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ICE - WATER "SCOOT"

Page 112

SPEEDEX

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2. MORE COMFORT! "Truly remarkable service", writes W. T. Sherin of Greenwich, N. Y., who has driven his BFG tires 43,519 miles. That remarkable service includes more comfort, proved by riding tests that show BFG tires give a smoother ride than other regular tires.



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This One





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THERE ARE 10,000 pegs in this machine, representing 10,000 subscribers in a crossbar telephone exchange—the latest switching system which handles dial calls with split-second swiftness.

The pegs represent many types of telephone users—two-minute talkers and ten-minute talkers . . . people who dial accurately . . . those who make a false start or two. They are starting a journey through a unique machine which analyzes the performance of dial equipment in a typical central office.

But while an actual crossbar exchange connects your call in a matter of seconds, this counterpart moves far more slowly. It gives the Bell Laboratories engineers who built it time to observe what happens to

each call—where bottlenecks develop, which parts are overworked or underworked, which of the circuits are most used.

In a manual exchange, the number of operators may be changed to meet different traffic conditions. In crossbar, all switching is done by complex electro-mechanical devices, permanently built in. This machine shows how many devices of each kind there must be in a new exchange to give you the best of service with a minimum of expensive equipment.

This traffic-study machine is one of the many ingenious research tools devised by the Laboratories as part of its continuing job—finding new ways to give you better and better telephone service.



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Popular Mechanics Magazine

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this month's cover

VERY SPORTY LOOKING, that strange amphibious craft portrayed in beautiful northwoods surroundings on our cover. Actually, it isn't for fun. It's a business coupe for travel on lake ice or open water. To get better acquainted with it, try hunting game out of season along the Canadian shore of Georgian Bay, or go stealing timber from some private Ontario woodland. You'd find yourself a fugitive from the "Scoot," which has as its sole reason for existence the chasing of poachers for the Ontario government. Conceived and built by Ontario forestry men, the craft is unique and alone in the world. Only one has been built; but if we know our family of readers, a lot of homespun copies of the Scoot will be speeding over frozen landscapes next winter. Roswell Brown was the cover artist. Story of the Scoot appears on page 112.

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 Fettridge, vice president and assistant to the publisher; Clover L. Perkins, advertising manager; Alan M. Devoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in United States and possessions, Canada, Philippines and countries of the Pan-American Postal Union, 1 year, \$3.50; 2 years, \$6.00; 3 years \$8.00. To all other countries add \$1.00 a year

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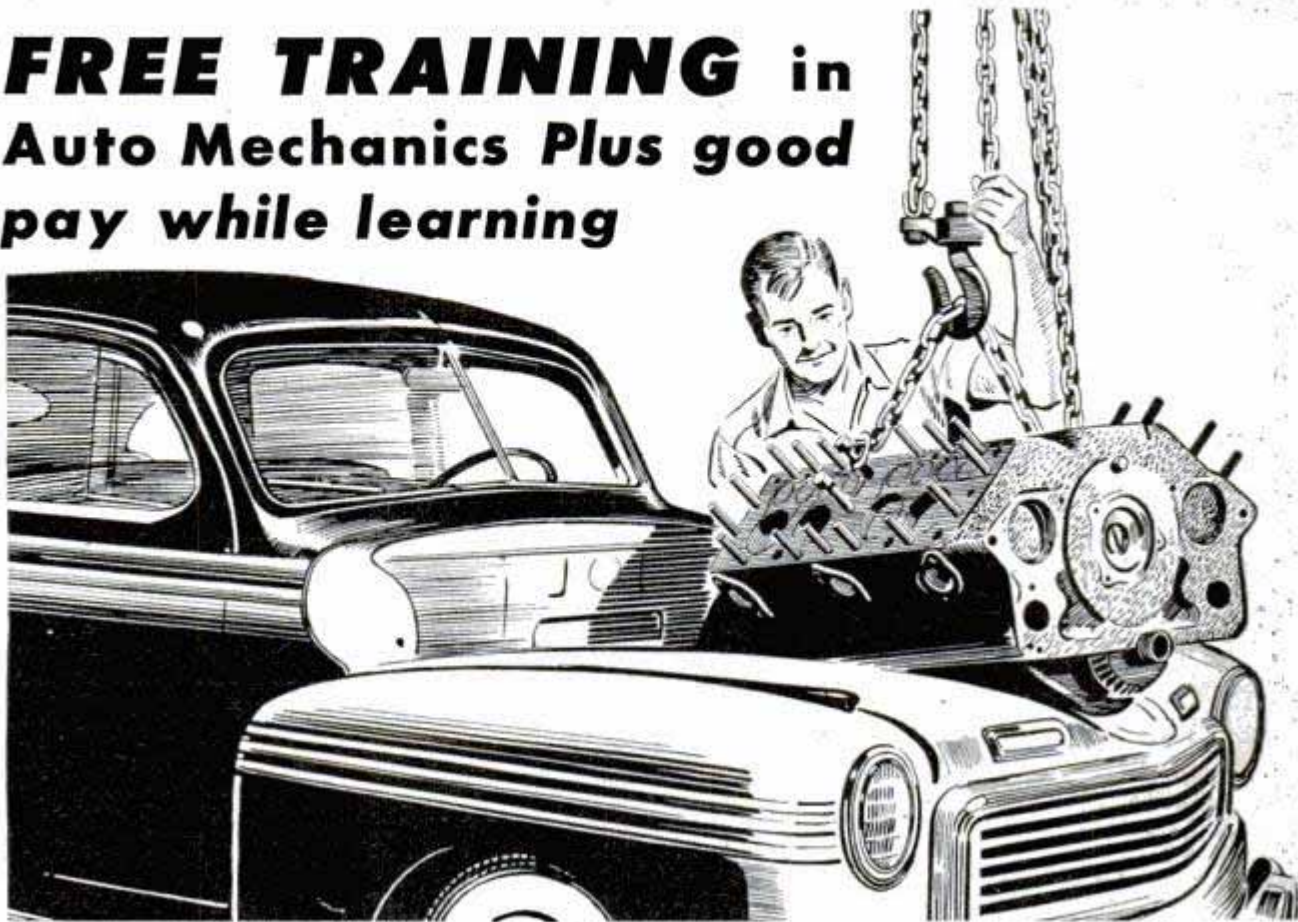
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This was Ultrafax in action—a super-fast television communications system developed at RCA Laboratories. Reproductions of *any* mail—personal, business, or military . . . including police descriptions, fingerprints, bank drafts—can travel at 186,000 miles a second!

Material to be sent is placed before an RCA "flying spot" scanner, and transmitted by ultra-high frequency radio signals. Miles away, the pictures appear on a picture tube and are photographed. By a new photographic process, negatives are ready for printing or projection in 40 seconds.

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Ultrafax is but *one* of scores of major achievements pioneered at RCA Laboratories. This leadership in science and engineering adds *value beyond price* to any product or service of RCA and RCA Victor.

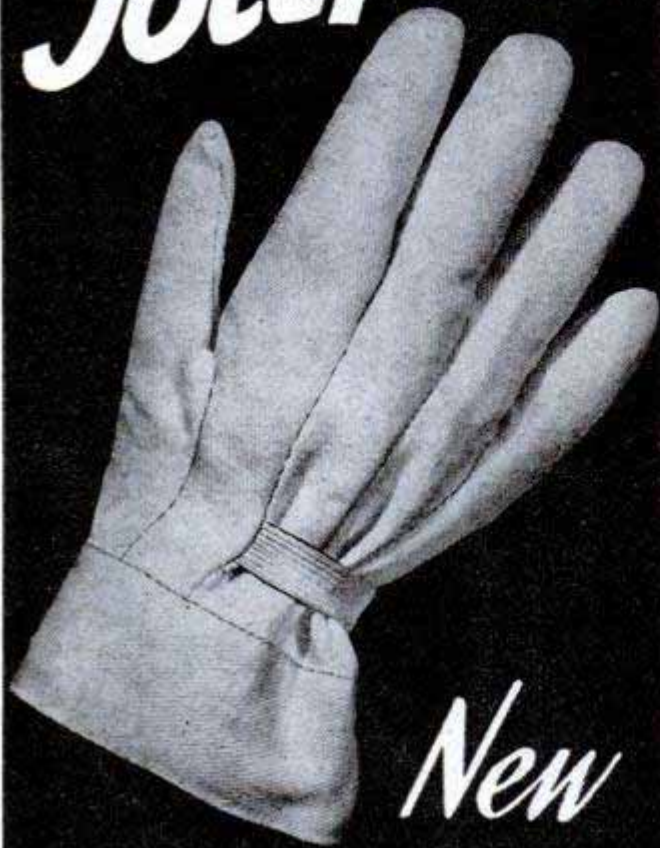
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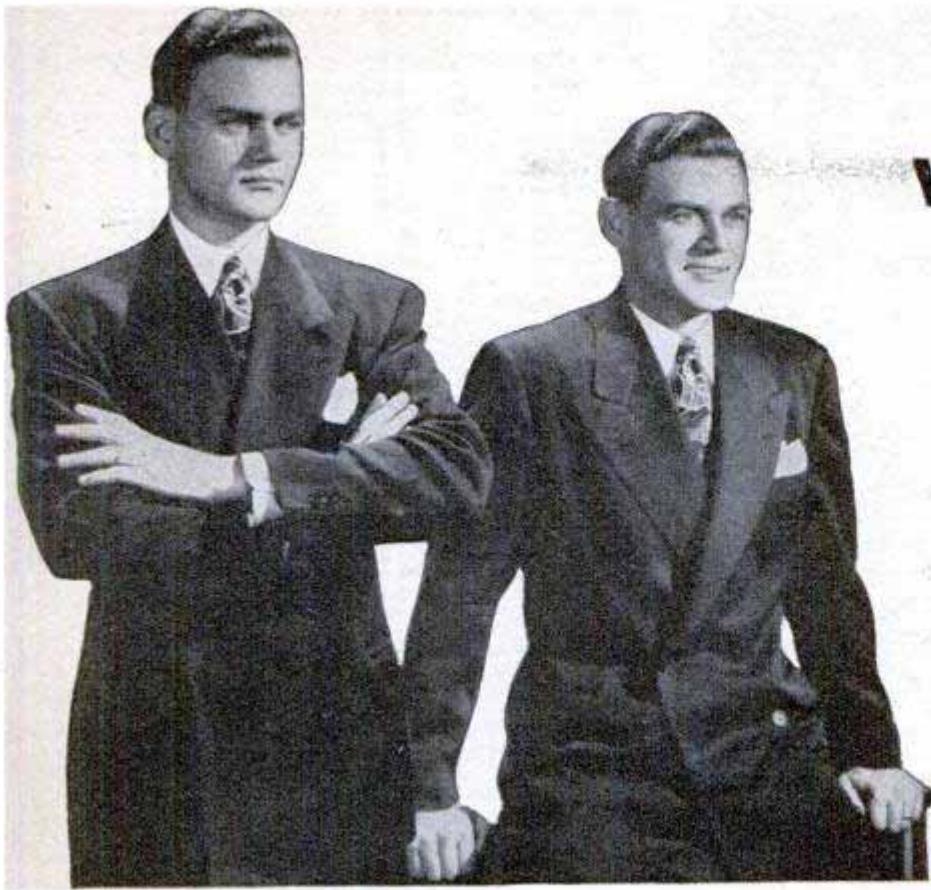
THE BOSS spotted a headline in the paper: Operation Hole-in-the-Ice. There ought to be a story for us. Next Wednesday a few hundred hardy fishermen would start chopping holes through 40 inches of ice on the bleak surface of Great Slave Lake, 800 miles north of the Canada-United States border, to haul up whitefish and lake trout.

Anybody want to go up there and get the story and pictures for us? We cast around for one willing and capable, and found him in the person of Harry Rowed, Canadian photographer and writer. He caught a plane north from Edmonton about the time he meant to hang up his sock for Santa, spent the holidays in the land of quick-freeze and came back with a whale of a story, which please sit by the fire and read. It begins on page 114.

Mr. Rowed wrote us glowingly about the wonderful break in the weather. It really warmed up for him.

"I was comparatively lucky," he said. "Just three or four days before I arrived they recorded temperatures below —60. Was out on the ice one day at 40 below, but had more grief trying to keep the camera warm than I did myself. Fortunately, I had winterized the cameras about a month ago. Daylight is a pretty slim quantity this time of year... however, we had plenty of low sun for shadow effects, even at high noon!"

The fisher folk who swarm out across Caribou Bay with their dog teams every winter are a rugged and interesting lot... some of them Ukrainians, like Bill Workun, former Canadian paratrooper, and John Kashak; or Irish, like Bill O'Connor, Cree Indians like Leonard Cardinal and Frank Ladoucuer whose lead dog pulled him dripping from a break in the ice. Our own favorite is pretty Edna Powder, who helps her father, brother and sisters pack whitefish. You'll meet her on page 121. Agree?



If YOU were Boss would YOU promote "YOU"?

Business is always willing to pay the man who knows—and pay him well. The man who is ready and will-

Be honest now—

suppose that a better job had opened up in your company—carrying with it promotion and more money—could you qualify?

If you were boss, would you select "YOU" for that better job?

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First of all, could you *fill* the job? Has your experience fitted you for the step forward—have you been preparing for promotion apart from experience gained on the job?

Or have you just been filling a niche, doing daily tasks well but making no real and intelligent effort to learn and qualify for the job ahead so that if an opening should occur you would be ready to fill it?

The man who gets real promotion is the one who makes his own breaks—the man who slaves in the ordinary job at low pay just wishes and dreams of promotion and more money. Which are you?

ing to take responsibilities—and capable of directing the efforts of other men is a valuable asset to any business organization. He never wants for a good job and above average earnings. He gets ahead.

We have helped thousands of men achieve promotion and more money—success sometimes beyond their dreams—a success that was started by a coupon similar to the one below.

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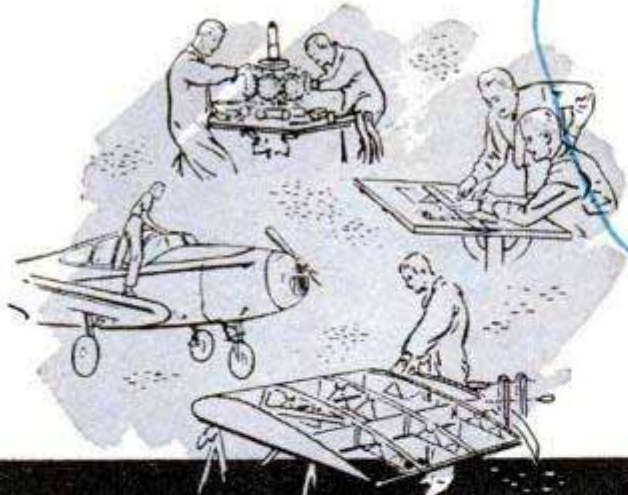
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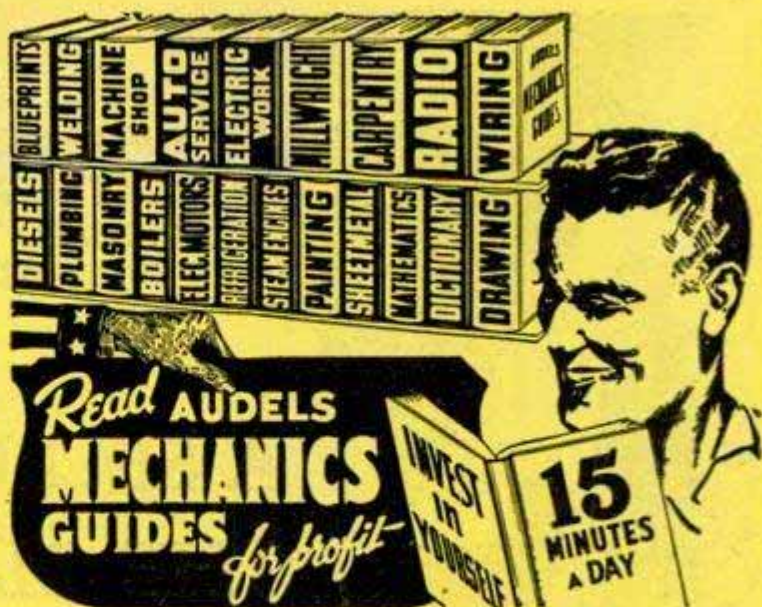
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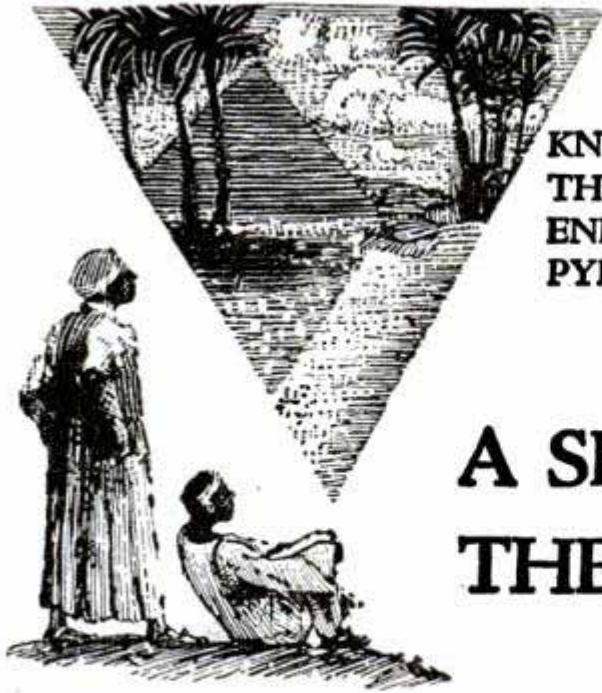
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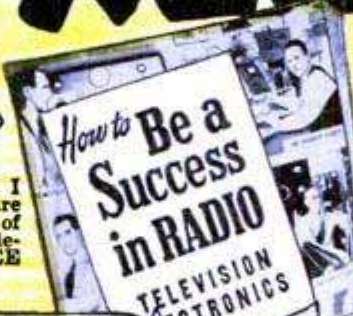
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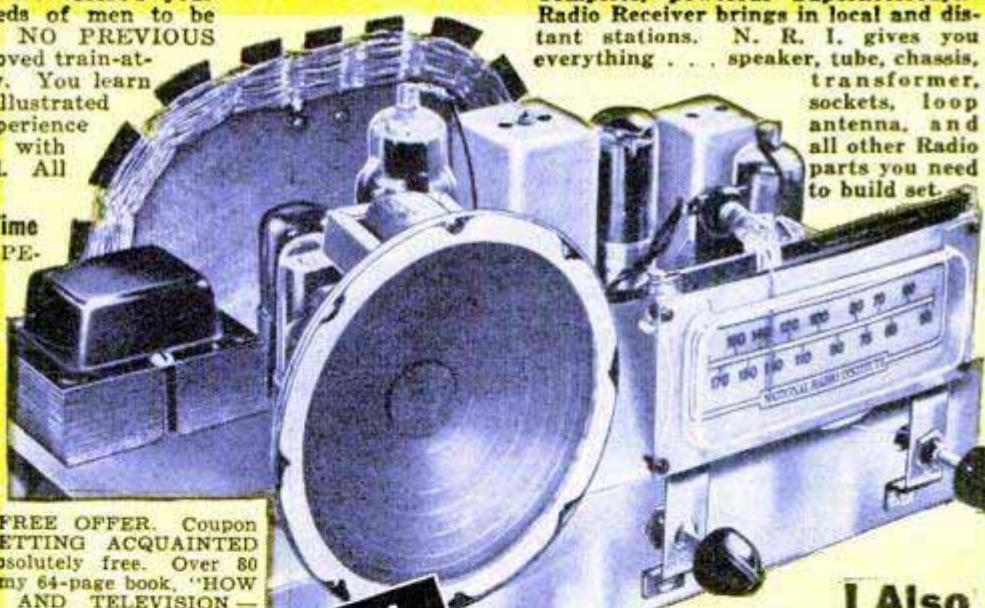
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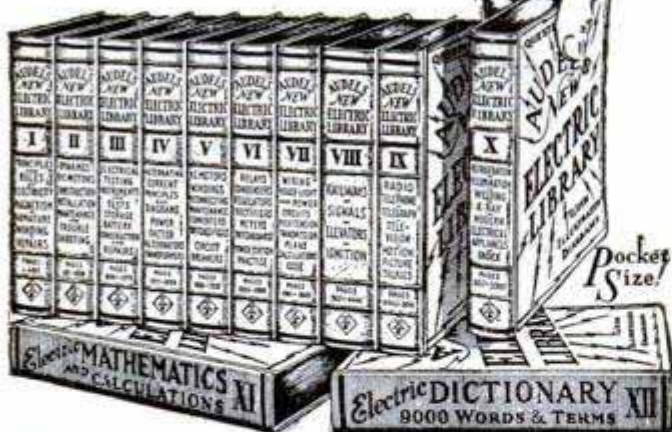
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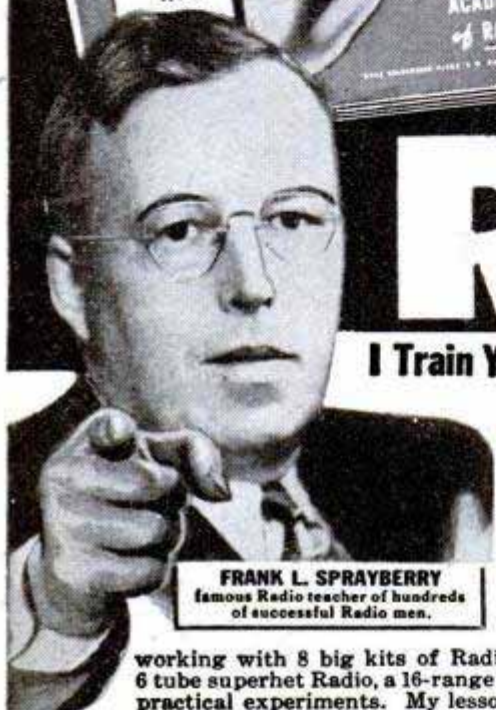
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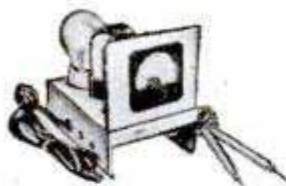


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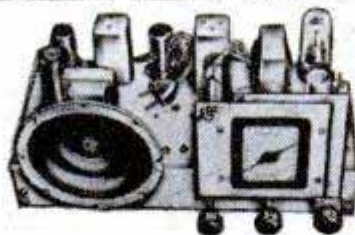
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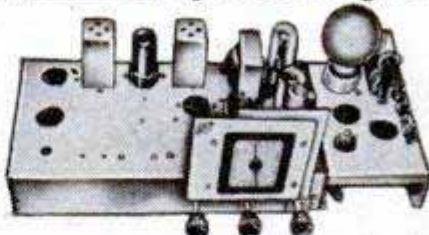
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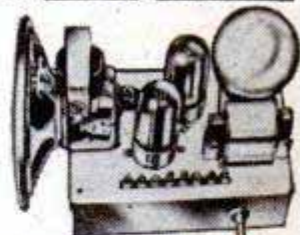
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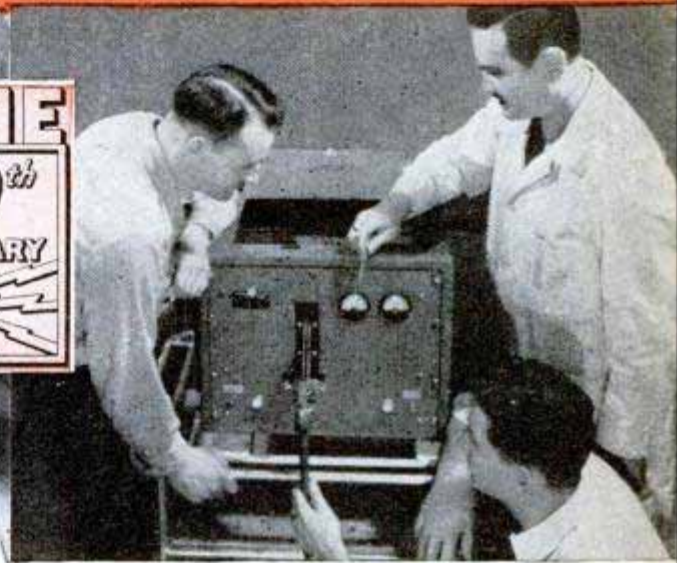
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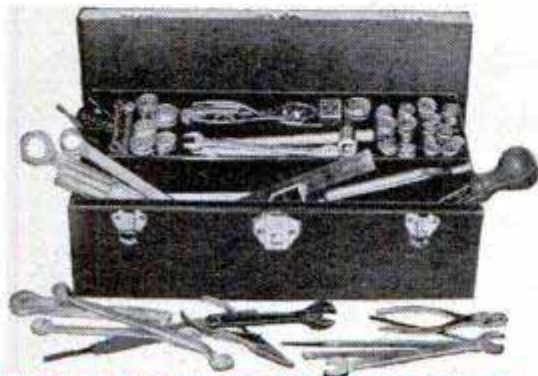
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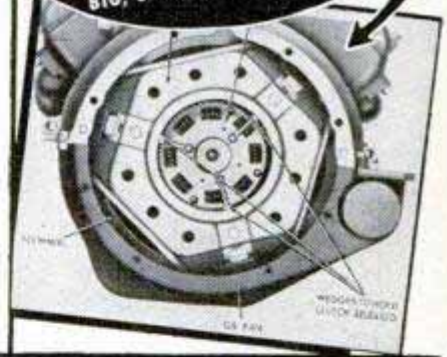
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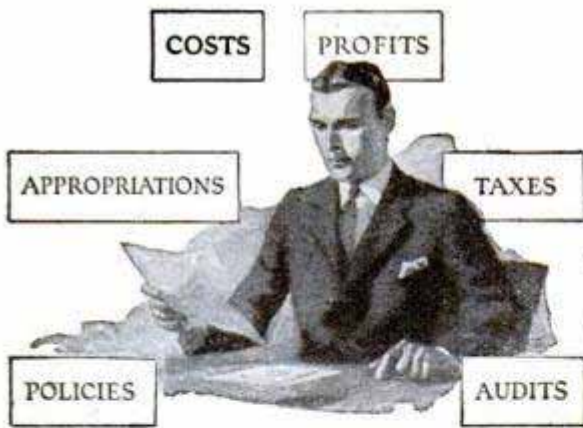
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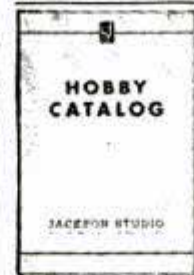
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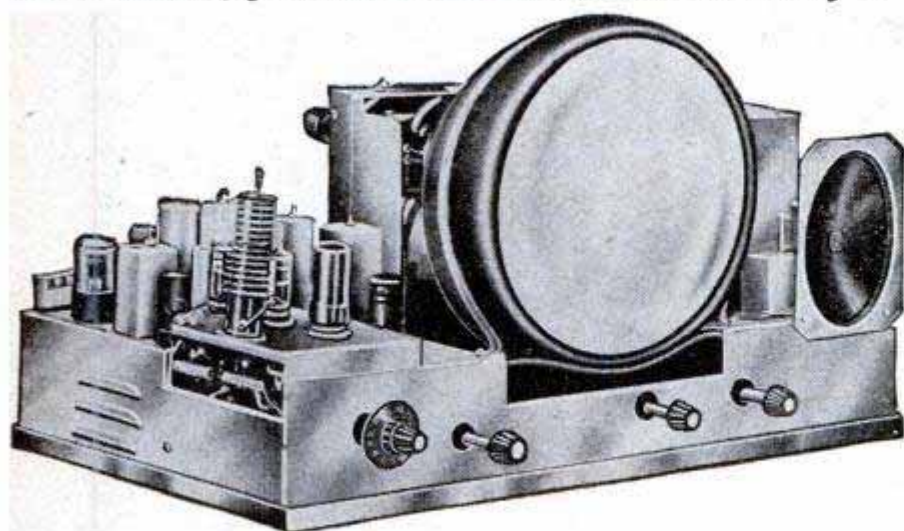
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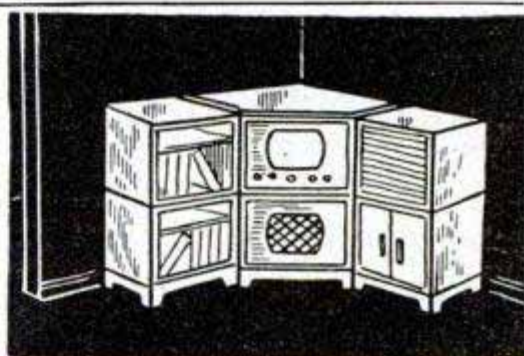
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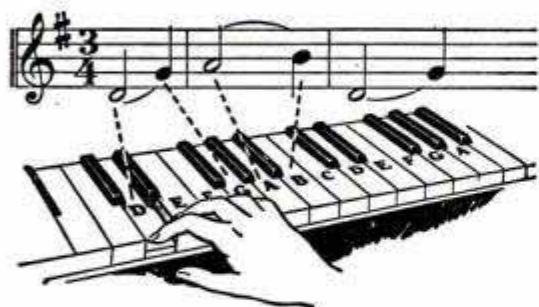
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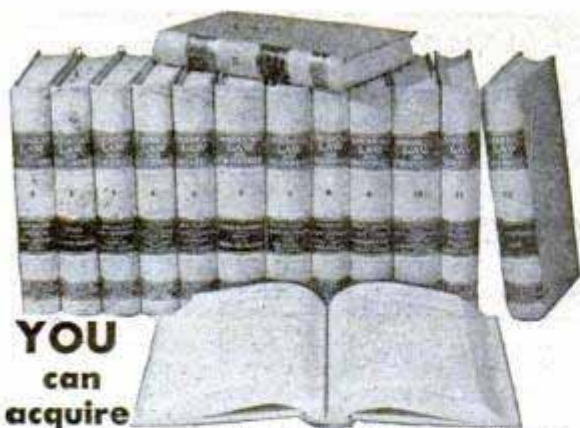
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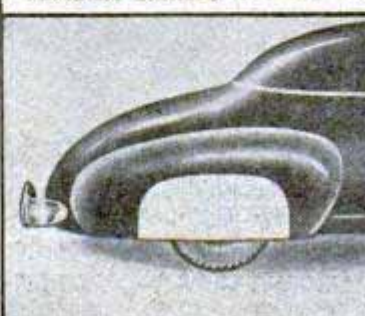
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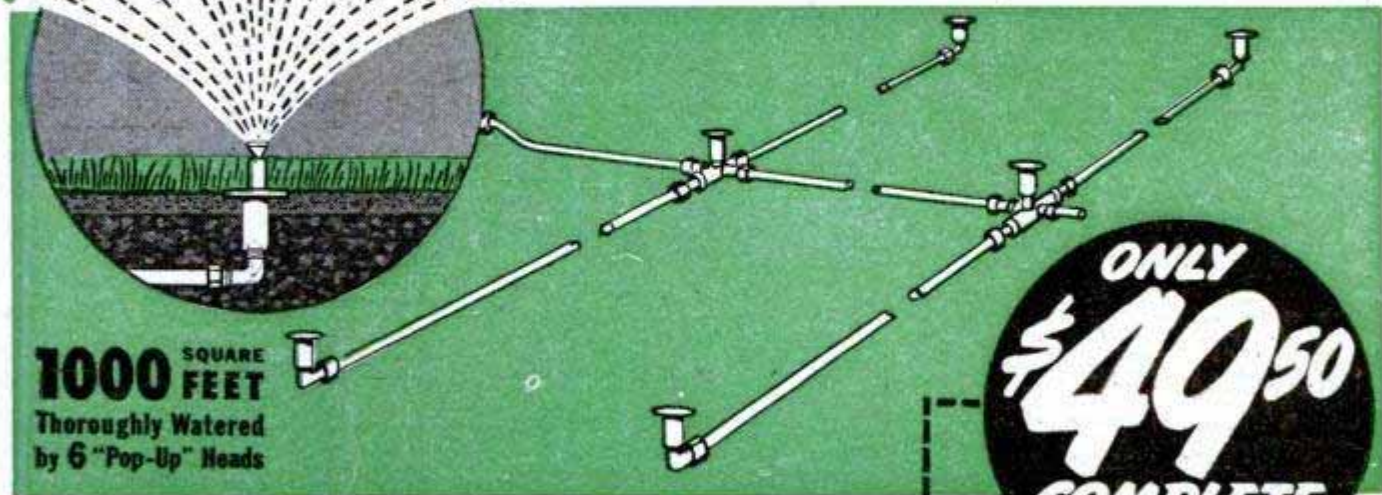
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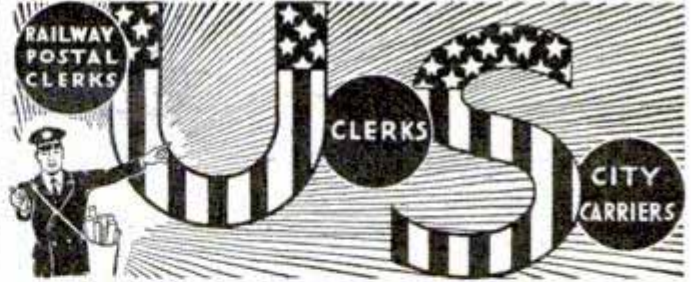
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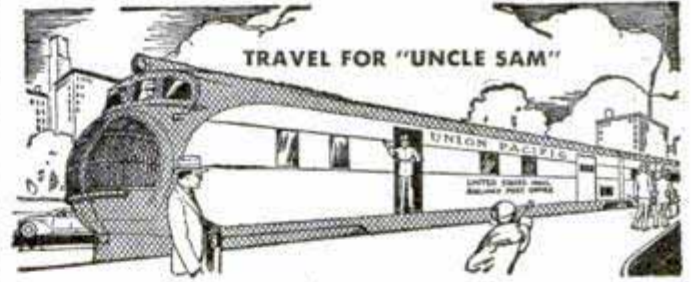
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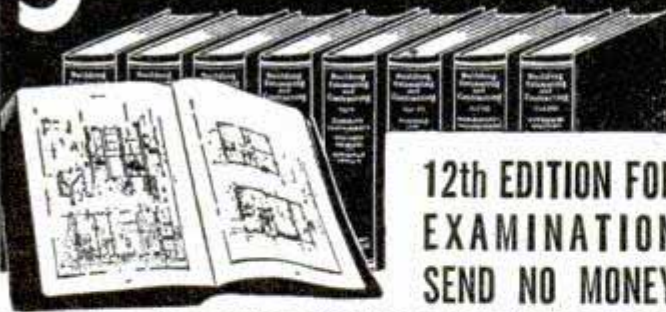
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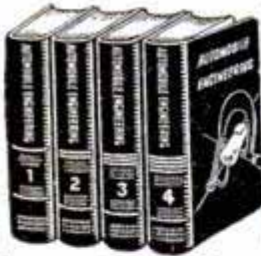
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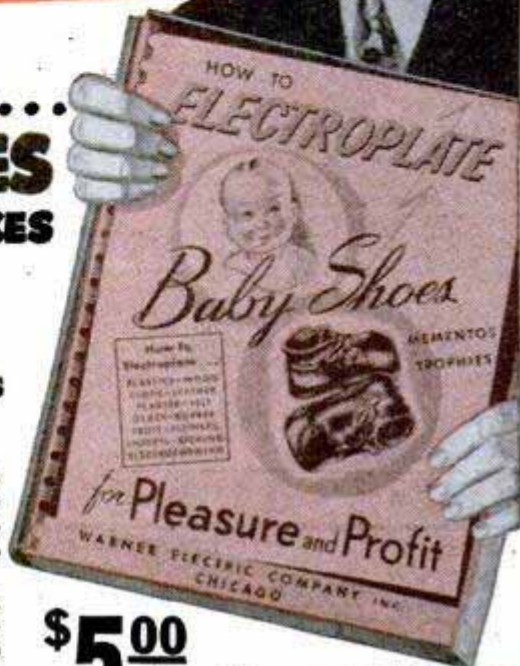
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TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

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PROPELLERS, Plans, for ice-snow sleds, air boats. Catalog 10c. Banks-Maxwell, Ft. Worth, Texas.

PROPELLERS—2-3 Blade for sleds, air-drive boats. Catalog. Standard Aero Craft, Box 387, Ft. Worth, Texas.

LIGHTPLANE Manuals, blueprints. Circular illustrating designs, motors 20c. Craftsman Books, Box 1153, Milwaukee 1, Wis.

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NEW Motors, General Electric, 1/2 \$12.50, others to 1 horsepower. Free literature. Plenge, 114 Elliot Place, Bronx 52, New York.

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BUY Lamp parts wholesale. Parts you need for building, repairing, or assembling. Save money on large or small orders. New catalog for 10c. Gearon Company, Dept. 300-B, 27 South Desplaines, Chicago, Illinois.

MAGNETS, Two Alnico (V) rods, booklet, circulars—25c. Terry Sales Company, Box 1014, Toledo 1, Ohio.

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WELDER! New portable Champion Special transformer welder; 110/120 volts a.c. develops to 75 amps.; 9 heat stages. Welds, brazes, solders, cuts all metals. Easy to use. Simple instructions. Special flame weld torch free. Splendid for shop, farm, home repairs. Saves hundreds of dollars yearly. Only \$27.50. Also heavier models. 10 day free trial. Magic Welder Co., 239 MP Canal St., New York, N. Y.

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BAND-SAW For home workshop—Hobbyists. Special \$14.95. Equals high priced band saw. Circular free. Woodcraft Tools, Inc., 147 E. Lake, Minneapolis, Minn.

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REAMERS Ground, 10c blade, plus postage. Frazer, Box 801, Santa Rosa, Calif.

POWER Tools, equipment wholesale prices. Free bulletin. Homcrafters Co-operative, Grand Rapids 6, Michigan.

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GAS Drive arc welders, "Build-ur-own" portable. Get profitable jobs anywhere. Save \$350 with Hobart generator plus auto engine. Free instruction book. Write Hobartweld, Box M-397, Troy, Ohio.

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DRILL Grinder for twist drills, \$2.95. See ad on page 283.

BENCH Saws, popular 8" size for home craftsmen, \$17.50. A. S. H., 2651 Cleveland, Westlawn, Penna.

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KNOCK Down boat kits. Outboards, inboards, sail, racing, molded shapes. Easy to assemble, enjoyable, minimum cost. Illustrated catalog 25c. Brooks Boat Company, Carrollton P3, Michigan.

BUILD Flashlight battery powered model boat. Powerful motor, shaft, propeller, boat plans, \$2.50. Free details. Montague Electric, R-1, Montague, Michigan.

WANT Outboard motor 10 to 24 horsepower. Wesley Allen, Windsor, Mo.

BOAT Plans, kits—Hardware, conversions, plywood. See Marine Mart display ad page 297.

BOAT Plans: Wood; steel. Book, "Modern Designs for Boats and Yachts." \$1.00. John B. Clark, Yacht Designer, 329 Kenmore Drive, Bay Village, Ohio.

STEERING Wheels, windshield brackets, from \$6.95. Modern fittings, lowest prices, also complete pre-cut plywood boats. Bargains-galore. Folder 10c. Marine, Box 681, Mendota, Minnesota.

BUILD Marine motors, Ford or Jeep. Federal Marine Motors, 9011 Cottage Grove, Chicago 19, Ill.

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MOSSBERG Bolt, 22 repeater \$28.60; Taylor barometers \$10.00; surplus sextants \$12.50; binoculars (new) 7 x 50 \$67.50; dealers wanted. (Free catalog). Pan American Navigation Service, 12021-6 Ventura Blvd., North Hollywood, Calif.

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NEW Binoculars. Introductory offer Zeiss type 6x25-\$23.35; 8x30-\$30.00; 7x50-\$40.00 with case, straps. Money back guarantee. Bushnell Importers, 672 S. Lafayette Park, Los Angeles 5.

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SEE Gulf Hamstery ad on page 18. Shows picture of Hamster.

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

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

METAL, Plastic, onyx, mountings for bronzed baby shoes, 20 styles. Hardening solution. Wholesale. Box 2095, Wichita, Kans.

MAKE Money from own home by mail selling office supplies. Tremendous demand. Snyder, 5-B Spring, Beachwood, New Jersey.

PACKAGED Offer gives all help needed to start you in mail order. Details free. Terwilliger, 303 PS Chestnut Street, E. Bound Brook, New Jersey.

INCOME From local information. Interesting. Sparetime. Neher Company, La Verne, Calif.

START Profitable mail order business. Literature free. Paul Keich, Box 133, Bloomfield, N. J.

WE Need more live-wire Rototiller dealers to handle the well known, nationally advertised Rototiller. This machine is a leader in its field. A demonstration usually means a sale. Occupies small floor space. Many owners say Rototiller pays for itself in one season. Big dealer profits on every machine plus profits on attachments. Small investment puts you into the Rototiller business. Why don't you, too, make big profits in '49 with Rototiller. Write or wire Frazer Farm Equipment Corp., York, Pennsylvania. A division of Graham-Paige Motors Corp.

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

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

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

BIG Profits operating automatic shoe shine machines. Vassar, Cleveland 5, Ohio.

BLUEPRINTING — Thousands of small manufacturers, inventors, and sales organizations need local blueprint facilities. New direct process requires only inexpensive, easy-to-make equipment. Establish full or part time business in your community. Complete instructions \$1.00. Macy of Illinois, Distributors, 30 W. Washington, Chicago, Illinois.

BABY Shoe plating for the trade only. 5 day service. Beautiful samples always available. Thoro Plate Co., 6260 Romaine St., Hollywood 38, Calif.

SCIENCE Of memory simplified. Free booklet "Memory Development." Memorology Club, 2016 Sunnyside Ave., Chicago 25, Ill.

MAKE Flexible molds! Cast plaques, novelties, bookends! Free sample! H. Tooker, Hamilton 44, Ohio.

NOW Available! 1949 edition of Official Concessionaire's Guidebook. Jam-packed with money-making ideas, games, formulas, equipment for concessions, roadside stands, carnivals, medicine business, etc. Buyers guide. Send \$1.00 today for copy. Concessionaire's Guidebook, Box 133B Sta. B., Toledo 6, Ohio.

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

BUY Nationally advertised merchandise for others; radios, appliances, etc. Low wholesale prices. Make commission each purchase. Up to \$5,000 year possible. Easy, fascinating new business. Free information. Cox, Saugus 10, Massachusetts.

POPCORN Equipment, potato chip outfits. Long Eakins Company, 4960 Hi Street, Springfield 99, Ohio.

BABY Shoe metalizing. Secrets never before revealed. Amazing offer. Schoettle, Friendship, Ohio.

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

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

RAISE Ginseng. Roots bring \$10.00 pound. Circular free. Fezler Seed Co., Patchogue, N. Y.

ANNOUNCING Home study course in commercial baking. Practical basic training. Good field for those with aptitude. Nearly depression proof. Send for free booklet, "Opportunities in Baking Industry." National Baking School, 1315 Michigan Ave., Dept. 3438, Chicago 5, Ill.

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

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

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

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

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

MAKE Money by mail. Howard, 1778A Hamburg St., Schenectady 4, N. Y.

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

BUY The new Concession popcorn machine. Biggest low priced popper on market. \$100 puts you in business, complete. Also caramel corn, candy toss, candy pullers, kettles, heating equipment. Write for new catalog. Concession, Dept. A, Toledo 6, Ohio.

LEARN Piano tuning, repairing, at home. Tremendous field! Piano parts, tools furnished. Established 1935. Empire School of Piano Tuning, 606-B East University Ave., Champaign, Ill.

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

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

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

BRONZED Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution, 30-amp. plating rectifiers with powerstat control, \$85.00. Geared motors for agitation \$20.00. Lead lined tanks. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

QUICK Money. "Repairing car batteries." At home! Easy tool! Batteryman, Grand Junction, Colorado.

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

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

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

SPECIALTY Manufacturing, the big money business that can be operated anywhere. start on a very small capital; we supply dependable formulas and complete instructions; get interesting free booklet, "Money-making Opportunities in Specialty Manufacturing." Howard Robinson, Ph.G., 1300-A South Ohio Street, Sedalia, Mo.

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

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

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

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

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

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

MAIL Order opportunities. Full or spare time. Hundreds of chances. No charge. Postal brings copy. Blackstone Press, Somerville, New Jersey.

START Home plaster novelty business. Amazing course tells how. Literature free. Kemo-Courses, Dept. A, 4862 Catalpa, Chicago 30, Ill.

EARN \$200 Weekly installing new amazing "Styron" plastic wall tile in homes, offices. Easily applied. Tile your own kitchen, bathroom, too. Instructions, everything furnished. Literature free. U. S. Tile Co., 30 W. Washington St., Chicago 2, Ill.

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

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

MONEYMAKING OPPORTUNITIES

SURE Money maker. Costs you 10c to 20c to make lawn chairs from vines. Send m.o. or check for full instructions and plans, \$2.00 or miniature sample, \$5.00. Write: Dewey Morgan, Box 15, Washington, N. J.

HOUSEWARES Items. Sell on sight. Every home a prospect. Men, women, boys or girls—make big money with these hot sellers. Write for circulars. Kooper Kraft, Box 8-M, Terre Haute, Indiana.

EARN Up to 100% profit selling beautiful personalized matches, napkins, coasters, pencils, novelties. Request free samples. Lynne Novelty, 739A Riverside Ave., Elmira, N. Y.

FREE Literature on money making ideas. Write: Lighthouse, 1023-M Hamilton Street, Lockport, Illinois.

MEN—Women — "Most everybody likes candy." Learn to make in a professional manner. (Our 39th year.) Ragsdale Candies, D4, East Orange, New Jersey.

MAKE \$100 Per week or more in a full or spare time baby shoe metalizing business of your own. Write now for free literature on this easy to learn highly profitable business. Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 23M, Penna.

START Profitable air conditioning business. Don Nelson, Warner Robins 2, Georgia.

LEARN Profitable clock repairing. All types. Illustrated manual \$1. Thies, Publishers, Genoa 3, Illinois.

15 MINUTE Advertising and sign lettering course; sign painter's secrets; cartooning book; all three, \$1. Free circular. Abenterprises, Box 875-M, Peoria, Illinois.

BIG Money daily making beautiful leather link belts, no tools, materials furnished, you assemble by hand. D-E Products, Dept P1, 8 E. Huron St., Chicago 11, Ill.

MONEY Making projects for your own business. Folder of ten for a quarter. Challenge, 87 Somerset, Springfield 8, Mass.

INVESTIGATE Mail order opportunities. Write Moy's, 517-7th S.W., Washington 4, D. C.

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

BIG Money making opportunities. Write Springer, 1126 E. Apache St., Phoenix, Arizona.

WIN Cash, cars in prize contests! Write for copy filled with current contests, winning hints and tips. Send only 25c. Wright Contest Digest, Dept. 17-C, P.O. Box 2266, St. Louis 9, Missouri.

SELL—Television, radios, appliances, bicycles, sporting goods, hardware. Wilson, 1416 Vliet, Milwaukee, Wisconsin.

CONCRETE Block molds, 8x16x4 \$6.70, others, literature free. Lehnert, Norwood 2, N.J.

START Home candy kitchen—Good earnings! Everyone likes candy. Learn professional methods. Etterman, 1991-B Lake Shore Drive, Muskegon, Michigan.

MAKE Big money handling popular, fast-selling books from your own home by mail. Everything furnished! Unusual opportunity! No experience needed. Details free. Write: National, Box 88-L, Dorchester 22, Mass.

DEALERS Wanted! Sell new merchandise item by mail, from home. Everything furnished! Novelty Products, 1200-B Goldsboro, Sanford, N. C.

MAKE Extra dollars in your own back yard! Real opportunities, fully outlined. Rush name. Pickett's, 62-A Sanders Drive, Florence, Kentucky.

FREE Book "372 Unusual Worldwide Business Adventures!" Successful! Australia, Africa, South America, New Zealand! Not hokum! Work home. "Different" plans. Prepare for surprise! Publishers-W, Carlsbad, Calif.

MAKE Extra money sparetime. Work at home. Literature free. Liebig Industries, Box 400M, Beaver Dam, Wisconsin.

BABY Shoes preserved. Formulas, instructions, \$1.00. Novelty Bronzing, Box 56, Hyde Park 36, Mass.

"DOLLARS In your mail from women." New. Different. Send quarter, refundable, today. Grant Lovell, 2166 South Shore, Erie, Pennsylvania.

GET "Dollars by mail." Postal brings details. Terrill, Bogard 2, Mo.

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

CHEMICAL Gardens. Eleven recipes \$1.00. Nunn, 659 E. Oxnard, California.

BIG Money—Sparetime. Make venetian blind repairs in your neighborhood. Send name and address. Americal, 2334 First Ave., New York City. No special tools needed.

FREE Mail of opportunities, profitable plans, samples. Dancer, Mansfield, Ohio.

MAKE Picture frames at home. Good as professionals. No machinery; very simple. Everything furnished. Amazing money-making opportunity. Read ad page 283 this issue. Futureframe, Box 829, Iowa City, Iowa.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 40, Illinois.

UNPAINTED Plaster ornaments, easily decorated. Firestone's thick, white, natural-latex Loxite for rubber molds. Midwest Novelty Manufacturers, 524-A East Park, Anaconda, Montana.

START Profitable mailorder business at home. Everything furnished. Complete information 10c. Suproco, Ogema, Wisconsin.

I MADE \$1000 From 1000 tomato plants. Instructions, \$1.00 (refundable). Alfred Dinsmore, Marlborough, Mass.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

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

CANDY Manufacturing and marketing, complete course \$6.00, literature 10c. Philip Pate, Kissimmee 1, Florida.

INCREASE Your earnings: Local business opportunities; mail order information; wholesale supply sources; valuable money-making tips; information, free details, rush name. Wilkin Company, Hillsboro, Ohio.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609 1/2 East 5th, Duluth, Minn.

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

UNPAINTED Figurines. Illustrated list free. Oman, 642 Broadway, St. Paul 1, Minn.

EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 6, Illinois.

PRIZE Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2685P, Miami, Florida.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

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WAX-O-GLASS; Cleans glass; polishes metals amazingly quick. Make it yourself. Formula \$1.00. Ideal Service, Park Ridge 3, Ill.

NEW Improved paint thinner. Powerfully sweet orange scented. Make at 1/2 the price of turpentine. Quart sample sent with formula. Price \$2.00. Steven J. Milan, Odorless Co., 107 Downs Ave., Binghamton, N. Y.

INVISIBLE Inks. Appear by chemicals. Ten recipes \$1.00. Nunn, 659 E. Oxnard, California.

21 MANUFACTURING Formulas. Cosmetics, shaving, cleaners. Supply directory. No machinery. \$1.00. Mark Moye, Windsor, Vermont.

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

MAKE—Seal cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

PLANS—New patent sewage disposal system. Requires less drainage, build it yourself. Specifications and drawings by registered professional engineer. \$2.00. De Haviland, Mundelein, Illinois.

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

PRODUCTS Analyzed. Duplicated. Improved. Formulas. Consulting Scientific Company, Swarthmore, Pennsylvania.

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

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

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

PLASTICS

INTERNAL Carvers! Beautifully finished pin and earring blanks, \$1 sample set, includes findings, gift box. Many shapes, also cigarette boxes, coasters, paper weights and other beautiful gift items, ready for carving. Catalog, Jamer Corp., M-1, Manufacturer, 22 E. 21 St., New York 10.

DOUBLE Your income. Do highly skilled plastics work at home. New short training course—free materials during training. Old established plastics organization offers this opportunity, act now. Plastics Laboratories, 3324 Park Blvd., Oakland 10, Calif.

PLEXIGLAS, Lucite, acetate, sheets, rods, tubes, jewelry findings, craft supplies, over 1700 items. 25c which brings catalog internal carving folder, information on fabricating plastics, deducted from first order. Plastic Parts, Dept. H-2039, 1157 S. Kingshighway, St. Louis, Mo.

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

MOLDS Made for Plasticor C-2, lowest prices. F. Giddings, 2544 Clarkson Street, Denver, Colorado.

PLASTIC Smoking set. Assemble yourself. \$3.00. Hanson Plastics, 7625 South Parkway, Chicago 19.

PERSONALIZE Your handicraft with cast plastic initials. Your three initials and other samples, three dimes. A. Dreher, 2232 Brockway, Cleveland 18, Ohio.

PLASTIC Materials and supplies for your hobby or business. Catalog and internal carving instructions free. Art Plastics of Calif., 8125 East 14th Street, Oakland 3, Calif.

AMAZING Liquid plastic pours cold, hardens in half hour. Clear, colors. Expensive equipment unnecessary. Embed photographs, coins, flowers, keepsakes. Complete kit only \$3.25. Kristalon Plastics, Dept. P-4, Box 29, Wilmette, Illinois.

MOLDEX! Molders best molding rubber. Pentucket Arts, Seabrook, New Hampshire.

LUCITE, Plexiglas. All size sheets. Cost square foot (12" x 12") 1/16" 96c; 1/8" \$1.25; 3/16" \$1.52; 1/4" \$1.80; colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

BEAUTIFUL Colored plastic catalog. Finished and unfinished items, instructions, and supplies 25c. Make gifts, jewelry, useful articles. Hobbyists, schools, salesmen, dealers, profitable line. Attention ladies: New glitter bird pins, you make them. 50c makes you \$15.00. Hurry. Plastic Mart, 2443 East 14th St., Oakland, California.

INTERNAL Carved roses, orchids, swans, goldfish, butterflies, etc. Jewelry and gifts. Crystal Floral Novelty Co., Bound Brook, New Jersey.

PLASTICS—Supplies, findings, shells. Illustrated fabricating manual, bargain catalog, 10c. Gem-O'-Lite, Box 686F, North Hollywood, Calif.

PLEXIGLAS—12" x 12" Masked sheets. 1/16"-\$1.00. 1/8"-\$1.25. 3/16"-\$1.55. 1/4"-\$1.85. Include 10% postage. Dyes, rods, tubes, luminous powders, carving blanks, drills, jewelry findings. Free catalogue. Craft Plastics, Somerville, New Jersey.

CHEMISTRY

NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Ill.

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

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

COMPLETE Supply catalog, 10c. Pili-grim Chemical, 348-RR Edith, Salt Lake City 4, Utah.

CHEMICALS, Glassware. Send 5c. Atlantic Laboratory Supply Co., 21 Wenham, Boston, Mass.

MAKE Chemistry your hobby. Fascinating, educational, recreational, vocational. Large general catalogue chemicals and apparatus 15c. Microscopic stain catalogue 20c. Both 25c. National Scientific Company (Est. 1916), 2204 W. North Ave., Chicago 47, Ill.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-Scales, semi-professional microscopes and biological supplies. Specializing in chemicals and laboratory supplies in small quantities. Send 15c for catalog. Established 1931. John H. Winn, 124A West 23 St., New York, N. Y.

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

HELP WANTED

BOYS Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample. Write Dept. 46, National Engravers, 214 Summer, Boston, Mass.

AGENTS WANTED

WHOLESALE Article. 100% profit. Quick resales. Territory going fast. Know 20 years. Glenn Perkins, Byron, Mich.

AMAZING Offer—\$50 is yours for selling only 100 boxes entirely different, new deluxe all-occasion cards. Patented feature television card included. Each box sells for \$1.00, your profit 50c. Surprise items. It costs nothing to try. Write today for samples. Cheerful Card Co., 584, White Plains, N. Y.

NYLON Uniforms, immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P3, 3936 Market, Philadelphia 4, Penna.

\$6.00 HOURLY Showing Firestone Velon handbag—opens into large shopping bag. Fastest seller in America. Women buy several for gifts. Commissions advanced daily. Sample furnished. LeNard, 179-C, West Washington, Chicago 2.

EXTRA Cash income. Sell friends new, different greeting card assortments, exclusive stationery unobtainable elsewhere. Profits to 100%. Bonus. Request free samples exclusive personalized stationery and all-occasion samples on approval. Regal Greetings, PM-6 Hazel Park, Mich.

HOTTEST 39c item on the market. Write National Sale & Service, Greenville, Penna.

GREETING Card money-makers. Birthday, Easter, motherday. Catalog free. Greenport Art Company, Dept. 938P, Brooklyn 15, New York.

BE Renewal headquarters for all magazines. Handle everything at home. Big profits. No experience. No capital needed. Free catalog tells how. Write McGregor Magazine Agency, Dept. 129, Mount Morris, Ill.

AT Last! Something new and sensational in everyday cards. Gorgeous satin and velour designs. Get orders fast. Big profits. Imprinted stationery. Floral charmettes, napkins. 25 assortments for all occasions, retail 60c to \$1. Samples on approval. Puro Co. 2801 Locust, Dept. 940-C, St. Louis 3, Mo.

AMAZING New non-electrical burglar alarm for windows, or doors of homes, stores, offices, etc. Millions of prospects. Sells on sight. 100% profit. Easy sales. Tremendous opportunity. Retail at \$2.25. Write immediately. Robertson Company, 228 N. LaSalle, Chicago 1, Ill.

LOOK! 10 Day free examination offer starts you in easy, profit-making, greeting card business. Profits to 100%. Bonus. Special offers. Request all occasion samples on approval for 10 day free examination and free name imprinted and floral stationery samples. New England Art Publishers, North Abington 102, Mass.

FREE Nylons given if Kendex hosiery runs or snags! World's only women's hosiery sold with written guarantee arising everybody. Mere words could not press unbelievable money-making opportunity. Fantastic earnings become reality. Armstrong earned \$202 in 9 days. Watkinson sent 92 orders in one day. Imagine replacing hosiery free regardless of cause—can whether use or abuse! Truly sales dynamite for terrific profits. Even if you never sold before, three magic words: "Guaranteed Against Everything" will open doors for you—make women listen and pour money in your pocket. Complete line from sheers to service (15-20-30-40-60 denier)—all lengths 28 to 35 inches—latest colors—seamed full fashioned and seamless. No competition because Kendex guaranteed nylons not sold in stores. Also complete line men's hosiery actually guaranteed for one full year! Nothing like this anywhere. Includes rayon, nylon, lisle, wool, cotton, mixtures, etc. All styles, patterns, colors, prices to please everybody. Thousands shipped daily, 100,000 pairs constantly in stock for fast delivery. Over 30 years in business. You need no money or experience. Nothing to pay now or later. Show free outfits. Write orders. We deliver and collect. Big advance cash plus huge bonus. Earn money spare or full time—exclusively or side line. No restrictions. Become manager—appoint others to sell for you—earn steady income on their sales. Complete money-making outfits including salesbooks in color, samples of hosiery materials, etc. furnished free and prepaid. Simply mail name and address to: Kendex Company, Babylon 32, N. Y.

HERE'S Easy extra money for you. Greeting cards, Masslinn napkins, towels, utility purse-shopping bag etc. Show new, largest, most beautiful greeting card line of all time; all-occasion, birthday cards, gift wraps, etc. New bonus plan earns you up to and over 100% profit. Name-imprinted and personal monogrammed stationery samples free. Write now. Dept. PM3, Pen-Brush, 139 Duane St., New York 13.

I'll Put a "shoe store business" in your pocket! Nation's leader trains you to make big money! Fit men, women. Free sample outfit. Write today! Consolidated Shoe System, Dept. S-314, Chippewa Falls, Wis.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 100 samples ultra-blue signs "7x11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 452, New York City 70.

NEW Patented plastic sink rack, retails \$1.00. Active distributors protected. Sample \$1.00. Write wholesale prices. Savasink Company, 194 Hempstead Tpke, Franklin Square, N. Y.

EVERYDAY Cards. Earn \$5.00 with every ten \$1.00 boxes of everyday cards you sell. Also new plastic cards, personalized stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-3, Pitman, N. J.

FREE Water and our concentrates, make flavors, lotions, shampoos, 125 products, labels, bottles supplied. Qualco, E20030 Russell, Detroit.

MAKE \$50 Selling America's leading all occasion greeting card assortments. Samples on approval. Complete line fast money makers—gift wrappings, place cards. Free samples imprinted and monogram stationery. Write Lorain Art Studios, Dept. AO, Vermilion, Ohio.

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

BIG Money—Fast! Sell quality plastic tablecloths (from \$4.00 dozen), curtains, aprons, etc. Factory prices. Free samples! Durever, 282-C Albany Ave., Brooklyn 13, N. Y.

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

SELLS Itself. Key chain miniature telescope attached, shows glamorous girls. Sample 35c, details free. Baldwin Specialty Co. 10217 Atlantic Blvd., South Gate, Calif.

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

A DRESS For you with every 3 you order for yourself and family. Amazing new plan. Everything free. Harford Frocks, Dept. B-9128, Cincinnati, Ohio.

EARN Many dollars now with Thomas Terry's amazing new springtime and year end plans. Send today for two unusual assortments on approval and new free display folders. Write Thomas Terry Studios, 1 Union Ave., Westfield, Mass.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 4776, Cincinnati, Ohio.

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! Write post! Craftcards, Box 235 (L), Pittsburgh 30, Pennsylvania.

MAKE Money calling on friends. Show greeting card assortments—Birthday, get-well, others. Floral stationery. Gift wrappings. Experience unnecessary. Samples on approval. Wallace Brown, 225 Fifth Ave., Dept. F-4, New York 10.

POCKET Pal: Replaces pocket knives, new, safe, beautiful. Always razor sharp. 50c seller, 321% profit. \$15.00 or more daily. Agents, salesmen, distributors. Sample 10c. Nelson Mfg. Co., 222 W. Kellogg, St. Paul 2, Minn.

NEW "Sponge" dish cloth. Replaces messy dishrags. Banishes dishwashing drudgery. Lightning seller. Samples sent on trial. Kristee, 117, Akron, Ohio.

DE-ODORIZER—Refrigerator and ice-box unit. Sell finest, retails \$2.00, and profit 100 to 300%. Exclusive territory. Write L. A. Muffler, Continental Bldg., Los Angeles.

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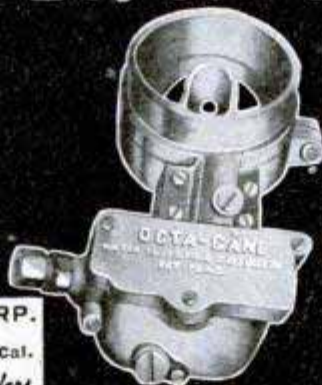
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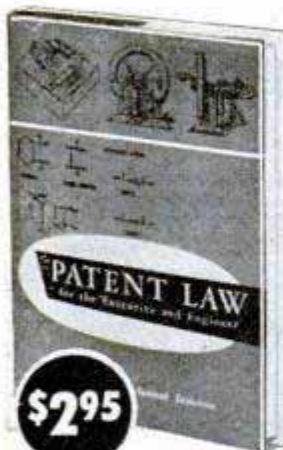
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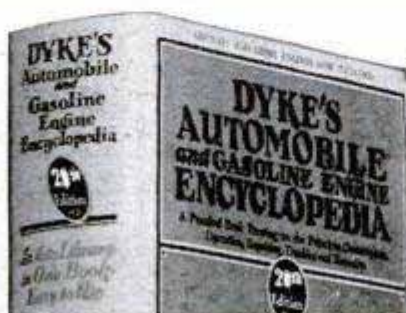
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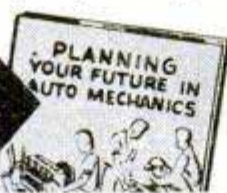
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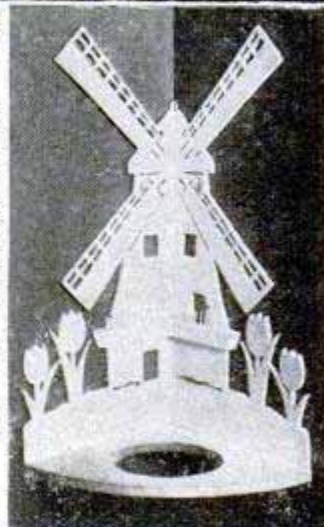
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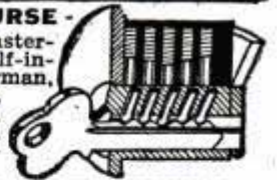
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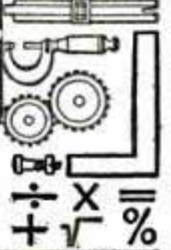


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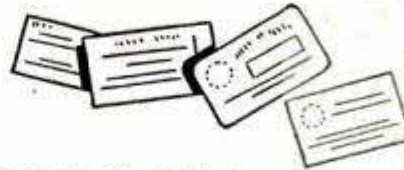
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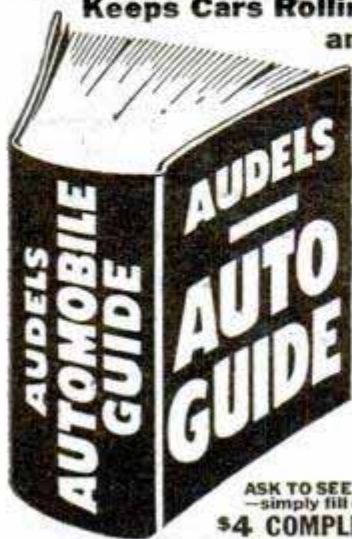
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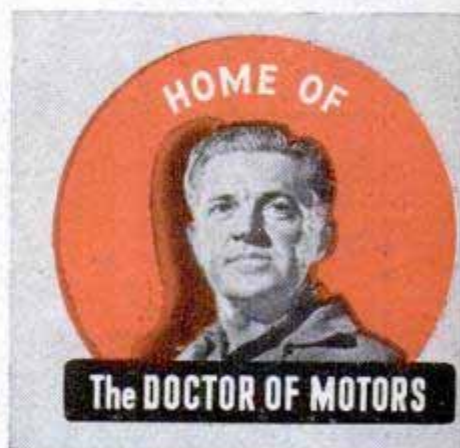
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**In an independent survey just completed among automotive engineers—maintenance men, fleet operators and designers of new equipment—Perfect Circle was first choice as the best engineered piston ring—first by more than 4 to 1—and received more votes than ALL other brands combined!*





the navy explores the air waves

OUT ON THE END of Point Loma that overlooks San Diego Bay radio technicians are beaming microwaves straight up at the sky. At a nearby receiving apparatus they listen for the faint echoes that are reflected back to earth from turbulences and currents in the atmosphere.

In an adjoining field, other experts are performing similar experiments with SODAR, a sound apparatus that for some purposes is comparable to radio. Sharp explosions are created and the sound of the explosions is beamed upward by a parabolic reflector. Echoes reflected back from the air currents are recorded.

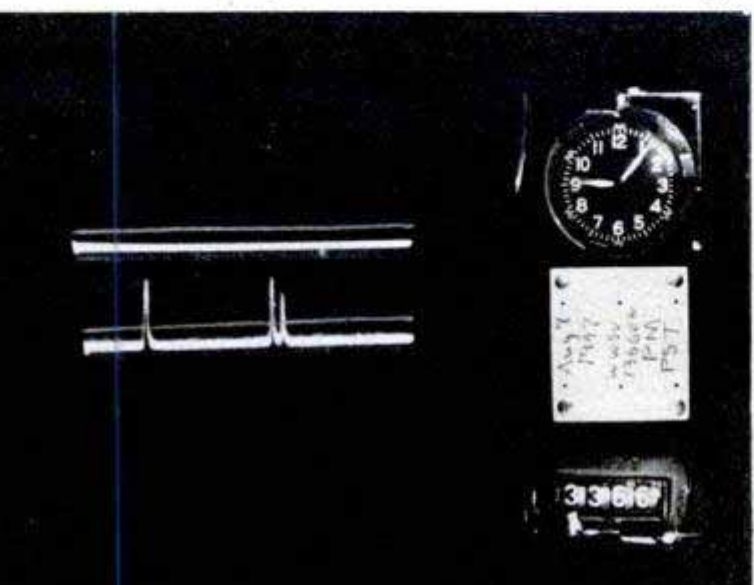
What is being sought is more knowledge about conditions in the troposphere that influence radar, television and other high-frequency radio signals.

In theory, these high frequencies are good for line-of-sight distances only and yet it sometimes happens that VHF and UHF signals are received at points hidden from the transmitter by mountains or by the earth's curvature. A temperature inversion in the atmosphere, for instance, may create a temporary channel along which the

Ionosphere echoes caused three dots (lower line) to be received at San Diego when one was sent from Washington



Overhead rack at right is used to support a number of receiving pickups for testing antennas. Transmitting antenna is placed on a turntable under the naval officer's right hand. Pickups show strength of the signal along the curve



short waves can move parallel with the earth for greater than normal distances. The humidity gradient over the ocean can have a similar effect.

By probing the atmosphere with radio waves that are only one centimeter long, by studying the reflections from beamed explosions and by other research, the radio technicians soon may learn new facts that will help them to invent high-frequency radios of greater range, accuracy and reliability.

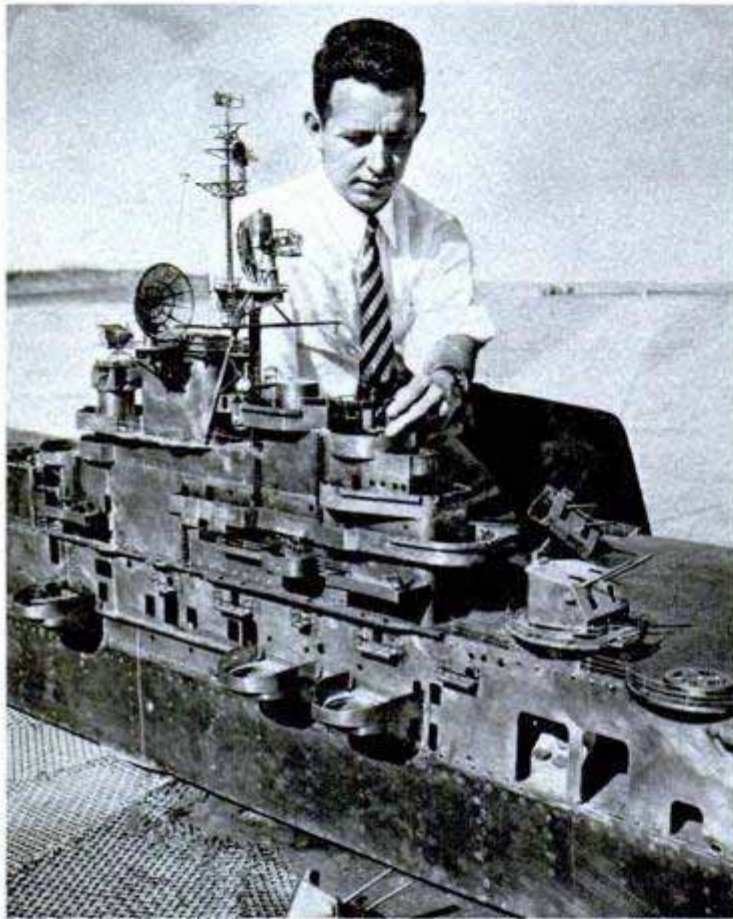
Radio atmospheric is one of numerous

projects underway at the U.S. Navy Electronics Laboratory, which has its headquarters in San Diego. NEL is one of the country's major research institutions and is directed by Capt. R. Bennett II, U.S.N. Joseph P. Maxfield, noted for his contributions to telephony and other subjects, is superintending scientist. The laboratory is operated by the Bureau of Ships and is engaged not only in research but also in development and "systems engineering" by which new ideas are converted into practical pieces of equipment for use by the fleet. About two thirds of the 1000 persons on the staff are research technicians or scientists.

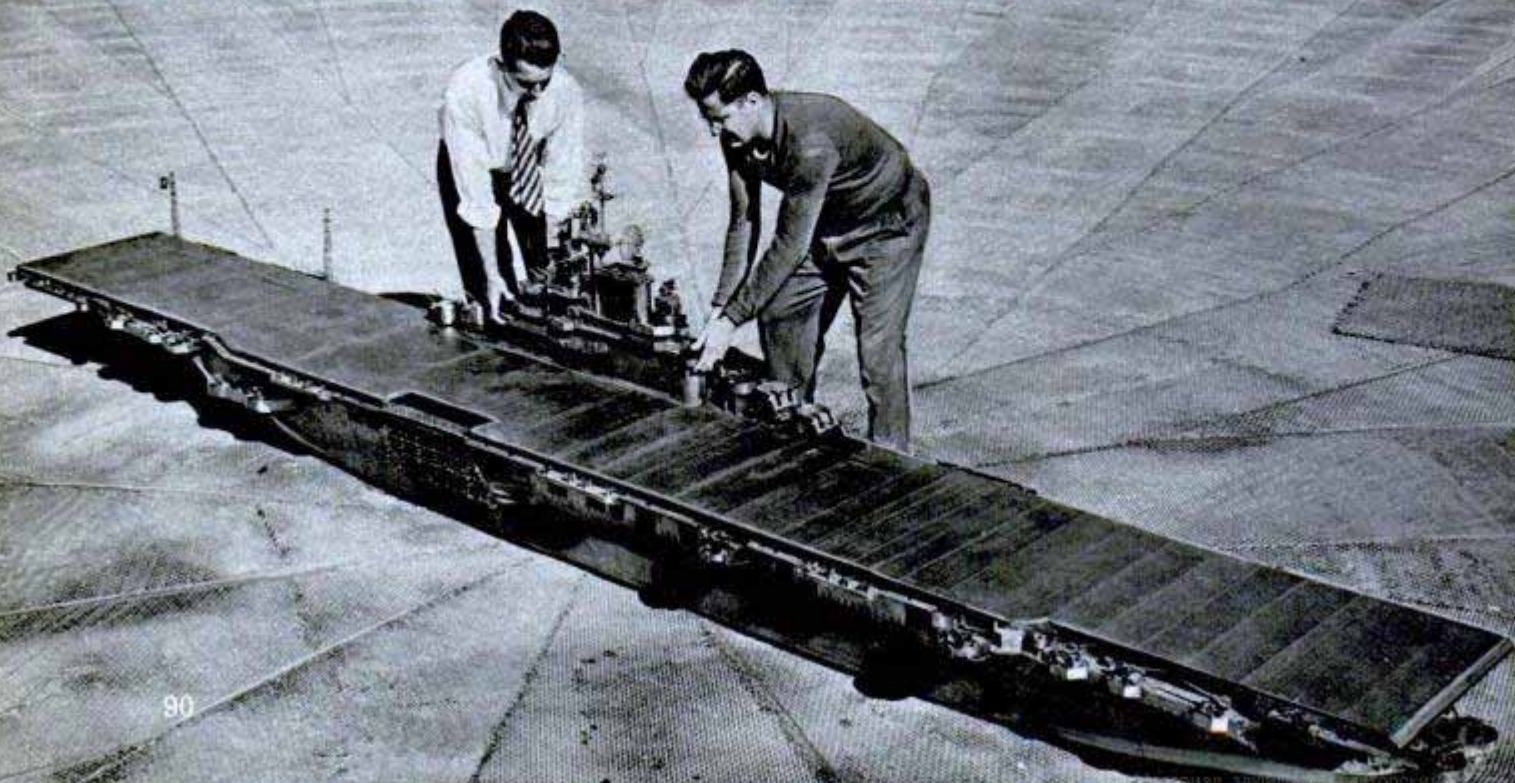
Useful and versatile as radio is, it is not yet as perfect as the scientists would like to make it. They want, for example, a radar apparatus that would locate a distant target almost to within a matter of inches instead of the 100 feet or so that is acceptable now. Such highly accurate radio ranging would be valuable, among other uses, in selecting sites for offshore oil wells.

The engineers want to eliminate fading on long-range radio transmissions and they want to develop long-range radio circuits that can handle several thousand words a minute. They would like to transmit a dozen messages at once, on different frequencies, from a single antenna and they would like to hook a dozen receivers to a single antenna to receive the messages.

They want to find the best locations for



Left, turrets on scale-model ships are demountable and the guns can be pointed in various directions to test effect on communications. Below, technicians place the carrier's island in position for testing



placing communication antennas on ships so that each antenna will be efficient at all points of the compass. A big aircraft carrier, as an example, may use 25 different communication circuits at one time and the traffic requires a forest of transmitting and receiving antennas. The efficiency of each is affected by the locations of the other antennas, by the size, shape and heading of the ship, and even by such protuberances as turrets and deck guns.

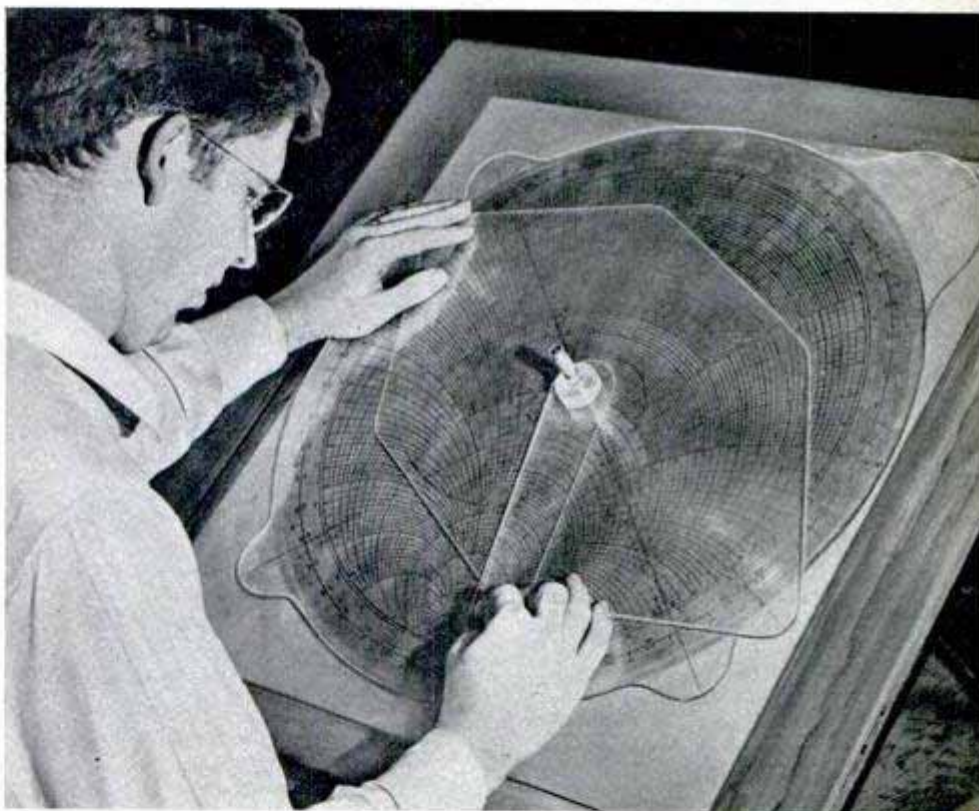
The result is that a certain antenna may have an effective range three times greater in one direction than in another. The pilot of an aircraft some distance away may find that his radio suddenly fades out completely when the surface ship makes a turn and blanks off the antenna behind its island. Ship-to-ship and ship-to-shore communications likewise are hampered. One of the tasks at NEL is to determine the best locations for antennas on existing ships and to determine the best electronic structural requirements for future vessels so as to provide nondirectional radiation patterns.

It's easiest to do this work with models instead of full-size ships. The laboratory builds its own models of brass, to $\frac{1}{24}$ or $\frac{1}{48}$ of full scale. A model of an Essex-class carrier is 18 feet long, $\frac{1}{48}$ the length of the ship itself. The model weighs 646 pounds and is complete down to the barrels of its anti-aircraft guns. Turrets can be rotated, gun barrels can be moved to different angles and the model's deck elevators raised or lowered. These details permit studying the effects that the masses of metal have on radio transmission.

NEL uses a scaled-down artificial "ocean" for testing its model ships. The ocean consists of wire mesh laid flat on the ground. It provides the same electronic effect as water. The model to be tested is placed on a turntable in the center of the artificial ocean and spun around, six times a minute, at the same time that the model transmits a radio signal from the antenna being tested. The signal is picked up by receiving antennas placed around the perimeter of the ocean and the varying strength of the signal is recorded on graph paper.

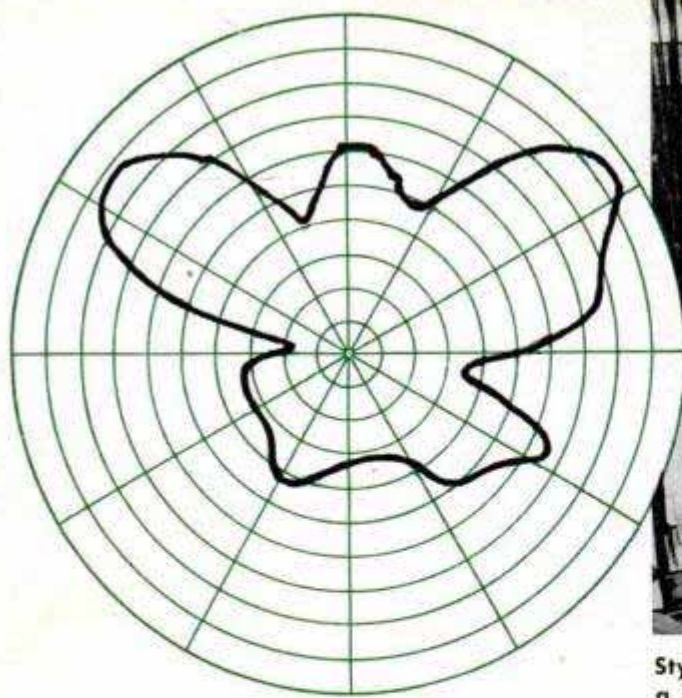


Explosions above reflector send sound waves into troposphere where they are reflected back to earth for study by scientists

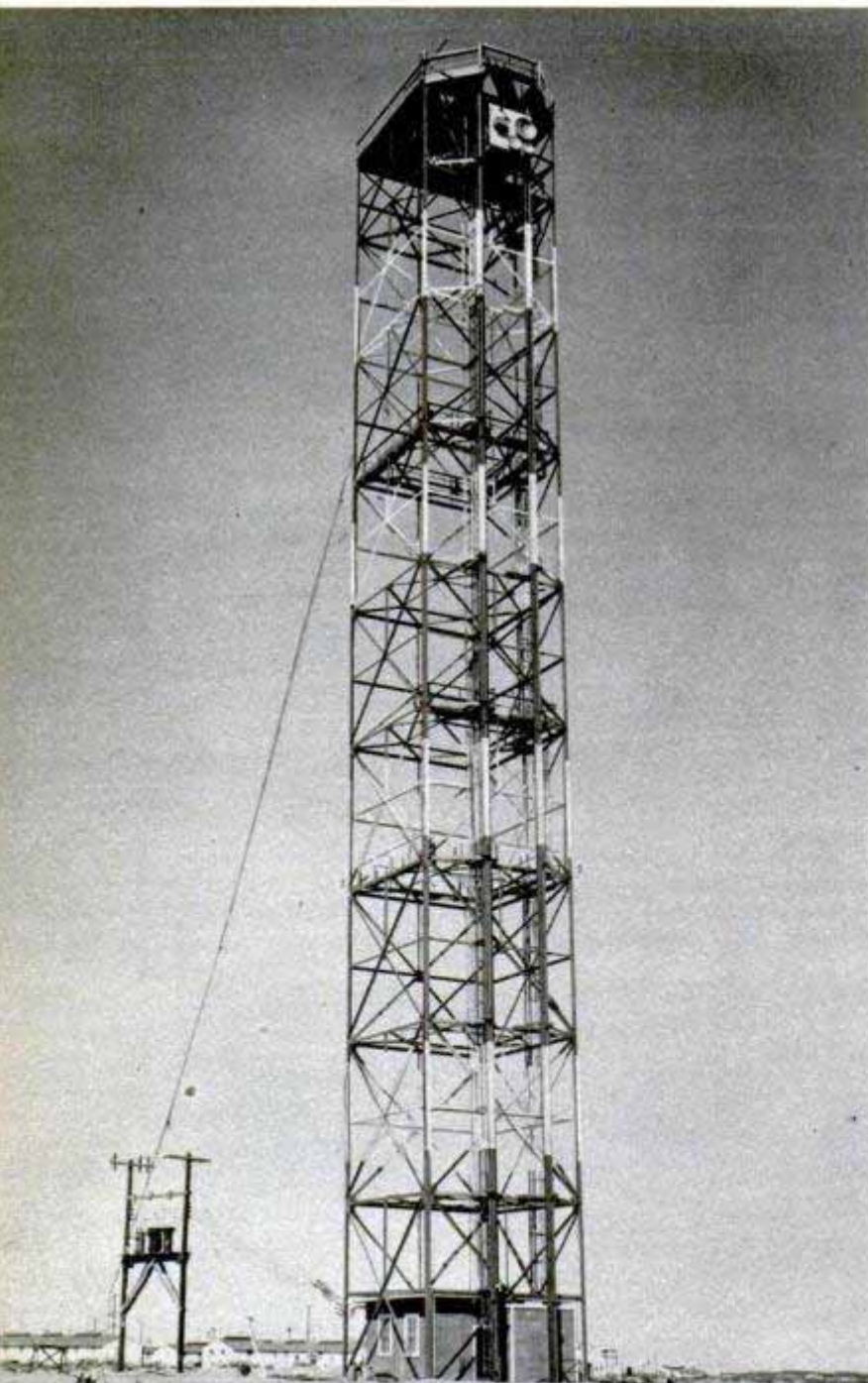


Above, this complex impedance chart is used in measuring the electrical characteristics of antenna designs. Below, worker adjusts a wave guide that emits radio waves which are beamed straight up by the parabolic reflector for the reflection tests





Stylus on swinging arm plots the all-around range of antennas on a 360-degree chart fastened to turntable. On the chart, shown at left, the masking effect of a ship's superstructure is very apparent



When two or more radio circuits can be handled by a single antenna simultaneously it will be possible to reduce the number of antennas on a ship or it will allow more traffic to be handled by the present number of antennas. This "multiplexing" of antennas is receiving considerable study and the indications are that by means of filters it will be possible to handle numerous circuits through one antenna without excessive energy losses.

Another important subject is the application of teletype and other land-line equipment to radio communication, particularly the adaptation of automatic high-speed equipment to long-range radio circuits. NEL has equipment that can transmit and receive several thousand words a minute in the laboratory, but so far the equipment is good for only 200 or 300 words a minute on the air.

The stumbling block is the so-called "multi-path delay phenomena." Portions of the transmitted energy are reflected from different layers of the ionosphere. At high speed the result is unintelligible gibberish. A dash becomes elongated, a dot is no longer a single dot. At slow speeds the human ear or an automatic machine finds nothing wrong with the reception but a high-speed machine that is timed in microseconds faithfully records every separate reflection of energy. So far the phenomena have limited reception to perhaps a tenth of the speed possible with present transmitting equipment.

Tower elevator lifts antennas and instruments to various heights for determining relationship between signal strength and atmospheric conditions

Allied with the above is the problem of fading, a condition ascribed to cancellations and phase interferences of the energy reflected from the ionosphere. NEL hopes to reduce fading from distant stations by the development of so-called diversity systems of antennas. The idea is that signal strength may increase on an antenna of a certain design just as it begins to fade away on an antenna of a different type.

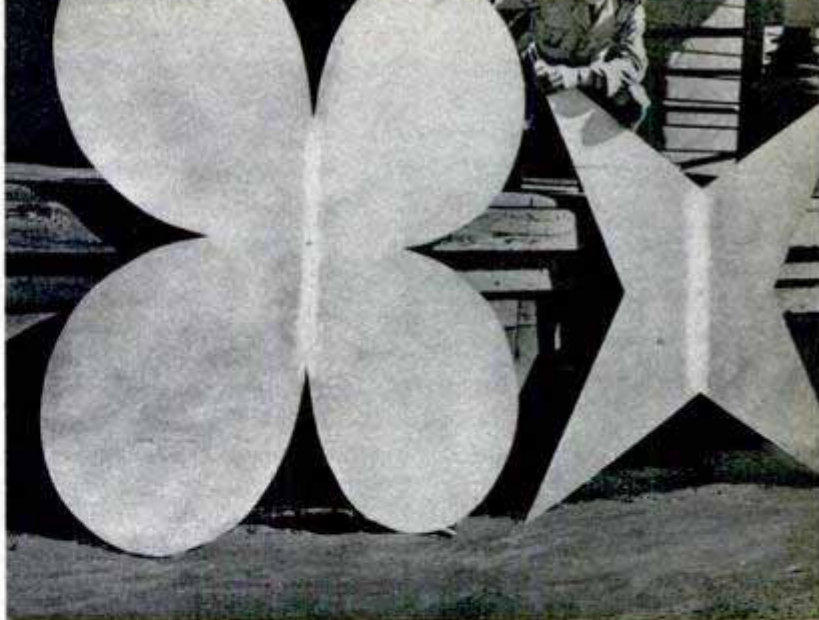
These problems have to do with the medium frequencies. The very high frequencies are being investigated just as thoroughly. In one study, an airplane equipped with meteorological instruments plus a number of radio transmitters with wave lengths ranging from a few meters to a few centimeters is flown back and forth within sight of the laboratory. The plane transmits streams of signals to the ground while passing through various atmospheric conditions. Later the strength of the signals received at the laboratory is checked against the readings of the weather instruments on the plane.

Work that is even more precise is done at a location in Arizona where the clear, dry atmosphere is virtually the same day after day. Heat radiation from the ground produces a nightly temperature inversion at low levels and allows a close-up study of what this phenomenon does to radio waves. "Microscopic" measurements of atmospheric conditions and their effects on radio transmission are made by instruments that are carried up and down on elevators. Other information is obtained from instruments carried by a captive balloon that climbs 5000 feet above ground. Readings on the instruments are transmitted electrically to the ground by wires attached to the cable.

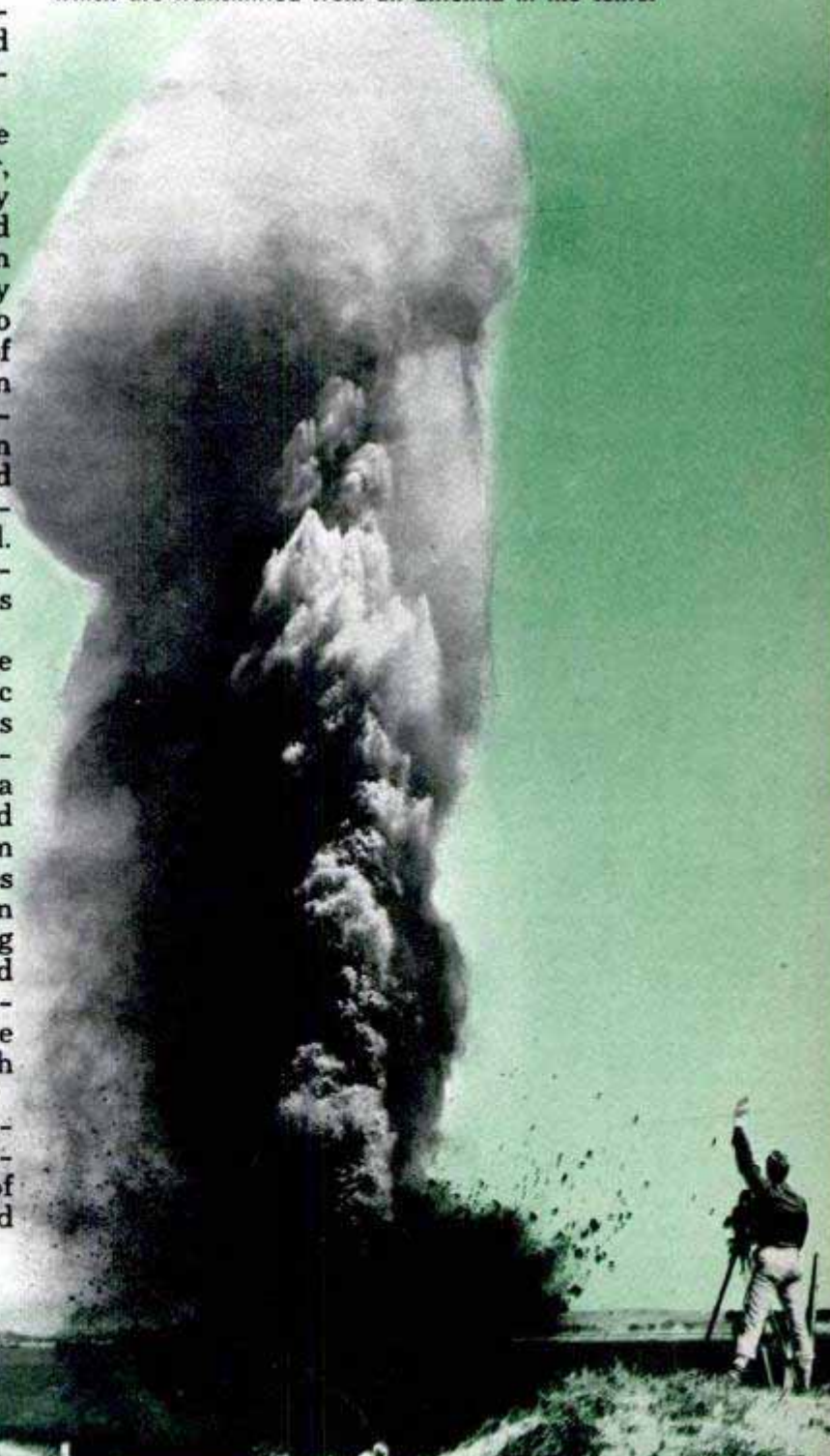
NEL handled the installation of the SOFAR network in the eastern Pacific that will be placed in operation late this year and by means of which it will be possible to pin-point the exact location of a ship or aircraft in distress. A four-pound depth charge is dropped overboard from the distressed vessel and the sound waves from the resulting underwater explosion are picked up at three SOFAR receiving stations, one in the Hawaiian Islands and two on the California coast. By triangulation of the directions from which the sounds are received, the point at which the explosion occurred is determined.

Some of the experiments at the laboratory are, for obvious reasons, highly secret, but it's no secret that the findings of these experts may mean better radio and television reception in the future.

Underwater explosions provide valuable information on behavior of sound waves in the sea



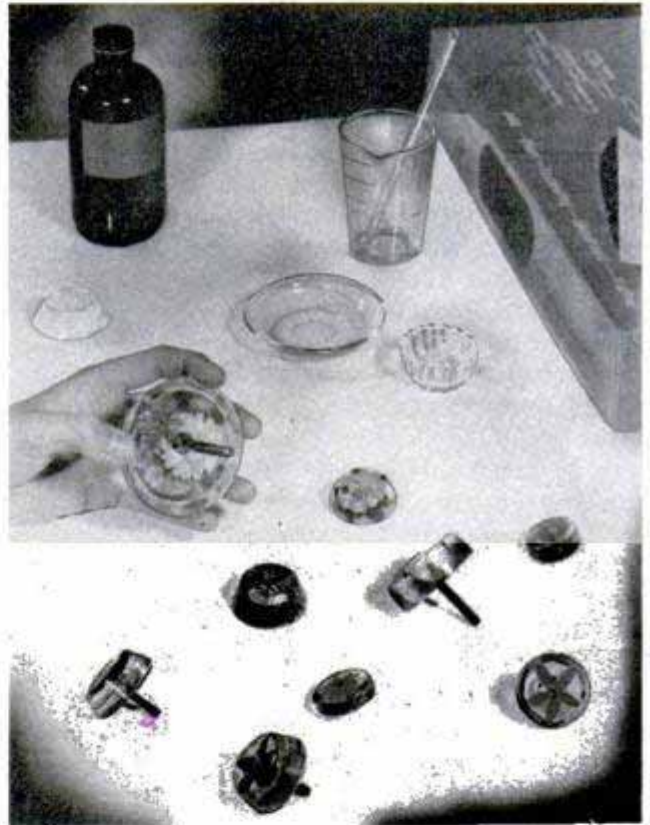
Above, these sheet-metal cutouts illustrate the two theories on the patterns formed by radio broadcasts which are transmitted from an antenna in the center





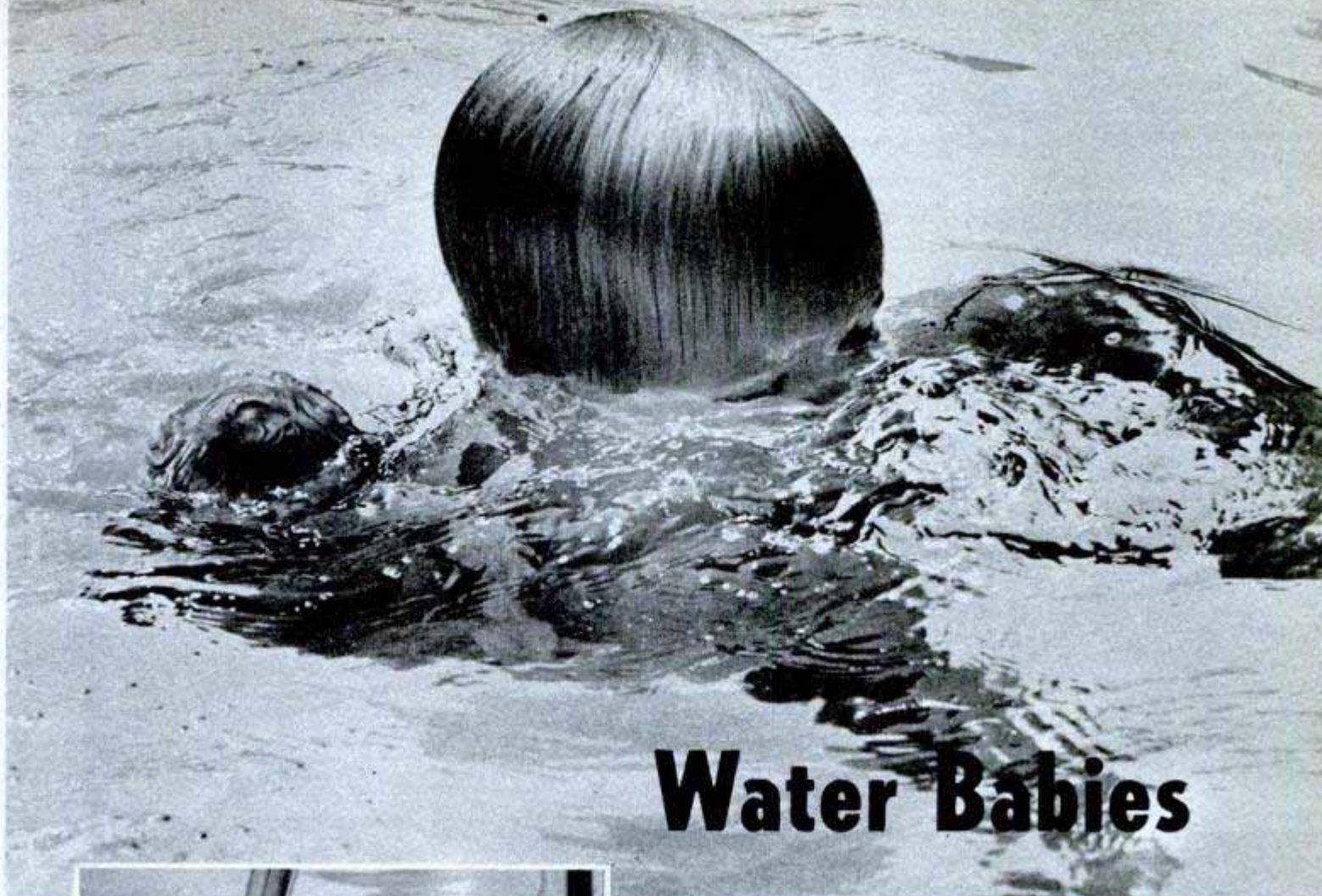
Kit With Molds Casts Plastic

Plastic toys and decorative objects can be cast at home with a kit that includes molds and all necessary materials. Two ½-pound bottles of liquid plastic are provided. The plastic is thermosetting and is cured by heat in a double boiler or an oven. Once hardened and cured, it retains its shape permanently. Objects such as photographs, insignia and real or artificial flowers can be embedded in the plastic, which is normally crystal clear but may be tinted if desired. The hardened objects can be sawed, machined, drilled, sanded and polished. Ordinary household items also can be used as molds.



Meter for Color Photographers Measures Color Temperatures

← Color photographers can now determine the exact color of light with a new meter that measures color temperature in degrees Kelvin. The meter consists of an extra-sensitive photoelectric cell which measures incident light. It is aimed away from the subject and toward the camera. When the trigger is pulled, the meter registers color temperature within 100 degrees Kelvin. The photographer, knowing the temperature for which the film is balanced, then is able to select the proper correction filter to provide true color reproduction.



Water Babies

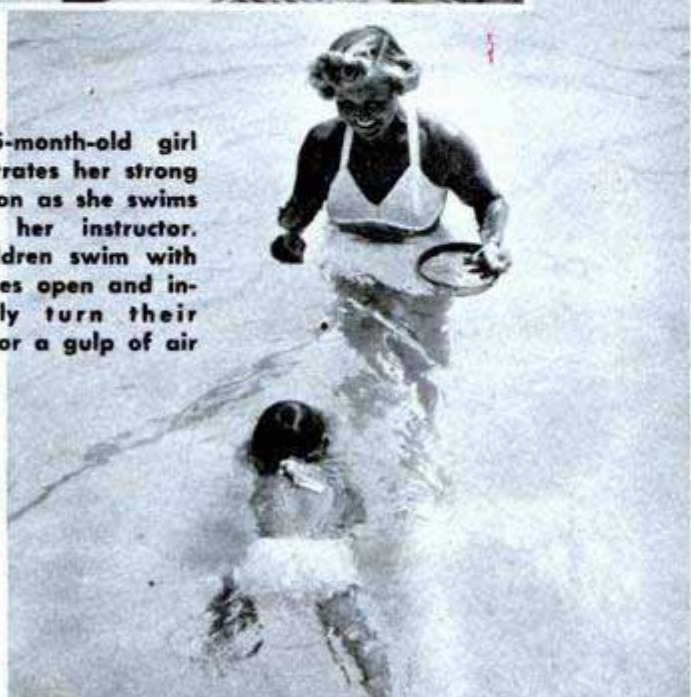


Swimming is child's play for this lad who learned to swim at nine months, two months before he could walk! Above, at 14 months, tiny swimmer "rescues" his favorite doll with all the skill of a lifeguard

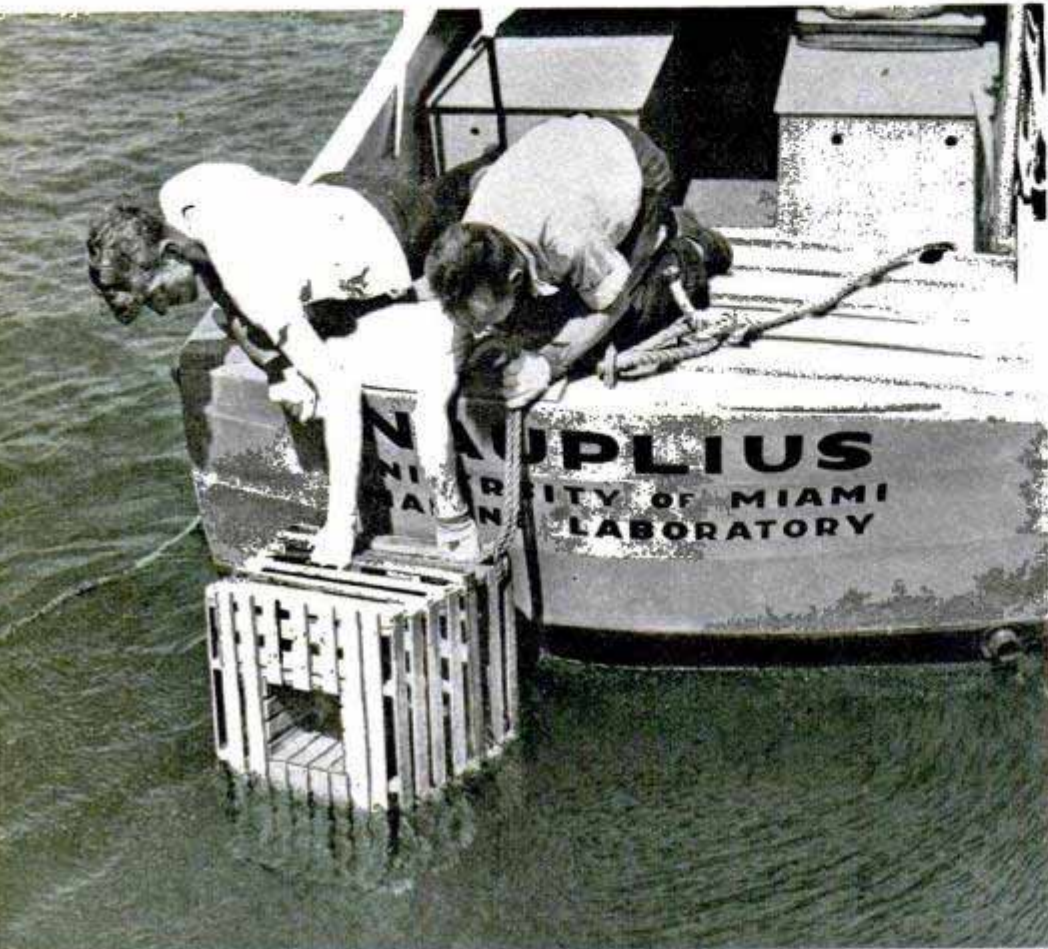
Left, the youngster has more trouble climbing out of the pool than he has in the water. He's one of many Los Angeles children who learned to swim here

Below, Mrs. Crystal Scarborough, who has taught more than 5000 tiny youngsters to swim, gives student some pointers on diving. She believes babies should begin swimming lessons in the pool at three months

This 15-month-old girl demonstrates her strong leg action as she swims toward her instructor. The children swim with their eyes open and instinctively turn their heads for a gulp of air



PLAYING TAG WITH LOBSTERS



Above, thousands of lobsters, caught in traps like the one being raised here, have been tagged and released along the Florida coast. Funnel-like entrance to trap lets lobsters in, but prevents exit. Below, biologists unload the trap, placing the lobsters in a tank prior to tagging them



LOBSTERS along the coast of Florida are wearing "dog tags" to help scientists learn more about their private lives. The decreasing population of the spiny lobster, a clawless but valuable crustacean, threatens the livelihood of several hundred fishermen in the \$500,000 industry.

Before effective conservation laws could be written, more information on the extent of the lobsters' migrations, their rate of growth and their total population was needed. Scientists at the Marine Laboratory of the University of Miami knew they could get this information only by tagging the crustaceans.

But what kind of tag would be harmless to the lobster yet durable enough to stand perhaps years at the bottom of the sea? And how could it be attached to the lobster so as not to come off when the lobster shed its old shell during the seasonal molt?

Test lobsters living in laboratory tanks helped solve the problem. The answer was a thin plastic strip about two inches long and $\frac{3}{16}$ inch wide, pointed and barbed at one end. Laminated indelibly into the plastic are a record number and returning instructions.

In tagging a lobster, the barbed end is skillfully inserted between two shell segments of his tail, just to one side of the center line down his back in order to miss the intestinal tract, and thrust home into the muscle

By Verne O. Williams

leaving about 1/2 inch protruding.

The flexible plastic does not harm the lobsters. When the old shell slips off, the tag stays with the lobster and protrudes from the new shell. And the tags resist long immersion perfectly. One tag was even returned still legible after being boiled with the lobster and found at the dinner table!

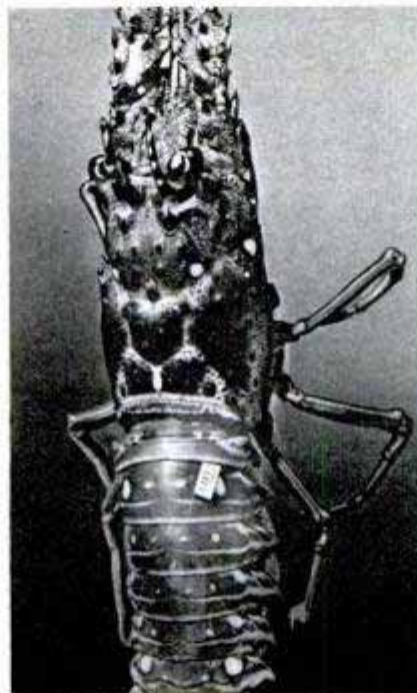
When they return the tags, fishermen report when, where and by whom the lobster was caught. To encourage the return of tags, a \$1 reward is given. As the returns came in from Key West to Dania on the southeastern Florida coast, it was apparent to the scientists that the lobsters were more venturesome fellows than had been thought.

