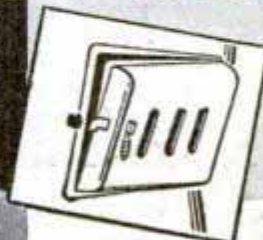
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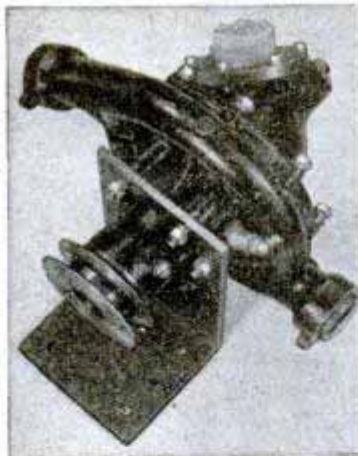
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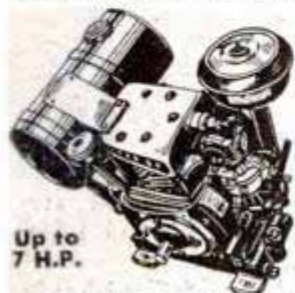
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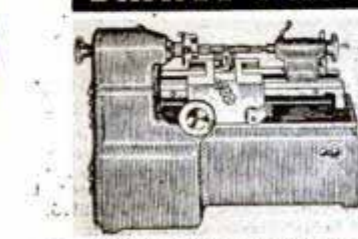


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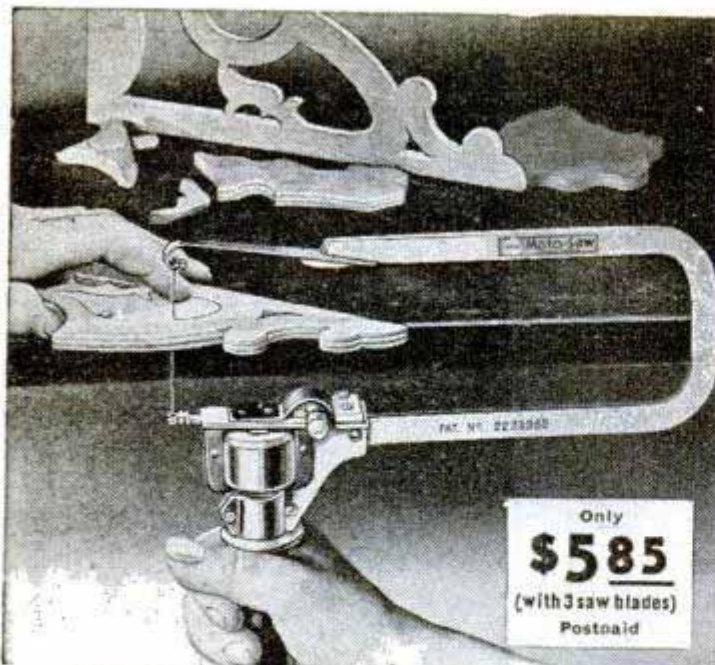
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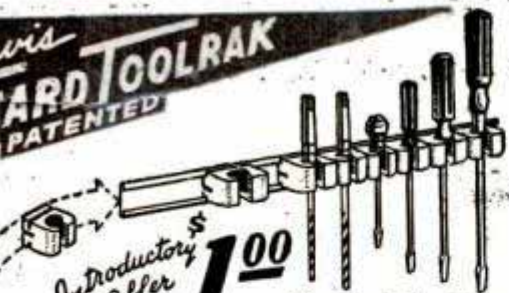
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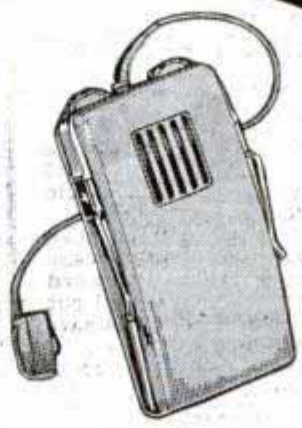
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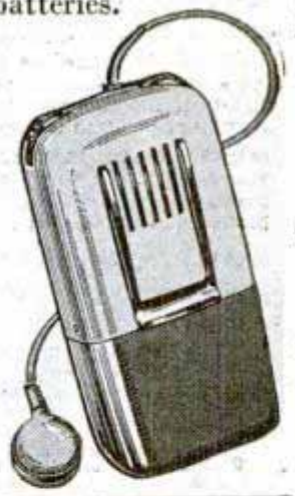
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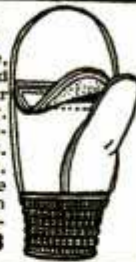
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