In a little over a year one marathon walker traveled a distance of 119 straight-line miles from the releasing point along the irregular coral reefs. In finding food and escaping enemies, the ugly creature probably traveled hundreds of extra miles on side trips. On a size basis this is roughly comparable to a man's hiking from Miami, Fla., to Juneau, Alaska, with side jaunts to New York and San Francisco.

Some of the lobsters, however, were recaptured in the same vicinity within a week or two. Others, like tourists, moved northward in summer and southward in winter. During the spring mating season they gathered in bunches on shoal banks.

The percentage of tagged fish caught in the various trapping areas is used to estimate the number of lobsters on the bottom. The data leads to the conclusion that heavy fishing has depleted certain areas.

"But it also shows migrating lobsters from virgin grounds will repopulate these depleted areas, saving the jobs of the fishermen, if proper conservation laws are enforced," says Dr. F. G. Walton Smith, laboratory director.

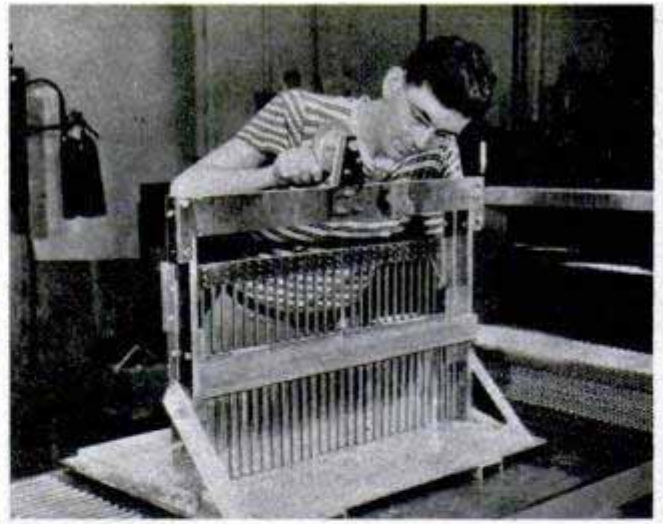


Top, left, tag is inserted between tail segments off the center line to avoid intestinal tract. Printed plastic tag is shown above

Left, numbered end of the tag extends outside shell so that it can be easily seen by fishermen who return it to the laboratory

Below, biologists measure lobsters prior to tagging and releasing them. When recaptured, the tagged lobsters are measured again





Above, left, long strips of the aluminum foil are corrugated by machine preparatory to assembling the panel. Right, several pieces of the corrugated foil are assembled for application of adhesive to form honeycomb

Below, left, bonded together by adhesive, the core sections are cut to size by this saw. Right, the completed honeycomb section is removed from the oven ready for use in building airplanes, furniture and auto bodies



Aluminum Foil Forms Core of Lightweight Panels

Aluminum foil such as is used in cigarette packages may not look very strong to you, but when properly fabricated it produces a lightweight panel strong enough to serve as flooring in your new home. The foil is corrugated and cemented between sheets of metal, wood or plastic in honeycomb fashion. This sandwich-like panel, a cross section of which resembles a beehive, is bonded together by a special adhesive to form an extremely strong unit. Previous honeycombing techniques have used kraft paper or linen, impregnated with a plastic,

but the aluminum-foil method produces a panel of equivalent strength that is unaffected by humidity, dryness or temperature. The new paneling has many applications. It may be used as walls or floors in the home or to make doors and furniture. Its light weight makes it ideal for aircraft and automobiles and it is already being used in the Martin 2-0-2 and 3-0-3 airplanes. There are 800 cells to the square foot and the material is so light that it will float even though 80 percent of the cells have been punctured.

Detector Uses Ultraviolet Rays to Measure Lead in Air

Designed for use in plants where the amount of lead in the air may reach toxic levels, a new instrument is so sensitive that it detects lead in amounts as low as one part in 20 million. This quantity is so minute that one BB shot ground into an extremely fine powder would have to be dispersed in 500,000 cubic feet of air to pro-

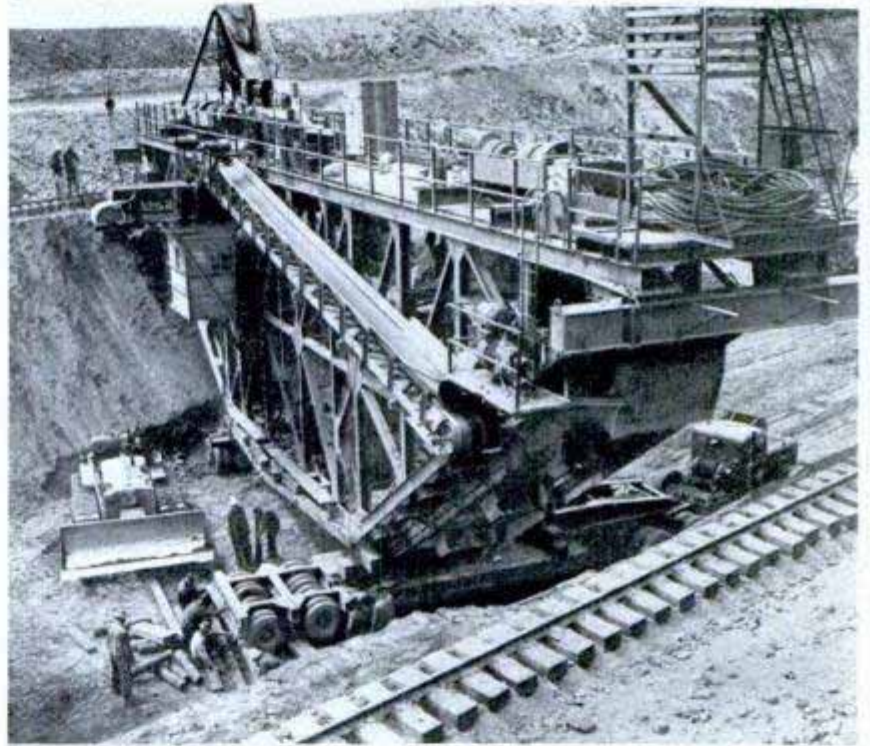
duce a similar contamination. The mobile instrument makes instantaneous and continuous readings. Air samples are passed through an electrical-spark discharge and the resultant light rays go through a photoelectric Geiger counter where the lead content is determined from the ultraviolet rays in the light.



Trimmer Slices a Canal

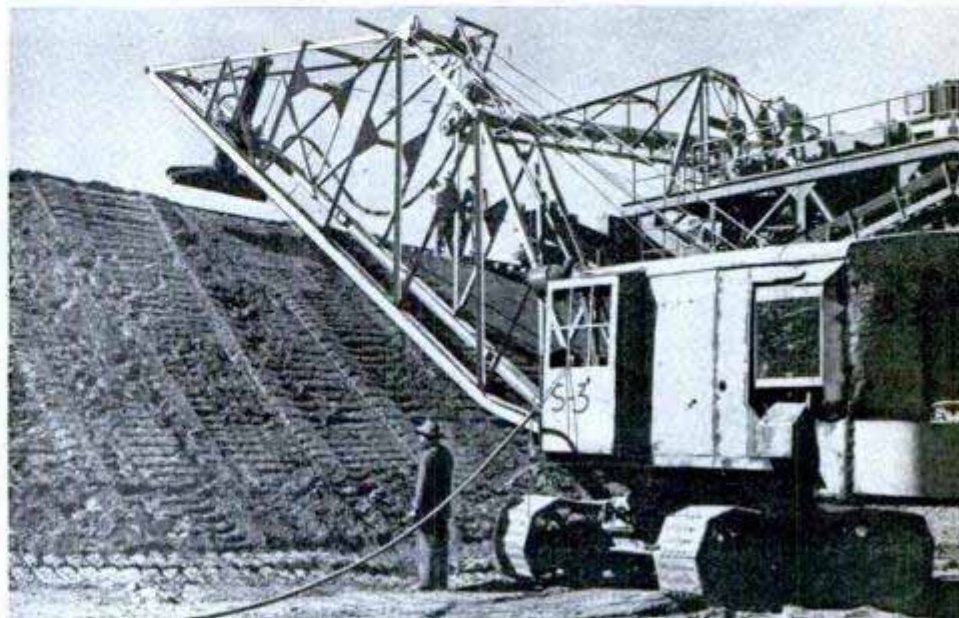
Moving ponderously along two rails more than 100 feet apart, a huge trimmer used on reclamation projects skims the surface off newly dug canals. The smoothed earth then is ready for the concrete lining. Weighing 120 tons, the trimmer is 38 feet across the base and 100 feet between the tips of the two arms. It follows the machines that make the rough excavation, moving along at a top speed of 42 inches per minute. Accurate trimming is important; if too much material is removed, more concrete lining will be required, and if not enough is removed the lining will be too thin. As the machine moves along the rails, 11 buckets on each side move upward, scooping out the earth and dumping it on conveyor belts which carry it to waiting trucks.

Skimming off earth's surface, trimmer dumps material at left



Bureau of Reclamation photos

Above, right, huge truck, dwarfed by trimmer, moves big machine into position. Below, left, buckets on an endless chain scoop up the rock and soil. Below, right, before trimming, air hammer smashes earth into solid mass



Tips from the

By Claude M. Kreider

GOOD FOOD, properly cooked and attractively served, can make any camping trip a whopping success. Tasty meals are possible only if they are carefully planned and cooked in an adequate camp kitchen. The camper's food usually is chosen from staples that are easy to carry. Here are some tips that may make your next expedition more enjoyable.

FOR THE AUTOMOBILE TRIP

With a reasonable amount of space for carrying the "kitchen," many persons simply raid their cupboards of a wide assortment of kettles, pots and pans. These are heavy, awkward to transport and usually fail in their purpose. And those shiny utensils which are the housewife's pride will come home battered and blackened. At the other extreme, the old-timer's dented coffee pot and heavy iron skillet, which he vows are enough utensils for anyone, are wholly inadequate for preparing good camp food. The solution is the nesting aluminum cook outfit. A six-person kit of this heavy-gauge material weighs only about 12 pounds. In its protective bag it is one compact unit about 12 by 14 inches in size—an entire kitchen.

These aluminum utensils, while light in weight, hold the heat well, an advantage in outdoor cooking where space over the fire is limited. A covered kettle or frying pan may thus be set aside for a moment and it will keep the food hot until time to serve it. The full kit contains four buckets or kettles having straight sides and removable bails. Each nests snugly inside the next larger and the largest kettle, of three-gallon capacity, holds the entire kit.



One camper angles for the evening meal while the other prepares the fire. This "stove" is simple but satisfactory for the deep woods. It consists of carefully leveled rocks to hold the frying pan and a green limb to support the kettles

Old favorite of the camper is a stack of golden flapjacks. A cast-aluminum frying pan turns them out in a hurry without constant greasing. All that's required is to touch a bacon rind to the bottom of the skillet before the batter is poured in



Camp Cook...

Photos by Ray Chapin

Inside the smaller kettle nest the eight-cup coffee pot and six soup bowls. And inside these fit the coffee cups, the only items of the kit not of aluminum. Here the ability of that material for holding heat might result in burned lips. If aluminum cups come with the complete kit, they should be discarded and replaced with those of white enamelware.

The heavy-gauge plates and the two 10-inch, cast-aluminum frying pans with detachable handles fit over the top of the assembled kettles along with the flat kettle lids. The largest kettle serves nicely for a water bucket or will hold a huge stew or "mulligan," the kind that is warmed up for another meal and gets better with each warming. The smaller kettles serve for boiling and stewing of vegetables, fruits and cereal. The frying pans are excellent for frying and serve for hot cakes without continued use of grease after a bacon rind has been touched to the surface of the pan.

The final essential items of this kit are two nesting milk pans for the washing of hands and dishes. These do not come with the kit as sold but may be purchased of either aluminum or "dairy tin" of a size to fit together and then over the bottom of the assembled outfit.

Sheet of heavy-gauge galvanized iron forms an excellent stove top, yet is not hard to pack in the kit



Experienced camper doesn't worry about the smoked-up exterior of his aluminum utensils but keeps the inside clean and bright

FOR THE "GO LIGHT" TRIP

Three or four persons on a short camping trip may, of course, dispense with those parts of the kit that are not needed. For a canoe or mountain pack trip, where weight and bulk are important, the two larger kettles might well be left out, and perhaps the wash pan, thus reducing the bulk considerably without destroying the efficiency of the outfit as a whole.

Even the back packer may choose his necessarily light cook kit from the assembly by taking only the smaller kettle, one frying pan and the coffee pot, plus the necessary plate and cup.

The knife-and-fork roll with a complete





Folding fire irons are staked in at an angle to hold the coffee pot at narrow end, kettles at the other

assortment of tableware, plus necessary "kitchen tools," while complete and compact for the more luxurious automobile trip, may also be reduced in size to fit any need and mode of transportation. With a loop in the roll for each item, the danger of losing or forgetting an important piece—perhaps the butcher knife or can opener—is minimized.

In mountain country, flat rocks can serve as a stove and at the same time they provide a convenient table top. Below, right, on an auto trip nothing can beat the folding gasoline stove for turning out a piping-hot meal

THE COOKING FIRE

The automobile camper will, of course, have his gasoline stove, of either two or three-burner size, and cook almost as comfortably as on the gas range at home. But the woods camper must depend on a wood fire, supporting his utensils with any means available. The simplest "stove" is perhaps a sheet of heavy-gauge galvanized iron about 12 by 30 inches in size. Being flat, it packs nicely and the weight is little. This is laid on large rocks and the fire built in a trench beneath.

Even less bulky is a pair of fire irons. These are made of one-inch angle iron, from 24 to 30 inches in length, with 12-inch folding legs of strap iron riveted loosely at the end of each bar. They are best used over a trench between large, flat-top rocks which will serve as a worktable and warming oven beside the fire. The legs, sharpened at the end, are driven into the ground, leaving the bars level at the proper height. These irons may also be used in a woods or desert country without the rocks and are perhaps the best solution for outdoor cooking where nature does not cooperate. They should always be placed at a tapering angle, with the wide end for the larger utensils, such as the frying pan, and the coffee pot at the narrow end.

In cooking over these irons the fire is kept blazing at one end for quick boiling, and the hot coals are raked down under the frying or grilling end where they won't produce flames and smoke to irritate the cook. The folding irons are easy to construct in the home workshop and their cost is small.

While some kind of a "stove," the sheet



of iron or the folding fire irons, can usually be carried, there may be times when you'll want to depend on the country alone. Then, flat boulders, carefully arranged, will do nicely for holding the cooking utensils. These will need careful bedding with the shovel for a level top and should be slanted as recommended for the fire irons. In a woods country, where green small growth is available, an ideal combination is the rock stove for slow frying, and the kettles and coffee pot suspended above a blaze on a cross stick laid in two crotched stakes driven well into the ground. These, of course, must be of green wood to resist the heat. Willow, alder, cottonwood, poplar and all the softwoods are good for this purpose. Resinous woods, such as pine and fir, are unsuitable.

Dry firewood is essential for good cooking. Any of the hardwoods is better than either soft or resinous wood. The experienced woods camper locates his camp only where there's good firewood. The small dead limbs of oak, ash, sycamore, maple and nearly all hardwoods are ideal for cooking. They need little chopping and produce great heat with a minimum of smoke. A dead log that is sound and dry also provides fine cooking wood but requires some strenuous work with a keen ax to provide both kindling and heavier lengths for a lasting fire.

Many of the dry softwoods and small dead limbs, which often may be knocked off the trunks of pine and fir trees, will serve for camp cooking when the hardwood is absent. The former provide a quick, hot fire which needs constant replenishing, and the small limbs of the conifers burn well, fortunately containing little resin or pitch. Conversely, a pitch-pine log furnishes fine kindling for starting the fire quickly on a cold morning or even in the rain. The splinters from such a log burn at the touch of a match, flaring up like torches.

Complete kitchen for the auto trip includes the cook kit and dish pans, cutlery roll, stove stand and stove

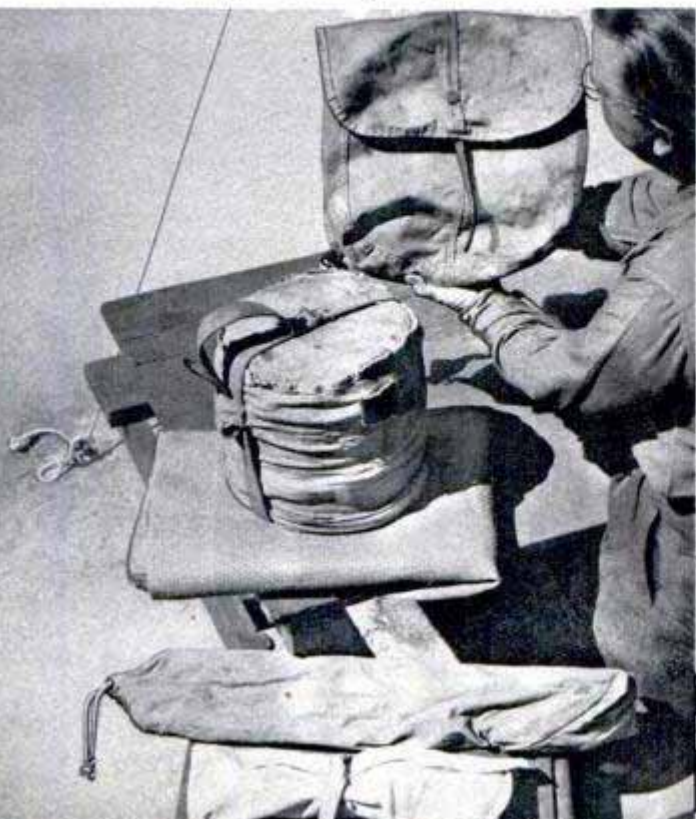


Compact camp kitchen provides most of the comforts of home. Note reflector oven in front of the fire

Complete kitchen for the auto trip includes the cook kit and dish pans, cutlery roll, stove stand and stove

The good woods cook checks carefully for his firewood supply before he camps for the night. And he sallies forth with a sharp ax, which he guards with jealous care, to provide an ample supply of good firewood even before he starts to unpack his "kitchen."

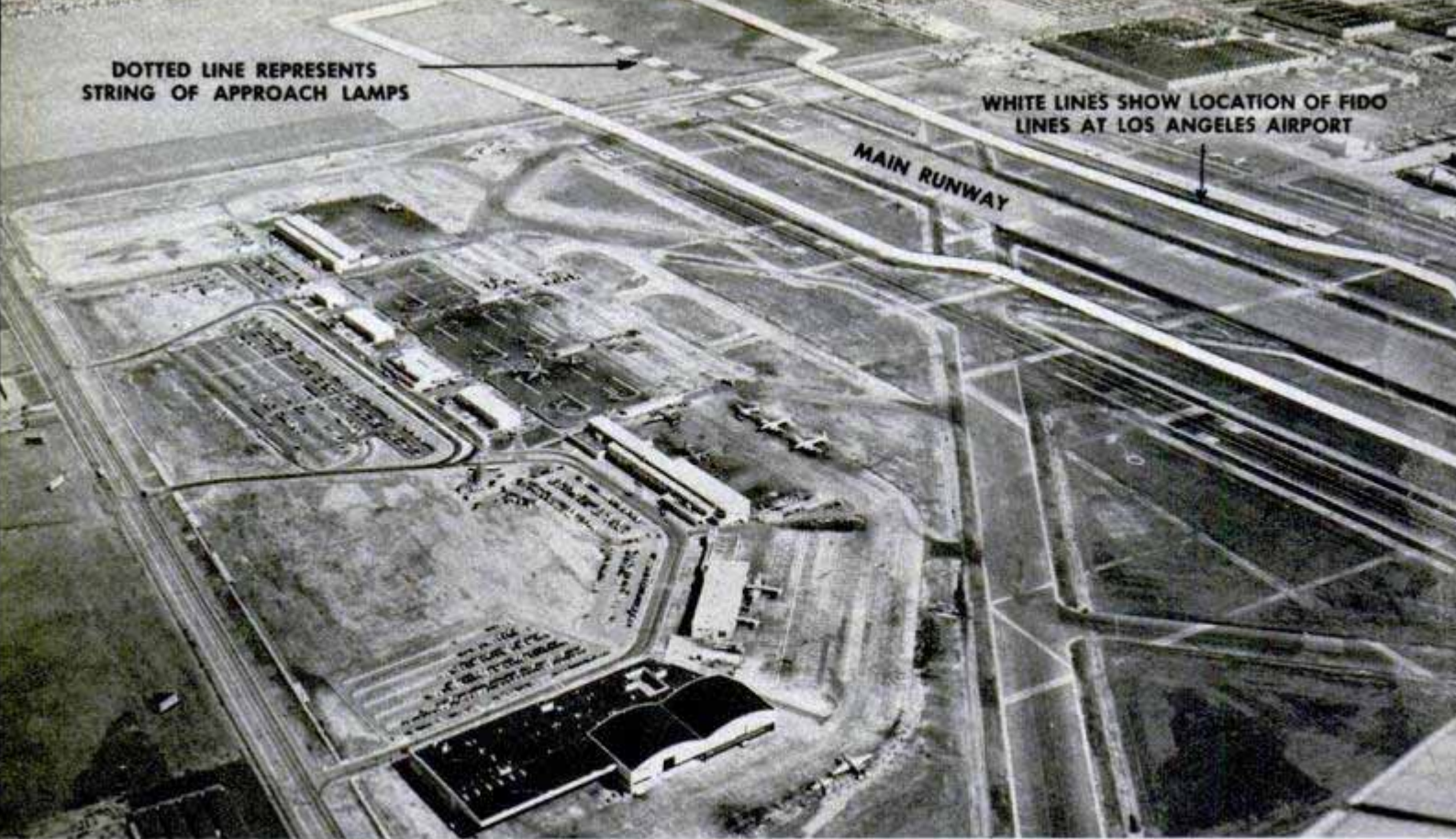
Finally, the cook assumes the essential duty of extinguishing the fire carefully and thoroughly when it is no longer needed. Forest authorities who know the ever-present danger of a forest fire advise: "Extinguish your fire with water, then cover it with dirt."



DOTTED LINE REPRESENTS
STRING OF APPROACH LAMPS

WHITE LINES SHOW LOCATION OF FIDO
LINES AT LOS ANGELES AIRPORT

MAIN RUNWAY



Fog burners at Los Angeles airport will create island of good visibility in worst weather

They must land safely

By Thomas E. Stimson, Jr.

AIR TRAVEL is safe enough, but is it dependable? Not always, disgruntled passengers say, and it won't be until planes are able to take off and land on schedule in spite of adverse weather.

Take the busy Los Angeles airport, handling five percent of the nation's total air traffic. Two hundred transport operations are scheduled in and out of Los Angeles every day, a volume that amounts to some 1,200,000 passengers a year.

Yet for more hours per year than airport officials like to admit, Los Angeles is shut down tight by ocean fog. Sometimes westbound transcontinental planes are held over at intermediate stops while the passengers fume. Then, likely as not, they are finally landed at alternate fields as far as 100 miles from their destination. A southbound passenger from San Francisco may spend as much travel time on the bus as he spends in the air.

To cure this, Los Angeles is installing an all-weather landing system that will permit all traffic to arrive or depart on schedule. Heart of the new landing system is a FIDO (the letters stand for "fog inten-

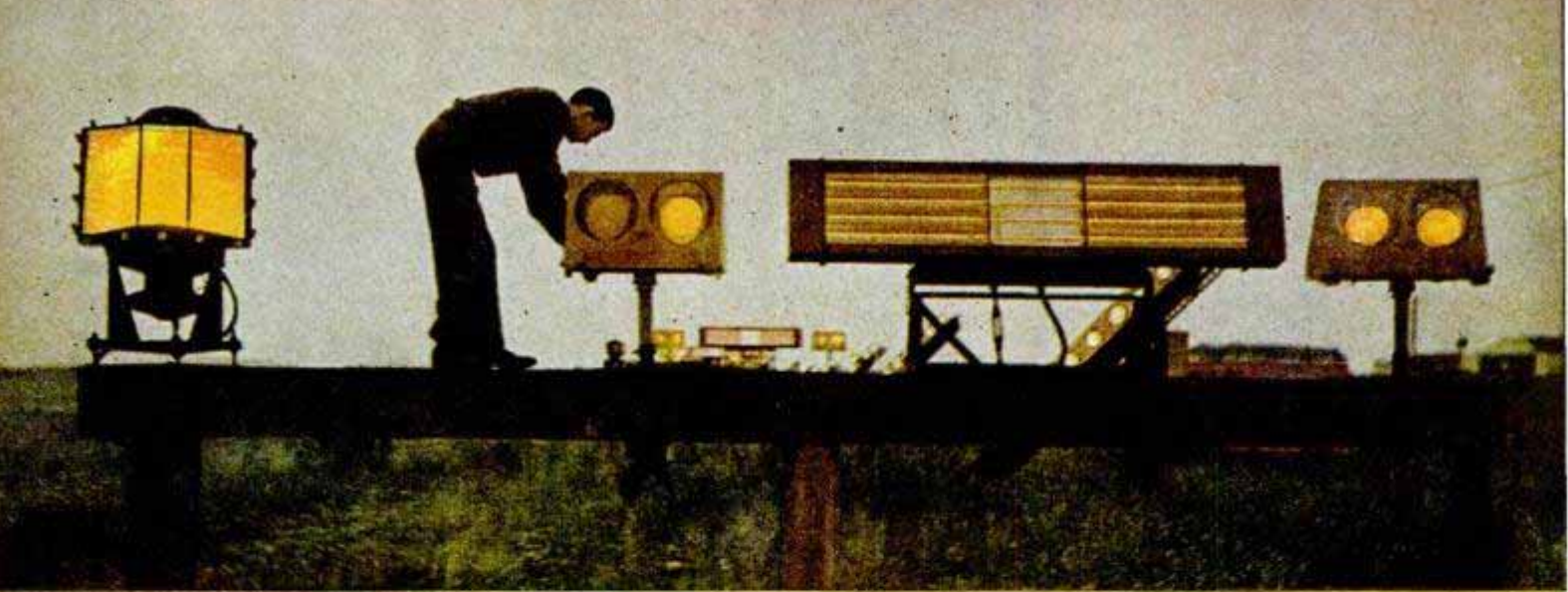
sive, dispersal of") installation that burns away the fog and makes the runway an island of good visibility, even in zero-zero conditions. FIDO was invented by Britain during the war and has since been considerably refined in this country.

The Los Angeles FIDO system is planned for completion this month and will consist of two lines of burners, one on each side of the main east-west runway. Each line will extend for 4000 feet along the runway and for 2000 feet into the approach zone. Six-foot flames from the oil burners, ignited electrically, will heat the air and dissipate fog sufficiently to provide a ceiling of more than 300 feet and a visibility of more than three quarters of a mile within two or three minutes after the system is turned on.

FIDO is costing \$820,000 and the airlines that use it will be charged from \$100 to \$400 per landing, depending on traffic density and the length of time of each burn. This is considerably less than the cost involved in landing at outlying fields and carrying

Painting at right visualizes fog burners in use. → Six-foot flames can heat air and dissipate fog fast enough to boost ceiling to 300 feet in three minutes





Amber-colored lights being tested along right side of approach corridor at Arcata, Calif., experimental station

passengers to their destination by bus.

All-weather landings at Los Angeles will depend on several types of aids, all coordinated into one system. An incoming pilot will let down through the overcast by means of standard radio procedure or ILS radio—or both. As he passes over the inner radio marker he will visually pick up the outer end of a string of powerful approach lights that lead directly to the landing runway.

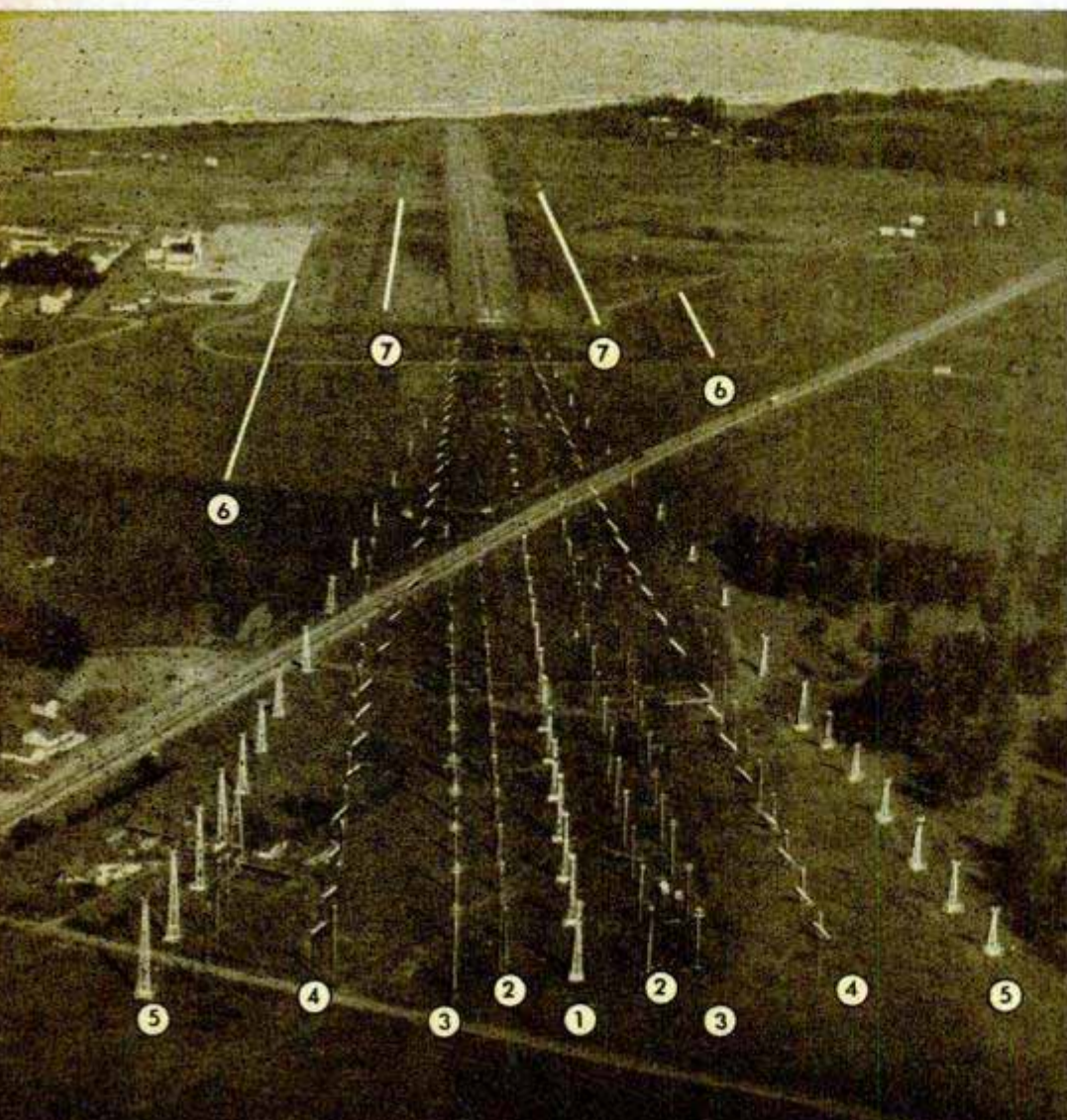
Somewhere along this illuminated approach the pilot breaks into the area of

good visibility that was manufactured by FIDO. He continues on to the field and makes his landing in the normal manner, still in good visibility. During his approach the pilot is monitored by a GCA crew on the ground who will wave him off by radio if he appears to be deviating from the prescribed glide path.

All the system's components have been tested exhaustively at the Landing Aids Experiment Station at Arcata, Calif., where FIDO has been in use for years and where the modern high-pressure FIDO system

was developed. The early low-pressure systems used gasoline as fuel; today diesel oil or furnace oil is equally as good. The heavier fuels now used are completely atomized at the burners under a pressure of 1500 pounds per square inch.

The Arcata field has a reputation as the foggiest airport in the United States. Its system of landing aids, however, has enabled Southwest Airways to conduct on-schedule passenger transport operations in



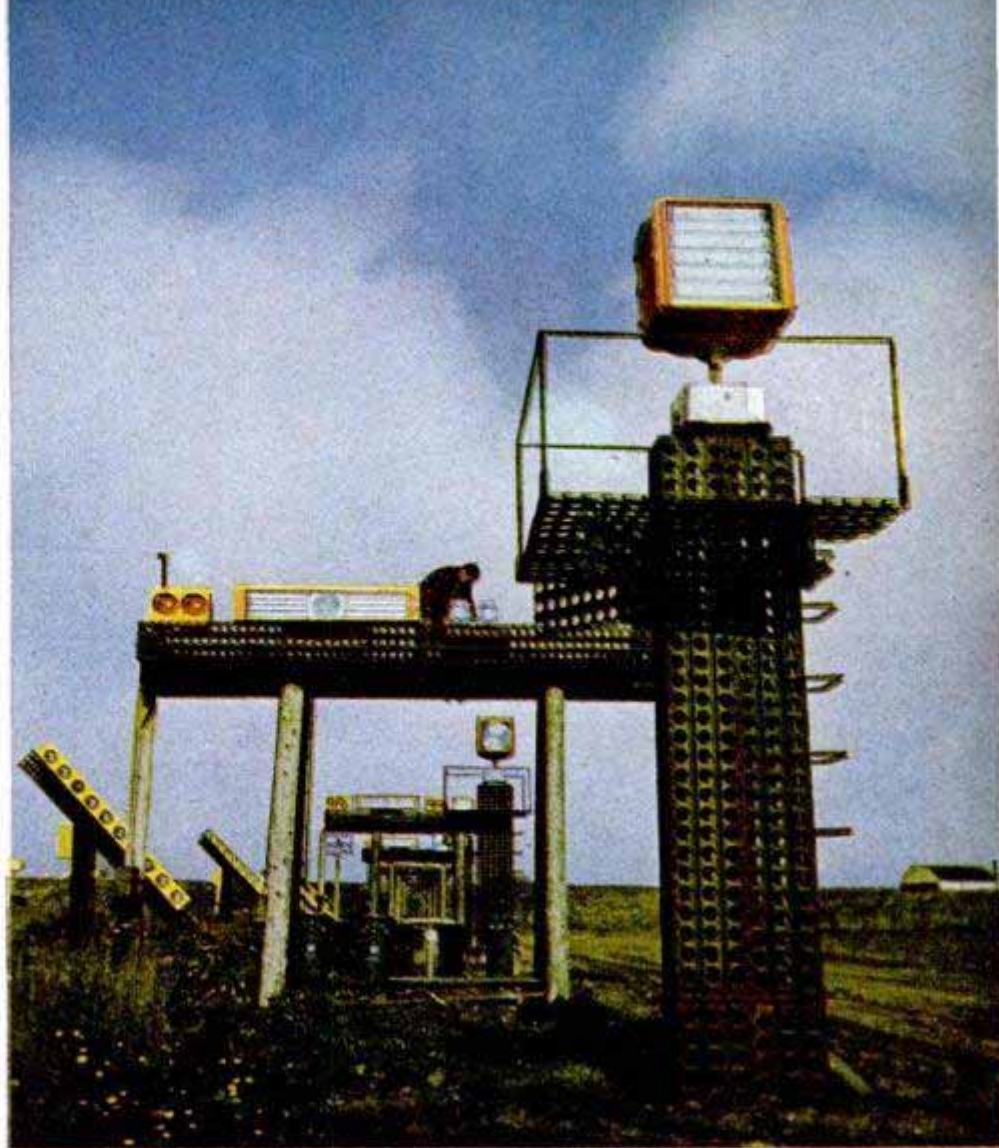
Man-made forest of metal towers spreads out below planes landing at Arcata. They are: (1) center lights, (2) AGA systems, (3) Bar-tow multi-row system, (4) slope-line lights, (5) experimental approach towers, (6-7) parallel FIDO burners

and out of Arcata since December, 1947, in spite of fogs so dense that automobile traffic on an adjacent highway often has to slow down to a crawl. From 400 to 700 passengers per month arrive at or depart from Arcata, a considerably higher volume of traffic than is considered normal for such an area, and that is attributed to the reliability of operations, rain or shine. Many landings from July to November are made with the assistance of FIDO.

The Landing Aids Experiment Station was instituted by the Navy during the war and its value as a research airport was so apparent that the station has been continued as a cooperative project. It is sponsored by the Navy, Air Force, Civil Aeronautics Administration, Air Line Pilots' Association and the Air Transport Association. Transocean Air Lines operates the field under contract and conducts the investigations desired.

To evaluate the different landing aids, Transocean staffed the field with a group of experts that includes Rolf Tingdale, station director; E. C. Marlin, operations manager; Dr. Maurice Garbell, technical consultant; James Davis, lighting engineer; R. J. McDonald, fog-dispersal engineer; Robert E. Fogle, electronics supervisor; Hugh Stocker, meteorologist; and Vance Gudmonson, flight-test supervisor.

The airport is closed to private flying but is used by Southwest and United Air Lines, with eight scheduled transport oper-

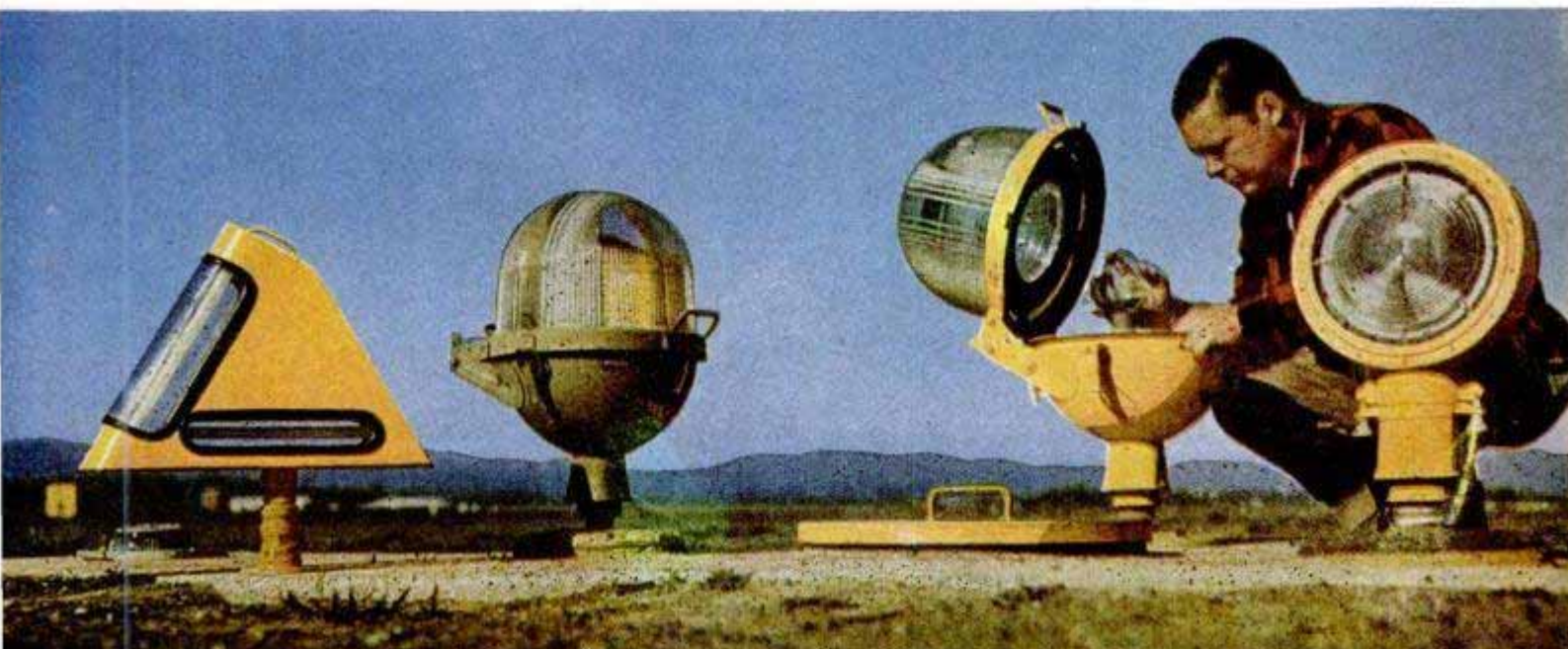


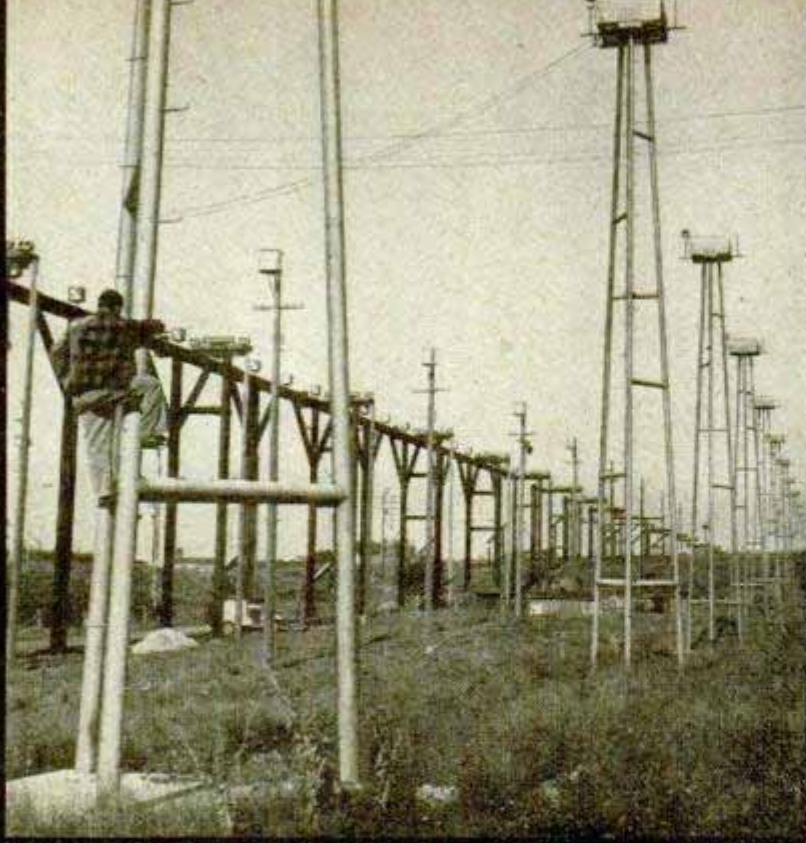
In foreground is one of 36 high-intensity red neon "blaze" approach units that emit light flashes of up to $3\frac{1}{3}$ billion candle power

ations a day. There are also numerous unscheduled test flights by the field staff whenever visibility approaches zero.

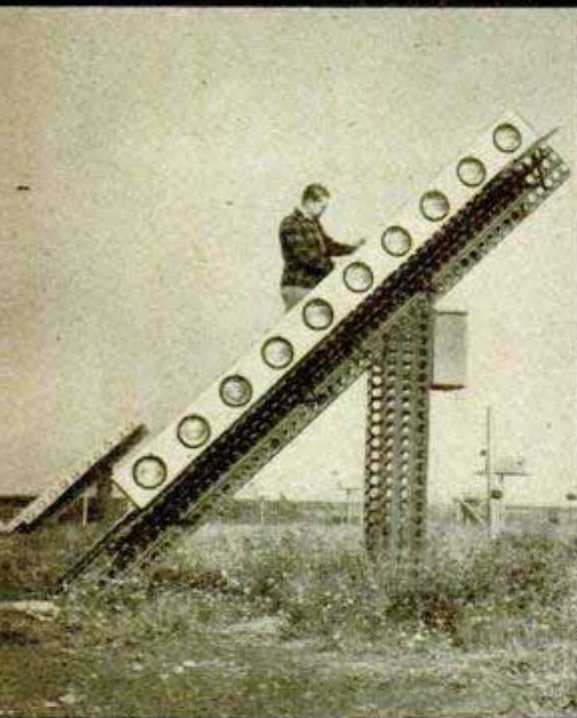
Transocean's test pilots use six aircraft that include a B-17 and a DC-3 and last year made more than 400 separate test flights under adverse weather conditions, principally for studying approach-light

Runway lights under test have "breakaway" joints flush with ground so they won't damage plane if struck





Network of towers brings the approach lights up to the level of runway. Towers on left were made from war-surplus landing mats



Each of the diagonal units of the slope-line lighting system pierces the sky with ten 500-watt landing lamps. Above right, diagrams show appearance of the slope lines to an incoming pilot when he is above, on and below the glide path

Right, scanning unit of ceilometer continuously reports the ceiling under clouds or fog by measuring the height of a light beam. It reports by radio to central recording machine

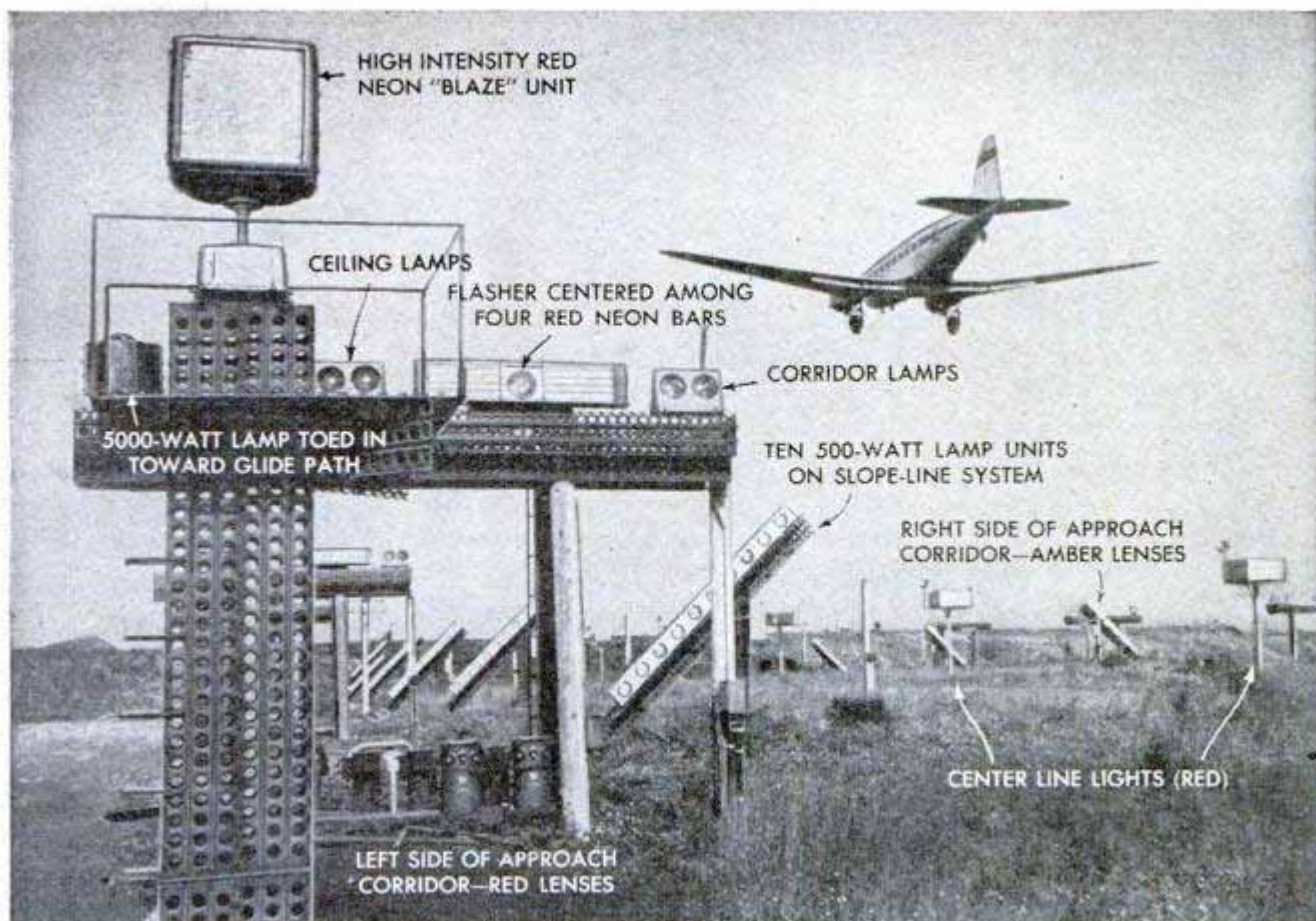


systems. All flights of this type are monitored by GCA and a permanent record made of the path of each. All radio conversations between the pilot, the tower, and GCA are recorded, and each aircraft carries a flight recorder that shows how closely the pilot followed his ILS readings.

Various FIDO systems, including 13 kinds of burners and various ignition devices, have been tested at LAES. Two sound systems intended to dissipate fog have been studied, as has a chemical spray intended for the same purpose.

One of the main projects at present is to evaluate the different approach-light systems. Six in all have been installed in the approach area, a zone some 600 feet wide and 3000 feet long. One is operated at a time and a test pilot makes use of it during an approach, then another system is turned on for the next approach. The entire experimental lighting system amounts to nearly 3000 powerful lamps and some 75 miles of wiring.

All lamps in the approach zone are at runway level. Since the field itself is at a higher elevation than is the ground in the approach zone, this has made it necessary to erect a forest of weird-appearing towers and standards to support the lamps. Many of the supports are fabricated from



Airliner coming in for landing at Arcata, with approach-light test installations on supports in foreground

war-surplus metal landing-mat material and the towers range from 3 to 87 feet tall. So much electricity is required that the field has installed its own generator plant.

The newest system under test is a Westinghouse design that consists of 72 lighting units spaced in a straight line 100 feet to the left of the center line of the approach area. Every other lighting unit is a clear krypton high-speed flash of the condenser-

discharge type similar to the Strob lamps used by photographers. Each can produce a brilliant flash of up to $3\frac{1}{3}$ billion candle power that lasts for 17 microseconds.

The alternate units are high-intensity red neon "blaze" markers which can either be flashed in sequence with the krypton units at high candle power or burned steadily, alone, in good flying weather. The

(Continued to page 246)

Left, landings in fog and at night are under constant radar "eyes" of crews in GCA trailer. Right, all approach and runway-light systems are turned on and off, and their intensities varied, from panel in control tower





Above, Douglas Aircraft photo



Below, Beech Aircraft photo

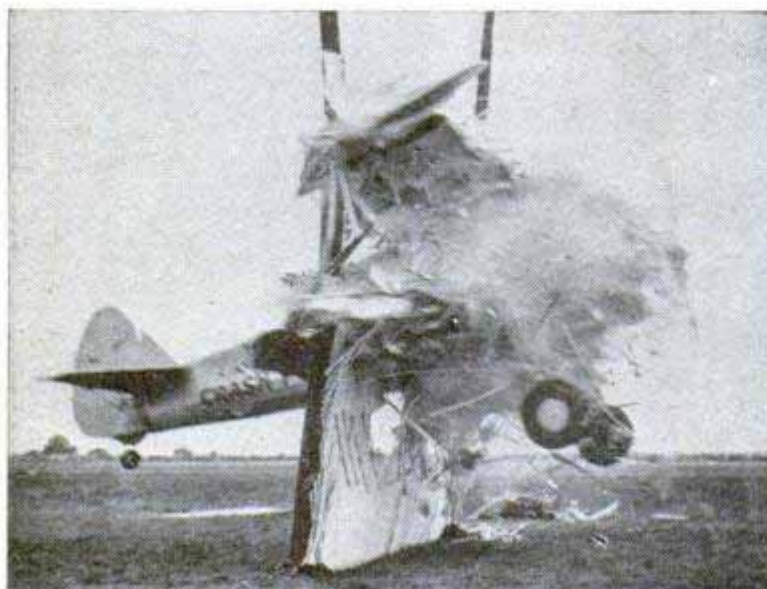
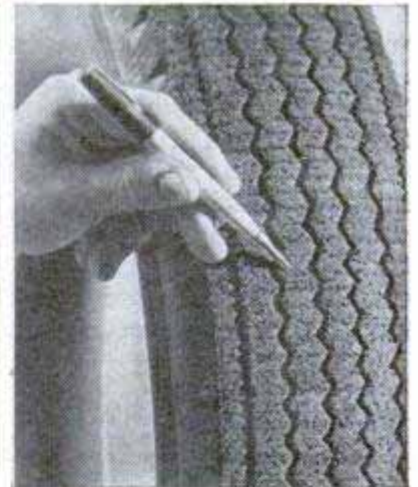
High-Speed Trainer Has Engine at Rear

Student pilots get greater visibility with the engine-in-the-rear design of the new Douglas XT-30. A shaft under the cockpit floor drives the propeller. With length and wingspan approximately 36 feet, it has been designed to cruise at 190 miles an hour and operate as high as 30,000 feet. A smaller trainer, also developed for possible military use, the Beech Model 45 is an adaptation of the company's four-place Bonanza personal plane. In the trainer version, which costs less than wartime models to operate, a conventional tail replaces the "butterfly" tail.

New-design trainers, Douglas XT-30, top, and Beech Model 45

"Tattooing" Tires Increases Traction

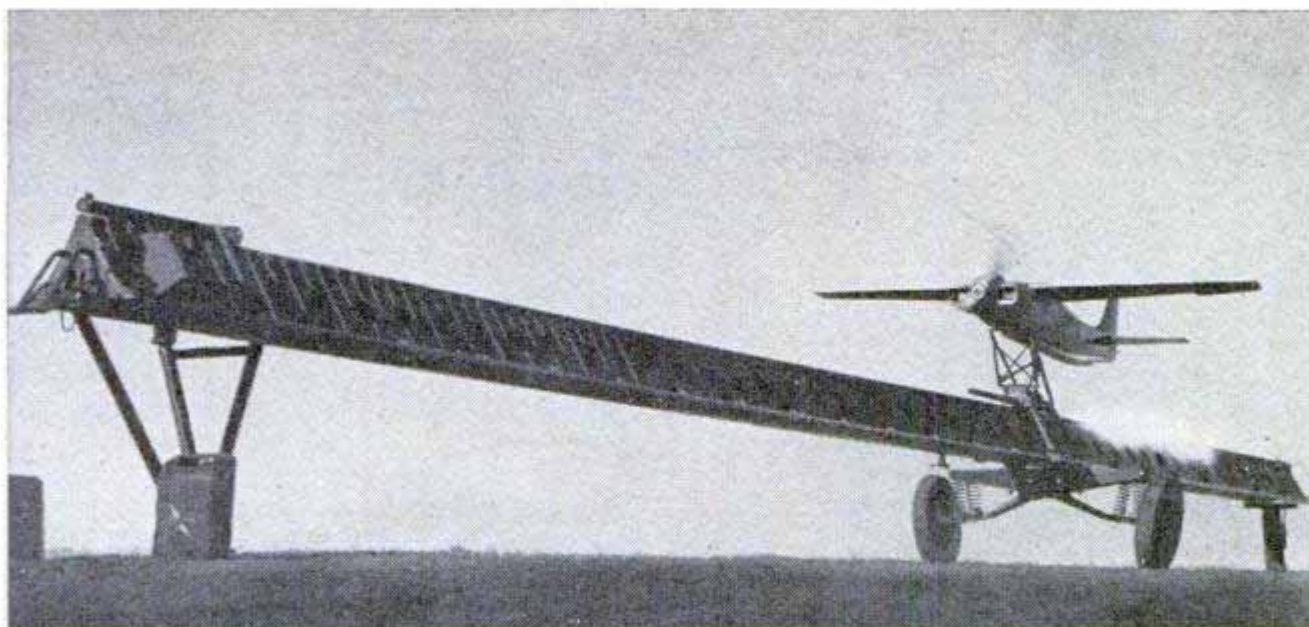
Tires are given increased traction by a "tattooing" machine that roughens the tread with thousands of irregular-shaped holes. This is done, without removing the tires from the wheels, by spinning each tire on two rollers covered with minute steel points. Four tires are handled an hour.



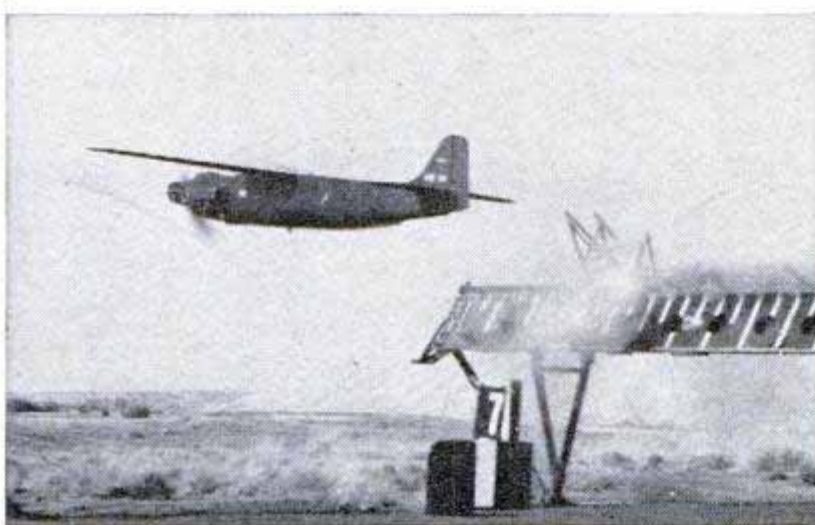
Pilot Clips Wings Flying Through Wall

Having his wings clipped is no new experience for Tommy Walker, who flies his light plane through a wooden wall as a feature of the Flying Tigers Air Show. The two uprights slice off the wing tips as the fuselage crashes through the wall. Walker, a former Flying Tiger, has successfully completed the stunt 16 times.

☐ American farmers have 3 million tractors that operate 15 million farm implements, an average of five tools for each tractor.



Air Materiel Command photos



Rocket car speeds a pilotless target plane, above, on 60-foot-long take-off catapult. Left, at 80 miles an hour the car hits hydraulic snubbing device and plane shoots ahead into the air. Below, after flying at speeds as great as 220 miles an hour, parachute 32 feet wide is opened automatically or by control operator to float craft down to earth

PILOTLESS TARGET PLANE FLIES 220 M.P.H.

HOUR-LONG flights at 220 miles an hour are made by a remotely controlled target plane that can simulate all the maneuvers of a fighter aircraft. At 200 yards it resembles a normal-sized fighter 500 yards away. The OQ-19A will be used by the Air Force for aircraft, antiaircraft and flexible gunnery practice. It can be operated anywhere within line of sight. The 300-pound target, over 10 feet long and with a wingspan of 12 feet, is driven by a 60-horsepower engine. The 2½-foot-high fuselage is all metal. It is launched from a 60-foot catapult at 80 miles an hour by a rocket car, which is stopped within the last four feet by a hydraulic snubbing device and used again. Landing is accomplished by a 32-foot-wide parachute which is released by the control operator. Interruption of the carrier wave, either by direct-hit damage or short circuits in the wiring, also opens the parachute. Another automatic device frees the chute upon landing, preventing damage by the plane being pulled along the ground. An aluminum keel from the engine mount to the tail absorbs landing shocks. Twice as fast as any previous pilotless flying target, the OQ-19A can climb 2400 feet a minute from a sea-level take-off to its service ceiling of 20,000 feet.

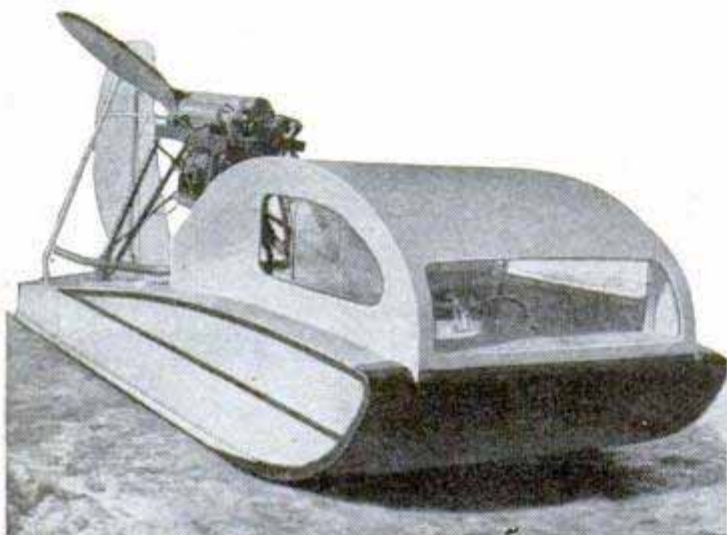




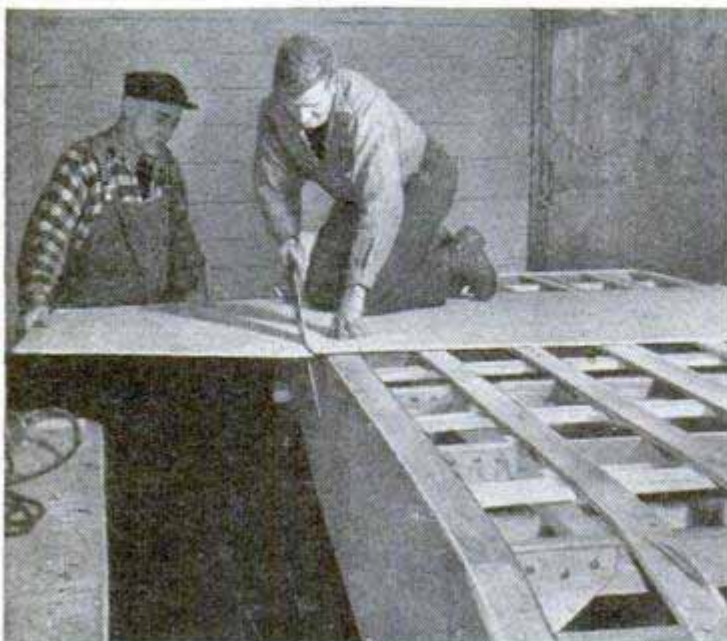
"SCOOT"

Chases Poachers on Ice and Water

Airplane engine mounted on steel piping sends craft skimming across ice. Below, bow is covered with galvanized iron

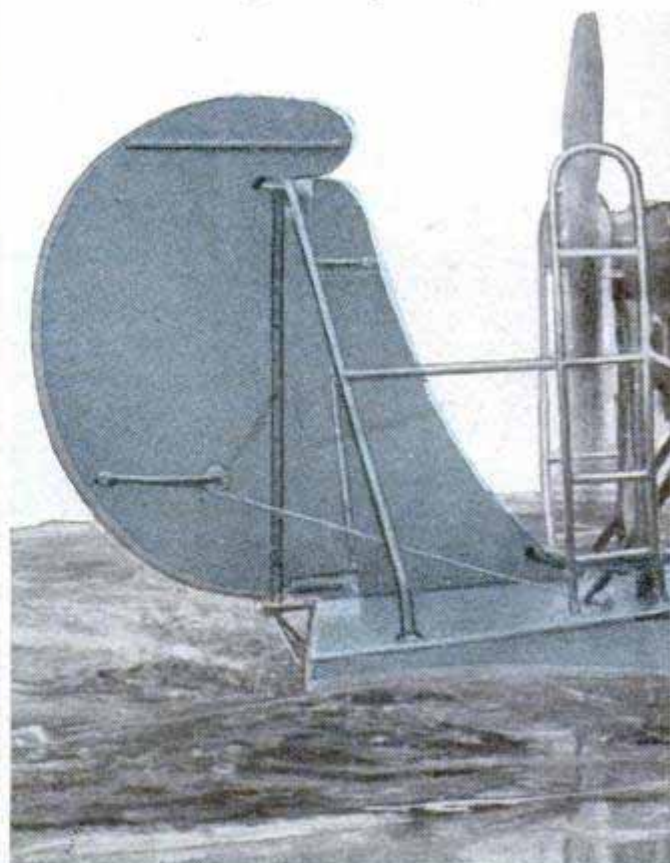


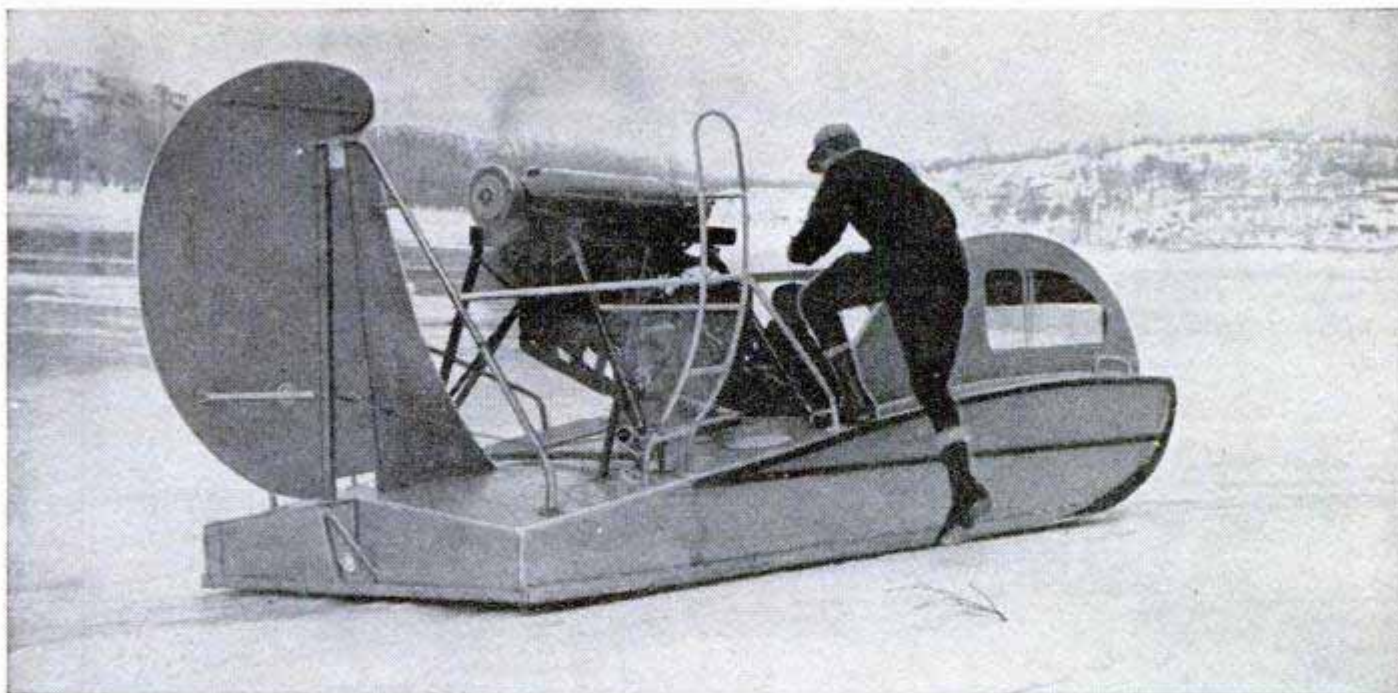
↓ Plywood skin is applied to the hull of the Scoot. Oak crossbeams and spruce stringers form strong frame for hull



WINTER game poachers and timber pirates along the eastern shore of Georgian Bay, an arm of Lake Huron, dread the sound of an airplane-type motor. But retribution doesn't descend upon them from the skies. It skims along the bay in the Ontario Department of Lands and Forests' unique propeller-driven amphibian, appropriately called the "Scoot."

The shores of Muskoka and Parry Sound districts stretch 100 miles as the crow flies, but innumerable inlets and Georgian Bay's "30,000 Is-





Novel craft skims along ice or snow at 35 miles an hour, swooping down on game poachers and timber pirates

lands" multiply the actual shore line many times. Summer resorts and camps dot the area, which includes a large provincial forest and several Indian reservations. In past winters, most of the shore line was inaccessible to regular patrols. A game warden or forest ranger might take days on snowshoes to reach the spot where an infraction was suspected. Even standard snowmobiles were helpless in the face of stretches of treacherous ice or open water.

But the Scoot pays little heed to such obstructions. Skimming along smooth ice at 35 miles per hour—higher speeds may be reached on good snow—it doesn't slacken speed when approaching open water. Its momentum causes it to plane lightly over the surface and the wave created at the bow cushions any shock which might

occur when the craft climbs back onto solid ice. The hull, made of oak cross-beams, and longitudinal stringers of spruce, withstands buffeting by rough ice and engine vibration. Sides, deck and cabin are of 1/4-inch plywood. Three layers of plywood form the bow halfway to the stern, with two layers for the balance of the bottom. The bottom and parts of the sides are also covered with three layers of 16-gauge galvanized iron. Welded steel piping forms a mount for the 134-horsepower Menasco aircraft engine. Aluminum piping is used for propeller guards and braces for the fin and rudder.

Already, it is reported, the regular patrols made possible by the Scoot have inspired several would-be lawbreakers to abandon their schemes.

Scoot approaches a layer of strong ice from the open water



By Harry Rowed

A SOUTHERN GI JOE, fresh from a frigid flight over the Canadian Arctic, had this reply to a reporter's query:

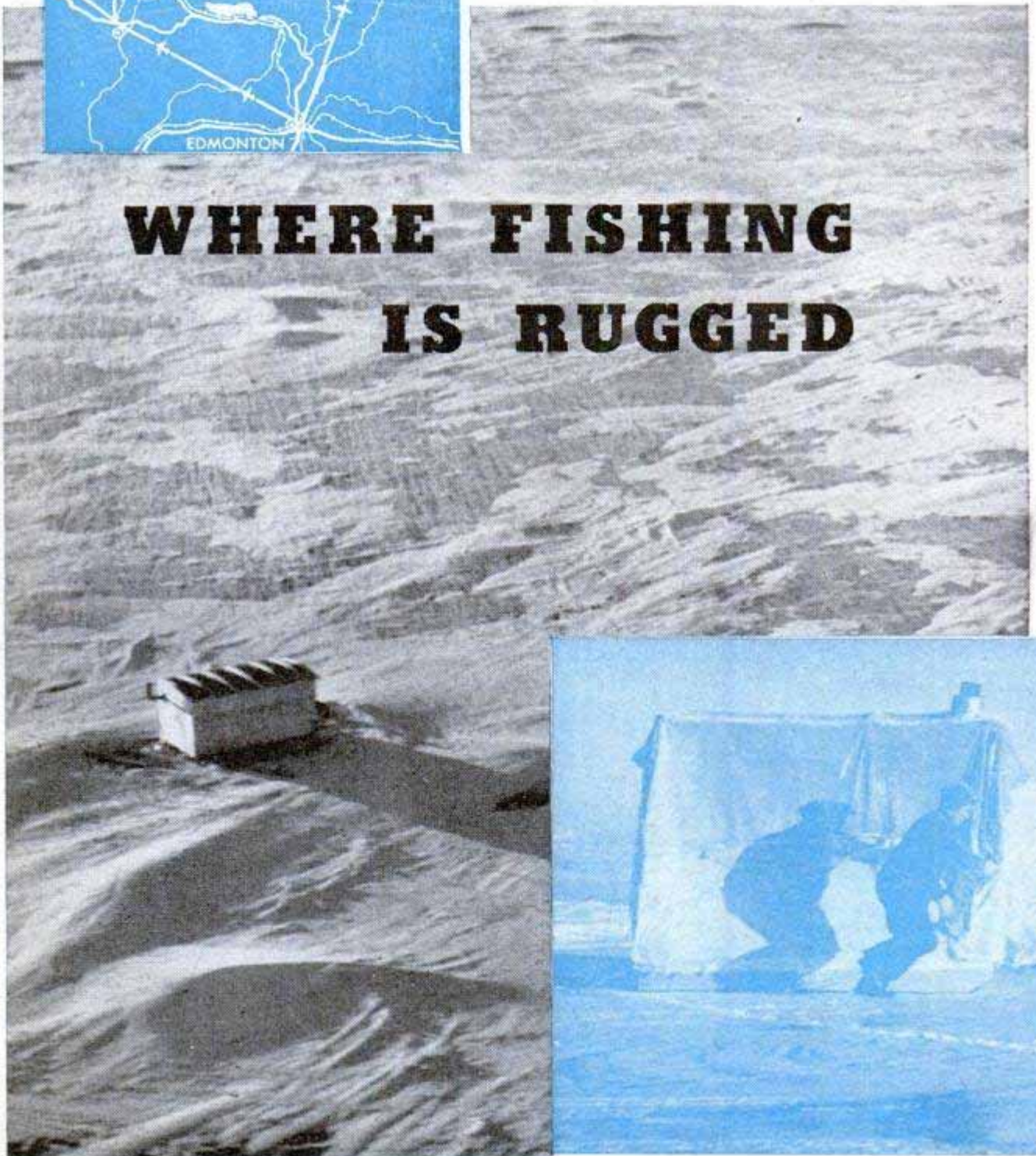
"The North? Boss, it ain't nothin' but miles and miles of nothin' but miles and miles!"

There is some basis in fact for his appraisal. A northland flight in winter unfolds hundreds of miles of wind-crusted barren lands, frozen muskeg, lakes and rivers. After hours of flying, the terrain seems limited only by the horizons. Most northerners will concur with the

Left, map of the Great Slave Lake region showing transportation facilities. Fish are hauled south to railhead at Grimshaw in insulated trucks. Below, a fisherman's caboose, 25 miles out on the windswept ice of Great Slave



WHERE FISHING IS RUGGED



soldier, but with important reservations. There are literally miles and miles of miles and miles; there are also activity and industry and an acknowledged potential of greater wealth and significance.

Out of Canada's north-land recently have come reports of new discoveries in gold and base metals. The uranium deposits of Great Bear Lake became exciting news following release of the first atomic bombs. In the North, too, are other rich resources, not so sensational as the mineral finds, but adding materially to the stability of the far-flung regions.

Had the GI's aircraft dropped altitude over Great Slave Lake, he would have noticed dozens of small wooden buildings, some of them on the ice 25 miles offshore. Closer inspection would have revealed men busy nearby, dog teams mushing across the ice and snow, and snowmobiles scurrying between the camps and shore line. Even the air traffic he noted in the area probably was playing a vital role in the industry below.

The men scattered over the vast expanse were winter fishermen and the buildings their movable

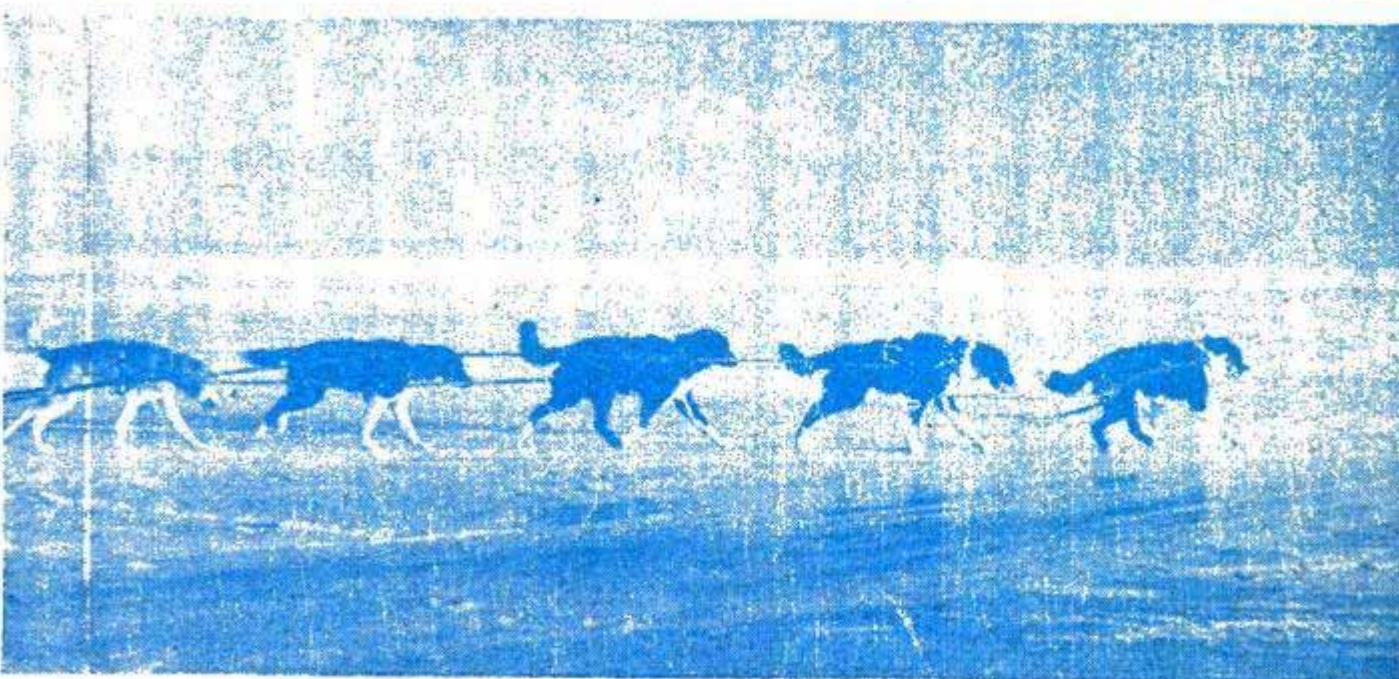


Photos by Harry Rowed

As protection from the winds and extreme temperatures, some fishermen pitch small tents, like the one shown above, near their basin holes



Above, fish are hauled ashore in snowmobiles that speed across the ice at 45 miles an hour. Below, dog team pulls shelter to new fishing spot





Days are short at Great Slave and the sun hugs the horizon. This fisherman is testing the ice adjacent to a new crack. Nobody walks around on ice after dark because of the possibility of falling into hidden crevices

Below, left, part of the long night is spent taking care of the tools. Fisherman sharpens the needle bar he uses to chop holes in ice. Right, Frank Ladouguer and the dog that saved his life when he fell in the lake





Left, dog's paw, cut on sharp ice, is treated by fishermen who look upon the animals as extremely valuable helpers. Right, the cold job of removing the fish from the nets must be done as soon as nets are pulled in

living quarters, skid-equipped cabooses. The dog teams sped freshly caught fish for cleaning and packing, or transported the men and their nets to new sites. Snowmobiles and aircraft were carrying on from there, rushing the fish to the settlement at Hay River for shipment by truck, and finally train, to markets in New York and Chicago.

Great Slave Lake spreads across 11,170 square miles in the Territories. It ranks twelfth in size in the world, fifth in North America, is 325 miles in length and boasts an average breadth of 50 miles. Depth, in places, is greater than 2000 feet. History dates it back to 1772 when Samuel Hearne discovered its existence. The name was derived from the Slave (Slavi) Indians who once dominated its shores.

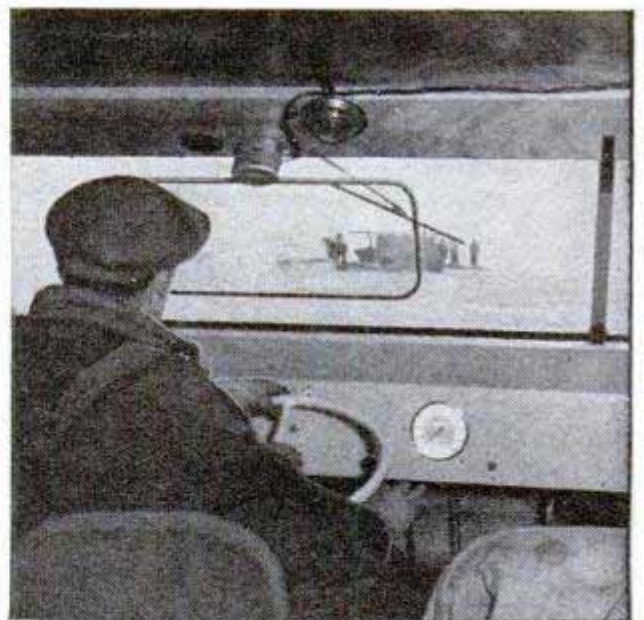
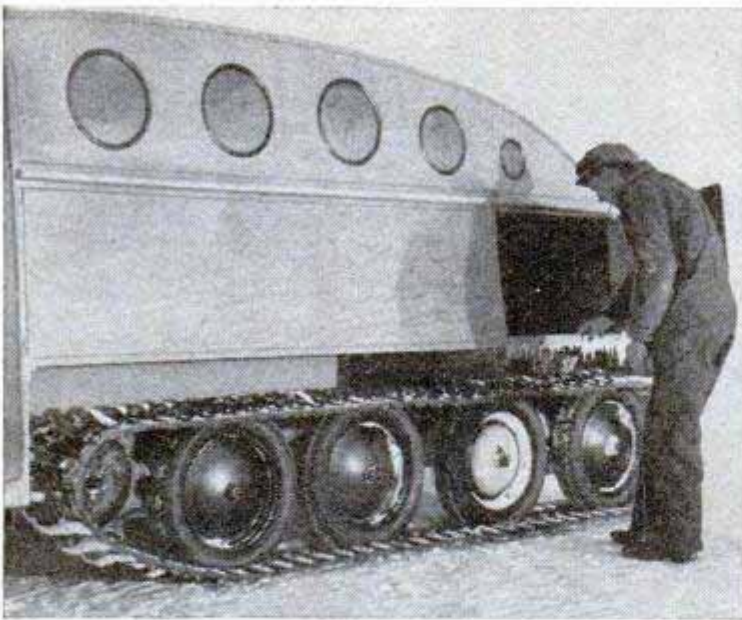
The lake boomed into prominence in recent years with the finding of large gold deposits in the vicinity of Yellowknife. Since then, as a result of government surveys, the lake was opened for commercial fishing and first produced during the summer of 1945. This winter more than 600 fishermen daily "jiggered" their nets through basin holes in Great Slave's ice, seeking whitefish and trout to help fill the brisk demand from the U. S. and Canada.

Opening of the new highway spanning the north country between Grimshaw, Alta., and Hay River at Great Slave's southwest corner was mainly responsible for the unprecedented influx of fishermen from almost any part of western Canada

you'd care to name. The improvement in transportation, as the road brought a direct route to a railhead, brought visions of quick financial returns which were realized by many of the professional fishermen but lost to the bulk of the inexperienced "part timers" who flocked into Hay River. With a wary eye to conservation and prolongation of the industry, the Canadian government, at the beginning of the winter fishing season, set a limit of 1½ million pounds, the fishing to cease immediately when that figure was reached. In January, the authorities increased the quota to a new figure of 4 million pounds.

While the get-rich-quick aspect of the business is a falsity generally, there is no doubt that an experienced fisherman, given any kind of break in weather and locating the fish, can make an excellent livelihood over the winter. This is a worthwhile supplement to the more generous remuneration of summer fishing. But it is a rugged and hazardous life which demands tremendous resourcefulness and resistance to the spirit-breaking cold that sweeps in from the polar regions on Arctic winds. More than one embryo fisherman, probably wisely, headed back south early this year when Great Slave temperatures slipped down to 64 below zero.

Most hazards and hardships are directly connected with weather and ice conditions. With fluctuating temperatures, great cracks and pressure ridges appear without warning except the startling "gurrump," a



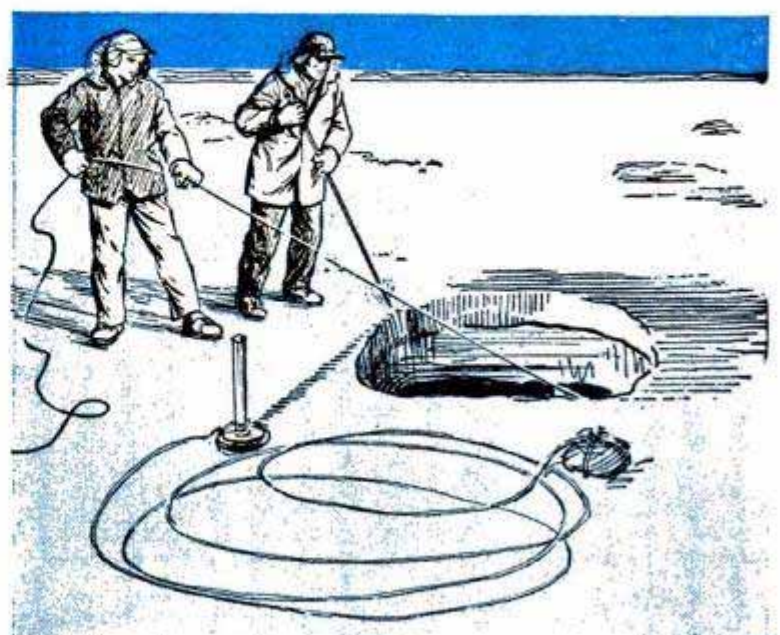
Top, left, rear-engine snowmobile is driven by rubber tread. Right, it is fairly comfortable inside the cab of the snowmobile as it nears a fishing camp on the ice. Above, frozen stiff, the fish are piled like sticks as pickup approaches

Below, jigger is lowered into water. At right, jigger pushes forward under ice as line is pulled. Net is attached to line and pulled through to another hole. Rock drags net to bottom

thunderous rumble that is altogether too familiar to the winter fisherman. A blizzard can follow before the surface refreezes solidly, completely obliterating the crack with snow. The danger is obvious.

Frank Ladoucier, husky Cree Indian who has been fishing on northern lakes almost as long as he can remember, was driving his dogs into the teeth of a Slave Lake wind. The low sun of midwinter brushed the horizon, silhouetting the drifting snow as far as Frank could squint in the direction where sky and ice met. His catch had been good. In another hour he and the dogs would be heading for the rewards of the day, warmth and food of the shore-line cabin for Frank, the usual meal of partially thawed fish for the dogs.

Suddenly, the lead dog swerved,



then burst into renewed speed. The latter act saved the lives of Frank and his team for the momentum carried the alert lead dog over the drifted snow blanketing a wide crack in the 40-inch ice. Frank and the remaining dogs were plunged into the icy waters, the man clinging perilously to the sled. Yipping in terror, the lead dog pulled away. The second dog caught his footing, then the third. Combined strengths yanked Frank to solid ice. Even then he was in grave danger. Before he reached the cabin his clothes were frozen so stiff he could hardly walk. His feet, face and hands were frostbitten.

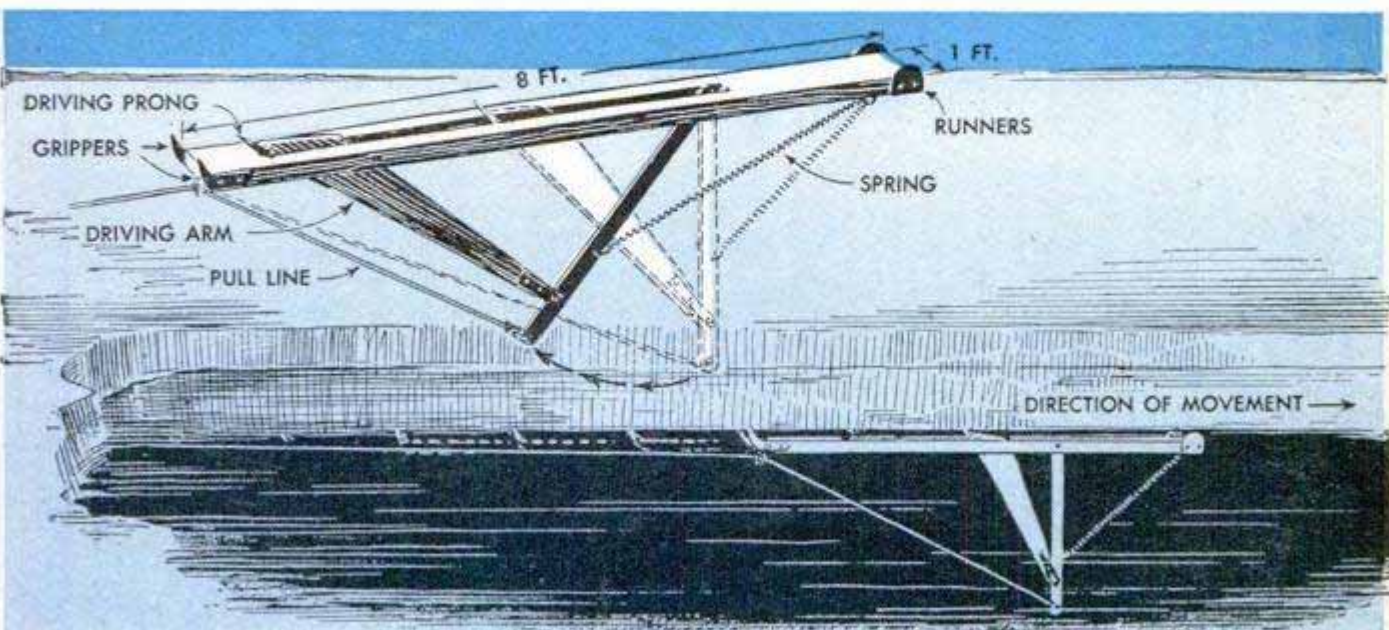
Earlier in the season, uplake from Frank's fishing area, a group of fishermen was setting nets several miles from shore. The center of Great Slave still had open water but the fishermen were on thick ice and prospects were encouraging. Without warning, the ice to shoreward split open and moved away from the main body. The fishermen raced their dog teams in frantic effort to find an ice bridge or narrow section they could cross. In a matter of minutes they had become marooned on an ice floe which would break up with the first sign of wind. They were lucky. A passing airliner noticed their plight, radioed Hay River and circled the spot while canoes manned by Royal Canadian Mounted Police and natives rushed to the rescue.

The ice cracks and pressure ridges are



Heads of large trout are cut off so fish will fit inside standard boxes

unpredictable. In December of this season, a Hay River fisherman parked his truck near his caboose, about eight miles offshore. Next morning there was no sign of the truck, only unmistakable evidence that the ice had opened and swallowed it in 80 feet of water. An upheaval of the ice threw a disturbing surprise in the direction of Bill Workun, former Canadian paratrooper, who fished before the war and now is back in the business. Bill was just about to climb into his bunk when the caboose lurched, depositing him, dishes and everything not nailed down in an ungainly heap in the middle of the floor. Bill continued to the door to find a grandpappy pressure ridge parked near his steps. Another few feet would have brought the ridge, some of which erupt to a height of 20 feet or more,





Plane hauls four tons of fish on each trip from fishing area to Hay River. It makes up to three trips daily

near enough to have turned Bill's caboose on its side, perhaps completely over.

Most of the original and basic mechanical features of the actual fishing operations are unchanged. In transportation there is another story. Progress of the McInnes Products Corporation of Edmonton

serves as illustration. McInnes, pioneer on Great Slave Lake, is one of the acknowledged "Big Four" operators in the region, the others including the Menzies Company, the Clarke Fisheries and Gateway.

McInnes' winter operations got underway in the '20s. Horses hauled frozen fish

Fish are cleaned as soon as net is hauled in. Some are then packed in cartons. Fisherman loads box of fish in snowmobile



from camps in Saskatchewan to the railroad, covering the distance over a system of relays on winter roads. Later, chartered aircraft entered the picture, transporting fresh fish to heated cars spotted for fast shipment south. In 1946, the company dipped into reserves for three Anson aircraft and a Douglas. The Douglas operated this winter at Great Slave Lake, lifting four tons of fresh or frozen fish per load from the McInnes main camp at Caribou Bay to Hay River. From Hay all companies run trucks to Grimshaw where the Northern Alberta Railway terminus is located.

In view of the quota basis for Great Slave, speed in handling is of primary importance. The fishing companies have been employing every means to get the fish off the ice quickly and en route to the markets. Most revolutionary machine at Slave is the Bombardier snowmobile, a Quebec-manufactured vehicle which has proved invaluable to the fishing industry on the big lake. Powered by a

Chrysler motor and utilizing rubber tread belts for drive, the plywood Bombardiers number nearly 20 at Hay River, speedily making the rounds of fishermen miles out on the lake. They are rated at 45 miles an hour with a 1200-pound payload of fish, will virtually triple that weight figure when the fish are hauled in a keen-runner sled rather than in the cargo compartment of the Bombardier itself. Used by all major companies, the Bombardier is rapidly replacing trucks as it is safer and greatly expedites gathering of the harvest.

The fishermen's tools of trade have not altered greatly over the years but two changes are noteworthy. Most important development has been introduction of the "jigger," an ingenious device which facilitates the setting of nets by pulling them under the ice by means of a running line. The wooden jiggers, eight feet long, are forced through the basin holes cut by the fishermen and the running line attached securely to a hinged arm in a slot in the jigger. When the running line is pulled, the jigger moves along under the ice. Release of the running line introduces action of a spring on the jigger which pulls back the driving arm. This arm, in swinging back, taps the ice with a pointed spike on its upper end. The tapping, easily audible to the fisherman even when the ice is several feet thick, enables him to follow the progress of the jigger and locate the point where the next basin hole should be cut. The jigger is lifted through the new hole and the running line detached.

Then the nets, which are weighted (usually with stones or leads) for lake-bottom fishing and also bear wooden floats to keep them erect, are tied to the line and pulled through under the ice.

When it is recalled that the former method of set-



Pretty Edna Powder, daughter of a fisherman, helps out with the packing

ting nets employed cumbersome poles, the jigger's usefulness to the industry can be appreciated. Now the fishermen set nets in gangs of 100 yards between basin holes and with much greater ease and assurance.

His other tools are simple but effective. For cutting the basin hole, the fisherman uses a needle bar. His ice chisel comes in handy for trimming the edges of the basin

(Continued to page 274)

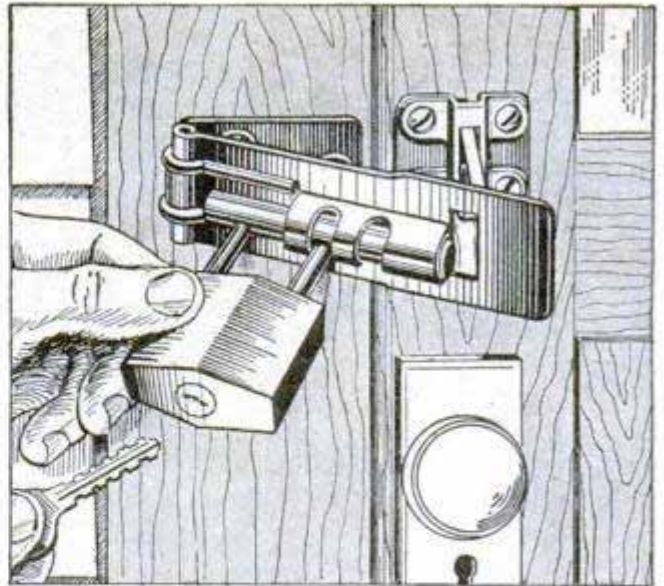
At Hay River, fish are packed in ice inside wooden boxes for trip south





Coating on Ignition System Makes Engines Start Easier

Coating all wires and parts of the automobile ignition system with an insulating spray makes engines start easier and run better. When the liquid is sprayed on wiring, spark plugs, coil, condenser, and inside and outside of the distributor cap, it provides a moistureproof barrier. Packed under pressure, it is released from the can in a fine spray when the top valve is opened, coating the various ignition parts quickly and thoroughly.

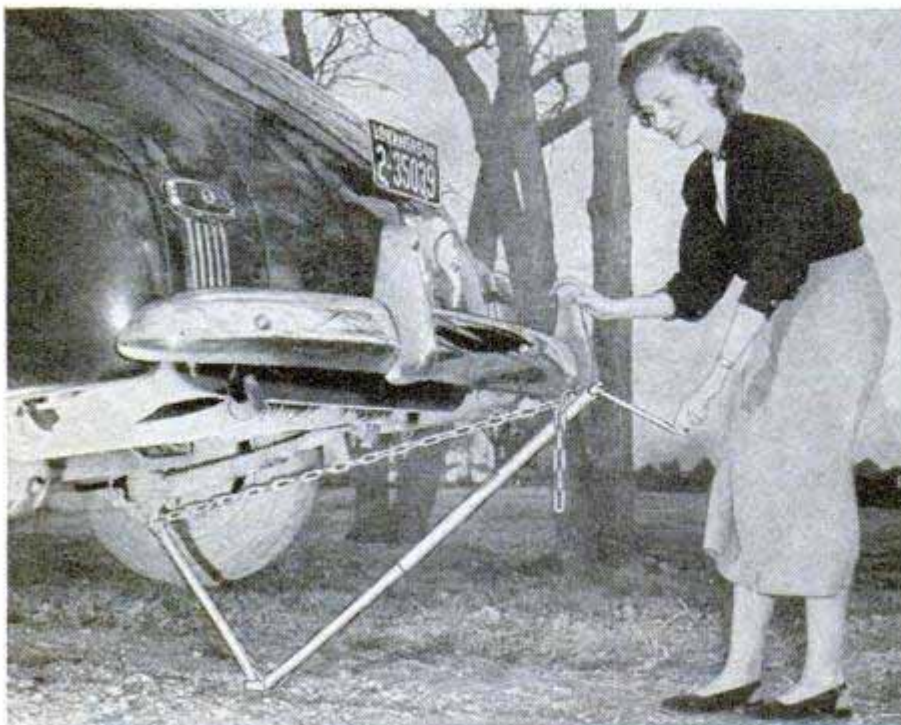


Padlock-Bolt Secures Door Hasp

Permanently attached to a sliding bolt, a padlock permits a hasp-type fastener to be securely locked. The user swings the hasp shut, slides the bolt into the eye and then pushes the padlock shut, which snaps one pin of the lock into a hole in the bolt. This prevents the bolt from being pushed back through the eye.

Automatic Refrigerator Defroster

Electric refrigerators are defrosted automatically every night by a clockwork mechanism that shuts off the current at a preset time and turns it back on when defrosting is completed. The device can be set to defrost the freezing unit at any time during the 24-hour period. Plugged into any outlet, the timer has a socket into which the refrigerator cord is plugged.



Car Jack Can't Slip Even on Incline

Even on a hill, you don't have to block the wheels when jacking up your car with a jack that combines the advantages of a bumper jack with those of an axle jack. The jack has two arms that pivot on the base plate and are connected at the other end by a chain. As you crank the jack, the outside arm lengthens, pulling the chain and raising the inside arm. There's no chance of the car falling off the jack because the chain acts as a cradle.



1949 Pontiacs Accent Roominess and Visibility

More space has been provided in 1949 Pontiac Chieftains and Streamliners by advancing the rear seat well ahead of the wheel housing. Moving the front seat four inches forward and the steering wheel two inches to the left gives the driver and those beside him more elbow room. In 10 types, the new bodies are 2½ inches lower, front and rear doors are respectively six and nine inches wider, and there is 38 percent more glass area, front and rear. Wheelbase has been standardized at 120 inches on all models. Last year's grille has been replaced by a single chrome bar, simulating a second bumper, spanning the entire front above 10 louvers. Both the Chieftain series, which replaces the Torpedo line, and the Streamliners will come with a 90-horsepower six-cylinder engine or a 104-horsepower eight. The starter button



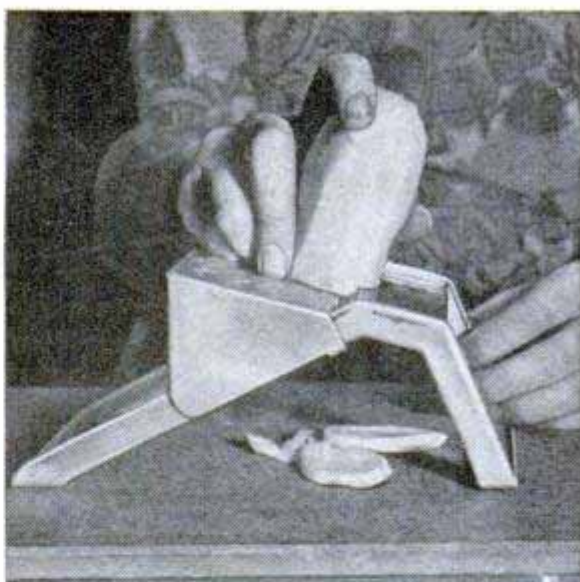
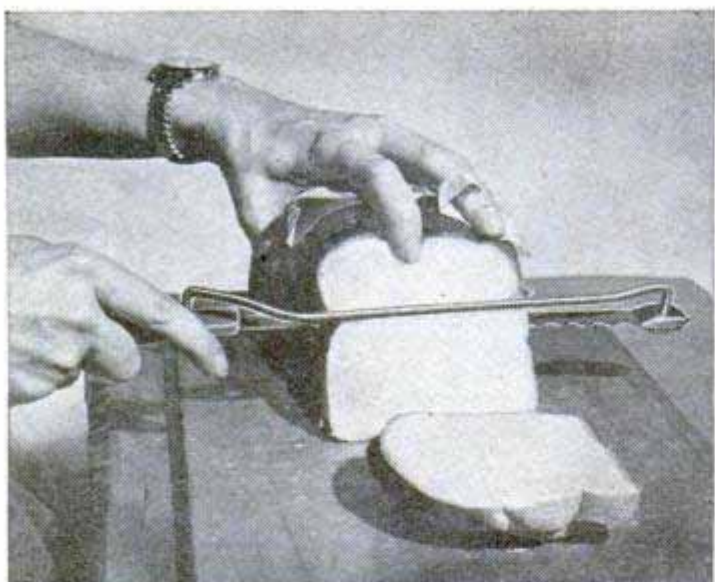
and all operating controls are grouped around the steering column. Hydramatic drive, ordered by 75 percent of the 1948 Pontiac buyers, will continue to be available as optional equipment.



Power Wheel for Bikes

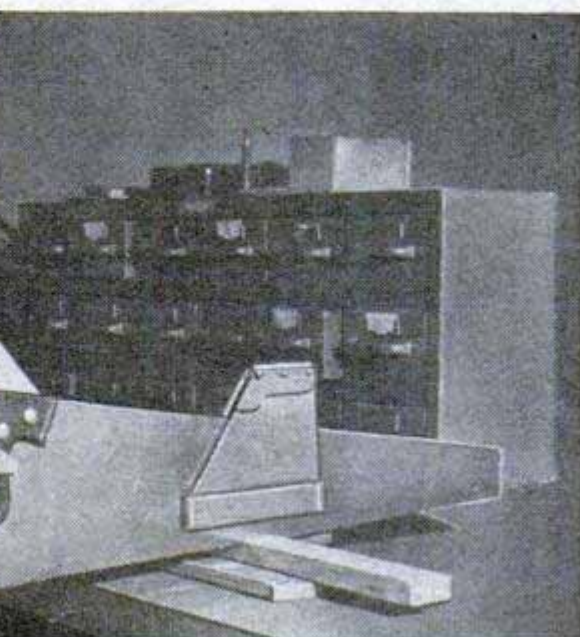
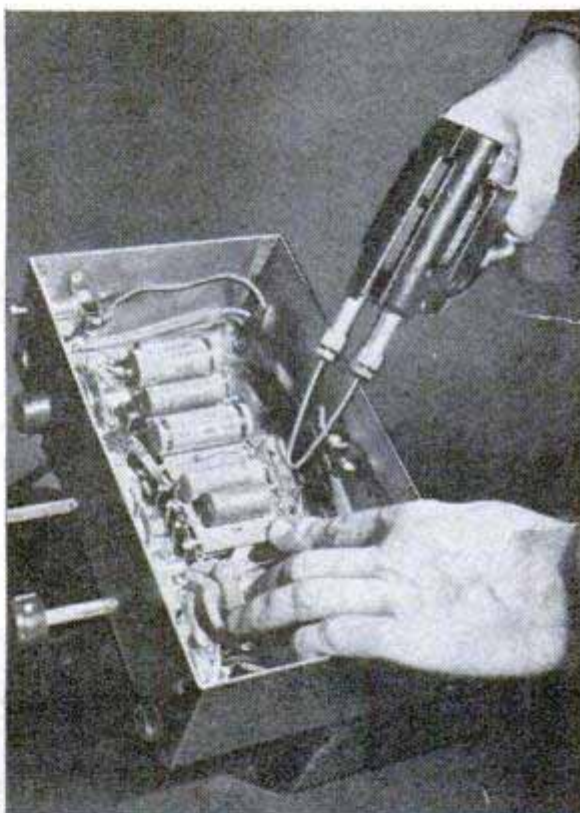
Instead of driving the rear wheel, a new power unit for bicycles provides a third wheel which is rotated by a gasoline engine. The unit can be attached to any make or style of bicycle. The gas control is attached to the handle bars, and power is transferred from the 1.3-horsepower engine to the third wheel through an automatic centrifugal clutch. The engine provides enough power to drive a bicycle about 100 miles on a gallon of gas.

☐ Some 21 million acres of desert land have been brought under irrigation by the U.S. Reclamation Service and private agencies.



TIMESAVERS FOR THE BLIND

Kitchen and workshop chores are made simpler and safer with equipment specially designed by the American Foundation for the Blind. The foundation's technical research laboratory is devoted entirely to developing tools and gadgets that ease the problems of blindness. A bread slicer with an adjustable guide, above, cuts slices any thickness from a sliver to $\frac{1}{2}$ inch thick. For paring vegetables, there is a kitchen aid, upper right, on which desired thicknesses are preset by raising or lowering a platform on which a vegetable is moved toward cutting edge. A quick-heating soldering iron, right, helps the sightless technician locate his work carefully while the iron is cool. A pull of a trigger switch provides soldering heat in a few seconds. The iron cools by the time he is ready to make another connection. Precise work is possible with a saw holder, below, that can be adapted to ripping lengthy sections of wood and used with standard handsaws and some types of hacksaws. Items are sold at cost to the blind

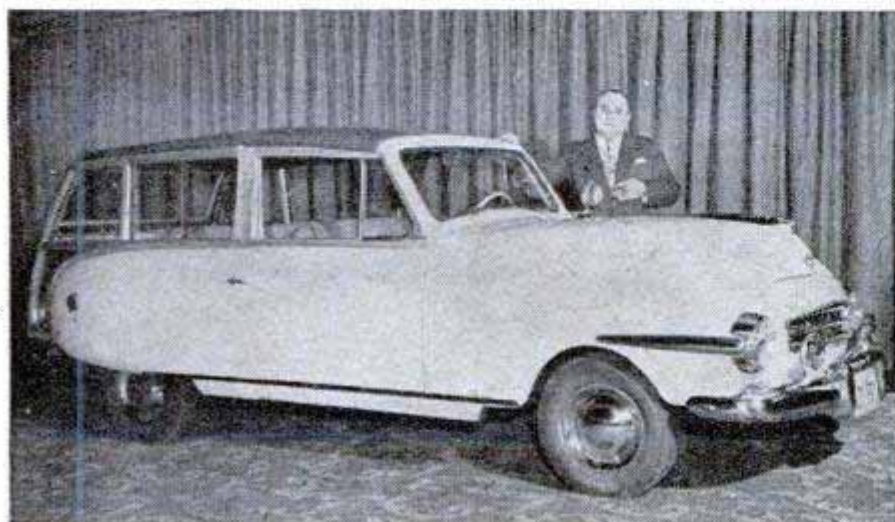
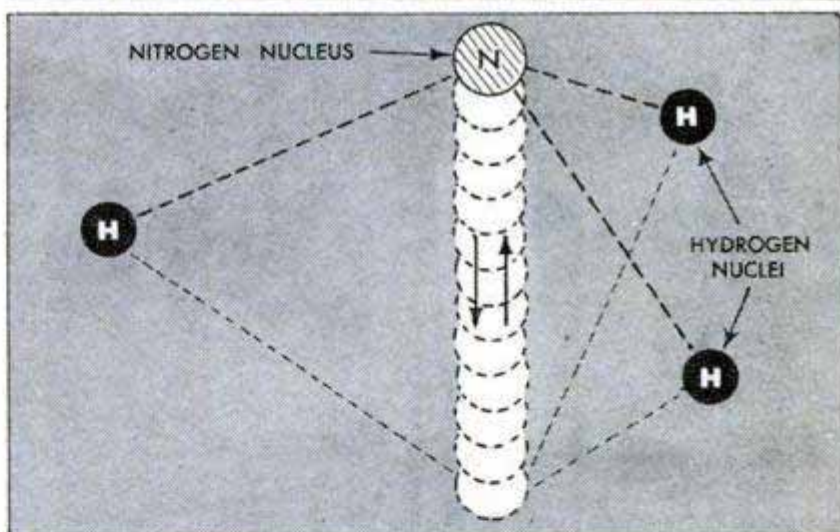
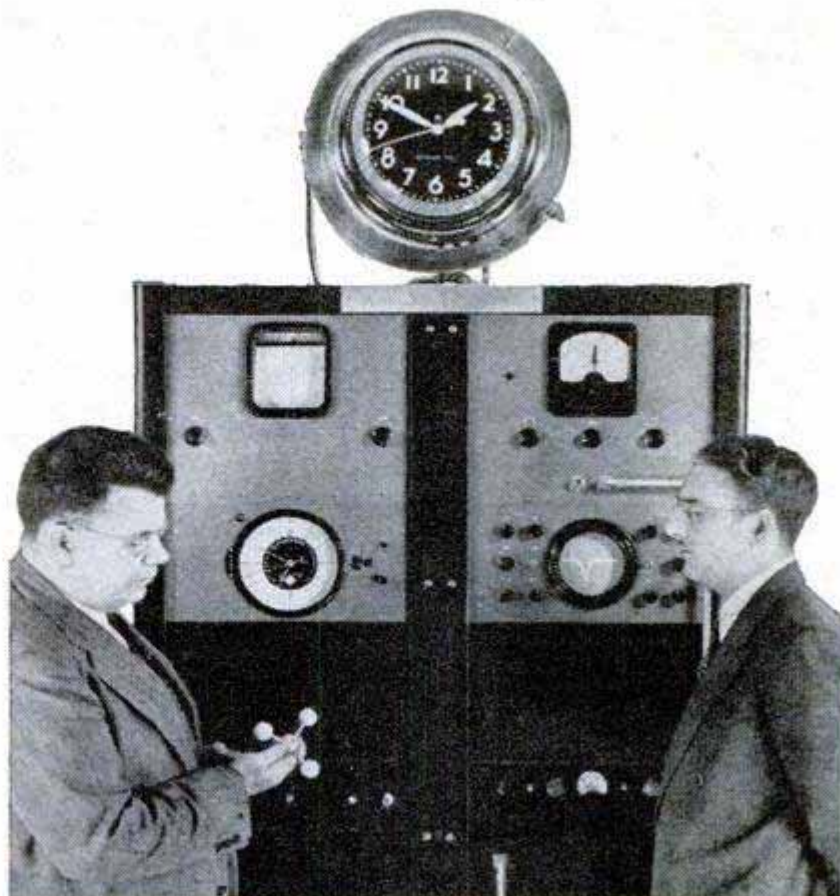


Clock Regulated by Vibrations of Molecules Keeps Perfect Time

So accurate that it will lose only one second in 300 years, an atomic clock developed at the Bureau of Standards is controlled by the constant, natural vibration of atoms in the ammonia molecule. The atomic timepiece is the first clock not dependent on astronomical observation.

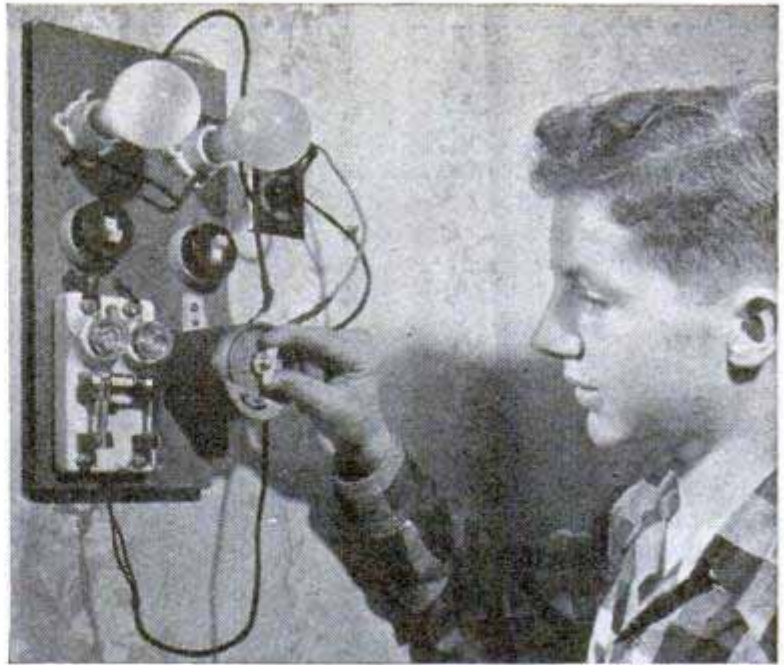
Driven by a quartz-crystal oscillator, the clock is a complex electronic instrument. A low-frequency radio signal, generated by the crystal oscillator, is transformed into a very high frequency signal. This signal is then compared with the natural vibration frequency of the ammonia molecule, which oscillates or turns itself inside-out 24 billion times a second. When the two frequencies differ, an "error signal" adjusts the oscillator, bringing them into agreement. The natural frequency of the ammonia molecule being invariable, this continuous synchronization enables the clock to tick off seconds far more accurately than any other method.

Top, standing in front of the atomic clock are Dr. E. U. Condon, director of the Bureau of Standards, and Dr. Harold Lyons, inventor of the clock. Condon is holding a model of the ammonia molecule which furnishes invariable frequency for controlling the timepiece. Right, schematic drawing of ammonia molecule showing the way nitrogen nucleus oscillates above and below the plane of three hydrogen nuclei to control timepiece



Playboy Station Wagon

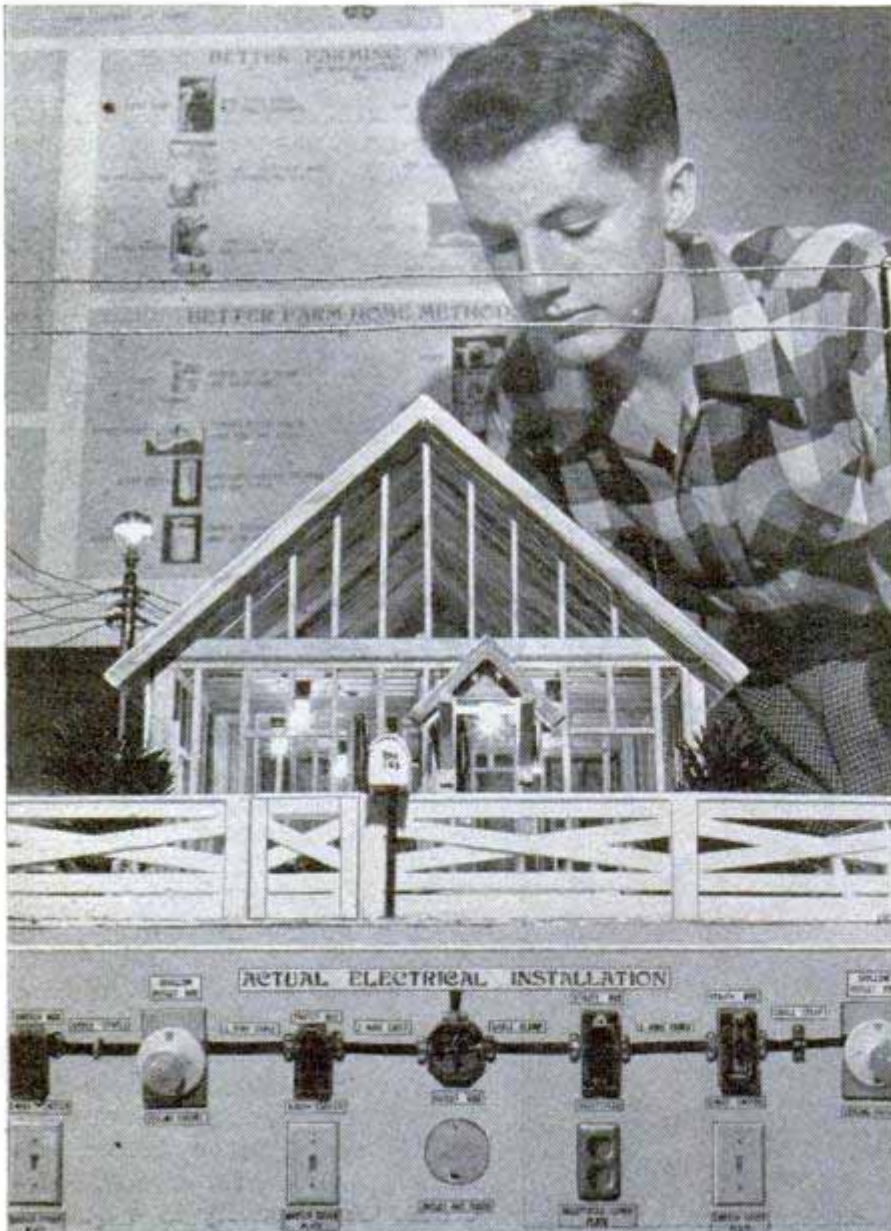
Designed to sell for about \$1500, the Playboy station wagon is a bigger and heavier car than the convertible built by the Buffalo manufacturer. The station wagon has a 96-inch wheelbase, an over-all length of 163 inches and weighs 2350 pounds. It is 300 pounds heavier and 8 inches longer than the convertible. Both models will be powered by the same engine, an L-head, four-cylinder, 48-horsepower, water-cooled Hercules. Oil capacity is 4 quarts.



Westinghouse photos

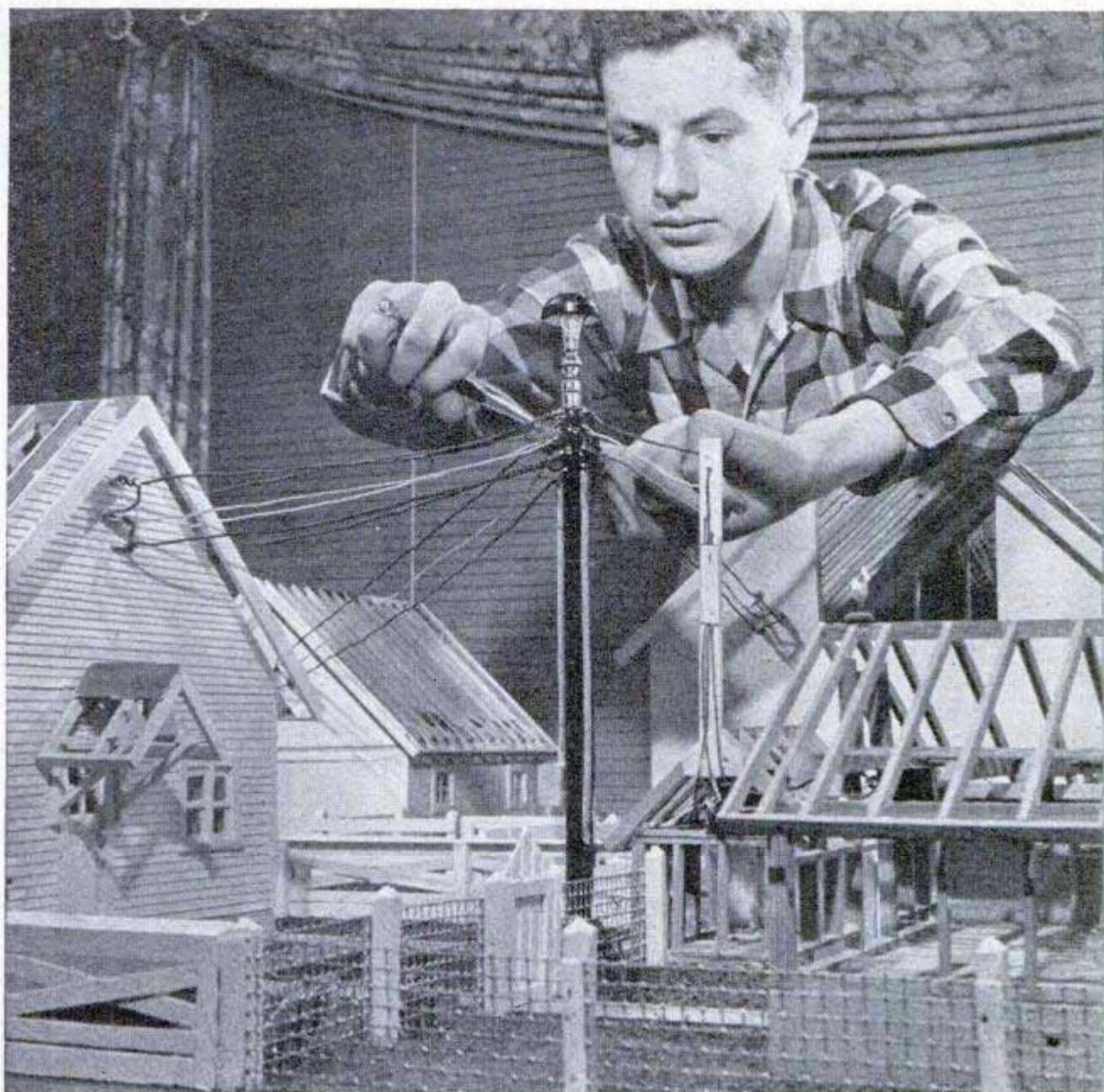
Left, Jimmie tunes in a program on the radio he built from an old keg, a crystal, wires and earphones. He contrived the automatic timer, right, to turn on hen-house lights early to give chickens longer working day

Model electrified farm really works. Bulbs are from old pin-ball game



Ben Franklin, Junior

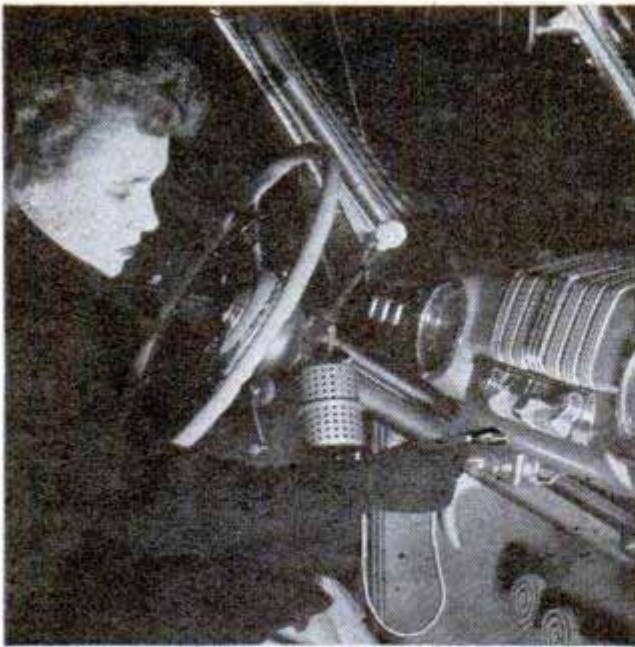
THAT OLD-TIME tinkerer, Ben Franklin, would find a kindred spirit in Jimmie Sutherland of Windsor, Mo., who can't resist electromagnets and earphones, bolts and wires. It's paid off for Jimmie, too—he recently won a Westinghouse scholarship for his feats of electrical wizardry on his father's farm. The lad's model farm with a wiring system that really works amazes even professional engineers. For his hen house Jimmie has worked out an automatic timer that snaps on the lights at 4:00 a.m. to lengthen the working day. Result—more eggs. He has electrified the milking job on the neighboring farm, built radios from fig barrels and now is installing an automatic door-opener for the hen house.



Young wizard completes center pole of his farm—his biggest wiring headache. The wooden farm buildings were fastened with glue that Jimmie made himself and put into old glue tubes, a neat trick if you can do it

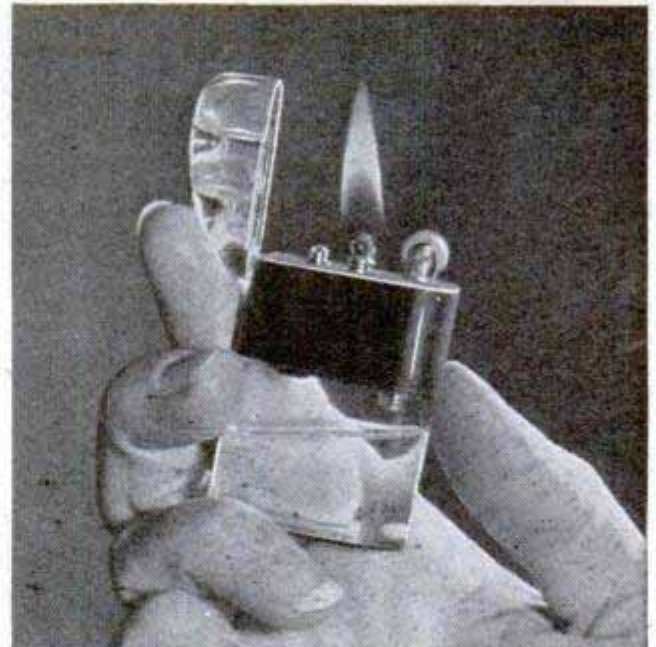
Left, electromagnet holds pliers at right angle. The magnet, made of baling and doorbell wire, has 10 pounds' pull. Right, Jimmie tries to lick a current problem in automatic door opener he'll install in hen house





Vitalizer Keeps Battery Strong

Car batteries are kept at summertime operating conditions during cold weather by an electric vitalizer that supplies a slight current to the battery through the ignition system. This current, drawn from any 110-volt household outlet, maintains chemical activity in the battery so that its starting power is at summertime levels. A handy plug connects the device to the cigarette-lighter socket on the dash.



Plastic Base of Cigarette Lighter Lets You See When Fluid is Low

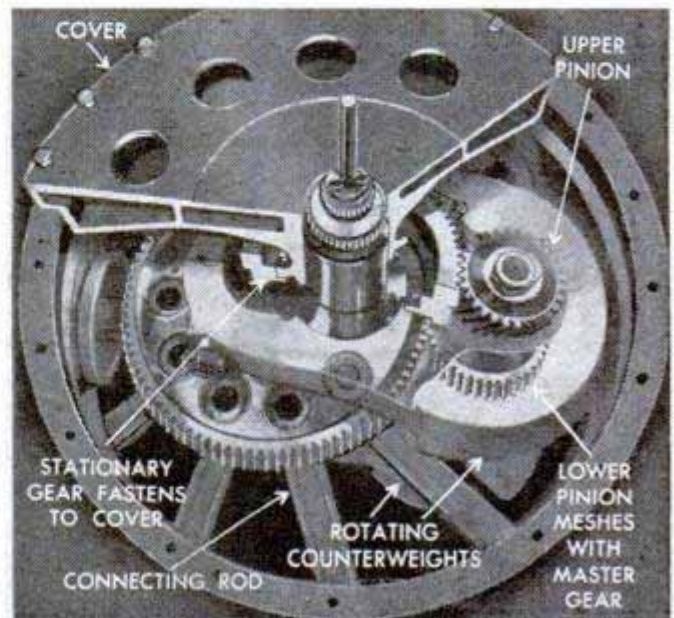
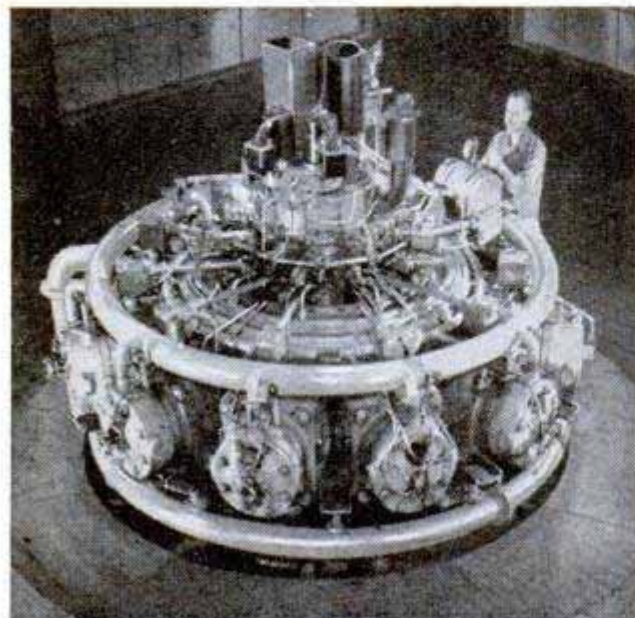
Your cigarette lighter won't run dry unexpectedly if it has a transparent fuel reservoir, enabling you to see when it needs refilling. The fluid is transferred from the reservoir to the wick chamber by means of a small valve near the spark wheel. Because the reservoir is sealed, the fluid cannot evaporate. The lighters come in four different colors.

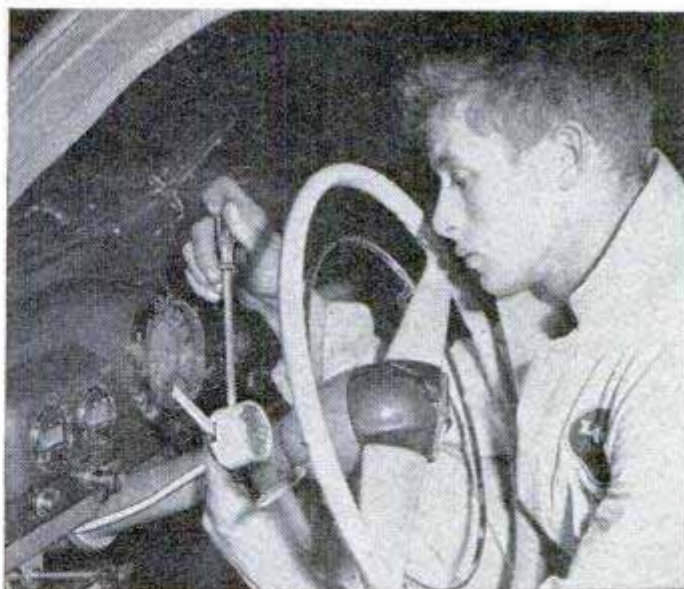
Radial Diesel Engine Develops 1800 Horsepower

Developing 1800 horsepower, a radial diesel engine provides a heavy-duty power supply in a compact design that requires minimum headroom for servicing. The engine is a two-cycle type with 11 cylinders of 14-inch bore. Unit weight per horsepower is only about 39 pounds. Connecting

rods are attached to the crankpin in an unusual manner, which causes the pinions to "walk" around the master gear. Counterweights and a balanced design reduce vibration to a minimum. The engine can be used as a spark-fired engine when special cylinder heads are installed.

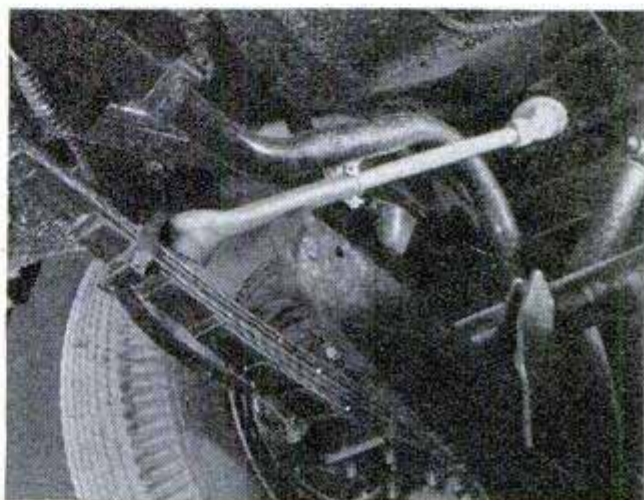
Left, over-all view of the radial diesel shows its compactness. Right, cutaway of the master-gear assembly





Dash-Controlled Car Sander Prevents Skids on Icy Roads

Winter driving is made safer by an automobile road sander that spreads a specially prepared grit in front of the rear wheels to provide traction on the slickest ice. A convenient switch on the steering column operates two solenoid valves, releasing the grit from hoppers permanently mounted in the rear trunk. Discharge tubes equipped with slushproof nozzles spread the grit directly in front of the wheels. Installation is easy. Only two holes have to be drilled in the trunk floor. The grit, which gives twice as much traction as sand, is sold in large cartridges that fit into the collar of the hoppers, thus eliminating the necessity of handling the material.



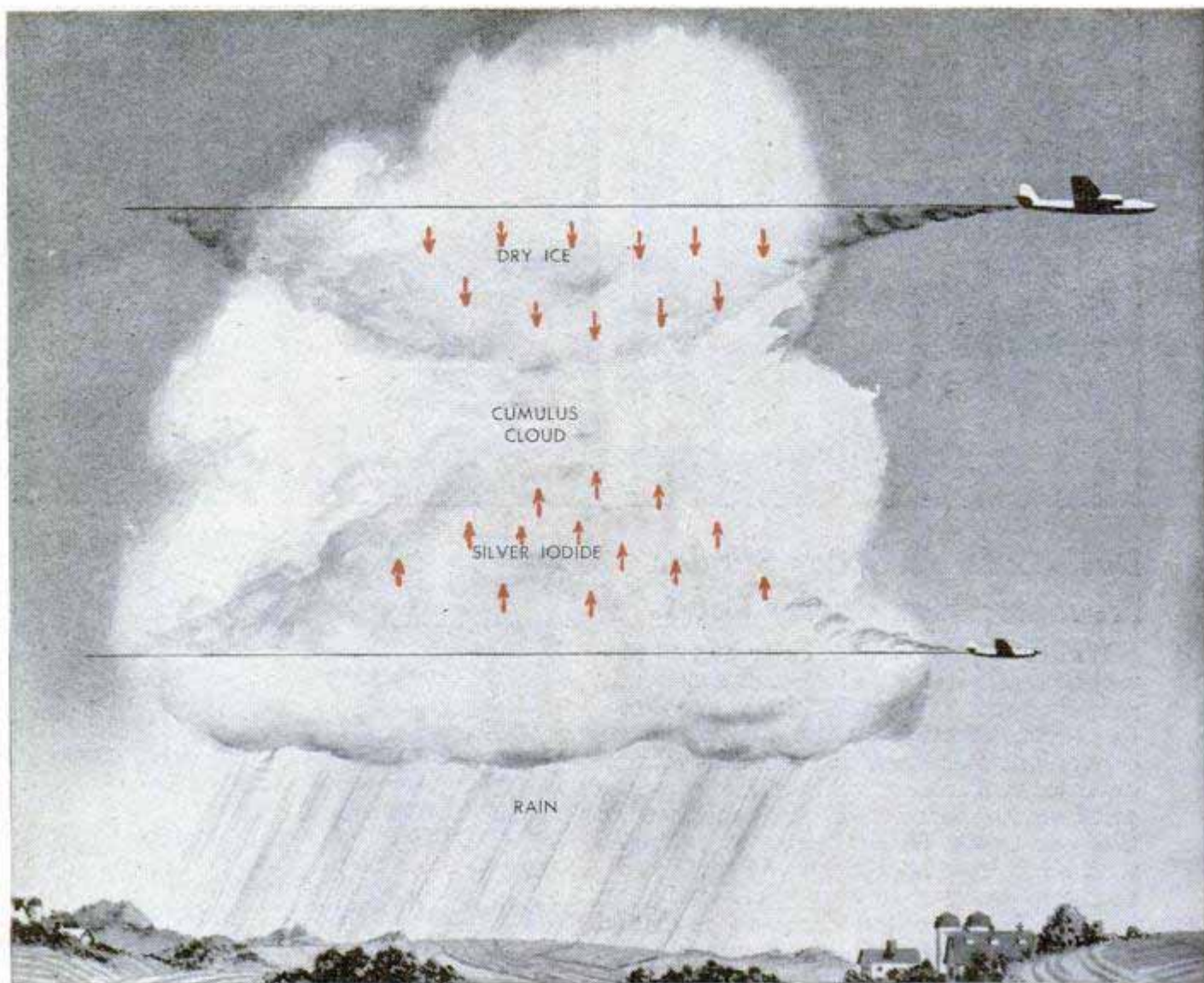
Mounted in the trunk, the two hoppers release grit in front of the rear wheels to stop skidding, top, left. Switch on steering column, top, controls flow of grit. Below, close-up of one of the discharge tubes



Road Lamp Flashes Warning

With a new trouble lamp, stalled motorists and truck drivers are assured of both a warning light and a beam to help them in making repairs. The red warning light is in the top of the lamp and the trouble light in the side. A switch permits five different combinations of the red flasher and trouble light. The lamp has a swivel base which can be adjusted to focus the trouble light. A 14-foot cord clips to the ammeter of any car or truck.

☐ Airline travel last year was twice as safe as in 1947, according to a Civil Aeronautics Administration report listing 109 fatalities in six accidents during 1948 compared with 219 deaths in eight accidents the year previous.



In double-seeding method, one plane dumps Dry Ice from above while another sends up silver iodide from below

Want to Buy Some Rain?

By Irving P. Krick

American Institute of Aerological Research

as told to

Thomas E. Stimson, Jr.



DR. KRICK, president of the American Institute of Aerological Research, for 17 years was head of the meteorology department of California Institute of Technology. Among other duties during the war he served as Chief of the Weather Information Section of the U. S. Strategic Air Forces. At present he operates a meteorological consulting service for clients throughout the United States

ARE MODERN rain-making techniques any good?

No! The Air Force and the Weather Bureau speak. The two agencies declare that they got negative results in numerous attempts to stimulate rainfall over an 8 by 20-mile test area in Ohio last year.

Yes! This is the equally positive answer by a number of other investigators.

The latest and perhaps most authoritative confirmation is supplied by a project conducted under the auspices of the Arizona Weather Research Foundation. The results indicate that during one month last summer, cloud-seeding operations over the Salt River, Verde River and Tonto Creek watersheds placed 12,000 acre-feet of water in storage in excess of the amount that would have been produced naturally by existing atmospheric conditions.

The difference between the Ohio and the

Arizona experiments seems to be that the Air Force-Weather Bureau effort was a study in which virtually every cloud that passed over the test area was seeded even though the clouds may not have been in the necessary physical state to yield moisture, while in Arizona only those situations were utilized in which it was thought more rain could be produced than would occur naturally.

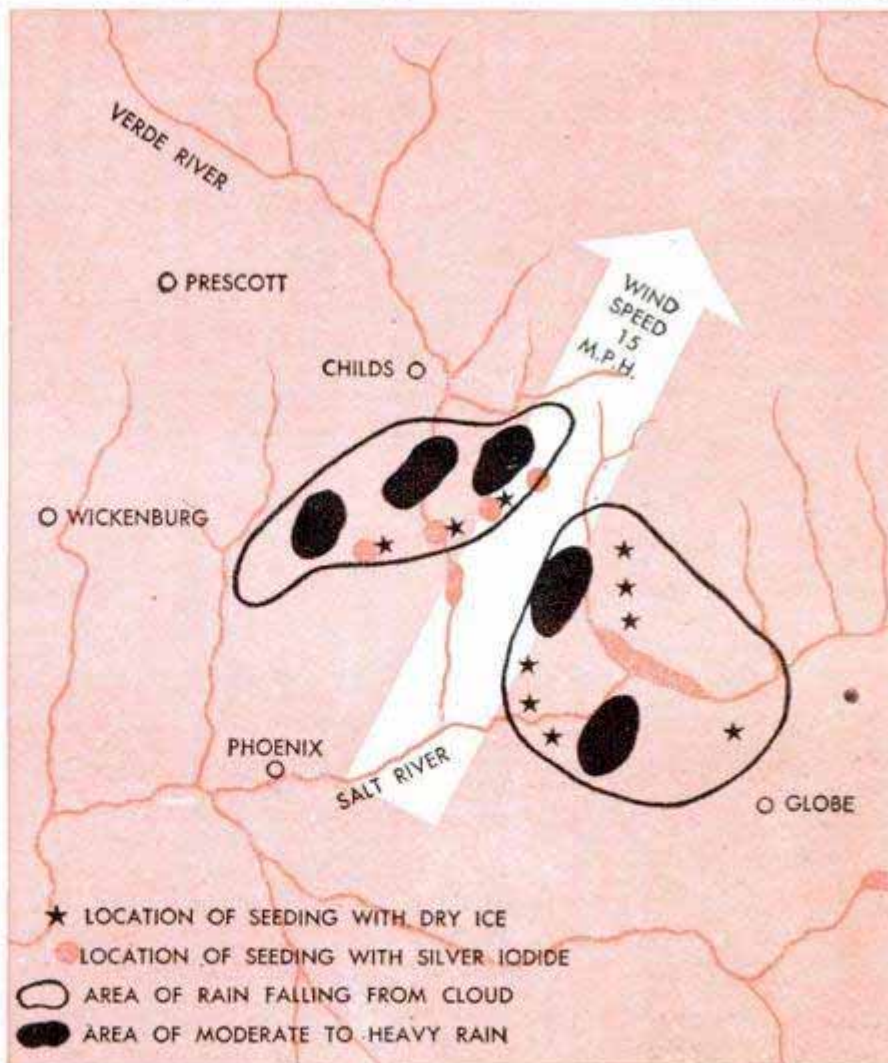
Too, it is believed that the Ohio test area was chosen arbitrarily because of a pre-existent rain-gauge network on the ground, without determining beforehand whether the region was suitable for the experiment. Finally, the test area was too small for measuring the rainfall from clouds that passed down-wind from the seeded sector.

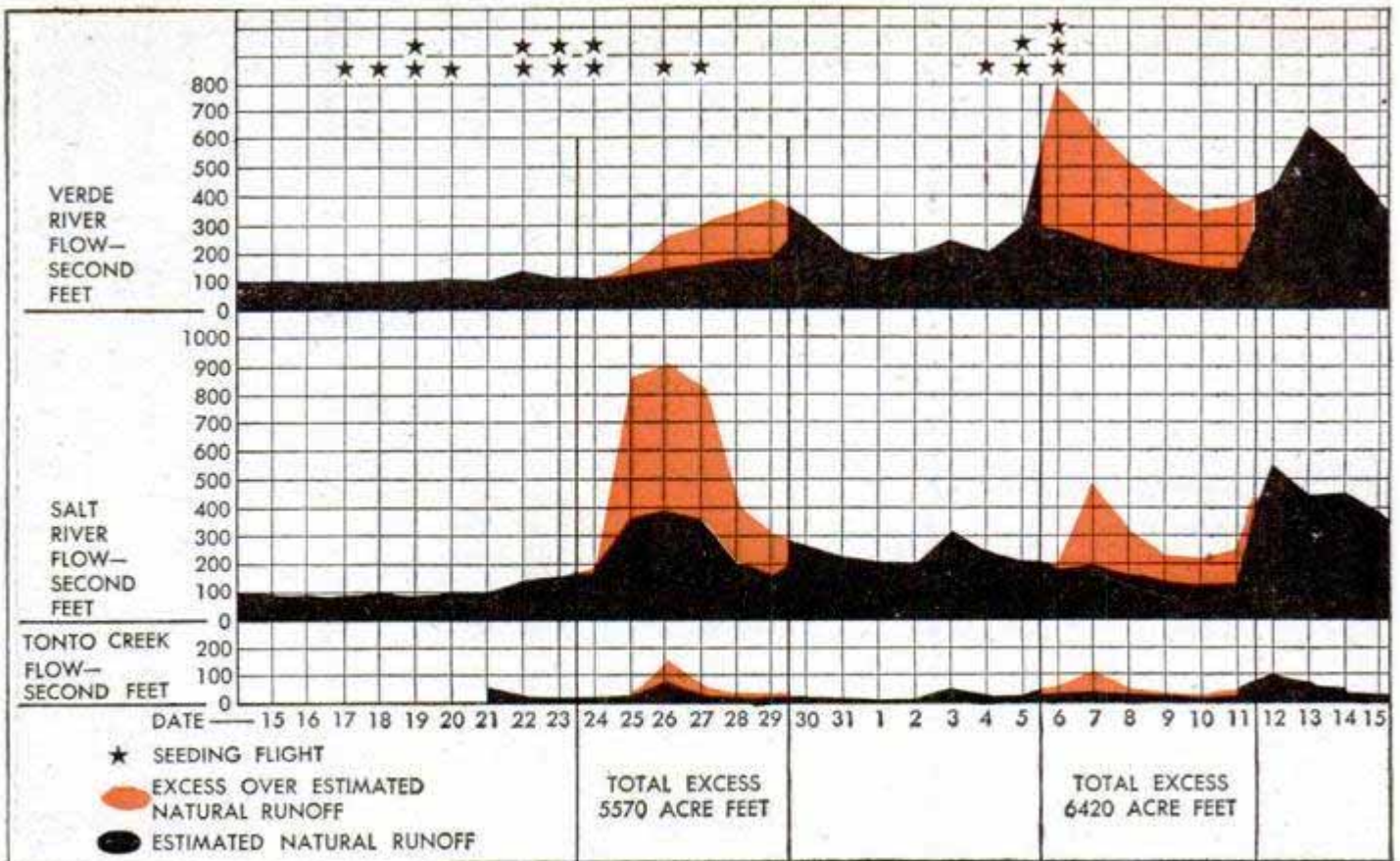
In spite of the pessimistic Ohio report and the uncertain results of amateur rain makers, the body of scientific evidence indicates that properly equipped and directed campaigns to increase rainfall can be economically successful in suitable areas. Fortunately, the areas most suited for the work seem to be the semiarid regions of the earth. Agriculture in those regions suffers unduly in periods of less-than-normal rainfall, a condition that may now be prevented or ameliorated.

The present understanding of how rainfall most often occurs is based on the Bergeron-Findeisen ice-crystal theory of precipitation. Generally speaking, clouds are formed when a mass of moist air is driven upward to an altitude at which temperatures below freezing exist. This



Inside this funnel-shaped chamber, twine impregnated with silver iodide is burned to send out clouds of particles that can grow into snowflakes. Below, a map of the seeded area shows how the location of intense rainfall corresponds to the up-wind location of seeding operations





Red areas on graph show the estimated runoff produced by rain-making flights. Each star denotes a flight

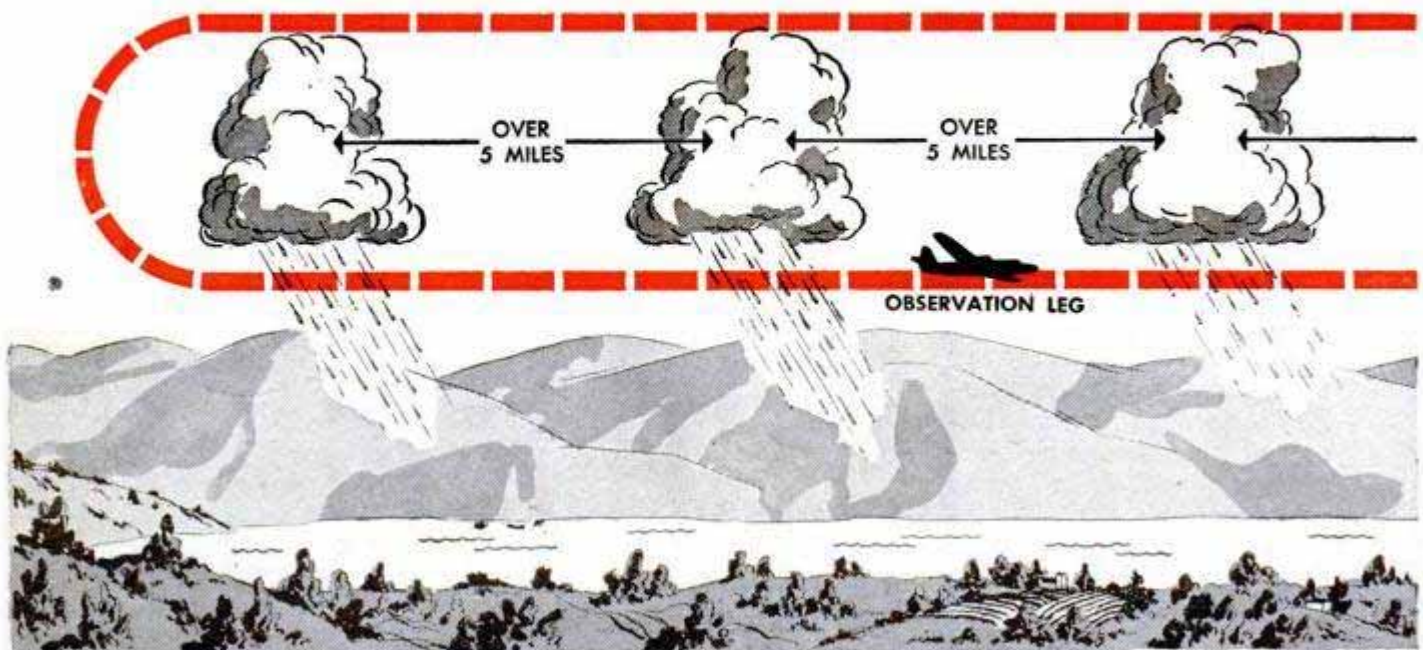
can happen when a steady wind blows the air up the side of a mountain or up a sloping boundary surface between two dissimilar air currents in a storm area, or when the lower layers of an air mass become heated to such an extent that they are forced upward by adjacent cool-air bodies. These conditions cool the rising air and condensation takes place, creating a cloud.

When the temperature in the upper part of the cloud drops below freezing, some of the cloud droplets are changed to ice crys-

tals. Other droplets quickly freeze on these nuclei, which then grow to snowflake size and descend, turning into raindrops below the freezing level.

Modern attempts to bring on this condition artificially are based on experiments by General Electric investigators who produced miniature snowstorms in the laboratory by using Dry-Ice pellets to cool artificial clouds to temperatures at which ice crystals form spontaneously.

Later, the experimenters were able to





U. S. Air Force photo

Compartment behind pilot contains apparatus for dispensing clouds of silver-iodide particles. Above, right, Air Force poured Dry Ice from B-17 in Ohio experiments. Below, right, four switches operate silver-iodide dispenser

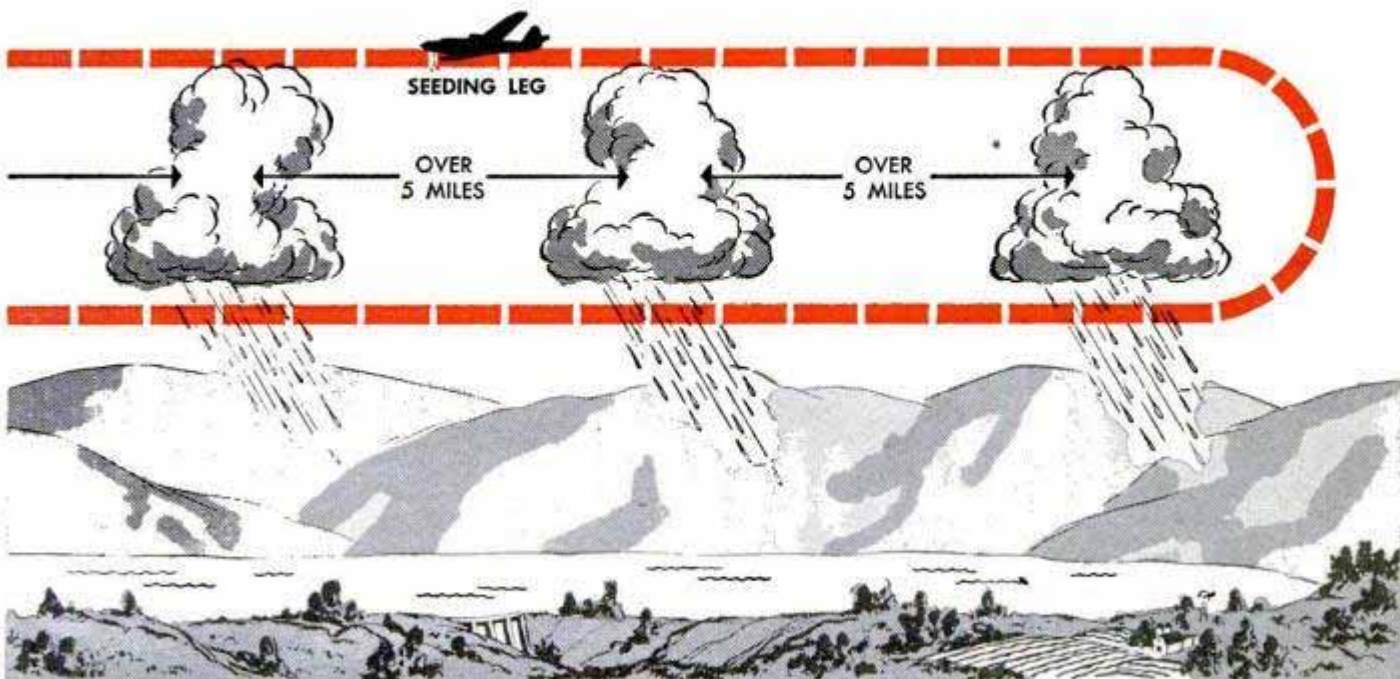
induce cloud droplets to coalesce into raindrops by introducing silver-iodide smoke into the cloud. Silver-iodide particles have a crystalline structure similar to that of ice crystals, and attract moisture. Additional experiments have tested the effectiveness of other condensation nuclei such as sprays of water, dusts and volcanic ash.

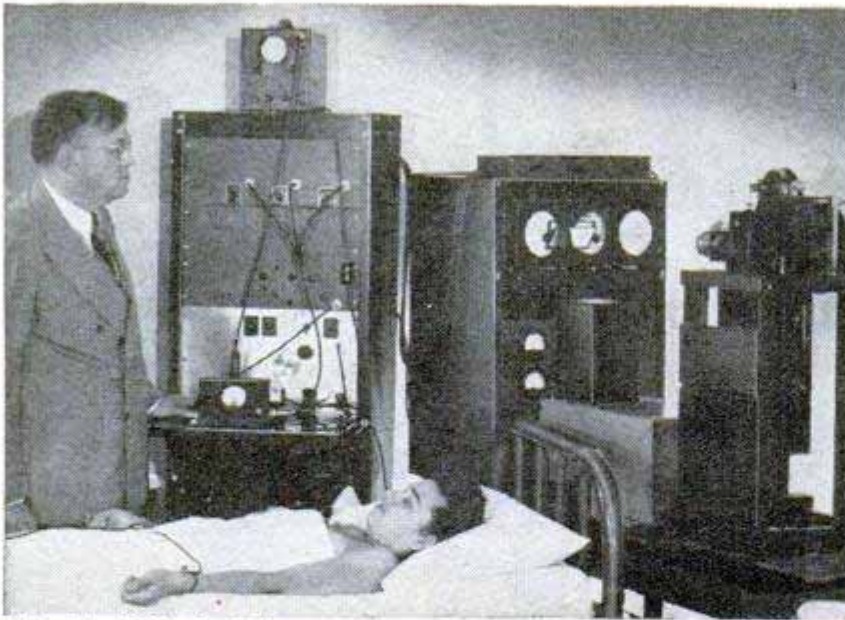
In transferring these techniques to Nature, it has been customary to seed clouds from above with Dry-Ice pellets or to release silver-iodide smoke into the clouds.

(Continued to page 266)



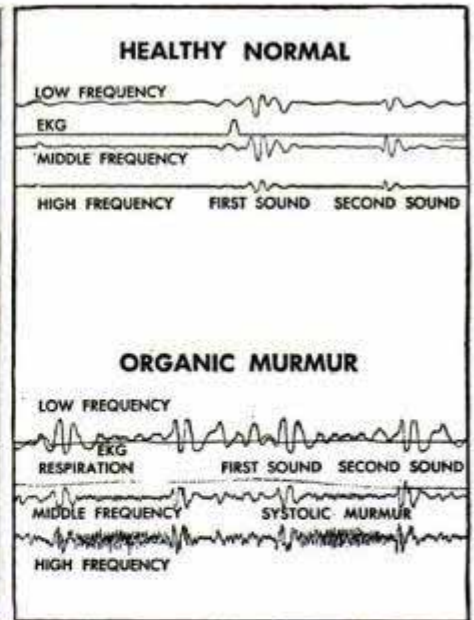
Plane seeds a line of thunderheads, then makes an observation run beneath clouds to determine results





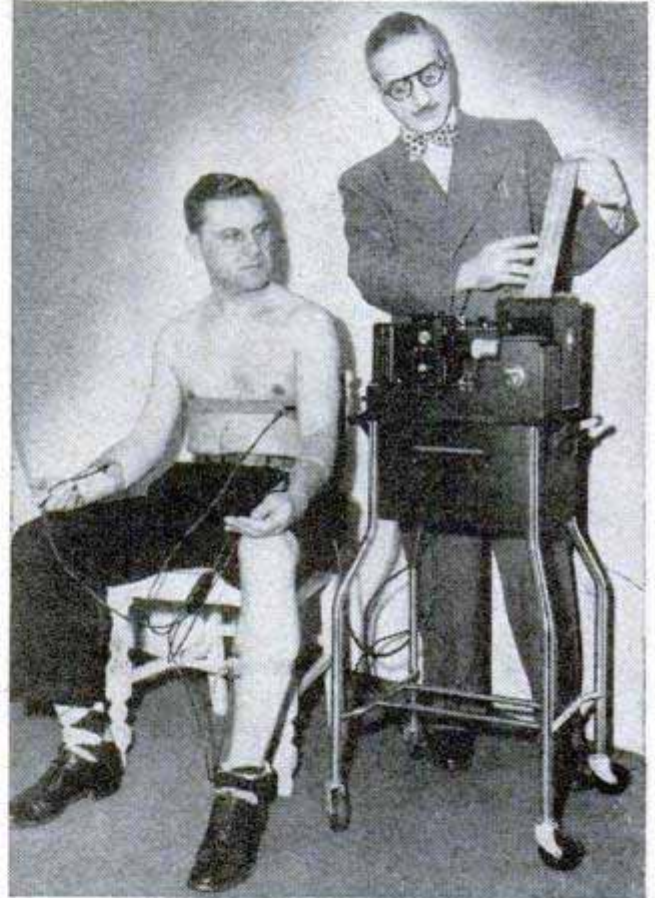
University of Nebraska photo

↑ Instrument picks up even the faintest sounds of human heart and records them on film. Above, right, film strips show differences between healthy heart and one with organic murmur. Right, camera photographs and prints electrocardiograph in four seconds



Cameras to Fight Heart Disease

Two cameras developed recently are expected to aid man's fight against heart disease. One records visibly the sounds made by the human heart—sounds that are too faint for a doctor's ear to detect. In using the instrument the doctor places a small microphone over the patient's heart. Sounds picked up by the microphone are amplified and then turned into light beams by cathode-ray tubes. A moving film records the track of the beams, producing a picture of the sound pattern of the patient's heart. The other camera is connected with an electrocardiograph and photographs the rise and fall in the electrical heart current. The action is recorded on film which is exposed, developed, fixed, washed and dried in four seconds, producing an immediate record for the patient's heart action.

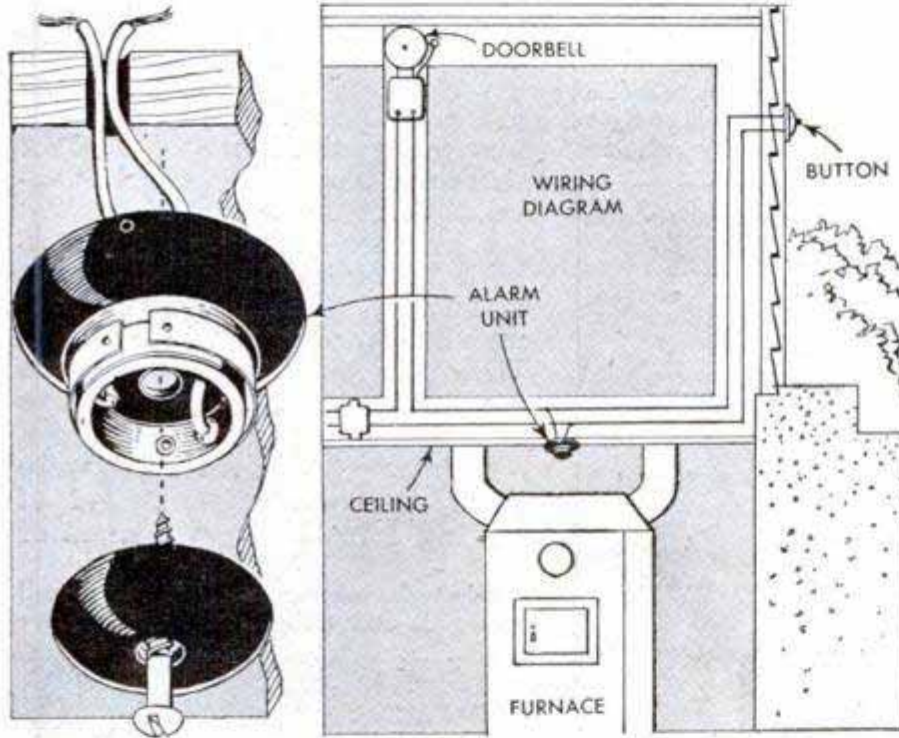
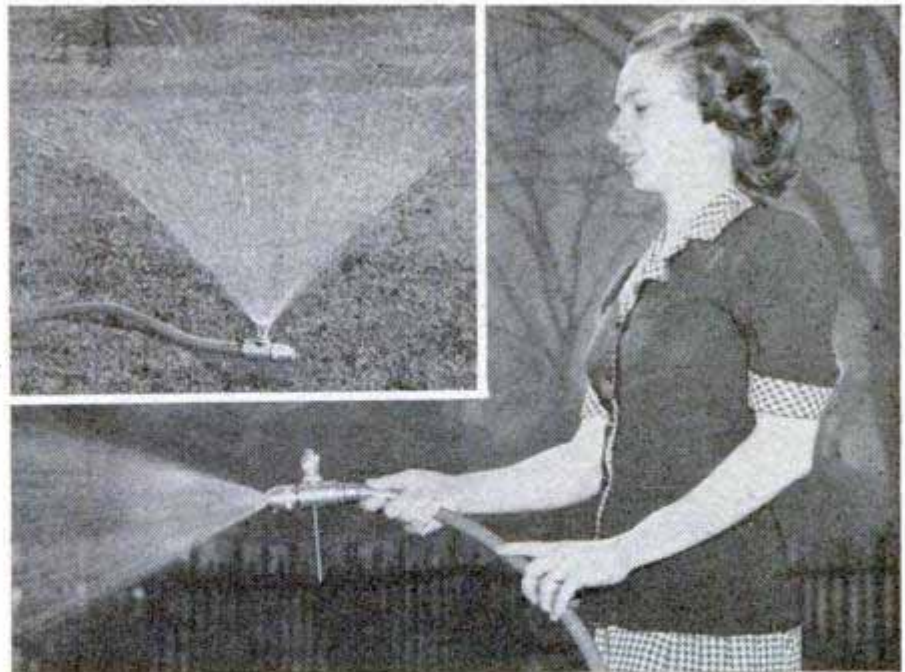


Aluminum Car

Constructed largely of aluminum, a new French car, the Gregoire, travels more than 100 miles an hour. The front-wheel-drive auto is powered by an 11-horsepower engine and travels 23 to 25 miles per gallon of gas. Each wheel, with tire, weighs only nine pounds. The car was shown recently as a feature of the Paris Automobile Exposition.

Sprinkler-Sprayer

By changing a control valve the homeowner can convert a new lawn sprayer into a sprinkler for hand use. For automatically soaking the lawn he pushes a spike, which supports the sprinkler, into the earth. When he wants to spray by hand, he moves the control valve and a fine spray shoots out the forward end of the sprinkler. The spray field is adjustable from 5 to 40 feet in radius. The sprayer is aluminum except for the brass fittings and the steel stake.



Doorbell Thermostat Makes Fire Alarm

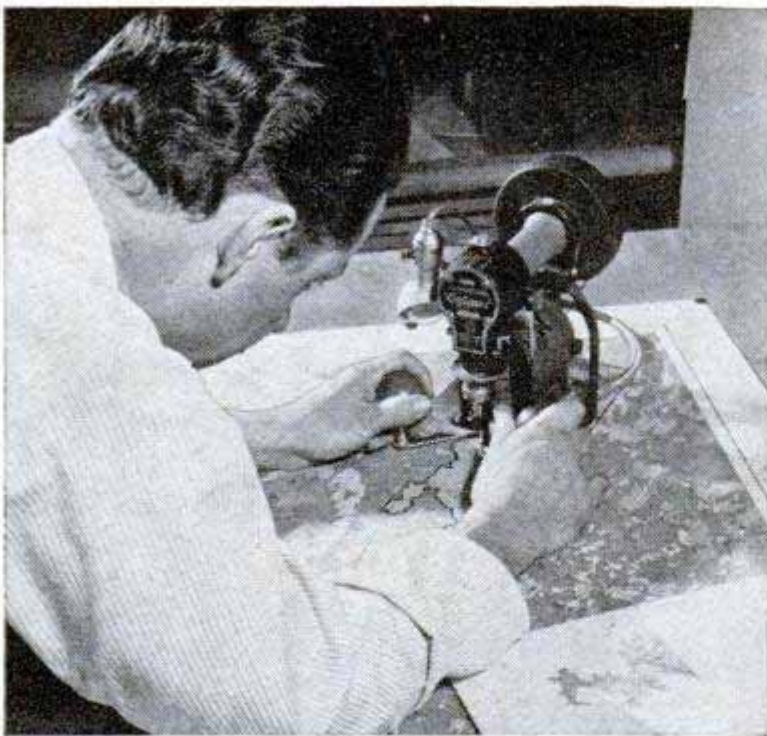
When a small thermostat is connected on the same circuit with a doorbell, the latter serves as a fire alarm. The thermostat is fastened above the furnace, near a water heater or in any other area where there is danger of fire. If the temperature rises above 140 degrees, contact is made within the thermostat to sound the bell. Several thermostats can be connected in circuit with the same bell. The thermostat can be tested by holding a match near the unit or by pressing a contact.

Window Folds as Top Lowers

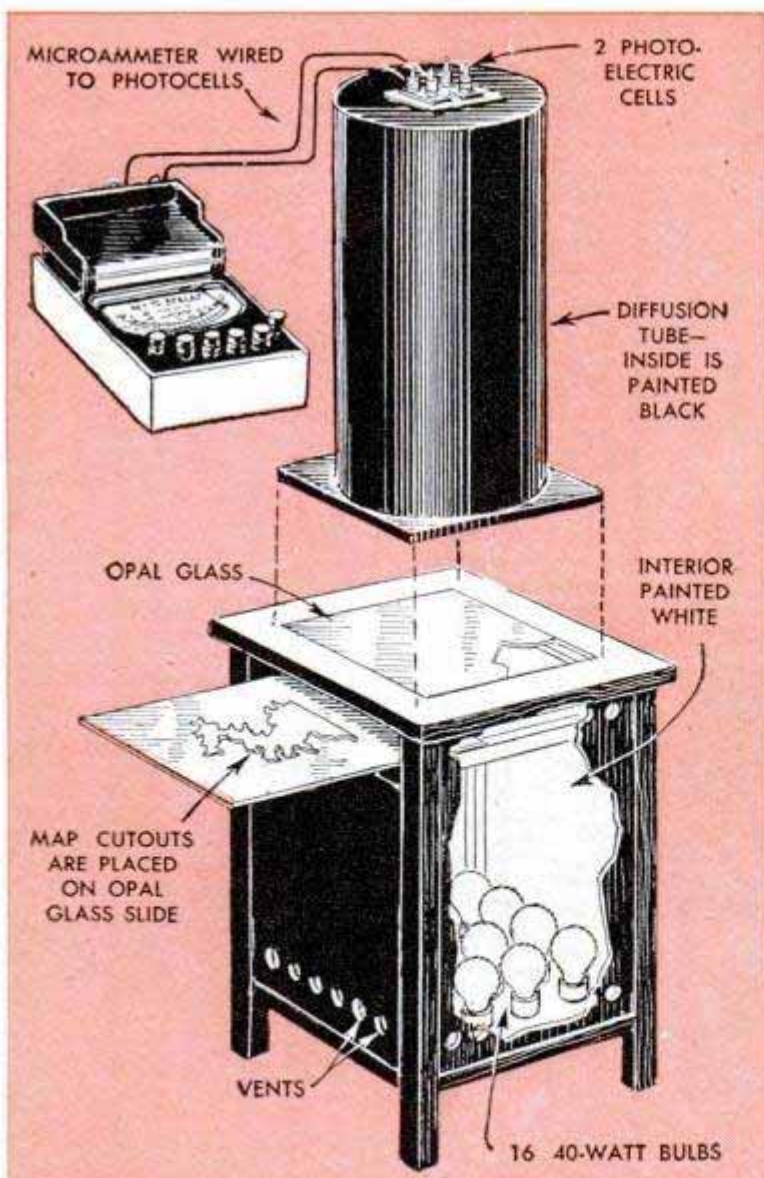
Folding glass permits the use of a full-size rear window on convertible automobile tops. The glass, formed of a special plate glass-plastic sandwich, folds in the center like an accordion on a narrow plastic joint when the top is lowered. It is used on the new Hudson.

☐ Pine pitch, used in the production of turpentine, rosin and other naval stores, is now being extracted from stumps of the western yellow pine, thus providing a valuable use for millions of these stumps available in the Northwest.





Above, Canadian forestry worker cuts out the portions of the map to be measured by the photoelectric planimeter. Below, an exploded drawing of the planimeter shows the bank of lights, the opal glass slide, the two photocells and the microammeter



Photocells Take

LIKE ANY good businessman, a country has to take inventory of its resources. When these resources include millions of acres of trees, the problem of inventory is tremendous.

Forest survey maps, scaled one inch to the mile, are marked to show patches of hardwoods and softwoods, with an additional breakdown according to height, density and commercial value. Computing the acreage of each of these categories by usual methods involves hours of computation.

In the Dominion Forest Service of the Canadian Government, skilled map-measurers formerly spent hours hunched over the huge maps, measuring and computing the tree inventory.

But today, thanks to an ingenious machine called a photoelectric planimeter, the time required for this work has been cut by 75 percent. Until the new machine was put into use, technicians spent 23 hours computing the timber stands in an area of 135,000 acres on a map scaled one inch to the mile. With the planimeter, the same measurements are made in five hours—a saving of 18 hours.

Formerly, two methods were used. One method consisted of placing over the map a sheet of

Ready to be measured, a cutout is placed on a slide and pushed into the planimeter



"Census" of Trees

Cellophane covered with evenly spaced dots. Each dot represented one acre and by tediously counting the number of dots enclosed by the forested area the technician computed the approximate acreage. The second method, more accurate than the first, required a polar planimeter. By tracing the outline of each area with a stylus on the arm of the device, the map-measurer arrived at the number of acres enclosed by the outline. Because of the mathematical work involved in this method, serious errors often resulted.

There's no tedious computation with the photoelectric planimeter which is accurate to plus or minus one percent.

The new instrument measures the area of any opaque material placed on its glass slide simply by measuring the amount of light intercepted by the material. Two photoelectric cells are mounted on top of the planimeter and are wired to a sensitive microammeter. When any opaque material is placed between the lights and the photo-cells, some light is prevented from hitting the cells and the dial reading decreases proportionate to the size of the material.

The technicians paste the map on a sheet of cardboard and cut out the forested areas just as you would cut out a jigsaw puzzle. The irregular-shaped cutouts are placed on the opal glass slide and pushed into the machine. By reading the microammeter dial, the technician determines accurately and instantaneously the number of acres in the map section being measured.

Measuring forest areas on a map this size takes 23 hours when this polar-planimeter technique is used



Atom-Smasher in Can Detects Neutrons

Because neutrons are neutral and carry no electrical charge they cannot be detected directly by electrical means, but a neutron counter has been invented that is actually a miniature atom-smasher and it fits inside an ordinary tin can. Developed at Westinghouse, the counter consists of an electronic tube coated with a mixture containing a very small amount of uranium 235, the atomic-bomb ingredient. When neutrons strike this coating, uranium atoms are split, throwing off atomic fragments which are detected electrically. The tin can is lined with a two-inch wall of paraffin to slow down the speeding neutrons before they strike the electronic tube.

Five Times the Speed of Sound Is New Wind-Tunnel Record

Air speeds more than five times the speed of sound have been achieved in the captured and modernized German supersonic wind tunnels at the Naval Ordnance Laboratory, White Oak, Md. The new record is designated Mach number 5.18, or 5.18 times the speed of sound. The high speed was obtained at -377 degrees Fahrenheit and is the equivalent of a speed of 3960 miles an hour under normal temperatures at sea level. The record was attained in a 16-inch-square working section of the tunnels, captured by American forces at the conclusion of World War II. The high speeds are used to test air flow over projectiles fired from supersonic aircraft, or at such aircraft.





Small Cars For Britons

Morris Oxford (top) carries six passengers; below, smaller Morris Minor



AMERICAN designers of small cars are casting a sharp eye across the Atlantic at the new products turned out by veteran British builders of midget cars. The postwar British midgets, especially the popular Morris cars built at Oxford, stress increased visibility, a lower center of gravity and at the same time a high road clearance, definite curves in their designs and—surprise—rear fenders.

These midgets with British accents have the solid look of their big automotive brothers and the engineers have striven for big-car comfort and handling. All changes, however, were dictated by economy of maintenance and operation. With cruising speeds of about 50 miles per hour, the Morris Oxford sedan will travel 25 miles on a U. S. gallon of gasoline and the



This four-cylinder Morris Minor convertible carries four persons and travels 40 miles on a gallon of gas

smaller Morris Minor about 40 miles. The Morris has a quiet-running four-cylinder side-valve engine.

The British midgets are presented as "quality" cars with luxurious interior trimming in English leather. The bodies are sprayed with sound-insulating material, are rustproofed and the paint jobs are in varied colors. Gone is the separate chassis; the new Morris cars feature all-steel mono-construction of body shell. Gone, too, is the conventional front suspension. Torsion bars give efficient suspension at the least expenditure of weight and steel, according to the Nuffield Organization, builders of the Morris and known as the "General Motors of England." Rear suspension remains faithful to long semielliptics hung on oilless rubber bushings.

Lockheed hydraulic brakes are featured on all four wheels with the latest type double-leading shoes in the front drums. A separate parking brake operates through a quick-action pistol-grip lever to the rear wheels only. The transmission consists of a conventional four-speed gearbox. Synchromesh engagement of the upper three gears is used and larger models have finger-tip gearshifts under the steering wheel.

Other departures from tradition on the

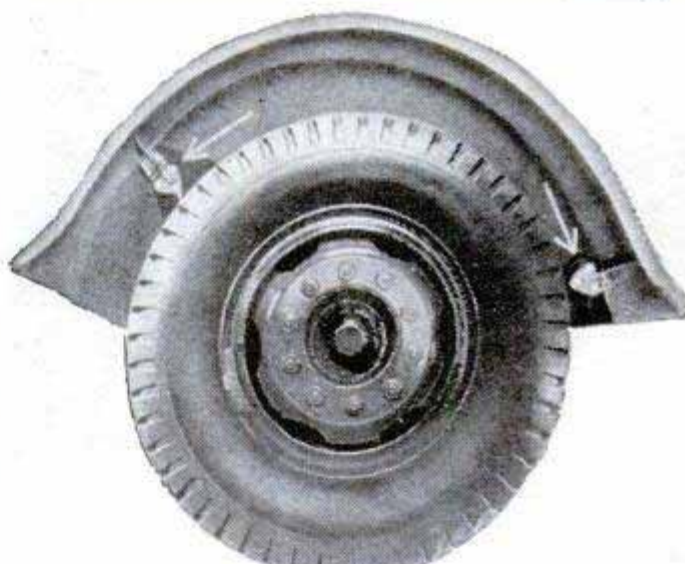
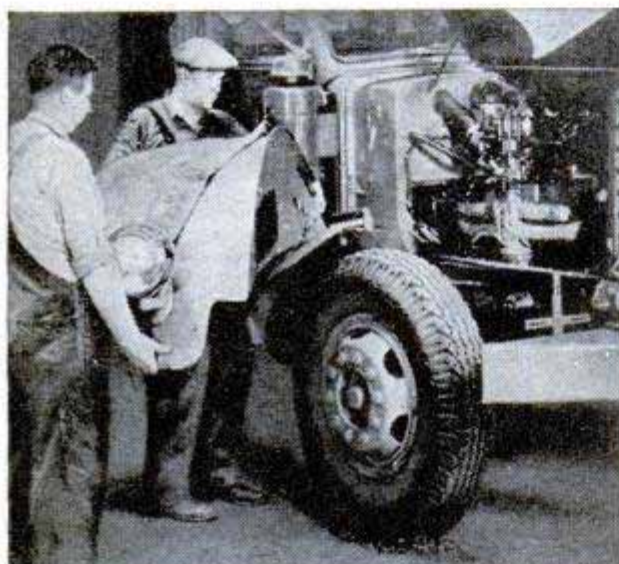
new midgets include movable front seats, easily adjusted for tall or short drivers, a new steering system utilizing an ingenious rack-and-pinion arrangement to give an easy action, and a drive which made it possible to reduce the height of the transmission tunnel through the floor of the car. Another feature, which makes the cars ride smoother, is the positioning of the rear seat in front of the rear axle instead of over it and moving the engine slightly forward.

The Morris midgets are built in two models, the "big" six-passenger Oxford sedan and the small Minor. The Oxford has a wheelbase of 97 inches and an overall length of 166 inches compared with 86 and 147½ for the Minor. The 62-inch-high Oxford is four inches taller than the Minor. Widths are 64½ inches for the Oxford and 60 for the Minor. Tire sizes: 5.25 by 15, Oxford; 5.00 by 14, Minor. The latter is built as a sedan or convertible.

So-called luxury appointments are grouped instruments, easily read at night by soft-glow lighting, built-in defrosting and heating ducts under the instrument panel, pull-out ash trays, roomy glove compartment, alligator-style hood with a locking control on the dash, and a reasonably large luggage trunk at the rear.

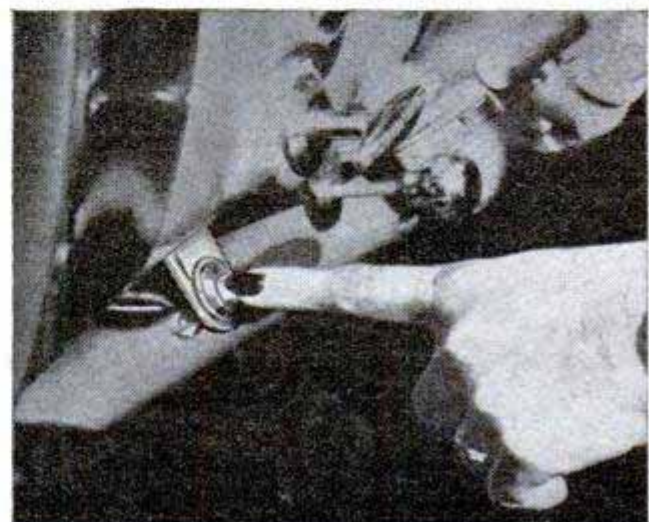
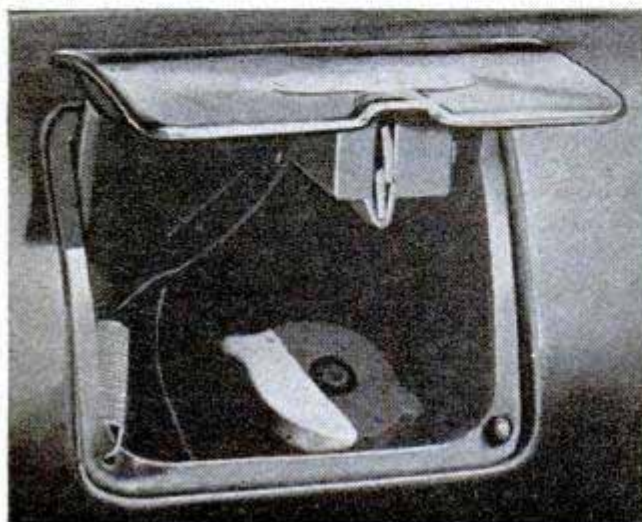


DESK OR CHILD'S PLAYPEN, you can have your choice with a wide platform that fits in the back seat of a sedan or club coupe. Supported by two hangers that hook over the front seat, it can be raised or lowered. It can also be made wide enough to fill the complete width or narrow enough to leave room for a passenger



REMOVABLE TRUCK FENDER makes mechanics happy by uncovering the engine for easy accessibility during repairs. After disconnecting headlight wires at a junction box, the mechanic loosens the fender by removing three bolts at front, three at rear (see arrows). The fender assembly is then lifted off, exposing the engine

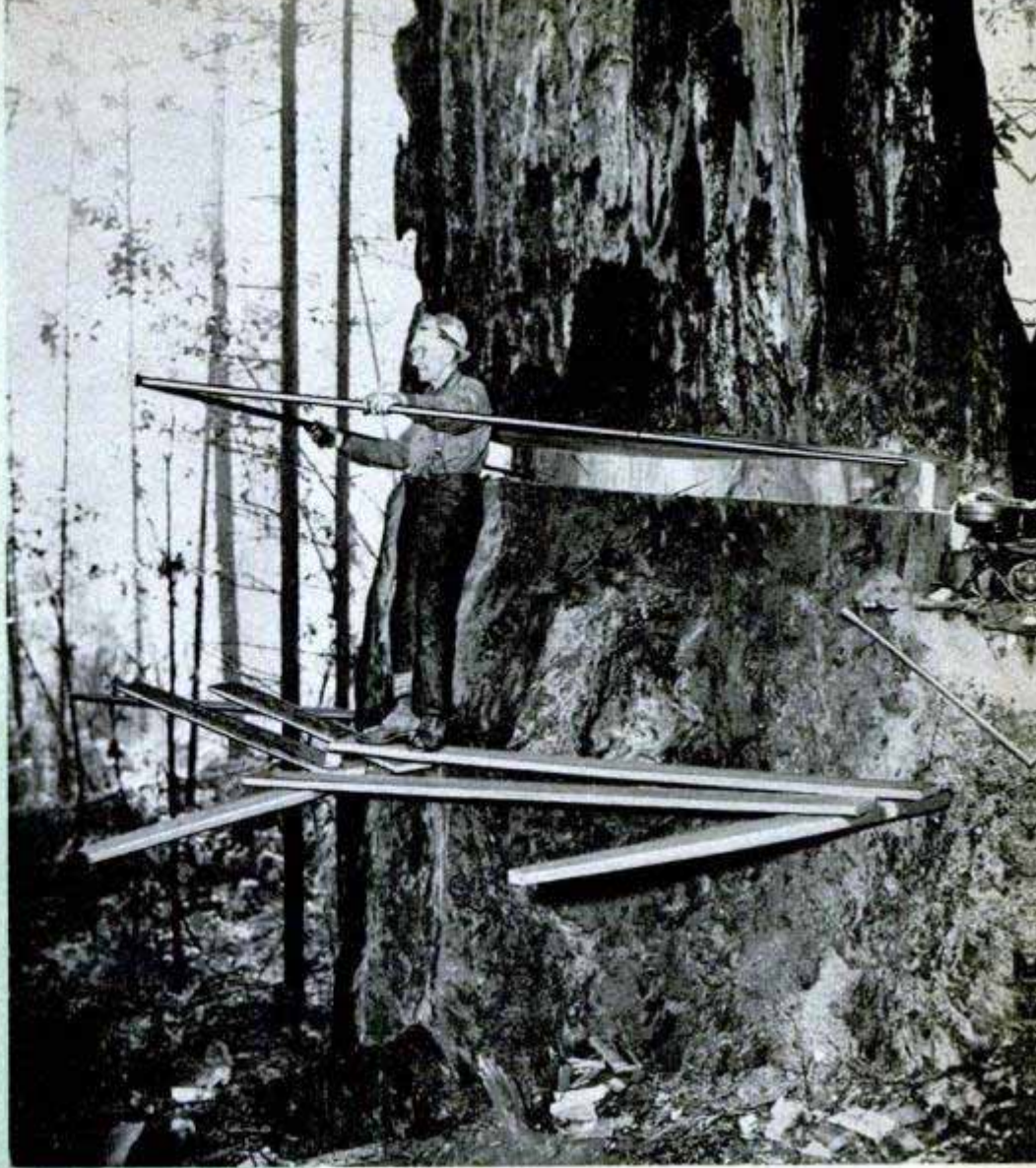
GASOLINE-TANK LOCK for cars having a hinged fender door is controlled by a button on the dash. No key is needed to lock or unlock the door. You push the door shut and it is locked. When you need gasoline, you press the dash button and an electrical circuit unlocks the door, which springs open automatically



Our groves of redwoods aren't dying out, say the tree experts. These forest giants, some born more than 3000 years ago, are seeding new groves that will insure a ceaseless supply of valuable wood

Right, with the undercut completed, a lumberjack sights along his "gun sticks" to determine the direction the giant will fall after opposite side is sawed and wedged

Giant logs are moved easily by water. An artificial pond is maintained beside redwood sawmill



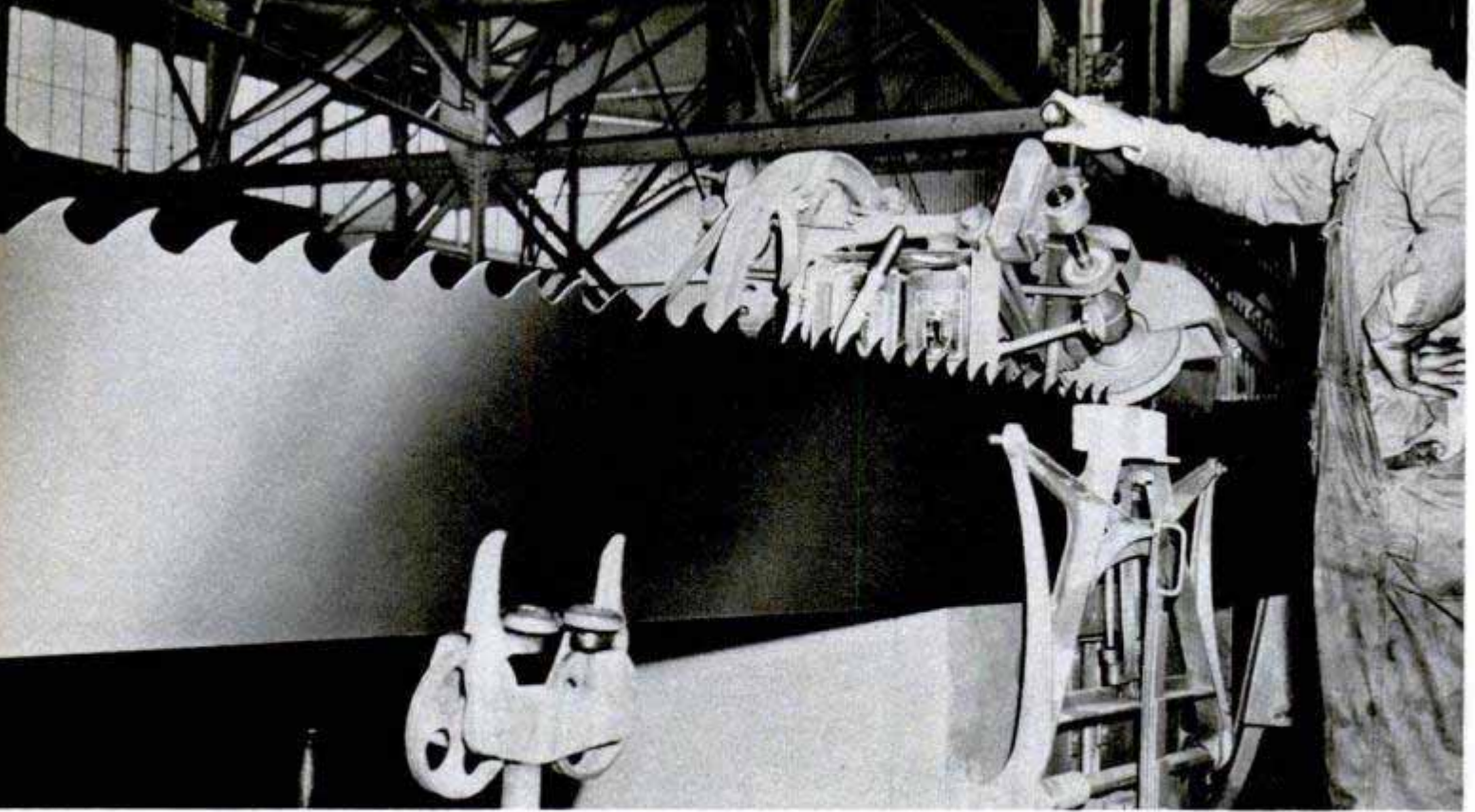
Prehistoric Crop



SOME OF California's redwood trees are so large that when one of them fell across a ravine it was used as an automobile bridge. Ranchers merely chopped a flat roadway along the trunk.

Many living redwoods have hollow bases, the result of forest fires, and it is not uncommon for a farmer to stable a horse in the woody cavern or use it for sheltering his wagon or truck. Such a room is called a "goosepen." Occasionally a woodsman boards up the entrance to a goosepen, fastens on a door and lives comfortably inside the tree.

The General Sherman tree is the largest living thing. Its base exceeds the width of many city streets. Its exact height is 272.4 feet, its diameter at the ground



Bandsaw blade is a ribbon of steel more than a foot wide. This automatic machine sharpens the huge teeth

36.5 feet. One of its branches is 140 feet long and has a diameter of almost seven feet, large enough to make an impressive tree all by itself.

Years ago one man working with an ax required 4½ months to fell a large redwood, then spent most of the balance of the year splitting the wood into 4 by 5-inch fence posts seven feet long. He got 7700 posts without touching the knotty upper portion of the trunk.

Today, two men with a power saw that is operated by an attached gasoline engine can fell an average large redwood in half a day. Saw blades are as long as 14 feet. One of the lumberjacks often has to chop into the far side of the tree to keep the saw blade free. Explosives are sometimes used to split open the fallen trunks.

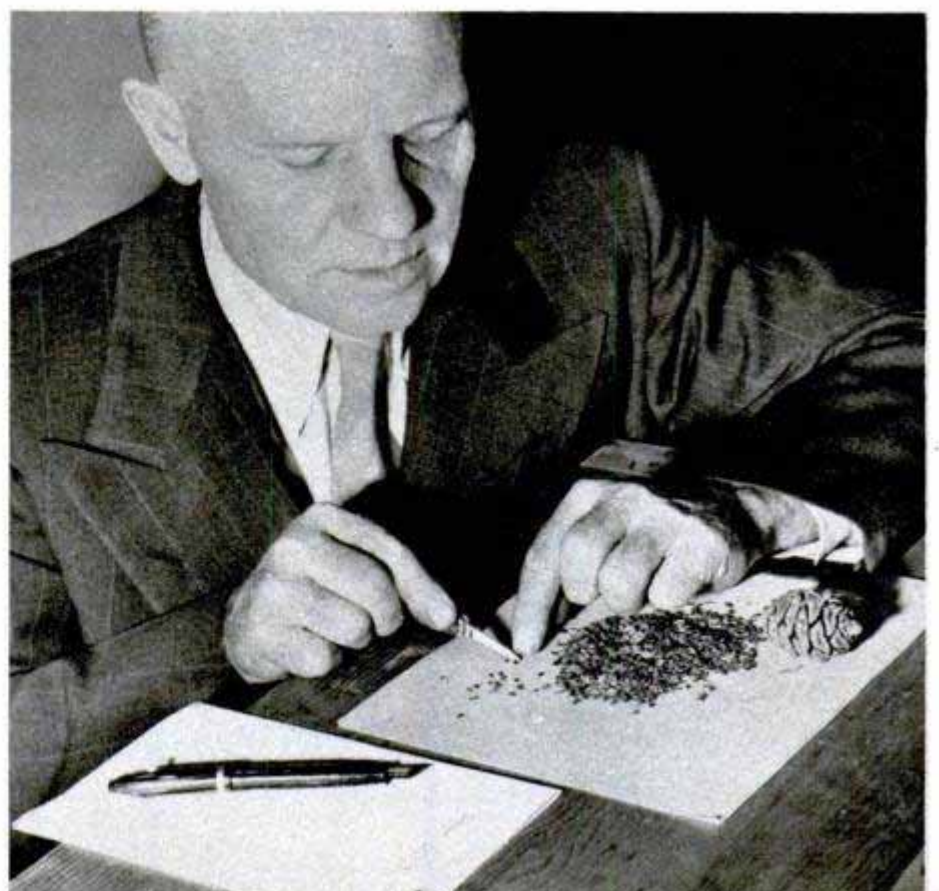
The General Sherman and some of its companions probably are close to 4000 years old, judging by counts of the annual rings of other big trees that are lying on the ground. No one knows the precise age of the General Sherman because no instrument built for coring into a tree is long enough to reach its center.

There are actually two types of California redwoods. The *Sequoia gigantea*, the

true "big tree," exists in scattered groves between the 4000 and 8000-foot levels on the west slope of the Sierra Nevada. Most of the groves now are inside Sequoia, Kings Canyon and Yosemite National Parks or are otherwise protected. Although cut extensively in the past, the *Sequoia gigantea's* soft, brittle wood was never of great commercial importance.

The so-called coast redwood, *Sequoia*

Seeds of the towering trees are about the size of a speck of sawdust. Here a sample is checked to discover the percentage of live seeds

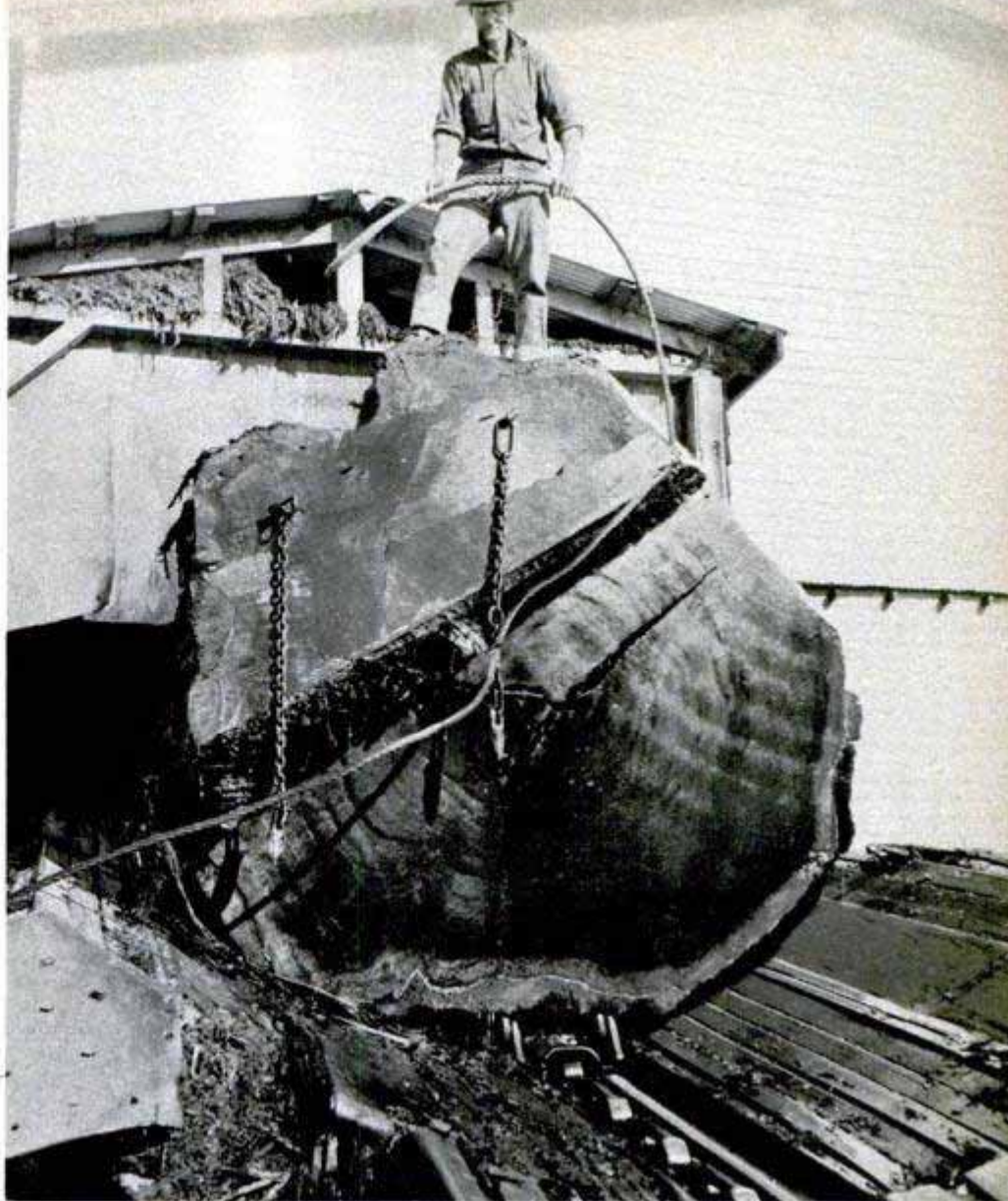


sempervirens, grows almost as large and frequently taller than its relative. Great forests of coast redwoods flourish in the fog belt that extends 30 miles wide from southern Oregon to south of San Francisco. Many of the best stands are preserved inside public parks. As commercial lumber, the coast redwood is extremely important. Its strong, dark, insect and rot-resistant wood is widely used as siding, framing, shingle and fence-post materials.

The general belief has been that the California redwoods are the dying survivors of an almost-extinct race, for fossils show that the genus *Sequoia* had almost worldwide distribution some 30 million years ago. It is understood now that the redwoods are hardy, flourishing species that probably will be with us forever. Both types have been planted extensively throughout the United States and abroad and it is almost safe to suggest that there are more healthy redwoods alive today than when the groves were discovered.

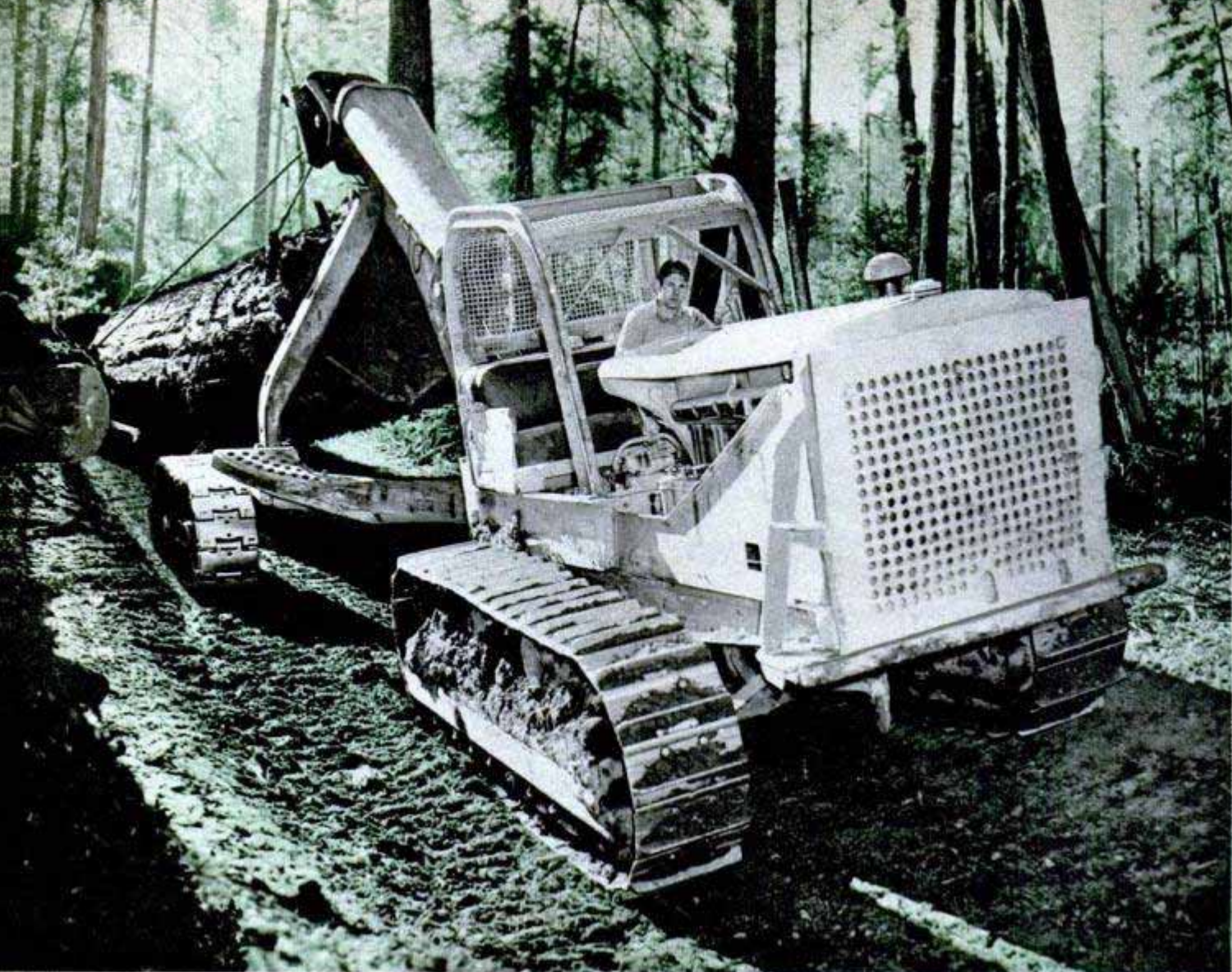
Fossil specimens of another *Sequoia*, the dawn redwood, have been found in many parts of the world and silviculturists have thought for a long time that the dawn redwood is one species that actually had become extinct. It is an interesting type because it is considered to be one of the ancestors of the coast redwood, though the number of their chromosomes differs widely.

Four years ago, however, a living dawn redwood tree was discovered in Szechuan Province, south of the Yangtze River in China, and since then several hundred specimens have been identified in the district. They are looked upon as true living fossils. The dawn redwood somewhat resembles a bald cypress and loses its leaves in the fall, unlike the other redwoods which are evergreens. Seeds of the dawn redwood



At the mill a giant log rides up a conveyor to a platform where the bark will be skinned off. Below, 3000 years from now this one-year-old seedling may still be alive. Under good conditions it will grow at a rate of two feet per year for a period of more than 70 years





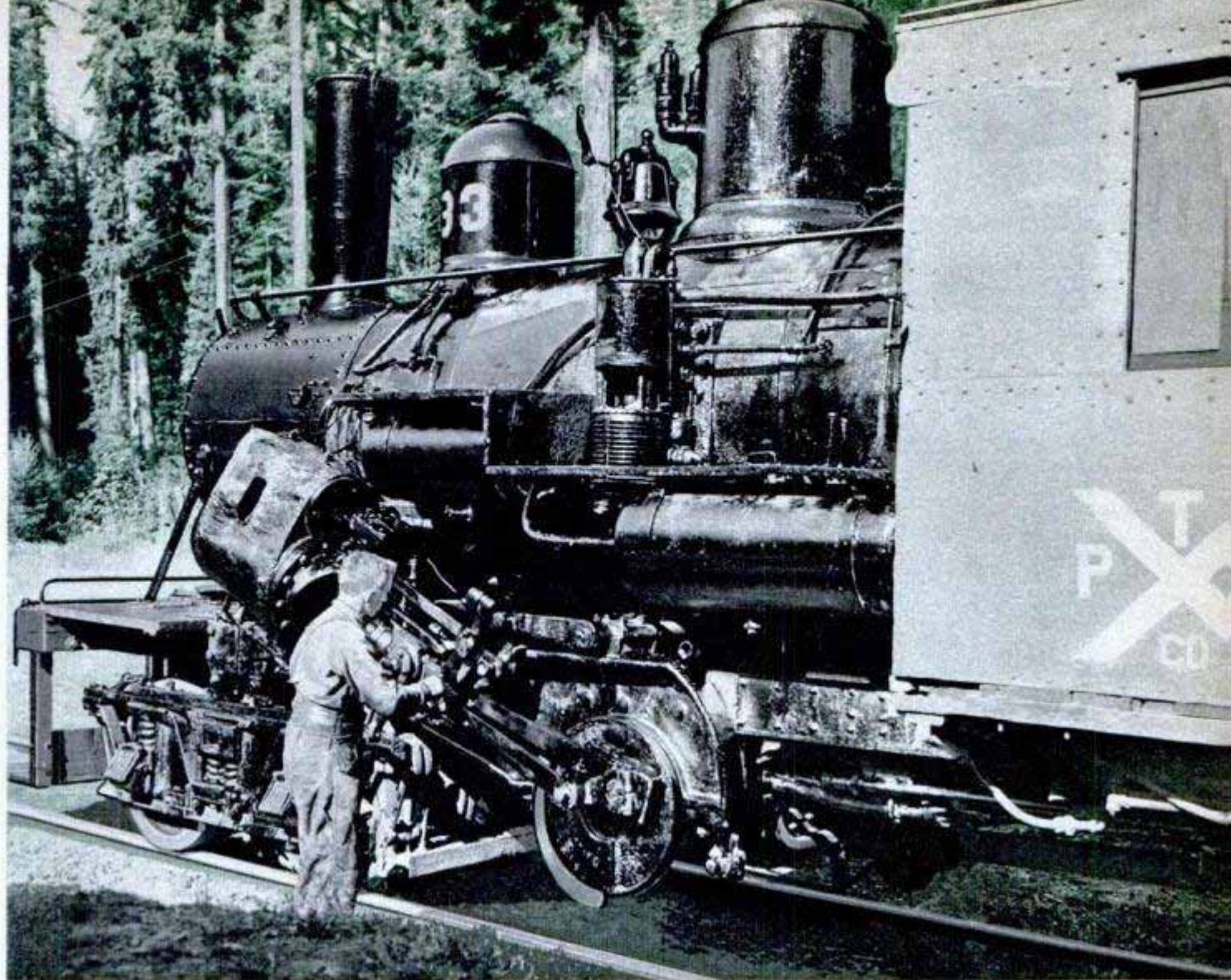
Hoist attachment for a tractor moves on its own tracks to pull redwood logs through the forest. Below, a two-year-old stands beside a redwood more than 2000 years old. Tunnel has not damaged trunk



are to be planted in California to determine whether the tree will grow there.

Much of what is known about the domestic redwoods has been learned from several experimental forest areas maintained by public and private agencies. For instance, at Whitaker Forest, adjacent to Sequoia National Park, Dr. Woodbridge Metcalf and members of the agricultural college of the University of California have made extensive studies of *Sequoia gigantea*. Whitaker Forest consists of 320 acres of densely timbered land that were deeded to the university in 1910 and have been used as a laboratory ever since. Many misconceptions about the big trees have been cleared up by the studies.

One of the reasons why the redwoods were thought to be dying out was that few, if any, seedlings and small trees were found growing under natural conditions. It is known now that *Sequoia gigantea* is virtually unsuccessful in reseeding itself because the forest floor is so littered with debris that seeds can't get a start, and there is not enough sunlight close to the ground for a young *Sequoia* to grow. For such huge trees, the seeds are incongruously small. They resemble tiny bits of sawdust and are so light that an average of 90,000



seeds are needed to make a pound.

At Whitaker Forest, however, and at other locations, it has been learned that when the seeds are deposited in a moist and slightly mineral soil and have plenty of room and some sunshine they grow faster and more thickly than almost any other tree. Young *Sequoias* under good conditions average a growth of two feet per year for more than 70 years.

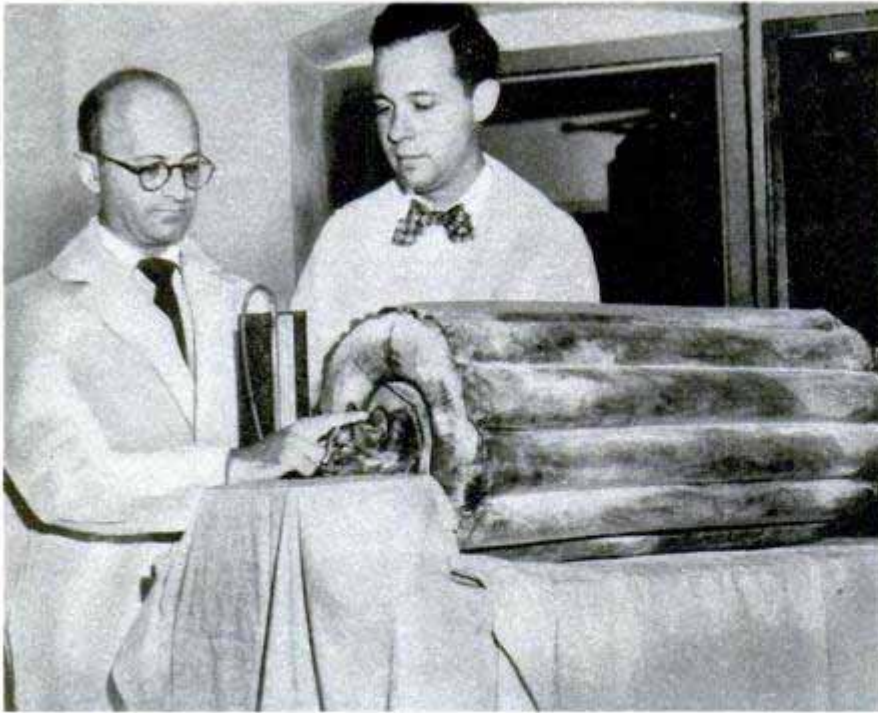
The modern idea, demonstrated at Whitaker Forest among other places, is that selective logging of mature trees is a requisite of maintaining a perpetual forest, as this provides more light and also exposes more soil. Likewise, much of the new growth must be weeded out from time to time to make room for the rest. Fire prevention is important while the trees are young but after 40 years the thickness and relative fire-resistance of *Sequoia* bark enables that tree to survive fires that kill most other species.

Sequoia gigantea has been

(Continued to page 262)

Old-time standard-gauge locomotive still hauls big redwood logs down from the forests. Below, a docksaw churns the water as it cuts a floating log to the desired lengths. Some logs are so heavy they must be anchored to lighter logs or they sink



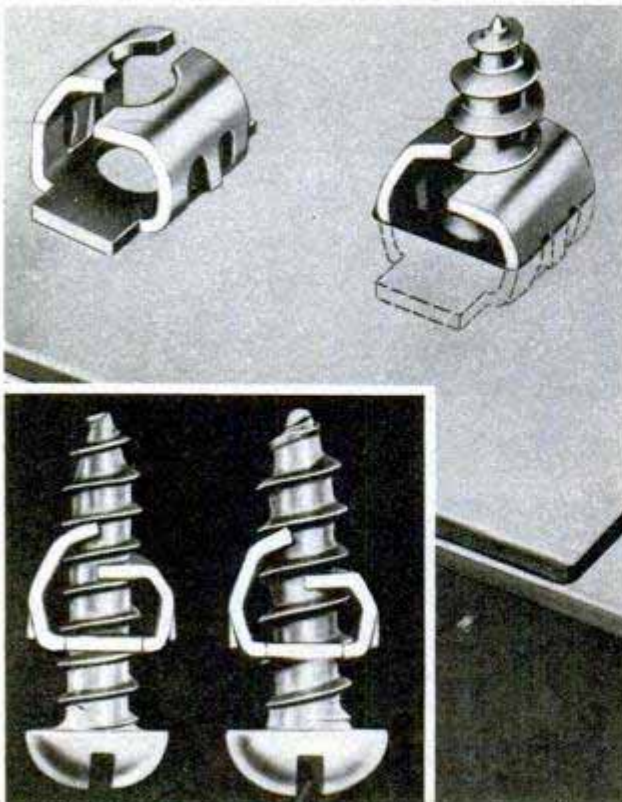


Collapsible "Lung" Has Cloth Walls

Two sheets of rubberized cloth with compressed air between them form the shell of a respirator developed at Yale University for possible low-cost mass production. The cloth "lung" is collapsible and a 32-inch-long model that tested satisfactorily weighs under two pounds. A plywood disk fitted with a sponge-rubber neckpiece seals one end of the inner cylinder and contains tubes to measure pressure and to permit evacuating air from the chamber.

Snap Nut for Sheet-Metal Screws Expands to Lock Pieces Together

Sheet-metal parts are fastened together tightly and quickly with the aid of a snap nut that fits Nos. 8 and 10 metal screws. The nuts are designed for mass production of sheet-metal assemblies, and can be anchored without access to the rear surface. The nut snaps into a $\frac{3}{32}$ -inch-square hole in panels .037 to .055-inch thick. After it is inserted, prongs snap out to hold it in place while the screw is tightened. As the screw is driven, the spring arms expand to lock the two sheet-metal parts together.



Shotgun Fires .22 Scatter Shells

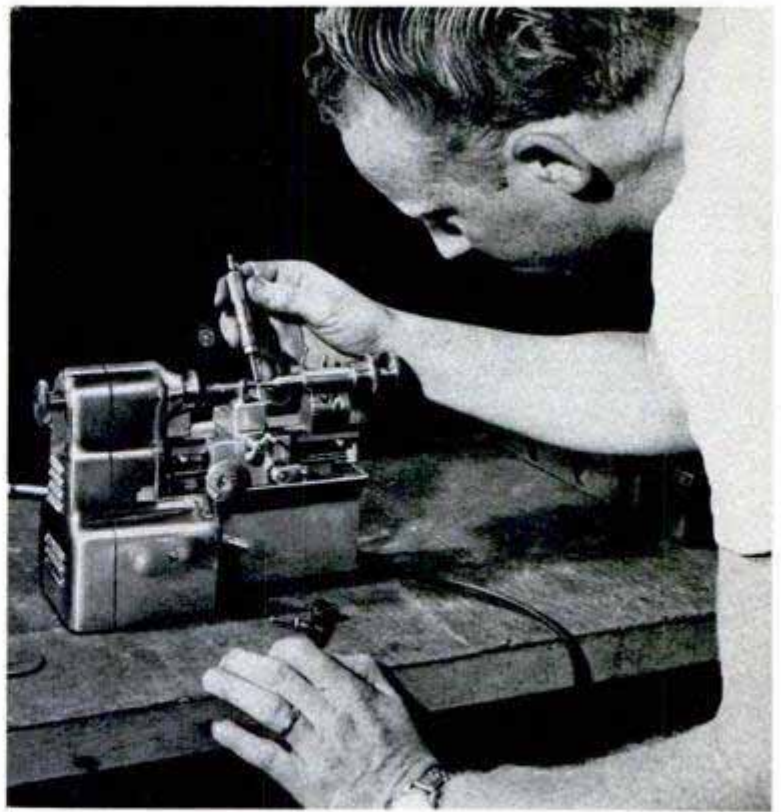
Sportsmen can fire .22-caliber ammunition from a shotgun with an accessory that fits into the breech. The small attachment reduces the gauge of 12, 16 or 20-gauge shotguns, adapting them for short-range trapshooting. It gives a pattern of approximately 100 shot in a 15-inch circle at 30 feet with sufficient penetration to shatter small clay targets. Adaptable for use in single-barrel, double-barrel, over-and-under or pump gun, the accessory gives the sportsman four practice shots for the price of one shotgun shell.





Car Sheds Engine and Rear Axle

Designed for quick city delivery of light loads, a three-wheel car called the Thrif-T can change engines with ease. The entire power plant, a two-cylinder air-cooled engine located in the rear, is removed along with the rear axle and wheeled out from under the chassis frame for replacement of the unit or for major repairs. The compact engine is mounted in a cradle beneath a deck in the rear and is removed by disconnecting the rear springs and the front end of the cradle and accessories. This car carries a 500-pound pay load and has a top speed of about 40 miles per hour. It weighs only 900 pounds, has an 85-inch wheelbase and an over-all length of 126 inches. The Thrif-T is available in several models including a covered type with extra head-room suitable for florists or cleaners.



Miniature Metal-Turning Lathe Has Motor Mounted in Base

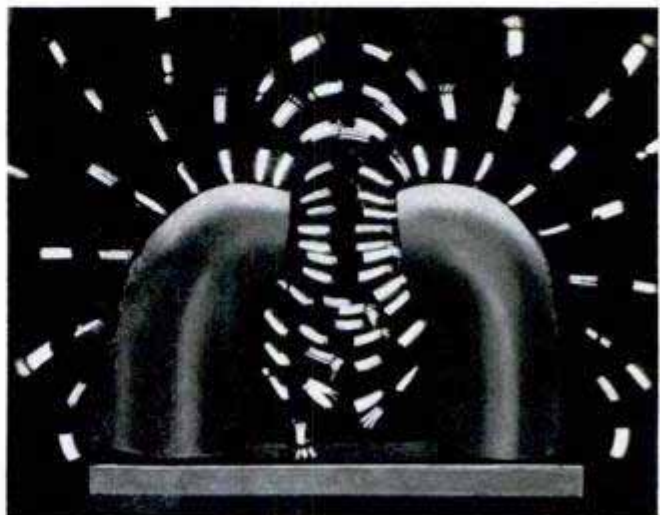
Extremely compact, a new metal-turning lathe for craftsmen and hobbyists combines standard lathe facilities with the highly specialized features of a jeweler's lathe. Only 10½ inches long, 7¼ inches high and less than 4 inches deep, the lathe includes a self-contained motor mounted in the base. It has a speed range of 100 to 3000 revolutions per minute.

Electronic Tube Permits Magnetism to Pose for Photographs

Magnetism can be photographed with the aid of an electronic tube which resembles a large radio tube. An electrical charge produces a ball-shaped bluish glow from the tube. When the tube is held near a

magnet, the glow follows the lines of force, producing a three-dimensional image of the magnetic field. These glow lines then can be photographed. The tube was developed at New York University.

Below, left, tube produces bluish glow. Right, photo shows how glow paths follow lines of magnetic force





Pal, veteran parade horse, enjoys the fuss of getting ready for the big night. Below, groom lathers body after soaking mane. Left, squeegee is used after final rinse



BEAUTY SHOP in a BUCKET

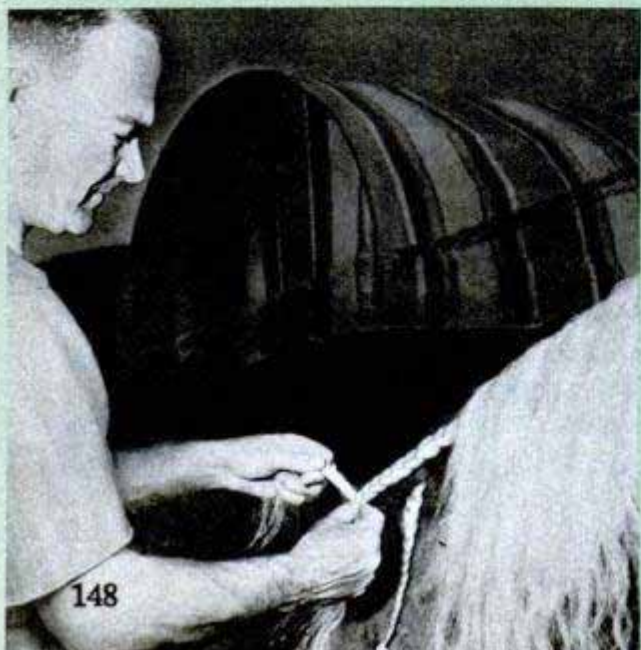
Photos by
Richard W. Emery

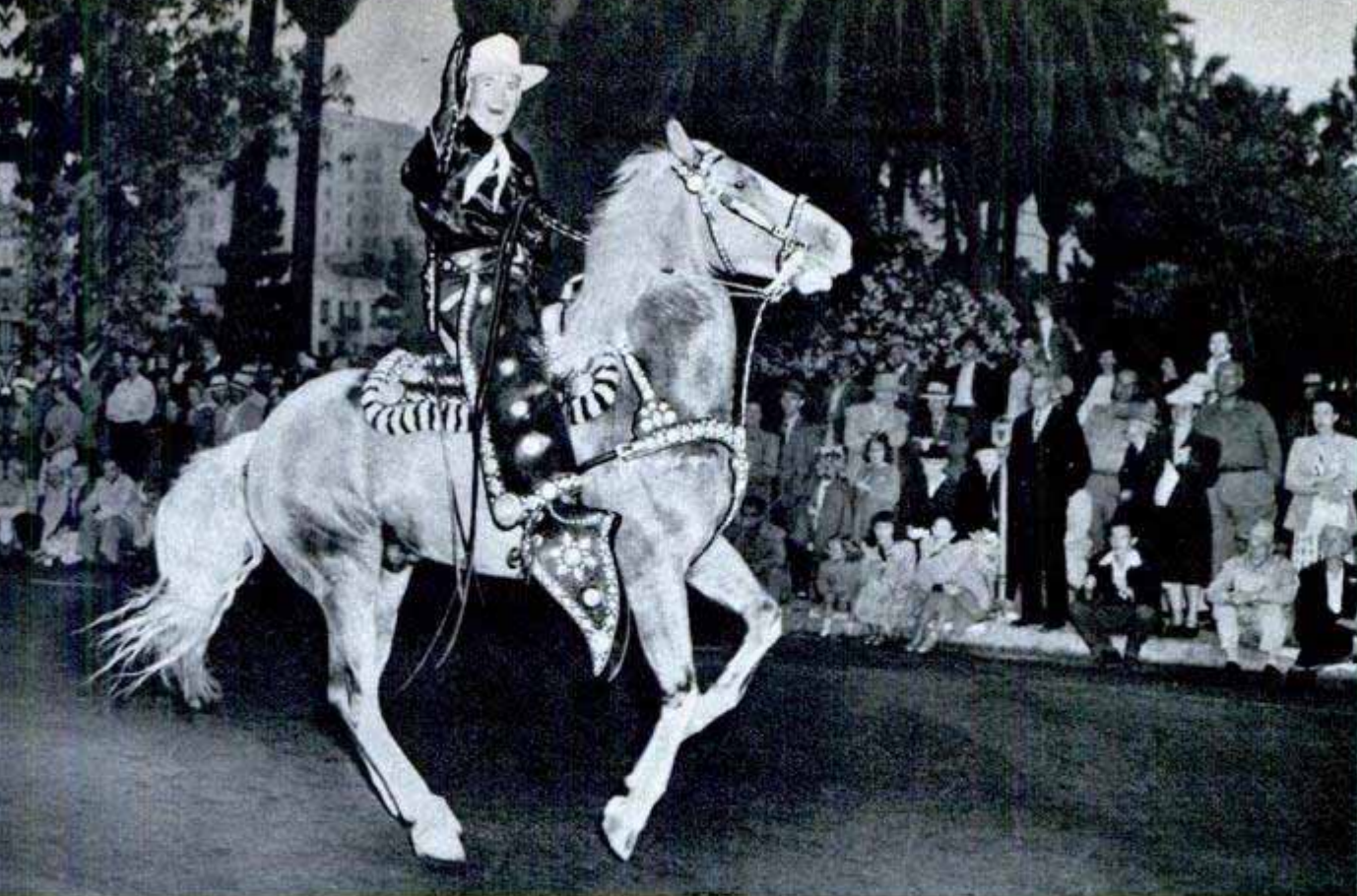
After rinsing and bleaching, the mane is braided tightly while it is still damp. This "sets" the hair and when it is dry the mane is brushed out (below, right). This results in a beautiful fluff. The process is duplicated with the tail

WHEN CHIEF OF POLICE Al Slaight of Long Beach, Calif., and his famed mounted patrol appear on parade there are loud cheers from the onlookers. Behind the spick-and-span appearance of both horses and riders are hours of preparation.

Horses—even parade horses—like to roll in deep dust and sink their hoofs in mud when they are turned loose. Their manes and tails are magnets for burs, and stray whiskers have a way of growing in the wrong places.

The beauty shop for these sleek parade animals is a soapsuds bucket. On parade days Chief Slaight's horse, Pal, (pictured on these pages) is first corralled and then led to a sunny outdoor stall. A groom approaches with a bucket of suds. Pal, being a veteran, appears to wel-





Pal looks as proud as his rider when Chief of Police Al Slaight of Long Beach heads the parade

come the cleaning operation. If he is really dirty with dust caked into his coat, the job calls for curry comb and brush before soapsuds.

Pal gets his mane and tail soaked with suds. The lather soaks in while the groom bathes the rest of the horse. After the mane and tail are scrubbed and rinsed, a bleach solution is used to remove any stains. For horses like Pal, with a blond mane, a bluing solution is used in the rinse.

After a final all-over rinse, Pal is squeegeed with a metal or wooden scraper. Then from nose to tail the horse gets a thorough rubdown with heavy towels. The mane and tail are braided tightly while the hair is damp. This results in a "set" which is brushed out to form a fine fluff. Clippers and scissors are used to trim around the hoofs and to cut away any stray whiskers. Hoofs must be scrubbed with a brush and given a coat of polish. The shoes of a parade horse must be in perfect condition to prevent slipping on hard-surfaced pavement.

Saddle, bridle and decorations must be cleaned and polished. This tedious job is done usually after the horse has been blanketed down and put in a stall with 18 inches of straw under him.

"A parade horse loves a parade," says Chief Slaight. "Pal really goes for that applause. He's a ham actor all the way through."



Pal holds still while his tail is scrubbed before bleaching. Below, polishing silver decorations and cleaning leather are also part of the job of making parade horse like Slaight's Pal look his best





Machine Squeezes Moss Into 40-Pound Bales

Bill Crane has devised a baling machine for moss he collects on islands off the coast of British Columbia and ships to nursery-men in Los Angeles. The moss is put in a

long box with plungers at either end forcing it into compact 40-pound bales, which are tied with wire. The moss is used to line hanging baskets and window boxes.



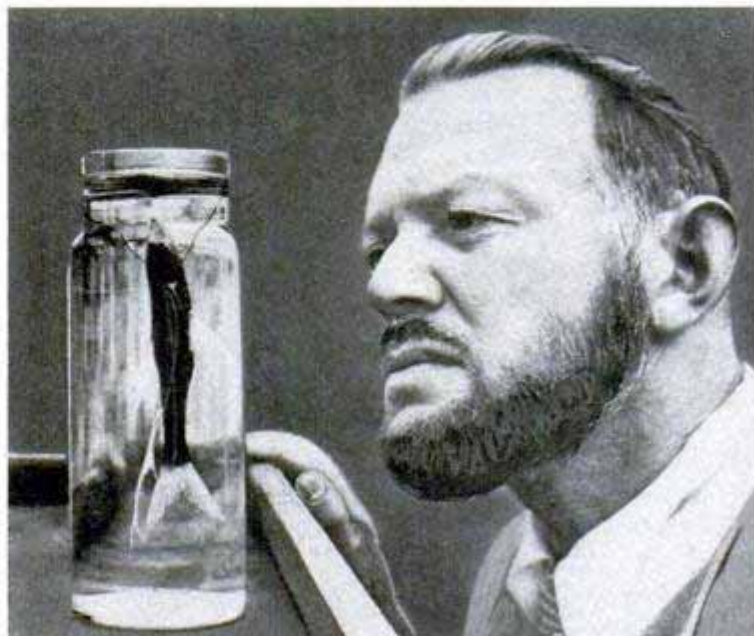
"Pistol" Fires Stroboscopic Light To Test Ignition Timing

Auto mechanics can make timing tests in broad daylight with a stroboscopic light similar to that used in high-speed photography. The light, made in the shape of a pistol, throws a blue-white beam more than 10 feet to "stop" the motion of the part being tested by lighting it once every revolution. It can be used at all engine speeds to synchronize and test ignition timing as well as to study the action of the governor and to determine whether there is excessive play in the distributor shaft.

Fish at 16,000-Foot Depth Caught by Research Anglers

Fish that live more than 16,000 feet beneath the surface of the ocean recently were caught during a cruise of the Swedish motorboat, Albatross, which made a research voyage around the world. A fish called the bathypterois was caught at that depth. A trawl made at a depth of 26,000 feet brought up no fish, but produced evidence of other life.

☐ When you shuffle a pack of cards and deal a single bridge hand, you have only one chance in 635,013,-559,600 of getting the perfect hand of 13 spades.



Static From Hair Combing Fires Photoflash Bulbs

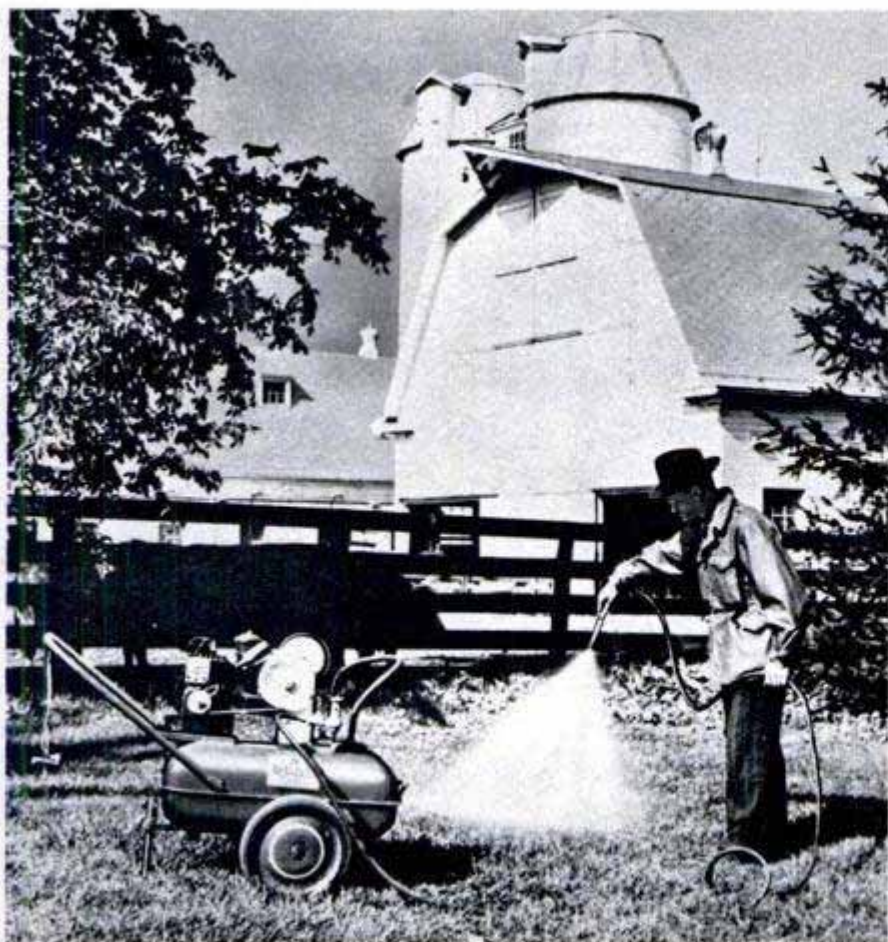
Electricity that crackles when a girl combs her hair is powerful enough to fire photoflash bulbs. A General Electric photographer has attached a metallic collector rod to an ordinary comb, and then connected the rod to the electrodes of the high-speed bulbs. Each stroke of the comb through a girl's hair supplied 8000 volts of power, enough to flash the lamps and take the girl's picture. Engineers have determined that the crackle of a comb running through the hair represents 8000 to 10,000 volts of potential electricity. Static electricity that is generated when a person scuffs his feet across a rug will generate as much as 18,000 volts, according to the General Electric engineers.



Synthetic Mica Produced on Pilot-Plant Scale

Man-made mica with all the characteristics of natural mica is being produced on a pilot-plant scale in this country. Great quantities of mica are required for use in many types of electrical equipment, radio and radar. In the past, the principal supply has come from India and Brazil. Research


toward a synthetic mica was started by the Army and Navy during the war. The man-made substance has all the desirable characteristics of natural mica. The manufacture of synthetic mica may relieve the U. S. from dependence on foreign supplies—especially in times of crisis.



Lightweight Sprayer Has Variety of Uses

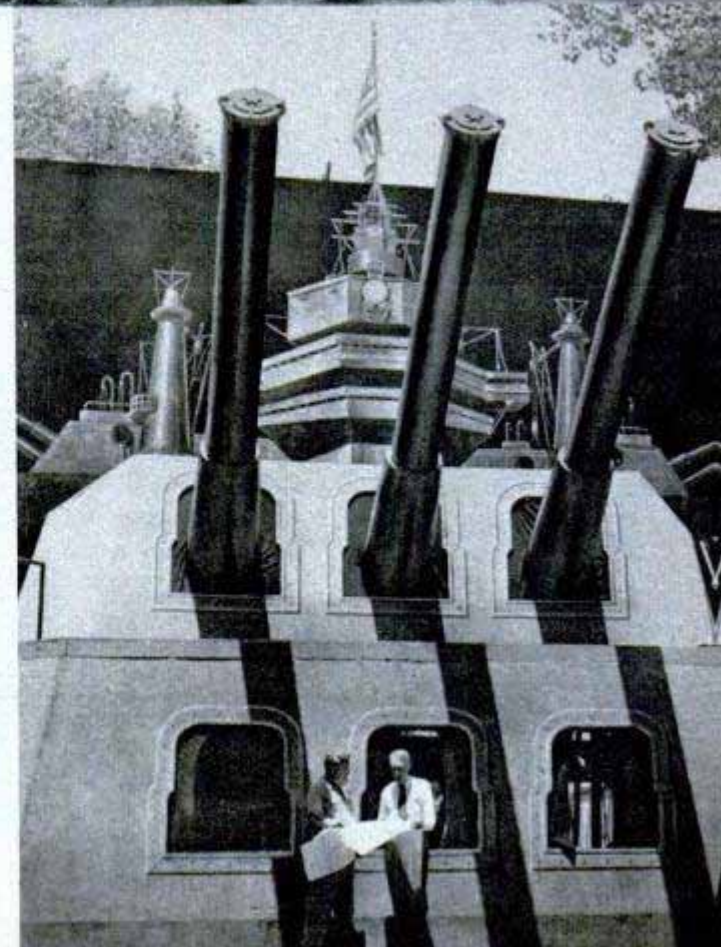
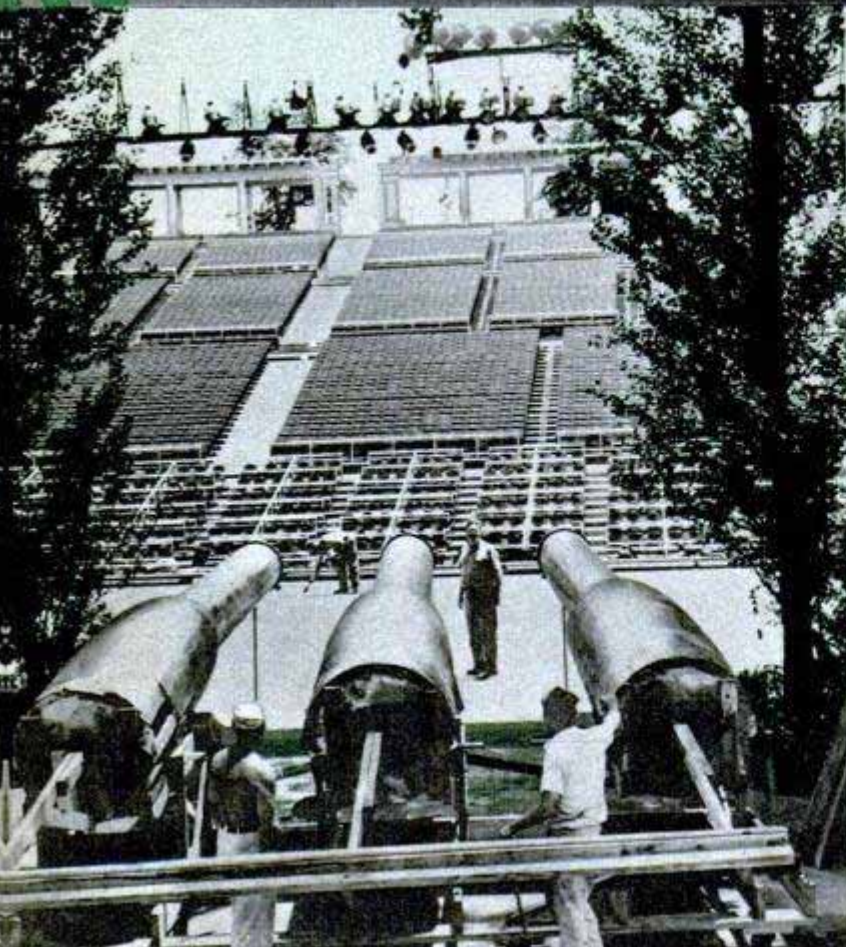
Everything from bugs to fires can be controlled by a portable sprayer that weighs only 118 pounds and is mounted on rubber tires. Powered by an electric motor or gasoline engine, the sprayer has a control valve that changes it from high to low pressure. As a high-pressure sprayer it can be used on tall trees and shrubbery. For spraying weed killer on lawns, low pressure is used. Pressure can be varied from 10 to 200 pounds. The tank holds 15 gallons.

Prehistoric Eskimos lived in houses using the ribs and jawbones of whales as timbers, excavations on Baffin Island have revealed.



Backstage Miracle Makers

Building battleships, palaces or the Gardens of Versailles is all in the day's work for scenery men at the St. Louis Municipal Opera Company's huge outdoor theater. Below is a replica of USS Nevada used in "Hit the Deck." Guns at left are inserted from rear





Long before show time a crowd of 12,000 gathers in St. Louis outdoor theater. Huge sets are at the right

By Wayne Whittaker

A PPLAUSE like the roar of seven seas from 12,000 persons in the big outdoor theater rises toward the night sky. It is the end of Scene One. The giant stage is blacked out and a curtain of light turned on the audience makes phantoms of the scene shifters. There is no other curtain in this theater with its auditorium built into a hillside and the stage framed by two great oaks. White pillars atop the hill give the place the grandeur of ancient Greece or Rome—but this million-dollar outdoor municipal theater happens to be the glory of modern St. Louis, Mo.

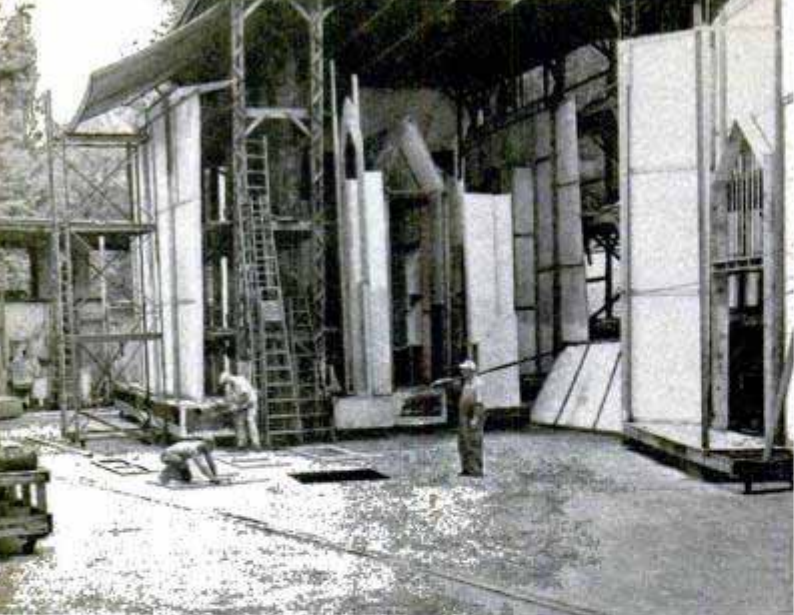
In the dim regions backstage, organized confusion reigns. Huge pieces of scenery that form a full-size water-front restaurant come apart and disappear into the shadows. Scores of performers scurry through the moving sets.

"Hey, grip!" barks a foreman at a stage-hand. "Give a hand with this battleship."

Out of darkness loom the bow and tur-

rets of the USS Nevada with its big guns protruding. The battleship unit is centered on stage and three more guns on a separate mount are pushed through the lower gun windows and raised menacingly. The stage flooring serves as the forward deck. Sailors swarm up the ship's ladders onto the sturdy upper deck and take their stations. The lights go on and the audience is looking down on the deck of one of the most realistic ships this side of the U. S. Navy.

The audience applauds politely at a setting which would bring down the house in New York, Chicago or Los Angeles. The reason is that St. Louis audiences are accustomed to stage settings on a scale found nowhere else in the world outside of the movie studios. The municipal theatergoers have seen the gardens and fountains of the Palace of Versailles, the exterior of a medieval inn with a frontage of 125 feet, a portable arched bridge that could hold 30 men, a full-size orchard of apple trees



Except at show time building activity hums backstage where the sets are made. Night crews use spotlights

in bloom, a genuine outdoor fireworks display in a garden scene, castles and grand staircases galore, a four-story "living" tapestry in a French chateau, and scores of other breath-taking settings.

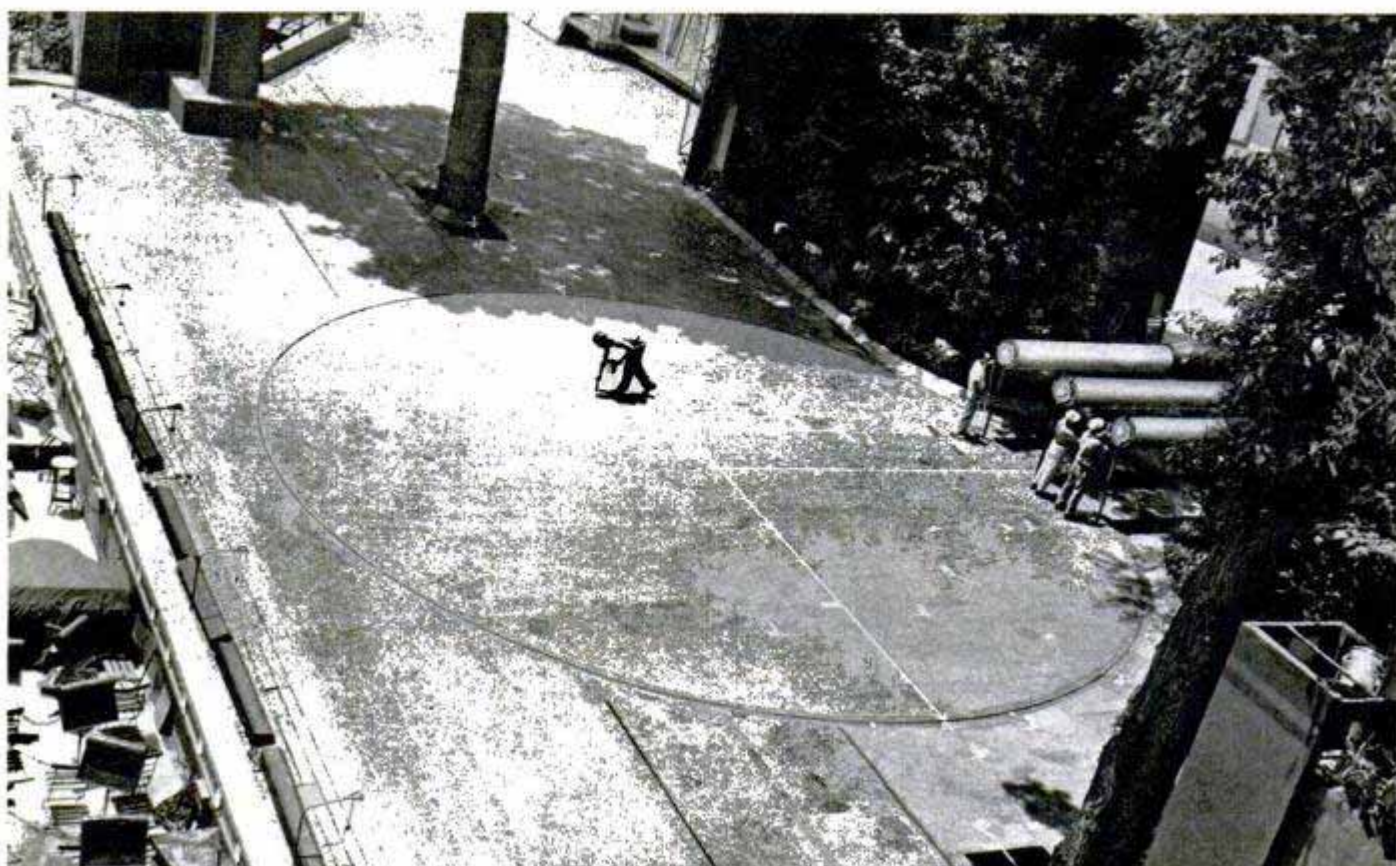
These backstage miracles are produced by a hard-working crew that operates around the clock. Most of the operettas play for only seven nights, which means that every week an entire setting of new scenery must be built. John Kennedy, productions manager, and Watson Barratt, art director, ignore what any script calls for in the way of settings. If, as in *Auld Lang Syne*, the script specifies a Scottish landscape, Barratt will toss in an arched bridge that can hold half the cast. If, as in the *Desert Song*, the script designates the set-

ting as a Persian garden, Barratt includes not one but three fountains in staggered formation extending downhill from a pergola. All the fountains are electrically operated. The pools about the fountains are watertight galvanized tubs with recirculating pumps attached. The beauty of the fountains is enhanced during the shows with colored lighting effects. The remotely controlled lights, big floodlamps, are installed in an arch which extends high above the front of the stage. Sound-amplification horns, also placed here, are connected with the row of microphones across the forward part of the stage. Lights and horns are serviced from a catwalk.

The stage proper is 125 feet wide and extends back to a maximum depth of 160 feet. A turntable at the front is 47 feet in diameter and makes a revolution in 90 seconds. The full stage depth includes a 70-foot ramp leading back to an old administration building, rehearsal stage and scenery storehouse. Under the ramp and below this rear backstage section flows the River des Peres. Years ago this stream occasionally overflowed into the actors' dressing tents. After a major engineering operation the river now makes an underground detour and today performers are safe far above it in a modern brick building with comfortable dressing rooms. The theater plant also includes three rehearsal stages, the newest being the same size as the stage proper.

The region backstage where the big sets are built, stored, torn apart and rebuilt is as interesting as anything presented to the

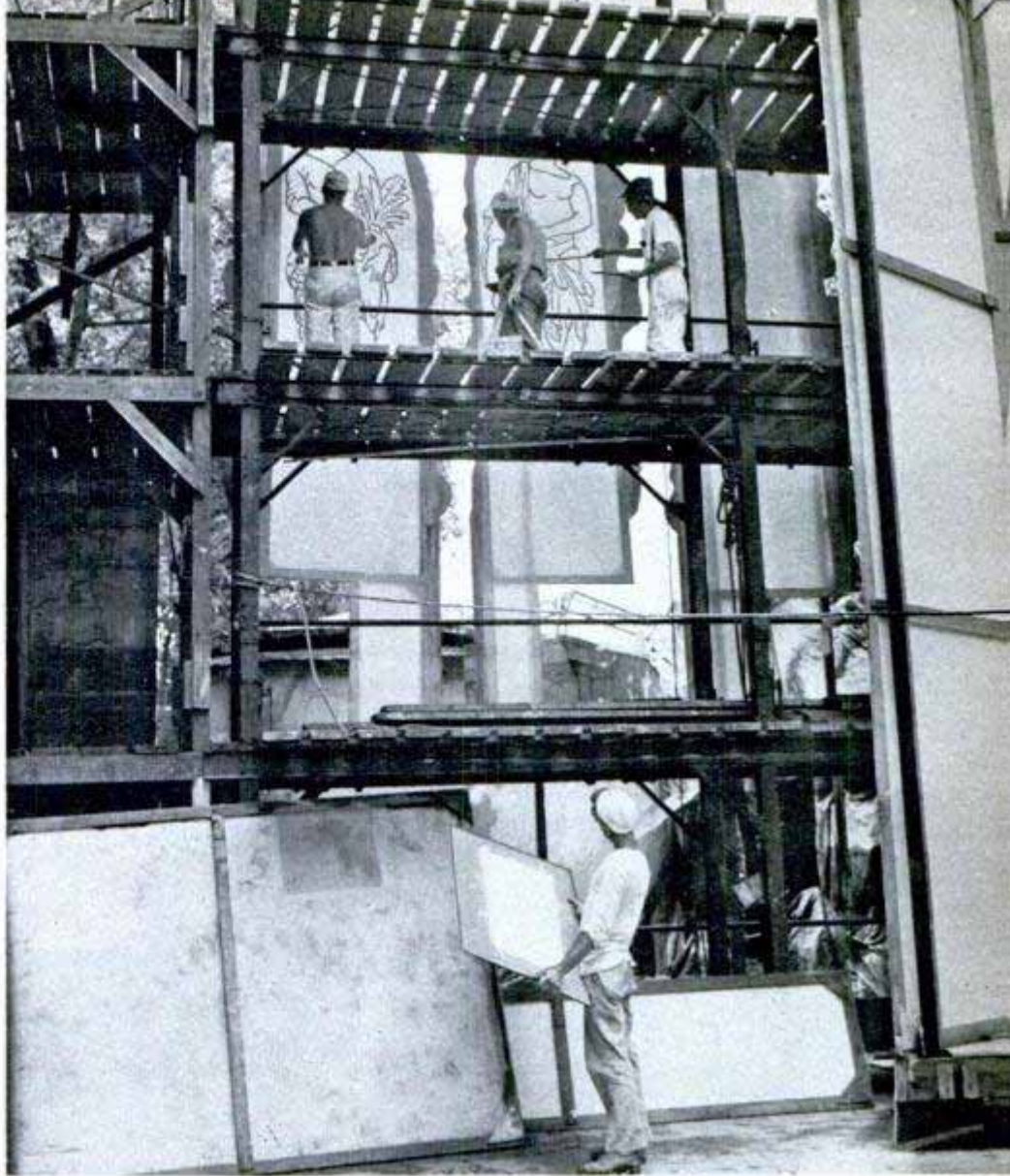
Giant stage is 125 feet wide and 50 feet deep to rear of turntable. The workman is painting scenery marker



audience. A stroll through this beehive at any time of the day or night—except during show time when construction ceases—is done to the hum of power tools. The entire place is an outdoor workshop because the scenery is too huge to be made inside. Many sets are 30 feet high and 40 or 50 feet long. Fifty-five men work here in three shifts, in good weather and bad and under sunshine and floodlights. They include building crews, electricians, painters, property men and scene shifters.

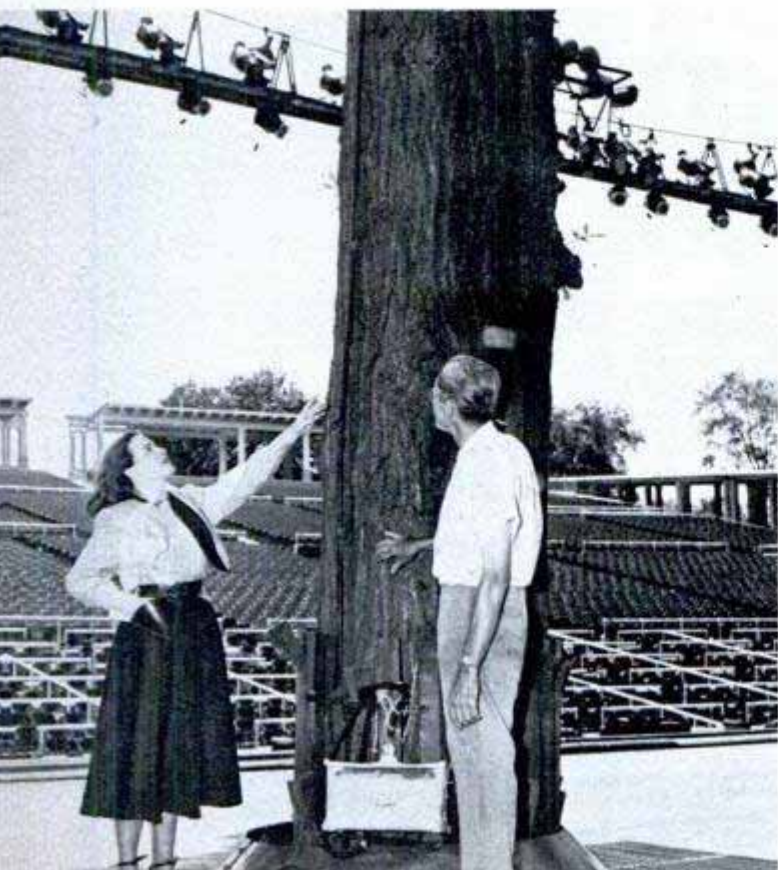
The general backstage scene is like that of a Hollywood studio. Here is the front of an ancient inn with heavy wooden stairs leading up to a balcony. Over there is the setting for a saloon in Havana. The deck of a luxurious yacht with realistic portholes. The tower of a castle. A colonial facade—Greek temple or southern mansion?

Along the "paint bridge"—a three-story steel skeleton structure—painters are busy on various levels creating new pieces of scenery. Some are at work on the front of a "stone" inn and others on a series of 18-foot "statues." These statues are what the workmen call transparencies,



Photos by John Drew Atkin

The stage scenery is so big artists have to work on a three-story paint bridge. Here they are making transparencies (above and below at right) which will be lighted from behind. Below, left, Sydna Scott, the actress, inspects lightning rods on one of theater's twin oaks





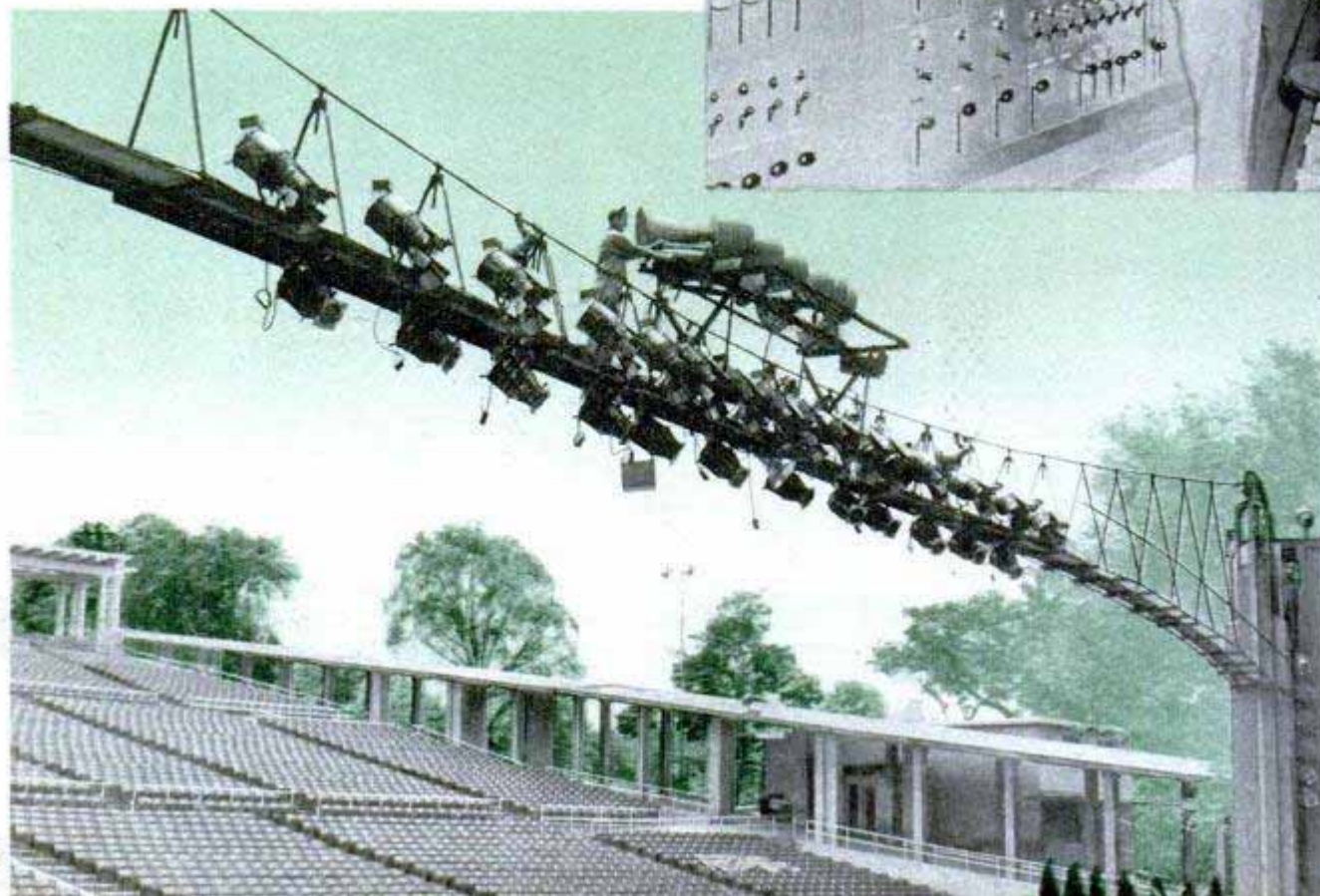
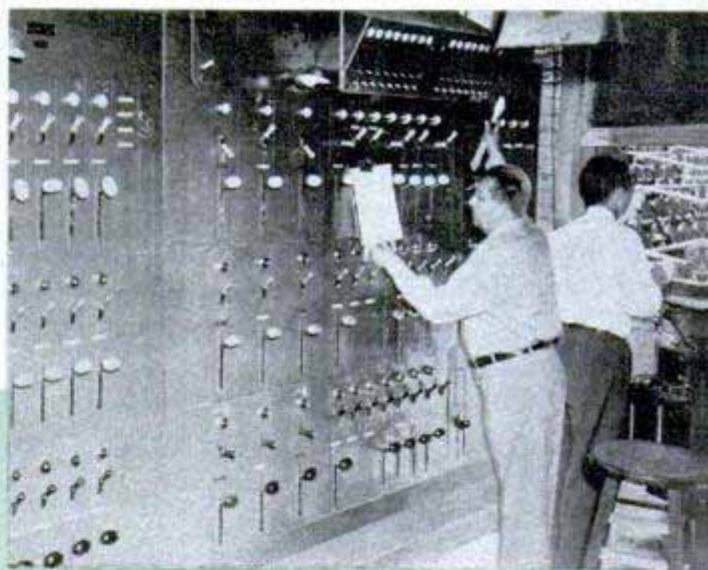
John Kennedy, New York producer, rehearses actress on unfinished set. Right, Louis Anweiler, electrician, studies his script while an assistant director at window gives cues at the rehearsal. Below, stage lights and amplifiers form big arch

used frequently and with good effect at the Municipal Opera. They are painted in such a way that illumination from the rear makes them stand out like real statues on the stage in garden scenes. The same system is used for chandeliers or windows covered with Venetian blinds.

When the plan for an outstanding piece of stage scenery, such as the battleship replica for *Hit the Deck*, leaves the worktable of Barratt it goes directly to John Steinigger, master mechanic. First, trucks are assembled to support the set. The low trucks roll on casters and are weighted by heavy railroad rails. Part of the battleship (turret and side guns) is painted on muslin stretched on a wood framework. Part is constructed of strong 2 by 4s and 2 by 8s. The big guns call for 2 by 4 centers surrounded by 1/4-inch strips wrapped in canvas and covered with oil paint to give them a metallic luster.

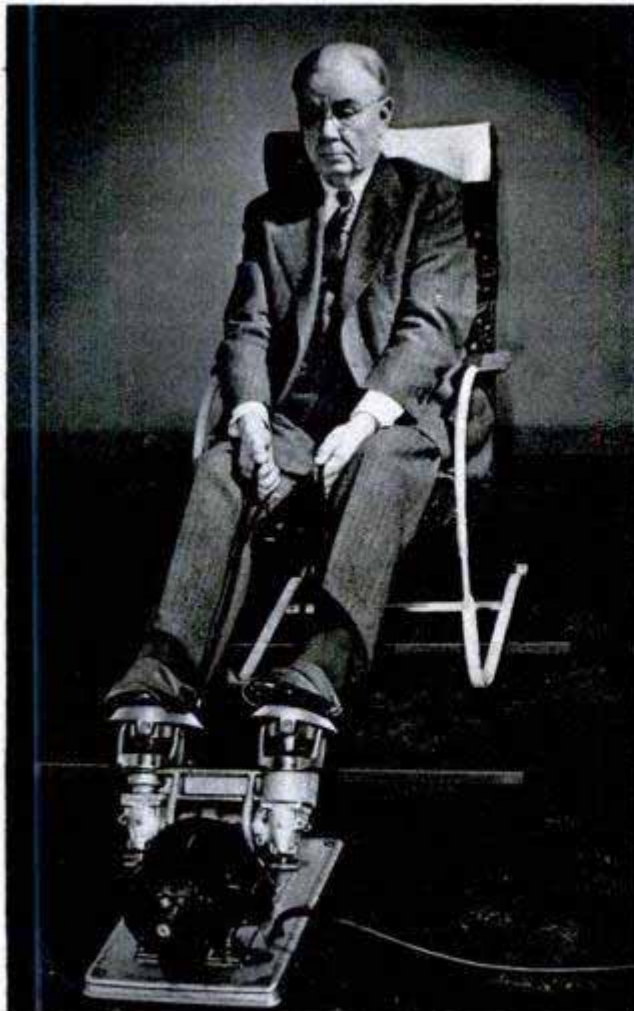
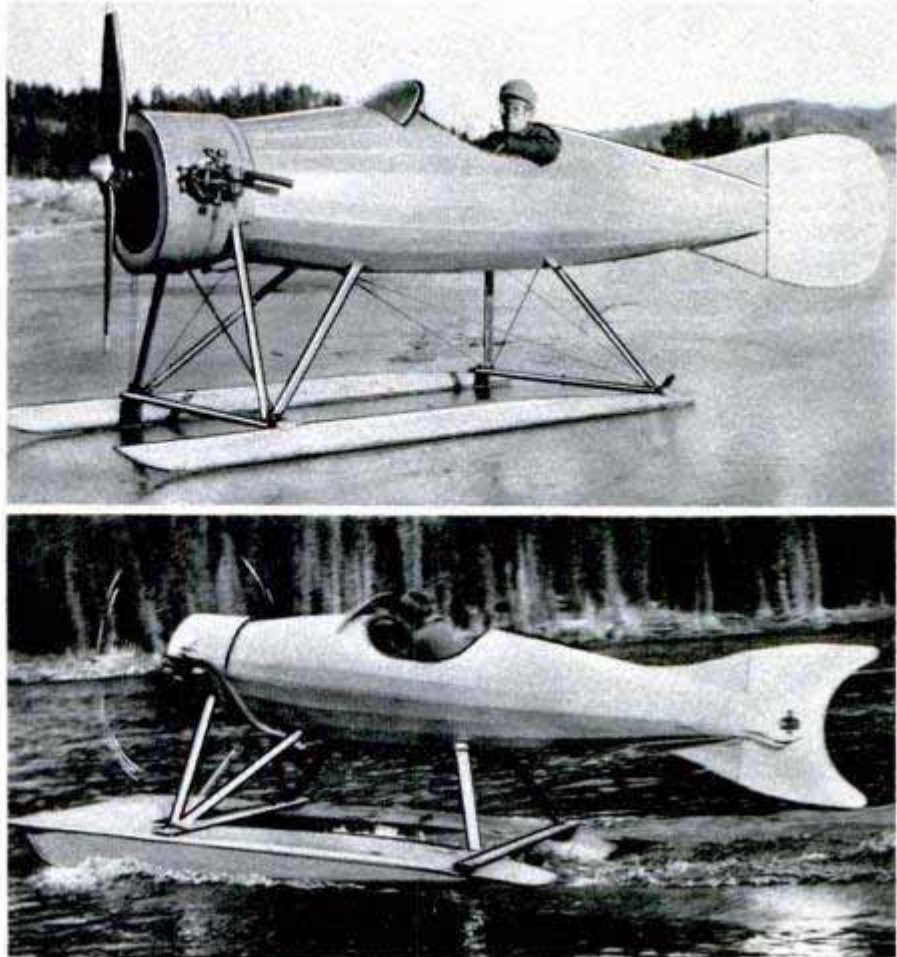
During the 12-week season, the construction crews use 36,000 feet of 1 by 12-inch boards, 60,000 feet of 1 by 3-inch battens, 26,400 feet of 2 by 4s and the same amount

(Continued to page 260)



Ranch Patrol Craft For Snow or Water

Built to meet the changing weather conditions of Montana, a streamlined sled can be quickly converted for use on ice, snow or water. The craft was designed by Jack Coultas of Conner, Mont., to be used as a ski patrol craft on his ranch. Its versatility quickly became apparent and detachable ice runners and water floats were added. Mounted on skis for snow, the craft travels 45 miles an hour. On runners over clear ice it will make 90 miles an hour. As a water craft it draws only a few inches of water. The craft is made of spruce and aluminum framing covered with fabric. It is powered with a 35-horsepower light-plane engine and is steered by a rudder, using a modified stick control.



Sit-Down Exerciser

Many muscles of the body are exercised by a motor-driven exerciser that becomes more active as the pull on two hand straps is increased. The portable machine is powered by an electric motor. Two pedestals, attached by ball-and-socket joints to rotating spindles, have jackets for the feet. When the feet are placed in these jackets and the hand straps pulled, the machine exercises the feet and legs and the pull on the straps brings the arm and shoulder muscles into play.

Scientists Study "World's Best Fire"

How fast does fire burn? Westinghouse scientists hope to build the "world's best fire" while conducting research on the design of jet engines and gas turbines. Fire is being studied from four different approaches: How it burns under various conditions of pressure, temperature and fuel mixture; how air should be injected into the combustion chamber; how the chamber should be designed, and what kind of fuel nozzle will give the greatest efficiency. An oil atomizer developed in the research rips heavy fuel apart into microscopic droplets at the rate of 25 billion a second to increase the burning efficiency.



GOOSENECK LAMP can be used to shed either direct or indirect light. Flexible cable bends in any direction to focus the beam on the desired spot. Right, lamp slides into a bracket that is screwed to the wall. All parts, including shade, are made of brass

GLASS WEATHER STRIPPING, below, is punched into cracks around windows and doors with a knife. Made of fine glass fibers, the material keeps out water, heat, cold, dirt, soot and pests. It is impervious to moisture and won't rot. Cracks up to one inch in width can be plugged with the weather stripping

WHAT'S NEW *For Your Home*



↑ **BALL-BEARING GLIDER** for windows eliminates the need for sash balances. A strip of metal, punched at intervals, is installed in the side channels. Ball bearing mounted in the sash rolls up strip and can be seated in desired hole



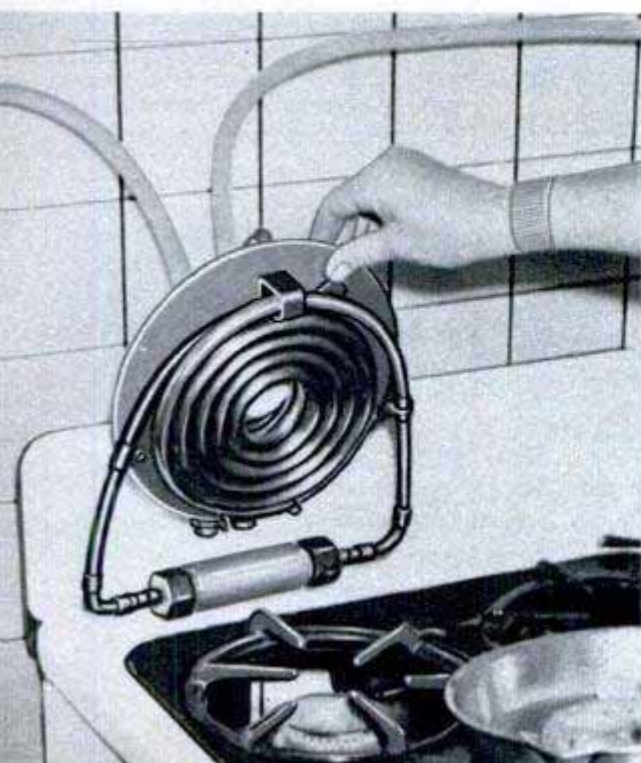
↑ **PLASTIC COATING** for imitation leather, applied with a paintbrush, produces a gleaming surface that makes worn furniture look new again



↑ **GLOWING HOUSE NUMBER** has wires that attach to the terminals of the doorbell button, providing constant illumination. The cost of operating the numeral is less than two cents a month



FIBERGLAS CURTAINS need no ironing or stretching, can be washed by machine or hand, rehung while still damp



STOVE-TOP WATER COIL, below, heats water for bathing and dishwashing while meals are being cooked. Designed for boats, trailers and cabins, coil can be used on any stove burning gas, kerosene, gasoline or fuel oil. Below, left, coil swings back when burner is needed for cooking





Youths Build and Operate Mountain-Top Diesel Railroad

Boys and girls enrolled in the Pioneer Movement, a youth organization in Hungary, have built a railway and operate it with little help from adults. The railway is atop Mount Szechenyi, a wooded hill which overlooks Budapest and the Danube River.

Children who built and operate the project range in age from 12 to 14. The only adults on the line are the passengers and the engineers who drive the diesel engines. During the first week of operation 43,345 persons rode on the youth railroad.

Sensitive Ammeter Measures a Billionth of An Ampere

Electrical currents as minute as one billionth of an ampere are measured accurately by an ultrasensitive microammeter designed by the Radio Corporation of America. Battery operated, the portable meter will have wide application in the

fields of radioactivity, television and astronomy as well as other projects involving the measurement of faint electrical currents. A safety feature of the instrument makes it capable of withstanding overloads of 10,000 percent without damage.



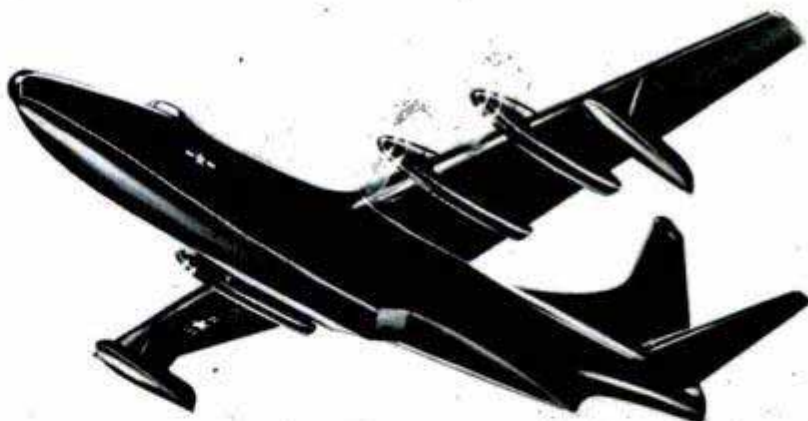
Toy Rocket Plane Climbs 100 Feet

Fired from a rubber-band gun, a toy rocket plane of aluminum zooms 100 feet into the air and then floats slowly back to earth under its own parachute. The parachute, made of paper, is carried inside the fuselage. When the plane reaches the top of its flight, the hinged fuselage opens, releasing the parachute for the trip back to earth.

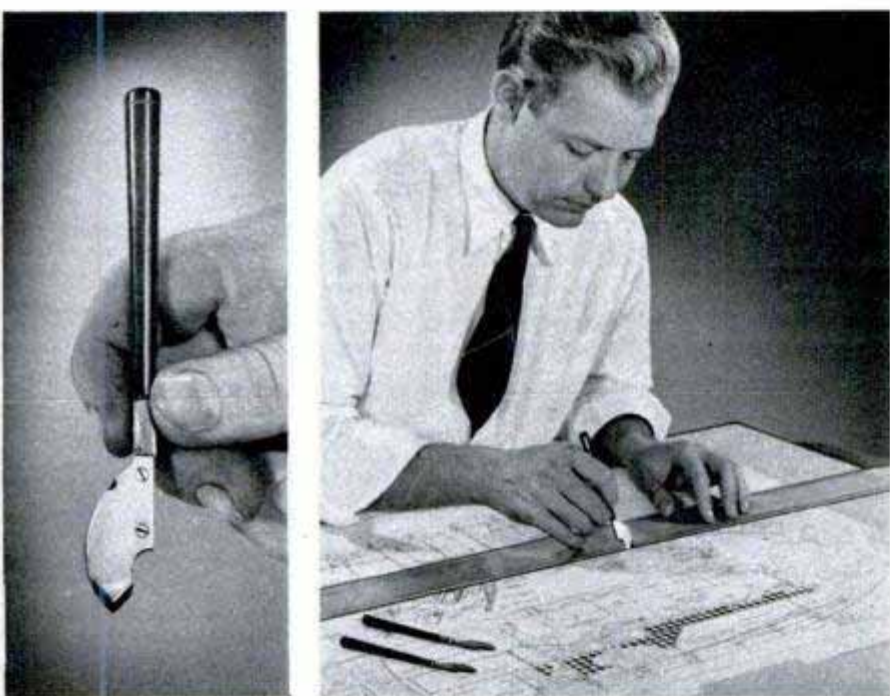
☐ Army C-rations, familiar to veterans, now come equipped with disposable plastic spoons that are sterilized and sealed in Cellophane wrappers.

High-Speed Patrol Plane

Two high-speed patrol planes designated the XP5Y-1, now under construction for the Navy, will be powered by four propeller-turbine engines. The engines develop at take-off more horsepower per pound of airplane than some modern fighter planes. The flying boats are designed for long-range day and night search of sea areas, for rescue operations and antisubmarine patrols. They have an especially high length-beam ratio which gives them excellent characteristics in the water. The first plane, under construction by Consolidated-Vultee, is expected to be flown early this year. The



design was tested with a radio-controlled model, while a nonpowered catapult model was used to check landing characteristics.



Nonblotting Drafting Pen Has Large Ink Capacity

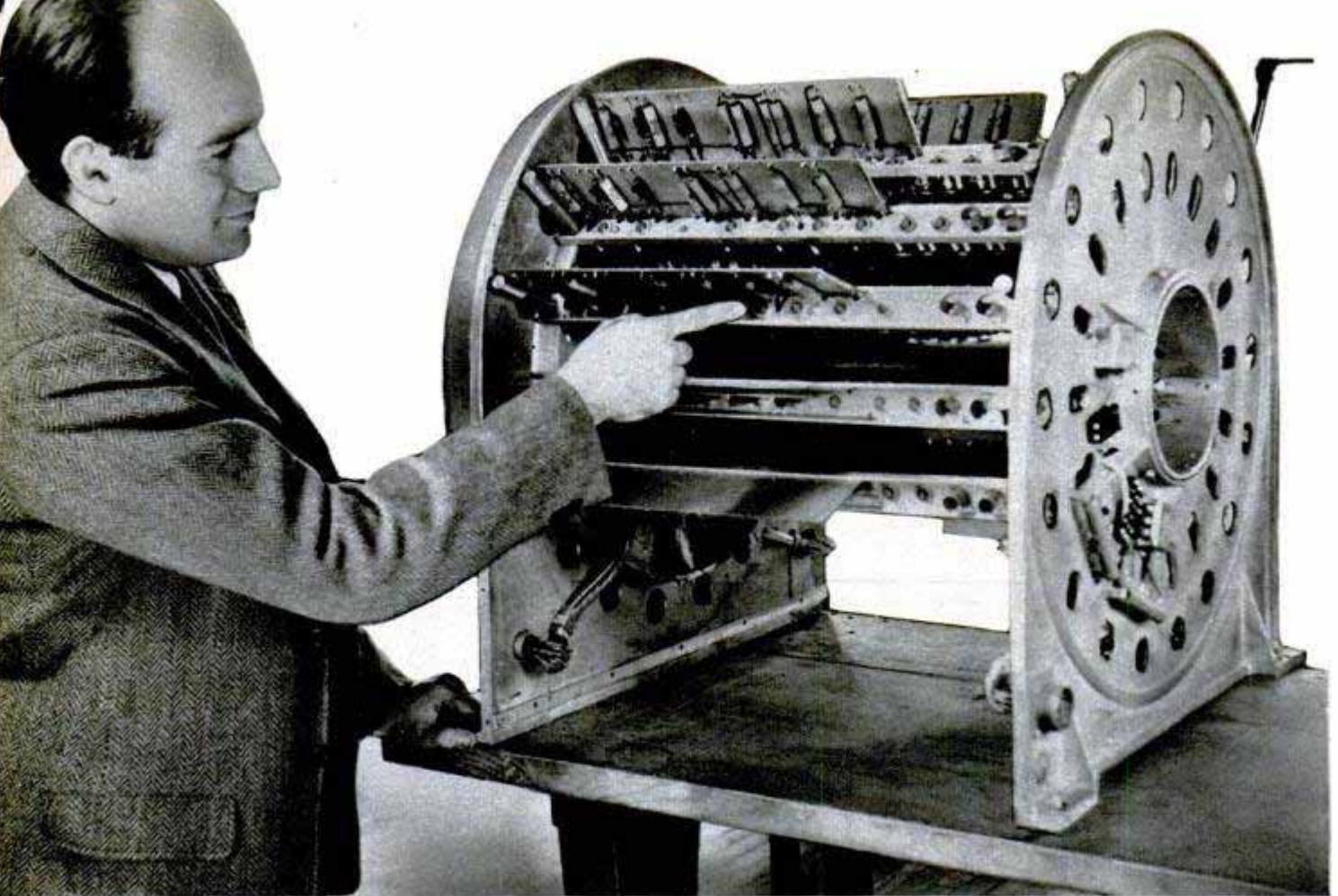
Draftsmen can draw from five to eight times more lines between fillings with a drafting pen that has an extra-large ink capacity. The new pens come in three standard line widths. These precision-set line widths are .009 inch for center and dimension lines, .013 inch for section lines and .020 inch for outlines. Consisting of two parallel plates between which the ink is held by capillary attraction, the ink-filled pens can be laid on the work without blotting. The pens are easily cleaned by drawing a strip of paper between the plates.

Ailerons on Blade Tips Guide "Flying Easter Egg"

Ailerons on the rotor-blade tips control direction of a one-man helicopter built by Fred Landgraf of Los Angeles, Calif. Nicknamed the "flying Easter egg" because of its shape, the 850-pound craft has a retractable gear that can stand the shock of power-off emergency landings. An 85-horsepower engine turns its two overlapping, synchronized rotors at a top speed of 100 miles an hour.

Usefulness in business was the No. 1 reason given by 86 percent of the most active private pilots for flying, the results of a Civil Aeronautics Administration survey revealed.





Eckert-Mauchly Computer Corp. photo

Eckert inspects ingenious memory units he devised for the computers. Pulses representing numbers flow into the mercury tubes. They are amplified and switched back and forth until needed, then pop up in the calculator

Brains that Click

By Andrew Hamilton

YOU KNOW HOW it is when you have some figuring to do—your income tax, plans for a new house, or perhaps next year's vacation. You work yourself into a frustrated frenzy and usually come up with several different answers. There's addition, subtraction, multiplication, division, fractions, percentages, square roots, decimals . . .

More than one weary pencil pusher has wished aloud: "Boy, if I only had a machine to do this!"

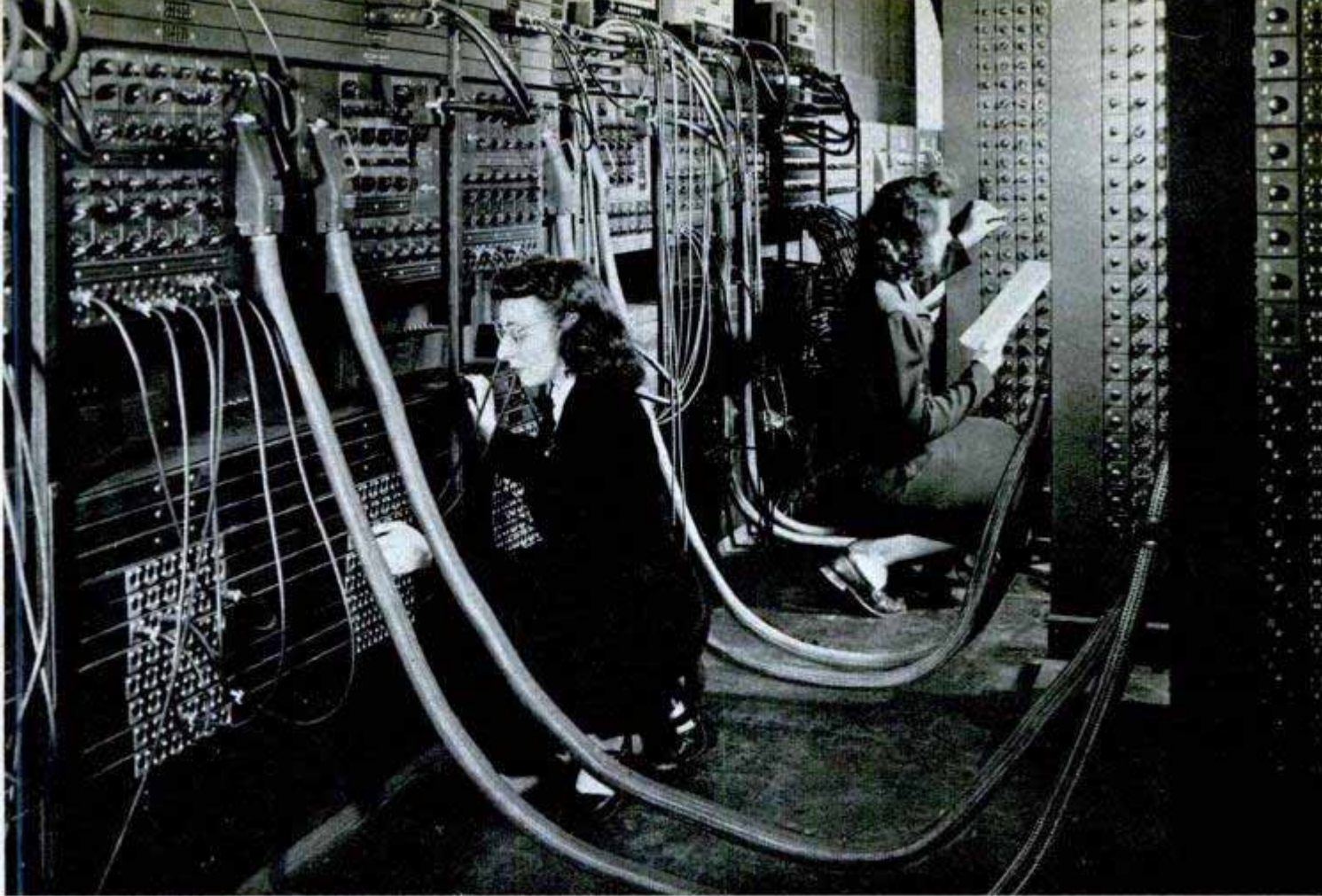
For 300 years scientists have been working on mechanical devices to take the drudgery out of mathematics. But it's only recently that they've come up with anything worth shouting about.

Today, in the mathematical and engineering laboratories of America's universities and research centers, giant robots are being built that can do complicated problems thousands of times faster than the human brain, store up long strings of figures in their "memories," flash red lights and ring bells when they get out of whack, and tackle problems so complex it staggers the imagination.

"Some of these machines are almost human," a mathematician said recently. "It gives you the creeps to think what they can do."

The high-speed calculators of science, however, don't remotely resemble the popular notion of a mechanical robot. Instead, they are huge mechanical and electronic machines that cost up to \$750,000, weigh as much as 100 tons, fill whole rooms and are equipped with thousands of vacuum tubes and millions of feet of wire. If you can imagine a Rube Goldberg combination radio-phonograph-telephone switchboard-organ console-typewriter-newspaper teletype-pin-ball machine, you will have a faint notion of a high-speed calculator's appearance.

These machines are unbelievably fast. An ordinary desk calculator will multiply two 10-digit numbers, such as 3,650,678,548 by 5,477,648,971 in about 10 seconds. A "thinking machine" will give you the multiplication in $\frac{3}{1000}$ second. Here's another example: About 400,000 customs declarations are made each month and it takes



Army photo

At the Army's Ballistic Research Laboratory, digits in astronomical numbers are put through ENIAC which comes up with firing tables, solves other complicated problems. Above are table panels and switch assemblies

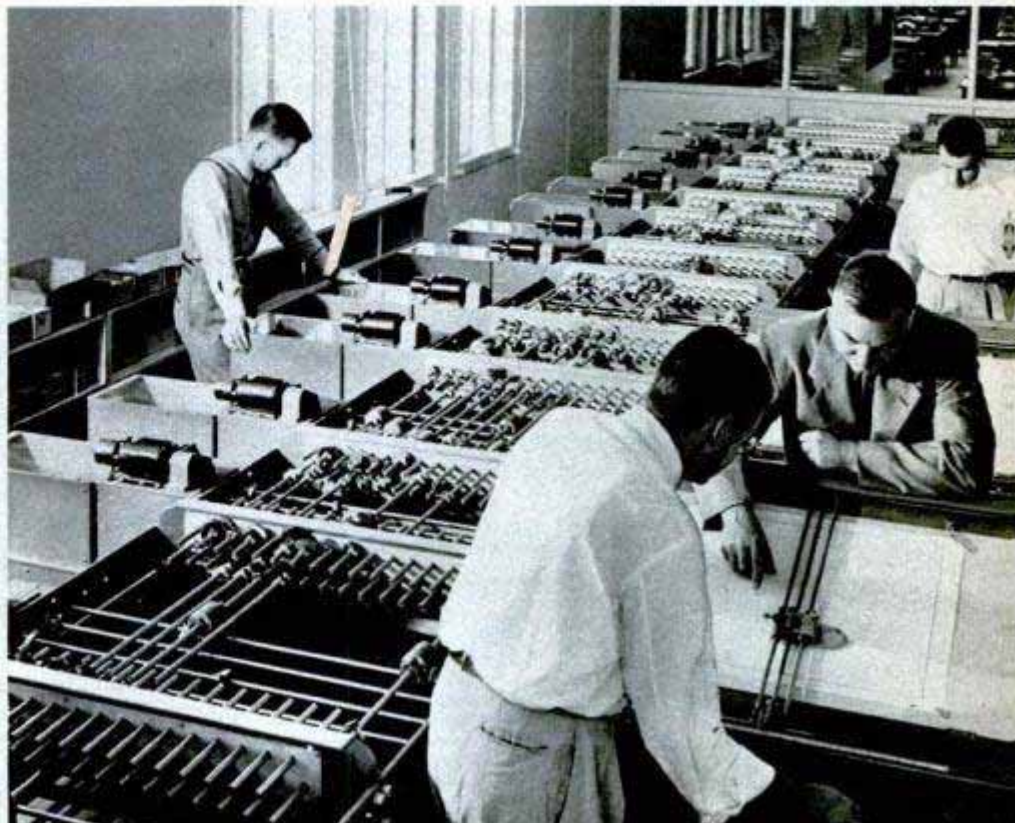
about 1800 man-hours to process them. A machine being built for the U. S. Bureau of the Census will do the job in approximately 36 hours.

The high-speed computers are at their best when handling problems that involve a number of "variables." For example, it might be easy to describe by ordinary mathematical methods a penny tossed into the air—how high it rose, how far away it fell, the arc it described, and the number of seconds before it reached the ground. But how do you describe a whole handful of coins, all spinning to various heights and dropping to the ground at various times? Those kinds of "variables," which are found in many scientific and business problems, are taken in stride by the computers.

The "memory units" of the high-speed calculators are ingenious devices. One type consists of a number of stainless-steel tanks of mercury equipped at each end with quartz crystals. When electrical impulses, representing

numbers, are fed into one end of the tank, the crystal changes them into sound waves. The waves travel through the mercury and emerge at the other end as electrical impulses again. After being amplified, they are fed back into the first crystal—thus

Differential analyzer at U. C. L. A. has gears and shafts instead of tubes, finds the answers by rearrangement of the individual parts



Photos on the three following pages show how an electronic calculator solves a problem. Here an operator punches holes in cards, each hole representing a number from zero to nine. Both numbers and instructions to the machine are recorded



moving in a continuous circuit until they are needed on a problem. Although moving at high speed, they are held separate by a central oscillator which keeps the digits in step and $1/4,000,000$ second apart.

In general, there are two principal types of high-speed calculators:

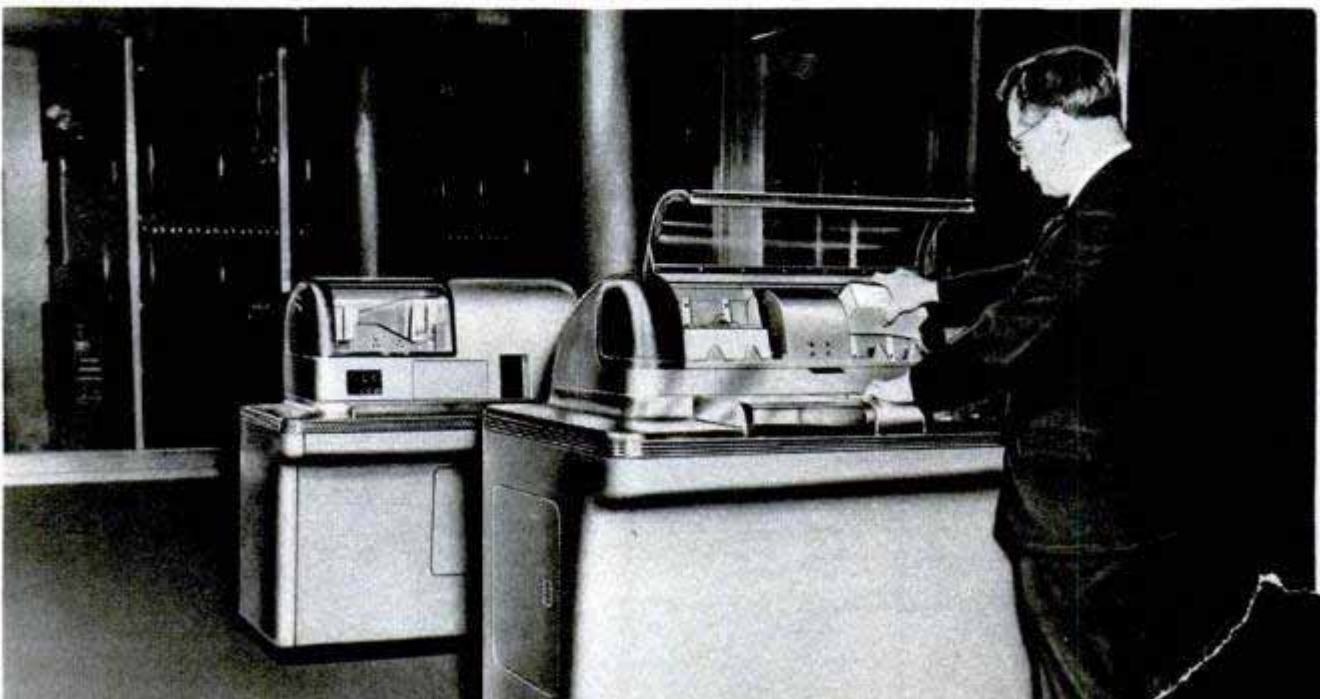
(1) *Analogue computers* arrive at their total by the use of some substitute for actual figures. A slide rule, for example, substitutes distances along its length for actual figures. It's difficult to get an accurate answer when adding 10 ohms to a previous total of 2,000,000 ohms. But there are many problems where an approximate

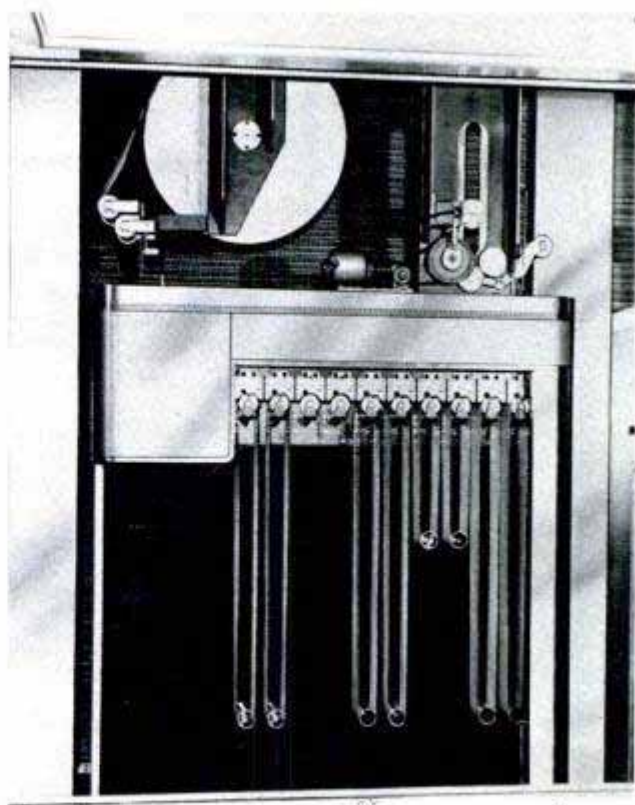
answer is as good as an accurate answer. And here the analogue computers shine.

(2) *Digital computers* arrive at their totals by counting. Man's 10 fingers comprised the first digital computer. Then came adding machines, which depend upon a series of wheels. And finally the giant calculators of today, which use electrical impulses.

On duty 24 hours a day, these jumbo-size machines are expected to open up vast new fields of knowledge. A scientist said recently: "So superior are they in efficiency and capacity that the mathematician whose domain at one time was merely that which

Prepared cards are dropped in a card reader, which senses the holes electrically and enters the numbers in memory units at the rate of 30,000 digits a minute. Machine then has necessary data to solve problem





International Business Machines Corp. photos

↑ Information also can be fed into the machine by punched paper tapes. Punch automatically reads numbers from cards and records them on tape. Right, a memory unit punches intermediate results for use later

he could see from the crest of an anthill now commands everything he can see from a mountain top."

Every science known to man—from archeology to zoology—has developed vast amounts of sheer statistics that are useless unless properly interpreted. To speed up such routine brainwork and leave the best human minds free for creative thinking, this is the type of thing that the "thinking machines" will do:

Predict accurately how a rocket motor will work before it is built.

Digest the complicated statistics of the census or the national income tax.

Estimate the impact on the nose wheel of a plane landing at a force too dangerous for actual testing.

Predict the speed at which a gas turbine will vibrate according to its design.

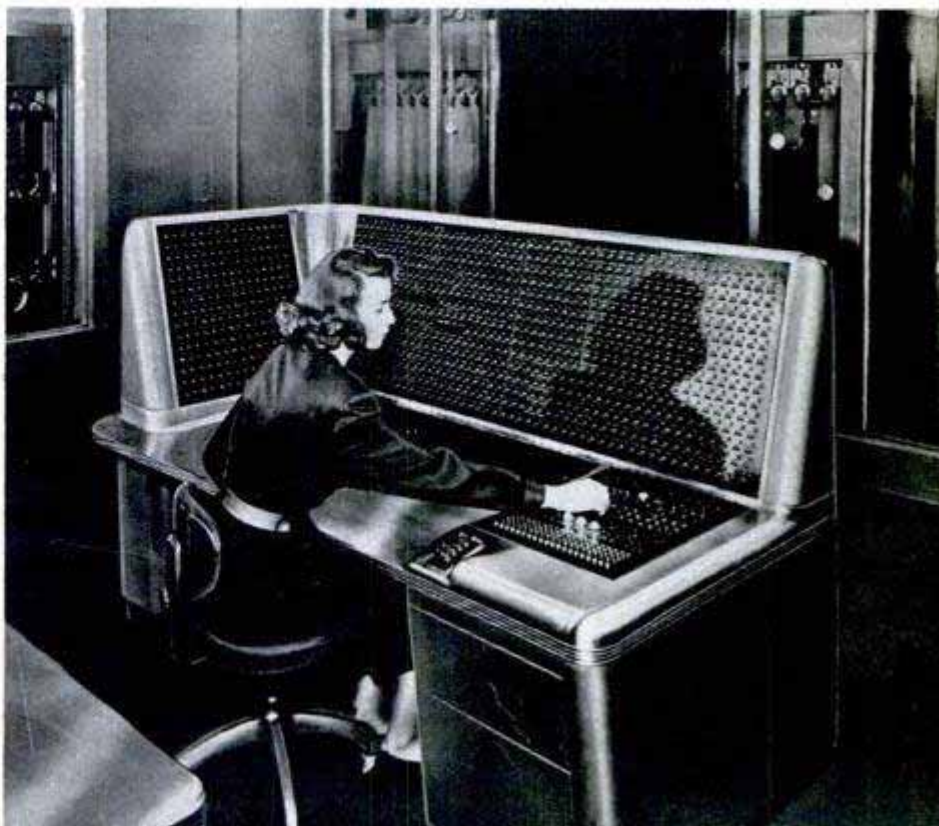
The mathematical automatons probably will reduce the need to build more and more complicated and expensive wind tunnels, miniature water channels and other models designed to determine the characteristics of new planes, ships and harbor construction.

Although it's easy to think of these giant pieces of machinery as "mechanical brains" and "electronic brains," they are purely robots and not in any sense inde-

pendent thinkers. They don't formulate problems themselves—but only work them out after they have been instructed to do so by humans.

For example, oceanographers of the University of California are interested in plotting the bottom of the Pacific off San Diego. A great many soundings of the sea have been taken at different locations. But the

At all times the console control desk shows the operator the function that is in progress and the results being achieved





Printer publishes the running results at a rate of 24,000 digits a minute, permitting scientist to modify problem as he sees results

problem of joining these soundings into the most likely profile of the bottom is enough to discourage any mathematician.

Here's how a "thinking machine" will do it: Thousands of sounding figures (each identified by latitude and longitude) will be fed into a high-speed calculator on cards or a magnetic tape. After these figures have been fixed in the machine's "memory," the computer will be asked to calculate point after point. For each point it will be instructed to search the soundings in its memory and pick out all those, for example, within half a mile from the point in question. Then the machine will be asked to search the soundings again and select all within a mile radius. Giving these distant soundings somewhat less weight, the machine will average all the figures and come

has reached the stage of higher mathematics. Some of these formulas are so difficult that the weather forecasters can't work them out with the old pencil-and-paper methods until the weather has already passed over.

Army ballistics experts use the machines to work out the gasoline consumption of jet planes at various speeds and altitudes. The Navy employs them to compute range tables for new missiles. They can be used to measure the effect of a coal strike on the nation's economy, the long-range forecasting of earthquakes, the distribution of cosmic rays falling on the earth and many other scientific and social problems that never have been accurately solved.

Ever since Blaise Pascal, the French philosopher and mathematician, invented an "arithmetic machine" in 1647, scientists have been trying to devise computers to save wear and tear on human brains. Adding machines and I.B.M. punched-card machines are both fairly recent examples of this trend.

But it was not until the late 1930s and World War II that the real, giant-size "mechanical brains" and "electronic brains" appeared. As in the early days of the automobile industry, they assumed various sizes and shapes and were equipped with several types of motive power.

There are, for example, various types of differential analyzers, an electromechanical instrument composed of shafts,

When problem is solved, typewriter reads numbers from cards and prints them in form suitable for publication by offset printing
International Business Machines Corp. photo





Harvard University photo

Where does the next wire go? Jig used on Aiken Mark II calculator shows complicated wiring in each panel

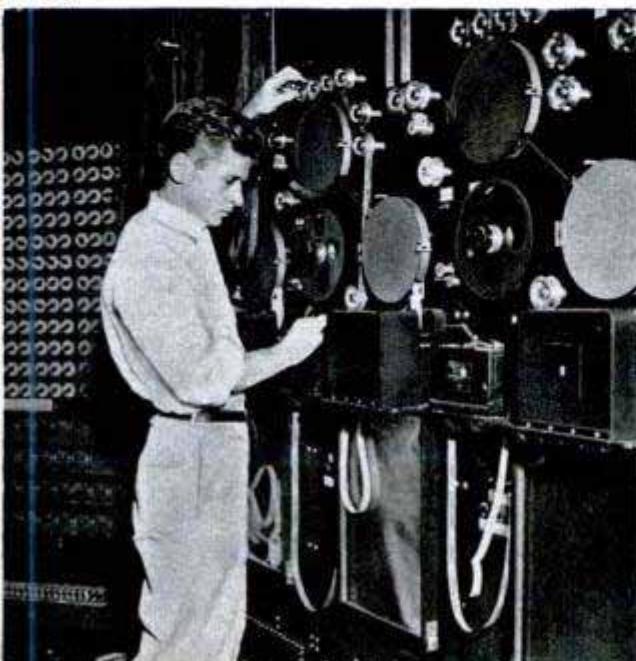
gears and couplings. Most of these parts are removable, which permits them to be put together in the correct relationship to each other to solve individual problems. Raw materials are fed into the machine from graphs representing numerical values. As many parts revolve and change position, it draws the answer in graph form with a mechanical pen.

The differential analyzer has been used to determine the trajectory of guided missiles, the path of water particles around the wing of an airplane and the design of aircraft radar. Several universities, including Massachusetts Institute of Technology, University of California at Los Angeles and the University of Pennsylvania now possess differential analyzers.

The second kind of high-speed calculator

Technician arranges value tapes to feed problem into Mark II computer. Answer will come out in minutes

Navy photo



is the network analyzer, a type especially useful for problems of electrical production and transmission. It's possible to turn it into a miniature electric-power company, with portions representing generators, transmission lines and consumers. The effect of adding a new generating plant to the system can be calculated even before the plant is on the drawing boards.

A network analyzer can also be used to solve many kinds of mechanical problems. It can examine the designs for machinery and predict how much vibration can be expected. A special kind of network analyzer called a thermal analyzer can solve problems in heat flow—determine, for example, whether or not a certain kind of a machine-gun barrel will hold up. Firing rate, water

(Continued to page 256)

Like an old-time player piano, M.I.T.'s 100-ton calculator gets its instructions from punched paper roll

Massachusetts Institute of Technology photo

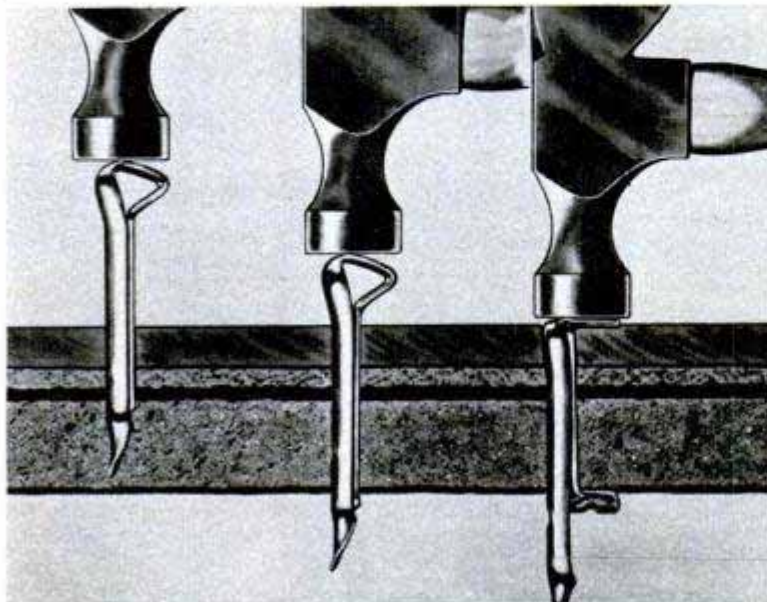
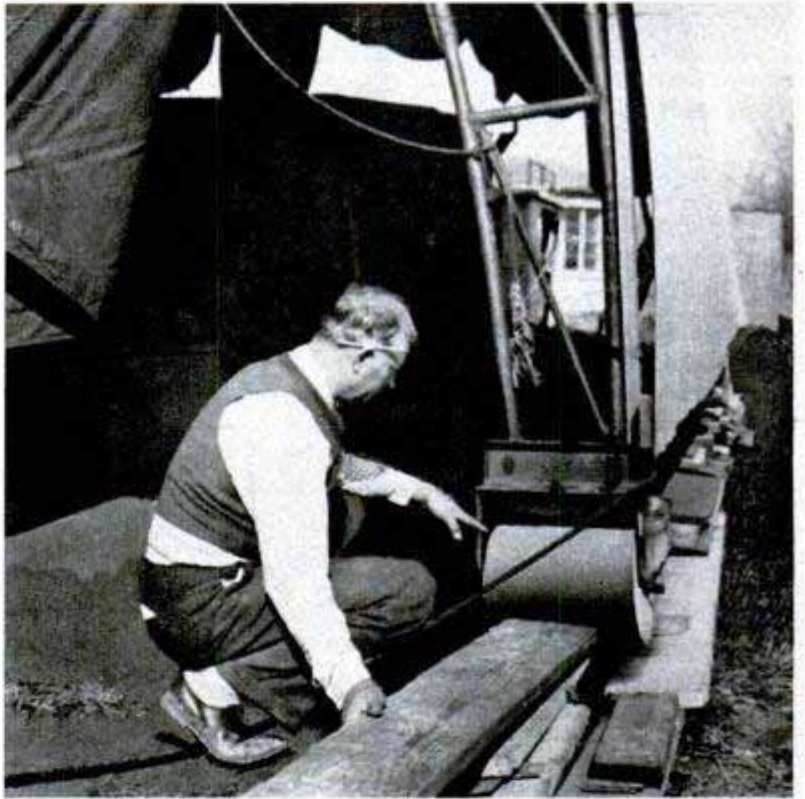




House Within a House

How can you build a house in bad weather without slowing down construction? This problem, which has baffled builders for centuries, has been solved by contractor Caesar Marconi of Chicago, who rolls a large Quonset building to the site and proceeds to build the house inside. Large rollers make it possible to move the building into position and then roll it away when the house has been completed. The building protects workmen and their materials from the rain, snow and the heat of the sun.

Top, portable Quonset building is rolled away after the house is completed. The building shelters workers from rain, snow and sun. Right, giant "hangar" is moved from site to site on large rollers



Self-Locking Shingle Nails Clinch Behind Sheathing

Self-locking nails clinch with the last blow of the hammer, making it possible to fasten shingles to low-cost gypsum sheathing. The nails are made with two legs, one nested inside the other. The head is in the shape of a triangular loop. When the loop is flattened by the hammer, the inner leg bends at a right angle to clinch behind the sheathing. The nails can be driven at any convenient point without locating studs. They are $1\frac{3}{4}$ inches long, made of low-carbon steel coated with zinc and count 200 pieces to the pound.

they hunt

WOOD

By Henry F. Unger

TURN Wilbur F. Opdyke loose in an unusual wooded area and you are virtually giving him a ticket to heaven. The Ohio hobbyist is one of the foremost wood collectors in the world and his filing cabinets containing about 2600 species of wood are proof of his gathering ability. However, there are about 100,000 different trees and woody plants in the world, each having a variety of color, grain and texture and Opdyke feels that he still has a long way to go to complete his collection.

President of the Wood Collectors Society, which has members in most states in this country and in more than 13 foreign countries, Opdyke isn't merely a mail-order collector. He makes periodic "hunting" trips when he hears of a tree or wood not included in his files. Recently, he had a field day in California, where he claims the wood collector has his greatest opportunity. While there, Opdyke loaded his car with roots of various trees and hauled them to his wood "laboratory" in Cleveland Heights, Ohio.

For years, hundreds of hobbyists scattered throughout the world were collecting various species of wood without any common system. Under Opdyke's direction, the Wood Collectors Society was formed in April 1947. Rules specify that pieces of wood to be used as specimens should measure $\frac{1}{2}$ by 3 by 6 inches. Opdyke has a special filing cabinet that he built to take these sample pieces. It has 43 drawers, each holding 50 pieces.

With this filing system, Opdyke now collects methodically. He checks through his file cards, on which are typed the common name, botanical name, the family, the key number and the location where the wood was found. He checks this data against the list of 100,000 species available in the world. Correspondence with foreign collectors produces missing species. Hearing of nearby "strikes," Opdyke hauls out his saw, gets permission from the owner and cuts down the small tree.

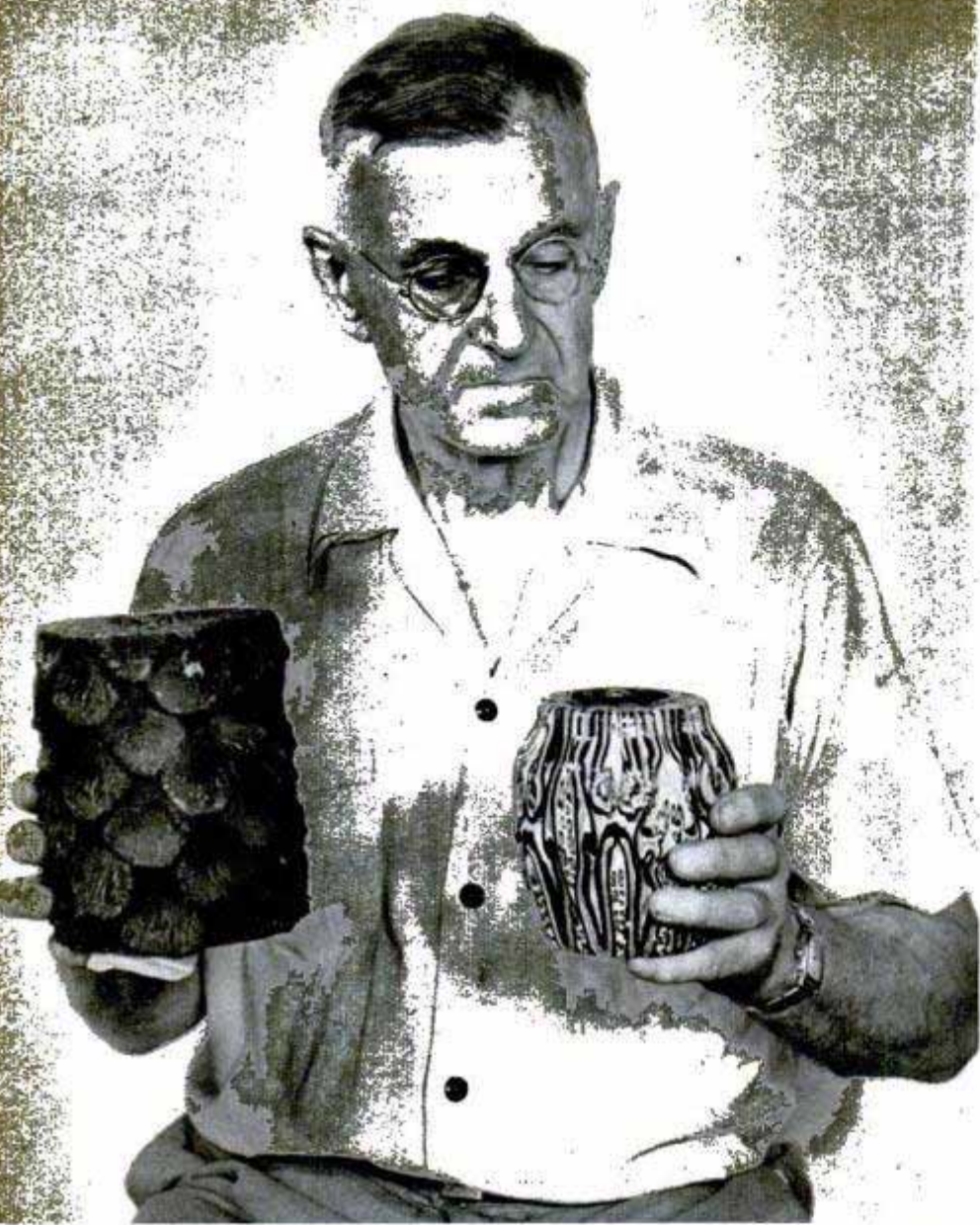
When he brings the specimen home or receives a rough sample through the mail, he hurries into his workshop. The wood is cut with a circular saw. Opdyke prefers



Wood collectors have to be agile at times. Here a man climbs a tree to get a leaf for aid in identification during a field trip through a Texas forest

to get several standard pieces from each sample. The extra pieces he trades with other collectors for specimens not in his collection. Once the pieces are cut to regulation size, Opdyke sands them, catalogues them, types out the required information, pastes it on each piece and files it.

Because of the completeness with which Opdyke catalogues his collection, the filing cabinets would serve as encyclopedias



Not all his collection consists of neat blocks. Opdyke is holding two pieces of an unusual wood sent to him by a foreign collector. The wood is from a New Zealand tree fern. The piece at the left is in its natural state. At the right is a vase made of the same wood

on wood if necessary. Some of his woods, however, have more than scientific interest. One of his exhibits is a piece of the oak flooring that was laid in the White House.

Opdyke started his wood collection by accident. Illness forced him to retire from business. He occupied his time making inlaid table tops and trays of rare woods. When he finished this work, he found that he had 113 different types of wood. The collecting bug bit him right then. Today, the tropics and arctics, the forests and deserts of the world are all represented in his collection. He has the brilliant canary-yellow wood of *Mahonia haematocarpa* from Arizona, redwood from California, ebonies from Africa, heavy rosewood from Brazil, flinty yellow-heart satinwood from Santo Domingo, palms from the Canary Islands and a poisonous sumac from a swamp near Mentor, Ohio. To the wood collectors, wood means more than trees. They also collect specimens of woody plants, such as shrubs, vines and even grasses. Bamboo, for instance, is a grass. Boston ivy is classed as a plant, but Opdyke has a slab hewn from an ivy trunk three inches in diameter.



Three specimens of wood in the rough. Left, the ocotillo, which is a native of Arizona. Center, Jeffrey pine from California. Right, another one from California, this being greasewood-chamiso

When Opdyke first began collecting, he was eager to obtain only woods with pretty colors. Soon he found that there was interesting folklore connected with many of the woods he had gathered. For instance, he has a toothache-tree specimen, which is used in the South to "cure" a toothache. The taste of the wood is worse than the toothache. He has a sample from the manchineel, the poisonous tree growing in southern Florida. It poisons the surrounding air and causes skin irritation if a person passes close to it.

Another interesting specimen is a "pink-ivory" wood which comes from Africa. It is a sacred wood to the natives and the tribal chieftain is the only person who can possess it legally. If another native is found with a piece of the wood, he is quickly executed. Another unusual wood, that of the Ginkgo tree, is a veritable "living fossil." It was held sacred in the Orient for several thousand years. The *Leguminosae* or pea family has thousands of species. It is the second-largest family in the world with its 15,000 different species.

The heaviest wood in the Opdyke collection is the *lignum vitae* and the lightest is balsa. Rarities in the collection include lace barks from the East Indies and New Zealand. Opdyke has the upper parts for these woods, but has been unable to get a sample of the woody part. Also in the unusual category is the Vine of the Cross, a tiny wood from the Dominican Republic, which has a perfect Maltese cross in its center.

As a hobby that has the world as its playing field and yet can be started in your own back yard, wood collecting is becoming a favorite. And certainly there is very little financial investment required. Members of the society sell the sample pieces to each other for 25 cents each, regardless of their rarity. The society's constitution sets this price as the standard.



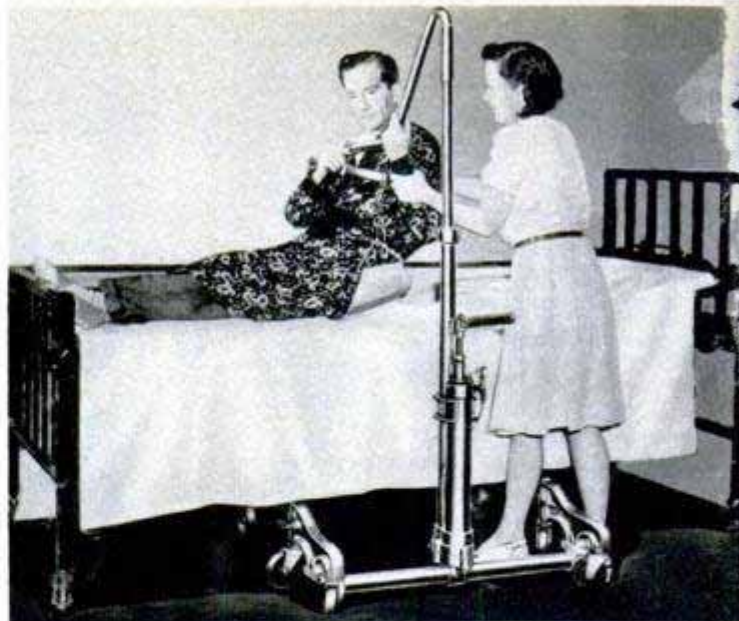
Above, Opdyke gets ready to cut up a piece of *Aralia*, an Ohio wood, into sample blocks. He cuts as many samples as he can from a single piece and sells or trades the extras with other collectors. Below, he removes a sample of Macassar ebony from his large filing cabinet





Pneumatic Spade

Even hard-packed clay can be dug easily with an air-operated spade that combines the features of a shovel with those of a pneumatic drill. Weighing only 18 pounds, the shovel is 19 inches long. A trigger control inside the D-type handle turns the air on and off. Oil from a reservoir in the handle is metered into the air stream and forced through the working parts to lubricate the mechanism as it is used.



Hydraulic Lifter for Invalids

Invalids are lifted in and out of beds, chairs and automobiles by a hydraulic lifter designed for use in hospitals and homes. A canvas cradle, suspended from the lifting arm, is placed under the patient and he is raised when the pumping lever is operated. The lifter operates smoothly without strain on the patient or attendant and its legs fold inward for easy movement through narrow doors and hallways.



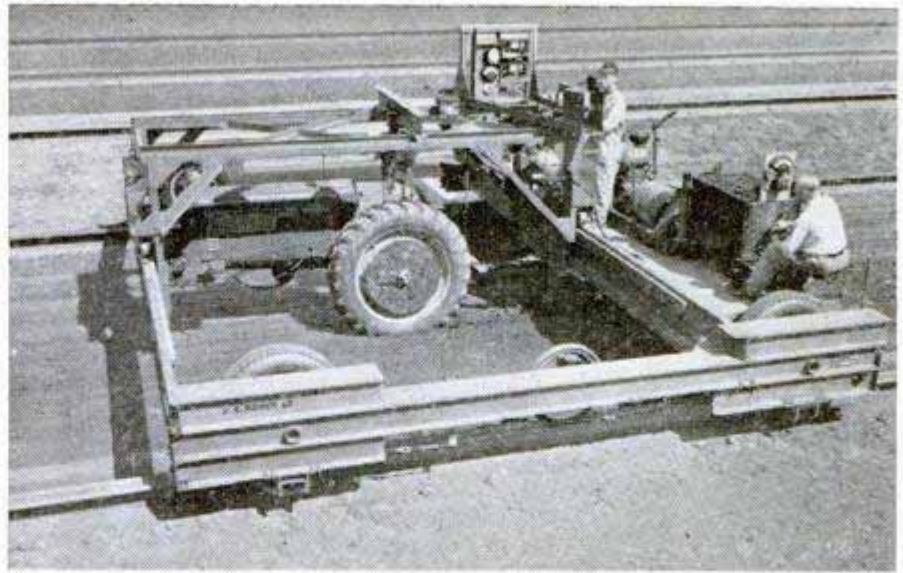
Radio Guides 'TNT' Ships To Blast Enemy Beach

Phantom ships, unmanned but carrying a load of high explosives, were guided ashore by radio to blast enemy beach defenses during the war, the Navy recently revealed. The ships were used only once—during the invasion of southern France—but were scheduled for use in the invasion of Japan. They varied from small sea sleds to cargo ships, PT boats, destroyer escorts and amphibian landing craft, all equipped with radio-control gear. The larger ships could carry up to 7000 tons of high explosives. Especially designed for the project were small craft driven through the water by a conventional propeller, but which could climb across the beach on tractor treads and sidle up to a beach defense position before the explosive was set off. Larger ships could have been equipped with television cameras to show the remote-control operator what lay in the path of the robot vessel.



Tractor-Tire Tester Checks Tread Design

Improved tread designs for tractor tires may result from tests with a special machine at the Department of Agriculture's proving grounds at Auburn, Ala. A tractor equipped with a single tire is mounted inside the framework of the power machine. It then is driven over a prepared soil bed while instruments measure the drawbar pull, traction and slippage of the tire. Each tire is tested with 12 different loads in three types of soil to approximate most field conditions. The purpose of the research is to design



tractor-tire treads that will have greater traction with a corresponding saving in gasoline consumption.



War-Surplus Gas Covers Protect Plants From Frost

Plants are protected from frost by plastic covers that were issued to soldiers during the war as protection against gas attacks. The covers, which protect plants up to five feet tall, can also be used to isolate plants during spraying. When not in use, the covers fold into a small package.

Flame-Thrower's "Jelly" Used as Boiler Kindling

Fires in giant industrial boilers are started more quickly with thickened fuel, a wartime material used in flame throwers and incendiary bombs. The jellylike substance is made of diesel oil and aluminum soap. It brings boilers to full operating pressure in 30 minutes, compared with the eight hours usually required. Because it can be spread over the entire grate, the material shortens the time required to build up a fire.

One Filling of Flameproof Motor Oil Lasts Life of Car

Because it won't burn, a new lubricating oil perfected in England is said to enable automobiles to run for a lifetime on one filling of oil. By displacing the hydrogen in hydrocarbons, the base of all lubricants, with fluorine, the British scientists made the oil noninflammable. If the motorist uses an efficient oil filter, he will be assured of a constant supply of oil provided there

are no leaks in the lubricating system, the scientists claim. The flameproof nature of the oil also will reduce fire risks in aircraft and ships.

☐Forty-two percent of the cars and thirty-seven percent of the trucks in use today are over 10 years old, according to the Automobile Manufacturers Association.

science hits the bull's-eye



By Morris Chaklai and Allan Rechtschaffen



ROBIN HOOD may have been a whiz with the bow and arrow, but he would have a tough time competing with modern archers. Spark chronographs, synthetic materials, prismatic sights, electronic pictures, mathematical computations, and even psychological principles are helping produce scores that would have stumped not only Robin Hood but archers of a couple of decades ago.

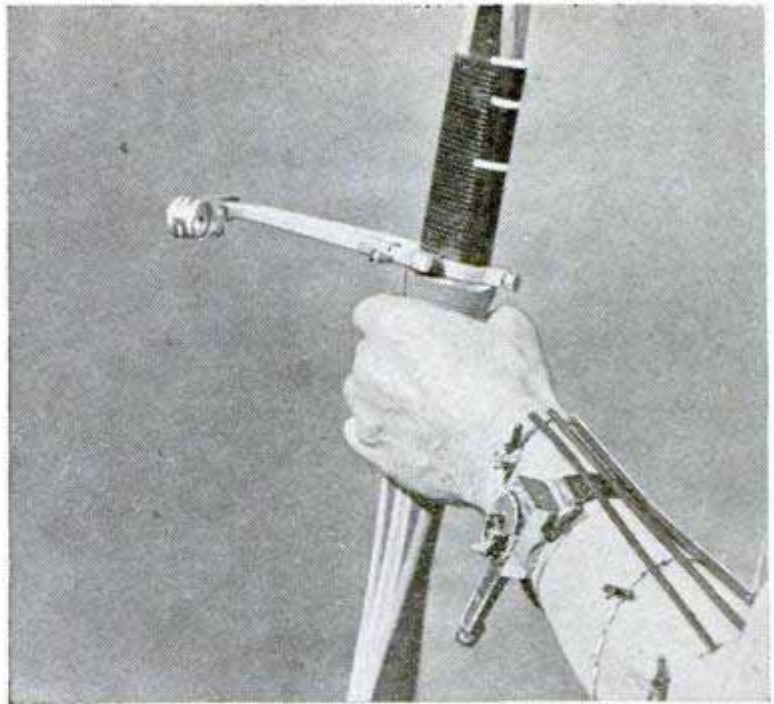
Whereas a score of 500 in an American round (30 arrows each at 40, 50 and 60 yards) was enough to top a tournament 20 years ago, the archer of today must hit 700 or better out of a possible 810 to put a first-place trophy on his mantelpiece. Women are putting in unheard of scores and, for the first time in history, they are giving the men a run for their money.

But the scientific development of archery was long neglected. The bow and arrow, one of man's first inventions, provided him with a means of existence, enabled him to conquer new lands and determined in large measure the destiny of nations until a comparatively recent date. Yet the scientific sages ignored the improvement of man's earliest great weapon until 1929.

In that year, Dr. Clarence N. Hickman, now a physicist at the Bell Telephone Laboratories, published the first scientific paper on archery — "Velocity and Acceleration of Arrows." During the last two decades—a span infinitesimal in the vast history of archery—more has been done to improve the bow and arrow than

Dr. Clarence N. Hickman drawing his new center-shot flight bow. Note cutaway center part

Right, Doctor Hickman's prismatic sight, timer, arm guard. Plunger under timer on wrist is pushed up before each shot and clicks out after a few seconds — signal to shoot arrow



in the entire 50,000-year existence of the weapon.

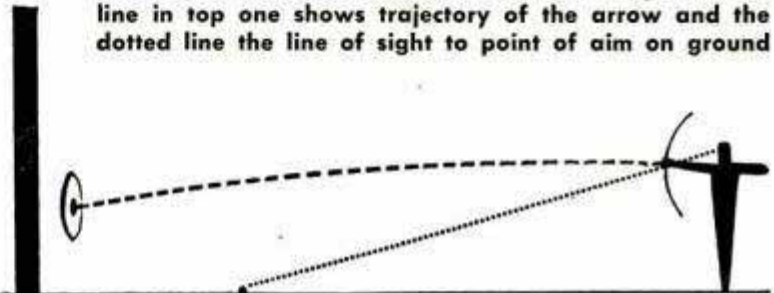
Regarded as "the Father of Scientific Archery," Doctor Hickman's interest was derived from his grandfather, who learned to shoot from the Cherokee Indians. As a boy, Doctor Hickman hunted fish in Lizton, Ind., by shooting umbrella staves at them. He took up archery as a hobby and later, as a research physicist, became interested in the physical aspects of the sport.

Doctor Hickman's first experiment with the bow and arrow was prompted by the fact that he was not strong enough to pull a heavy bow. By measuring the force required to pull various bows, and by measuring the velocity of arrows shot from them, he found that the application of some reinforcing material on the back of the bow, the side away from the shooter, considerably enhanced the efficiency. Thus, by gluing some material like fiber on the back of the bow, the archer is able to shoot his arrow farther and faster without proportionately increasing the force required to draw the string.

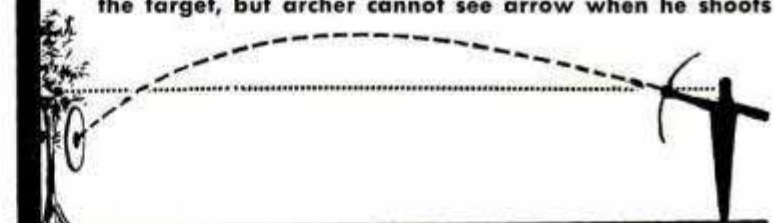
In the course of these experiments, Doctor Hickman developed an automatic shooting machine which could release every arrow in exactly the same way, enabling him to get accurate results. This device was used in many subsequent experiments in studying arrow velocity. Even more important, he developed a spark chronograph for measuring the velocity of arrows. When Doctor Hickman was placed in charge of rocket development by the National Defense Research Committee in 1940, he made extensive use of a modified version of this chronograph in testing the velocity of rockets.

After proving the worth of reinforcing bows with some sort of backing, Doctor Hickman kept on the lookout for suitable backing materials. Rawhide had been used as a bow backing in ancient times,

Drawings below illustrate methods of aiming. Dashed line in top one shows trajectory of the arrow and the dotted line the line of sight to point of aim on ground



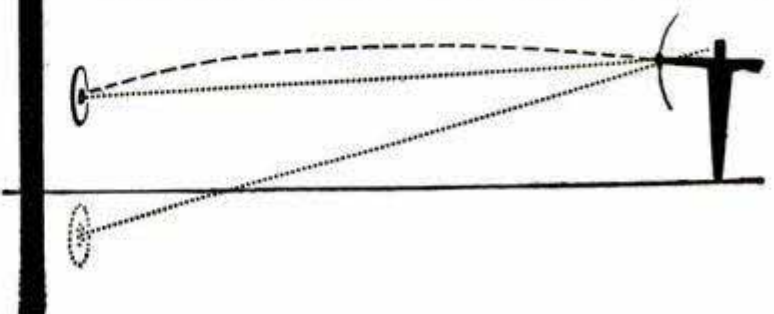
Here the bead of a mechanical sight is put in line with the target, but archer cannot see arrow when he shoots



This is another example with different positioning of mechanical sight, but archer still can't see his arrow

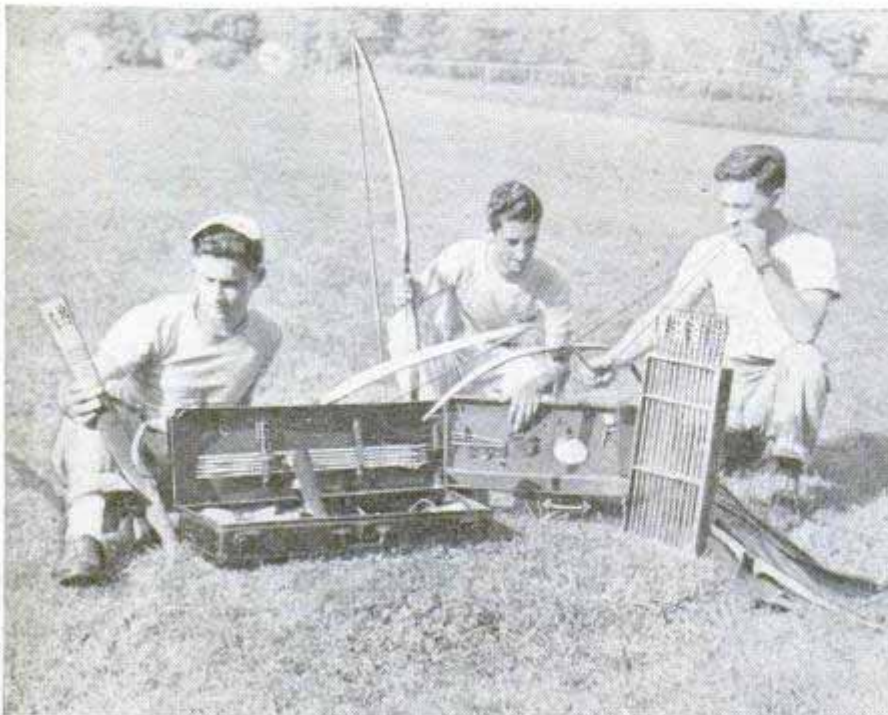


With Doctor Hickman's double prismatic sight archer can see both the arrow tip and the target at the same time





With 25-pound center-shot bow Doctor Hickman shot farther in 50-pound-class match than all but one contestant. Shooting close to center results in flatter trajectory since arrow loses no force in curving around the bow. Below, tournament gear includes aluminum arrows, range finders, sights



but as some experiments showed, unless it was applied just right, it actually lessened the efficiency of bows. In many cases, it only increased the strength required to draw the string without substantially increasing the distance or the speed with which the arrow traveled.

Doctor Hickman finally hit upon a new synthetic substance for bow-backing purposes, Celanese Fortisan. While working at his ballistics laboratory in Cumberland, Md., during the last war, he learned of a new secret fiber which was being used for parachute shrouds. He obtained samples of it and found that it was ideal for bow backings and bowstrings, since it was even stronger than nylon and three times as strong as silk, which he had been using previously.

Doctor Hickman searched for means of getting the bow to do more work and keeping the archer from becoming exhausted. For centuries weaker archers had been excluded from such aspects of the sport as flight shooting, which is shooting for distance. This was just a question of having enough strength to draw an 80 or 90-pound bow. Doctor Hickman delved into a mass of mathematical computations and experiments and emerged with the most efficient bow ever developed in the history of archery.

Sporting a radical new design, in addition to the most favorable features of the ancient weapons, the new bow is nearly 100 percent more efficient than most of those in use today. The proof is in Doctor Hickman's success in flight shooting.

Last year he entered the New Jersey State Flight Shooting Championships in the 50-pound class.



While most of the competitors took advantage of the maximum weight allowed, Doctor Hickman used his new bow, a 25-pounder. He came in second, shooting farther than many who were using bows twice as strong.

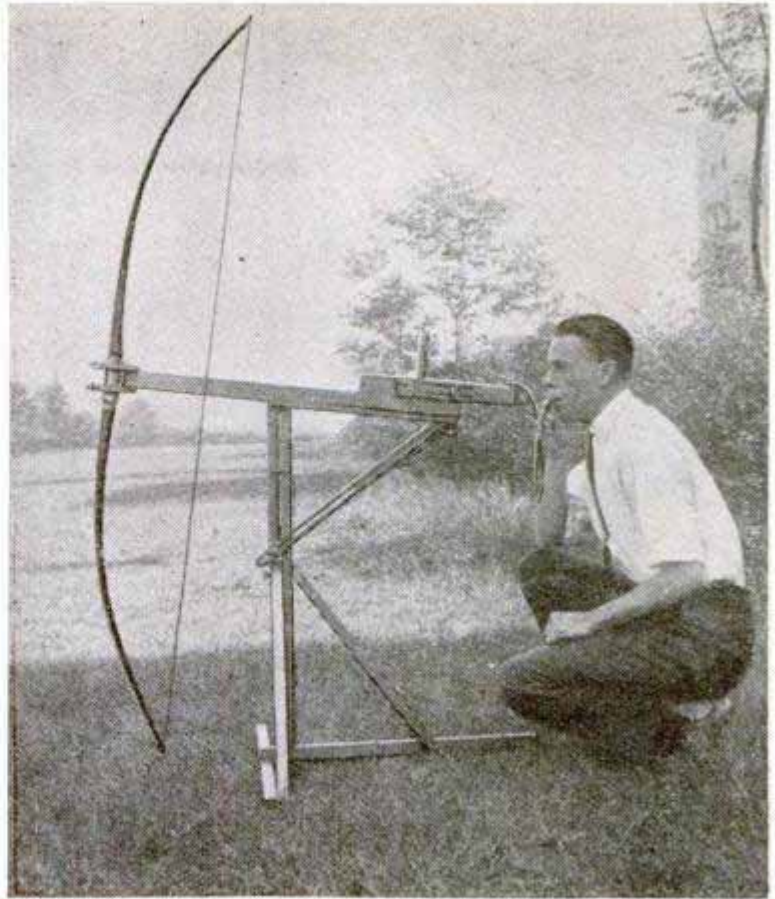
The new bow is a reflexed, recurved, bizarre-looking affair whose limbs are semicircles curving away from the archer when at rest, resembling a figure 3. When at full draw, the limbs straighten out and the string makes an angle of 90 degrees with the tips of each limb. This construction permits the use of short limbs with relatively long arrows, an ideal setup for gaining velocity and distance.

Although the bow is still in the experimental stage, preliminary results have been encouraging. It may be looked upon as an oddity by those who are used to the graceful curves produced by the traditional English longbow.

This will not be the first time Doctor Hickman's scientific evidence has bucked tradition. When the sporting scientist showed that a bow of rectangular cross section was more efficient and durable than one with a rounded belly, many tackle makers laughed and continued to round the inside of their bows. But the desire for greater accuracy finally won out.

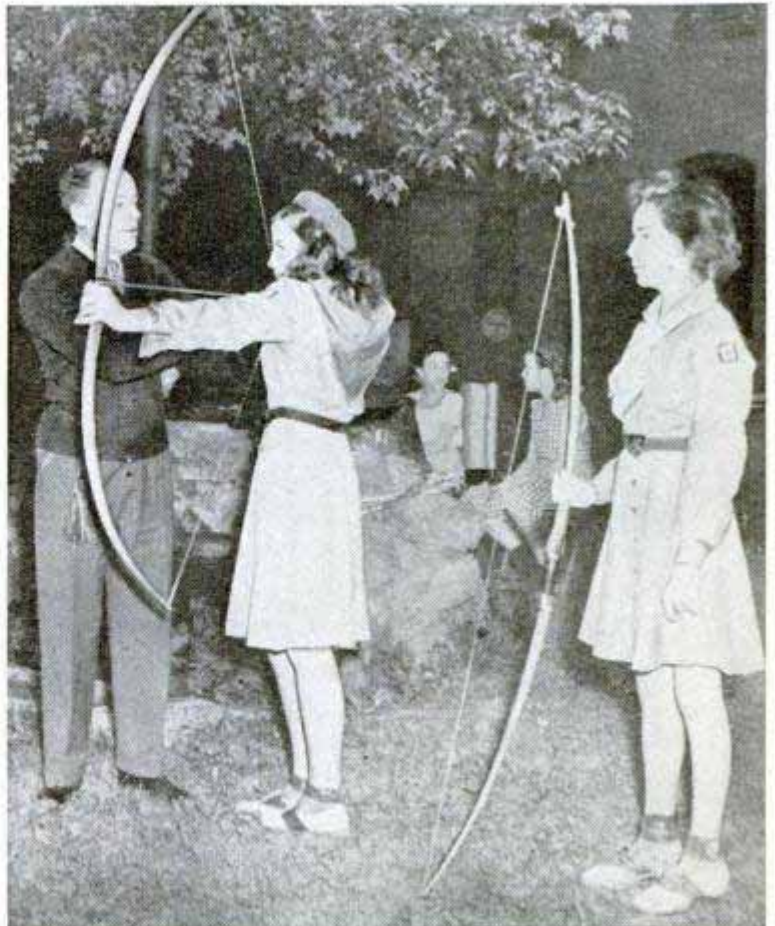
One by one, tackle makers converted to flat-bellied bows. As Doctor Hickman pointed out, there

(Continued to page 252)



Top left, Doctor Hickman's center-shot bow (left) compared with orthodox English longbow. Above, his shooting machine, first used in 1929, measures velocity of arrows and marked the linking of technology and archery to improve this ancient sport

Doctor Hickman explains to Girl Scouts that it takes proper form as well as modern equipment to acquire archery skill

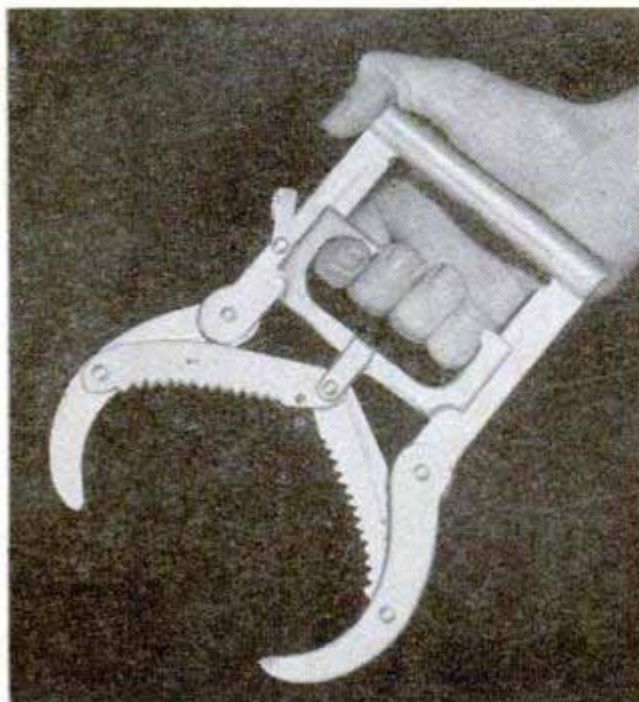




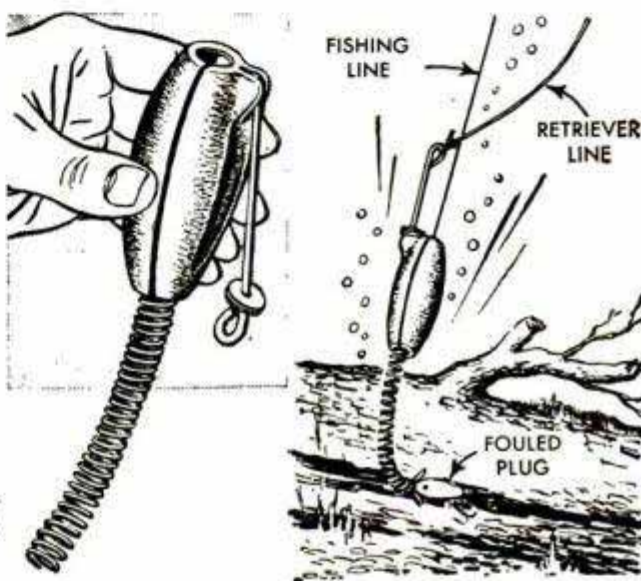
MAGNETIC FLY BOX holds fragile flies firmly without danger of crushing hackles or wings. Small permanent magnets grip the hooks, eliminating clips

New Angles for Anglers

METAL CLAW takes the place of the usual landing net. Pressure on the sliding handle closes the jaws of aluminum, locking the fish in an 800-pound grip

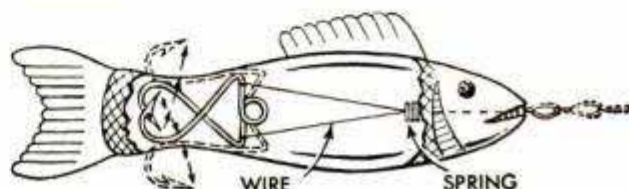


PERSONAL BAIT BUCKET floats alongside you as you wade, keeping your supply of minnows always handy. Tied to the belt by a short line, the bucket is kept afloat by a buoyancy chamber inside the lid



PLUG RETRIEVER consists of a heavy weight and a coiled spring. You slide it down the line and, by jerking it up and down, jostle the fouled plug free

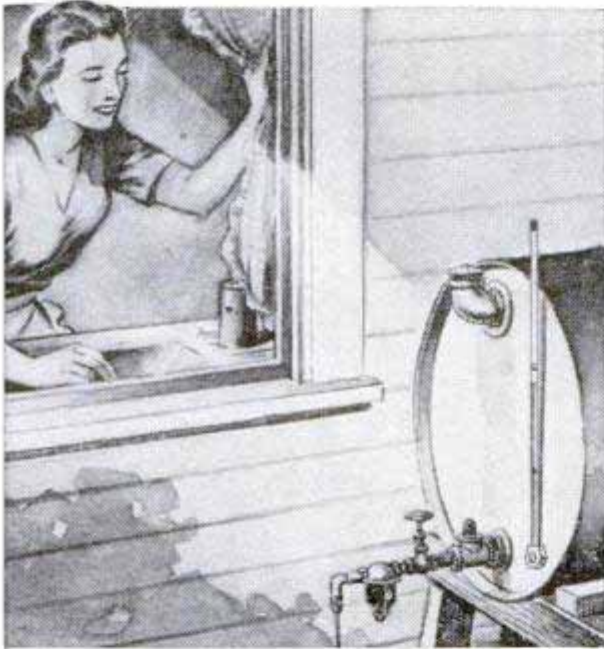
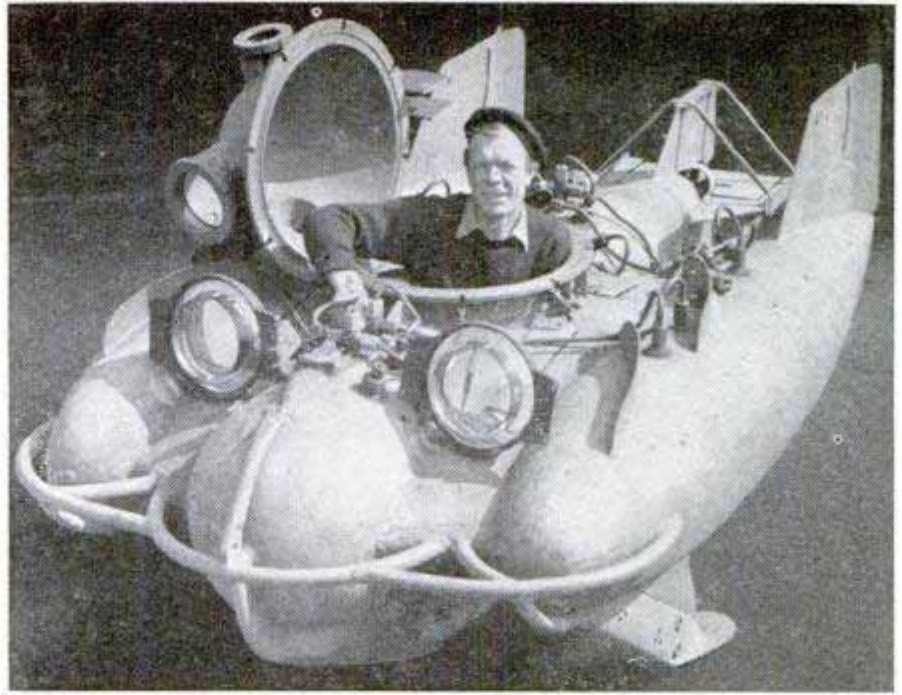
CONCEALED HOOKS on this lure, below, make it virtually weedless. Two retractable hooks are held inside the lure by a spring during trolling. When a fish strikes, the pull on the line ejects the hooks



POPULAR MECHANICS

Midget Sub

Built from scrap found in a Hamburg, Germany, junkyard, a midget submarine is designed to move along the ocean bottom in search of ship wreckage. Peter Luetjens, a mechanic, built the craft and claims he can descend 300 yards and remain underwater four hours. The little craft must be towed by a surface vessel. Two searchlights capable of penetrating 20 yards at a depth of 70 yards provide light for the inventor's underwater excursions. The sub is divided into three compartments.



Gauge on Oil Drum Is Easy to Read

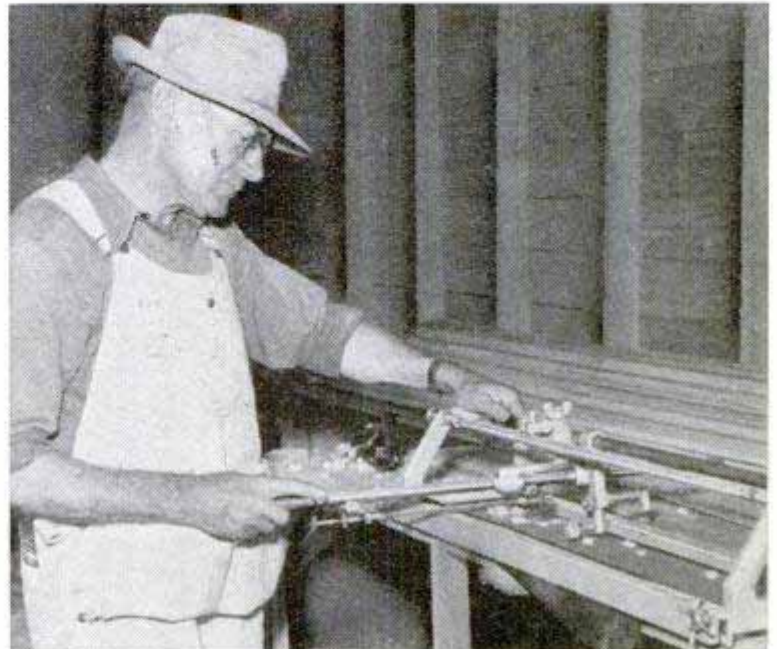
Installed with a hammer and screwdriver in less than a minute, a liquid level gauge for oil drums has no moving parts to get out of order or adjustment. Because of this it will give accurate readings for years without attention. The transparent tube is formed of unbreakable plastic and has an easy-to-read scale etched into it. One screw holds the gauge against the drum and neoprene washers prevent leaks.



Frame Guides File For Saw Sharpening

Even a novice can sharpen saws correctly with a portable frame that clamps to the workbench. The saw blade is held vertically in the base of the frame and the file is guided along a track at the correct angle to sharpen the teeth. A rectangular guide rod along the top of the device is notched on each side to control file movement for four different types of saws.

☐ The mass of the earth is 6,586,-000,000,000,000,000 (six sextillion, 586 quintillion) short tons, according to the General Electric Research Laboratory.



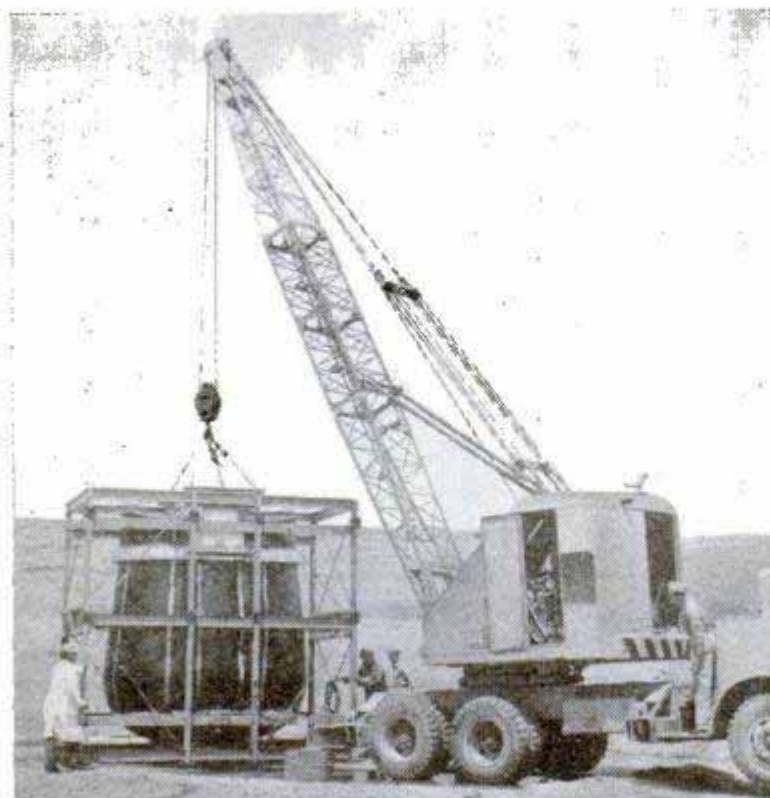
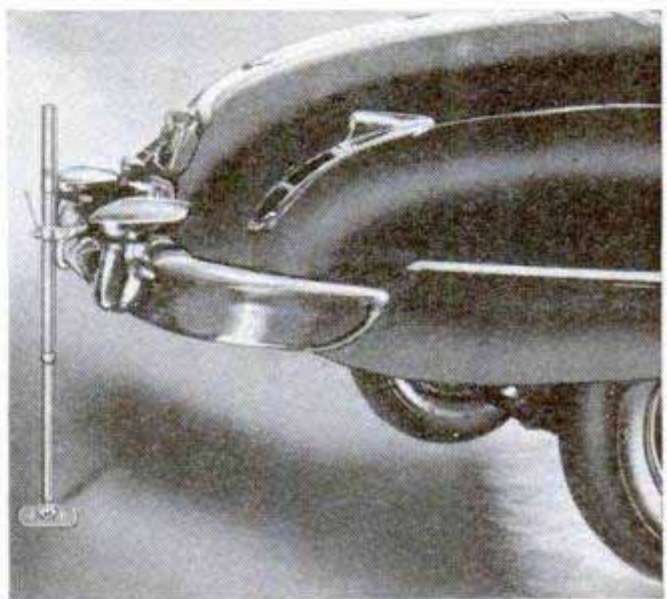
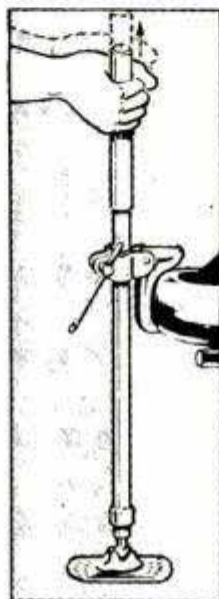


"Jackknife" Harrow Works Three Ways

Consisting of two sections joined by a giant hinge, a tractor-drawn implement serves as a bush-and-bog harrow, a cutting harrow or a pulverizing harrow. The back section, made up of plain disks, swings up over the front scalloped-disk section to add weight for use as a bush-and-bog harrow. With the rear section down, the implement becomes a pulverizing or cutting harrow.

Sleeve-Type Handle Raises Car Jack

Only a few pumps of the vertical handle of a hydraulic bumper jack are required to lift a car wheel off the ground. When the sleeve-type handle is rotated, the car lowers itself. The bumper hook is so designed that the jack can be used on any kind of car. A ball on the bottom fits into a socket in the base. The lifting range of the jack is 18 inches and its weight is 10 pounds.

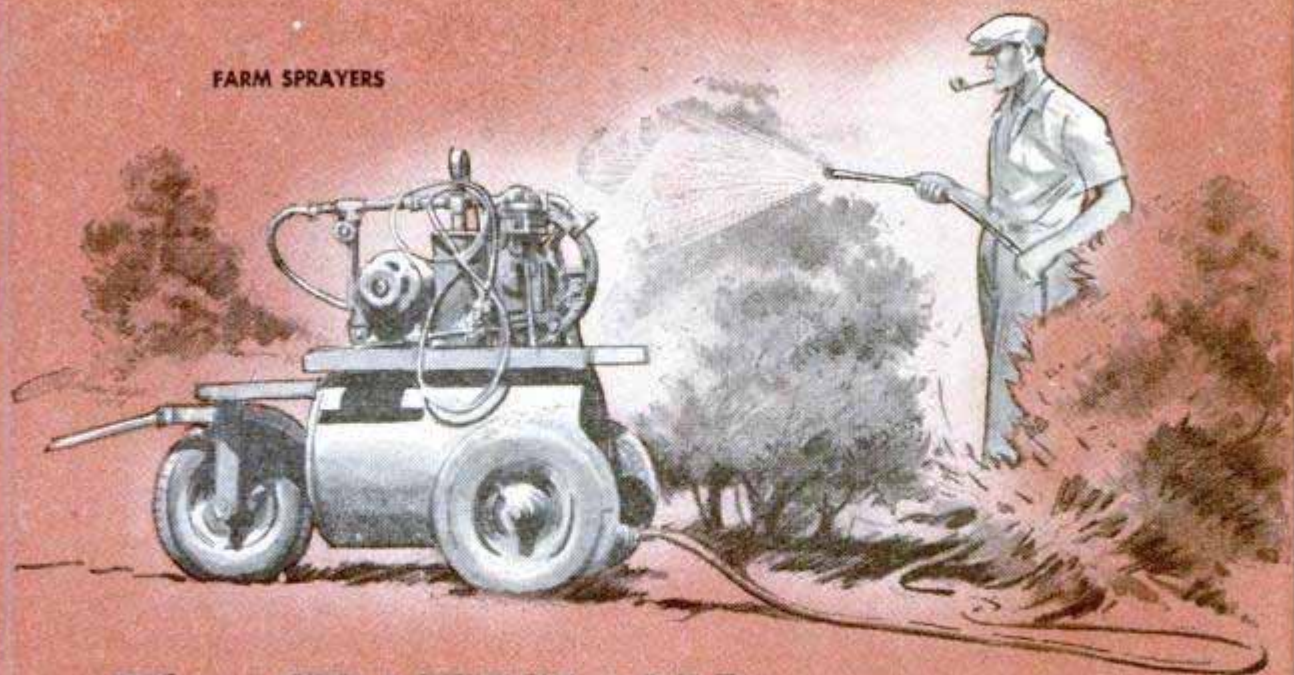


Giant Fuel Tank for B-36 Has 3000-Gallon Capacity

Big enough to serve as a filling-station storage tank, a giant airplane fuel tank for the Air Force's mammoth B-36 is so heavy it has to be moved around with a mobile crane. To protect the tank during shipment, a steel shipping crate is used. The 3000-gallon "fuel cell," which is self-sealing and will be carried in the plane's bomb bay, was designed and built by Firestone for Consolidated-Vultee's six-engine sky giant. It was recently tested for damage by gunfire at the Muroc Dry Lake firing range in California.

☐ Carrying only meteorological instruments, an Army Signal Corps balloon reached an altitude of 140,000 feet, setting a record for ascent into the stratosphere.

FARM SPRAYERS



The CRAFTSMAN

★ Designed and built by practical farm craftsmen, the power sprayers pictured and detailed on page 226 cover just about all the requirements of both farmers and orchardists. One, a self-contained, electrically driven unit, is designed to handle any of the common materials which are sprayable, from insecticides to paint. The other, a heavy tractor-drawn unit, is made especially for field spraying in row crops, but it can be adapted to orchard spraying, weed killing and spraying ornamental trees.

★ One evening of pleasant home-shop work will give you an attractive finished project in hand-hammered metal. Although hammered craft pieces are almost unlimited in design possibilities, we have selected six patterns in hammered-copper ash trays, page 182, as being the easiest to finish in one short evening.

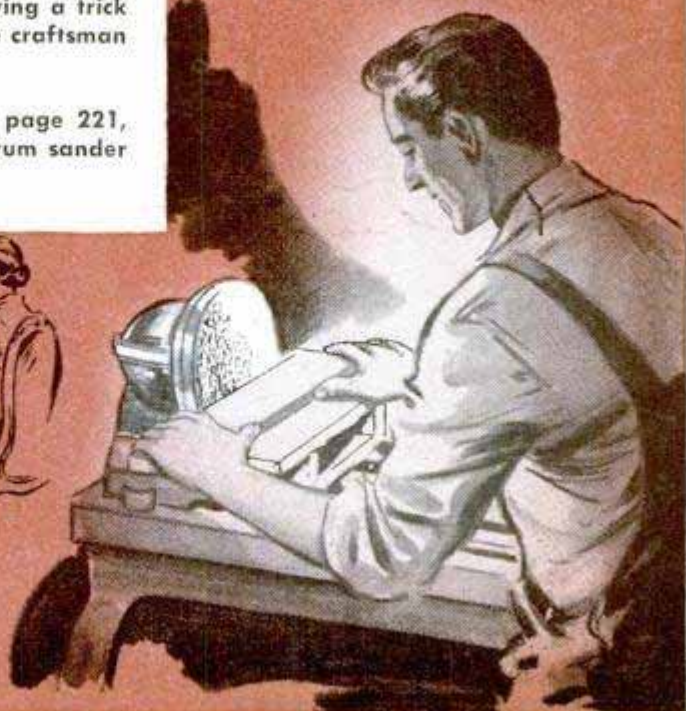
★ A wooden trinket chest, page 208, having a trick lid and a charred or sugi finish, offers the craftsman something new in woodworking.

★ Practical shop feature for the month, page 221, gives instructions for fitting a disk and drum sander to your wood lathe.

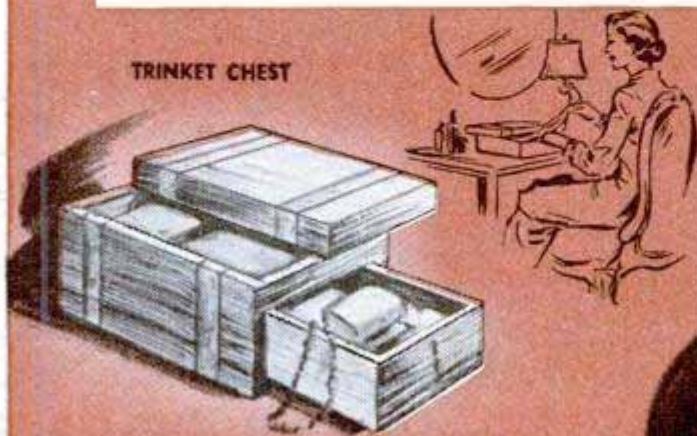
HAMMERED ASH TRAYS



LATHE SANDERS



TRINKET CHEST

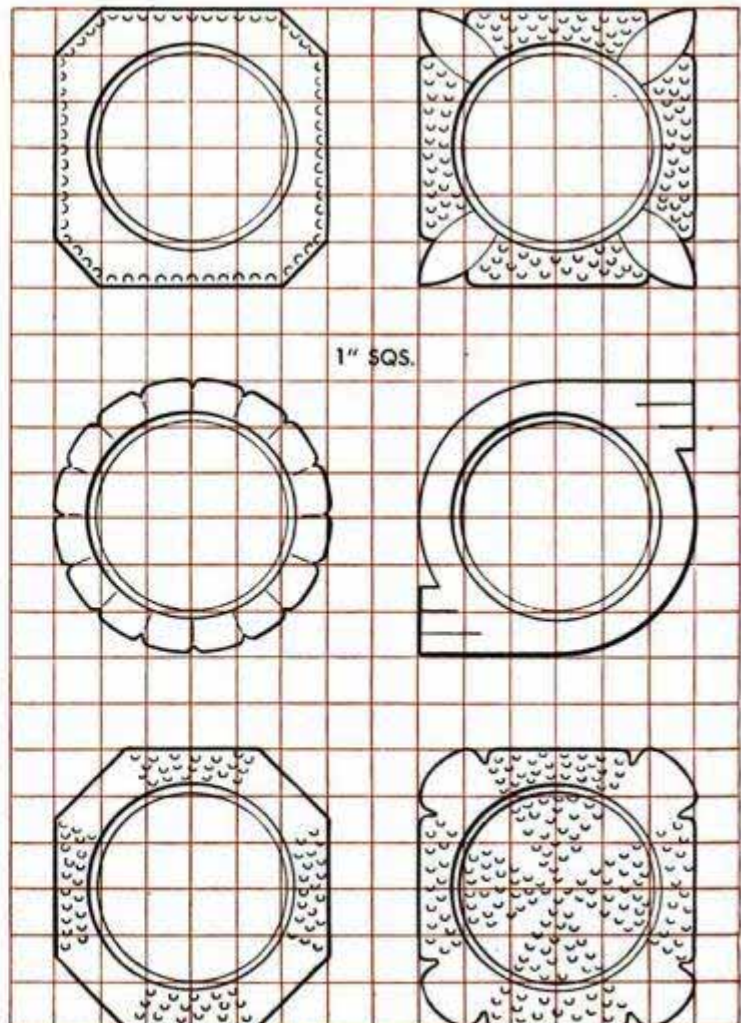
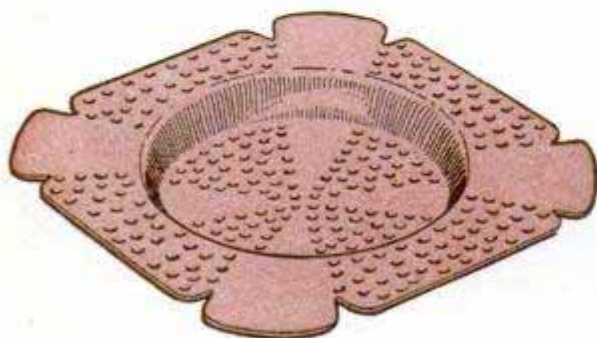
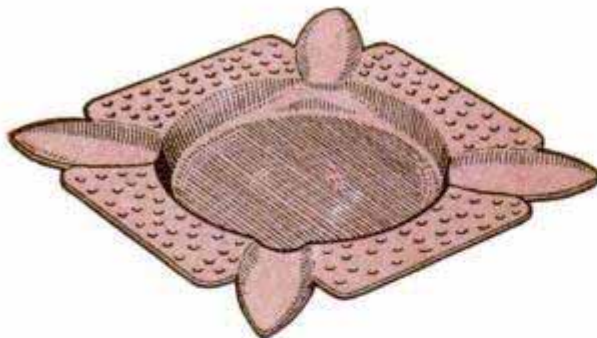
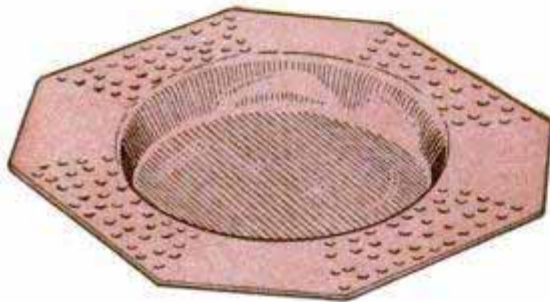
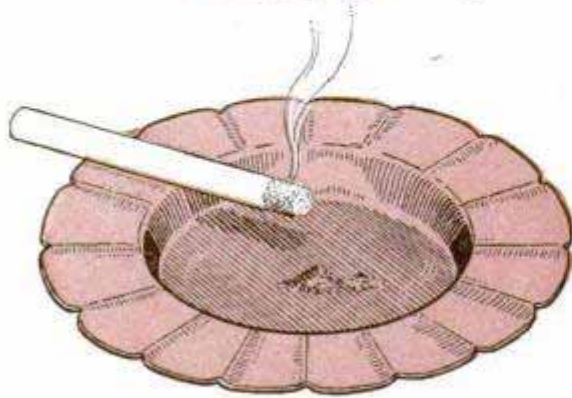
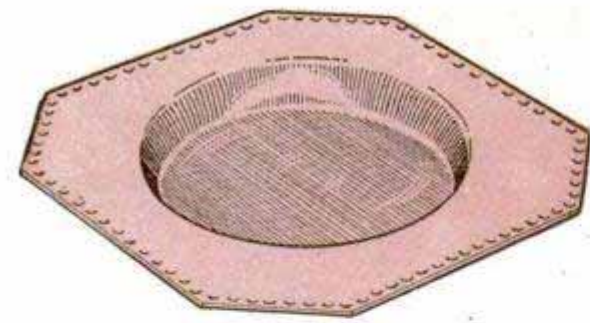


HAMMER 'em

By Ralph S. Wilkes

HAND-WROUGHT in copper and highly polished, these gleaming ash trays are smart accessories for a basement rumpus room. The series of eight progressive steps pictured on the opposite page show how a tray is made. The mold is made by recessing a hardwood block $\frac{3}{4}$ in. deep, and the tools required are improvised from a tack hammer, a nail set, a small cold chisel and a wooden mallet. Each of the six designs given below requires a piece of copper 6 in. square which is annealed by heating it until it is purple in color and then quenching immediately in water. This softens the metal and reduces the chances of tearing it when hammering. The annealing operation is done once or twice during the forming. The rounded nose of the tack hammer is used to iron out any wrinkles in the metal at the corners of recess.

Dishing is done with the rounded end of the wooden mallet by centering the metal over the mold and working in toward the center from the outer edge of the depression in the block. As the dishing progresses,



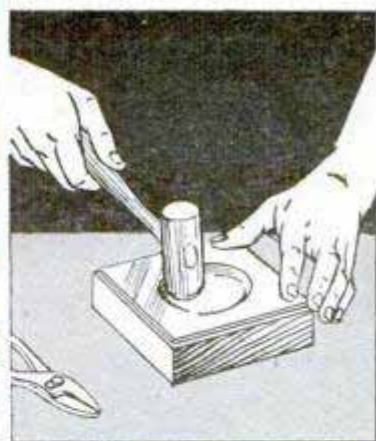
in COPPER

the metal will wrinkle at the rim. This is annealed and hammered flat with the smooth end of the mallet. When dished, the desired design is drawn on the rim of the tray with a pencil and cut with tinner's snips. The rough edges of the metal are smoothed with a fine file. The completed tray can be ornamented by engraving, peening or etching.

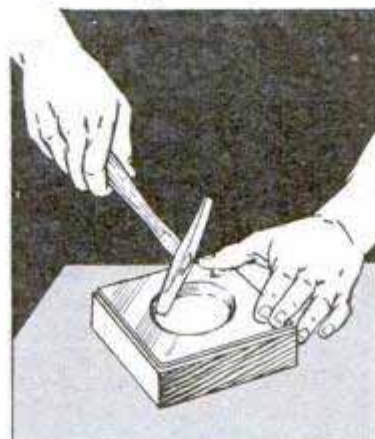
The trays can be finished in several ways. A satin finish is had by merely rubbing the metal with fine steel wool and a high polish can be obtained by buffing with jewelers' rouge. Another attractive finish is had by dipping the metal momentarily in a solution of nitric acid, one part, and water, four parts, and rinsing immediately in water. Care should be taken in handling the acid to avoid getting it on the hands or clothing. Whatever treatment is used, the finish should be protected from tarnishing by coating the metal with clear lacquer, applying it with a brush or spray gun.



1st—Anneal copper by heating, then quenching in water



2nd—Dish metal by hammering into turned wooden mold



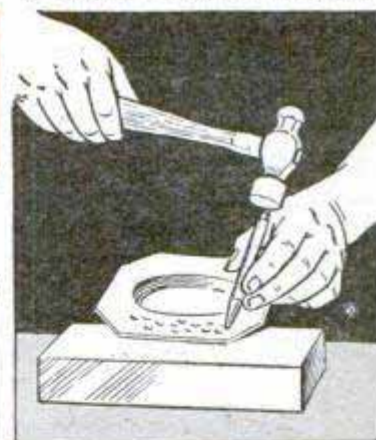
3rd—Use a tack hammer to iron out wrinkles in corners



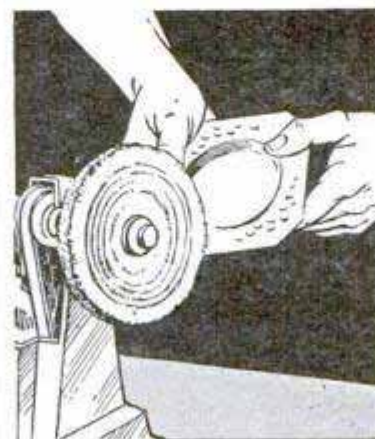
4th—Mark rim design with a pencil, following patterns



5th—Snip off corners. Then smooth rough edges with file



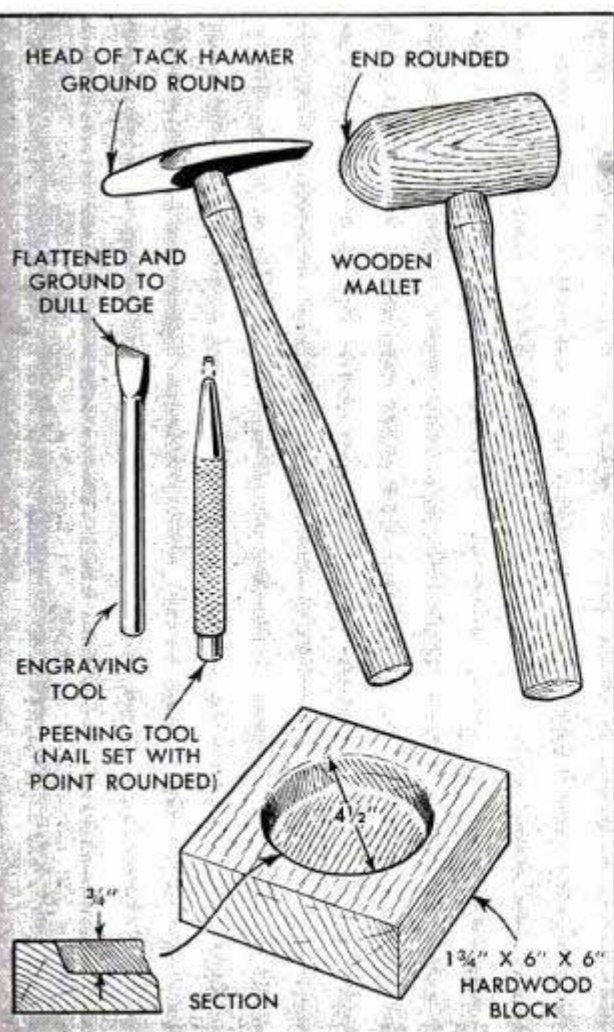
6th—Use rounded end of nail set for a peened effect



7th—Buff metal to obtain a bright finish by using rouge



8th—Prevent tarnishing by applying coat of clear lacquer

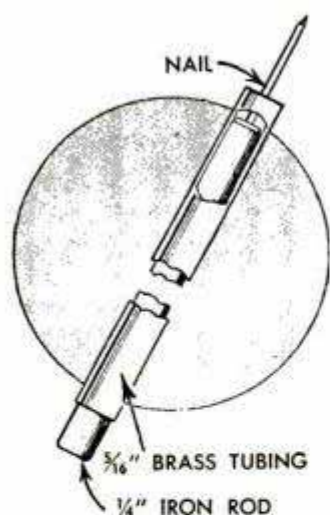




Ice-Cream Mix Frozen Quickly By Using Home Freezer

In making ice cream, the use of crushed ice and salt can be eliminated by suspending the ice-cream mix in a home freezer. Remove the ice container from an electric ice-cream freezer and fit the mixing unit into a wooden frame. Then, assemble the unit with the container in place, remove one of the covers from the home freezer and place the unit in the freezing compartment while mixing.—Thomas E. Stimson, Jr., Los Angeles, Calif.

Extension Aids Driving Nails In Hard-to-Reach Places



end. With the nail held in position by the tubing, the projecting end of the rod is hammered to drive the nail. If desired, the rod can be magnetized to hold the nail straight.—S. L. Tish, Bronx, N. Y.

☞ Plain vinegar will remove fish odor from your hands, pots and skillets.

Emergency Eye Shade Fits Glasses

Mislaying an eye shade necessary to your work is not serious as a substitute can be cut from paper. Cut out the shade as in photo and slip it over the frame of your glasses.



Magnet Holds Spring for Cutting

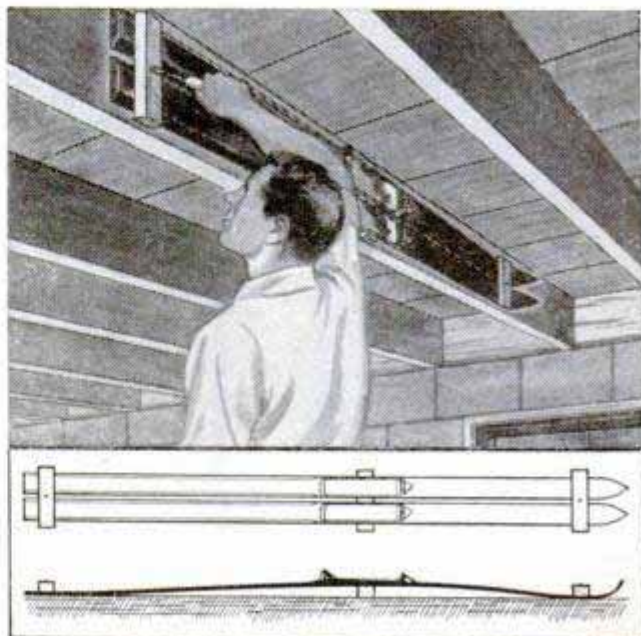
When cutting off the end of a coil spring with a cold chisel, the severed end can be kept from flying off by use of a strong horseshoe magnet. Lay the magnet on the anvil and rest the spring against it so that the ends of the magnet contact the spring on each side of the cold-chisel blade.—G. E. Hendrickson, Argyle, Wis.



Stored Skis Retain Proper Arch If Clamped on Ceiling Joist

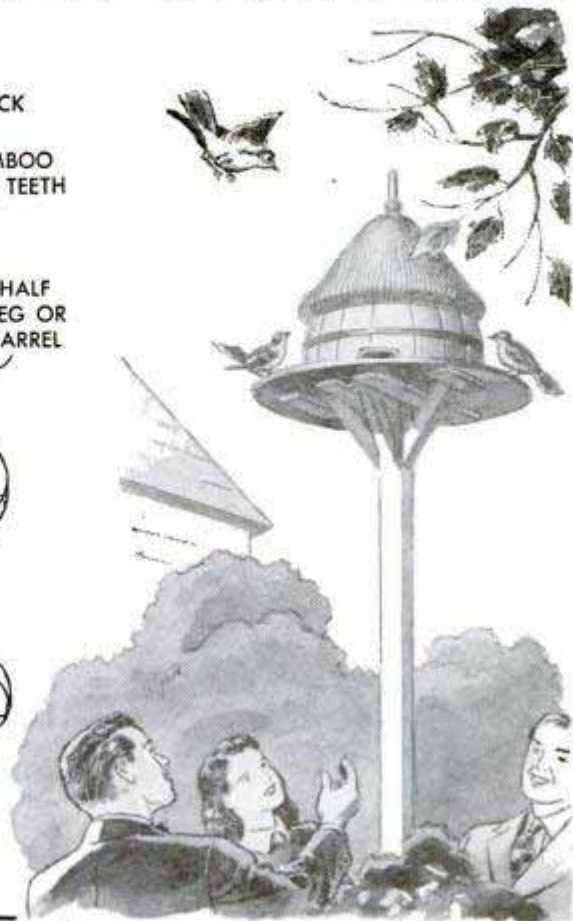
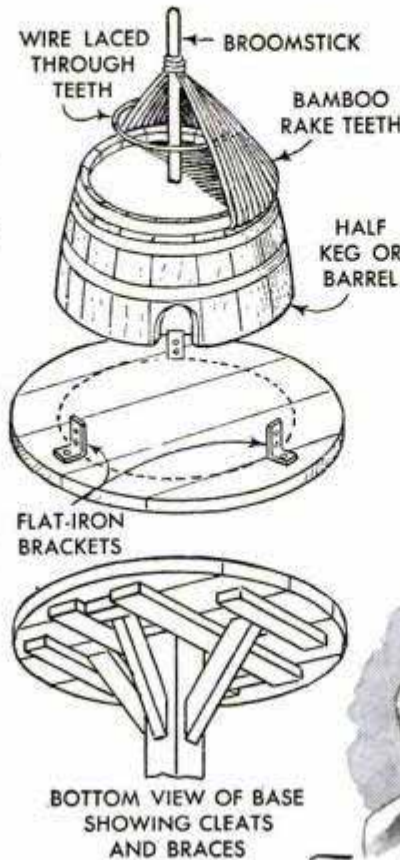
Finding that one ski repeatedly lost its arch when the pair was stored in the usual manner, one man now stores his skis by fastening them to a basement ceiling joist. The ends of the skis are held to the side of the joist by simple clamps consisting of pieces of 1 x 2 screwed to the joist. A block of the necessary thickness placed under the skis retains the proper arch when the clamps are drawn tight.

H. E. Winchester, Salt Lake City, Utah.



A nail keg or small barrel, cut in half and anchored to a wooden platform, makes an attractive birdhouse when mounted on a post in the back yard. The house has an unusual thatch roof which is made by tying bamboo rake teeth to a center pole and lacing a piece of wire through them to hold them against the rim of the keg. The roof pole is simply a piece of broomstick forced into an under-size hole drilled through the end of the keg. The platform or base of the house is made as shown in the lower detail and is fastened to the post with wooden braces. Flat-iron brackets or steel corner plates anchor the house to the base. Although the original birdhouse had only one opening, another opening or two can be added and the house partitioned, using plywood or hardboard panels.

Birdhouse Constructed From Nail Keg Has Appearance of Thatch-Roofed Hut

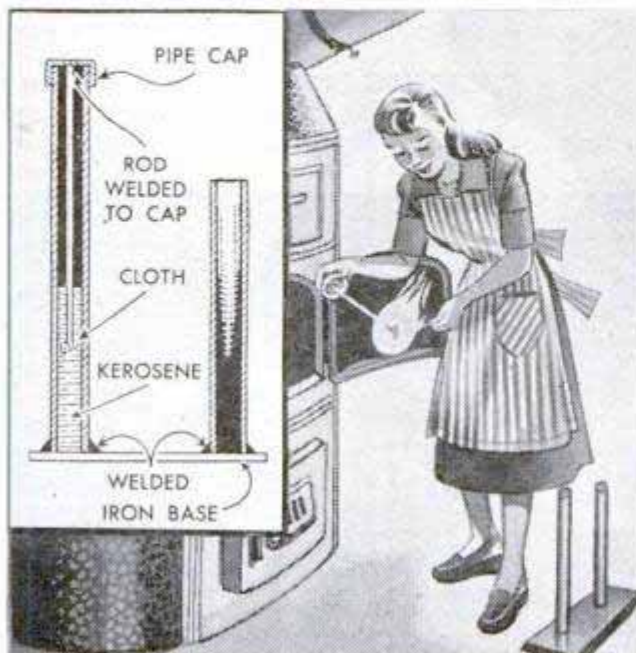


Kerosene Torch Aids Lighting Furnace Without Soiling Hands or Clothes

After you've placed kindling and fuel in the furnace there's the problem of lighting it without getting hands and arms smeared with greasy soot from the edges of the fire-door opening. That's where this long-handled kerosene torch comes in handy. It's simply a length of rod welded to a pipe cap, a piece of cloth being tied around the

end of the rod. The rest of the unit consists of two lengths of pipe welded to an iron base. One pipe contains kerosene and the other, a shorter one, is left empty to serve as a "snuffer" for putting out the lighted torch safely. When the torch is not in use, its cap is turned onto the threaded end of the longer pipe, thus preventing the kerosene from being spilled if the unit is knocked over. The level of kerosene should be high enough to keep the cloth saturated.

Jack Lee Thompson, Nocona, Tex.



Bowl Cover Catches Crumbs

When grinding dried bread or crackers in a meat grinder, slip a plastic bowl cover over the end of the grinder to catch the crumbs. It will keep them from being scattered over the table top.

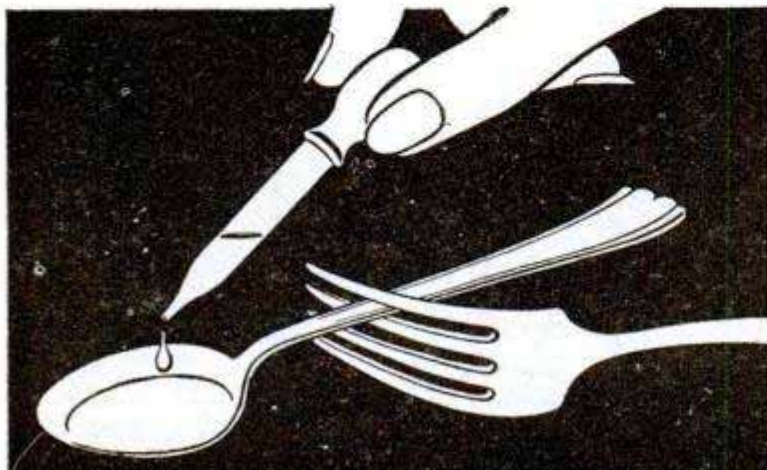


☐ Bread and other baked goods will remain fresh longer in camp if half a potato is placed in the bread container.

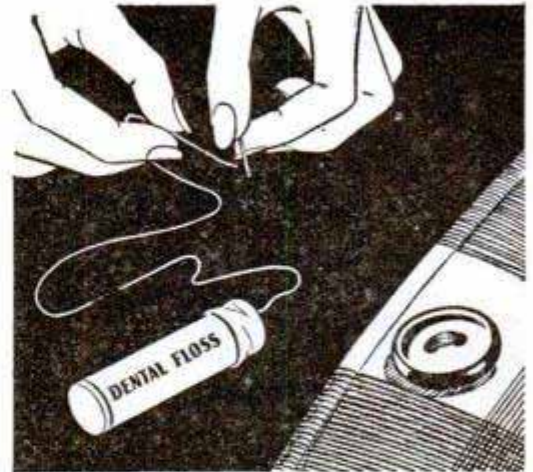


WAFFLES WON'T STICK to waffle-iron grids if the latter are cleaned by brushing with baking soda. Applying the soda with a stiff, wire-bristled brush will remove all the discoloration

WHEN MEASURING LIQUIDS of two or more kinds into a teaspoon with an eye dropper, both hands are left free if the handle of the spoon is propped between the tines of a fork



SOLVING

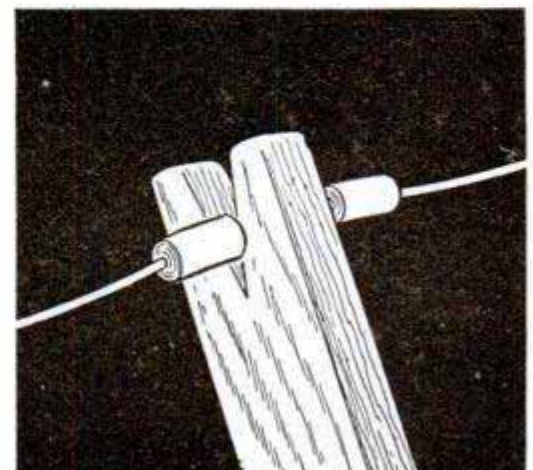


TO SEW BUTTONS on children's garments and men's work clothes use dental floss instead of ordinary thread. The dental floss is considerably stronger than thread and better able to withstand rough usage

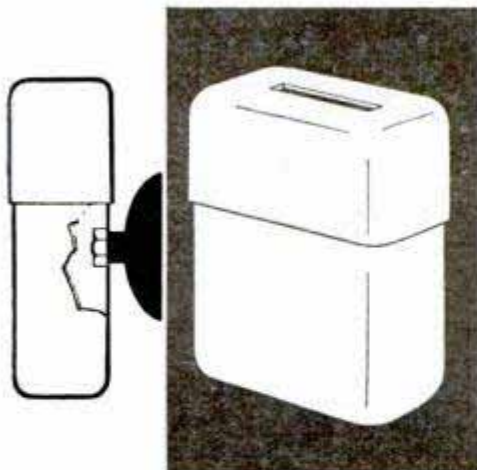


DYEING CLOTHES is done more easily by using an old curling iron to stir and inspect the fabric. The spring action of the iron assures a firm grip which prevents dropping the cloth and splashing the dye

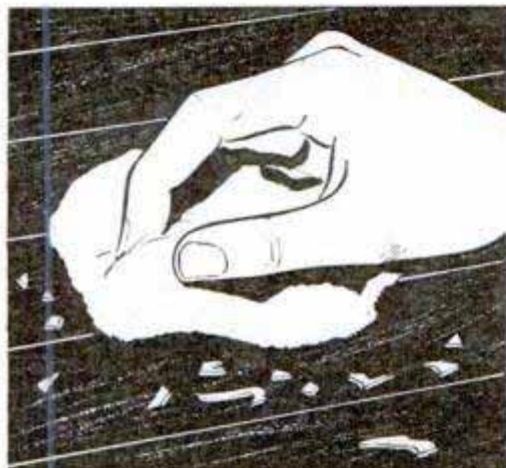
CLOTHESLINE PROPS are kept from sliding and falling by wrapping adhesive tape around the line at the sides of the props



HOME PROBLEMS

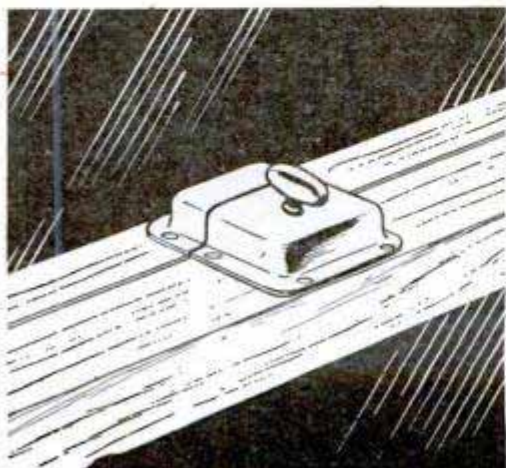


DISPOSAL OF USED RAZOR BLADES is no problem if they are placed in a metal or plastic cigarette case fastened to bathroom wall. Suction cup is bolted to side of case and the cover is slotted for blades

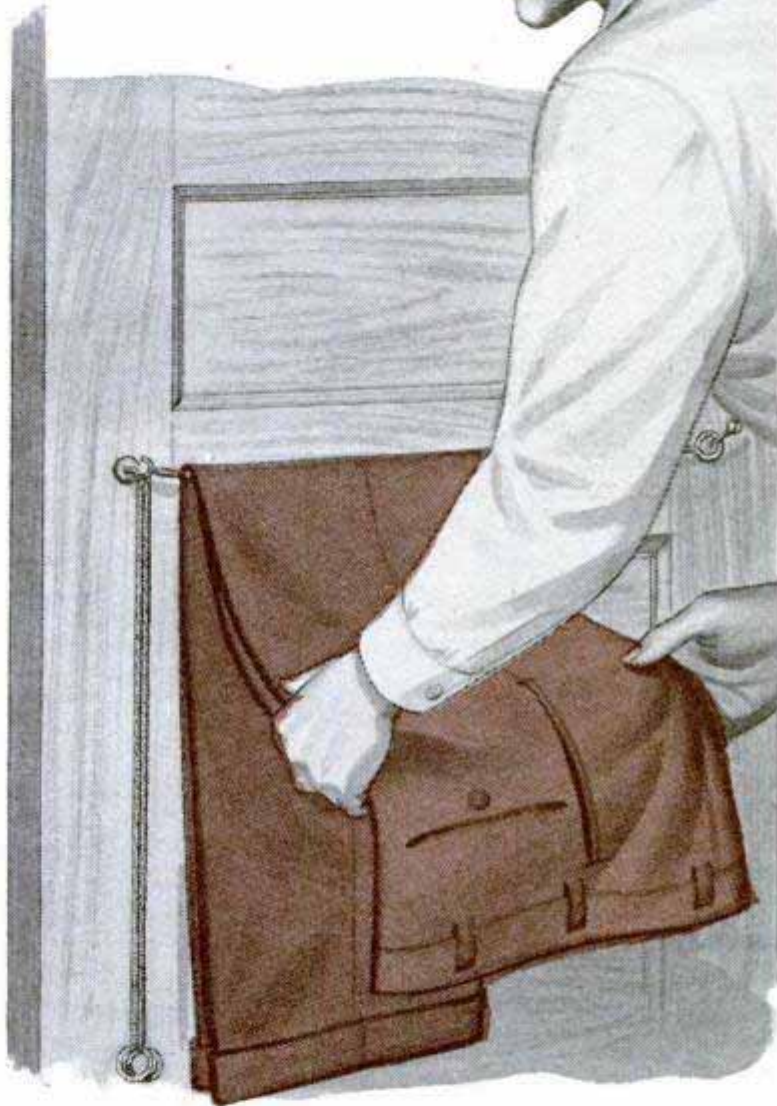


SLIVERS OF GLASS can be picked up from the floor or table top in a jiffy with a moistened wad of absorbent cotton. This will do a thorough job and considerably reduce the danger of injuring the fingers

WINDOWS LOCK AUTOMATICALLY when they are closed if the usual sash locks are replaced with cupboard-door catches



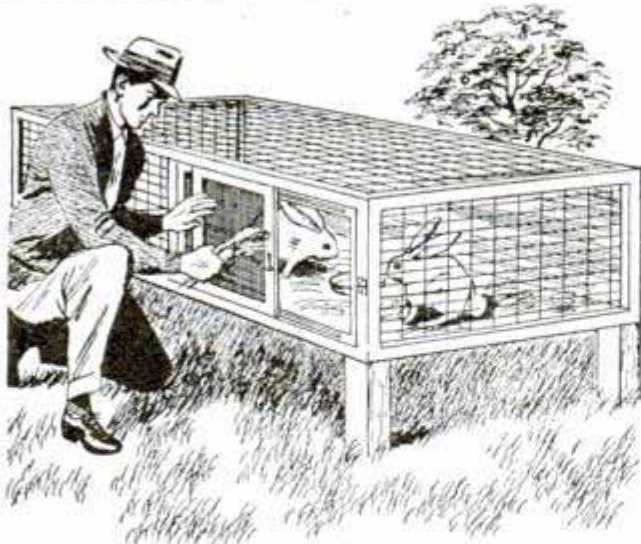
TROUSER RACK for closet door is provided by spring-type curtain rods. One end of each rod is held by a screw hook, and key ring attached to other end loops over a screw



GLASS TOP FOR WINDOW SILL protects the finish from dampness caused by potted plants. Use a piece of ordinary window glass, cutting it to size and smoothing the edges with an oilstone



Sliding Door on Rabbit Hutch Provided by Extension Screen



An extension screen of the type commonly used on house windows serves as an excellent sliding door for a rabbit hutch or small pet cage. It is easily opened or closed and can be fastened with a screen-door hook and eye.

W. S. Darling, Danbury, Conn.

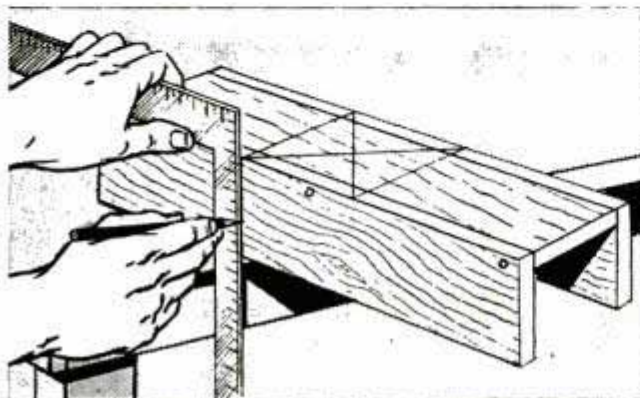
Slanting Improves Cutting Action Of Jigsaw Blade

For cutting metal or hardwood, the performance of a jigsaw is improved by moving the blade slightly forward in the top chuck. In this way, the cutting action on the downward stroke is forward. On the upward stroke, the blade moves away from the work, eliminating the lifting action usually encountered. Slight adjustment of the blade probably will be necessary to obtain the best operation.

Richard Hanscom, Elmhurst, Ill.

Angle Slots in Miter Box Laid Out Accurately

When assembling a wooden miter box, you can make sure that the 45-deg.-angle slots are accurate by laying them out on the underside of the box. To do this, carefully mark an exact square on the bottom of the

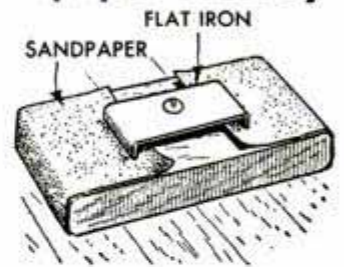


box, draw the diagonals, and extend them across the sides of the box to the top. Then, make the saw cuts in the usual way.

Michael Ligocki, Gary, Ind.

Block Clamps Sandpaper Securely

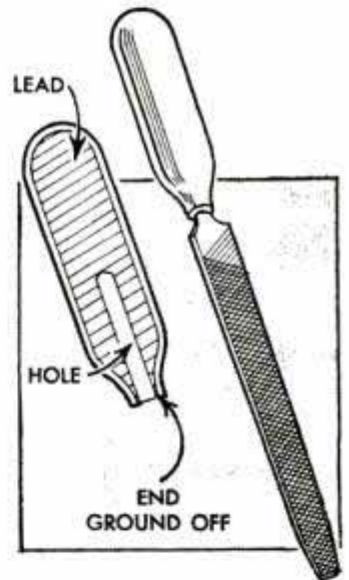
Instead of improvising a makeshift sanding block whenever one is needed, make one from a piece of hardwood fitted with a flat-iron clamp and keep it around the shop. Drill a hole through the center of the flat iron and bend it at right angles about $\frac{1}{4}$ in. from each end. Then fasten the clamp to the block with a round-headed screw so it grips the paper securely.



Arthur Trauffer, Council Bluffs, Iowa.

Weighted File Handles

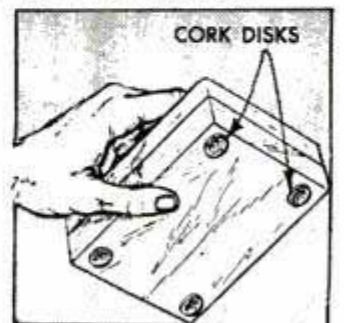
Empty carbon-dioxide cartridges filled with lead provide heavy handles for small files. Should a file be dropped, the extra weight of the handle will cause it to fall handle-first, thus protecting the tool blade from damage. To make a handle of this type, grind off the end of a cartridge, as shown, and fill it with lead. After the lead hardens, drill an undersize hole for the file tang and press the tang into the hole.



David Jenkins, Xenia, Ohio.

Cork Disks From Pop-Bottle Caps Serve as Feet for Trinket Boxes

Cork disks found in bottle caps are just the right size to make feet for jewelry and trinket boxes so they will not mar the tops of dressers. The cork disks are easily removed from the bottle caps with a knife blade and then they are glued to the bottoms of the boxes.



Frank Shore, New York City.



Furniture You Can Build p. 45

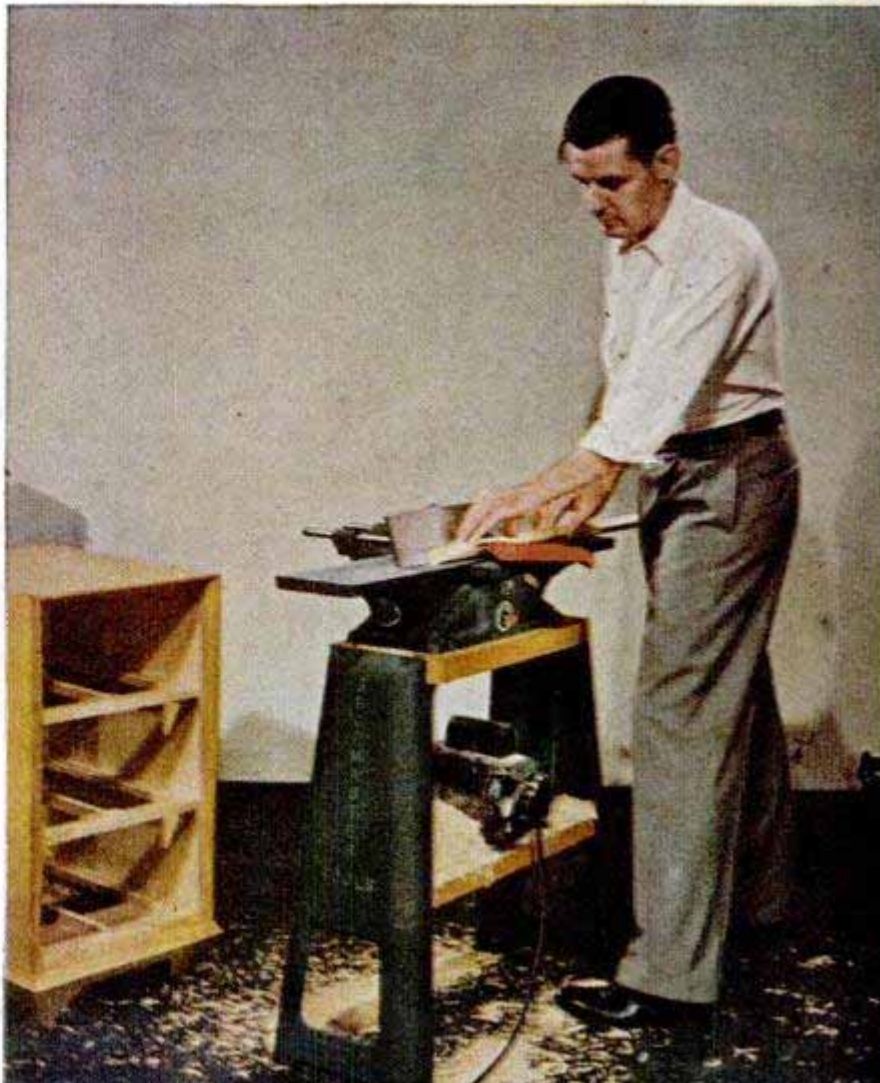
Furniture for Your Bedroom

**Part
Two**

WITH THE night stands, chests and vanity units completed as described in Part I, you can tackle the bed. In addition to its pleasing simplicity, it features a built-in storage compartment in the headboard for bedding and two roomy drawers for shoes. If twin beds are preferred to a full bed, the basic construction is the same. It would be merely a matter of making the bed narrower, installing only one drawer and eliminating the center partition in the storage compartment. Most of the bed is made of $\frac{1}{4}$ -in. plywood. On the original bed, the lid of the storage compartment was a $\frac{3}{4}$ -in.-plywood panel, but to save cost, this too can be of $\frac{1}{4}$ -in. material by gluing it to a half-lapped frame as shown in Figs. 13 and 14.

The bed footboard consists of a $\frac{1}{4}$ -in. plywood panel which is framed on three sides with a $\frac{3}{4}$ x 2-in. molding. The latter is chamfered and grooved

Right, a jointer plus a bench saw are the only power tools needed. Here, base molding is being run on jointer after being ripped on saw





A roomy drawer opens at each end of the bed headboard to provide storage space for seasonal footwear. Being concealed when the headboard is flanked with night stands, the drawers also provide a safe place for personal papers and jewelry

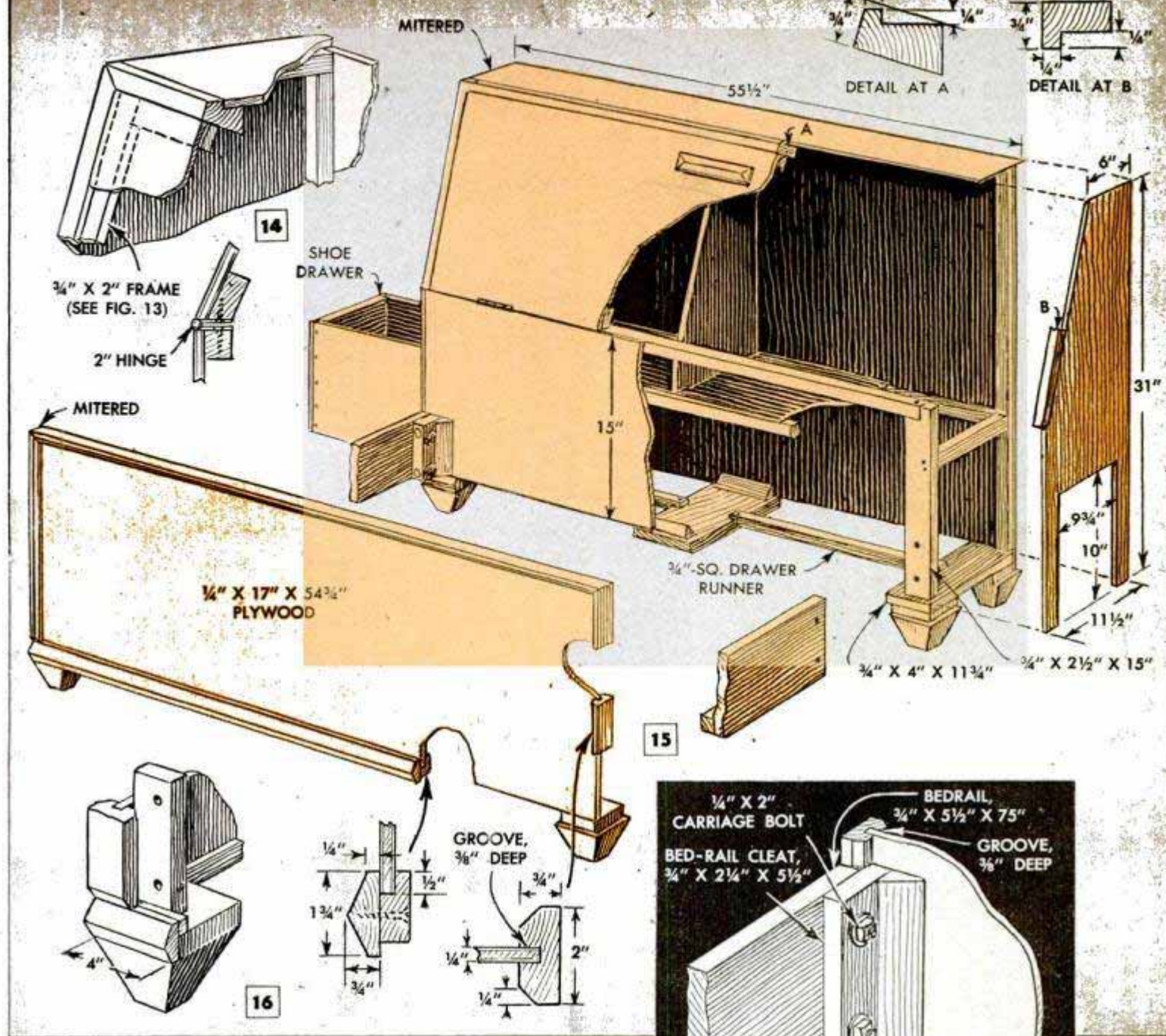
Another feature of this headboard is a convenient built-in storage compartment for bedding. If you wish, the compartment can be lined with aromatic, red cedar to protect woolen blankets from moths. Open, the lid rests on the bed



$\frac{3}{8}$ in. deep on its inside face to fit over the edge of the plywood. The panel is faced across the bottom with a $\frac{3}{4} \times 1\frac{3}{4}$ -in. molding which matches the molding on the night stands, chests and other pieces. This molding is glued to the plywood so that it overlaps the bottom edge $\frac{1}{2}$ in., sectional detail Fig. 16, and then five rabbeted cleats, 6 in. long, are spaced along the inside and screwed to the molding. Note that the molding is mitered at the ends and returned at the corners for a distance of 4 in., Fig. 16. Note also that the lower ends of the grooved molding, which covers the edges of the plywood, are chamfered on two adjacent outside edges to fit flush with the bottom molding and the upper ends are mitered. The feet are made the same as detailed in Part I, except that here the shoulder must measure $1\frac{1}{4}$ in. long instead of 1 in. The feet are rabbeted on two adjacent sides and glued into the corners formed by the molding to bring them flush.

The headboard is built around a framework of scrap wood, Fig. 15. Start each end assembly with a $\frac{3}{4} \times 4 \times 11\frac{1}{2}$ -in. base piece and screw a $\frac{3}{4} \times 2\frac{1}{2} \times 15$ -in. upright piece to it, $\frac{1}{4}$ -in. in from the front edge. Note that the upper end of this piece is notched for a cross member. Another piece, $\frac{3}{4} \times 1\frac{1}{2} \times 30\frac{3}{4}$ in., is attached vertically to the base piece, $\frac{1}{4}$ in. in from the rear edge. This piece is joined to the front piece with a cross member located 10 in. up from the top surface of the base, forming the drawer opening. Both end assemblies of the framework are joined together as shown, fitting a $\frac{3}{4} \times 1$ -

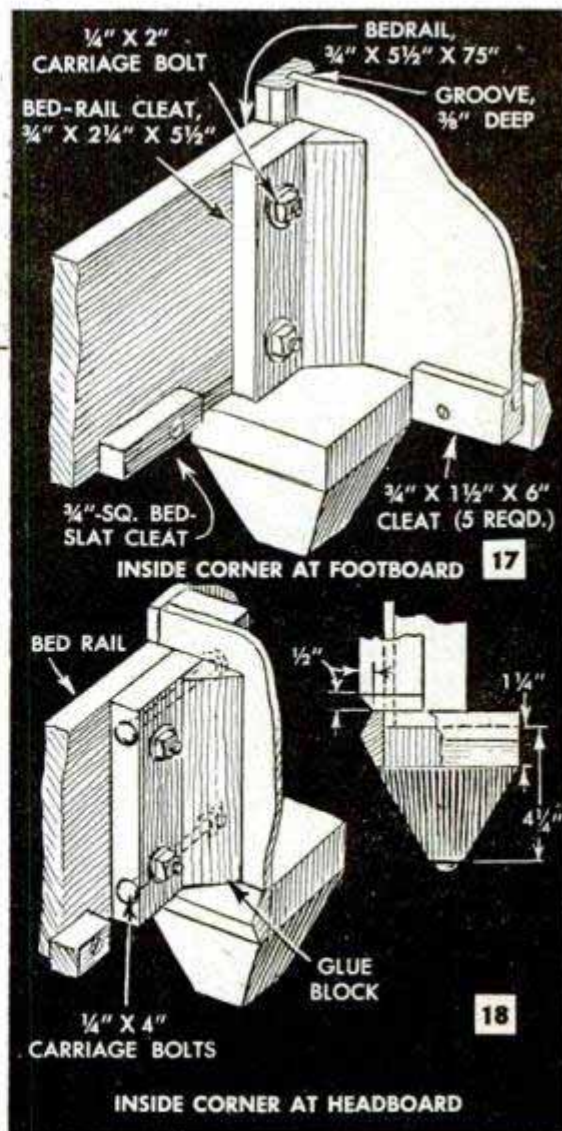


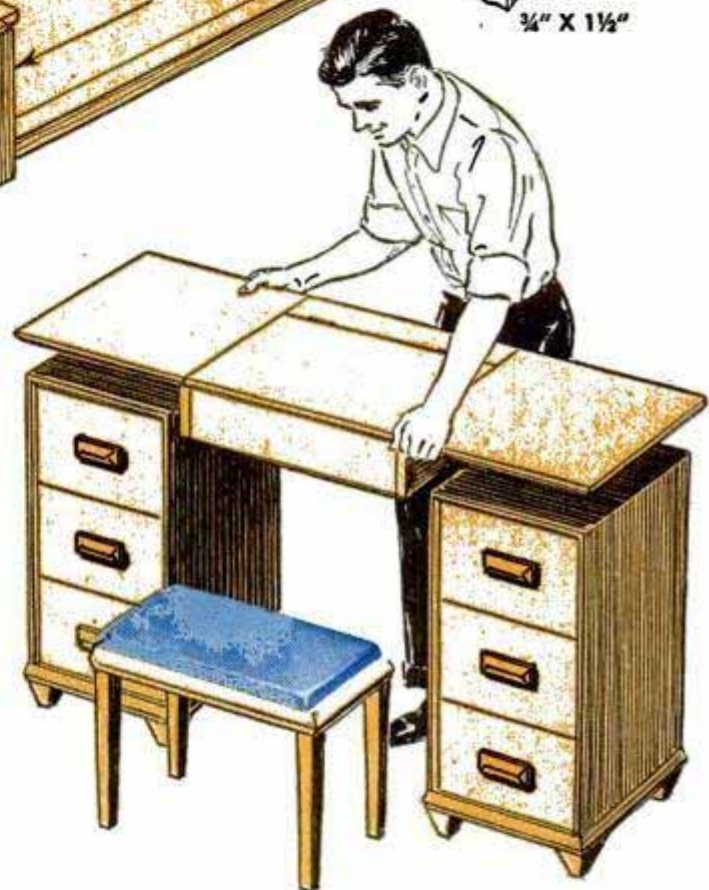
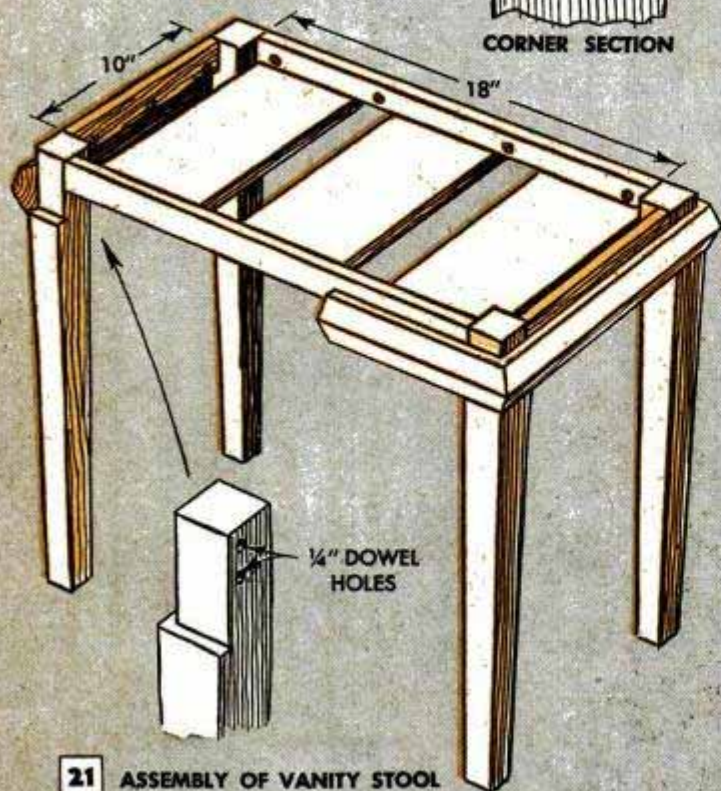
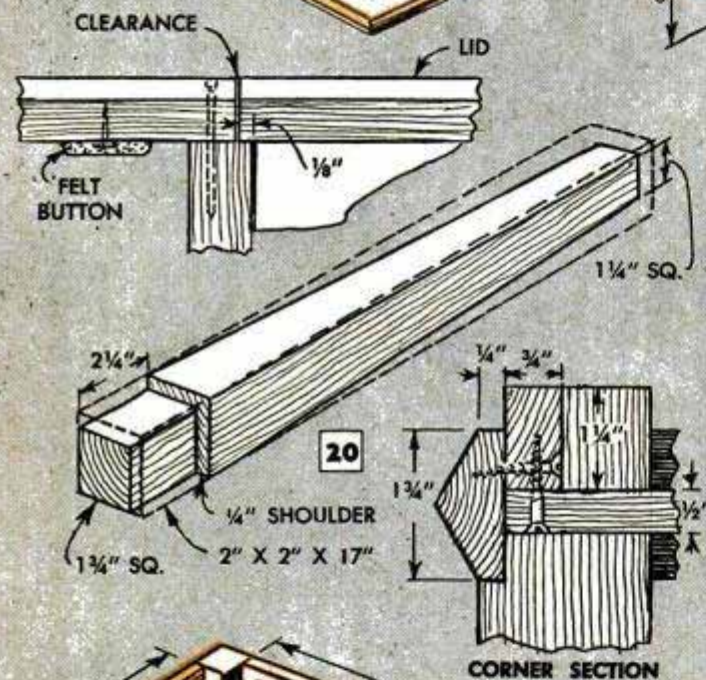
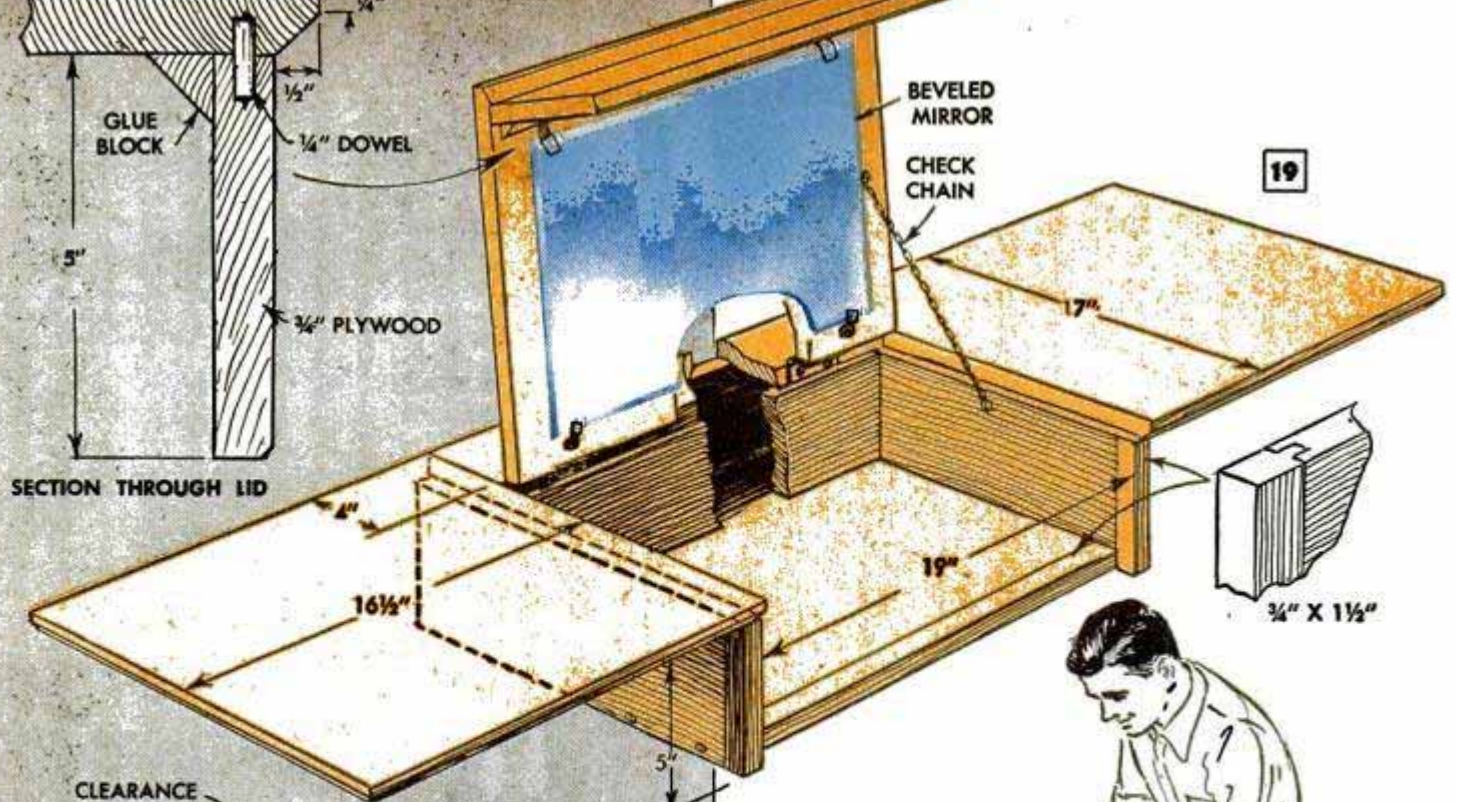


in. strip into the notched front uprights, another one below it at a point flush with the member at the top of the drawer opening and a third piece at the same height at the rear. These two latter strips form a ledge for the bottom of the compartment which is of plywood.

Now, cover the back of the framework. This requires a fir-plywood panel, 1/4 x 30 3/4 x 55 in., which is nailed and glued so that the edges are flush with the framework. Next, fit the front panel, cutting it 15 x 55 in. The plywood pieces covering the ends of the headboard taper to 6 in. at the top from a point 15 in. up from the bottom. These are made right and left hand, selecting the best face of the plywood for the outside, and mitered at the top. After the ends are glued in place, the drawer-runner assembly is installed. The runners are simply 3/4-in.-square strips, notched at each end to hook over the base pieces and a center piece fastened to the plywood with glue blocks.

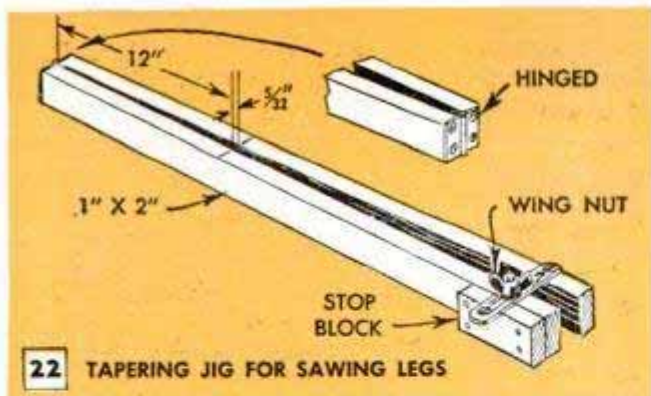
Fit the panel forming the bottom of the bedding





compartment next, and then add the top panel, mitering it to fit accurately with the mitered ends. The compartment partition, which gives support to the top, is notched at the front to fit around the framework strips. The exposed edges of the plywood framing the compartment are covered with a 3/4-in. rabbeted molding. The strips which cover the edges of the ends are cut as indicated in detail B, while the one that covers the edge across the top is cut as shown in detail A. The molding is mitered at the corners and glued and clamped to the plywood. A base molding, matching that used on the footboard, is fitted around the outside corners, gluing and clamping it to the edges of the base pieces of the framework.

21 ASSEMBLY OF VANITY STOOL



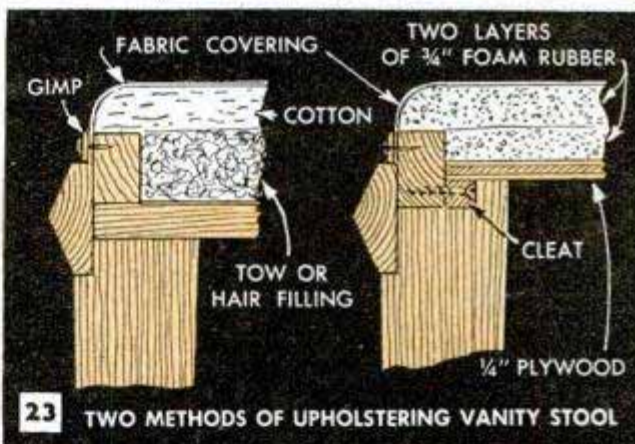
22 TAPERING JIG FOR SAWING LEGS

The compartment lid is hinged as shown in the sectional detail, Fig. 14, and drawers and handles are made as described in Part I. Bedrails are attached to the head and footboard as detailed in Figs. 17 and 18.

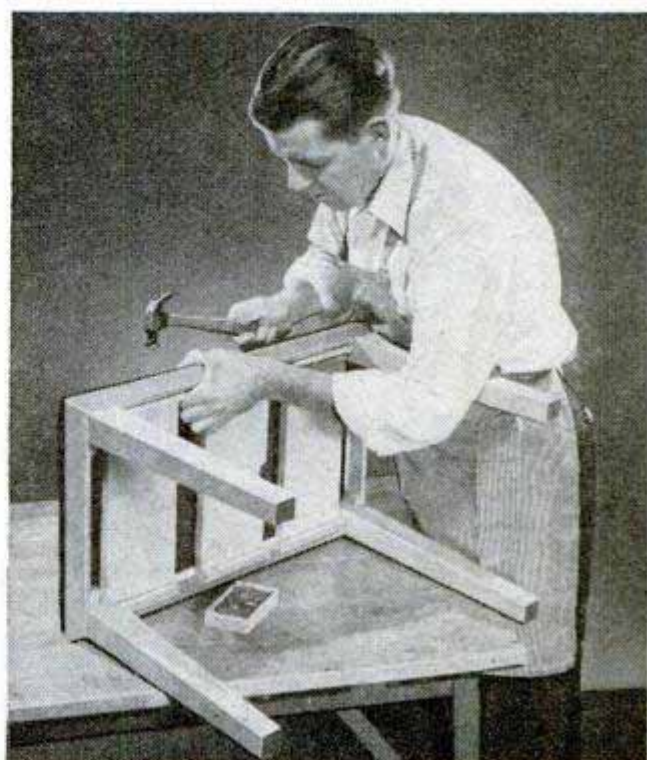
The separate top, Fig. 19, which merely rests on two base units to form a vanity, is made of $\frac{3}{4}$ -in. plywood and solid stock. The top requires a panel 17 x 52 $\frac{1}{2}$ in. Three edges are chamfered on the underside and then the panel is cut into four pieces. The cosmetic compartment is made like a box. The sides and back are screwed to a plywood bottom and a fourth piece is installed to support the narrow fill-in piece to which the lid is hinged. Note how end grain of the side and bottom members of the compartment is concealed with edging strips, tongued and grooved. The outboard panels are nailed and glued to the top edges of the compartment $\frac{1}{8}$ in. in from the inner faces to provide a shoulder for the lid. This is shown in the detail above Fig. 20. The front apron is attached to the lid with dowels and a triangular glue block is placed on the inside. The lid can be leaned against the wall when opened or a check chain can be used to hold it at the right angle.

Assembly of the vanity stool is detailed in Fig. 21. First make the legs by cutting a $\frac{1}{4}$ x 2 $\frac{1}{4}$ -in. rabbet on two adjacent faces of each one. The legs taper from 2 in. square at the shoulder to 1 $\frac{1}{4}$ in. square at the bottom, Fig. 20. Before tapering the legs, bore holes in adjacent inner faces as shown for doweling $\frac{3}{4}$ x 1 $\frac{1}{4}$ -in. rails flush with the face of the rabbets. A jig like the one shown in Fig. 22 may be used to rip the taper on each face, after which the cut is dressed smooth on a jointer. The corner-section detail at the right of Fig. 20 shows how a mitered face molding is attached to the rails with screws from the inside. A choice of two methods for upholstering the stool is given in Fig. 23. If tow or hair is used, the seat is supported by three $\frac{1}{2}$ -in. pieces spaced as in Fig. 21. If foam rubber is used, the bottom of the stool is covered with a piece of $\frac{1}{4}$ -in. plywood held by cleats screwed to the rails.

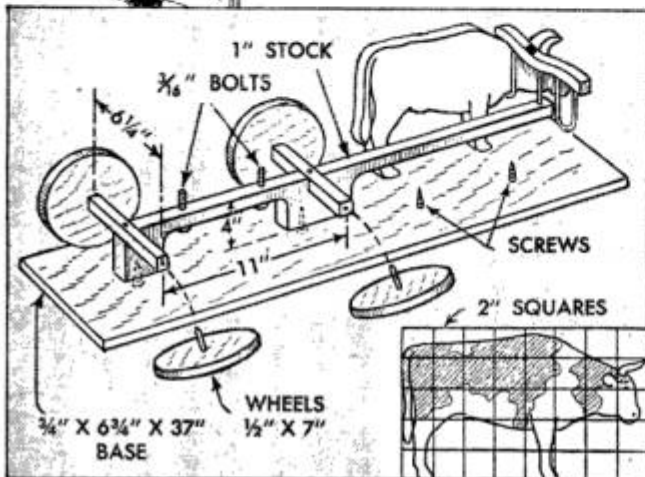
(Methods of finishing will be described in Part 3)



23 TWO METHODS OF UPHOLSTERING VANITY STOOL



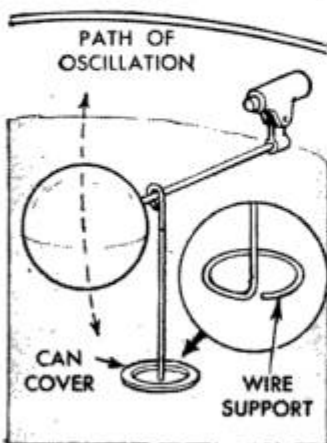
Covered Wagon Pulled by Oxen Forms Novel Rural Mailbox



Should you want something unusual and yet simple in a rural mailbox, mount the box on four wooden wheels and "hitch" a team of oxen to it. Cut out the oxen according to the squared pattern and make the frame and wheels. Then fasten these parts to a wooden base and bolt the mailbox in place. After painting the unit as desired, attach it to the mailbox post.

E. W. Kessler, Hocomo, Mo.

Silencing Pounding of Attic Tank



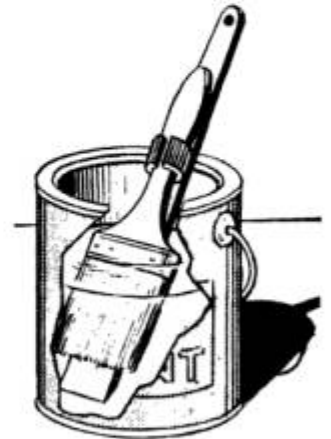
If your water is pumped to an attic tank which supplies pressure to the plumbing system, the noisy pounding of the intake valve usually is due to oscillation of the float. This can be eliminated by attaching a simple damper to the float. The damper is made by

bending a short length of brass or galvanized-iron wire, as shown, and inserting it through a hole punched in a can cover. The cover rests on the wire support and is free

to move upward only. In this way, the damper tends to retard upward motion of the float while it does not hinder downward motion. The resulting dampening action stops oscillation of the float before any sound can be emitted or damage done to the inlet valve.—A. Anderson, Nairobi, Kenya.

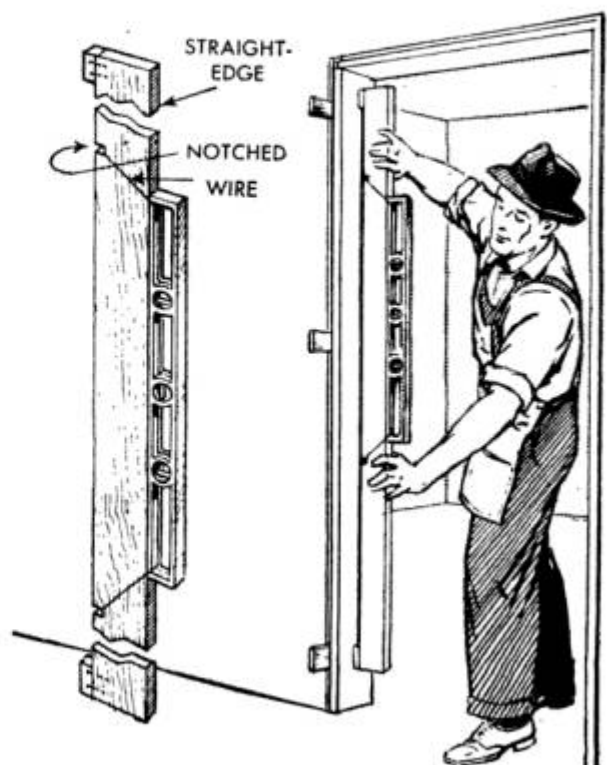
Paintbrush Suspended in Solvent

The bristles of a paintbrush stored in a can of turpentine or other thinner will remain in good condition for several days if the brush does not rest on the bottom of the can. A holder which allows the bristles to be immersed in the solvent without touching the bottom is made by nailing a split section of hose to a strip of wood or stirring paddle. The brush handle is inserted in the hose and the holder is placed in the can of thinner.

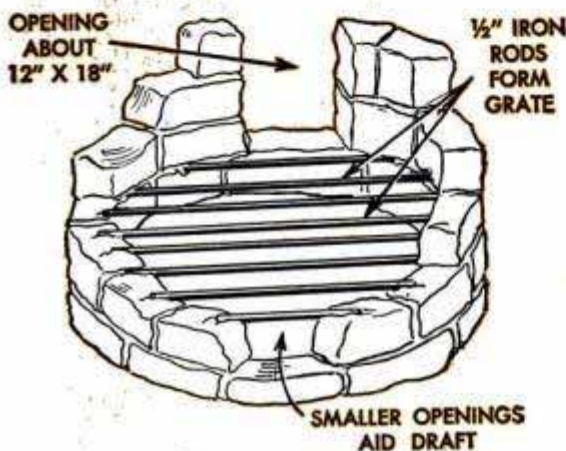


Level Wired to Straightedge Permits Easy Handling

When using a straightedge and a metal carpenter's level to plumb a doorframe or corner post, your hands will be left free to hold the straightedge if the level is wired to it. Notches in the straightedge permit the level to be wired temporarily to the opposite edge of the board.



New Design Gives Back-Yard Incinerators a Lift

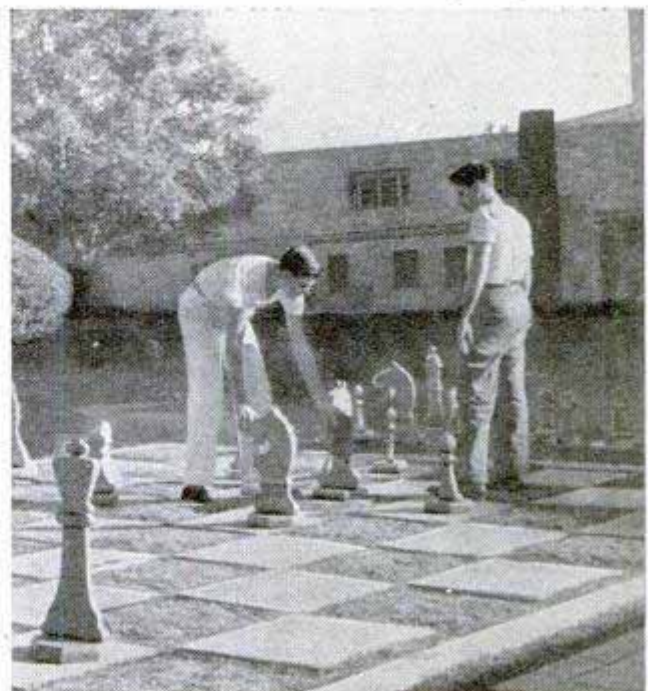


The average outdoor incinerator seldom amounts to more than a cylinder of fence wire or an old oil drum with the end knocked out. But one can be made to beautify a yard as shown in these two examples. The circular one resembles an outdoor fireplace, being made of stone laid in mortar and fitted with a grate and draft. The tall one, which looks like a miniature lighthouse, is open at the back and windows provide necessary draft

Outdoor Chess Played on "Flagstone" Board Adds Novelty to Game

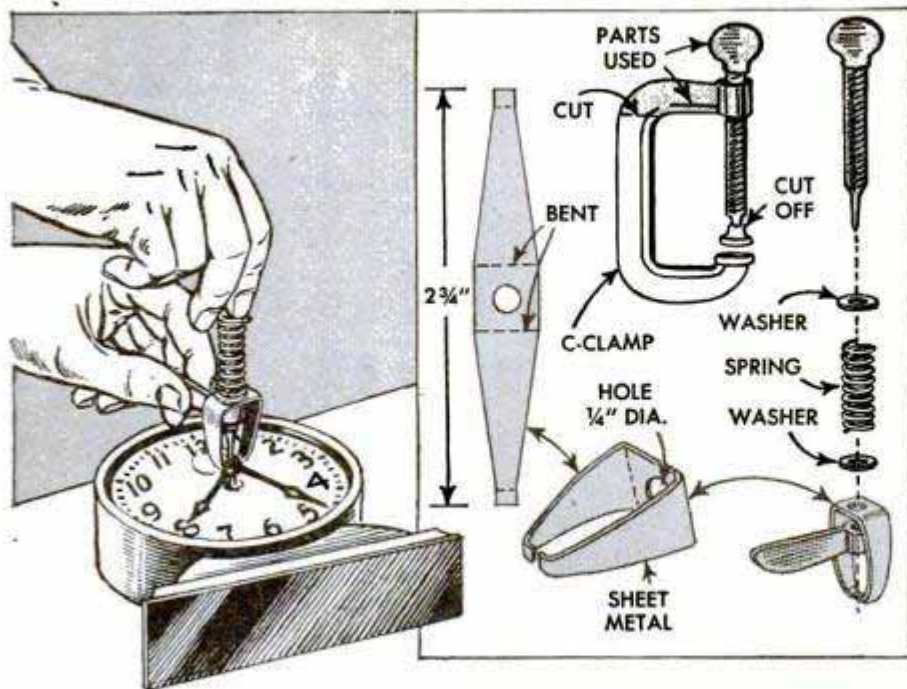
The game of chess takes on a new twist and keeps players on their toes when played on a "flagstone" board with giant-size chessmen. A concrete terrace laid out in a checkerboard pattern serves as a playing board and chessmen are jigsawed and turned to represent as closely as possible the kings, bishops, queens, pawns, etc., of a regular chess set. The photo shows a chessboard composed of alternate squares of grass and concrete, each square being 18 in. in size. Where space is limited, 12-in. or even smaller squares will do. The squares are cast individually in forms and set nearly flush with the ground. By greasing the inside of the forms, the flagstones can be pushed out of them without sticking. Painting the concrete a brick-red color will give the chessboard an attractive appearance. The chessmen, of course, are painted contrasting colors.

Joseph S. Baer, San Diego, Calif.



W.T.M. Concrete

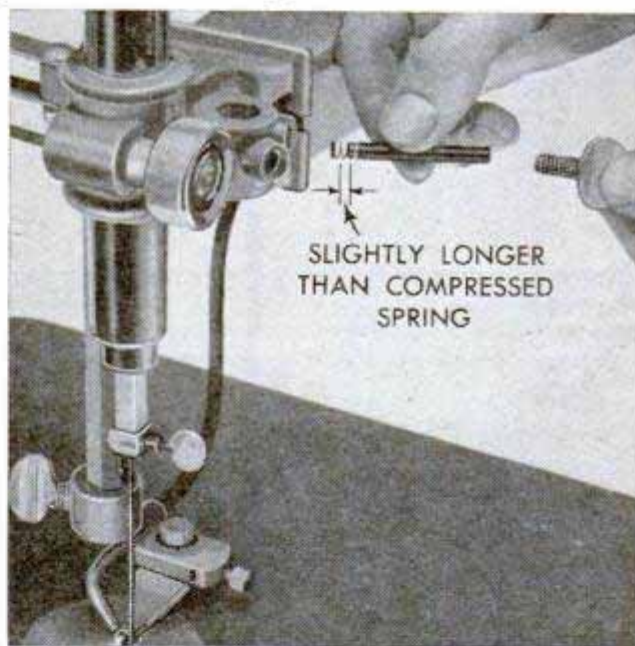
Tool for Removing Hands of Clock Operates Similarly to Wheel Puller



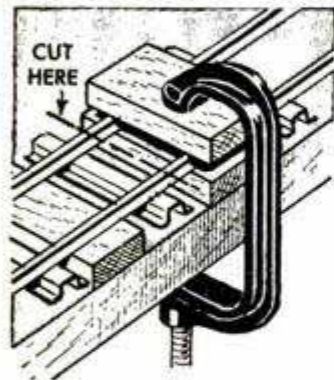
Working on the same principle as a wheel puller, this handy tool will remove even the most stubborn clock or gauge hands quickly and without damage. The handle-and-screw assembly is cut from a C-clamp, the screw being cut off and pointed as shown in the upper right-hand detail. Two washers and a compression spring placed over the screw hold a sheet-metal gripper tightly to the handle. To use the tool, slip the arms of the gripper over the clock hand and center the tip of the screw on the end of the shaft. Tighten the screw to force the gripper upward, pulling the hand from the shaft.

Saw-Blade Guide Kept From Slipping When Locking Screw Is Loosened

If the blade guide on a scrollsaw drops all the way down when the locking screw is loosened, this can be eliminated by fitting a short compression spring to the tip of the screw and, in some cases, to the extension rod also. The spring provides sufficient friction to keep the guide from slipping when the screw is loosened while still permitting the guide to be adjusted easily. A tenon slightly longer than the compressed spring should be filed on the end of the screw or rod. Then, when the screw is tightened, the spring will compress over the tenon, allowing the tip to make contact.



Sawing Model-Railroad Tracks

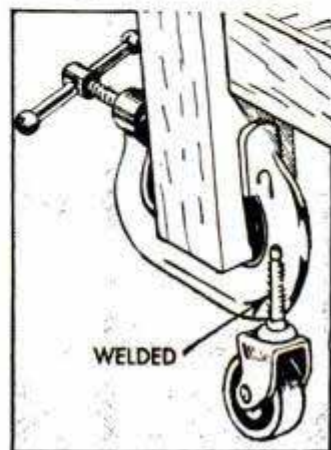


Cutting model-railroad track to fit a particular layout is simplified by placing the track on small blocks spaced between the ties and then clamping it to a workbench as shown. The wooden blocks under the rails keep the

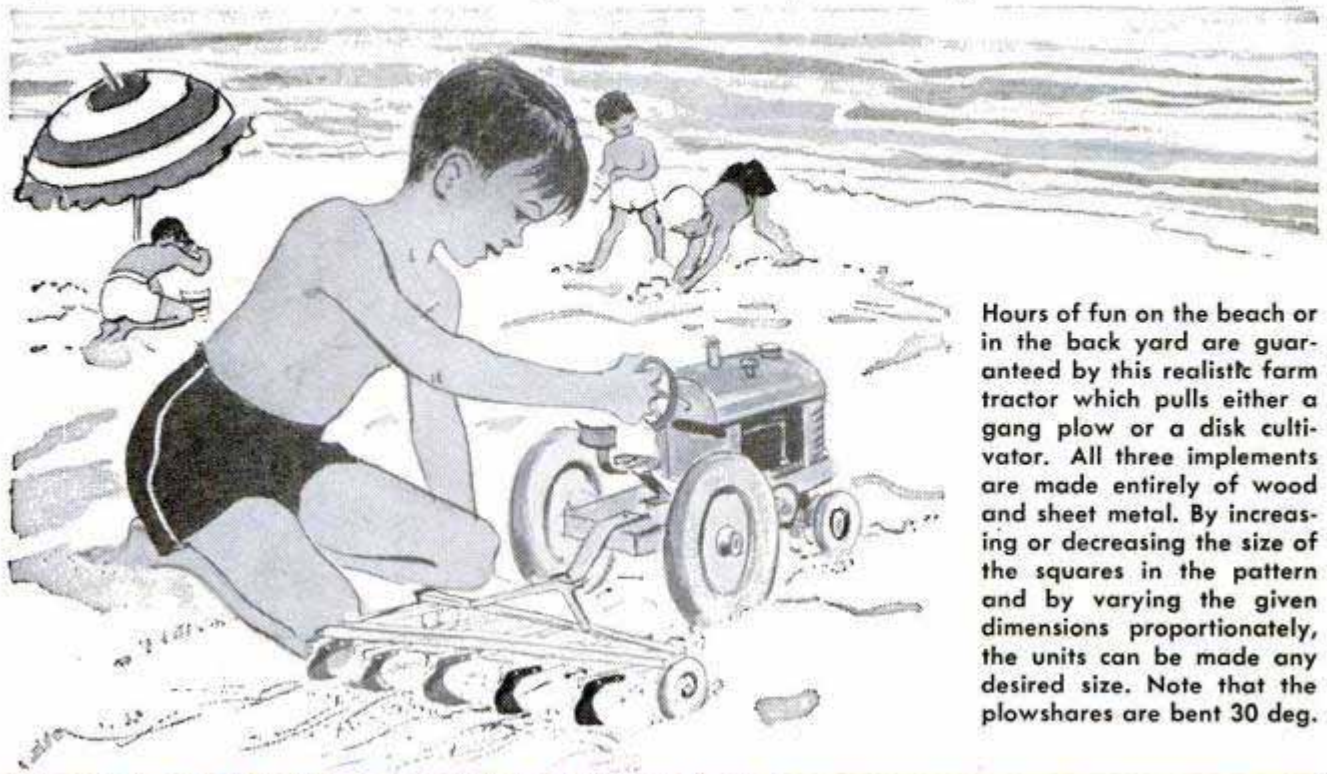
ties from being crushed or bent by pressure of the C-clamp, and the cleat on top holds the rails firmly while they are being hacksawed. Note that the saw cut is made near the C-clamp, the free end of the track being held with the hand. Use a fine-toothed saw for the job, and file off any burrs.

C-Clamps Aid Moving Furniture

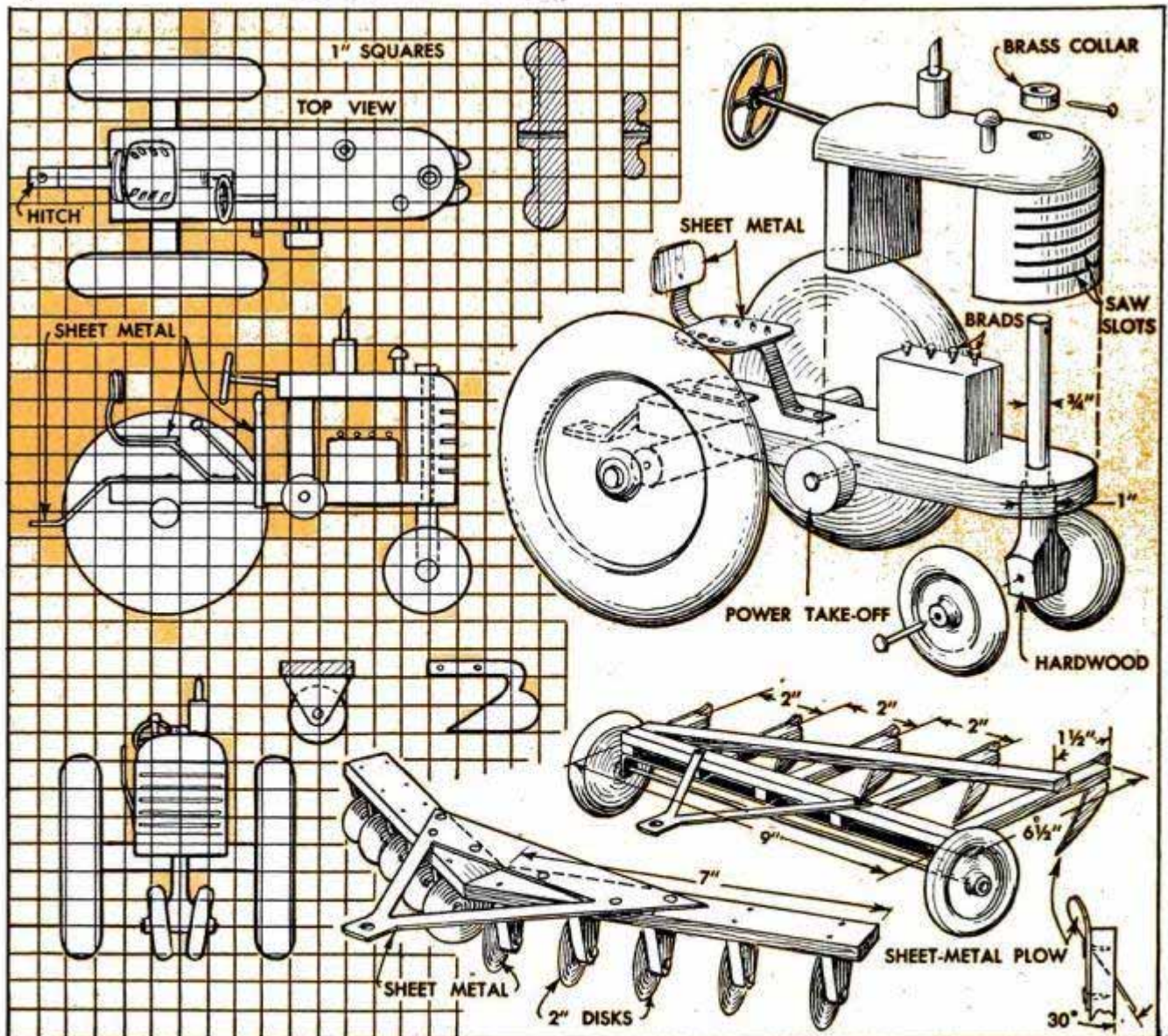
When a heavy desk or table must be moved single-handedly, the job is done more easily if casters welded to C-clamps are clamped to the legs at one end. With the casters in place, the other end of the piece is lifted and pushed as a wheelbarrow.



Get On With Your Spring Plowing



Hours of fun on the beach or in the back yard are guaranteed by this realistic farm tractor which pulls either a gang plow or a disk cultivator. All three implements are made entirely of wood and sheet metal. By increasing or decreasing the size of the squares in the pattern and by varying the given dimensions proportionately, the units can be made any desired size. Note that the plowshares are bent 30 deg.



USE CLEANING FLUIDS SAFELY

Solvents capable of cleaning the finest of fabrics or greasiest machinery can be used safely if a few simple rules are followed



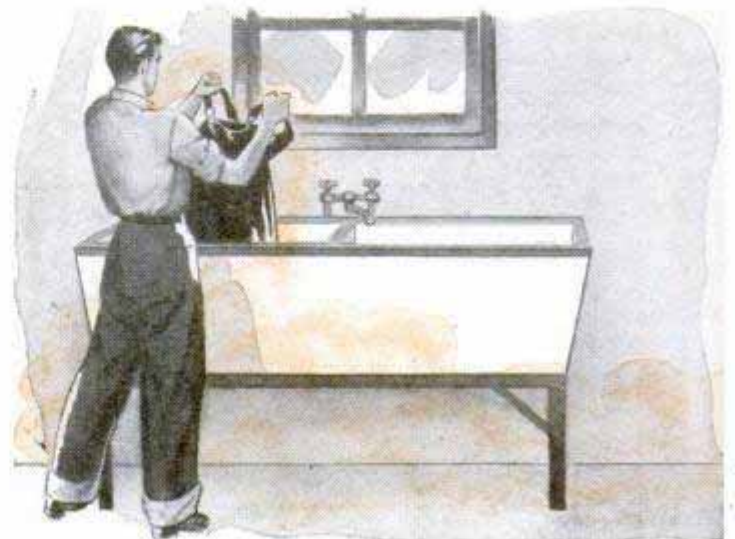
Large cleaning jobs, such as furniture upholstery, above, and clothing, below, should be done outdoors so that cleaning-fluid vapors will not be inhaled



NO ONE WOULD deliberately throw a stick of dynamite on a floor or point a loaded gun at his head; yet, in many homes, some cleaning fluids or solvents are handled in such a way that their vapors could become concentrated and be just as explosive. Most of these liquids are highly volatile and inflammable but they are perfectly safe to use if the vapors caused by evaporation of the liquid are carried into the open as fast as they form. The vapors of many of the solvents are also toxic and, if inhaled in sufficient amount, will cause illness. In industry, large quantities of solvents are used without accidents because suitable equipment and safety supervision make certain that the solvents are used in the correct manner. However, in the home, you can be your own safety supervisor by carefully following a few rules for the safe use of cleaning fluids.

Naphtha, benzene, gasoline, acetone and carbon tetrachloride are the commonly used solvents. From a safety standpoint, the most important property of a solvent is its volatility or the tendency of the solvent to evaporate, thus producing a vapor which escapes into the air. The vapors of many of the commonly used solvents, when mixed with the proper proportion of air, are readily ignited by a flame, spark or cigarette.

When cleaning clothing or furniture upholstery, the work should always be done outdoors, preferably on a breezy day so the vapors will be blown away. The mate-



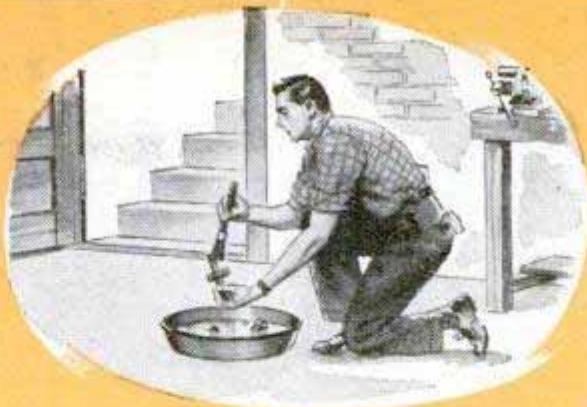
rial should never be rubbed together as is done when washing with soap and water. With some materials, this action may generate static electricity, resulting in a spark which would ignite the solvent. If dry cleaning is attempted in the basement laundry tub, remember that the solvent vapors can travel long distances along the floor, and might eventually reach a gas hot-water heater or furnace in sufficient concentration to start a fire which may flash back to the solvent in the laundry tub. Small cleaning jobs, such as removing spots from a tie or degreasing a piece of machinery, can be done indoors safely provided the work is done near an open window or door. Solvent-wet articles or rags should not be left to dry indoors unless there is adequate ventilation. If the solvent is spilled on the floor, it should be wiped up immediately and all windows and doors left open until the solvent vapor has dissipated completely.

When cleaning wall-to-wall carpeting or articles that cannot be moved outdoors, use one of the "high flash" petroleum solvents, commonly called "safety solvents" because they are not as easily ignited as the highly flammable naphtha or benzine. Certain solvents, such as carbon tetrachloride, are entirely nonflammable. However, adequate ventilation must be provided because the vapors of almost any solvent are toxic in varying degree when inhaled in large quantities. Solvent vapors may cause stomach distress, irritation of the eyes, nose and lungs, and dizziness. If the vapors are inhaled over a considerable period of time, they may act as an anesthetic, causing unconsciousness or even fatal illness.

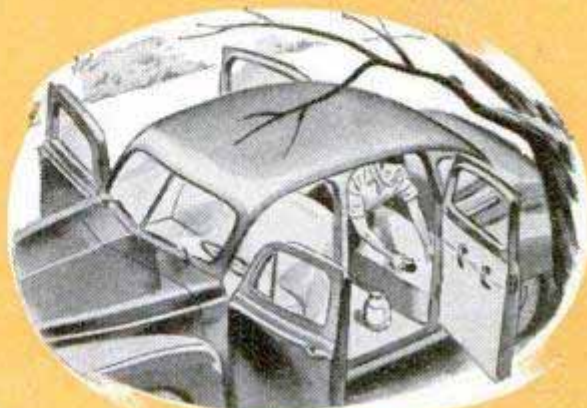
Strict adherence to the instructions given on the label of the solvent and plenty of ventilation to carry off the dangerous solvent vapors will make these useful cleaners perfectly safe to use.

(Information courtesy Safety Research Institute)

Do not use cleaning fluid in an unventilated basement. Solvent vapors can travel long distances along the floor to a gas heater, starting a fire which may flash back to laundry tub



Cleaning small machinery parts can be safely done indoors, provided the windows and doors are open



When cleaning automobile interiors with solvents, car should be parked outside with all doors open



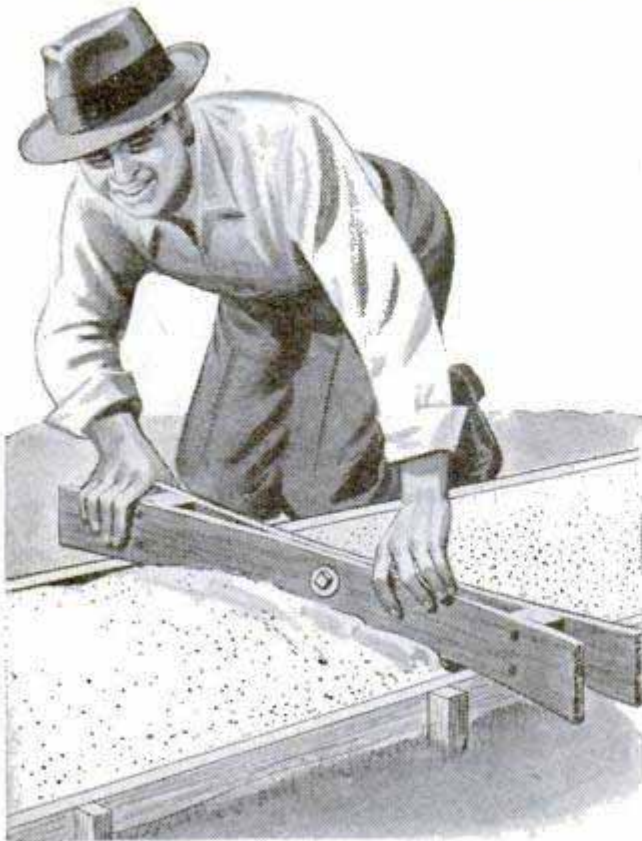
Cleaning spots from rugs requires cross ventilation or a fan to carry off the dangerous fumes



Solvent-wet clothes should be hung outdoors until the cleaning-fluid odors are completely dissipated

Straightedge for Finishing Sidewalk Is Easy to Use and Saves Concrete

W.T.M. Concrete



Two 1 x 4s bolted together at the center and blocked apart near the ends provide an easy-to-use straightedge for finishing sidewalks. The straightedge should be long enough to extend over the form boards at each side of the walk. The spread ends hold the straightedge upright, and the bowed portion tends to gather the concrete at the center of the walk, keeping it from being pushed out of the form.

Shutters Made From Scrap Wood Enhance Plain Windows

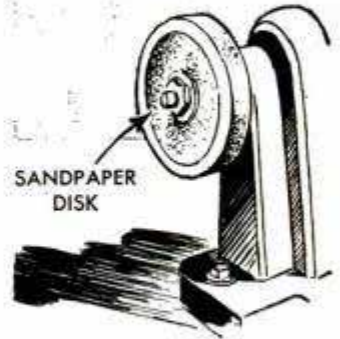
Enough lumber to make these attractive shutters probably can be found around the home. After the ends of the crosspieces are cut at 45-deg. angles, they are nailed to two vertical strips of 1 x 2-in. stock. The latter



should be positioned well in from the ends of the crosspieces so that a pleasing shadow line results. The finished shutters are painted a complementary color which, of course, is determined by the color of the roof and trim.—Bob Hurst, Chicago.

Grinder Doubles as Disk Sander

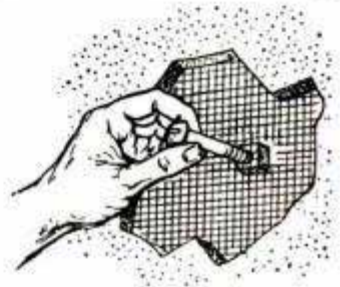
Fastening a sandpaper disk over the shaft of a grinder and against the face of one of the wheels permits the grinder to serve also as a disk sander. This setup is handy for sanding small wooden parts and shaping plastics. It does not interfere with the normal operation of the grinder.



W. H. McClay, Pasadena, Calif.

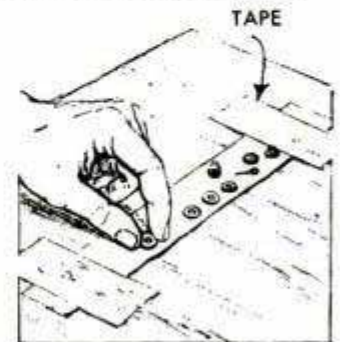
Screen-Wire "Lath" Backs Patching

Having to fill a fairly large hole in a plasterboard partition, I found that a piece of screen wire makes an excellent backing for the patching plaster. I inserted a bolt through the center of a piece of wire cut slightly larger than the hole and then turned a nut on the end of the bolt. I pushed the screen wire through the hole and pulled on the bolt to hold the wire against the back of the plasterboard while I filled the hole. When the patching plaster set, I simply turned out the bolt and filled the bolt hole. Elliott Erickson, Harbert, Mich.



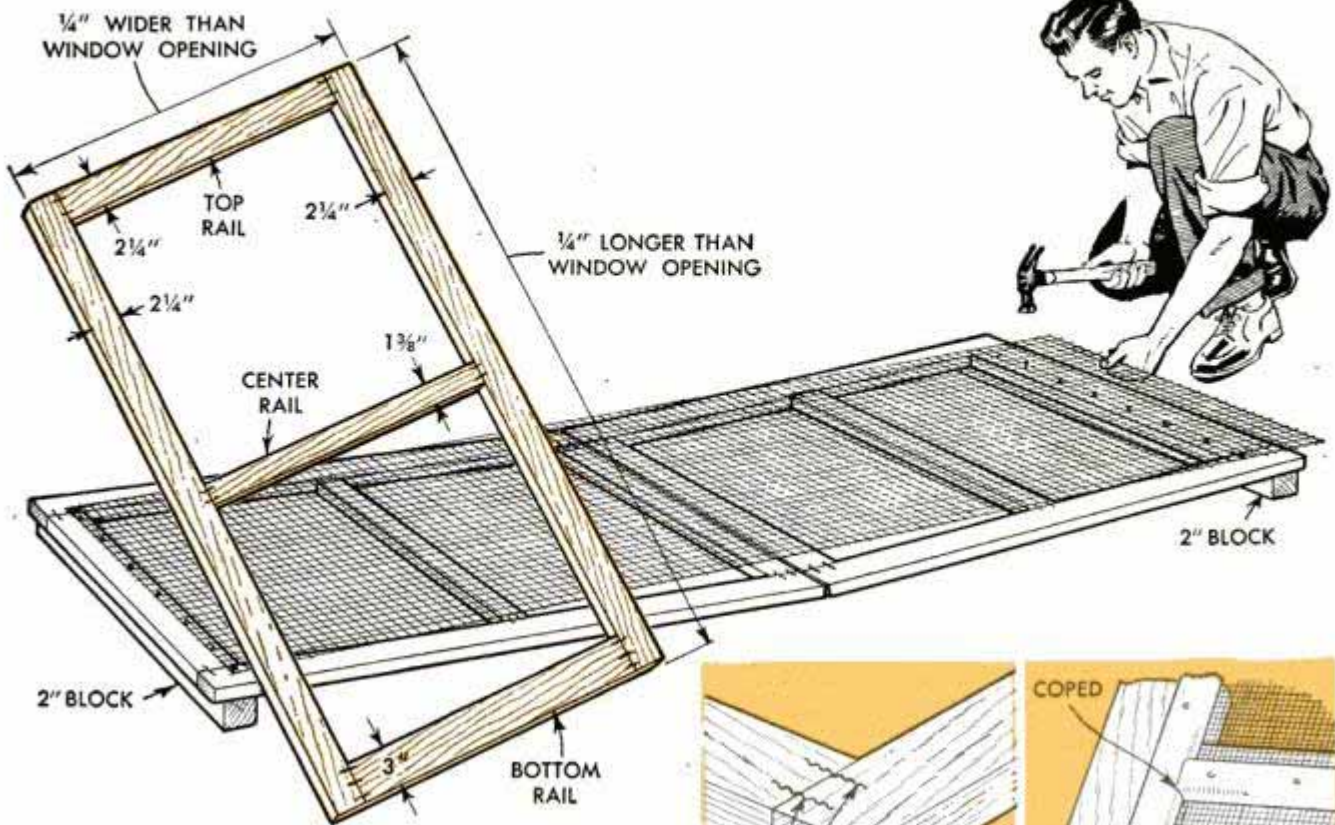
Adhesive Tape Holds Small Parts

When repairing clocks or electrical appliances where a number of small parts have to be removed, keep the parts in order by laying them on the adhesive side of a strip of tape. The adhesive will prevent the parts from rolling or being brushed aside accidentally and lost. Small pieces of tape across the ends of the strip will hold it flat.



Benj. Nielsen, Aurora, Neb.

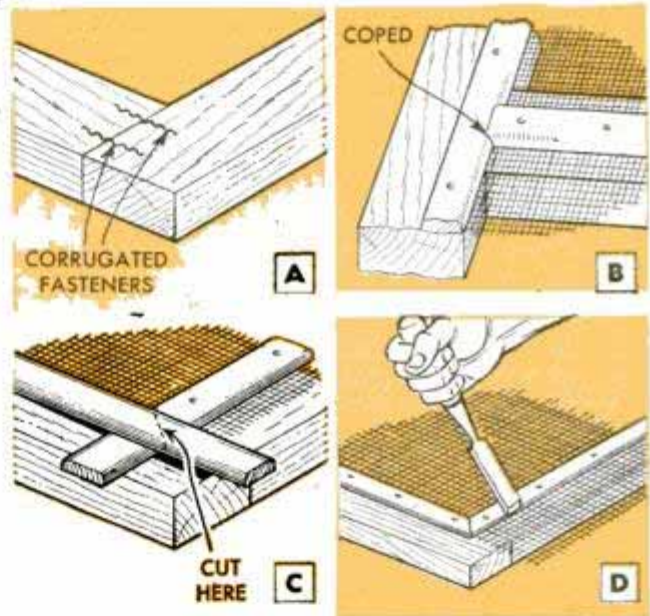
It's Easy To Make Your Own Window Screens



SOME OF YOUR window screens may need re-covering, others a new frame. Whatever is required, the work is not difficult for any homeowner to do himself. As for tools, a simple wooden miter box, a hammer and a chisel or sharp knife are all that is necessary. Clear white pine, 1 1/8 in. thick, is the best wood to use when a new frame is needed. It is stocked by most lumberyards. All pieces are cut so that the assembled frame will be about 1/4 in. larger over-all than the window. This makes it possible for the bottom to be planed at an angle to match the slant of the sill and also permits the rest of the frame to be fitted snugly.

Top, center and bottom rails of the frame are the same length. By using a miter box, it's easy to cut the ends squarely and, by providing a stop block, each piece can be cut to exactly the same length. If a long bar clamp is available, it can be used to hold the pieces in place for nailing. Corrugated fasteners or wiggle nails, 5/8 in. wide, are used to nail the joints, detail A. These are driven flush about 1/2 in. in from the edge and a nailset is used to drive them slightly below the surface to allow puttying over. Use three fasteners on each side of the bottom joints and two at all other joints. It's a good idea to coat all joints with paste white lead before assembling.

The screen wire should be about 1 in. wider than the inside measurement of the frame. To stretch it tautly, two frames are

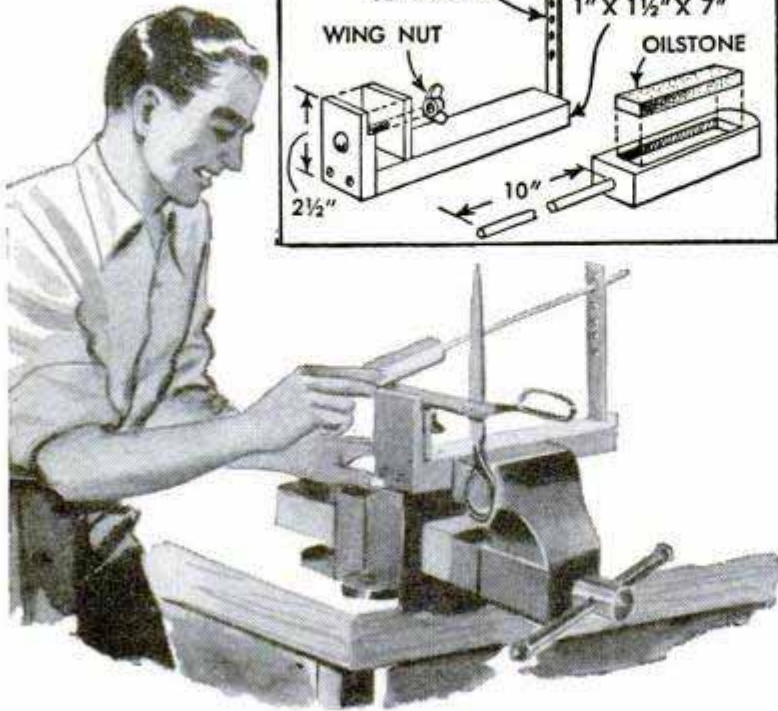


covered at one time. They are placed end-to-end and blocked up at the outer ends. The wire is tacked across the end of one frame and then pulled firmly and tacked across the end of the other frame. Use common carpet tacks or screen staples and space them about 3 in. apart. With this done, the blocks are removed and the tacking is completed with the frames flat on the floor, after which the frames are cut apart.

The edges of the screen wire are covered with stock screen molding. The molding is permitted to overlap at the corners and then a saw is run through both strips at a 45-deg. angle, as in detail C, resulting in a perfectly fitting joint. At the center rail, the molding is coped, or undercut, as in detail B. The job is completed by trimming off the excess wire at the ends, as in detail D, with the heel of a sharp chisel.

Joseph C. Stanko, Fair Haven, N. J.

Scissors Are Sharpened Expertly With This Homemade Hand Grinder



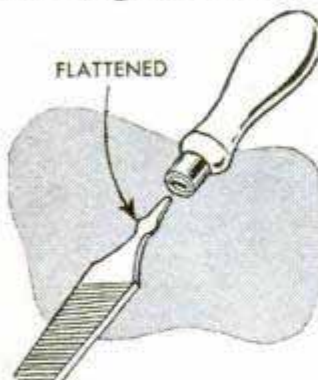
Designed and built by O. J. Potter of Bremerton, Wash., this easily made scissors-grinder permits sharpening the blades with a swinging motion which results in a smooth edge without burring or feathering. The jig is made as shown, a piece of flat iron drilled with a series of five or six equally spaced holes being screwed to the end of the wooden base. The spaced holes provide a means of changing the grinding angle to correspond to the bevel of the cutting edge. The grinder itself consists of an oilstone embedded in a wooden block and a length of rod which is a force fit in a hole drilled in the end of the block. When setting up for grinding, the arm is inserted through one of the holes in the upright and a check is made to see that the angle of the stone is the same as that of the beveled cutting edge of the scissors blade being sharpened.

Corncobs Impaled on Rake Teeth Mark Garden Seed Rows

To space seed rows in a small garden, just impale two corncobs on the teeth of a rake. Pulling the rake across the garden plot results in evenly spaced seed rows, their separation, of course, being determined by the spacing of the cobs on the rake teeth. If you want exact spacing of the rows, place one marker in the last row previously marked.



File Tightened in Wooden Handle



If a file works loose from a wooden handle, it can be replaced tightly by hammering a flat on the tang. To do this, first heat the tang and then flatten it slightly at a point that extends well within the handle.

Paste Application Removes Stains and Grease Smudges From Wallpaper

Grease smudges and fingerprint stains are quickly removed from wallpaper by an application of paste made by mixing carbon tetrachloride with fuller's earth. The paste is troweled over the stain and allowed to remain until it dries and turns a pale color. If traces of the spot are still visible when

the dried paste is dusted off, repetition of the process should completely remove them. If the spot covers a large area, clean only a small portion at a time. As the fumes of carbon tetrachloride are mildly toxic, keep the room well ventilated.

S. S. Palestrant, Bronx, N. Y.



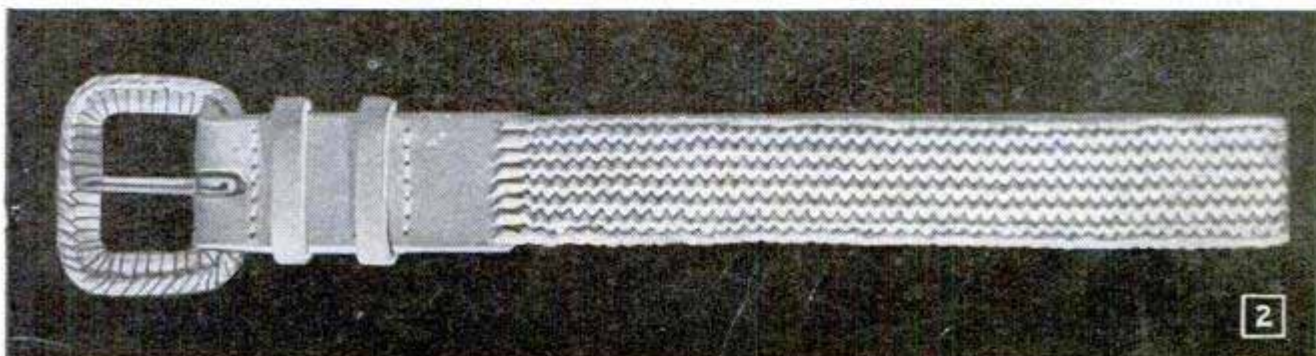
LEATHERCRAFT

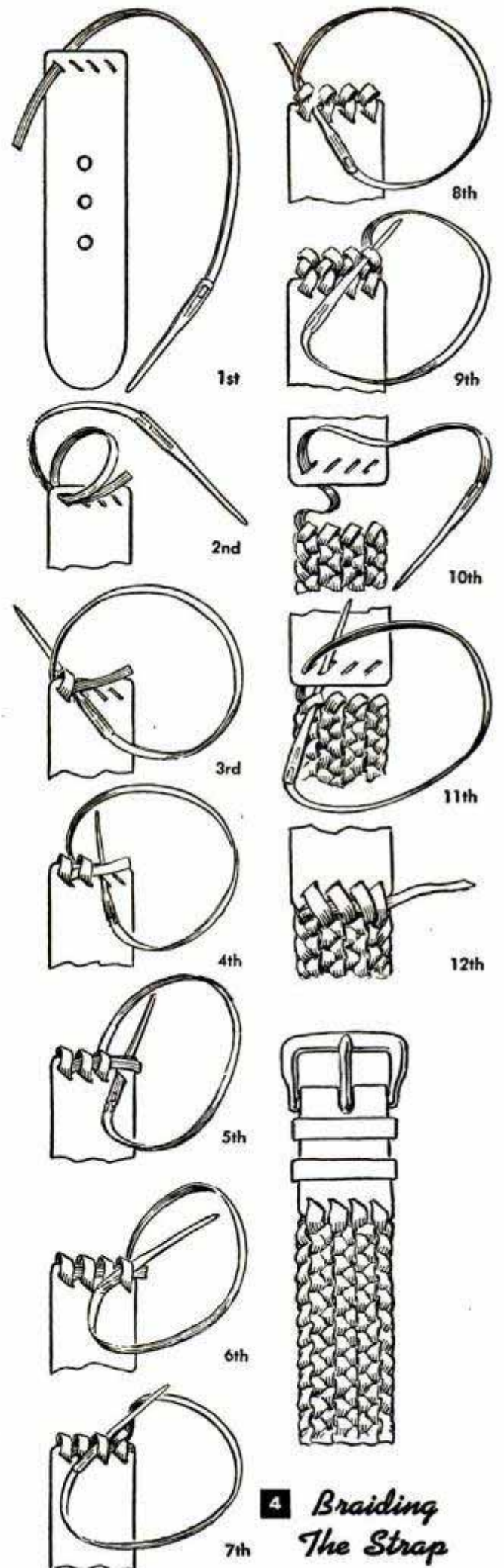
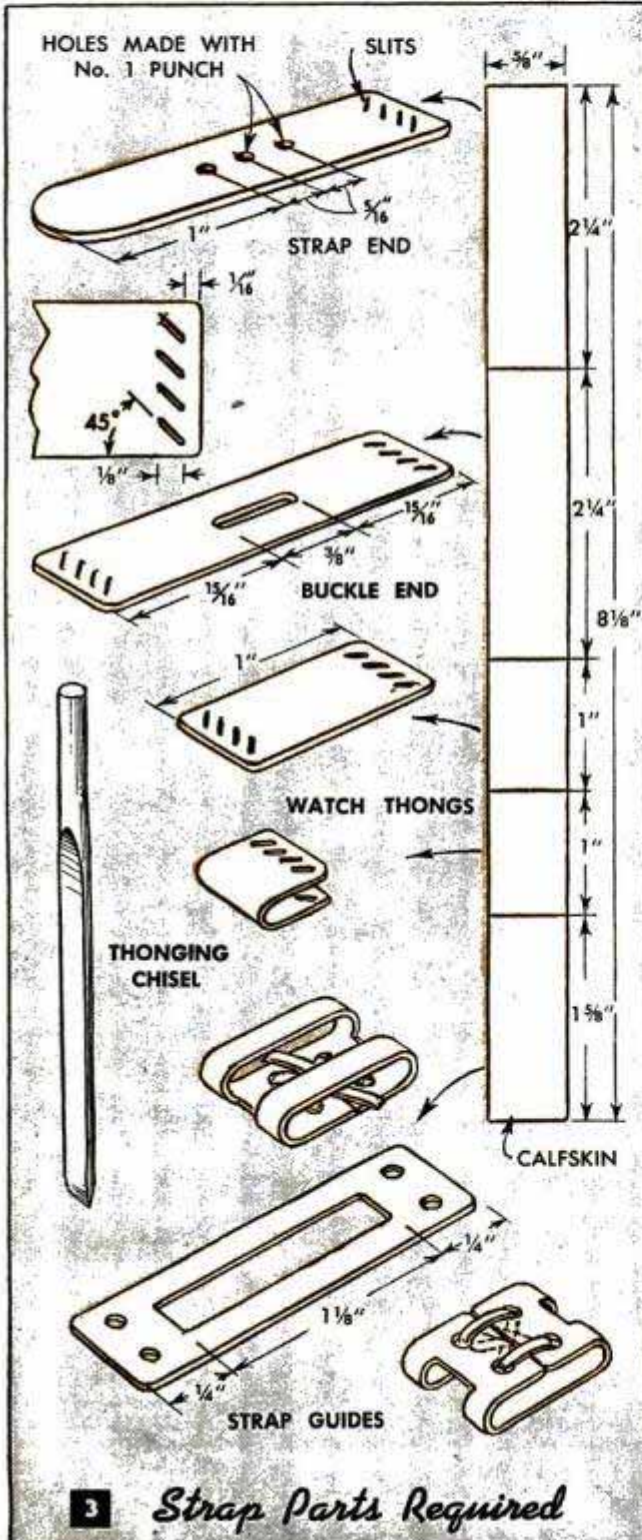
By Bruce Grant

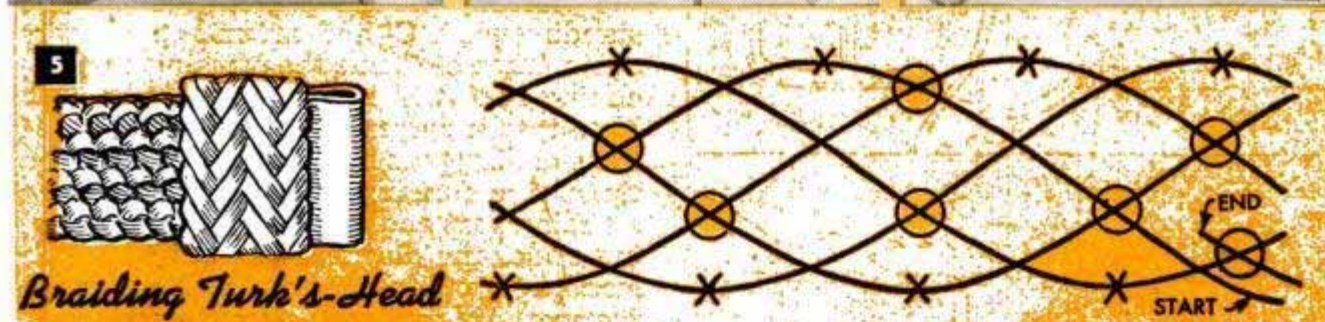
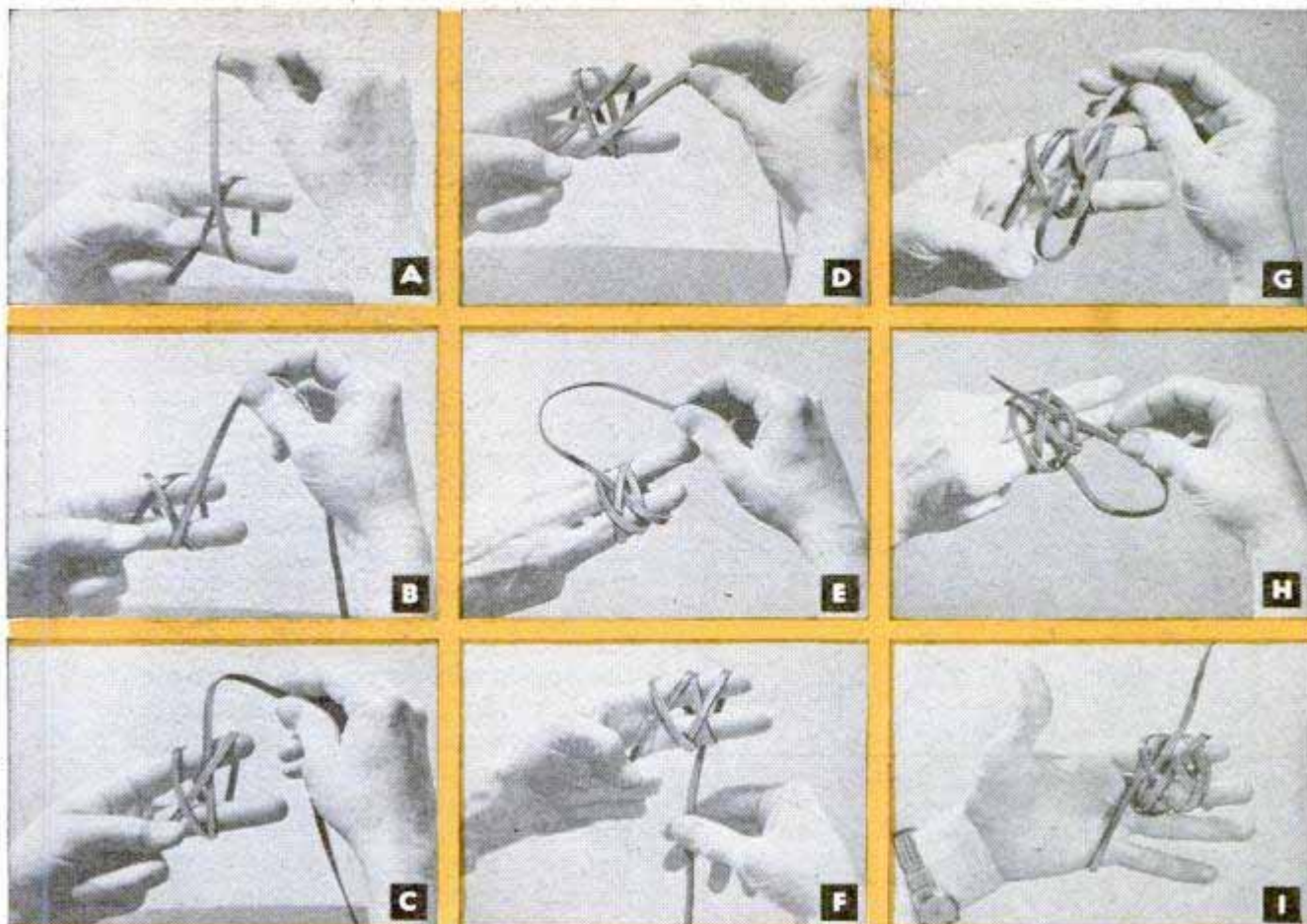
ADAPTED from the ornate braiding adorning the sword belts of early Spanish conquistadores, these two examples of leatherwork, although seemingly complicated, actually are quite simple and fascinating to braid. The wrist-watch band, Fig. 1, and the belt, Fig. 2, which is of the same braid, only made wider, are but two of the many practical accessories to which this attractive braid is suited. In addition to the procedure given for braiding a strap or belt, instructions also explain how to braid a turk's-head knot and how to cover a buckle.

The wrist-watch band requires a piece of calfskin $\frac{5}{8}$ in. wide by $8\frac{1}{8}$ in. long, three yards of $\frac{1}{8}$ -in. beveled goatskin lacing and a buckle with a $\frac{5}{8}$ -in. opening. For tools, you'll need a knife, a thonging chisel, a leather punch, an awl or fid, a lacing needle and a tube of cellulose cement. The end of the lacing is skived, then inserted in the needle and held with a dab of cement. The calfskin strip is cut into five pieces as indicated in Fig. 3. The piece forming the strap end is rounded at one end, punched for the buckle tongue and perforated with four slits. The slits are made with a thonging chisel held at a 45-deg. angle, $\frac{1}{16}$ in. in from the end. The buckle

To braid a belt, you merely weave it twice as wide as the wrist-watch band, as the braiding is the same





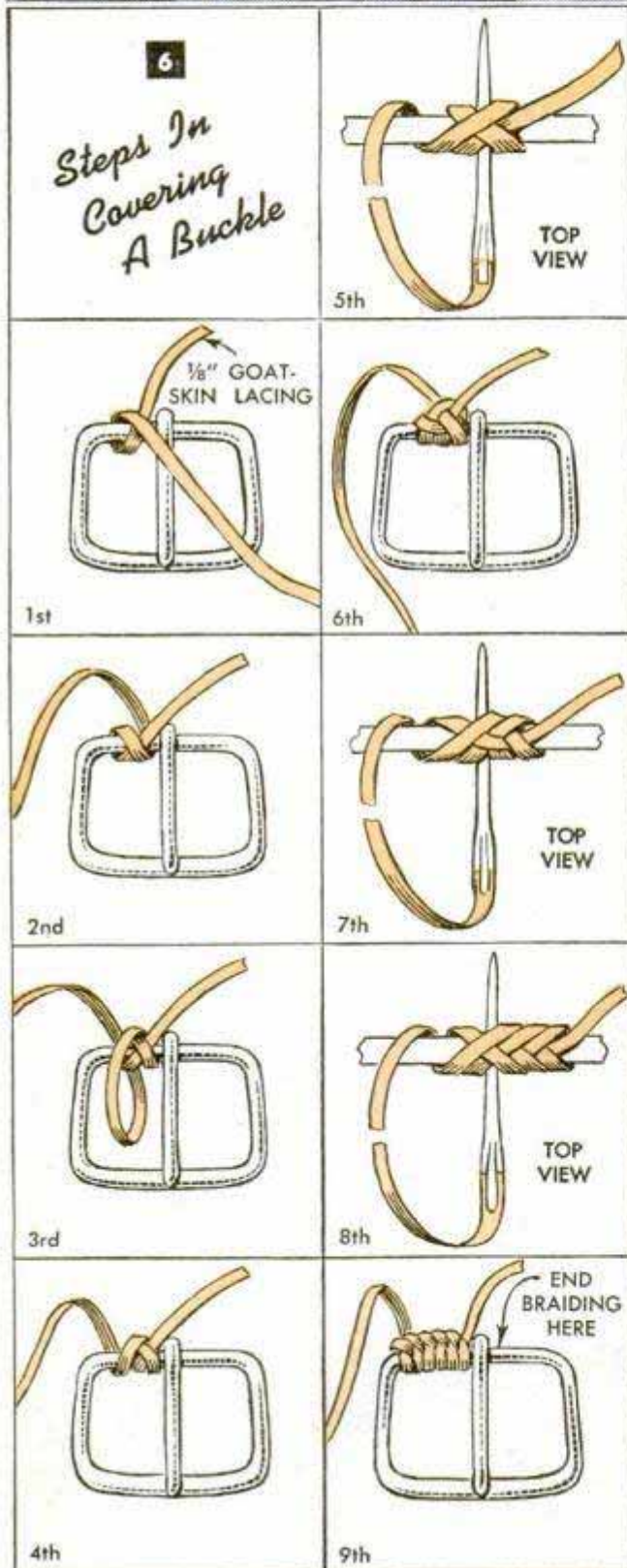
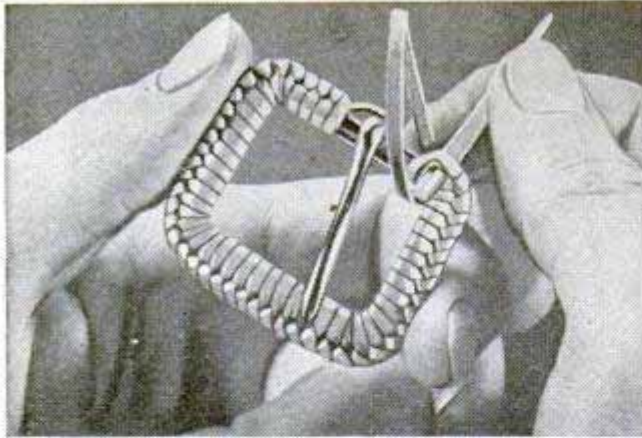


end, which is the same length as the strap end, has a slot cut in it. This is made by punching a hole at each end of the slot and removing the portion between the holes. Aligning slits in each end of the piece are punched at one time while the strip is folded, finish side out. The two pieces used for the thongs are punched in the same manner. The fifth piece is slotted and folded and the ends are laced together, as shown, to form strap guides.

To braid the wrist-watch band, take the strap end and start lacing through the slit at the extreme left as in Fig. 4, step 1. Draw the lacing or thong all the way through except for about an inch. Then come back around and go through the same slit again, step 2, drawing the lacing tight. Continuing, the needle is brought forward and pushed through the next slit, step 3, and drawn tight, the end of the thong being underneath. This is repeated as in steps 4 and 5 and then, being sure that the needle passes to the left of the working strand,

bring it to the front and through the right-hand loop, step 6. Pull it through and tighten and then proceed to come around again and pass through the second loop, step 7, pulling it tight. Keep going back and forth as in steps 8 and 9 until you have about twenty rows braided.

Now, take one of the watch-thong pieces and insert the needle through the left-hand slit as in step 10. Then pass the needle through the left-hand loop of the braiding and through the second slit as in step 11. Proceed in the same way, finishing by bringing the lacing under the loops as in step 12. Cut off the excess and secure the end with a dab of cement. The same procedure is followed in joining and braiding the other parts but, before attaching the braiding to the other thong, check to see if the band is the right size. In determining the size, remember that the braid when first woven stretches and, therefore, it should be made short enough so it will be fastened by the first hole in the strap.



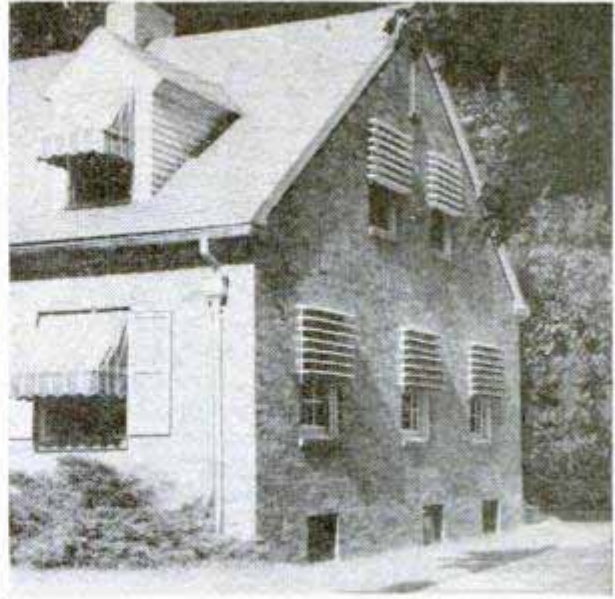
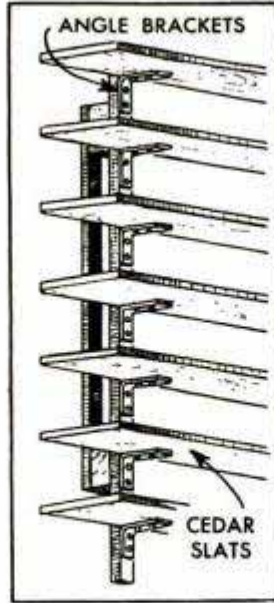
Braiding a turk's-head knot, which is used to add a finish to the watch band, is done as follows: First, make a paper pattern following the diagram in Fig. 5 and form it in a roll so that the ends of the diagram meet and the lines are continuous. Place pins at points marked X. Now, starting where indicated, begin following the lines with the lacing, going around the pins and passing under previous strands at points circled. When finished, remove the work from the pattern and place it over the strap where the braiding joins the watch thongs. Tighten the turk's-head by gradually taking up the slack, going over the knot several times. When tight, place a drop of cellulose cement between the lacing where the ends meet and cut it off. As you become adept at braiding the turk's-head, it can be formed rapidly on the fingers as shown in the series of progressive steps pictured in photos A to I inclusive. To start, wrap the lacing around the first two fingers of the left hand as in photo A. The part held by the left thumb is called the standing end, the other the working end. Pass the working part over the standing part and completely around the fingers as in B. Now the working part is passed beneath the standing part, C, and around the fingers again. Then continue the working part, inclining it to the extreme right, photo D. Note that it passes along the right side of the standing part but, when it reaches the tip of the forefinger, it passes over the standing part and along its left side, passing under the diagonal strand just as the standing part does, photo E. Now, bring the working part to the front once more, photo F. From this point on, the sequence will be over one strand and under one, leaving the lacing fairly loose, G. Working on the back of the hand, photo H, the lacing is passed under one of the scallops and over another. Finally, bring the working part alongside the standing part once more as in photo I.

Covering a belt buckle is shown in Fig. 6. Starting with a yard of $\frac{1}{8}$ -in. goatskin lacing, and holding the buckle with the heel upward, begin as in step 1. Then pass the lacing around and bring it to the front as in step 2. Go around again as in steps 3 and 4. Now, closely following the top view, step 5, open the lacing with an awl and insert the needle between the first and second strands, pulling the lacing tight, step 6. Repeat the same procedure, inserting the needle this time between the second and third strands, step 7. Continuing as in step 8, pass the lacing around the buckle, pulling each loop tight to produce the braid shown in step 9. The finished buckle is shown in the photo.

H K - 51

To keep the radiant heat of the sun out of my house during the summer and still take full advantage of its warmth during the winter months, I fitted my windows with solar awnings. Even on cold, overcast days, the awnings reflect a maximum amount of light into the rooms. Covering only the top halves of the windows, they are an attractive fixture on a home of modern design. The awnings consist of a series of 1/4 x 6-in. cedar slats long enough to extend 4 in. beyond the sides of the windows. The slats are mounted on strips of wood with angle brackets, and wooden blocks, along with another set of wooden strips, bring the awnings flush with the wall of the house. My home is located at 43-deg. north latitude, and I found that spacing the slats 5 in. apart keeps out the sun's rays from the middle of April to the latter part of August. The spacing, of

Permanent Solar Awnings of Cedar Slats Control Sun's Rays for Year-Round Comfort



course, is determined by the latitude in which the awnings are to be used and, once this is done, further adjustment is unnecessary. If desired, the awnings can be attached with storm-sash hangers and removed for the winter.

Charles H. Spurway, East Lansing, Mich.

H K - 51 U.E.'51

This Improved Wooden Gauge Makes It Easy to Check Wheel Toe-In

Hesitating to take my car to a service station every time I went over a bad bump or hit a curb too hard while parking, I made this simple gauge for checking toe-in of the wheels. It has meant considerable savings in worn tires. I fastened a piece of wood, 6 ft. long, to two 8-in. legs and attached a base to one of the legs to hold the

gauge upright. Then, I drove a nail through the horizontal member near one end and fastened another nail near the other end of this piece with a rubber band to permit adjustment. To check toe-in with the gauge, I scribe a line on each tire with an ice pick or screwdriver by holding the tool against the tire while turning the wheel. The wheel, of course, must be jacked up and held steady while scribing the line. Next, I set the gauge against the back of the wheels with the fixed nail on the scribed line of one wheel and adjust the movable nail so it is exactly on the scribed line of the other wheel. Then, without moving the nail, I bring the gauge around to the front of the wheels and check the position of the scribed lines. If the lines indicate that the toe-in is more or less than that designated in the instruction manual for my car, I take the car to my mechanic and have him recheck the alignment and correct the trouble.

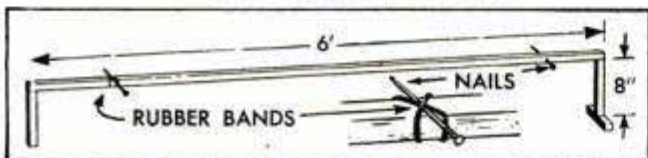
W. A. Leak, San Leandro, Calif.

H K - 51

Radial Model-Airplane Cows

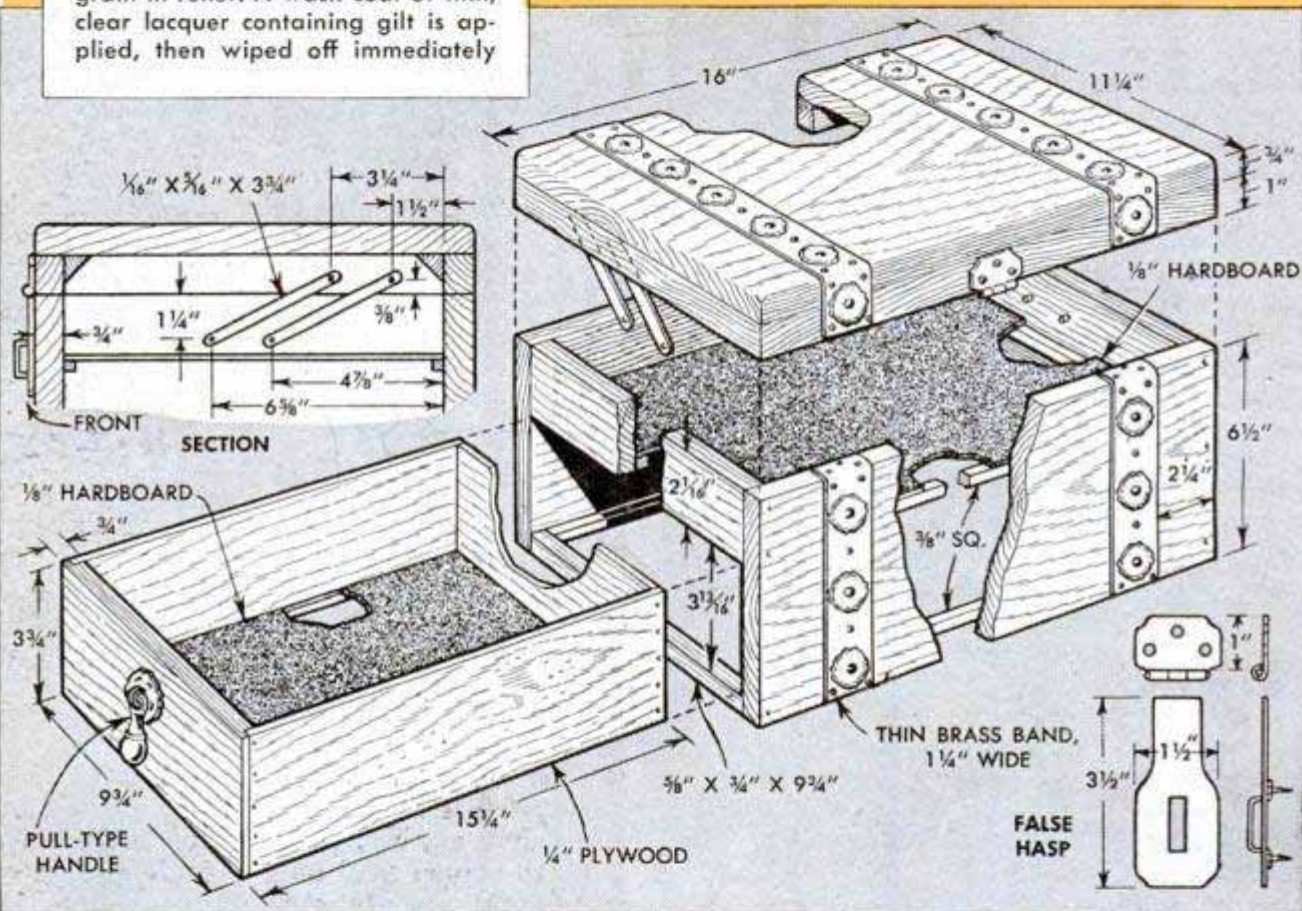
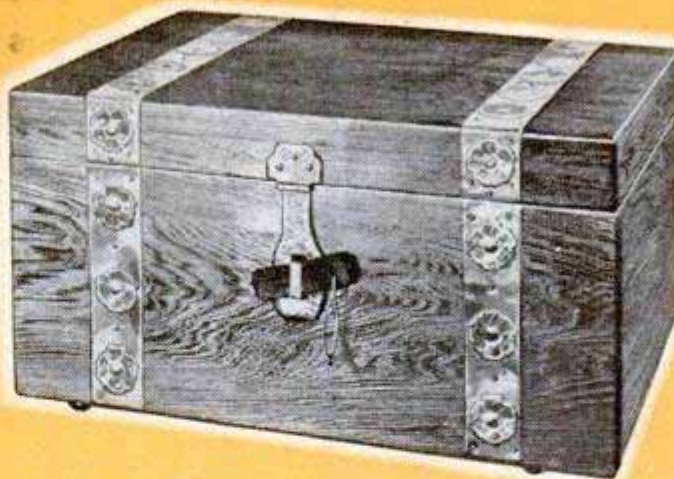
Realistic radial cowls for solid-model airplanes are made from metal chair glides. Drill the center of the glide for the propeller shaft and air intakes, grind off the points and glue the glide to the nacelle.

Fred M. Bowles, Annapolis, Md.



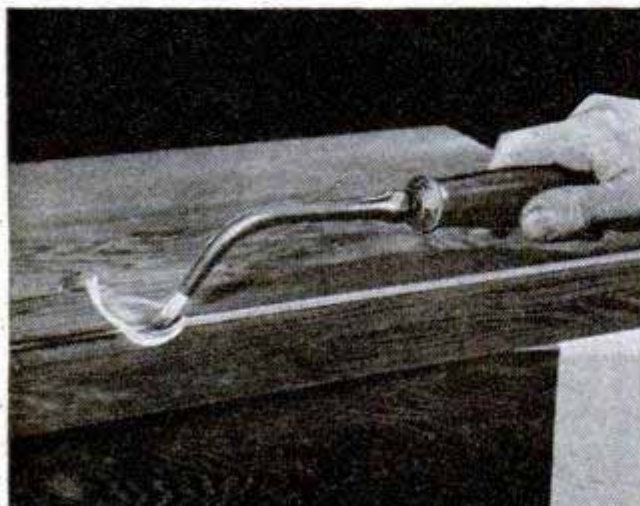
TRINKET CHEST

The trick lid on this attractive burnt-cypress trinket chest will foil tiny prying hands for, instead of opening in the conventional manner, the lid, being pivoted on parallel arms, must be pulled forward. The sugi or burnt-wood finish is produced by charring wood lightly and rubbing with suede-shoe brush to bring out grain in relief. A wash coat of thin, clear lacquer containing gilt is applied, then wiped off immediately



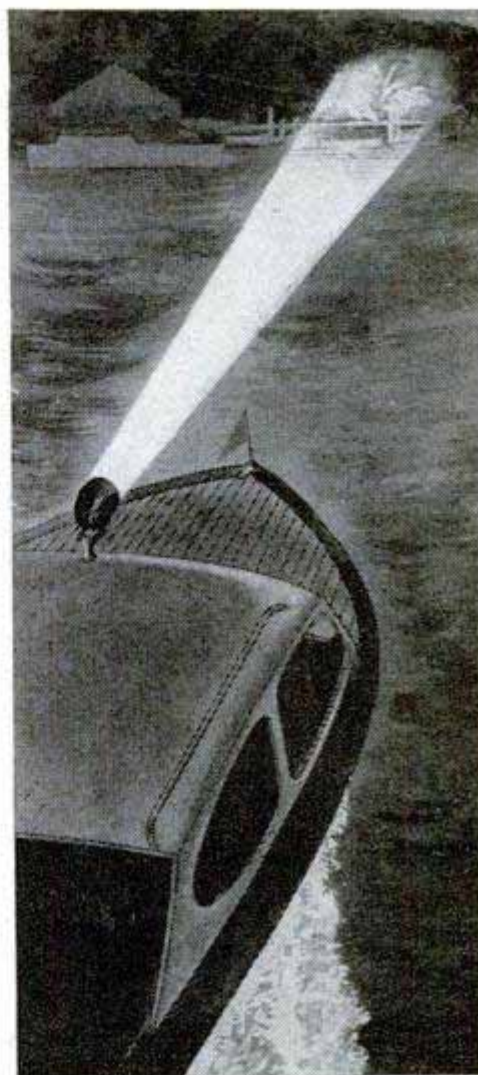
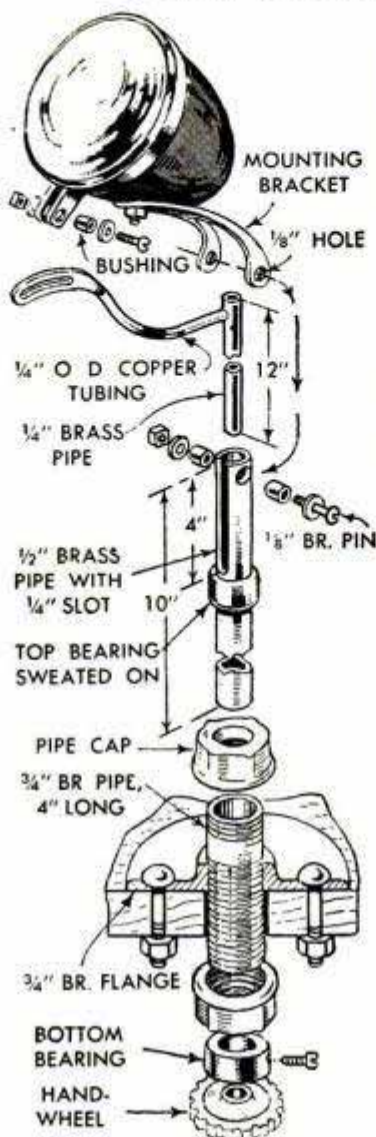
Sugi finish is produced by charring the cypress and then brushing with a fine-wire brush to raise grain

A two-piece dummy hasp parts when the lid is pulled forward and adds to the deception of how lid works



DESIRING a low-cost spotlight for my cabin cruiser, I made one from a sealed-beam car headlight of the bumper-mounted type. The unit is controlled remotely from inside the cabin and throws an elliptical spot a quarter of a mile or more, making it ideal for sighting buoys. The headlight is pivoted on its original mounting bracket which is cut and drilled to suit. The rest of the unit is made from brass pipe fittings, with the exception of a piece of 1/4-in. copper tubing used as an arm for controlling the light vertically. However, galvanized fittings will do if desired. The unit is attached to the cabin roof by means of a pipe flange through which a 4-in. length of pipe is turned. Note that the threads of the pipe are extended so it can be screwed into the flange to project below the cabin ceiling. Seam compound is applied liberally around the hole in the roof before the flange is screwed or bolted in place. The pipe caps attached to each end of this length of pipe are faced or filed flat and center-drilled to take a 1/2-in. pipe. The slotted 1/2-in. pipe for lateral control is polished smooth. The slot also is polished to allow the control arm to slide freely. A top bearing is provided by sweat-soldering a collar to the pipe just below the slot. Another collar, which is a slide fit on the pipe, is attached to its lower end with a setscrew and serves as a bottom bearing. The 12-in. length of 1/4-in. pipe which raises and lowers the control arm should be a sliding fit inside the 1/2-in. pipe and will require bushing. This can be done by spot-soldering shim stock to the inside of the 1/2-in. pipe at the bottom of the slot and at the lower end of the pipe. One end of the control arm is flattened and slotted and the other end is threaded to screw into a hole tapped in the 1/4-in. pipe. If equipment is available, these parts should be brazed together. Note how this arm is bent to permit raising the light. The mounting bracket of the lamp is attached to the 1/2-in. pipe with a brass pin and set of spacers, the latter taking up the difference between the spread of the bracket arms and the outside diameter of the pipe. The lens clamp of the

Low-Cost Spotlight for Cabin Cruiser Utilizes Sealed-Beam Auto Headlight



headlight is attached to the control arm with a bolt having a bushing which rides in the slot. After the unit is assembled, the bottom bearing is tightened so there is a slight drag when the spotlight is turned. Finally, a small handwheel is added to the lower end of the 1/4-in. pipe to manipulate the light. Wiring is done by bringing the wire down through the 1/4-in. pipe and connecting it through a switch on the light itself or on the light panel of the boat. The light is grounded to complete the circuit.

J. Wallace Millard, Amityville, L. I., N. Y.

Battery-Cable Insulation Protected With Section of Garden Hose

When battery cables come in contact with metal parts of a car, there is danger of the insulation wearing through, thus shorting the battery. As a safeguard, place a length of garden hose over the cable, leaving the terminals free. In this way, the hose must be worn through before the cable insulation is reached.—R. C. Zuiker, Chicago.



Make Your Rowboat Shipshape

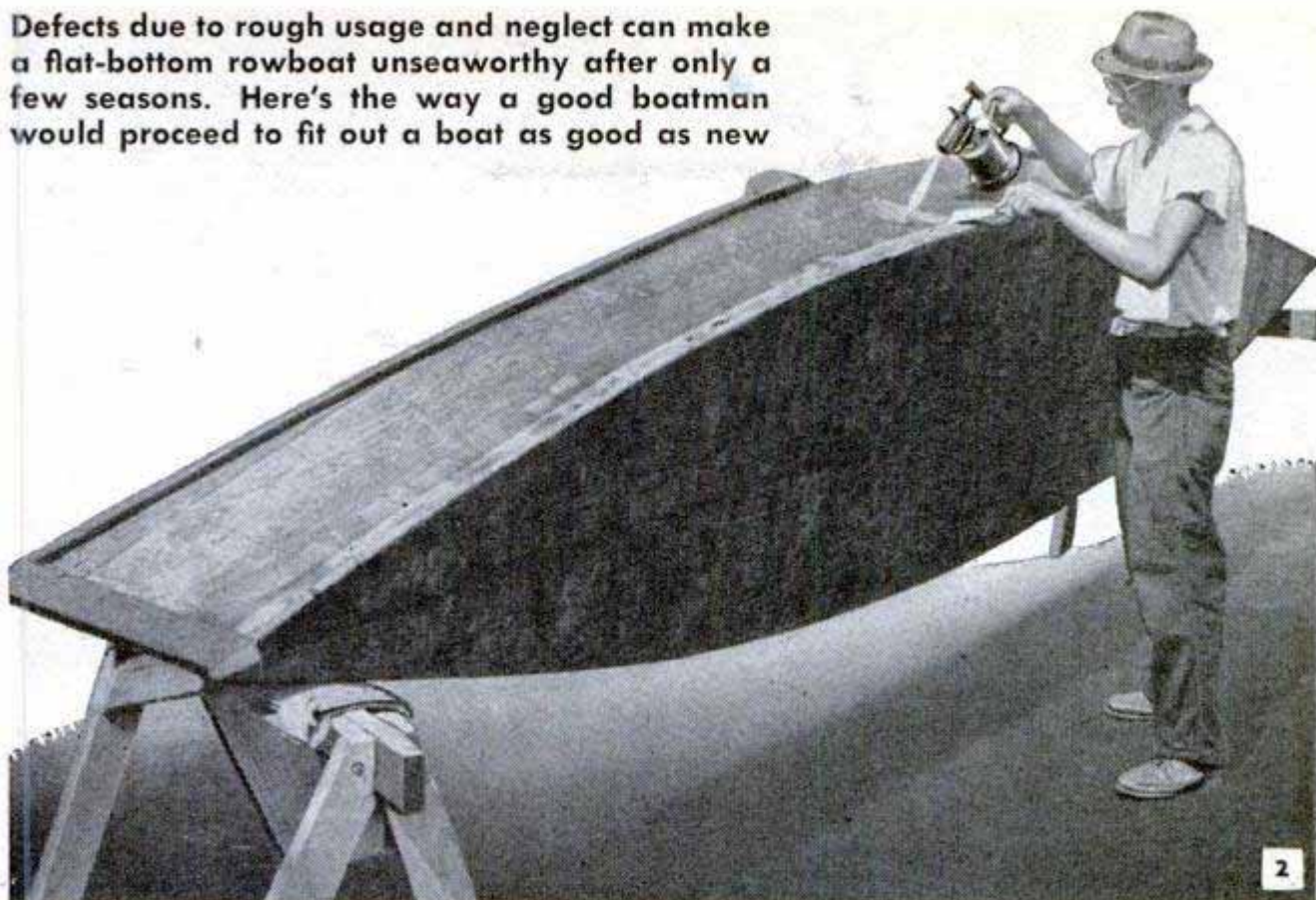
By S. S. Palestrant



BY USING the ordinary "making ready" methods of the good boatman, a worn and leaky flat-bottom boat, or "sharpie" as it is sometimes called, can be made shipshape in a few hours' time. In general, the methods used will apply to any type of boat, flat, round or V-bottom, but just what you do depends primarily on the age and condition of the craft. A boat that is taken from the water and stored during each off season probably will require very little repair from year to year, but work boats used by trappers, hunters and others need frequent and thorough check-ups. Flat-bottom boats that are merely tied up when not in use become waterlogged, leaky and hard to handle. In time, either dry or wet rot or both will weaken the boat so that it is structurally unsafe.

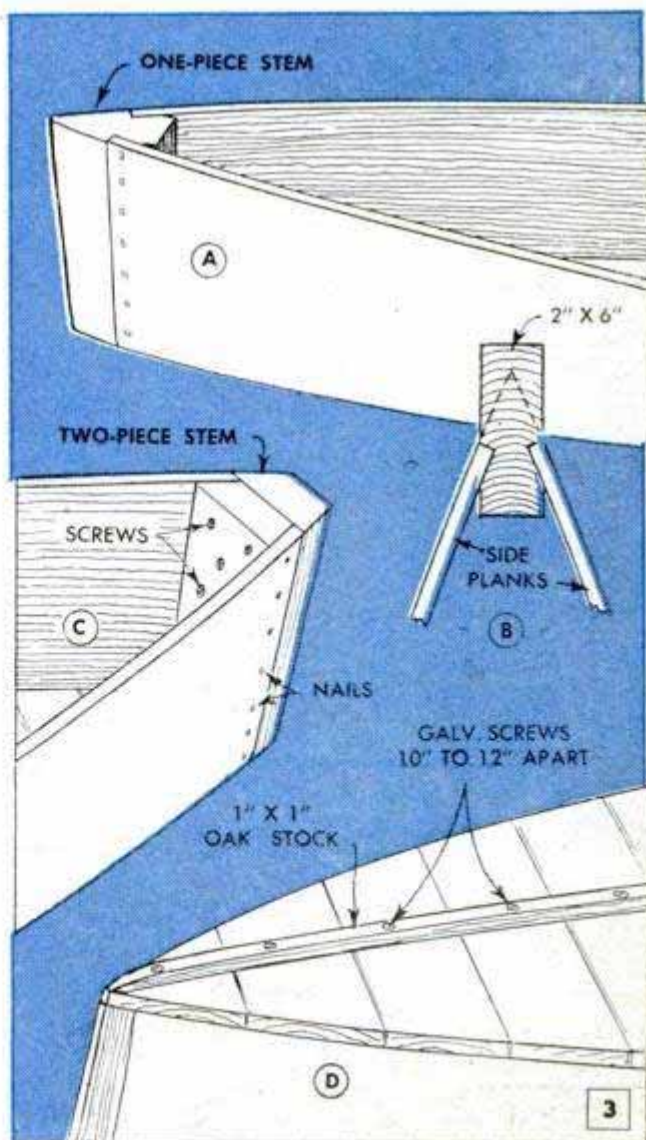
If the condition of the boat indicates only the normal amount of wear and the paint is chalky, but not peeling or scaling to the bare wood at any point, then sandpapering and painting are all that is necessary to recondition it. However, scaling paint, damaged oarlock mounts or decks and the presence of dry rot in the bottom planks or the stem call for complete repair and refinishing. If this must be done, place the boat on sturdy sawhorses, as in Fig. 1, and remove the paint either by softening the film with a blowtorch, as in Figs. 2 and 4, or by use of a paint remover. With either method, use a scraper to remove all the loosened paint down to the bare wood. Check the side and bottom planks along the chine for dry rot by forcing

Defects due to rough usage and neglect can make a flat-bottom rowboat unseaworthy after only a few seasons. Here's the way a good boatman would proceed to fit out a boat as good as new



a knife blade into the wood. If any of the planks are soft they should be replaced. Often a new stem will be required because of dry rot or wet rot due to lack of ventilation under the deck. Two common methods of making a stem for a flat-bottom rowboat are shown in Fig. 3, details A, B and C. The one-piece stem, details A and B, made from selected oak, is the best although it is more difficult to make. The ends of the side planks are fitted into rabbets cut into the stem block at the correct angle, detail B. Then the projecting portion of the block is shaped to form a cutwater. This can be straight vertically or at an angle as desired. In the built-up stem, detail C, the rabbet is formed by joining two beveled blocks of different widths. The blocks are joined with heavy galvanized screws and marine glue, although waterproof cabinet glue also can be used. Use galvanized screws or bolts wherever it is necessary to employ metal fasteners. In replacing any parts, select sound, seasoned stock and be sure to duplicate the dimensions of the old part in all details in the new one.

Prepare the wood for the priming coat of paint with a thorough scraping and sanding. Renew the caulking in the bottom planks, Fig. 5, and replace the keel, detail D, Fig. 3. If necessary to replace any bottom planks, it is important that the grain run the same on all pieces, detail D, Fig. 6. Repair or replace the decks and oarlock mounts and also the rub rails, if necessary, Fig. 6, details A to D inclusive. Be sure that

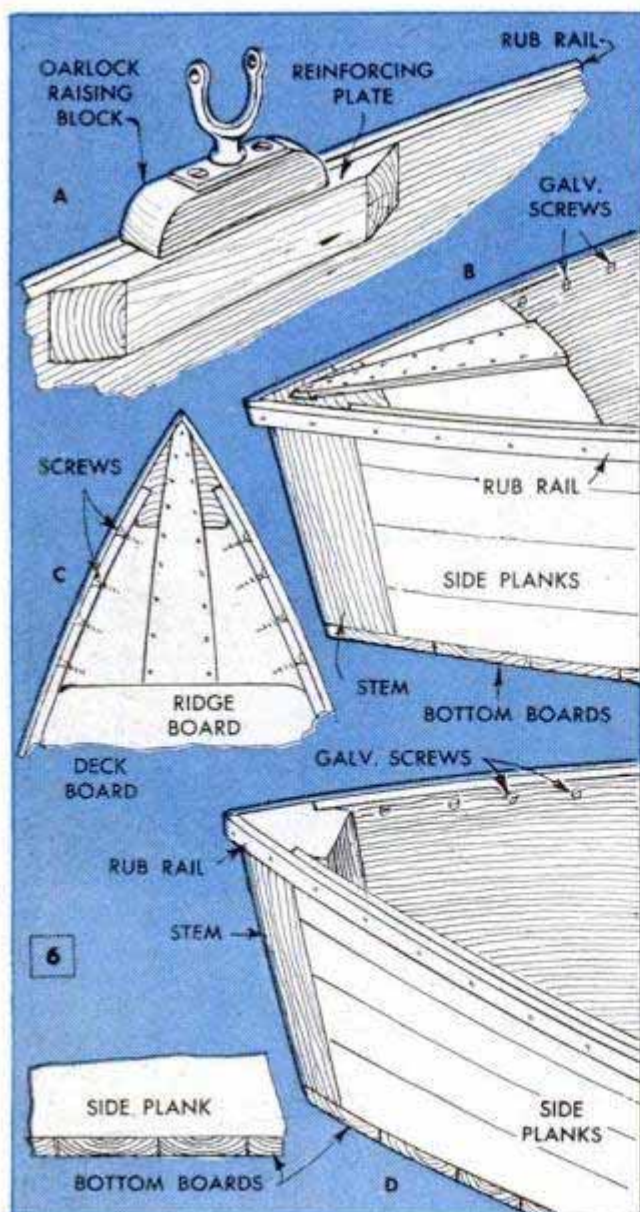




When refinishing, pay special attention to the inside of the boat. Damaged paint should be loosened with a blowtorch and scraped to expose bare wood

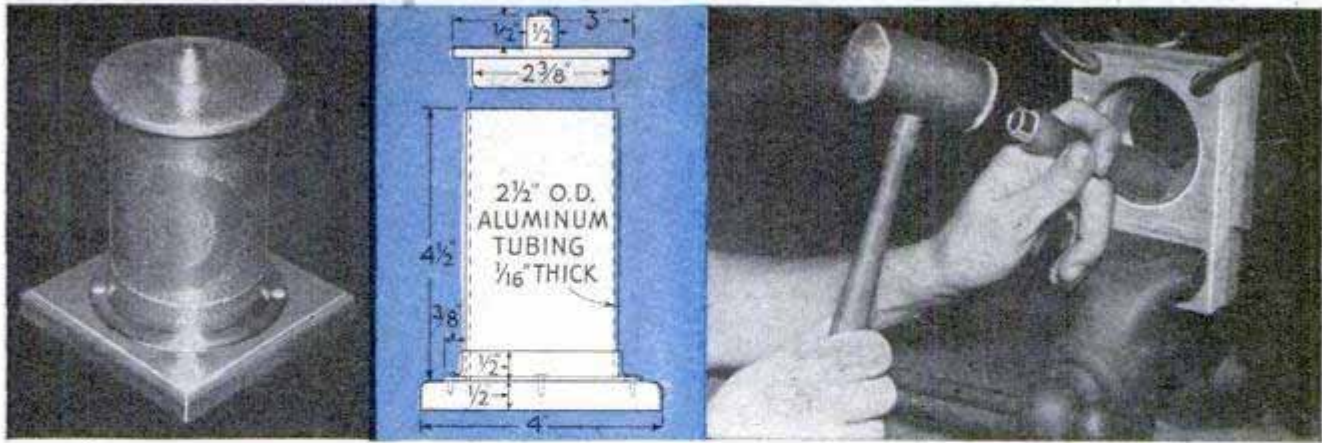


Recalcing periodically will assure a tight, dry boat and add greatly to the life of bottom planking. Important thing is to calk joints uniformly



the wood is thoroughly dry before applying the first priming coat. In priming a boat, usually it is best to apply two or three thin priming coats with long intervals of drying between. Brush out the priming coats well to assure uniform coverage, and be especially particular to work the primer into all exposed end grain. Use a primer with a white-lead base. After priming, most boat refinishers go over the entire surface and fill all dents, nail holes and slight nicks either with a filler made from white-lead paste or a commercial seam sealer made for boat work. Then the surface is carefully sanded in preparation for the application of the finishing coats of full-bodied paint. The last priming coat must be thoroughly dry before applying the first finishing coat. When painting the bottom, or any part where paint must be brought up to an edge, draw the loaded brush off the edge, not against it. In this way you will avoid drips and sags in the paint film which result from careless application. The first finishing coat should be thinned with a reducer to an easy brushing consistency. The second finishing coat can be slightly heavier, perhaps, but avoid a heavy application. Two finish coats over a three-coat primer should be sufficient to produce a smooth, durable finish. If desired, a copper bottom paint can be applied instead of the lead-and-oil priming coat. The copper-base paint may be applied only to the bottom boards, or can be brought up the sides to the load waterline. In this case, the sides are primed and painted with a lead-and-oil paint from the waterline to the sheer line.

Aluminum Humidor Holds King-Size Cigarettes



Although the body of this humidor is simply a piece of hammered aluminum tubing, the supporting base flange offers more of a challenge to the hand crafter's skill. The flange is formed by a hand-planishing operation, using a special jig made from two pieces of hardwood held in a vise as in the right-hand photo. After cutting the flange from soft aluminum to the inner and outer diameters, the resulting ring is centered in the jig and held securely with clamps. A hardwood file handle, used as in the photo, serves as a planishing tool. Work slowly and be careful to bend the flange uniformly to avoid tearing the edge of the metal. After forming, file the inner edge of the flange to a snug fit over the bottom of the tubing. Hand-hammering of the body is done with the tubing placed over a piece of pipe or a metalworker's bench stake. If you wish to decorate the hammered surface with your initial, lay out the outline of the letter with a pencil, and then carefully work around

it with a small ball-peen hammer. Hammer the metal top on an ordinary anvil or on a surface plate. Note that the cover is composed of three parts, a knob, or handle, a metal disk, and a bottom disk of hardwood which is an easy fit inside the humidor body. Both the handle and the bottom disk can be cut from hardwood, such as maple or boxwood. A small hole is drilled through the center of the metal disk, and the knob is joined to the bottom disk by a screw, preferably driven up from the bottom. This securely locks the three parts together. The base is made from the same wood as the knob so that the two parts match in color. Drill four equally spaced holes in the body flange and attach the flange to the wooden base with four aluminum rivets. File the ends of the rivets to a sharp point and drive them as nails. Polish the metal parts on a buffing wheel, being careful to remove all scratch marks, and then finish with a coat of metal lacquer.

R. J. DeCristoforo, New York City.

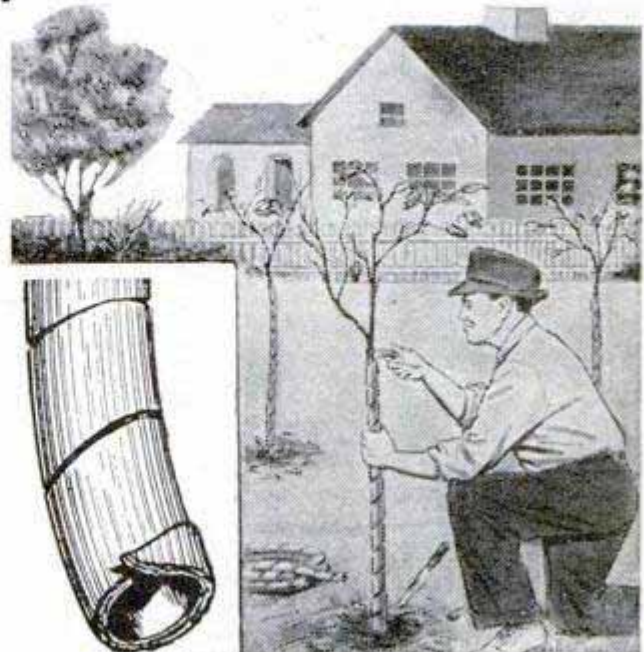
Trunks of Young Trees Protected by Guards Cut From Garden Hose

To protect the trunks of young trees from damage, I made effective guards from lengths of garden hose which were wrapped around the trunks. I cut the hose spirally by placing it in a wooden channel and then rotating it while sawing at a 45-deg. angle. No fastening is required, as the tension of the hose holds it firmly around the trunk.

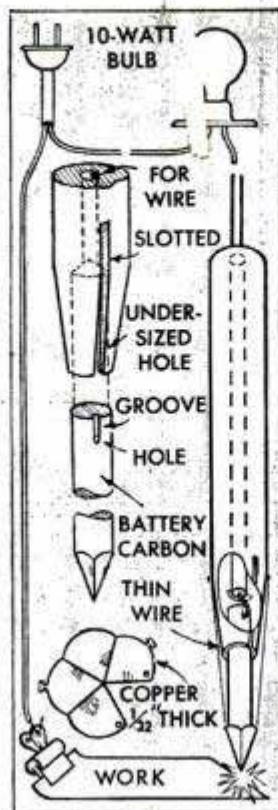
Edward H. Stutz, Cleveland, Ohio.

Paint Preserved for Future Use

Prevent paint from hardening in the can after exposure to the air by pouring a thin layer of turpentine over the surface. Put a bit of the paint in the groove in the friction top of the can also, and then drive the cover down tightly. This seals the can and the paint will not skin over as so often happens if the can is not well sealed.



Carbon From Dry Cell Provides Tip For Homemade Soldering Iron



Utilizing the carbon core of a flashlight cell as a tip and a piece of broomstick as a handle, one homeowner made an electric soldering iron for his shop. The battery is baked in a hot oven for an hour so it will dry and harden. Then the carbon core is removed and filed to a four-sided point. After the broomstick handle is drilled, tapered and slotted as shown, the top end of the carbon is drilled and grooved to permit attaching the wire. One wire is secured to the carbon and connected to a 10-watt bulb which indicates when the iron is on. A paper clip on the end of the other wire is clamped to the work to complete the circuit. Note that a copper tip is cut out and fastened to the carbon with two lengths of thin wire, the latter being wound around small screws driven into the handle. The copper tip, of course, must be tinned, and it should be detached occasionally so the loose carbon underneath can be removed. To use the soldering iron, touch the tip to the work and draw it away slightly to form an arc which heats the tip. Do this frequently to keep the iron hot.

C. L. Meehan, Lakeview, Ont., Can.

Wood Ashes Rid Tree of Borers

My favorite method of ridding a tree of peach-tree borers and other destructive insects is to sprinkle large quantities of wood ashes around the base of the tree during the spring and fall. The worms and

insects that would otherwise infest the roots will not live in ashes. In addition, the ashes provide fertilizer for the tree. Ashes should not be placed close to the tree in dry summer months.

Ralph Underhill, Beebe, Ark.

Cotter Pins Form Photo Stand

A neat stand for a cardboard-framed photograph is made by slipping two cotter pins over its bottom edge. One arm of each pin is first bent outward, as shown, to support the photo upright.

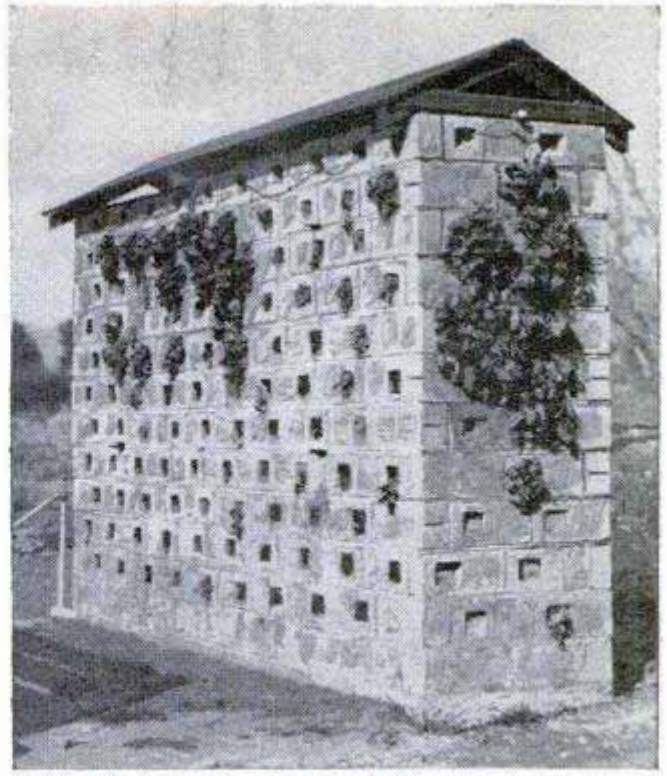
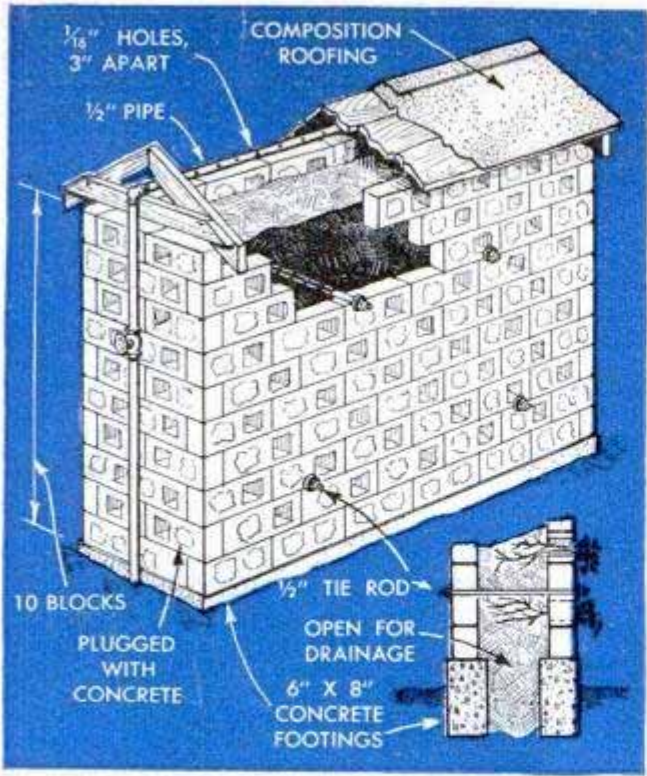


Handy Spacer and Aligning Jig Aids Building Picket Fence

To speed the job of spacing and aligning the pickets when building a picket fence, one homeowner devised this wooden level and spacer. It is made from a board cut to the exact length of the pickets. A strip of wood is nailed to each end of the board and a screen-door handle is screwed to one face. Note that the ends of the board must be cut perfectly square so the crosspieces form right angles. The bottom crosspiece holds the picket to be nailed while the top crosspiece aligns it with the previously nailed picket.

Roger Bechard, Montreal, Que., Can.



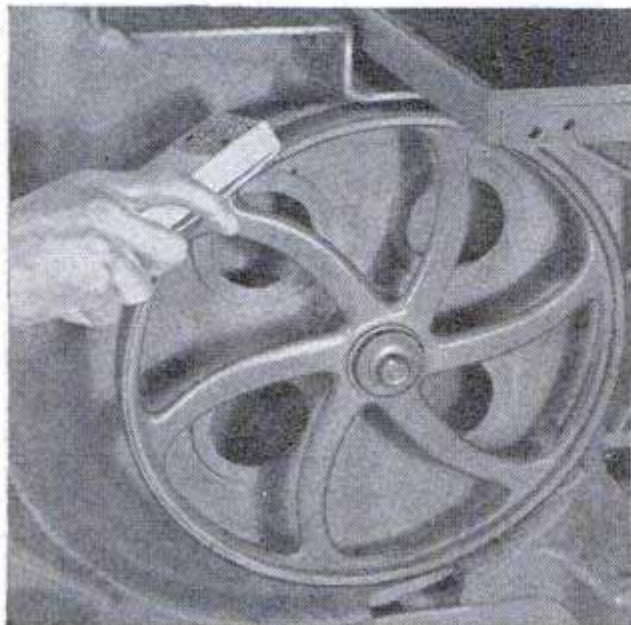


Hollow Concrete Blocks Form Strawberry Wall

Concrete blocks, of the hollow type, laid on edge on a concrete footing, form walls of this unique strawberry bed. One hole in each block is plugged with concrete and a strawberry plant is set in the other.

The plants are set after each course, or layer, of blocks is laid. For example, after laying a course of blocks, fill the enclosure to the level of the holes with a rich mixture of loam, compost and well-rotted manure. Then push the plants into the holes from the inside until the leaves are exposed to the sun on the outside of the wall. Care must be taken to soak and tamp each layer of soil to avoid loose soil settling away from the roots, thus causing them to dry out and

die. Tie rods are used to prevent the two long walls from bulging outward. After the top course is completed, a water pipe with $\frac{1}{16}$ -in. holes drilled 3 in. apart is installed lengthwise across the top as indicated. The flow of water should be directed straight down and regulated by a conveniently located valve. A roof, completely covering the top, will prevent excessive moisture during heavy rains. The structure should be positioned so the two long walls will benefit from the morning and afternoon sun, and should be located so it is not shaded at any time. By clipping the runners, most of the original plants can be made to bear fruit for several seasons.

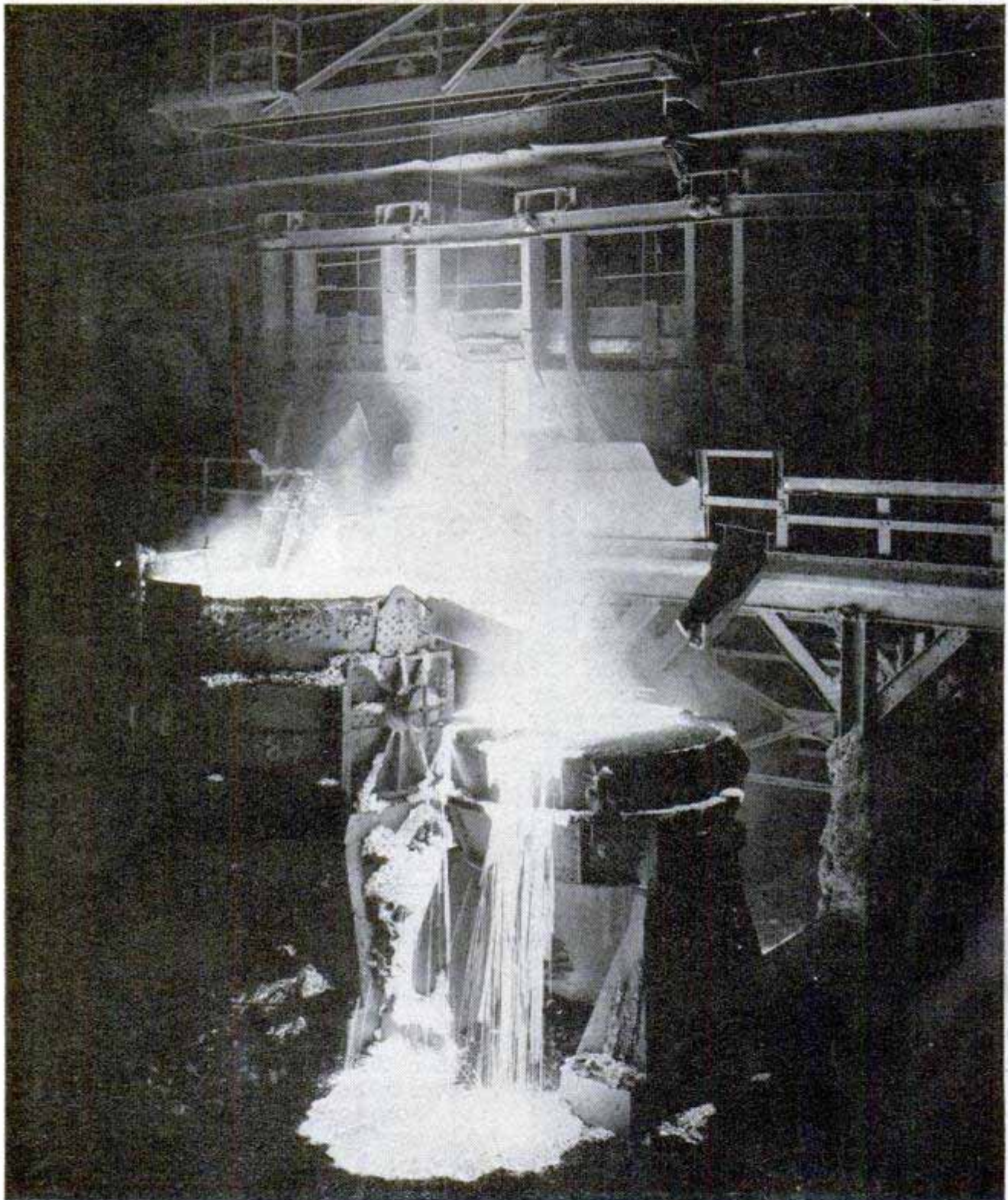


Bandsaw Tires Dressed Quickly With Sanding Block

When the tires of a bandsaw develop grooves as the result of long use, it is necessary to true them before the blade will again track properly. To do this quickly, tack a piece of coarse sandpaper around a wooden block. Then, remove the blade from the machine, turn on the power, and hold the sanding block squarely against the rubber tire on the lower wheel. After dressing the tire of this wheel, replace the blade, start the machine, and hold the block against the bottom of the upper tire.

☐ Faded wool rugs may be brightened by rubbing with a flannel dipped in warm water to which a little vinegar and common salt have been added. Dry in the open air.

Let the shot **LIGHT** *itself*



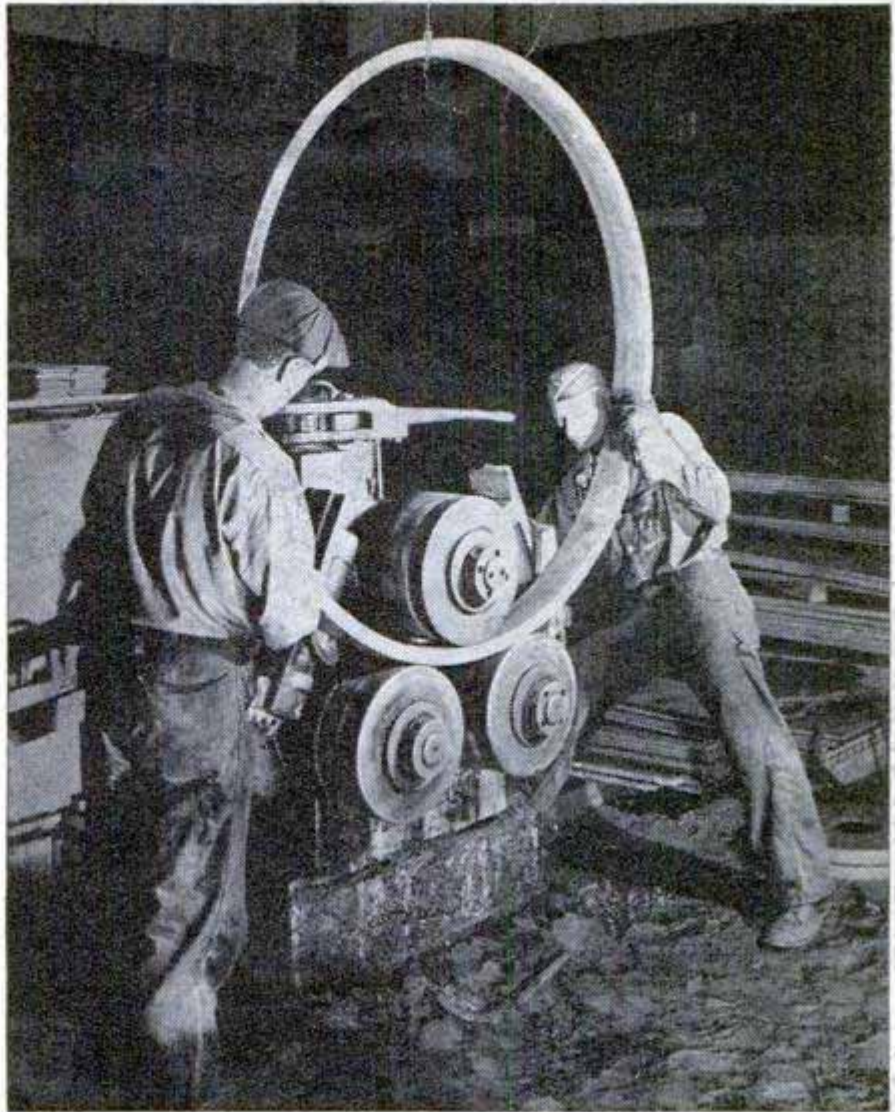
GOOD PICTURES of any subject result from a studied arrangement of background mass and correctly lighted foreground details. When shooting photos of industrial processes—men and machines at work—forceful presentation is achieved by simply utilizing bold contrasts of light and shadow. In many instances the picture is merely allowed to “build” itself on the background by means

By Fred G. Korth

of the radiated light from the materials in the object itself or by means of radiated light resulting from an operation or process. The photo directly above is a good example of this type of self-lighted shot. Here molten steel is being poured from an open-hearth furnace into a huge ladle, from which slag is overflowing onto the floor. The brilliant luminosity of the red-hot metal is the only source of

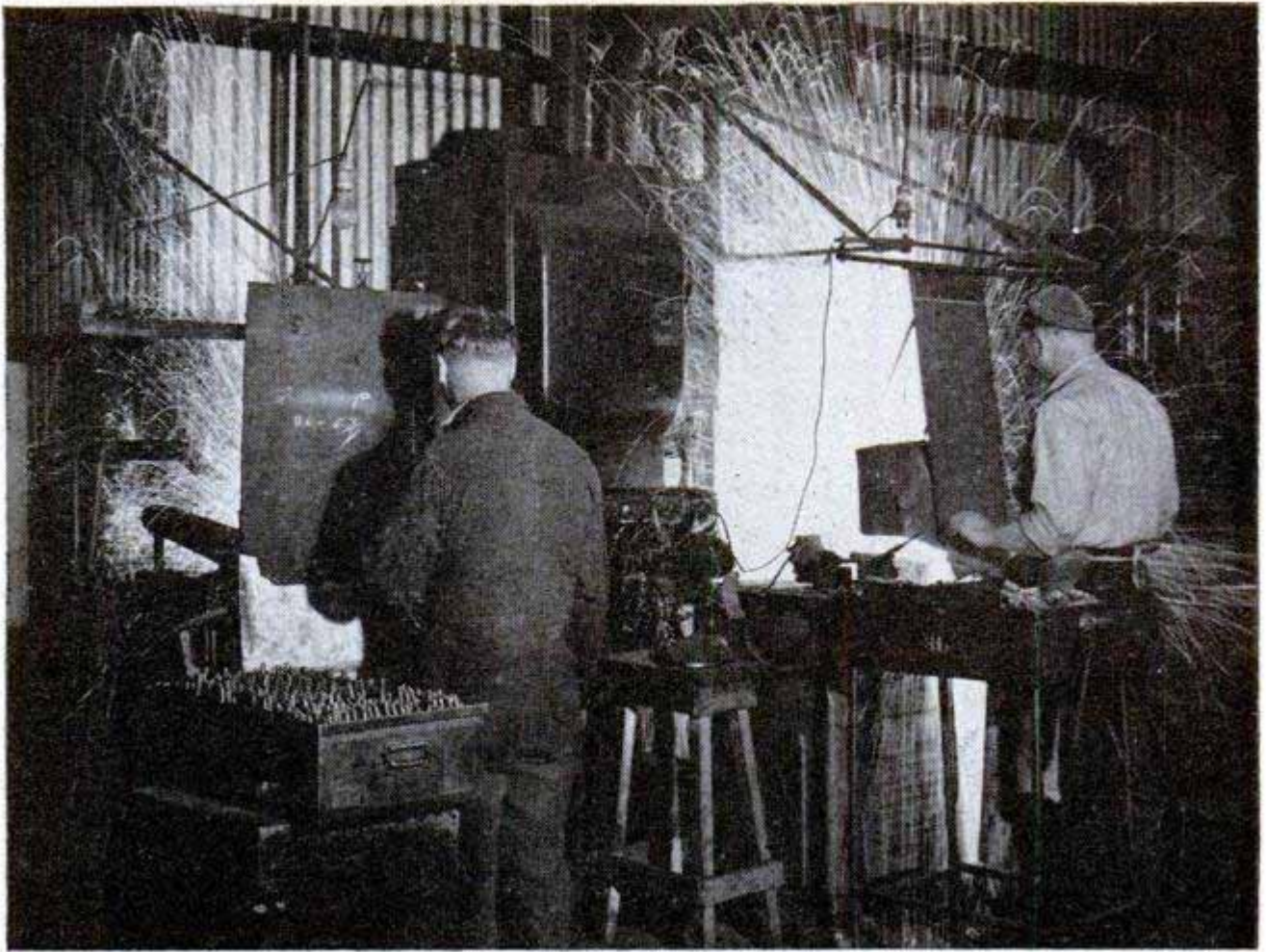
light. Radiated light has illuminated just enough of the background detail to fill in the story, thus definitely identifying the picture and at the same time lending its own dramatic emphasis. Note especially the location of the camera to take a three-quarter view which gives the proper angular perspective to the highlighted detail. Note also that the camera was placed above, rather than below, the center of interest. Shooting down on large objects has the effect of making them look smaller, brings all details into more natural size relationships and gives greater uniformity of emphasis to the composition.

The action photo at the right required only a single flash coming from the right to illuminate the machine, the operators and the work against a semidarkened background. The shot is taken approximately at eye level. Note that the flash was placed to illuminate the inside of the metal ring farthest from the camera and to high-light the edge



Above, a dramatic action shot with detail emphasized against a dark background by subdued flash lighting. Note that the flash is placed to light the inside of the ring farthest from the camera but only high-lights the edge nearest the camera. Below, a self-lighted shot of a large workroom





Above, the background is self-lighted by the welding operation while a single flash placed at a distance prevents loss of foreground detail. Below, a self-lighted shot in which only the tracery of the sparks from a welding operation is used to light the picture



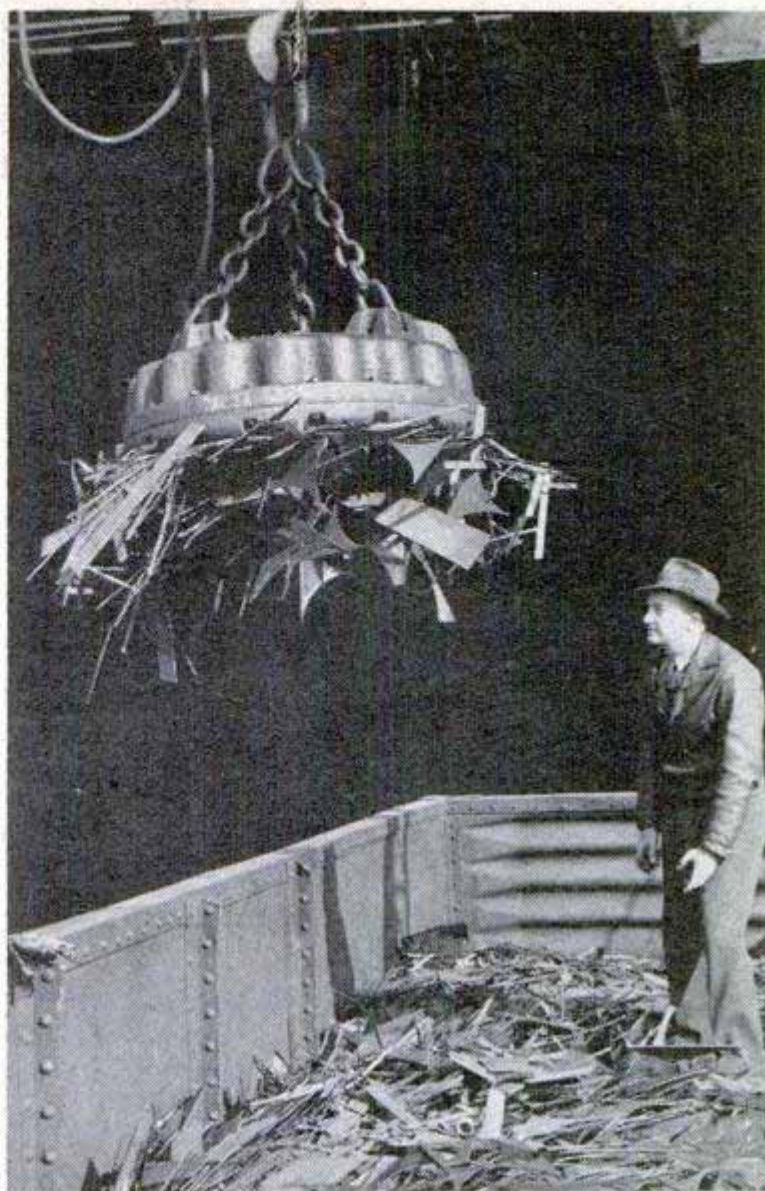
brightly. Both the position of the camera and the location of the single flash achieve balance and the foreshortening of the three-quarter view dramatizes the action.

The lower photo on the preceding page presents another problem to the photographer. Obviously, it would be impossible to illuminate this large workroom and the scores of operators with photographic lighting. But by simply raising the fluorescent fixtures a few inches the shot was made to light itself even more effectively. Then a small lens stop and a half-second exposure on fast pan film did the trick. Again the shot is taken at approximately eye level with the camera "looking" straight down the line of workers at the left. This position of the camera gives one more of a feeling of action, of work being done in the room, for the eye is led directly down the line of busy workers at the right of the aisle immediately in front of the camera. Any other angle or elevation of the camera would have resulted in a flat, uninteresting shot with an unnatural foreshortening of objects and persons in the foreground and a loss of detail in the background.

The photos above and at the left are examples of photos that are allowed to develop their own action through the delicate tracery of innumerable sparks from welding operations. The picture at the left is wholly self-lighted, but in the shot above, a

single flash is placed at some distance to the right to illuminate softly the workers and their equipment. When picturing welding operations it is important that the exposure be long enough for the spark pattern to attain maximum brilliance on the film. Any other necessary lighting should be reduced to secondary power either by using the smallest flash bulb or floodlight, or by moving it some distance away from the action. These two pictures also emphasize the importance of camera angle. Put yourself in the position of the photographer for a moment and you can see that only slight changes in camera elevation and position will alter the pictorial values and change the composition by bringing unseen details into the field of the lens. Certain positions around the lower scene would soften the sharp outlines, change the spark pattern and perhaps even lose the picture story entirely. After a study of the two shots you can see that the photographer has chosen his vantage point with care and only after a detailed examination of the work being done at the scene. It is quite evident from both shots that the picture possibilities were carefully appraised from several angles before selecting the spot at which to set up the camera. Only careful positioning of the camera could catch the sharp silhouette in the photo at the left. Moving slightly to the left or right of the position from which the action was shot, or just a slight change in camera elevation, would lose most of the dramatic values of the whole composition.

All of the accompanying photos emphasize the importance of correctly evaluating the kind and nature of the background to be included in industrial pictures. As in the first photo discussed, background detail is in many instances essential to the composition. In self-lighted shots the background detail included is more or less controlled by the camera position and the amount of radiated light. In flash or floodlighted shots, the trick is to light the background in such a way that the background detail appears only in greatly subdued outline. The action shot of the two operators at the bending machine is a good example of carefully controlled background lighting. An exception is the action shot of the welders at the top of the preceding page. Here the background is self-lighted but the

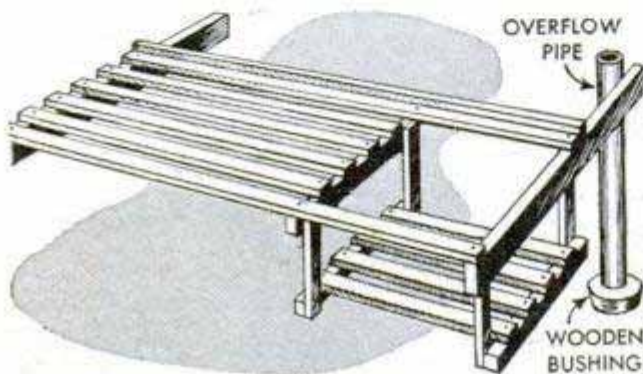
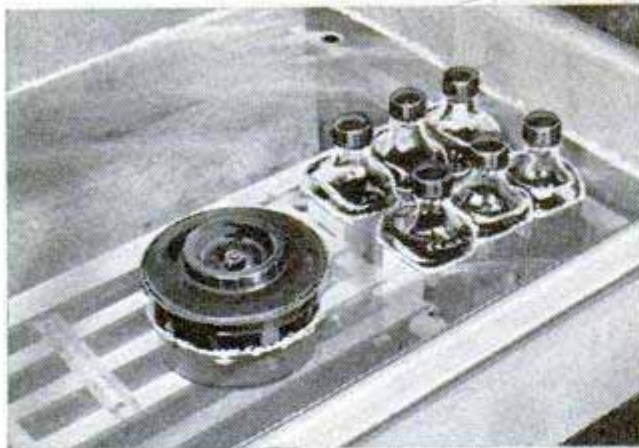


Only the sun was used to light this picture of the big magnet with its load of scrap metal being examined by the inspector

foreground is flash-lighted so that the necessary definition of foreground detail will not be lost in semidarkness.

Some industrial shots, however, tell the whole story without any lighted background props. The shot of the welder at the lower left on the preceding page and the photo directly above are good examples. Both are self-lighted, one by the glow of the welding operation, the other by the sun. In the photo above, the exposure was timed to catch the big magnet with its load of scrap metal in midair, and a careful study of the picture possibilities beforehand enabled the photographer to locate the camera so as to use the dark interior of an adjacent building as a background. Just enough of the loaded car was included to identify the picture as being that of an inspector examining the run of scrap material being unloaded at a foundry. This shot emphasizes the importance of making sure that objects in motion are in the correct position at the time of exposure.

Sink Rack for Developing Solutions Permits Easy Temperature Control



When developing color films, it is important to keep all solutions at the same specified temperature. This can be done easily by making a two-level rack similar to the one shown and wedging it inside the sink. An overflow pipe is fitted into the sink drain by means of a wooden bushing. A thermometer is laid on the rack and, as the volume of water involved is comparatively large, the temperature is kept constant simply by adding a little hot or cold water from time to time.

Willard Allphin, Danvers, Mass.

Label on Double Film Holder Describes Contents

As a reminder of the type of film loaded in double film holders, one photographer writes this information on a label glued to the edge of each holder. The labels are

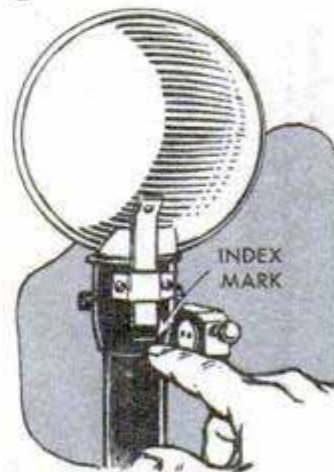


made wide enough to permit noting the film on each side of the holder when it is loaded with two types. If the notation is made with a soft pencil, it can be erased easily.

Wayne A. Ward, Watertown, N. Y.

Battery Case of Flash Gun Indexed To Aid Positioning Reflector

If bulbs of more than one size are used in a flash gun, the reflector can be centered quickly by first marking the proper position for each type of bulb on the back of the battery case. To do this, insert bulbs of various sizes in the gun, centering the reflector for each size and filing a small groove in the battery case directly under the end of the reflector clamp. These grooves, of course, are later used to position the reflector and they are easily seen if filled with white paint.



Obtaining Better Color Balance In Transparency Projection

Because of the fact that a color transparency usually is taken in daylight, the color balance of the projected image is improved by tinting the projector bulb a faint blue. A frosted bulb is tinted by dipping it in cellulose-acetate plastic dye until the desired shade is reached and then rinsing it in cold water. Be careful not to touch the bulb until it is dry as the dye softens the frosting. If the projector is equipped with a clear-glass bulb, the reflecting surfaces may be dyed a light blue. As an alternative, a thin sheet of clear plastic, tinted a light blue, may be mounted next to the diffusing screen.

Protecting Lenses From Chipping

Auxiliary lenses and unmounted color filters are less likely to be chipped if their edges are protected with a thick, resilient coating of fingernail polish. Cellulose cement also will serve the purpose. Apply the cement or polish carefully so it does not run onto the surface of the lens.



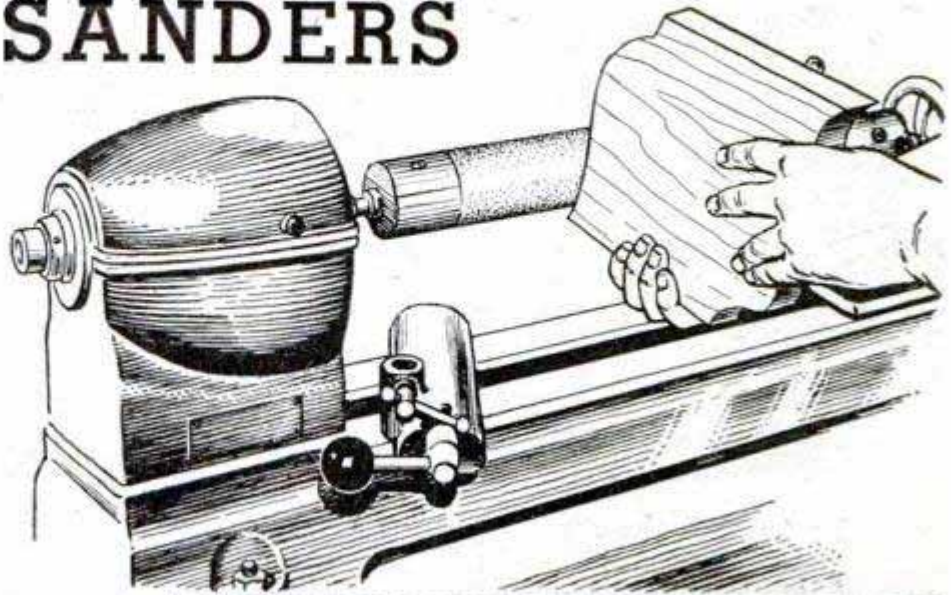
Rep. L.L.B. #14

SHOP NOTES

LATHE SANDERS

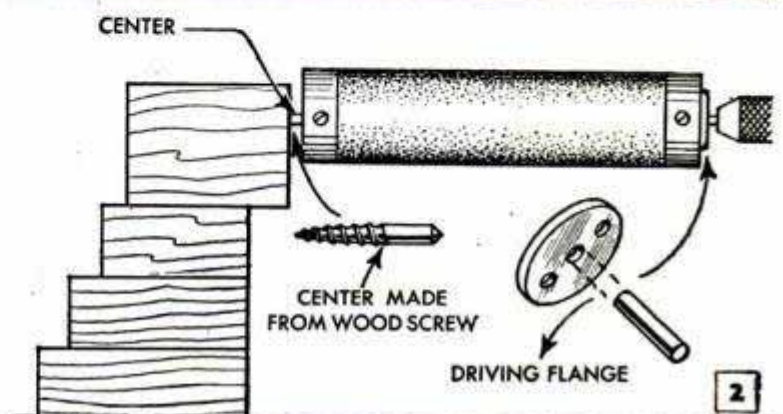
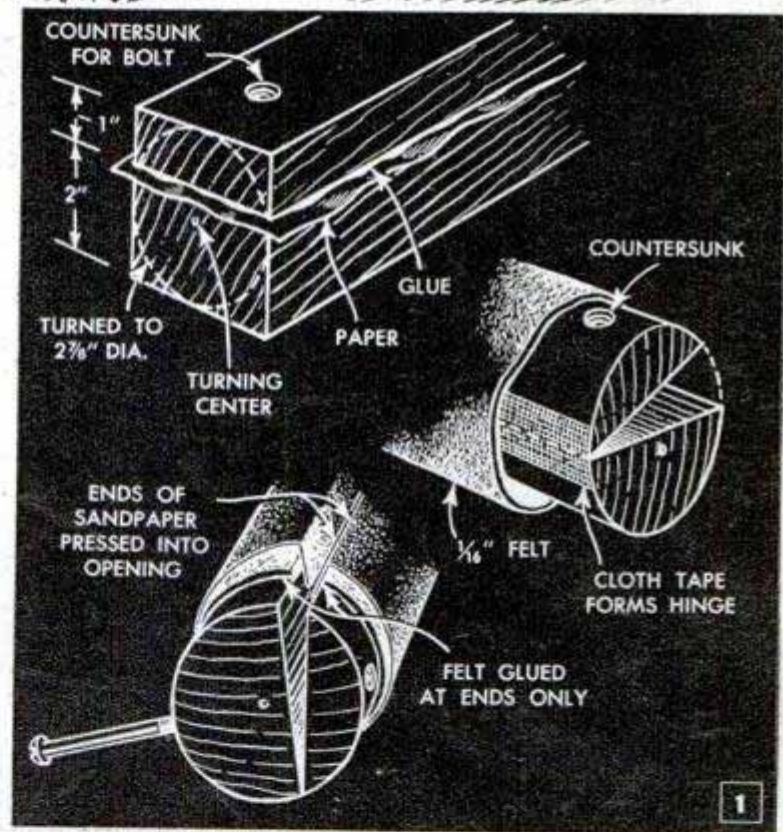
By Dick Hutchinson

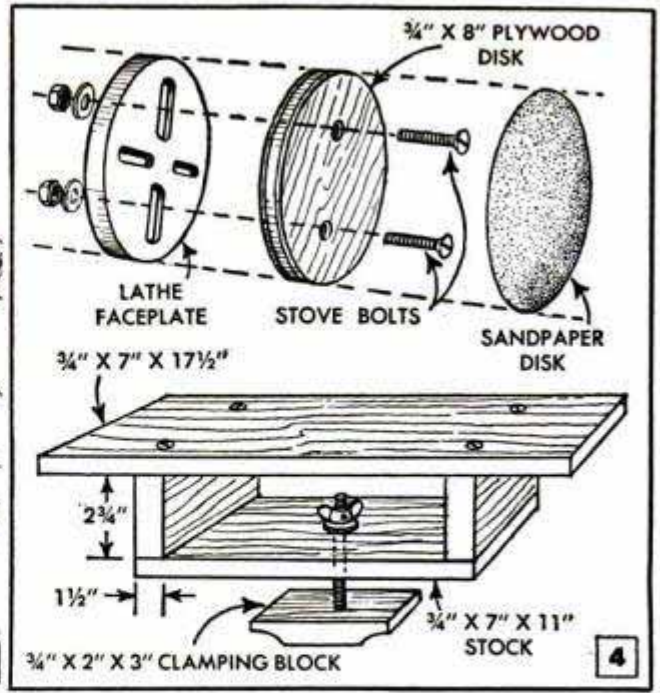
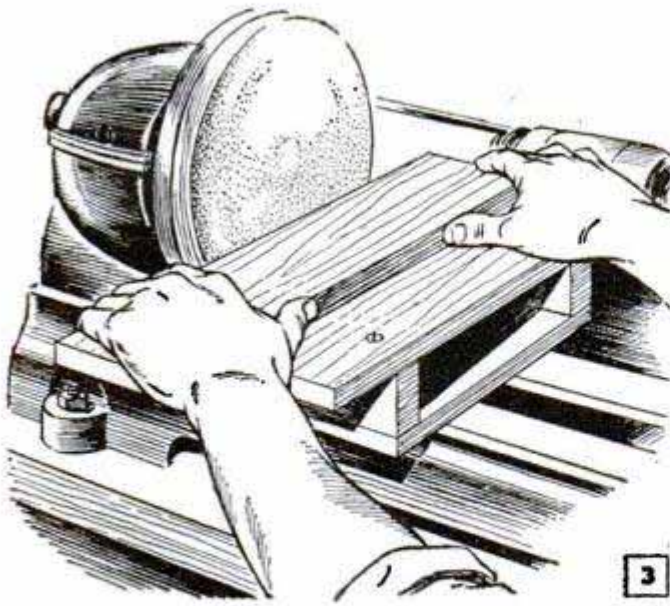
DO YOU need disk and drum sanders to supplement your belt sander? They can be obtained inexpensively by simply turning a wooden drum to operate between your lathe centers, and a plywood disk to attach to the lathe faceplate or screw center. For the disk sander, you will need a simple table



to fit on the lathe ways as in Fig. 3.

To make the drum sander, select two pieces of hardwood, one piece 1 in. thick and 3 in. wide, the other 2 in. thick and 3 in. wide. The drum can be any convenient length up to about 15 in. If it is made longer without increasing the diameter proportionately, there is a danger of whipping at high speeds. Glue the pieces together, as in Fig. 1, with a sheet of heavy paper between them. When the glue is dry, mark the center on each end; then mount in the lathe and turn to $2\frac{7}{8}$ in. in diameter. Drill and counterbore each part near the ends for a $\frac{1}{4}$ -in. stove bolt, and then separate the pieces by running a sharp knife blade along the joint. A piece of 1-in. cloth tape attached to one side of the drum over the joint makes a durable, continuous hinge. Cover the drum between the bolt holes with $\frac{1}{16}$ -in. felt, the edges of the felt meeting at the joint. Glue only the ends of the felt to the two parts of the drum, as in the lower detail, Fig. 1. When the hinged parts are drawn together with the bolts, the felt should be tight. Wrap sandpaper around the drum and insert its ends in the opening between the hinged parts. Then tighten the bolts. For best results, the drum should operate at a speed of about 2000 r.p.m. with a medium-grit sandpaper. Fig. 2 shows another





way of operating the same type of drum with an improvised tailstock, driving it with either a polishing head or a small grinder having a threaded spindle on which a drill chuck can be mounted. A driving flange is made by inserting a pin tightly in a small disk cut from $\frac{1}{8}$ -in. sheet metal, Fig. 2. The disk is screwed to the drum end.

Figs. 3 and 4 show how to make the sanding disk and a table which clamps to the lathe bed. When in position on the lathe bed, the top of the table should be about $\frac{1}{8}$ in. below the center of the disk. This distance is determined by the swing of your lathe. For average small work, a disk speed of 2000 r.p.m. is recommended.

Homemade Blacksmith's Forge Utilizes Old Vacuum-Cleaner Parts

By using the motor and fan assembly of a discarded vacuum cleaner as a blower, in addition to other odd parts, one blacksmith made himself a forge at little cost. The blower is connected to the air inlet and

fastened to one leg of the forge with a flat-iron bracket. The leg bolts are tightened with wing nuts to facilitate removal of the unit when electricity is not available. In this case, of course, a hand-operated blower must be used.

A. M. Morgan, Lafayette, Calif.



Pair of Gloves Kept Together

To prevent one of a pair of work gloves from being mislaid, use snap fasteners to hold the gloves together. This also permits hanging the gloves from a hook or nail.

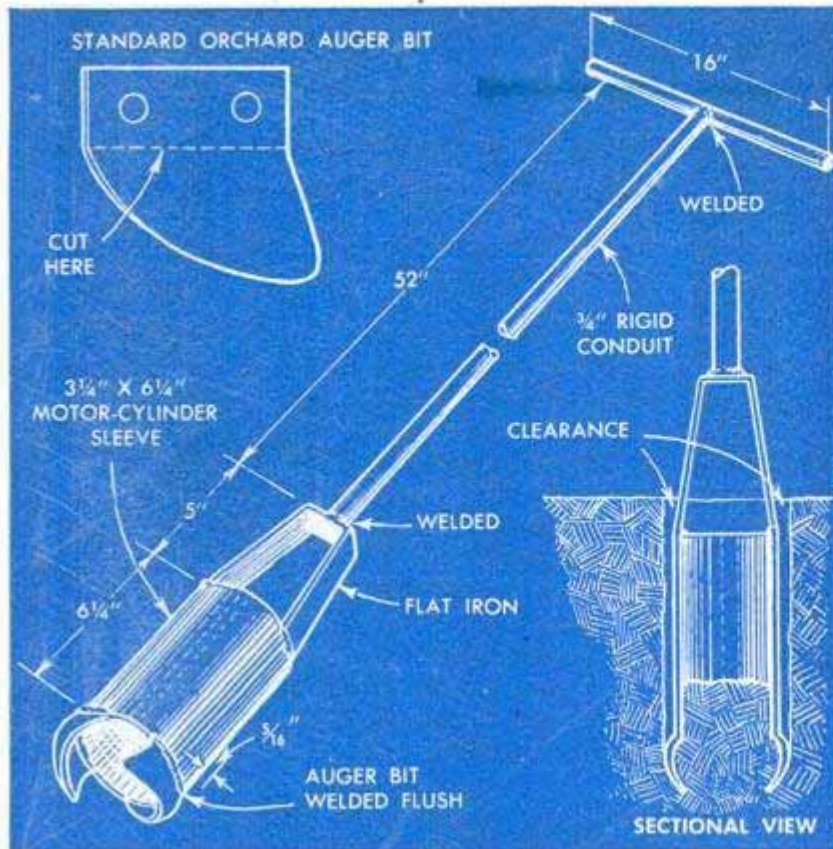


Substitute Thread-Cutting Oil

If you have a rush job to do and run out of thread-cutting oil, any of the following common items may be substituted successfully: melted bacon fat, linseed oil, or turpentine. White-lead-and-oil paint also will serve the purpose, but it is messy to use and must be thoroughly cleaned off.

Howard D. Wildman, Schenectady, N. Y.

This Light Auger Raises Unbroken Soil Sample



Sectional drawing above shows how the clearance between the soil and sleeve permits easy removal of the auger from fairly deep holes

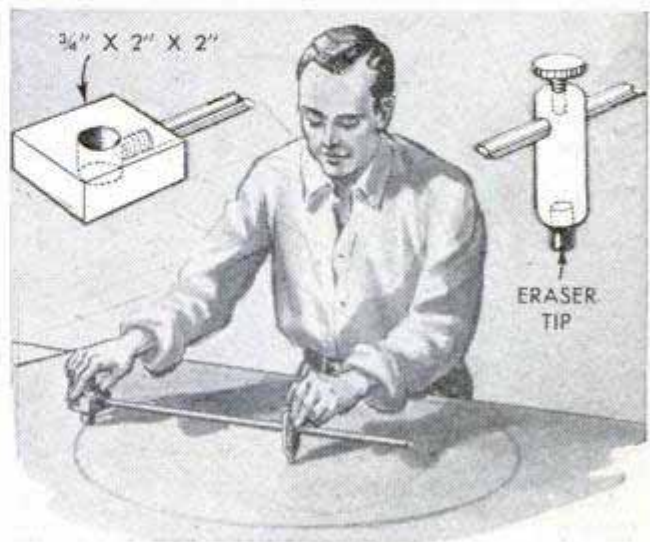
Weighing only about 5 lbs., this hollow auger for taking soil samples can be turned into the ground with less than half the effort required when using the conventional sample auger. It works equally well in soils that are either dry and loose or tight and sticky, removing a core of unbroken earth which makes it possible for the surveyor to examine the soil structure as it actually occurs at the full depth of the auger's capacity. A removable cylinder sleeve from a tractor engine is used

for the body of the auger and the handle for turning and lifting is made from two pieces of electrical conduit welded as indicated above. The lower end of the handle is welded to an A-shape bracket, the free ends of which are welded to the top ends of the cylinder sleeve. Two standard 4-in. soil-auger bits are welded to the other end of the sleeve, the bits being positioned so that they cut a bore diameter slightly greater than the diameter of the sleeve.

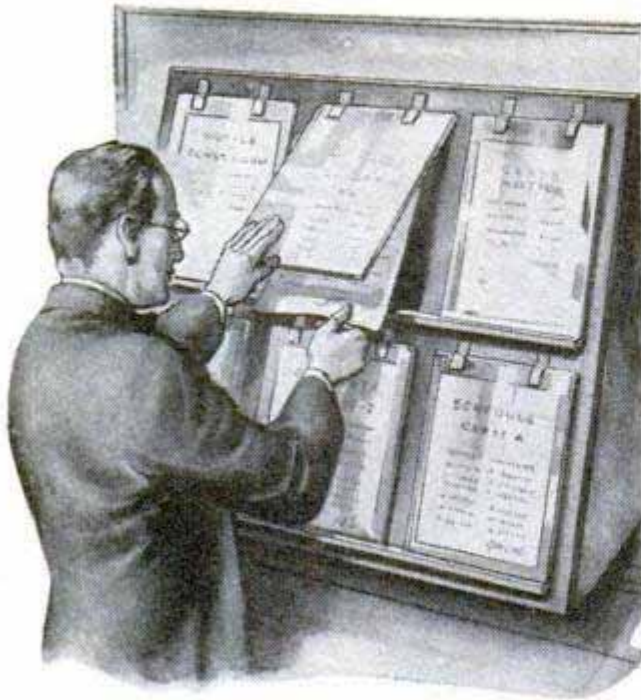
W. L. Southworth, Portland, Ore.

Adjustable Beam Compass for Rough Layout and Blackboard Instruction

For rough layout in sign painting, window-display work and blackboard instruction, this adjustable beam compass is just the thing. The arm of the compass is a length of 1/4-in. rod threaded at one end. This end is turned into a tapped hole in the edge of a metal block, entering a larger hole drilled through the center of the block to take a piece of chalk or crayon. The other sliding end of the arm fits through a hole in a sliding pivot made from a short piece of rod, 1/2 in. or more in diameter. A blind hole is drilled in the bottom of the pivot for a pencil eraser, and a hole for a setscrew is drilled and tapped in the top of the pivot. Chalk is secured in the holder simply by turning the arm.



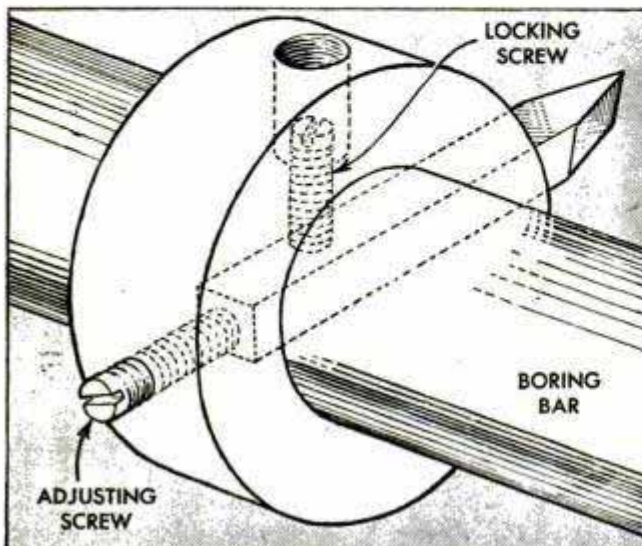
Glass Plates Hold Notices On Bulletin Board



Notices can be posted on a school or factory bulletin board without the use of thumbtacks if they are held with hinged plates of glass or clear plastic. The covers also keep the notices from becoming soiled or torn. The bulletin board must be fastened to the wall in a sloping position so the covers, which are hinged with adhesive tape, rest on the face of the board. Cleats extending the full length of the board are nailed under the bottom edges of the plates to give them additional support.

Metal Collar Added to Boring Bar Adapts It for Internal Threading

Large internal-threading jobs which must be bolted to the lathe carriage can be done with an ordinary boring bar converted into an adjustable threading bar. The conversion is made by adding a steel collar to the

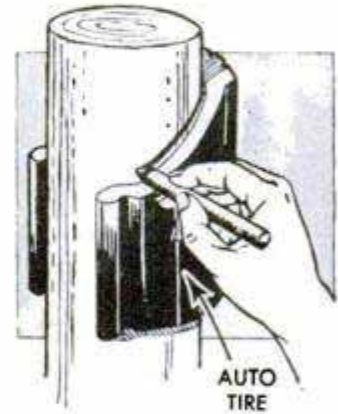


boring bar, the collar being drilled for the threading tool and also to permit access to the locking screw. Drill and tap a hole in the collar for a depth-adjusting screw.

H. Moore, Leeds, England.

Auto Tire Provides Marking Guide When "Topping" Fence Posts

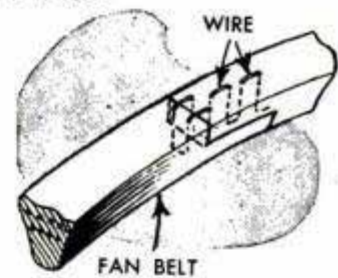
When one farmer wants to saw the tops of a number of fence posts at an angle so that they will shed water, he uses a small section of discarded auto tire as a marking guide. The result is a neat-appearing row of uniformly cut posts. If a little oil is rubbed on the edge of the tire, it can be tacked temporarily to the post and used as a saw guide.



If a little oil is rubbed on the edge of the tire, it can be tacked temporarily to the post and used as a saw guide.

Splicing Broken V-Belt

Recently, while pouring steps to my front porch, the V-belt on the mixer broke. As we were working on a holiday, I was unable to purchase a new one. Since the job had to be completed, it was a case of making the old belt do. I simply half-lapped each end of the belt as shown, formed holes with an awl, and laced the ends together with wire. By blocking up the engine to compensate for the shorter belt, the splice held and the mixer ran satisfactorily until the job was finished.



Herbert E. Fey, New Braunfels, Tex.

Cork Seals End of Chuck

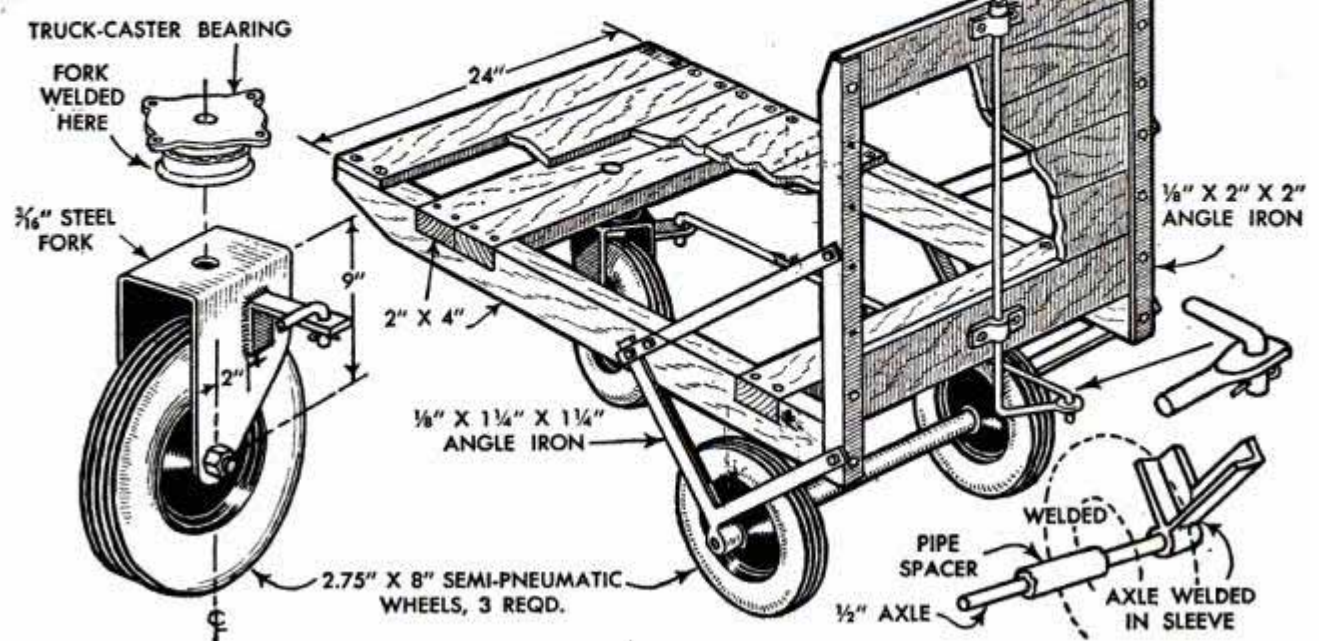
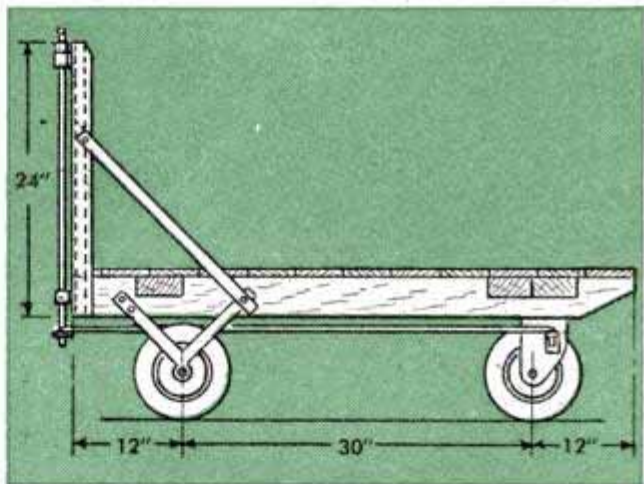
The life of a drill-press chuck which is removed from the press when not in use is prolonged by inserting a cork stopper in the open end of the chuck. This prevents foreign matter and moisture from causing wear and rust on the working parts. The jaws of the chuck must be completely drawn in before inserting the cork.



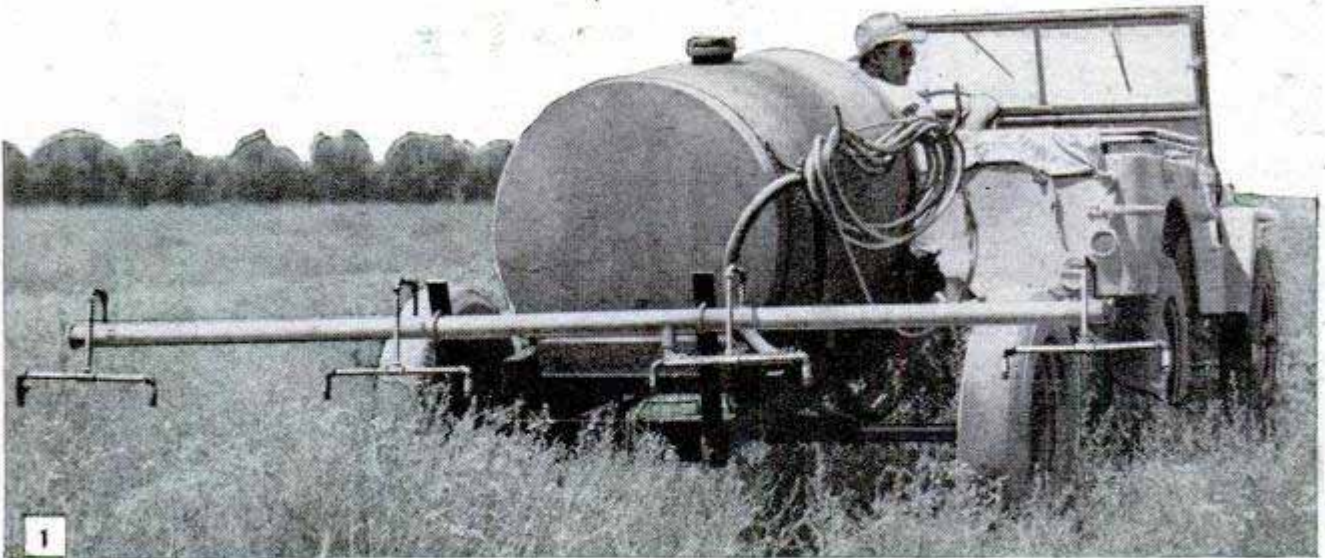
FARM PUSH TRUCK

handles heavy loads

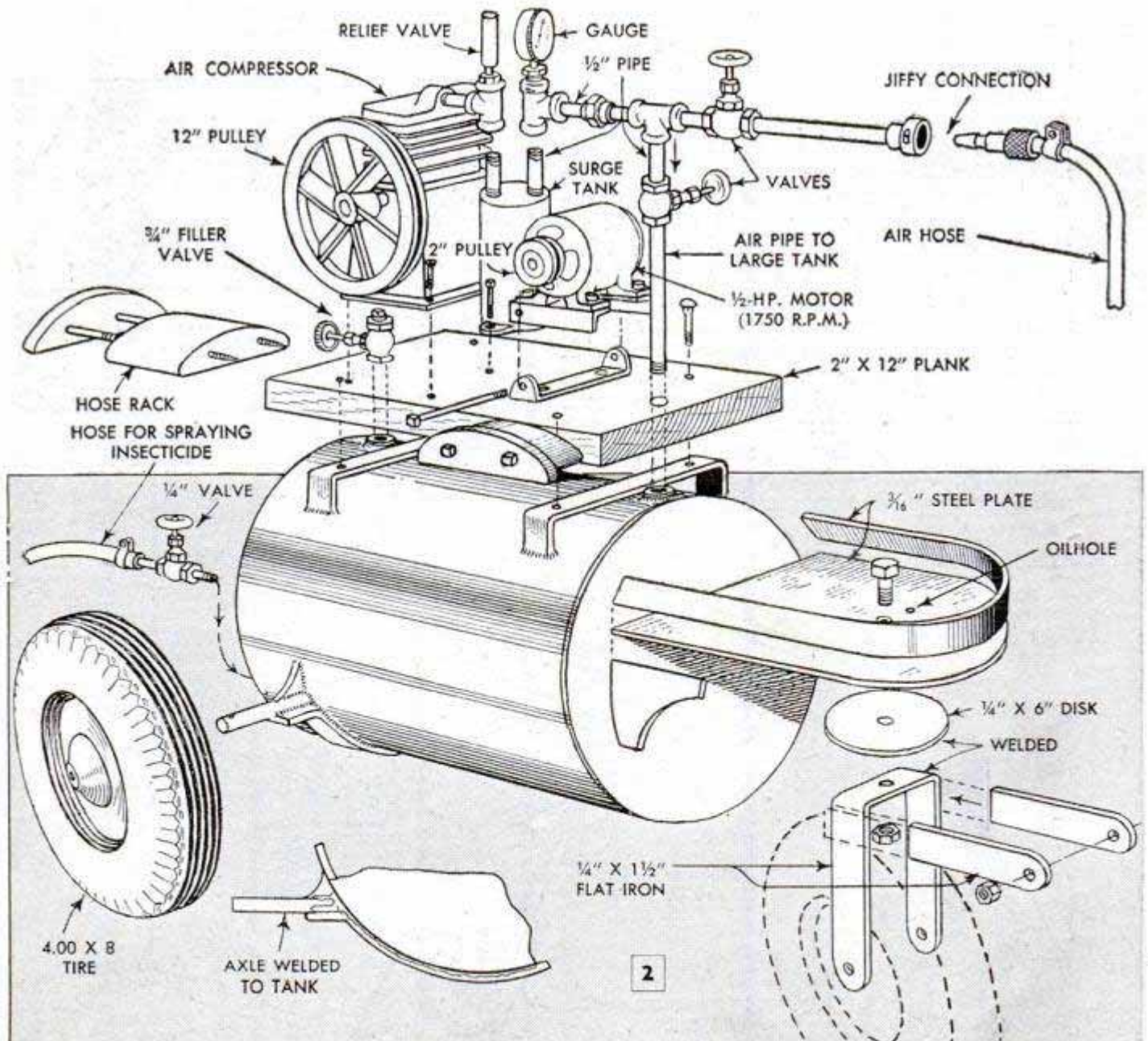
BUILT by Leonard Hammerschmidt, California poultry rancher, this labor-saving push truck can be used by farmers everywhere to simplify the handling of sacked feeds or small grains in the narrow feeding alleys of dairy barns, farrowing houses, and large granaries. A single caster wheel in front is controlled by a steering arm mounted on the rear panel of the platform body. Hardwood is used for the sills and cross members of the platform frame. The cross members are mortised the full thickness into the sills and fastened with bolts. The cross members are mortised the full thickness into the sills and fastened with bolts. The rear-axle brackets are each made from two pieces of angle iron and a sleeve welded together as in one of the details below. After assembling the wheels on the axle with a pipe spacer, the axle is welded to the sleeves at each end. To assemble the front caster, the fork is cut from a stock truck caster of the swiveling type and the ball-bearing swivel assembly is welded to a new and larger fork made from $\frac{3}{16}$ -in. sheet steel. Note that the swivel is located on the fork 2 in. off-center from the wheel axle. Before bolting the wheel assembly in place, an arm bent from flat iron is welded to one side of the fork and drilled at the outer end to take the steering rod. Angle-iron uprights are now bolted to the rear ends of the sills and braced as shown. The platform frame is then covered with 1 x 4 or 1 x 6-in. boards and spaced holes are drilled in the uprights for small screws used to attach the boards making up the back panel. The steering arm and handle are made from $\frac{1}{2}$ -in. rod and the parts are assembled as shown in the detail below.

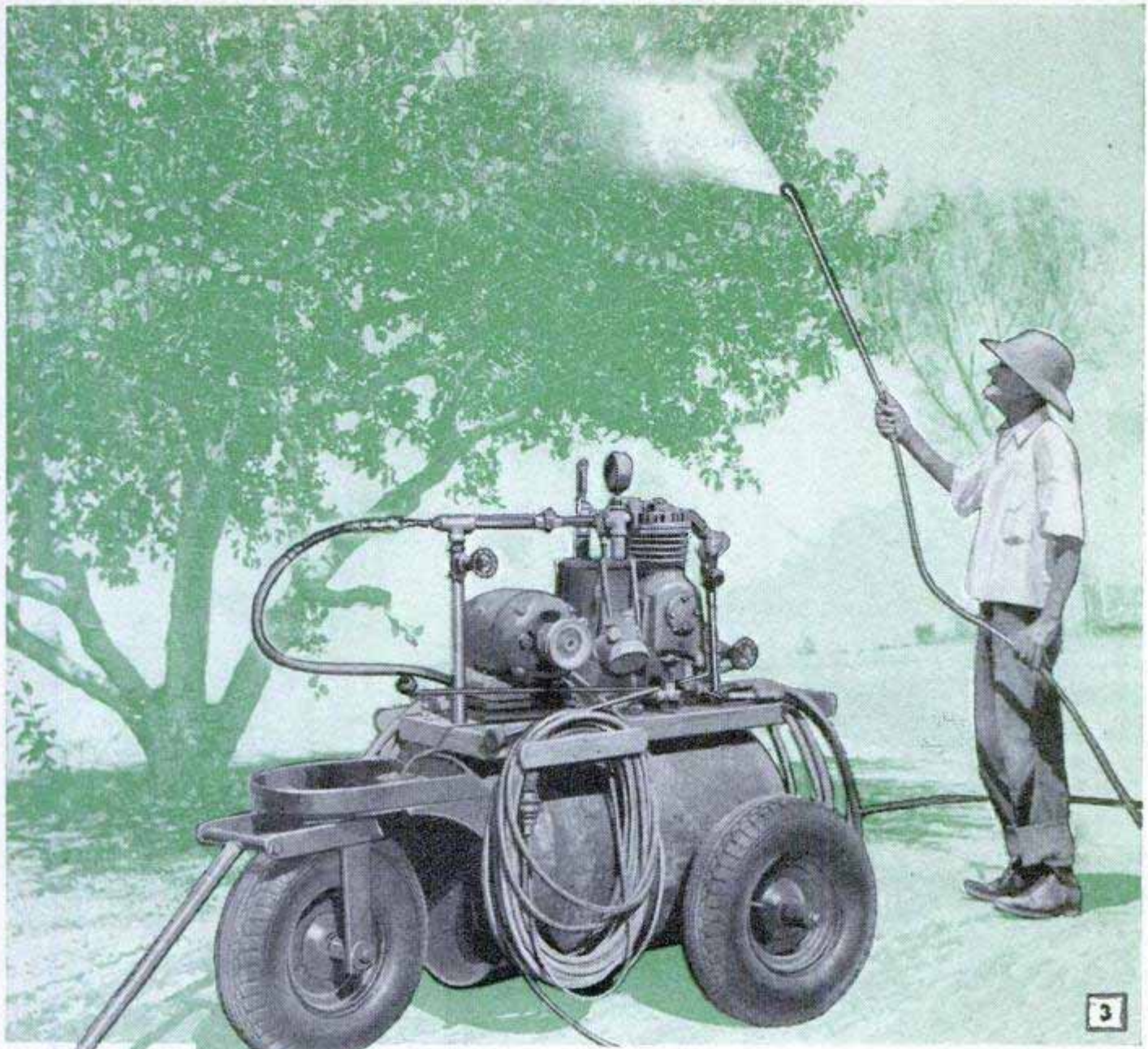


TWO FARM SPRAYERS

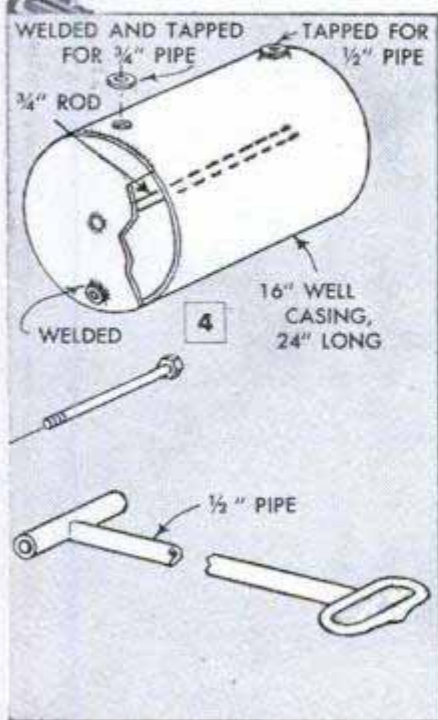


Here's the heavy field sprayer being pulled by a jeep and spraying plants in rows with the row-crop spray boom. Eight nozzles cover both sides of the plants. Other types of spray booms can be adapted to this unit





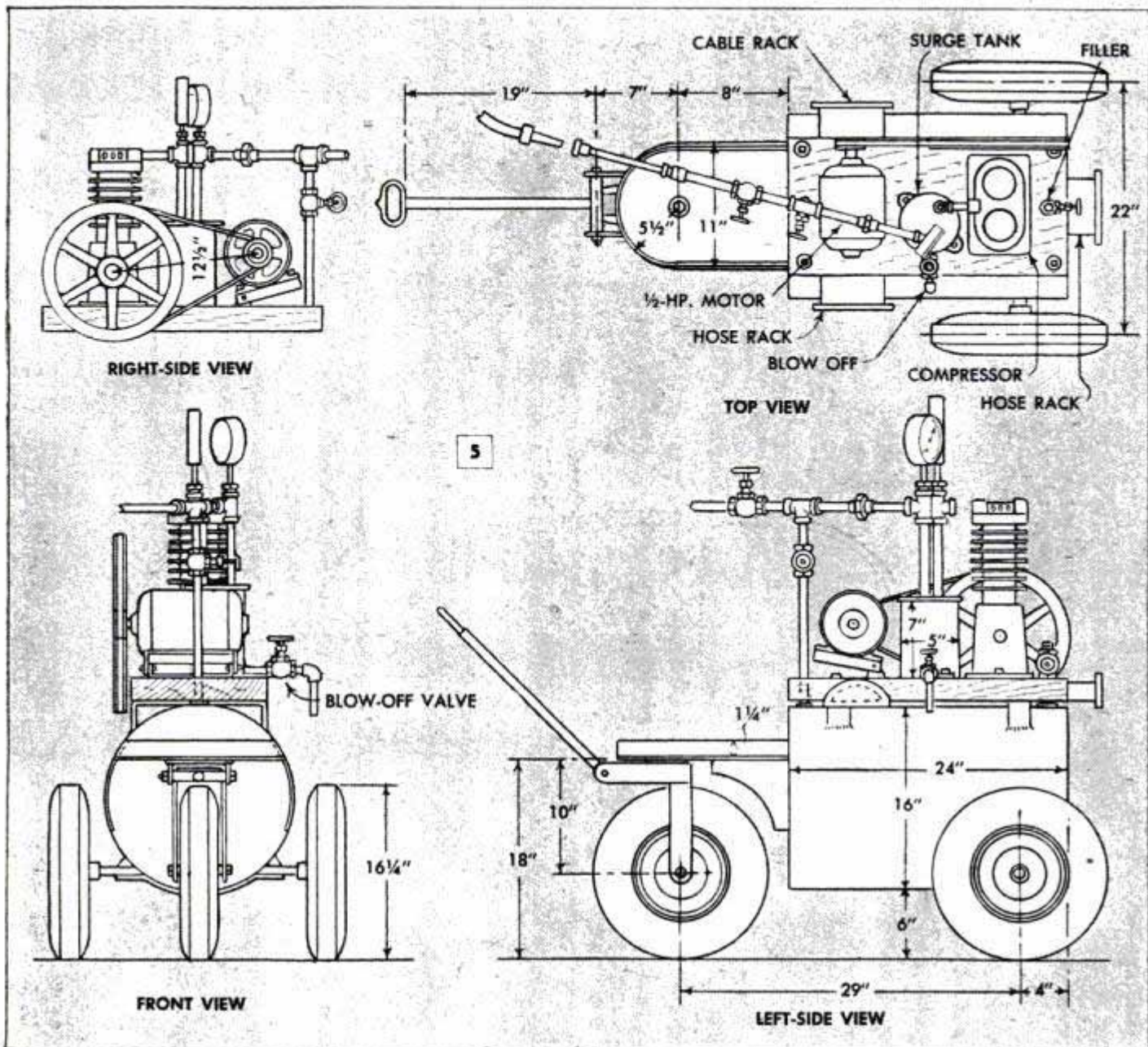
By Hi Sibley



WITH THE EXCEPTION of such standard equipment as an electric motor, an engine, pumps, and, in one case, the tank, both of these handy power sprayers were built entirely in small farm shops. Each has been in service for more than two years. The electrically driven outfit shown in Fig. 3 was developed primarily for use in spraying insecticides in poultry houses, but has since been adapted to such varied jobs as spraying fruit trees and garden crops, spray painting and inflating tires. It is easily pulled about by hand, being mounted on a tricycle truck with large pneumatic-tired wheels.

Many of the parts can be assembled from materials you have at hand as slight variations in the specifications given for certain parts will not affect efficient operation. As an example, the pressure tank is made from a length of 16-in. steel well casing. Of course, a tank made from lighter-gauge metal would be just as suitable. The power unit is mounted on a plank bolted to the top of the tank, which forms the chassis. Arrangement of the various parts is shown in Figs. 2 and 3. The steel platform just above the front wheel holds a paint pail, spray gun, hose or other accessory. General dimensions of the unit are given in Fig. 5.

The tank, Fig. 4, is the first part to build. It is fitted with a



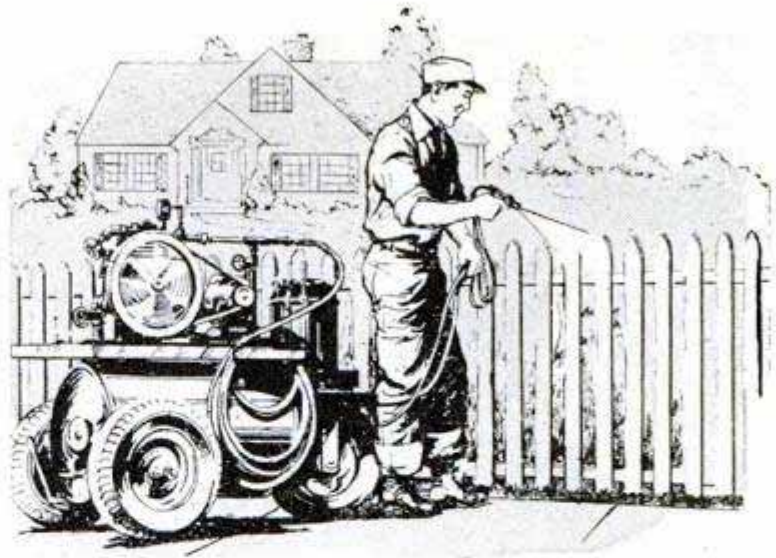
1/2 or 3/4-in. reinforcing rod that passes through the center and through steel disks, which are welded in the ends of the casing section that forms the body of the tank. This reinforcing rod is necessary to give sufficient strength, with a reasonable margin of safety, to withstand the high pressures developed. Next, weld on the front platform, which is simply a piece of sheet steel with one end cut on a 5 1/2-in. radius and a rim and supporting brackets welded to it. A hole for the kingbolt and one for an oilhole are drilled after the platform is welded in place on the tank. The stub axles for the rear wheels, Fig. 2, are welded to the tank and are reinforced with braces and a semicircular strap which passes under the tank and is welded there. After the front-wheel fork has been bent to shape, a 6-in. steel disk is welded to its top and two arms cut from flat iron are welded to the side members to complete the assembly. The handle is cut from 1/2-in. pipe with

a ring welded to one end for a convenient handhold. A pipe sleeve is welded to the other end of the handle to fit between the arms on the wheel fork, as shown in Fig. 2 and the top view, Fig. 5. Finally, drill holes in the tank for a filler tube, air supply and an outlet at the back near the bottom. Standard couplings are welded into the latter two holes.

The power plant should be assembled on the base before it is bolted to the tank. Note that the motor is mounted on a hinged base to maintain uniform belt tension. Use a 2-in. drive pulley on the motor and a 12-in. pulley on the compressor and drive with a standard 1/2-in. V-belt. Employ at 1/2-hp. 1750-r.p.m. motor, and a standard two-cylinder compressor. Air from the compressor passes into a surge chamber which cushions the impulses when using a paint spray gun or insecticide equipment. The surge chamber is made from a length of 5-in. pipe capped at

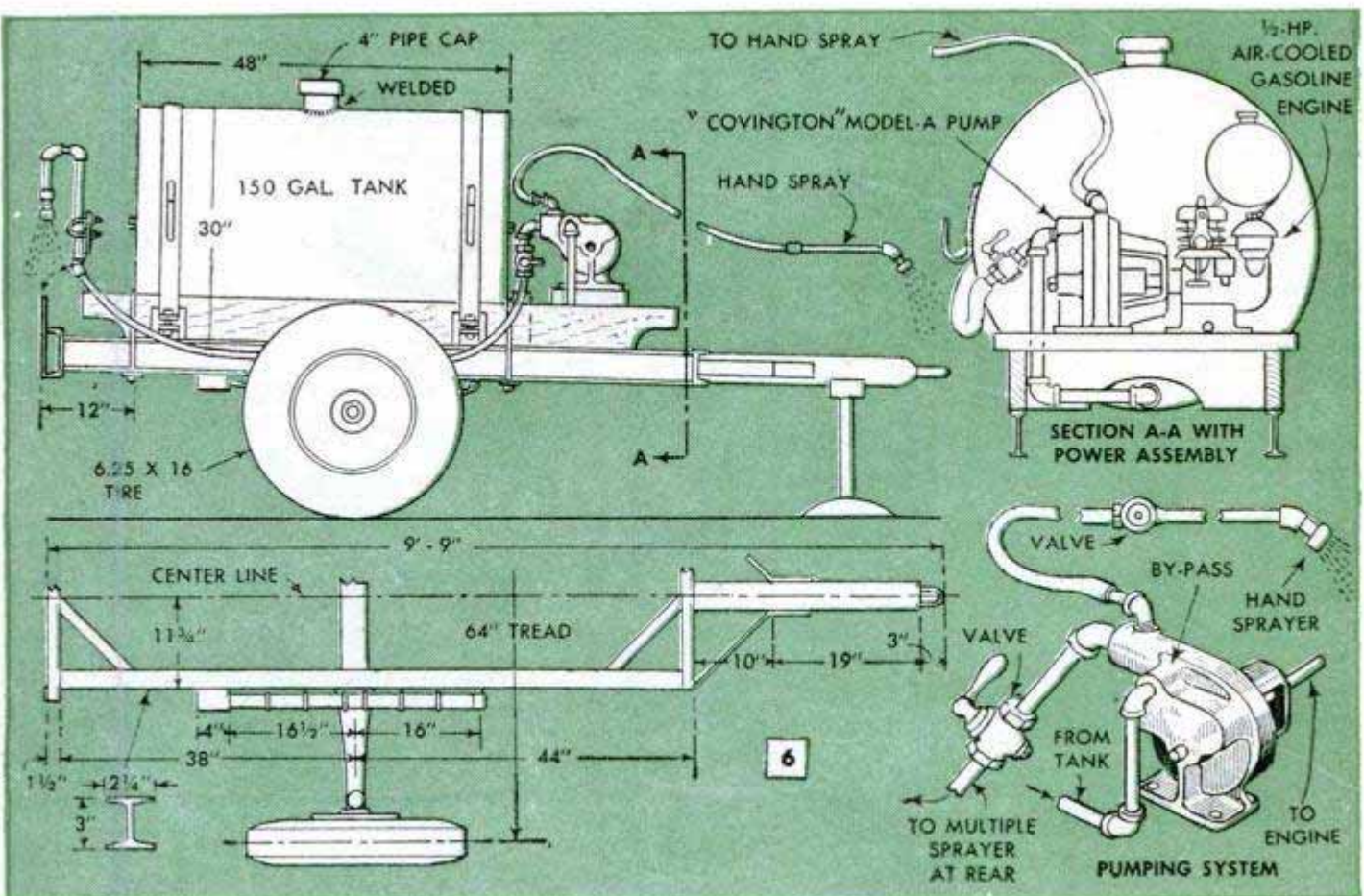
both ends and fitted with a valve at the bottom for blowing off condensation. Two bolt lugs are welded to the lower end. A pressure gauge is installed in the inlet pipe to the chamber and a poppet valve in the outlet pipe. When spraying insecticide, the valve is opened and air from the compressor passes directly into the tank, the liquid being discharged through a hose connected to the tank outlet. Wooden racks are fastened to the plank on both sides with lag screws to provide handy storage space for the motor cord and hose. Use industrial wheels with ball or roller-bearing hubs and 4.00 x 8-in. pneumatic tires.

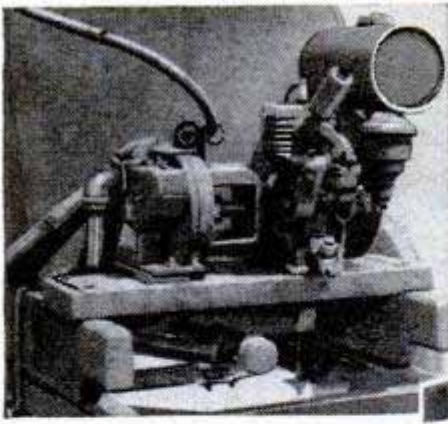
The pump-type sprayer detailed in Figs. 6 to 11 inclusive and also shown in Fig. 1 is designed for spraying row crops in large fields. The tank has a capacity of 150 gals. of liquid spray solution and the engine and pump are mounted in front of the tank. Outlets from the pump provide for a hand nozzle attachment for weed killing, Fig. 10, and also for a pressure-hose connection to a row-crop boom mounted at the rear of the chassis. The tank is of standard manufacture and it will prove good economy to purchase it



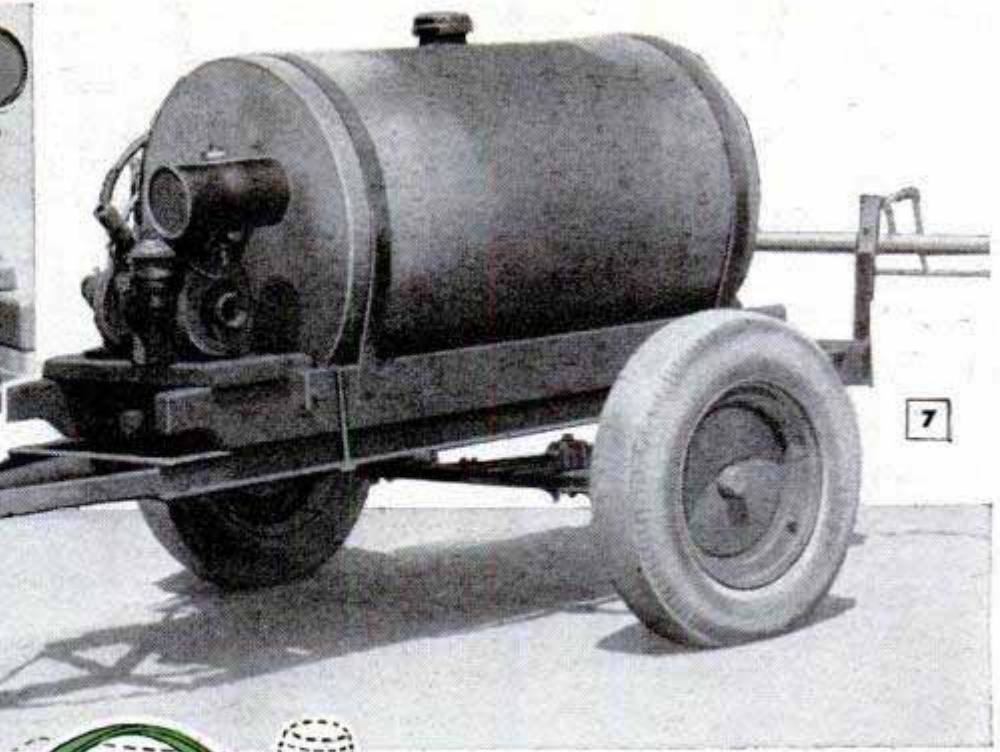
Electrically driven sprayer is fitted out as an all-around unit. It handles any ordinary sprayable liquid from insecticide to paint

outright rather than to attempt to make it in the average small shop. Side members of the chassis are steel I-beams, Fig. 9, and the drawbar is a length of 3-in. pipe with the outer end flattened over a heavy ring and welded. The axle was taken from a Star automobile, but a 1933 Ford or Chevrolet front axle will do as well. The steering knuckles are welded and the flat springs are used intact, except that the forward end of each is supported by a pin, without shackles, and the rear eye is cut

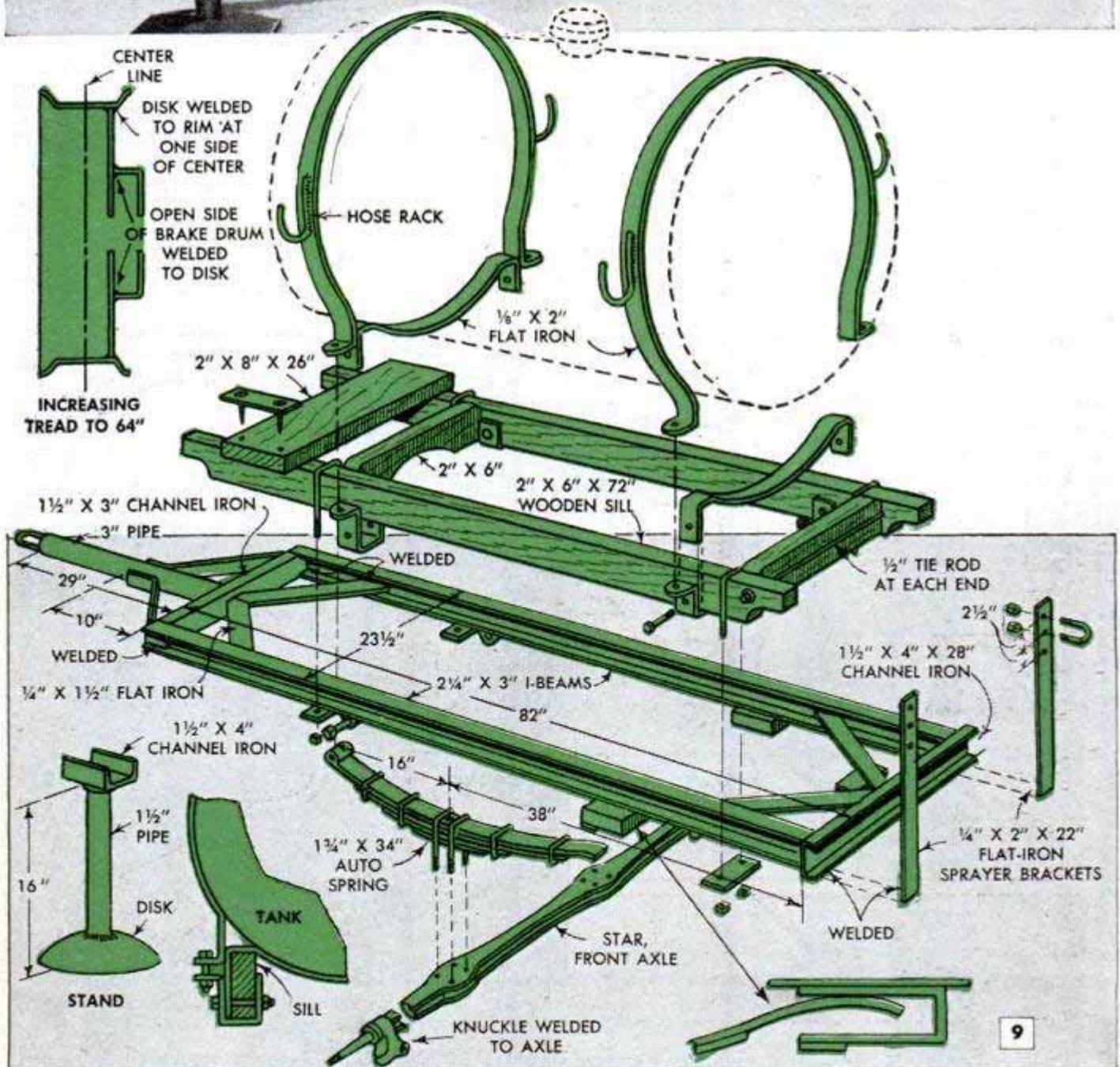


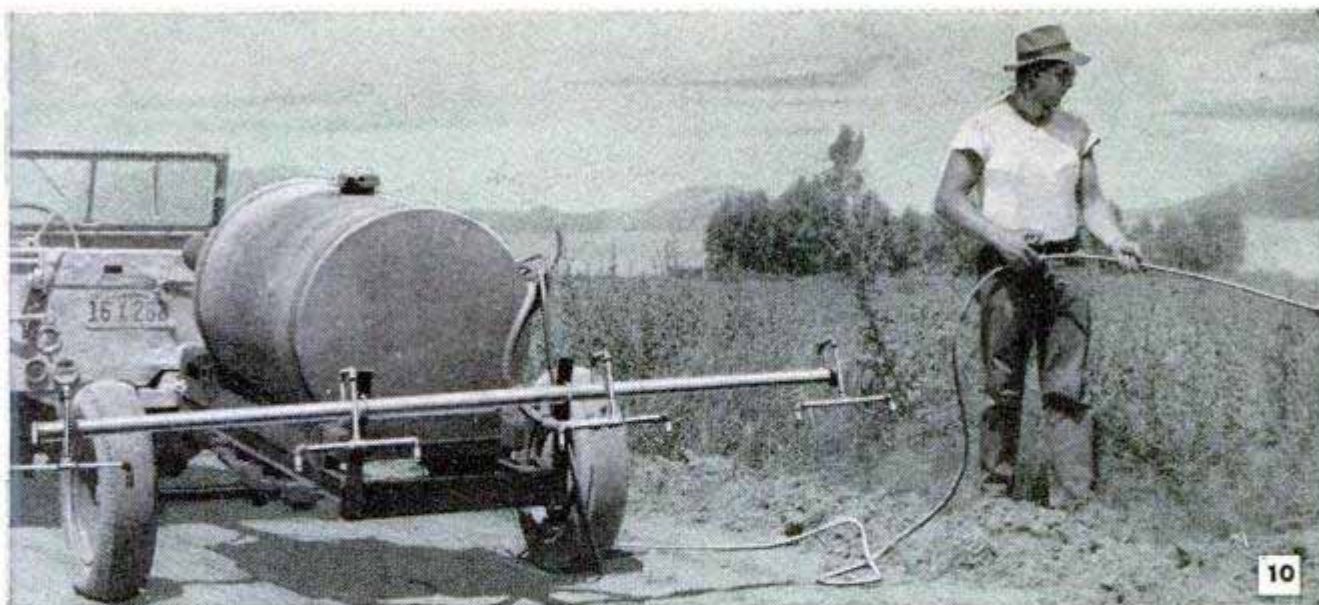


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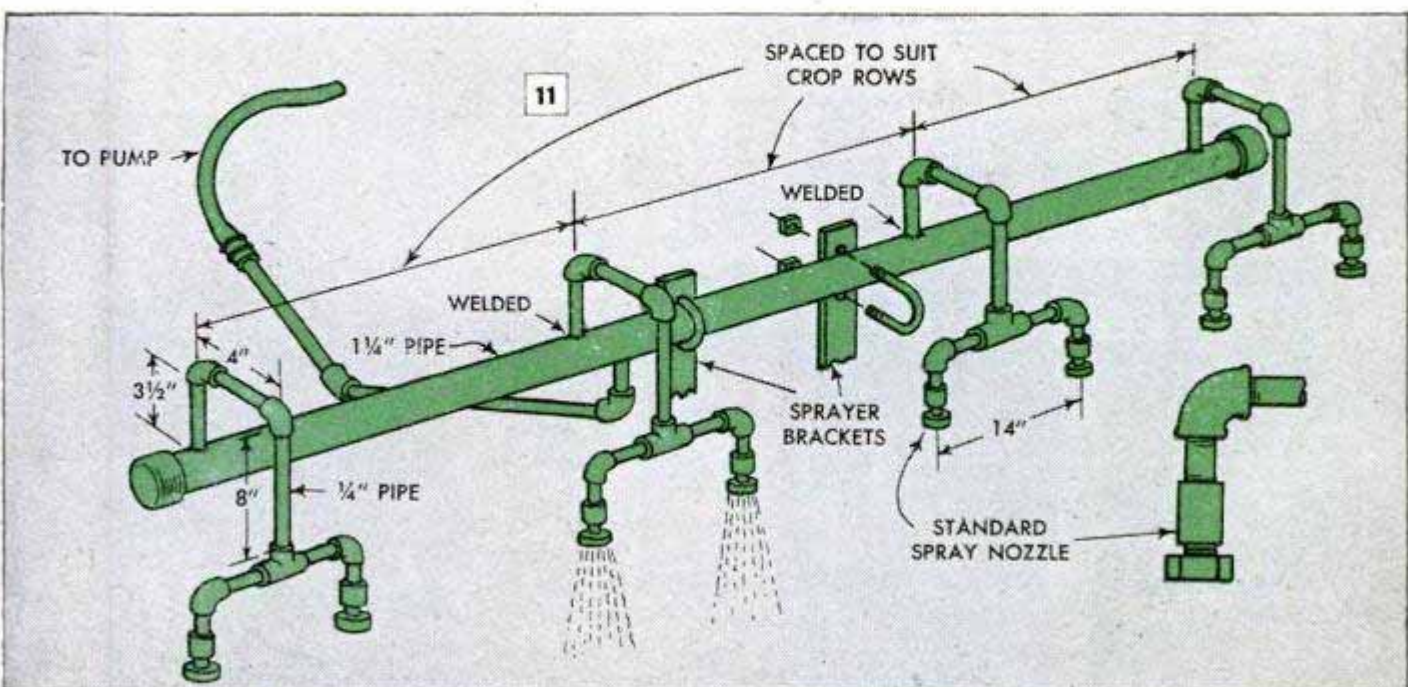


off and that end then rides in a box made by welding steel plates to the I-beam, as in Fig. 9. At the rear end of the chassis, two uprights are welded, each having a row of equally spaced holes to provide adjustment for the U-bolts holding the boom. A simple jack for supporting the drawbar is detailed in Fig. 9.

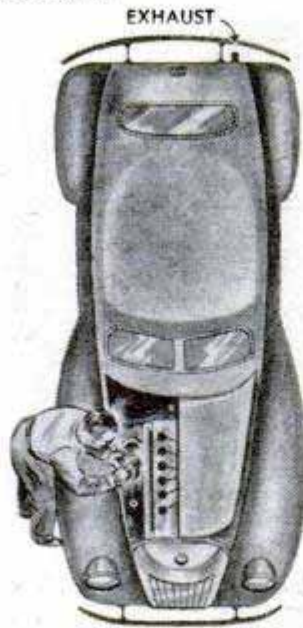
To widen the wheel tread sufficiently for average row-crop work, the wheels are altered, as in Fig. 9, by welding a standard wheel disk to the rim in an off-center position. A brake drum welded to the disk with the open side against the disk completes the change.

Fig. 9 also details the hardwood frame of the tank cradle. The sills are attached to the chassis with heavy U-bolts and the engine and pump are bolted to a heavy hardwood plank which extends across the front ends of the cradle frame. The plank is lag-screwed to the sills. Heavy tie rods

pass through the sills just outside each spreader member. Two-piece steel bands, or straps, bolted to S-brackets attached to the sills support the tank and prevent it from shifting when the trailer passes over rough ground. Hooks welded to the bands on each side provide racks for hose storage. A common type of row-crop boom with two nozzles above each crop row is detailed in Fig. 11. It is built from standard pipe and fittings and standard spray nozzles. When assembling, use pipe-thread compound in all joints and draw each joint tightly to prevent leakage under pressure. Some users, such as potato growers, require three nozzles to each crop row. In this type of boom, two nozzles are aimed upward and the third nozzle is aimed downward. While this type of spray boom could, of course, be made from pipe and fittings, it is a good investment to purchase the three-nozzle boom ready-made.



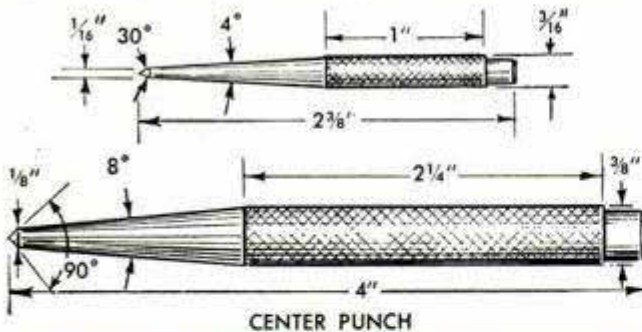
Determining Oil-Gauge Location By Exhaust-Pipe Position



On cars having a single exhaust pipe, filling-station attendants can quickly determine the location of the dip-stick oil gauge. The gauge usually will be found on the side of the car opposite the exhaust. For example, if the exhaust is on the left-hand side of the car, the oil gauge is on the right-hand side.—Opie Read, Jr., Chicago.

Set of Punches for Home Shop Made From Drill Rod

An essential item for the amateur as well as the professional gunsmith, modelmaker or experimenter, this special set of punches is easily turned from drill rod. The set includes a prick punch, upper detail, a center



CENTER PUNCH

A	B	C	D	E	F
.060	1/4	3/16	1 1/2	1	1/8
.090	3/8	3/16	1 3/8	1	3/16
.120	1/2	1/4	1 3/4	1	3/16
.150	3/4	1/4	1 3/4	1	3/16
.180	3/4	1/4	2	1	3/16
.210	3/4	3/16	2 1/8	1	1/4
.240	1	3/16	2 1/4	1	1/4

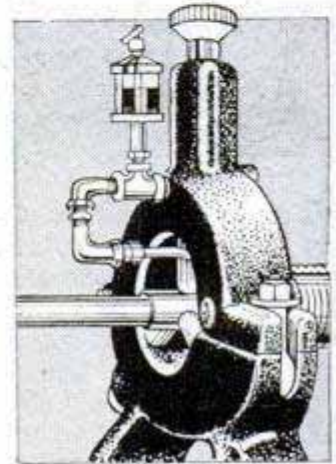
ABOVE DIMENSIONS IN INCHES

punch and extra-small pin punches of various sizes as shown in the table. The points of the pin punches should be faced perfectly square and the heads should be rounded or chamfered. Be sure to leave a fillet where the punch and grip sections join, as a sharp shoulder at this point may develop cracks in the process of hardening. Temper the punches by heating to a dull, cherry red and quenching in water.

John L. Alden, Maplewood, N. J.

Drip Oiler Lubricates Steady Rest

For long-running jobs on his lathe, one machinist keeps the steady rest lubricated with a drip oiler fastened to the top of the rest. Pipe fittings and a length of tubing carry the lubricant to the work.—Harry H. Hohberger, Chicago.



Large Pipe Cut Squarely

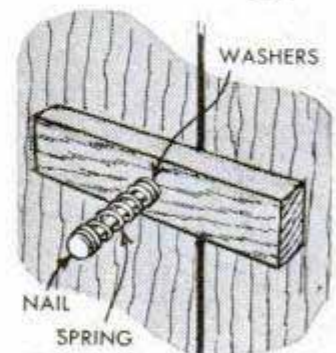
To cut large-diameter pipe squarely, mark it with soapstone using a piece of paper as a guide. The paper should have one perfectly straight edge and be long enough to overlap about 1/4 of its length when wrapped around the pipe. The overlap is required to align the edge of the paper.

John Krill, North Lima, Ohio.

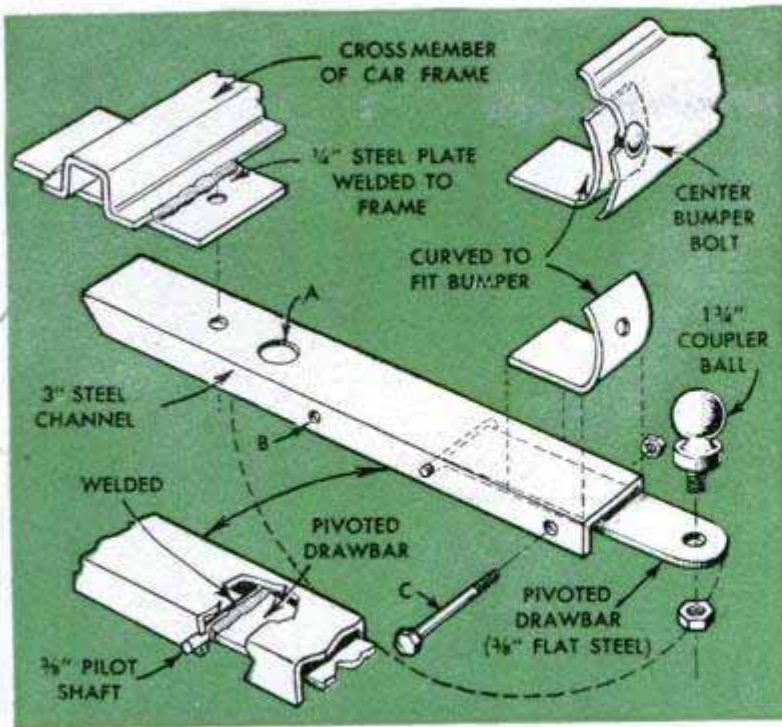


Spring Holds Turn Button Snugly

When a wooden turn button on a door wears and becomes a loose fit on the nail, it will stay put in any position if a short spring is slipped over the nail before it is driven in place. A washer is used between the spring and turn button, and also between the nailhead and spring if the former is smaller in diameter than the spring.



Trailer Hitch Folds Under Car When Not in Use



This trailer hitch is attached directly to a rear cross member of the car frame. The pivoted drawbar, which carries the coupler ball, folds back under the car when not in use, leaving the bumper clear. The main frame of the hitch is made from steel channel which extends from the car-frame member to a point flush with the rear bumper. The length of the channel frame will have to be determined by the distance from the car-frame member to the outer face of the bumper. As indicated in the de-

tail above, the large hole A provides an opening for the coupler-ball nut, allowing the pivoted drawbar to lie flat when in the folded position. To fold the drawbar, the bolt C is withdrawn, the bar folded back, and the bolt inserted in the hole B. Note that the holes for the bolt C are drilled in the legs of the channel in such a position that the bolt will pass under the folded drawbar. Use lock washers on all bolts to prevent the nuts from loosening.

Fred M. Sequin, Superior, Wis.

Discarded Metal Kitchen Pans Utilized as Poultry Watering Dish

If you have two fairly deep metal pans which are too battered for further use in the kitchen, they will make an excellent watering dish for the chickens. In one of the pans, cut four rectangular openings large enough for a chicken's head and neck.

Then, invert this pan over the other one and punch or drill holes through both rims on opposite sides of the pans. Rivet or wire the pans loosely together through one set of holes so that they will swing apart for filling or cleaning, and fasten the pans shut by inserting a nail through the other set of holes. Remember to bend over all edges of the cutouts or file them smooth.

Marion L. Rhodes, Knightstown, Ind.

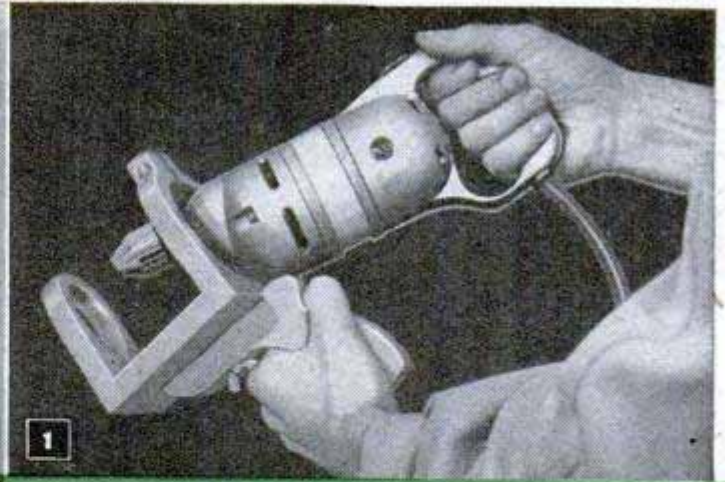


Pie-Plate Stand for Sign

One baker displays small signs in his store window by mounting them on paper pie plates. The pie plate is turned upside down and the card is held in a slot cut across the bottom of the plate.



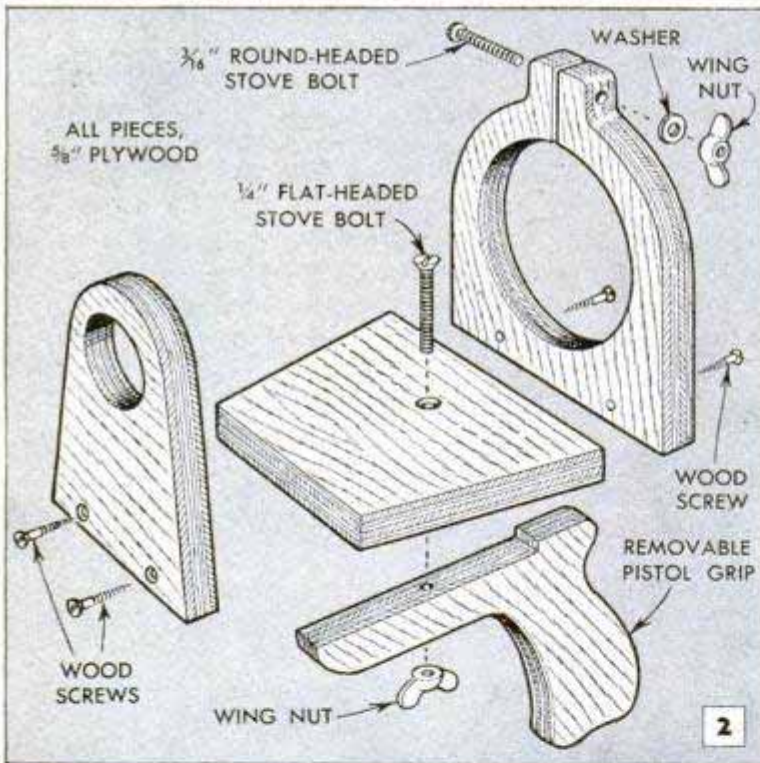
BRACKET INCREASES



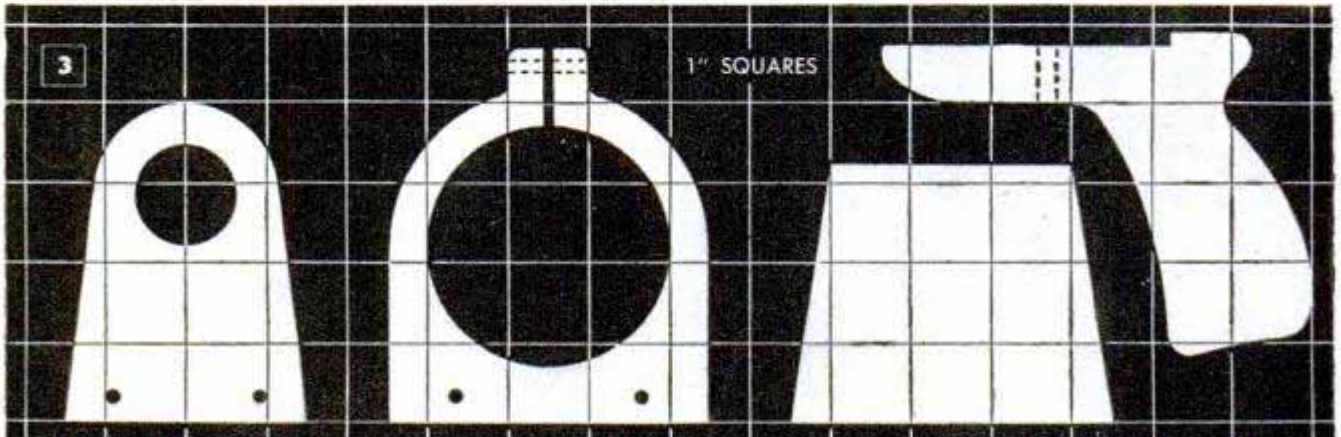
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Above, the electric hand drill and bracket are assembled by inserting drill through holes in the bracket. Left, bracket fastened to adjustable arm of photo enlarger makes utility drill press. Balancing spring aids in manipulation

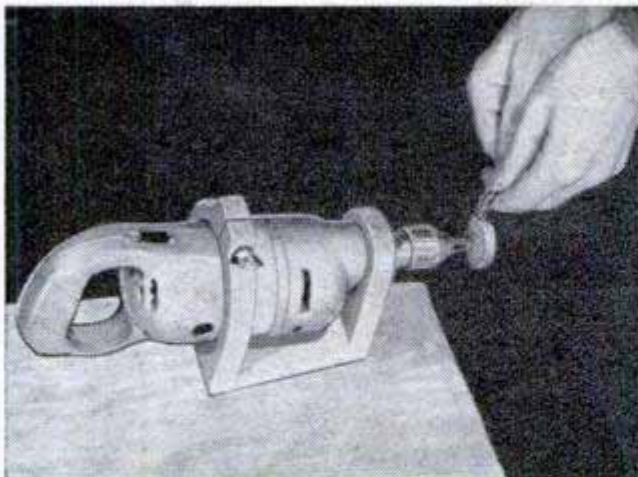
By M. G. Winterton



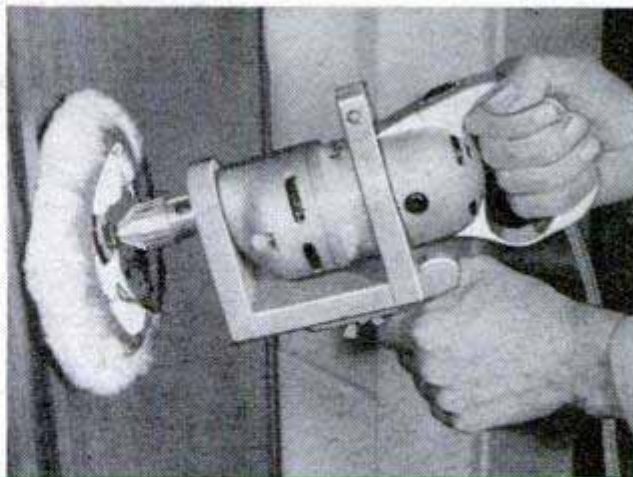
MANY attachments now available for small portable electric drills require the use of a stationary support for the drill so that the work can be held and guided with both hands. Figs. 1 to 3 inclusive and the photos on the next page show how a simple bracket for holding the drill in various work positions adds to the usefulness of this handy tool. The bracket consists of three parts, Fig. 2, with a pistol-grip piece added for two-handed operation of the drill in polishing or wire-brushing operations. Before sawing the opening in the clamping-bracket member, measure the diameter of the body of the drill just in front of the handle, then bandsaw or scrollsaw the opening slightly larger. Saw the outside to the contour given in Fig. 3 and split the



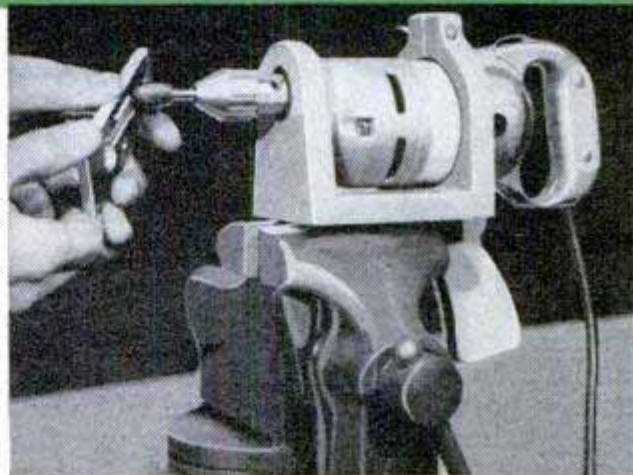
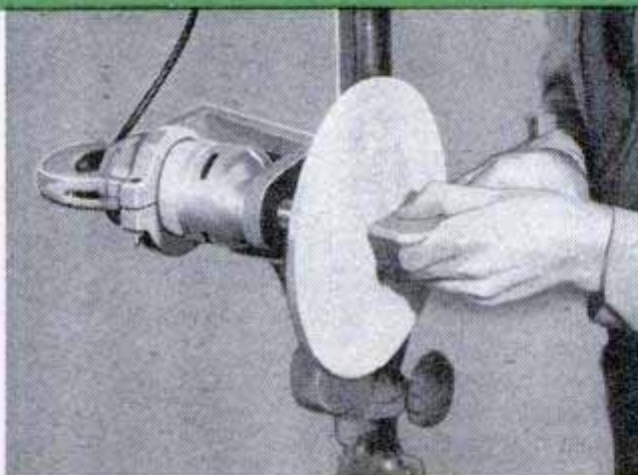
USEFULNESS OF PORTABLE DRILL



Above, with bracket handle removed, electric drill serves as portable bench grinder. Below, electric drill used as disk sander. Bracket mounted on adjustable arm of photo-enlarger stand can be set in horizontal or vertical position at any desired height



Above, bracket offers convenient two-hand control when using electric drill equipped with a buffer for polishing. Below, clamping the drill-bracket handle in bench vise will hold drill firmly when using rotary files or mounted abrasive wheels



boss at the top with two side-by-side saw cuts. Drill the split boss for a $\frac{3}{16}$ -in. stove bolt. Then drill the clamping piece and screw it to the bottom piece. Insert the drill in the clamping piece, center it, and tighten the wing nut. Place the assembly on a level surface and bring up the other supporting member against the end of the chuck. Mark a pencil line on the wood around the end of the chuck. Locate the

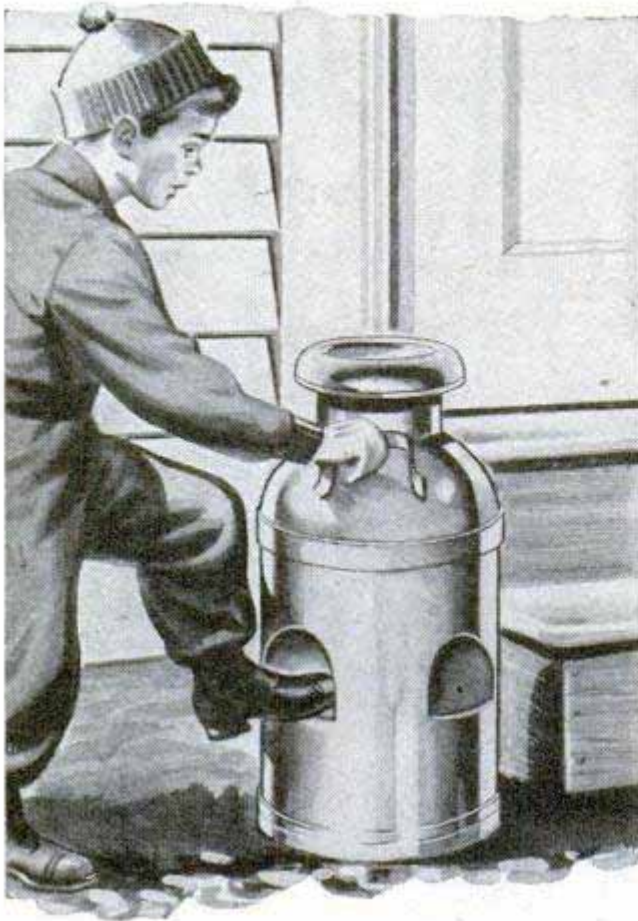
center of the circular pencil mark. Then measure the diameter of the bearing housing just back of the chuck and drill a hole in the supporting member of the same diameter as the housing. Screw this member to the base piece to complete the bracket. The pistol-grip piece is made removable by attaching it with a stove bolt and wing nut. Photo at the left of Fig. 1 shows the bracket attached to a photo-enlarger arm.

Removing Rust From Metal Parts and Restoring Polished Finish

The finish of rusted tools and instruments is renewed by first immersing them in a saturated solution of stannous chloride to remove the rust. The tools are allowed to remain in the solution overnight and then rinsed with water. Next they are placed in a hot soda-soap bath and dried. After this, they are cleaned with alcohol and polished with a chalk-and-oil paste. A recent coating of rust can be removed from large items simply by rubbing the metal with a cork

soaked in light oil. This not only removes the rust but polishes the surface as well. If the metal has been rusted for a considerable length of time, it will be more difficult to clean. In this case, use a paste made by mixing equal parts of flowers of sulphur and fine tripoli with olive oil. A cork charged with the paste is rubbed vigorously over the rusted area. Stubborn rust spots are removed with an oil-charged cork dipped in emery dust.

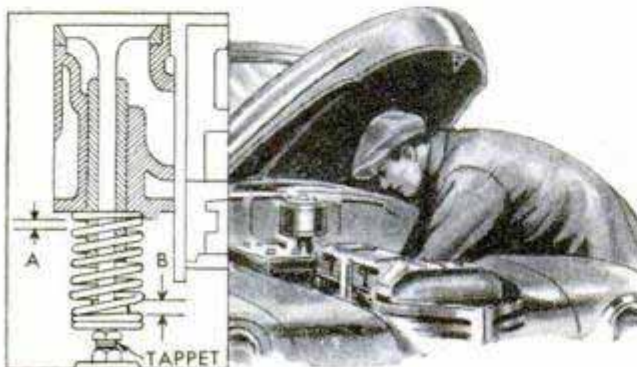
Milk Can Provides Foot Scraper When Cut Out for Shoes



Made by cutting several holes in the side of an old milk can, this portable foot scraper can be set wherever needed. Another advantage particularly appreciated when using it at the doors of the house is that the mud collects inside the container. Unlike an ordinary shoe scraper, there is little danger of children falling on this one and injuring themselves.

Valve Springs Cause Tappet Noise If Installed Upside Down

Upside-down installation of valve springs on Chrysler cars may be the cause of tappet noise. Note in the detail that the end of the spring having the least amount of separation between the coils, A, should be on the top, and that the end having the

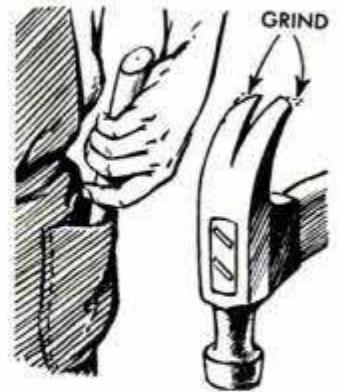


wider separation, B, should be at the tappet. Although the drawing is exaggerated, the difference can be seen by careful examination of the spring.

Corners of Hammer Claws Rounded To Aid Removal From Pocket

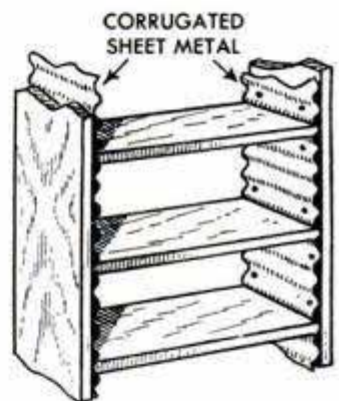
Carpenters who carry claw hammers in their hip pockets find that they are often difficult to remove. However, rounding the outside corners of the claws will not only make the hammer much easier to remove, but will minimize wear and tear on the pockets. Rounding the claws does not weaken them.

Roy C. Haynes, Sylacauga, Ala.



Adjustable Shop Shelves

When building shelves for use in the shop, nail strips of corrugated sheet metal to the inside surfaces of the uprights. The corrugations support the shelves and permit the spacing between them to be adjusted. If the ends of the shelves are rounded, they will fit snugly in the corrugations. Employing the same idea, built-in shelves are installed in the walls of a garage simply by nailing strips of the metal to the studding.



Erasing Hint Helps Typists

Before erasing on a typewriter, form the top of the paper into a shallow trough at back of the platen and turn the paper until the type to be erased is slightly toward the trough side and back of the top center of the platen. In this way, the eraser dust will collect in the trough and can be blown clear of the typewriter mechanism.

Henry Hanscom, Elmhurst, Ill.



RADIO *Television* ELECTRONICS

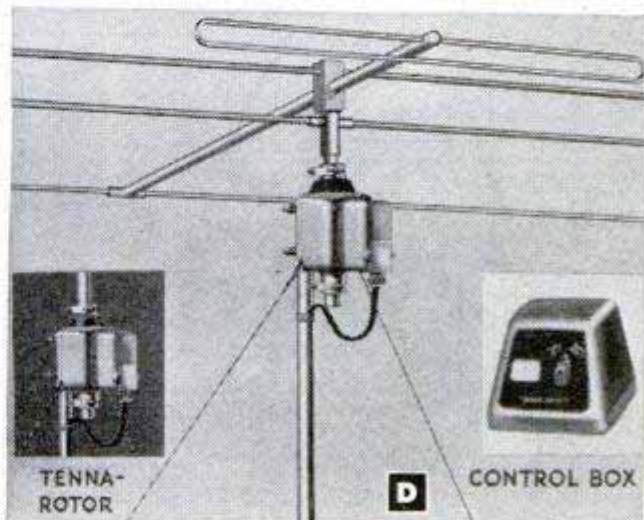
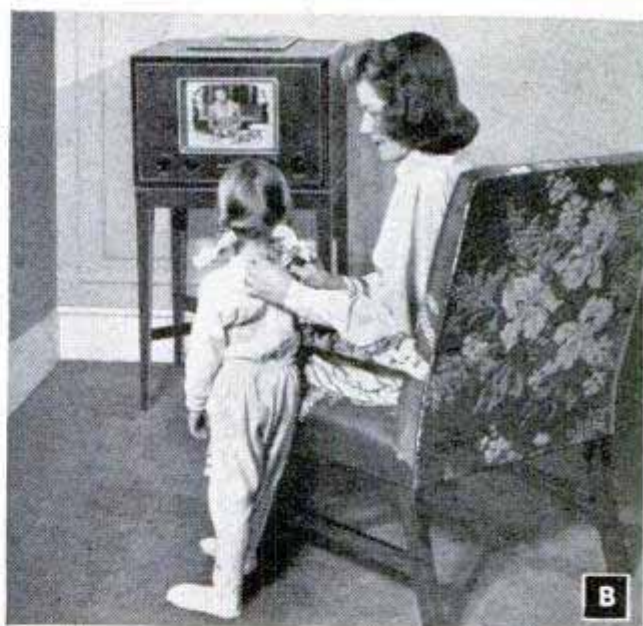
Keeping An Eye On Television

A—FM-AM radio-phonograph-television console set features the Zenith Giant Circle screen. The TV-receiver section employs 24 tubes plus 3 rectifiers. It is pretuned for all present channels and provision is made for a simple adjustment if needed to receive in ultra-high frequencies above 500 megacycles, if such TV frequencies are allocated

B—"Visible noise," the electronic interference that occasionally mars television-picture reception, has been greatly reduced by a new station selector, or tuning unit, in this RCA 22-tube table-model TV receiver. The engineering department is using several new circuit refinements, which include an additional tuned circuit and a special improved input system

C—Solving the problem of placing more television sets in homes and commercial establishments without buying complete receivers, this Olympic "duplicator" duplicates the image that is tuned in on the main TV set to which it is connected. Up to 12 units may be used. Automatic in operation, there are no controls except volume and the off-on switch

D—Electric rotator for FM or TV antennas operates in any weather and is connected to a plastic control box, located adjacent to the receiver. It may be installed on most TV and FM antennas. This Alliance Tenna-Rotor gives armchair control for the instant and correct "beaming" of the antenna to the exact compass point for best possible reception

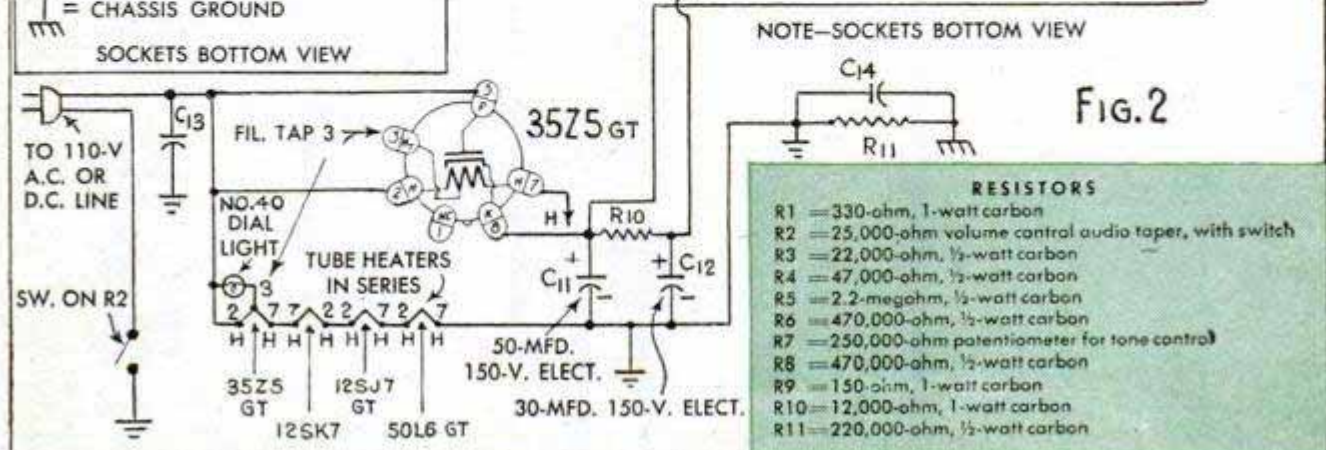
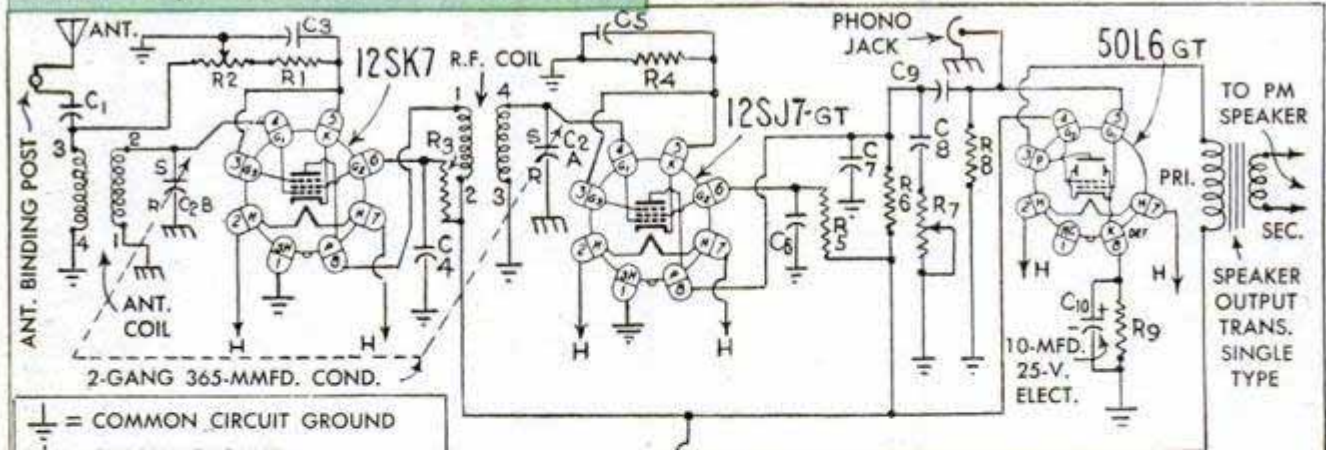
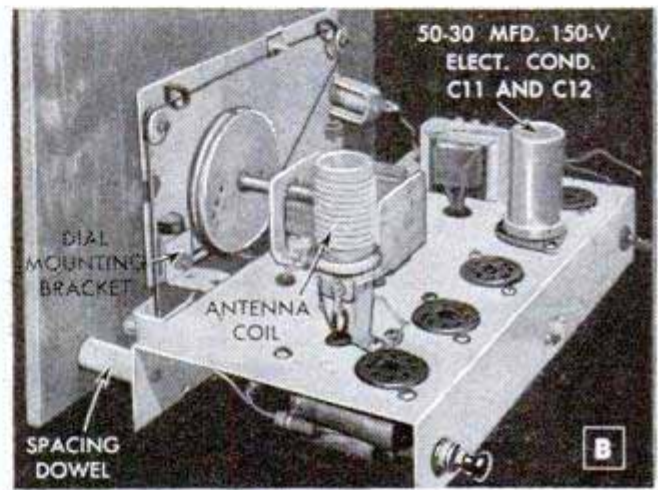
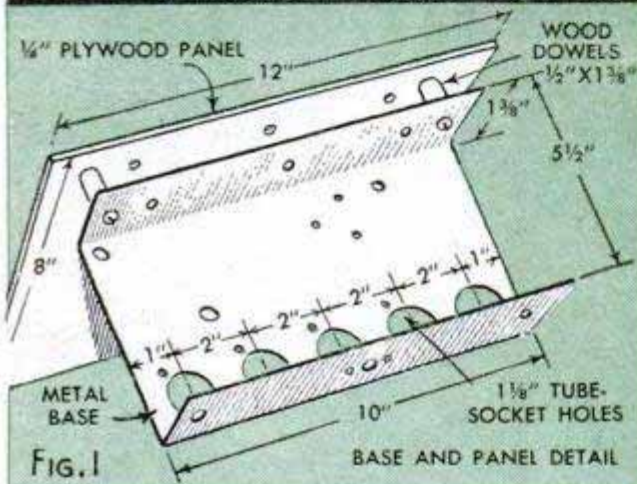
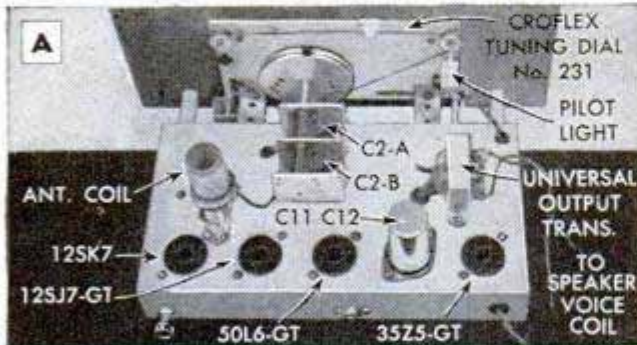


1949 "LITTLE GIANT" TRF

By Arthur I. Rattray



ALTHOUGH simple enough for the beginner, the unusual performance and flexibility of this 4-tube tuned-radio-frequency broadcast-band receiver will interest any experienced builder. This 1949 model of the popular annual student set costs much less to build than previous models. The set includes a phono-input jack and may be used as an amplifier for a record player. Furthermore, it makes an excellent AM tuner for a public-address system, or for use with any large audio amplifier and separate speaker. When tested in *Popular Mechanics* radio laboratory, the fidelity and sensitivity were highly satis-



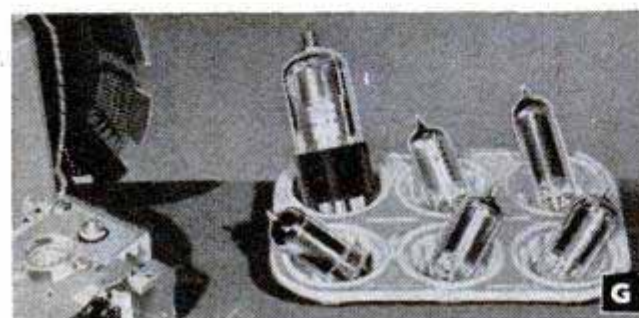
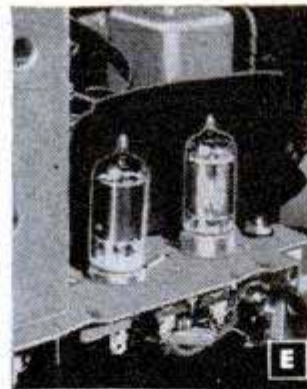
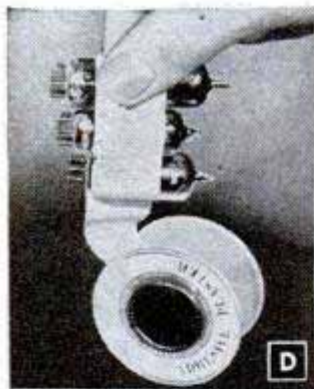
- NOTE—SOCKETS BOTTOM VIEW
- RESISTORS**
- R1 = 330-ohm, 1-watt carbon
 - R2 = 25,000-ohm volume control audio taper, with switch
 - R3 = 22,000-ohm, 1/2-watt carbon
 - R4 = 47,000-ohm, 1/2-watt carbon
 - R5 = 2.2-megohm, 1/2-watt carbon
 - R6 = 470,000-ohm, 1/2-watt carbon
 - R7 = 250,000-ohm potentiometer for tone control
 - R8 = 470,000-ohm, 1/2-watt carbon
 - R9 = 150-ohm, 1-watt carbon
 - R10 = 12,000-ohm, 1-watt carbon
 - R11 = 220,000-ohm, 1/2-watt carbon

More Tubes in Less Space

MINIATURE tubes make ultra-compact radio and television receivers possible. These tiny tubes weigh less than an ounce and range from 1 to $2\frac{1}{8}$ in. in height; they require one fourth the space of the tubes they are replacing. Besides their size and weight, miniature tubes have the advantage of shorter leads, which improves their performance by making them an immediate part of the circuit, according to GE engineers. They point out that the miniatures are valuable especially when used with high frequencies, such as are employed in FM and television. They require no Bakelite bases, and have fewer parts, making it possible to build them faster and more cheaply.

The miniature radio tube, displayed by the young lady in photo A, is contrasted with the conventional-size tube which it replaces. As these tubes are more fragile than the older types they must be handled with care, especially when inserting and removing them from their sockets. The pins are comparatively small and easily bent out of line. A metal pin straightener of the type shown in photo B costs only about 50 cents. The pins can be straightened by using a pair of tweezers, as illustrated in photo C, but this must be done very carefully, as the loss of just one tube would equal the cost of the straightener twice over. The straightener has fluted openings which permit the delicate pins to start easily. They are then forced into proper position.

If it is necessary to carry a set of these tubes to a service shop for testing, it is a good idea to bind the tubes together with adhesive tape, keeping the tips free, as indicated in photo D. The glass bulbs are drawn to fine tips which are easily broken if the tubes are carried loose in a bag. When inserting new tubes, seat them firmly in their sockets in the vertical position shown in photo E and be very careful not to damage the delicate prongs or tip. In photo F, an old-type tube socket is shown in comparison with the new one required for miniature tubes. These small sockets fit into $\frac{5}{8}$ -in. chassis holes; they simplify chassis construction for students and experimenters as small drill holes may be enlarged with a tapered reamer. A toy muffin tray makes a good safe holder for these tubes on the workbench, as illustrated in photo G. The entire set of tubes for one of the new table-model receivers is in the toy tray; all but one are miniatures. A selenium rectifier was employed in this set. The useful life of miniature tubes is comparable to that of the older types.



A
ROLL-FILM
CAMERA—



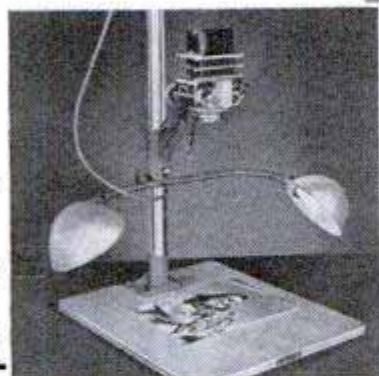
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FILM
CAMERA—



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AND
COPYING
CAMERA—



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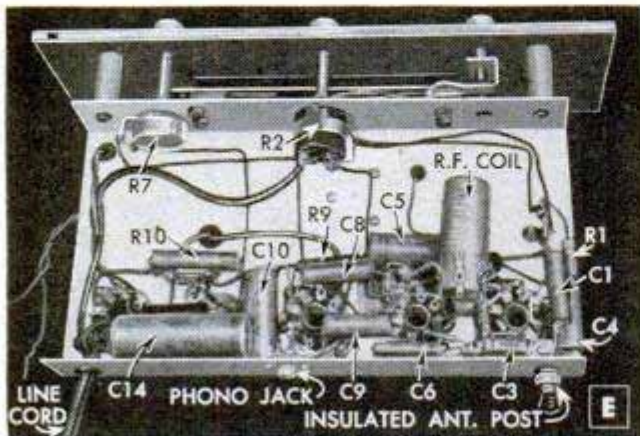
"Kodak" is a trade-mark

Kodak

1949 "Little Giant" TRF Dual-Purpose Set for Experimenters

(Continued from page 239)

is 1½ x 5 x 9½ in. These blank bases are available in either 20-ga. steel or in .005-in.-thick aluminum. The location of the parts on the chassis base is not critical but it is important that the tube sockets be mounted with the center keys in the posi-

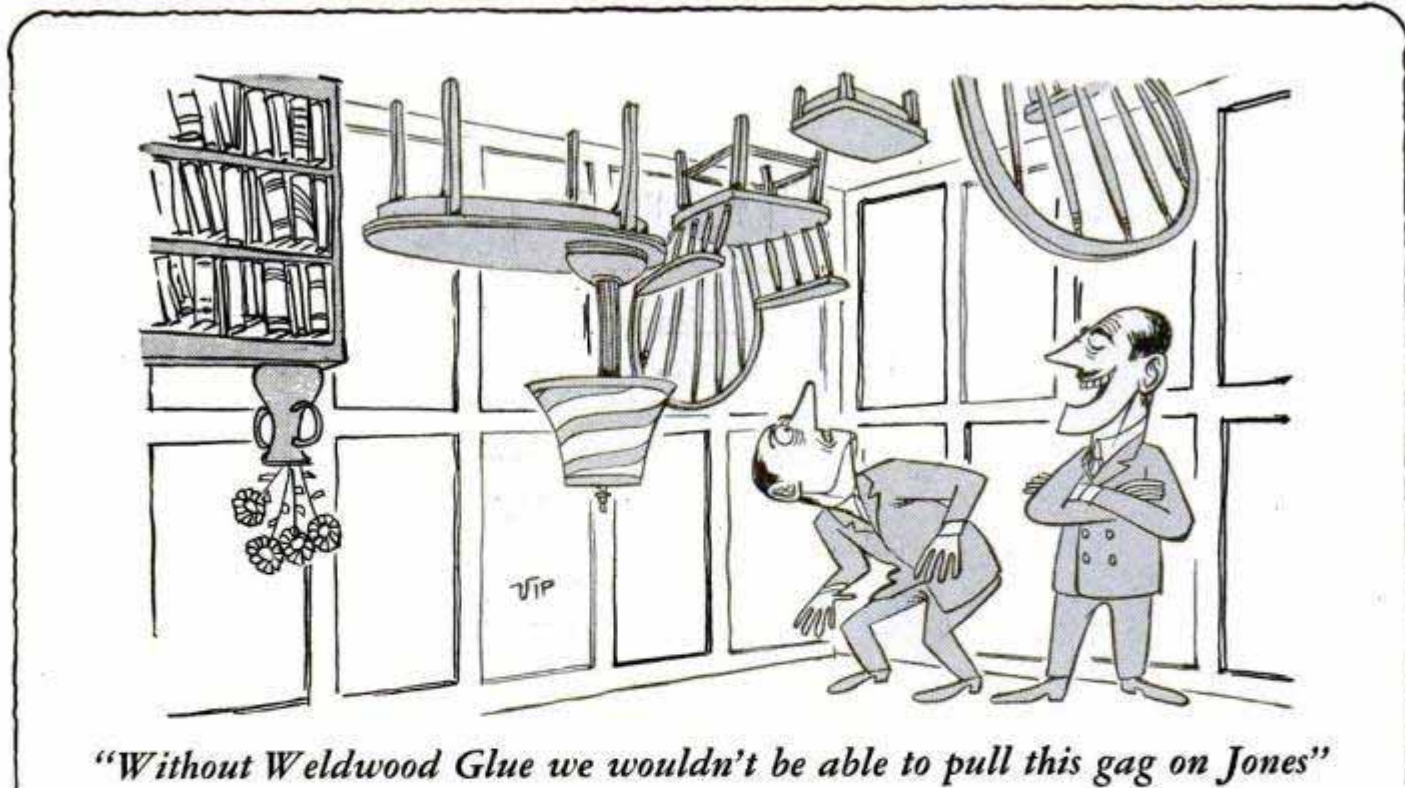


tion shown in the pictorial wiring diagram, Fig. 3. Photos A, B, C, D and E should be carefully studied before beginning construction. All parts are clearly identified in these photos and in the pictorial wiring diagram. Schematic circuit diagram, Fig. 2,

carries the same coil-terminal key numbers and both diagrams should be checked as the wiring progresses. Use rosin-core wire solder and make certain that all soldered connections are neat and both mechanically and electrically strong. Please note that the common circuit grounds and the actual chassis grounds are clearly indicated and must be made as shown. No common circuit-ground leads should touch the chassis. This entails a little extra wiring but it keeps the metal chassis from ever being "hot."

The antenna and R.F. coils are placed one below and the other on top of the chassis base and they are mounted at right angles to each other so that their corresponding fields will not cause oscillations. It will be noted that the antenna and the R.F. coil grid leads return to common ground while the variable-tuning condenser is to chassis ground; this also helps to prevent oscillations. If the Croflex tuning-dial assembly is not used, it will be necessary to mount the variable-tuning condenser on the chassis so that the substituted circular dial will be centered on the front panel. In this case, the small tuning knob shown in the model will not be used. Therefore, the volume control can be shifted to its position to keep all the controls

(Continued to page 244)



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TROY, N. Y.

uniform on the 1/4-in. walnut-finished plywood front panel. The dial-light bracket and socket are supplied with the Croflex tuning-dial assembly; therefore, if this type of tuning dial is not used, it will be necessary to purchase a dial-light bracket with a screw-base socket and jewel and mount it on the plywood front panel at any convenient point. A good location would be at the upper left-hand corner when facing the panel. If the Croflex dial is used, the builder will find that complete assembly instructions come with it. The Meissner antenna and R.F. coils are provided with mounting brackets; when they are mounted in the positions indicated, their terminal-numbering arrangement is as shown in the pictorial wiring diagram, Fig. 3. These standard coils are highly efficient, easily available, and should be used. The antenna coil is No. 14-1010 and the R.F. coil is No. 14-1011. The universal speaker-output transformer is a Stancor No. A-3856; the speaker voice-coil connections are made to secondary terminals 2 and 5 as the 50L6 tube should have a load impedance of about 2000 ohms.

If oscillations occur on the high end of the band when lining up the set after it is completely wired, it may be necessary to remove the "gimmick," which is a single-turn wire connected to the primary and wound around the secondary of the antenna coil. Merely clip it off where it is connected to the primary. When aligning the set, adjust the trimmers on the side of the variable-tuning condenser C2-A and C2-B on a station at the high end of the broadcast band for maximum output. Then adjust them on some station at the low end of the band for maximum output. Again return to the high end to see if maximum output is still obtainable. If it is not, a medium between the high and low end of the band should be reached. Either an indoor or outdoor antenna may be used, depending upon the location. In localities where there are a number of powerful broadcasting stations, a 15 or 20-ft. indoor antenna may be used. For distant reception, a good outdoor antenna will give the best results. No external ground wire should be used on this a.c.-d.c. receiver.

If the set is to be used as a tuner in connection with a larger amplifier and speaker, turn the set volume control to maximum to keep hum level at the lowest possible point. Volume is then controlled at the larger amplifier in the usual manner. Remove the set speaker and replace it with an 8-ohm wire-wound resistor. Detailed student material list R-375 is available from Popular Mechanics Radio and Electronics department on receipt of ordinary letter postage.

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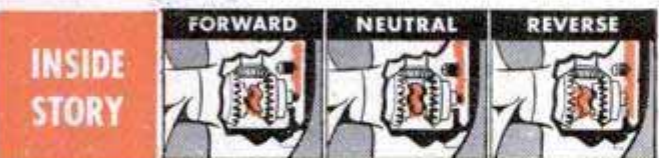
SHIFT
...to warm up motor in neutral

SHIFT
...to back away from dock

SHIFT
...to make an "eggshell landing"

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They Must Land Safely

(Continued from page 109)

entire sequence of speed lamps flashes on and off every $\frac{3}{5}$ second.

Somewhat comparable is a Sylvania system that has a row of 23 high-intensity flashers, again of the condenser-discharge type. Each of these is centered on a background of four horizontal red neon bars. The units are spaced 100 feet apart, starting at the outer end of the approach zone. Close to the field they are replaced by twin rows of red neon bar units—without flashers—as a warning to the pilot that he is about to encounter the end of the runway. Each flasher produces approximately 10 million candle power for $\frac{1}{5000}$ second and the system operates in sequence, completing a cycle every $\frac{1}{2}$ second.

A third system, designed by American Gas Accumulator Company, has eighteen 5000-watt lamps spaced along each side of a 200-foot-wide approach corridor at 200-foot intervals. Right-hand lamps have amber lenses, those on the left are red and the beams are toed in toward the glide path.

A Bartow multi-row approach-light system has 154 units, each consisting of two 600-watt aircraft landing lamps spaced along the sides of the approach corridor, amber on the right and red on the left.

Except for the lamps closest to the field, each installation consists of double units. One pair of lamps is directed upward and the other pair points out along the approach. Elevation and toe-in angles of the units are adjustable from the tower to fit varying weather conditions.

Another system, the so-called "slope line," contains about 600 clear 600-watt aircraft landing lamps which are mounted in groups of 10 on a series of diagonal supports along each side of the approach corridor. The lights are aimed so that an approaching pilot who is on the proper glide path sees what appears to be two straight lines of lights converging toward the runway. If he is off the proper path the groups of lights break up into echelon patterns that tell the pilot the amount and direction of his error. If he is too high the groups of lights separate and appear to lay over instead of joining in a line, and if he is too low the groups stand up straight.

The simplest lighting system of all consists of a single line of thirty 500-watt on-course airway lamps, red in color, that leads along the center line of the approach area to the landing runway.

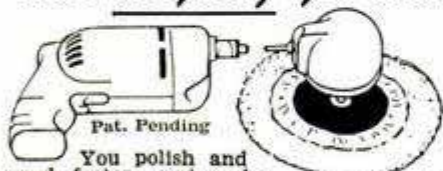
At present all of these approach-light systems are turned on or off manually at

(Continued to page 252)



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*See description under photo of Bull Buffer kit.

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Bull Buffer comes complete with sheepskin bonnet and two sanding discs, only \$9.95. Bull Buffer alone cuts drill speed $\frac{1}{2}$; for direct drive (or "same as") drill speed, order Adapter A with Bull Buffer; for twice drill speed, order Adapter B.

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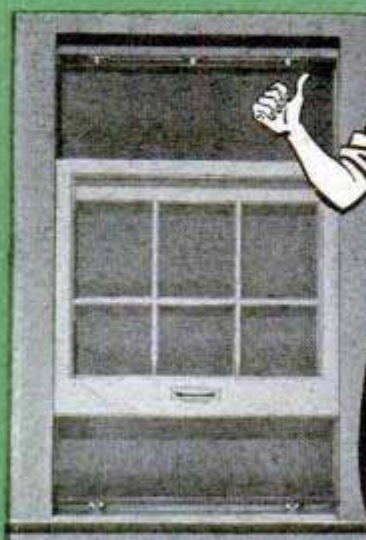
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Time for Pruning Shrubs

Q—What is the proper time for pruning both ornamental and flowering shrubs, spring, summer or fall?
W. R., Louisville, Ky.

A—In general, the shrubs that bloom during the early spring develop their flower buds during the previous season. If these shrubs are pruned while dormant, a large percentage of the flower buds will be removed and destroyed in pruning. If the shrub is being pruned to some definite shape, a heavy pruning at any one time may result in damage to growth. As a rule, the proper time to prune the early blooming shrubs is about two weeks after the flowers have fallen, when the plant is in full leaf. They then will develop blossom buds during the remainder of the growing season for the following year. On the other hand, most varieties of late blooming shrubs, those that bloom during the late spring and summer, develop the flower buds early in that same season. Such shrubs should be pruned in the early spring while still dormant and just before growth starts. Ordinarily, pruning has a three-fold purpose, the first being to remove excess plant parts to increase the size and number of blooms. The second is to trim and shape the shrub by pruning to make it strong structurally and to stop formation of sharp-angle crotches and overlapping branches. The third is to train the young plant from its earliest period of growth to form a definite and pleasing shape by careful pruning over a period of several growing seasons. The latter two are also reasons for training small ornamental trees.

Picture Spots Wall

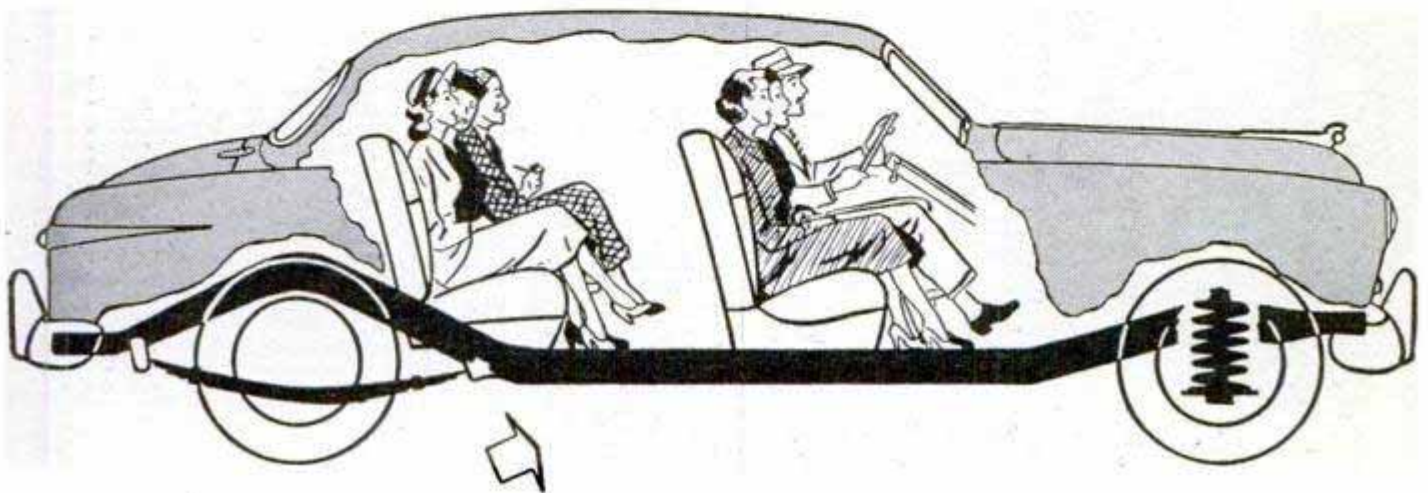
Q—Recently, I moved several large pictures which had been hanging for some time in the same place. Dark spots of the exact size of the frames now appear on the wall. How can I remove these unsightly spots and prevent their recurrence?—B. T., San Francisco, Cal.



A—As a rule, it is rather difficult to remove the spot entirely by ordinary means without damaging the wall or covering, as some wall coverings fade less behind the picture. However, most of the soiling is due to a lack of air circulation, which allows dust to collect back of the frame. If the walls are painted with a washable oil paint, a household paint cleaner will remove the grime and dust, making the spot less noticeable. Clean papered

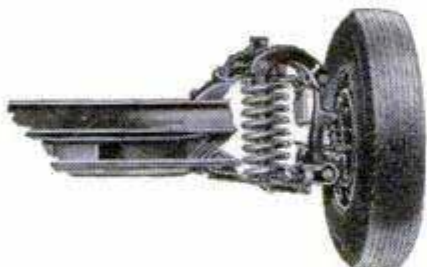
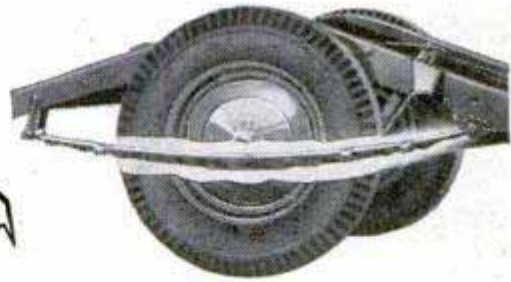
(Continued to page 250)

Facts about the NEW FORD "FEEL"



One of the most important things contributing to the New Ford "Feel" is the solid roadability and exceptional comfort of the "Mid Ship" Ride. Seats are scientifically positioned between the wheels to cradle the passengers luxuriously.

In addition, a completely new suspension system is part of the Ford "Feel" of cradled smoothness. The "Para-Flex" Rear Springs are extra-long semi-elliptic type. Impregnated inserts between tips of spring leaves, together with concentrated pressure-type rubber bushings at shackles and brackets, eliminate need for lubrication.



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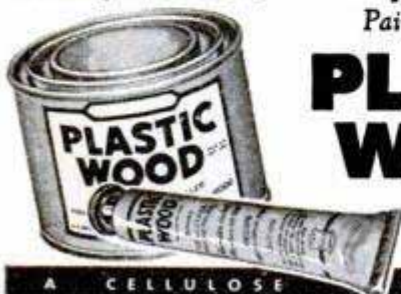
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walls with a wallpaper cleaner. When hanging the pictures, drive a tack at each lower corner of the frame, letting the head project from $\frac{1}{8}$ to $\frac{1}{4}$ in. The tacks hold the picture away from the wall, permitting air to circulate freely and preventing the accumulation of dust.

Seeding Shaded Curb

Q—I have a wide, shaded curb sloping to the north and for the past two years I have tried unsuccessfully to get grass to grow there. The distance from sidewalk to curb is about 10 ft. and the whole shaded area slopes rather abruptly. What are your recommendations?

M.B., Detroit, Mich.



A—It is not always possible to maintain a permanent lawn under heavy shade, especially in the location you describe. Usually, only a small portion of the grass will survive from year to year. However, you can get fairly good results by seeding yearly with a mixture of grass seed prepared especially for shade. At the outset, the soil and seedbed are prepared as for a new seeding, but thereafter spot seeding of the area may suffice, at least for a few seasons. A continuous fertilization program is nearly always necessary in such locations, as the trees feed heavily on soil fertility throughout the growing season, thus robbing the grass of needed plant food. Keep the new seeding mowed regularly throughout the season but set the mower to cut at least $1\frac{1}{2}$ in. high; 2 in. is better if possible.

Paint Chips On Woodwork

Q—I have just finished enameling dark-stained woodwork and now the enamel is checking in places, exposing the dark finish underneath and making unsightly blemishes. I used one coat of flat paint and three of enamel. What is wrong?

A.R., Boston, Mass.



A—By "flat" paint we assume you mean an ordinary, interior wall paint, and also that you applied it over a glossy varnish finish on the woodwork. This is a common cause of the trouble you describe, as paint does not bond well to a high-gloss finish. As a rule, the best procedure in enameling such a surface is first to give it a thorough cleaning to remove finger marks and grime. Then go over the finish with a medium steel wool or sandpaper to cut the gloss. Apply two coats of prepared enamel undercoater and follow with one coat of enamel. In most cases, it's a good idea to sand the second coat of undercoater lightly. If the stain on the woodwork is a dark brown or if it contains red, use a spirit enamel instead of the undercoater. Then there will be no danger of the stain bleeding through the enamel finish.

Leveling Basement Floor

Q—My basement floor is in good condition. There are no cracks or breaks anywhere. However, the slope, or fall, to the two drains seems much more than necessary, being at least 6 in. and resulting in a depression in the floor with rather steep slopes around each drain. I have thought of leveling the floor and raising the drains to give a fall of about 1 in. or so, by simply filling the depressions with new concrete laid over the old. Would this be advisable?

S.M., Racine, Wis.

A—The floor could be leveled by first chipping the area about the drains to roughen the surface and then pouring new concrete. However, we could not fully recommend this procedure. It is better, we believe, to break up the old concrete around the drains, removing it entirely, back to the point where the floor is more nearly level.

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the tower. One of the projects at LAES is to devise an automatic control by means of which a selected lighting system will turn itself on or off and adjust its intensity according to the existing visibility. It would be governed by devices that measure visibility and ceiling. Six transmissometers installed at different locations around Arcata measure the visibility of the atmosphere and report their readings continuously by radio to one central recording device. Two ceilometers that constantly measure the height of the cloud ceiling above the field are also in use.

Also being studied at Arcata are runway-marker lights of new design, and means by which a pilot touching down can determine his location in reference to the total length of the runway. Still another problem concerns identification and illumination of taxi-ways. Other studies are projected for the future, the goal of the whole research program being to find the simplest and surest ways of helping aircraft take off or land at will, regardless of the weather.

Science Hits the Bull's-Eye

(Continued from page 177)

is twice as much stress produced in the compression of the round-bellied bow as

in the stretching of the back of the bow. This meant that too much tension was produced in the belly of a rounded bow which had less surface area to absorb the strain. This resulted in the weakening and misshaping of bows through long use when the overburdened wood fibers in the belly became crushed.

Doctor Hickman also has done considerable research on arrow construction. This has had widespread significance, not only in archery, but in the development of American rocket warfare, since many of his findings were used in the development of such weapons as bazookas, rockets fired from airplanes or ships, and rocket motors that are used to increase the penetrating power of bombs.

For his war work, Doctor Hickman received the Presidential Citation Medal for Merit from the Army and Navy. It is the highest award given to a civilian by the armed forces.

Archers have long known that the spine, or stiffness and resilience, of an arrow must be matched by the drawing force of a bow if the arrow is to fly straight. But they did not know why. By taking electronic pictures of arrows in flight, Doctor Hickman showed how this was tied in with the archer's "paradox."

(Continued to page 254)

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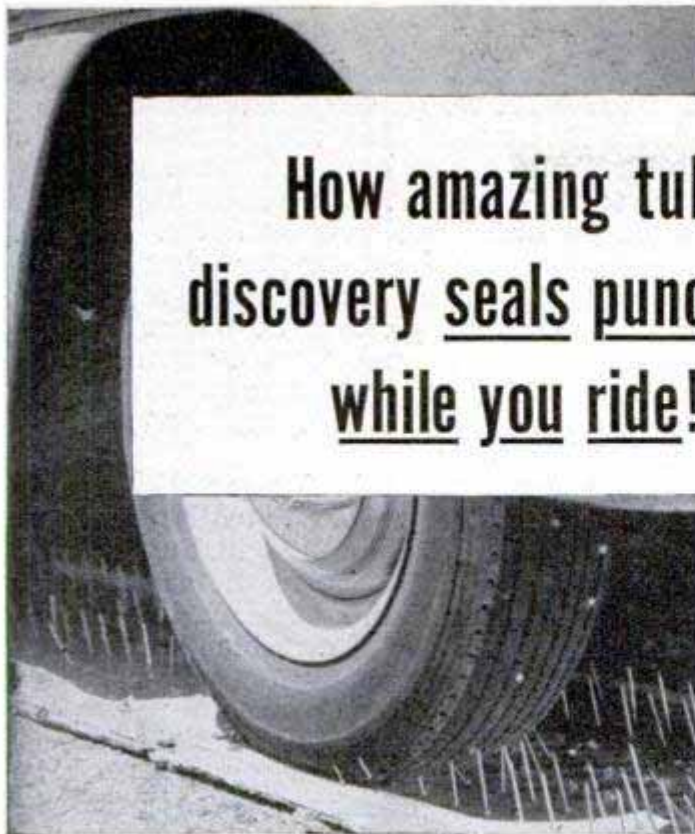
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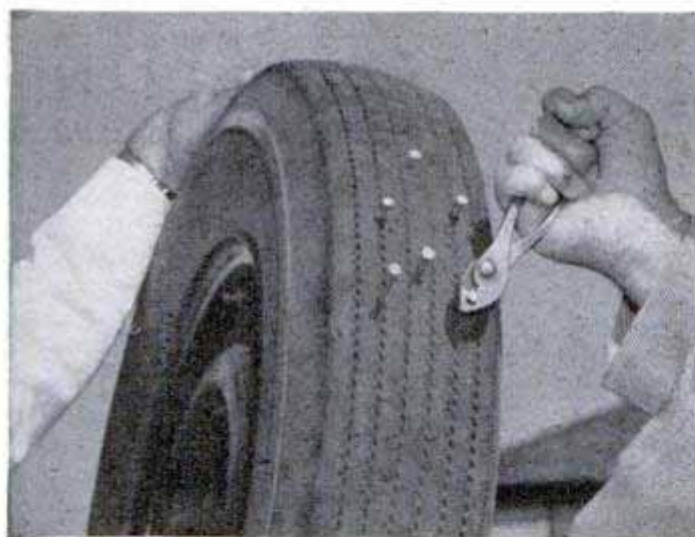
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For many years the paradox had played upon the imagination and curiosity of archers. From a first glance at the bow and arrow, it would seem that the arrow should fly far to the left, since it passes on the left side of the bow, while the string flies to the middle. This actually happens when the string is slowly let down.

In order to find out exactly what happened, Doctor Hickman developed a camera that would take pictures at the rate of 6000 frames a second. This camera was able to stop the flight of arrows and was soon adopted by the Army and Navy for filming projectiles.

The pictures taken by Doctor Hickman showed that the arrow actually bends around the bow and keeps oscillating in its flight. This not only solved the academic problem of the archer's paradox, but also showed why arrows of certain spine must be matched to different strength bows, lest a badly matched arrow assume a permanent warp or break due to its initial buckling from the force of the string.

Fortified with this knowledge, Doctor Hickman advocated shooting the arrow from a point nearer the center of the bow rather than from the side of the bow. This "center shot" bow eliminated the need for special considerations in matching arrows of correct spine.

The center-shot bow has the advantage that very light arrows may be shot with heavy bows, giving flatter trajectories than are possible with bows that force the arrow to bend around them.

Another of Doctor Hickman's inventions has solved the major problem in aiming. Experience has shown that the most comfortable and accurate shooting position is one in which the arrow is held by the fingers just beneath the chin. Since the eye is on a higher level than the arrow, the line of sight is downward from the eye to the arrowhead to some point on the ground before the target. This is known as the "point of aim" method of shooting. Here the archer sights at some small object which he places on the appropriate spot on the ground, and does not see the target in the act of shooting.

Many bowmen have tried to eliminate this bothersome practice by using mechanical sights. These consist of various appendages placed on the upper limb of the bow, allowing the line of vision to continue from the eye to the sight and on to the target. In this practice, however, the archer does not see the arrow and cannot check whether he has taken a full draw. To overcome this new handicap, some archers took to attaching mirrors to their bow limbs.

(Continued to page 256)

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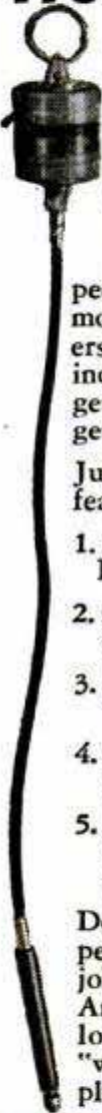
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But this only makes the bow cumbersome. Doctor Hickman solved both the problems of mechanical sights and point-of-aim shooting with one stroke. He invented a sight consisting of two prisms which bend the image of the target up to the eye. The archer then seemingly aims at the center of the target. Since the arrow actually rests on the arm of the sight, the archer lines up the point of his arrow, the cross hairs of his sight and the bull's-eye. Thus, he cannot pull his arrow back too far or too little.

Psychological, as well as mechanical, hindrances have plagued the archer. One of these is the habit of "freezing" before reaching the point of aim, a difficulty common also to riflemen. As many psychologists have pointed out, this is due to a subconscious fear that the shooter will release the arrow as soon as the tip of the arrow reaches the point of aim, thus deflecting the arrow in the direction the bow is moving.

To overcome this, Doctor Hickman uses a mechanical timer which he attaches to his wrist. He then proceeds to aim at his "point," and holds on it until the timer clicks. This has produced a conditioned reflex whereby he automatically releases when the timer clicks and not one second before. By developing this habit, he has eliminated the fear of losing the string too soon, permitting him to adjust freely on the point.

Doctor Hickman's home is an archer's paradise. In addition to a sizable collection of tackle, he has one of the largest private collections of archery books and prints in the world. And his box full of medals and trophies is a monument to his scientific achievements in archery.

Brains That Click

(Continued from page 167)

cooling and choice of metal for the barrel can be computed theoretically even before the gun is built. One of the best-known network analyzers is located at Illinois Institute of Technology.

The latest model "thinking machine" that scientists and mathematicians drool over is the electronic-type calculator. Such computers use vacuum tubes and literally figure with the speed of lightning, rather than by any ingenious system of wheels or gears. The Army, the Navy and the U. S. Bureau of Standards have spent several million dollars on such machines.

The Navy has sponsored the work of Dr. Howard Aiken at Harvard who has developed three calculators: Mark I, a mechanical type using counter wheels; Mark

(Continued to page 258)

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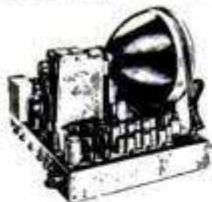
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II, an electric-relay type which recently was moved to the U. S. Naval Proving Grounds, Dahlgren, Va.; and Mark III, a hush-hush electronic computer which has not yet been completed.

The Army has backed the scientific team of Dr. J. Presper Eckert, Jr., and Dr. John Mauchly, formerly of the University of Pennsylvania. They developed the ENIAC (Electronic Numerical Integrator and Calculator) which has been moved to the Army's Aberdeen Proving Grounds, Aberdeen, Md. The ENIAC is the only all-electronic computer in operation today. It is not a machine in the usual sense—the only moving parts are devices to feed numbers in and print numbers out.

Not long ago Eckert and Mauchly set up their own company in Philadelphia and are now working on the UNIVAC, the BINAC and other types of computers. The UNIVAC, the only large computer designed to manipulate alphabetic information, will soon be made available to business and industry. The BINAC, two models of which have been built, is a smaller, simpler and lower-priced calculator—almost a "pocket" edition—which is only five feet high, four feet long and one foot wide.

The Army is also financing the work of Dr. John von Neumann at the Institute for Advanced Study, Princeton, N. J. He's developing a calculator of an advanced type which, it is jokingly said, may be called the MANIAC (Mechanical and Numerical Integrator and Calculator).

The U. S. Bureau of Standards has a four-part program under way. In Washington, D. C., it is setting up a Computation Laboratory, a Statistical Engineering Laboratory and a Machine Development Laboratory. In Los Angeles it has organized an Institute for Numerical Analysis on the U.C.L.A. campus to serve Western research and industry.

Engineers and mathematicians are like airplane designers. Models in use are already long outmoded by those on the drawing boards. Where a calculator like the ENIAC today is equipped with 18,000 vacuum tubes and weighs 30 tons, computers in the future may have only 1000 vacuum tubes and perhaps weigh only 1½ tons.

Though never completely satisfied with performance, scientists get a happy gleam in their eyes when they contemplate the high-speed electronic calculating machines of today and the future.

One of them puts it this way: "Just one of these machines will do in a few hours what a human mathematician couldn't do with a million pencils in a hundred lifetimes."

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DOES THIS... IT'S TIME
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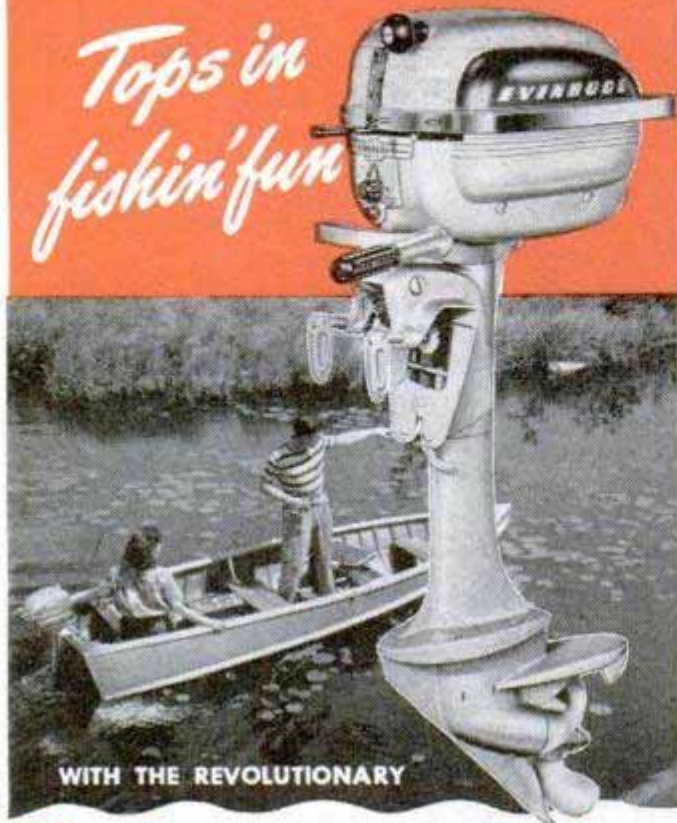
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FIRST IN OUTBOARDS • 40th YEAR

Backstage Miracle Makers

(Continued from page 156)

of 2 by 8s, 36,000 bolts of various sizes and hundreds of yards of muslin.

The muslin on which the scenes are painted is first given a coat of glue sizing. The artists use water-color paint which is sprayed with formaldehyde to keep it from running in case of rain. The finished sets must stand out in all weather, but the management fears wind more than rain. The big scenery pieces are like sails. When not on stage during a production every piece is tied down with ropes. If a storm threatens, the audience sees the ropes out front to guard against accidents.

"Our accidents ain't serious ones," chuckled one of the stagehands. "They're funny ones. Worst one lately was with a telephone. It rang good and loud. The actor went to answer it but there was no telephone to be found. Somebody forgot it. You should have heard the audience howl."

This story may be just one of the folk tales (usually false) which have grown up around the theater. Every stagehand, actor and technician will tell you that the two great burr oaks framing the stage and "hundreds" of years old are insured by Lloyds of London for "thousands." This is denied by Paul Beisman, manager of the theater, who has been associated with the Municipal Opera since it was founded.

"There's no denying those trees are priceless," he said. "All you have to do is witness one of the outdoor scenes at night when they are lighted to appreciate that. In fact, this spot was selected because those trees are there. They are probably the two most pampered trees in the U.S. Lightning rods reach into every branch; they are fed, fertilized, watered, patched, trimmed and cared for like a couple of prima donnas." He hesitated. "But insured by Lloyds of London? No. I keep denying that story but it makes no difference. Next year everybody will be saying the same thing."

Here are a few facts and figures about the St. Louis Municipal Opera: In the 30 years of its existence it has entertained more than 18,500,000 persons at 2254 performances of operettas, comic and light operas. The production cost (on a professional basis with leading New York producers, directors and principals) now totals \$600,000 a season. The company has never lost a penny and shows a small profit. The theater seats range in price from 30 cents to \$2.60. Every night there are 1500 free seats in the top section. This is

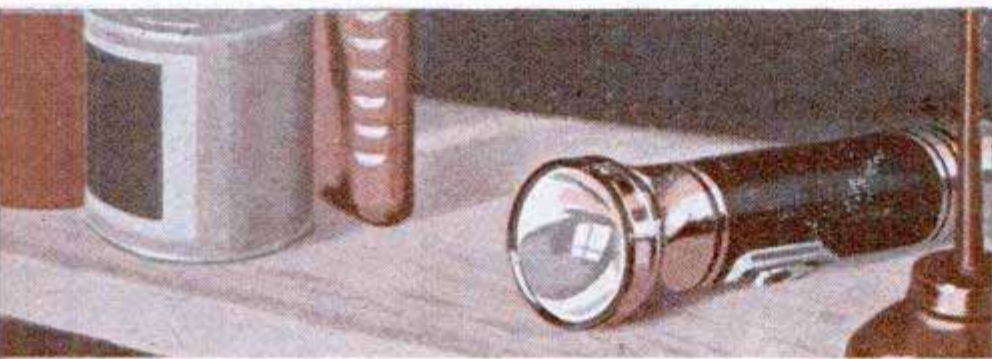
(Continued to page 262)

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bounces back with new pep... so "Eveready" batteries bounce back for extra life!



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because the theater is on city property and is itself actually owned by the taxpayers of St. Louis.

The success of the Municipal Opera has inspired other cities to build similar outdoor theaters: Dallas, Memphis, Louisville, Atlanta, Pittsburgh, Indianapolis and Los Angeles. Indoor civic theaters are found in Detroit and San Francisco.

Producer John Kennedy says that to succeed, every municipal theater must be self-supporting and not depend on a rich sponsor. The shows with their elaborate scenery must be so good that you can't keep the crowds away. That's true in St. Louis where theatergoers carry umbrellas to sit in the rain and where taxi drivers mention the "Muny Opera" with the same pride as they do the St. Louis Cardinals.

Prehistoric Crop

(Continued from page 145)

widely planted as an ornamental, and commercial plantings greatly extend its range and usefulness. For one thing, young *Sequoias* have ideal length and form for use as telephone poles. Deep ground frost and extreme dryness are the chief checks to its possible range.

The coast redwoods do not attain the

same bulk with maturity as do the *gigantea* but they frequently grow considerably taller. *Sempervirens* as tall as 350 feet or more have been measured. One huge tree alone may contain 360,000 board feet of lumber. In selected areas the trees run more than a million board feet of lumber to the acre.

Coast redwoods reproduce rapidly from seed although many people in the redwood country are ready to swear that the tree grows only from sprouts. This belief is due to the remarkable sprouting energy that the species exhibits. Practically every stump sends up a ring of new shoots from its root collar. Many newly cut logs also sprout if they are allowed to lie.

Bark-covered redwood logs that were used as columns for decorating the face of a wooden bank building a number of years ago destroyed their classic effect by sprouting their full length with new green growths. Logs used for building railroad trestles are apt to do likewise. Such sprouts usually die away after the first season but with sufficient moisture they send down their own root systems and develop into healthy trees.

The coast-redwood forests are yielding tremendous amounts of lumber and there has been considerable concern over this

(Continued to page 264)

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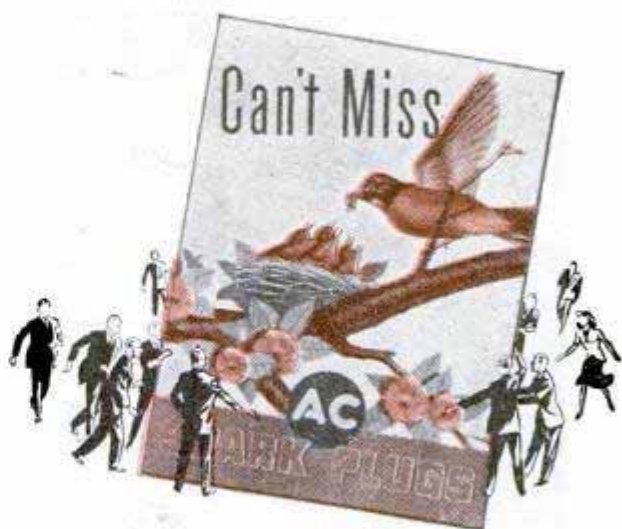
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Use Simoniz Kleener (liquid or paste) to clean finish. Then Simoniz for lasting beauty. Sold everywhere!

destruction of a great scenic asset. Aesthetically and commercially it is important that the forests continue to grow forever. The indications are now that this is going to be the case. Oddly enough the best results in maintaining the forests appear to come from controlling natural growth rather than producing seedlings in nurseries and setting them out.

Considerable work in reforestation has been done by the Pacific Lumber Company of Scotia, Calif., which, as the operator of the largest single redwood lumber plant, has a very real interest in never running out of raw material. The Pacific Lumber Company is processing 400,000 board feet of lumber in its plant every eight-hour day and it estimates that it will always have enough timber in reserve to stay in operation.

This conclusion is based on the fact that at present rates of cutting it has about a 30-year supply of virgin timber ahead of it, plus the fact that parts of its lands that were first logged in the '80s and '90s already are suitable for logging again.

Selective logging wasn't a formal procedure in the early days, as it is now, but the early loggers happened to leave enough mature seed trees and enough young growth on the slopes behind them to allow the forest to continue to grow. Removal of the biggest trees that had shaded and stunted the young growth permitted the immature trees to accelerate their own speed of growing.

Twenty years ago the Pacific Lumber Company went into the nursery business in a big way and grew thousands of hardy seedlings and set them out on cut-over land. The seedlings flourished but after a time it became apparent that just as much new lumber was being produced by natural processes on adjacent land as was being produced on the planted ground. Today, the company simply thins out the forest to obtain maximum growth from the trees that remain. That, plus leaving groups of mature seed trees here and there, is about all that is necessary.

There is no more waste in redwood lumbering than there is in the packing industry that proverbially uses everything except the squeal. Caskets, cigar boxes and other specialties, as well as general building lumber, are made out of the best wood. Short pieces that are left over are cut into shingles and lath. The shavings and sawdust that accumulate from the mill operations are pressed into logs suitable for burning in fireplaces.

Much of the thick fibrous bark is cut, shredded and processed into a fireproof

(Continued to page 266)

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Sets New Performance Standard

Amazing Resistor does it!



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A SMOOTHER ENGINE IDLE—WIDER SPARK GAP HELPS ELIMINATE OCCASIONAL MISSING.

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*All ratings are OBC Certified Brake H.P. at 1000 r.p.m.

material for insulation. The blanket industry uses some of the long strands of bark for mixing with wool. Dust from the shredded bark goes into paper roofing material and some of it is sold as a conditioner for heavy soils.

Some fiber becomes an ingredient in the material used in sealing oil wells, some refuse wood is exploded like puffed rice and becomes a constituent of various dark-colored plastic materials. The junk wood that is left over from all these operations is burned, but not because this is a convenient way to dispose of it. The wood is the necessary fuel that runs the boilers of the generating plant that produces the power by which the mill is operated.

Want to Buy Some Rain?

(Continued from page 133)

Often the latter is done immediately under a cloud where the strong natural updraft carries the vapor aloft.

Most investigators think that artificial nucleation is practical only when a cloud is in a state at which precipitation will occur anyway. The seeding simply provides a trigger action that starts or stimulates the natural process. Under proper conditions it is possible to develop considerably heavier rainfall than would occur otherwise. The extra yield depends more on the state of the atmosphere than on the amount of water in any single cloud.

Last year was a dry year in Arizona. Some rain could be expected from thunder clouds, but not enough to make up the deficiency, and the irrigators and other water users who draw upon the reservoirs behind Roosevelt and Bartlett dams wanted every extra drop they could get. Interested groups in the state created the Arizona Weather Research Foundation to test scientific rain-making techniques. The foundation in turn employed the Krick weather research staff in Pasadena, Calif., to determine whether summer weather over the watersheds behind the two reservoirs was suitable for seeding, to direct operations and to evaluate the results.

From a study of the very complete local upper-air meteorological records for a number of years it was apparent that air of suitable moisture content and physical structure quite frequently flowed over the watershed area. The freezing level in these air streams was at an altitude of around 15,000 feet. Artificial nucleation of cloud masses that extended above that level appeared feasible. Aircraft operated by the Precipitation Control Company of Phoenix

(Continued to page 268)

Steady work . . . big money with American



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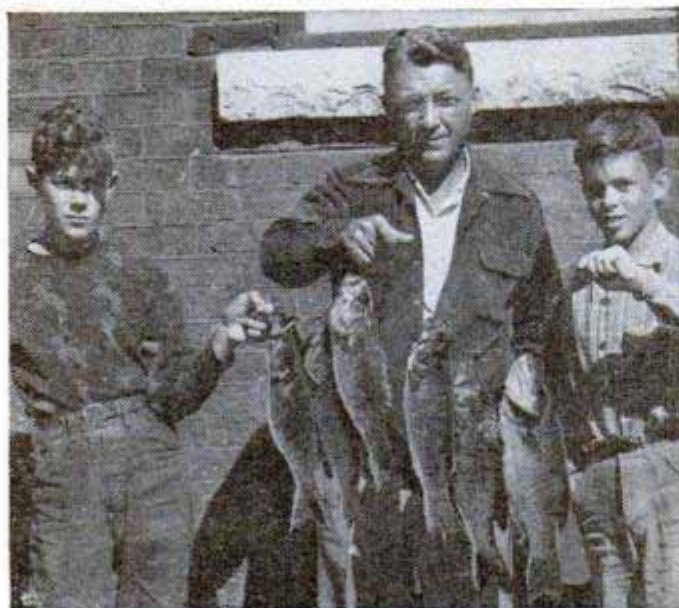
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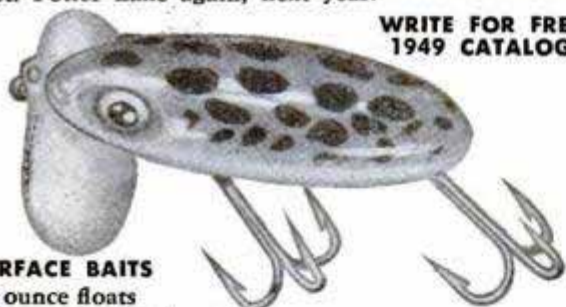
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ALL BROKE-WATER TO TAKE JITTERBUG!



"Our Jitterbug took the limit, each day, at St. Potier Lake, near Whitefish," is the way T. B. Stonerock of Dayton, Ohio, describes this photograph showing his son, Tommy (right), and friend, Peter Farrell (left), with their catch of Smallmouth Bass . . . all weighing over 2 pounds. Mr. Stonerock, the boys and a Jitterbug have a date to fish St. Potier Lake again, next year.

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1949 CATALOG



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$\frac{3}{8}$ ounce sinks when at rest

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and by Weath-Air, Inc., of Burbank, were used for the seeding flights.

Meteorologists in the Pasadena laboratories telegraphed a forecast for the watershed area to a staff flight-control meteorologist in Phoenix early each morning during July, August and September. If a forecast was favorable, the Phoenix meteorologist immediately alerted the pilots and informed them of the area in which seeding was to be done and the time at which it was to start. During the balance of the morning he conferred with the local U. S. Weather Bureau staff to modify the flight instructions if necessary.

Twenty-seven operational flights were made during the 90 days. On some occasions Dry Ice was employed, on others silver-iodide vapor was released, and on some days both agents were used to infect the clouds.

A war-surplus P-64, the "Barnestorm No. 3," specially rebuilt for the work by Precipitation Control Company, was used as the silver-iodide plane. The vaporizing apparatus consists of an electric arc through which silver-iodide crystals are passed. The vapor thus produced is ejected from the plane through 10 tubes spaced around the fuselage to provide maximum mixing with the slipstream air. The vapor may also be mixed with the water of combustion that condenses from the engine exhaust or it may be mixed with an atomized water spray that is ejected from the plane under high pressure.

C. S. Barnes, president of Precipitation Control, spent $3\frac{1}{2}$ years developing his present equipment and has flown numerous rain-making contracts. A typical operation consisted of a number of cloud-seeding flights over Bear Valley in the San Bernardino Mountains of southern California last spring during a period when the whole region was experiencing one of the worst droughts in its history. Bear Valley received from 90 to 180 percent of

(Continued to page 270)

U T I C A

UTICA TOOLS

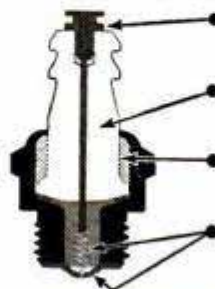
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CHAMPION "THERM-O-FLEX" CONSTRUCTION—longer element life, more dependable performance.

Follow recommendations of plug types and fuels approved by engine manufacturer.

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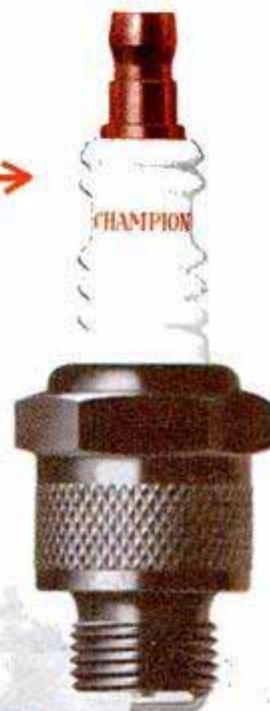
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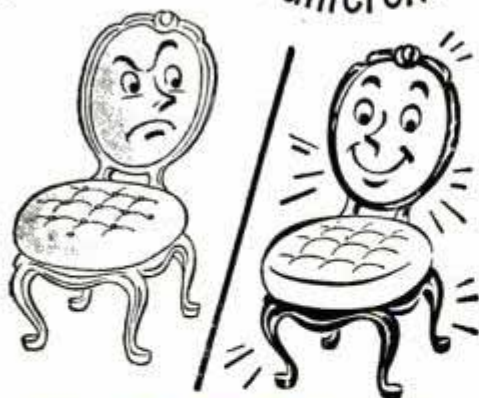
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DEMAND NEW DEPENDABLE CHAMPIONS
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Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network

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CLEAR-GLOSS VARNISH

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CROSLLEY
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its normal rain and snow during the time that Barnes operated, although in adjacent areas the precipitation averaged only 48 percent of normal.

Dry-Ice seeding for the Arizona experiment was done by Weath-Air's war-surplus B-25, now fitted with a Dry-Ice chute. The B-25 also carries a silver-iodide oxy-acetylene smoke generator that uses an open forced-draft combustion chamber, not employed in the Arizona tests.

At the end of the 90-day experimental period it was found that rainfall to the ground was started or increased locally on 66 percent of the flights. On 19 percent of the flights it was difficult to determine whether the observed rain had been artificially produced, and on 15 percent of the flights no rain was started.

In practically all cases where rain occurred either generally or in showers over the entire area, the heaviest rains were recorded directly below and down-wind of the points that were seeded.

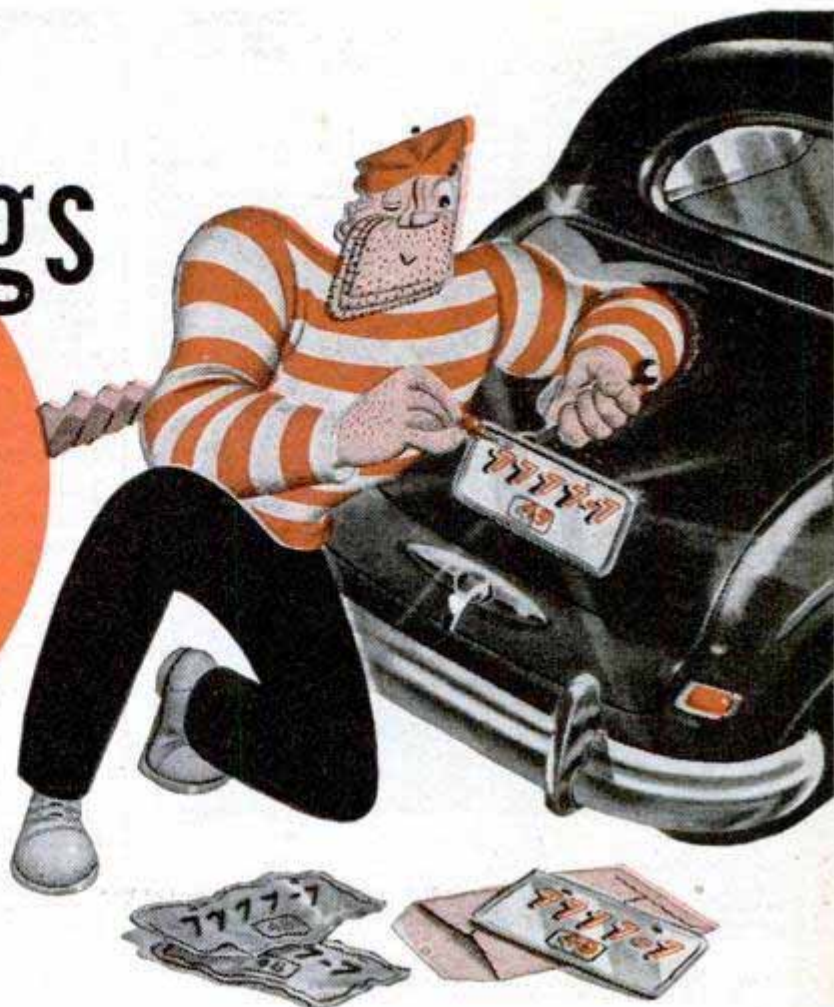
A direct way of measuring the exact amount of rainfall that is artificially induced doesn't exist. Close approximations, however, can be obtained when records of past weather sequences and the resulting rainfalls are available.

This permits use of the analogue method of evaluation, a wartime-developed technique. Briefly, a particular weather sequence is compared with similar atmospheric situations that occurred in the past. Other things being equal, the past rainfall is a good indication of the amount that will occur again. Any extra amount that is recorded during and immediately after a seeding operation can be ascribed to artificial nucleation.

In evaluating the results of the Arizona experiments, measurements of the water that flowed into the reservoirs were compared with the inflows that should have resulted from the existing weather sequences. Records of past inflows, tied to past weather sequences, provided the basis for comparison. By this method it was found that, following a single six-day operational period, a surplus of 5570 acre-feet of water that may be ascribed to the seeding flights was put into storage. A detailed study for two six-day operational periods showed that in all some 12,000 extra acre-feet of water were impounded. These figures do not account for the additional water that fell on the surfaces of the reservoirs themselves and could not be measured by the flow meters at the intakes. Similar positive results were obtained subsequently in a single seeding

(Continued to page 272)

Piston rings
 need
 replacing
 too!



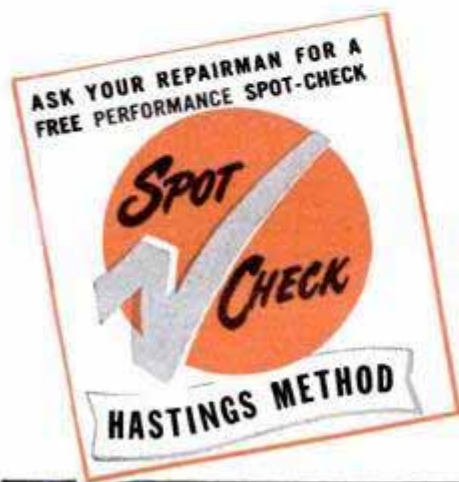
● Oil-pumping in your car flashes a warning that your piston rings are worn and should be replaced immediately.

Fortunately, replacing piston rings is a comparatively simple and inexpensive job.

And when you replace with Hastings Steel-Vent Piston Rings, you *stop* oil-pumping, *check* cylinder wear and *restore* performance.

It's the best money you can spend on your car.

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HASTINGS

STEEL-VENT PISTON RINGS

"TOUGH... BUT OH SO GENTLE"

TOUGH on oil-pumping — **GENTLE** on cylinder walls

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\$ 3,000!



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"Last year's profit amounted to \$3000. Not so bad for a one-man outfit" — from C. C. H., Penn. From Ohio J. B. W. wrote us—"I made \$765 last year filing saws, and it sure comes in handy. I do this work in my spare time." Men in communities of all sizes make up to \$2 or \$3 an hour with the Foley Saw Filer working full time or part time. That extra money comes in mighty handy in these days of high prices.

It's no trick to take care of the saw filing for your neighborhood hardware or lumber dealer — plus looking after the saws for farmers, townspeople, manual training departments and factories. The Foley files all hand saws, also band and cross-cut circular saws. It's a cash business, no canvassing, no eyestrain and no experience needed.

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INDEPENDENCE AFTER 40 shows just how you can start at home in your spare time — work in your basement or garage. It's an immediate cash business that can develop into a full-time repair shop.



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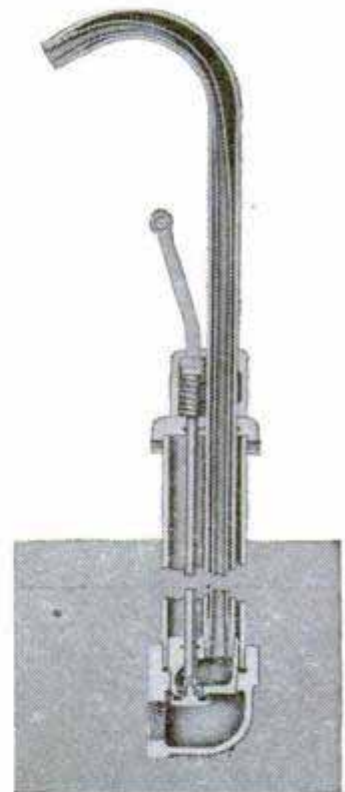
flight that was conducted over the watershed of Lago Toronto, Chihuahua, Mexico, by the same team.

The objective of the Arizona campaign was to increase materially the amount of water in storage. The ability of seeding operations to produce heavy downpours that result in heavy runoffs to the reservoirs was well demonstrated. Although the rain-making efforts were conducted as a research project rather than a normal business operation, the extra water that was placed in storage was produced at a cost of between \$2.00 and \$2.50 per acre-foot, a price that is satisfactory from an economic standpoint.

It's doubtful that chance alone could be responsible for these heavy downpours of rain. Research and development work are being continued, in any event, for artificial nucleation apparently may provide the water in dry years to save crops and grow the grass that makes cattle fat.

Frostproof Hydrant

Weather is no problem with a frostproof hydrant that provides a flow of water even though it is frozen solid. Secret of the device is a pipe-inside-a-pipe. The inner pipe is a rubber lining that runs the length of the riser-spout from the valve, below the frost line, to the outlet. When the water is turned off, the rubber lining, that is installed under tension, contracts until it holds a column of water not much thicker than a pencil. This water is above the frost line and freezes. When the valve is opened, the pressure of the water system expands the rubber lining against the pipe, allowing water to flow past the ice and out the spout. The flowing water soon melts the ice, completely clearing the hydrant.

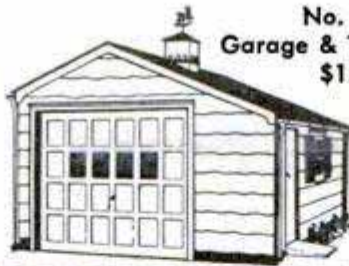


☐ New-model passenger cars require an average of 1000 pounds more steel per vehicle than those produced during the early 1930s.

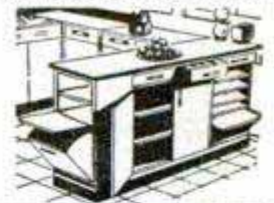
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No. 78
Garden Chaise, \$0.35



Thousands of American men are using their shops to save hundreds of dollars a year . . . building shelves, cupboards, cabinets, garages, furniture remodeling . . . beating high prices with their own skill and the new Atlas big-capacity quality tools. So can you. The 97 Easi-Bild patterns will help you get started. An Atlas 8" Tilt/Arbor saw should be your first shop power tool.

The Atlas 8" gives you so much more saw for your money it's hard to make comparisons. It has a tilting arbor — *table is always flat*. Cuts 2 3/8" deep. The table is *grey-iron — precision-ground*. It is 22" x 18" (22" x 35 1/2" with two extensions) and has 10 5/8" working surface ahead of blade — the capacity you'll want for big boards and panels. The new-type rip fence locks at *both ends* — releases instantly for easy positioning. Vernier control for fine adjustment. Blade height and angle controls work smoothly. Dust-sealed *ball bearings* assure long, smooth, accurate service.

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**MATCHED PRECISION TOOLS FOR
WOODWORKING AND METALWORKING**

Where Fishing Is Rugged

(Continued from page 121)

hole in order that the nets may be pulled or set smoothly, and he has an ordinary scoop shovel for clearing the hole of bro-



This wooden box contains 60 pounds of Great Slave Lake whitefish, carefully packed for the long trip

ken ice. Recently, the circular-type needle bar was replaced by a three-sided counterpart, more efficient than its predecessor.

For Great Slave fishing the law dictates that the gill nets used must have a mesh

of not less than 5½ inches. This regulation, obviously, is in the interests of conservation, limiting the size of the fish netted. While an undersized fish will slip through the mesh, the larger ones get hung up by the gills as they attempt to back out of the mesh.

For his \$10 license fee the fisherman may put out 1000 yards of gill net. In addition to his equipment, which he either rents or buys outright, the fisherman is responsible for his cabin or cabooses, his living expenses and, of course, the warm clothing necessary for the job. Each morning he totes along 10 to 15 pairs of woolen mitts, changing them as soon as they become wet. Parkas, with adequate hoods, are standard dress. For foot covering, the time-honored combination of Indian moccasins and low rubbers is most popular.

The fisherman usually teams up with one, two or three others as the operation is not an efficient one-man deal. They seldom work on a direct salary basis with the fish companies, preferring to gamble on the catch. On Great Slave this winter some crews of three were averaging 1000 pounds a day but many were far below that figure. Much depends on the experience of the fishermen and the locality.

As a rule, the fishermen operate on a

(Continued to page 276)



#411 South Bender

Presto-Lock offset handle locks reel and tip, aligns stainless steel guides and tip-top perfectly. Lengths 4'11" or 5½'. \$13.50. Solid and tubular steel rods, \$5.50 up.

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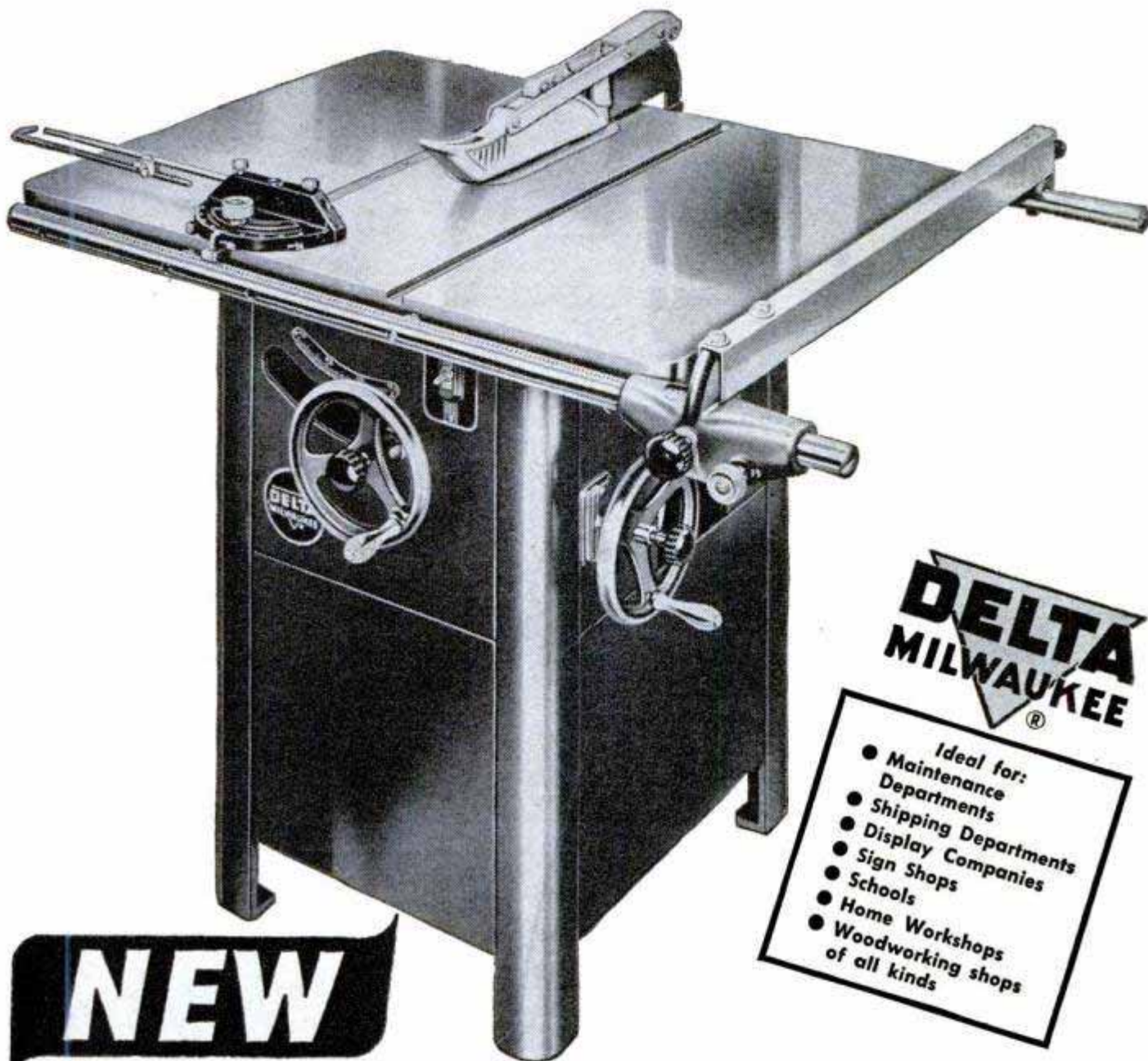
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quickly, easily, accurately**

A compact floor model — fits in small space. Takes maximum vertical cut of 2-5/16". Welded steel cabinet is of 18-gage metal. Big 25" x 33" cast-iron table — heavily ribbed for rigidity. 12" working surface in front of blade at maximum cut. Rip fence extends from front to back of table. Set-over feature of guide rails increases rip capacity at right of blade from 20" to 27". Convenient hand-wheel controls. Adjustable table insert. Auto-set miter gage. "Super-safe" saw guard. Universal motor bracket takes any frame motor. Price, \$149.50, without motor and switch—subject to change without notice.

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Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

Free Bulletin AD-455! Pictures and describes the new Delta 8" Tilting-Arbor Saw, feature by feature. Shows why Delta quality construction means longer saw life and greater operating satisfaction.

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HM-66

partnership basis, or one may be a "boss man" with a couple of hired hands who usually draw about \$150 monthly together with food and smokes and transportation to and from their homes, and who usually regard the job as an apprenticeship prior to going on their own. Occasionally, too, fishing turns into a family affair. Among the North's most consistent producers are the Powders at Caribou Bay. Robert, the father, and Rex, a young son, perform the arduous and more rigorous tasks of setting and pulling the nets while the girls of the family attend to the packing.

Together the crews live in the lake-shore cabins or in one of the cabooses far out on the lake. The cabooses are on skids and can be hauled by the Bombardiers whenever the fishermen decide to "follow" the fish which tend to migrate to deeper water as the weather becomes colder. Each day some or all of the nets are pulled and the fish removed. They are cleaned at once, the fisherman employing a round-tipped butcher-type knife which enables him to finish the operation in two adept strokes. The first slices open the fish, the second deftly gouges out all entrails. Fresh fish are packed in wooden boxes and iced down while the frozen product is often cartoned on the spot to be picked up later.

Whitefish and lake trout are the goal of all fishermen on Great Slave as remuneration varies according to the kind of catch as well as volume. Tentative prices to the fisherman, at the time of this writing, were 10 cents per pound for lake trout, medium-sized, and 8 cents for those described as "headless" because their heads must be cut off before they'll fit in the standard fish boxes. "Headless" indicates a larger and older fish, secondary in food value to the tender mediums. Whitefish, the bulk of the catch in Great Slave, was bringing eight cents a pound. A lower value was set on "connys," the inconnu, which is found in abundance in the Mackenzie River and many of its connecting lakes. The conny looks like an overgrown whitefish, also has some of the trout's characteristics, tips the scales to 40 pounds fairly consistently, but is not considered as delectable as the Slave's whites and trout, ranked among the world's finest table fish.

When next you sit down to a meal of Great Slave fish, dwell a moment on its story and the "miles and miles of nothing but miles and miles" from which it came. You might also save a thought for hardy northerners like Frank Ladoucier, Bill Workun and Indian families like the Powders who are braving the rigors of the sub-Arctic to set their nets.

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Hand Hydraulic Pump

Brand New

Used for hydraulic jacks, presses, hoists and other hydraulic applications. For operating hydraulic cylinders to pump oil or hydraulic fluid under pressure. Hand pump has built-in check valve and is capable of delivering 1000 lbs. of pressure. Has alloy aluminum housing. Dimen.: 8" long x 3 1/2" high x 2 3/4" wide. Ship wt. 3 lbs. A \$45.00 value Now **\$8.95** postpaid



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APPLICATIONS: oil burners, aquariums, fluid metering, fuel pump, tool post grinder, coolant pump, pressure lubricating pump, general industrial, etc.

MOTOR MFD. BY BLACK & DECKER; double ball bearing series wound, continuous duty, 1/30 H.P. electric motor, rated 12,000 R.P.M. Transformer included for use on 110 V AC current. Also applicable for 24-32 V DC.

PUMP MFD. BY WELDON TOOL CO. with standard 1/4" tubing ports; rated 2 G.P.H.; remove pump and use motor as high speed grinder.

OVERALL DIMENSIONS: 7 3/4" long x 3 1/4" wide x 3 1/4" high. Approx. wt. 5 lbs. \$51.00 value.



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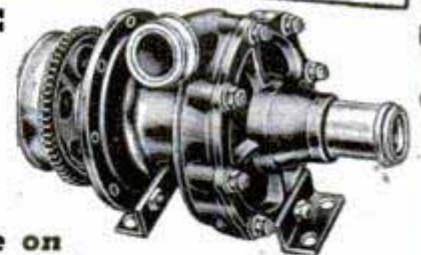
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IDEAL FOR MODEL BUILDERS, MODEL RAILROADERS, EXPERIMENTERS, HOBBYISTS. AC or DC. Reversible, speed may be regulated by varying voltage. Has miniature Kilixon thermostat switch. All connections are external and accessible. Has 3 mounting feet for easy installation. Double-end ball bearing supported shaft with small gear on one end. Die-cast housing with laminated field. Overall Dimen.: 3 1/4" long x 2 3/8" wide x 1 3/8" high. Net wt. 12 oz. A \$22.00 value.



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Pump is compact, powerful, rated 1,000 P.S.I., .507 cu. in. per revolution, 8 gal. per min. at 3750 RPM. Change rotation by reversing flow. Delivers up to 6 H.P. Requires 1/3 to 6 H.P. to drive directly or by pulley. BRAND NEW. Mounting kit has been especially designed to provide maximum utility and ease of mounting MF Series Vickers Pumps. Brackets are constructed of heavy steel plate; shaft is made of 1/2" steel with one end splined to fit pump; other end of shaft has machined flat for mounting a standard pulley with 1/2" hole. Shaft runs in oilite bronze bearings.

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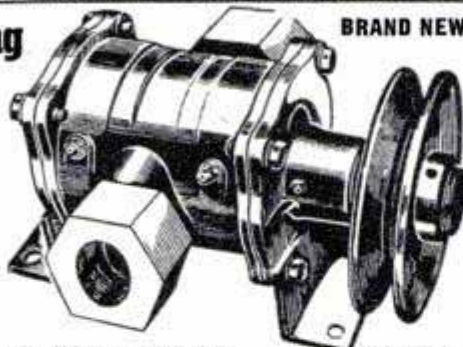
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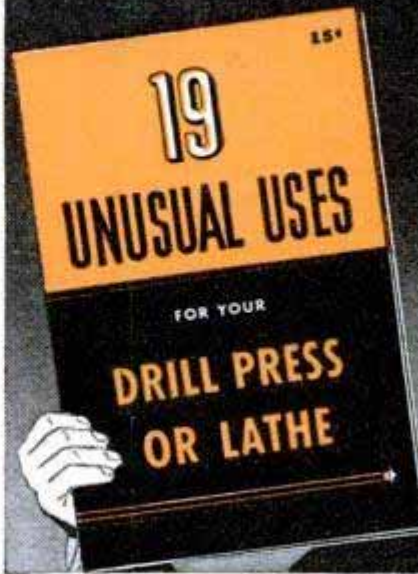
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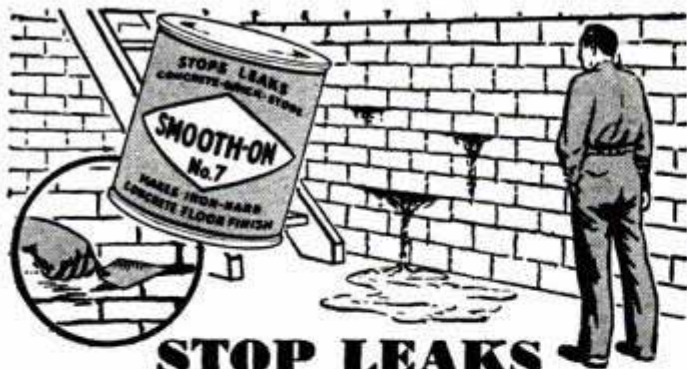
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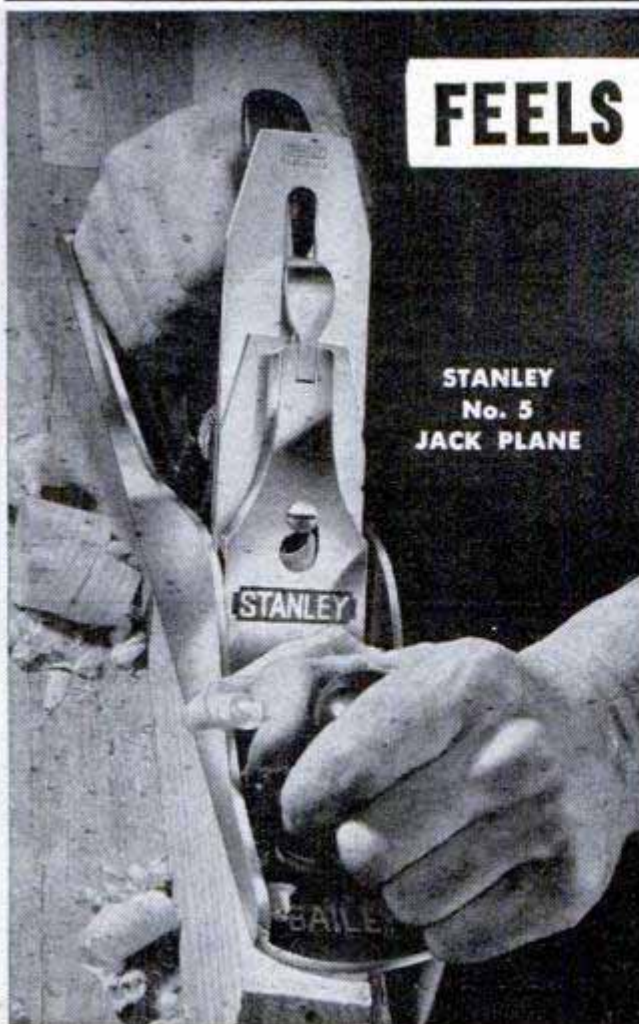
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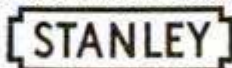


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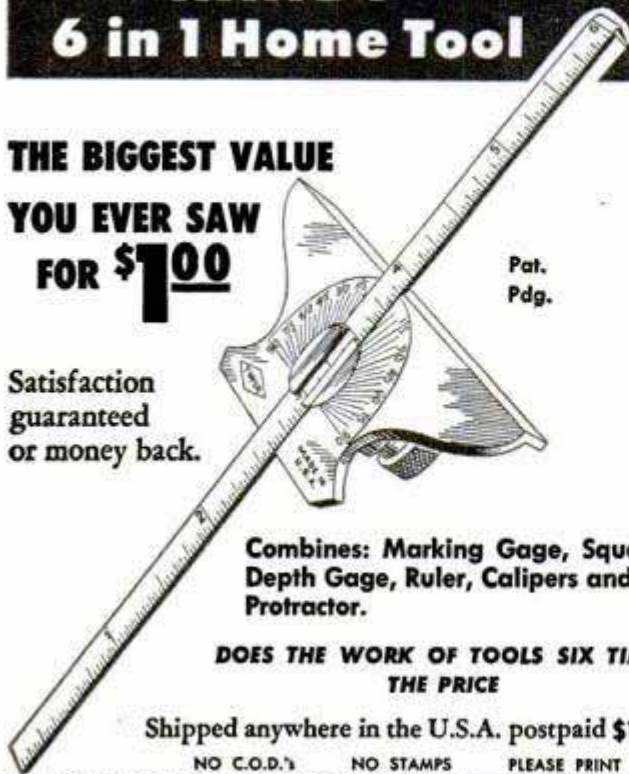
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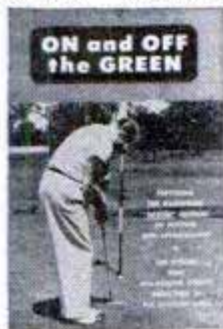
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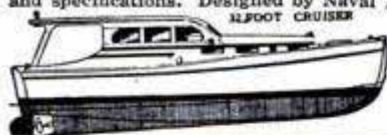
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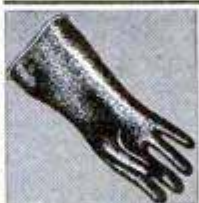
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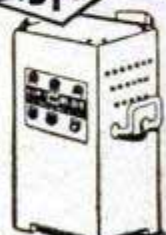
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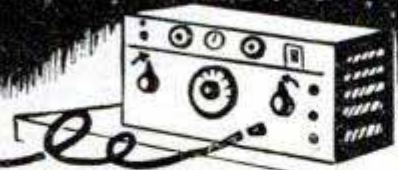
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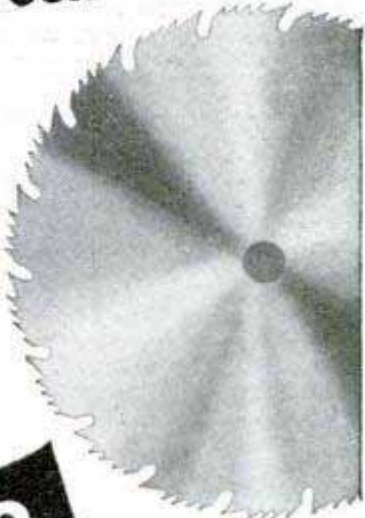
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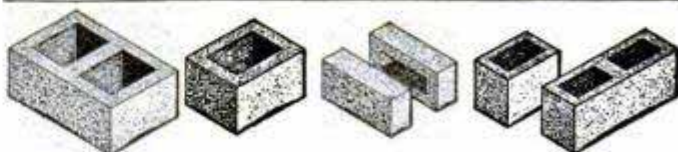
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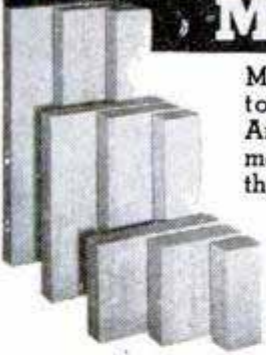
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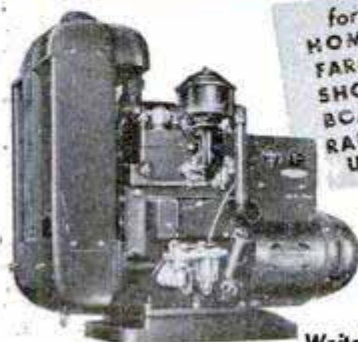
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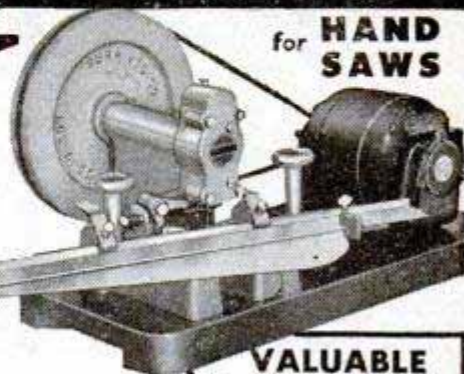
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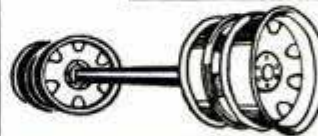
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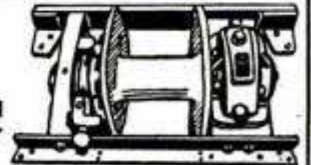
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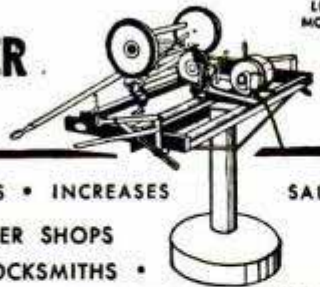


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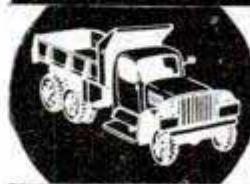
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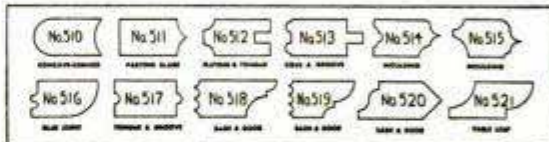


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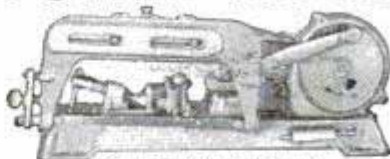
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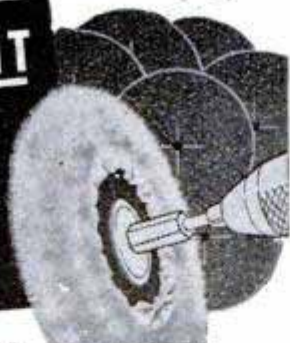
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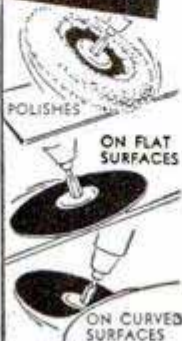
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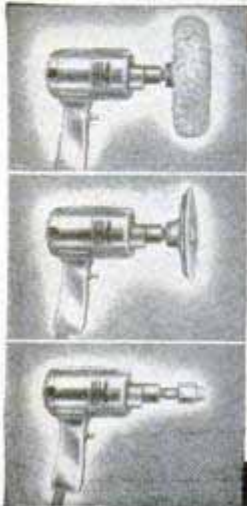
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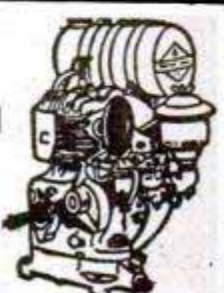
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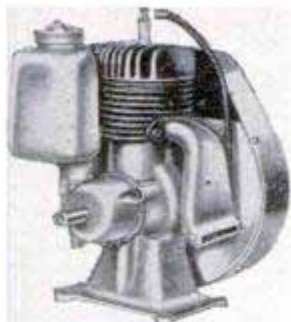
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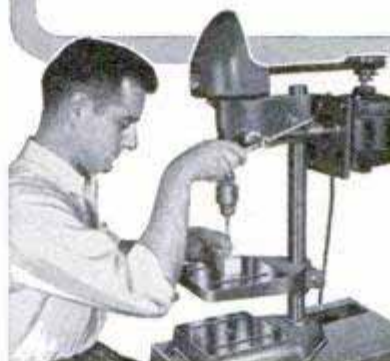
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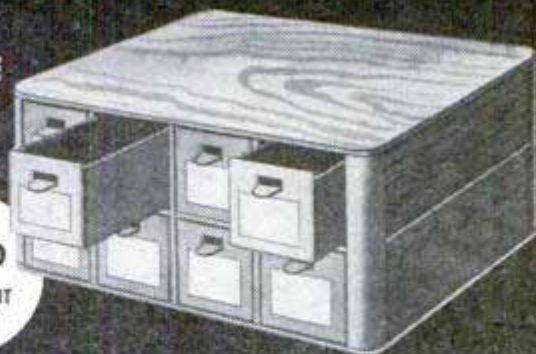
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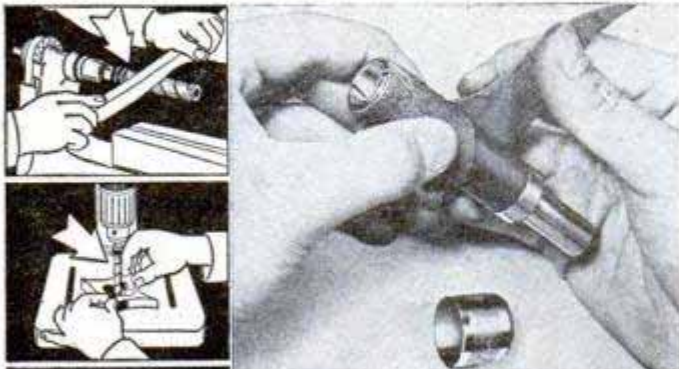
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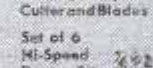
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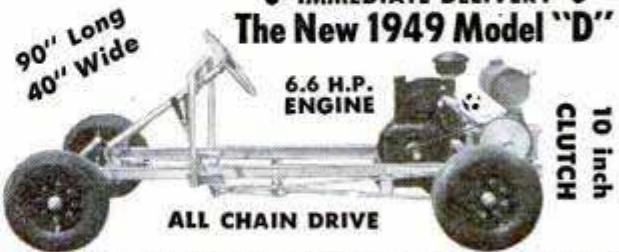


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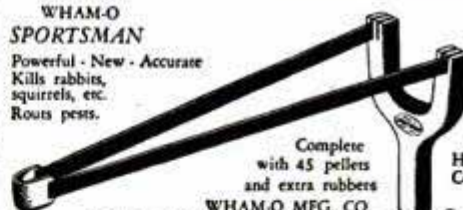


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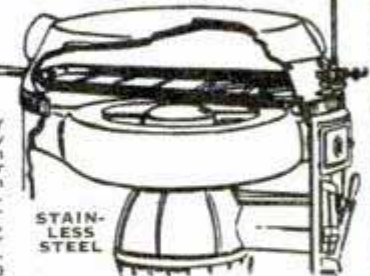


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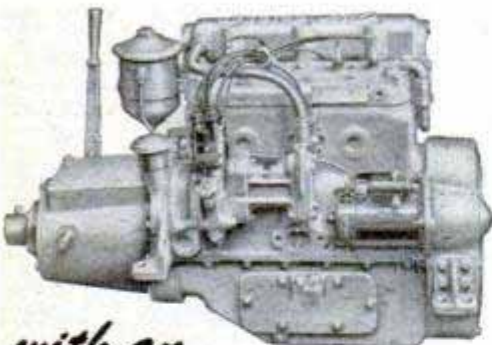


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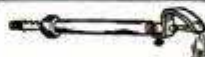
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per foot	2c	3/4", 1" (your choice) per foot.	6c
5/16", 1/2" (your choice) per foot.	3c	1 1/4" per foot	8c

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Powered by 6 1/2 HP Briggs & Stratton air cooled gas engine. Adjustable hinge, requires no clutch. 28" blade, will take up to 12" hardwood. 1 3/4" ball bearing mandrel. Has power take-off. Complete unit mounted with 400 x 8 pneumatic tires. Has tow bar for trailing. Wt. approx. 400 lbs. Sold complete or less blade, engine or wheels. Make \$25 to \$50 a day sawing wood with this sturdy unit. **WRITE FOR FREE CIRCULAR. (Stock #350)**

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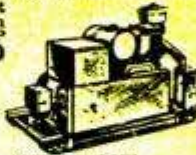


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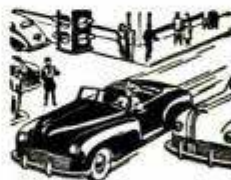
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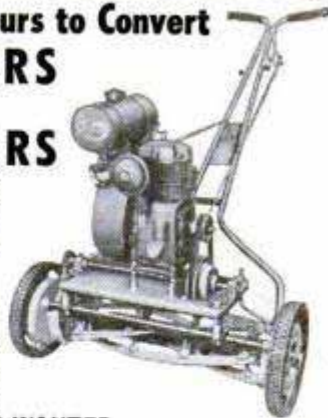
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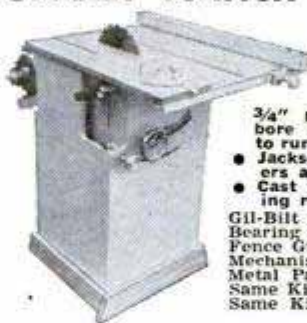
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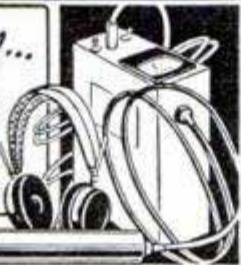
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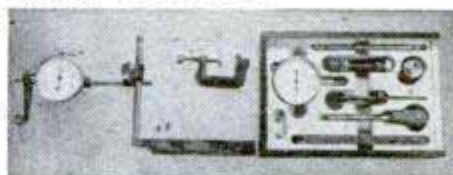
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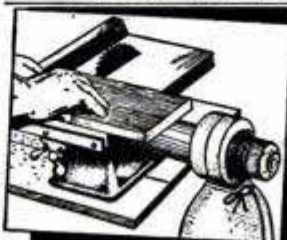
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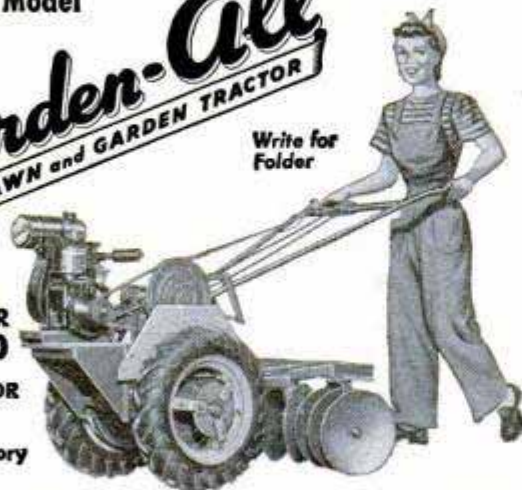
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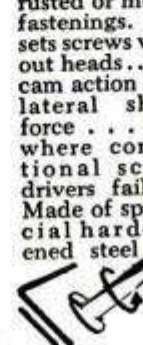
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SURPLUS BRAND NEW AIR COMPRESSORS

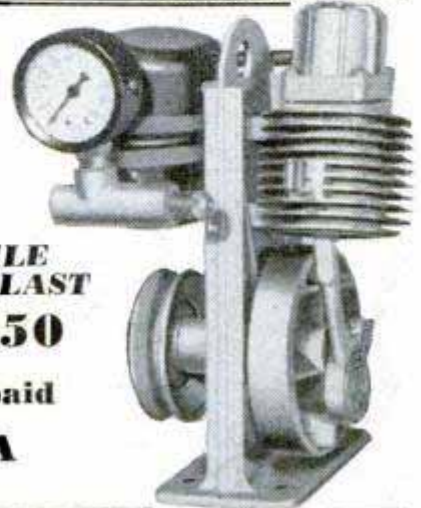
for Garage - Shop - Factory - Farm or Home
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\$8.50

Prepaid



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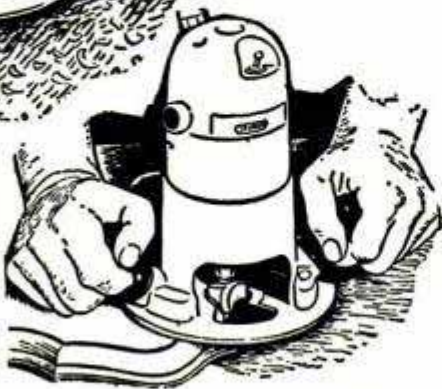
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11 items \$42.75
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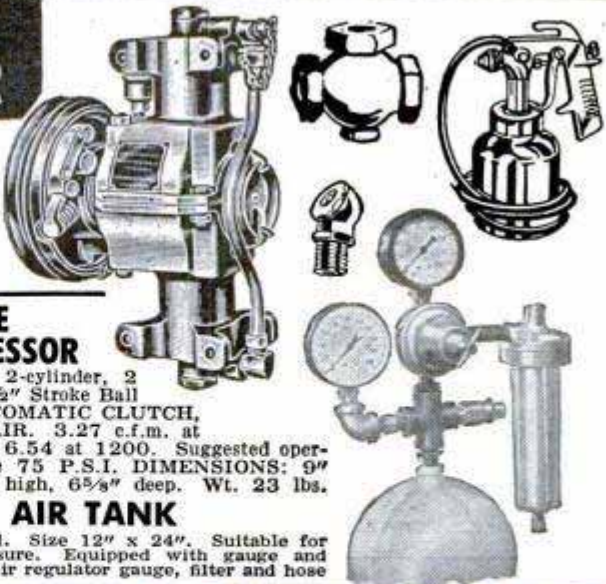
Compressor separately, \$22.50

THE COMPRESSOR

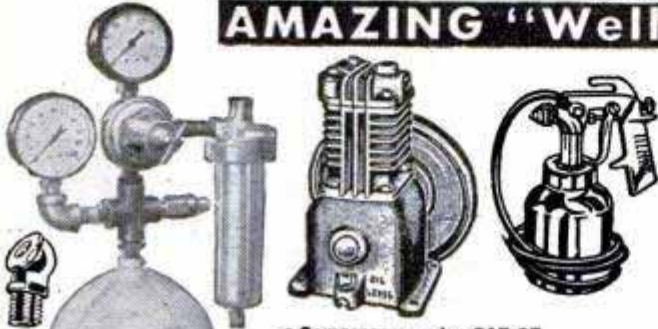
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Stainless steel. Size 12" x 24". Suitable for 100 lb. pressure. Equipped with gauge and safety valve, air regulator gauge, filter and hose connection.



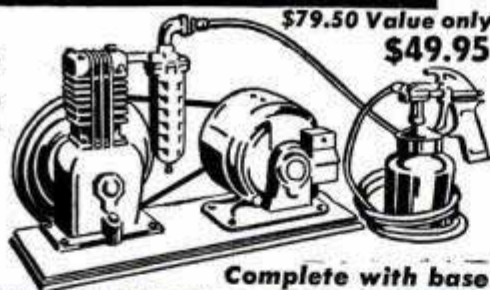
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1/3 HP
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ELECTRIC
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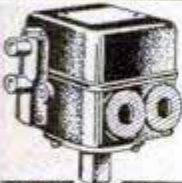


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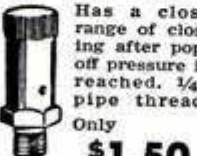
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1/2" valve \$ 4.50
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Complete outfit consists of compressor, pressure spray gun with 2 nozzles, pop valve, air chuck, 20 ft. hose, air tank and accessories as described. Complete for only.....

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5/32" Rivet.....

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With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$55.00. **\$1500** Only.

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3/8" Core. Ball bearing handle and arbor. Operates on 1/4 H.P. Motor at 1725 or 3450 r.p.m. \$29.00 value, **\$14.50**. Wt. 8 lbs.

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with 6 BASE optically correct precision ground and polished, GLARE-FREE LENS. Adjustable gold plated frame, Pearloid Sweat band and pads. Beautiful leather case that can be attached to belt.

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B-15 STYLE JACKET

A Garment You'll be PROUD TO WEAR! Water repellent, wind resistant, nile green, satene, genuine Zealand Sanitized Poplin, full zipper front with slash pockets and large genuine Moulton Fur Collar. Heavy Alpaca lined for Warmth. Sleeves also lined with Heavy Nylon Rib-knit cuff and bottom.

LOOK AT THE PRICE!
Junior B-15 in appearance and manufactured like garment above.

Sizes 34 through 46. **\$11.95**
In Sizes 6 to 18 **\$9.95**

Navy Melton Cossack Style Jacket

NEW All Wool, Sturdy, Warm Zipper front 2 slash pockets, Taped Collar. Wonderful Buy For Utility and long lasting Qualities **\$5.69**

Sizes 34 thru 46

HUNTING KNIFE

6" chrome vanadium blade handle, leather grip. In leather sheath.

\$5.98 Value For Only **\$1.79**

Like above but black Parkerized Finish. #307A **\$1.49**

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10" x 2" Parkerized Blade 5" Gripped Handle. Weight 1 1/2 lbs. Ideal for Hunting, Clearing Brush, or Trails. **\$1.19 ea.**

MACKINAW

Made of heavy water repellent poplin cover. Wool blanket lined, thigh length, sleeve flap for adjustment. An ideal coat for the outdoor man, truck driver, hunter, farmer. Sizes 36 to 38 **\$7.95**

MESS TRAY

6 compartments, rustless, stainless steel. Barbecue, outdoor cooking, save dishwashing. Hospital, Restaurant, Home, or roughing. **83c**

#311A Used but in Fine Serviceable Condition **59c ea.**

SLEEPING BAG

NEW! Mummy type, Heavy duty 30 zipper. #303 Gov't. Cost \$22.00 **\$3.95**

\$1.95 extra for water repellent cover. Sold only with Sleeping Bag.

FLYING HELMET

#407 Fleece or Chamois **\$1.59 ea.**

lined winter type. Ideal for cycle drivers, racers, sportsmen. Used.

New, Chamois lined with chin cup intermediate wt. **\$1.95**

U. S. Army ALL WOOL SOCKS Reg. O. D. Bleached white, standard lgh. ribbed tops, sizes 11, 12, 13 now, but can be shrunk to am. sizes. Really priced to sock you in the eye.

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With adjustable ball and socket swivel head, long rubber covered cord and wall plug.

The All Purpose Lamp. Wonderful for Indoor Photography, Floodlights, Baby Spot or Large Spot, Personal Bed Reading. **99c**

Highly Polished 9" diameter Parabolic Reflector or 5" diameter Spot Reflector at Only **85c ea.**

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A-14 Demand type **\$3.50** ea.

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Neo-Prone. Protective. Impermeable.

1000 Uses. Home Farm, Factory or Laboratory. **69c**

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UNSURPASSED VALUES FOR ARTISTICALLY INCLINED HOME HOBBYISTS!

Start Planning Now! Kit #1 contains 2 lbs. plasticine & 1000 sheets in various shapes. 1 ea. bottle of clearst cement. 1 ea. bottle color set cement and 4 bottles of color in Orchid, Red, Yellow, Peach, etc. Also a Plastic Handbook of uses and instructions. This set easily worth **\$2.50**. Our Price **\$2.19**

Kit #2 contains 1 1/2 lbs. of plastic sheet, 1 ea. bottle of clearst cement, and the Plastic Handbook. A \$2.50 Value for ONLY **99c**

TEAR SHAPED PLEXI DOME

Overall length 21" width at widest point 11" at base 4" 6" deep. **\$1.39 ea.**

FISH & FLOWER BOWLS, CAR ROOF LIGHTS

Plexiglass Windows

in Alum. Frames for your trailer, boat, or home ornamental use. Priced at the value of the sheet alone.

#703A - 18 1/2" x 15 1/2" x 3/16" thick **\$2.95**

#704A 12" x 9" x 3/16" **\$1.59**

#704A Plexiglass & Nascolite Clear Plastic Shds. at Tremendous Savings to You!

NASCOLITE - Full sheets app 1/2 x 27 1/2" x 24 1/2" app. 10 1/2" Sq. Per Sheet **\$12.50**

PLEXIGLASS - Full Sheet. Approx 1/4" x 28" x 28" Per Sheet **\$15.00**

Fabricator write in for our special quantity prices. All above are saw & mach'd. Also inquire about our other large stocks of Plastics.

NEW 100% ALL WOOL BLANKET

7 x 7 ft. Extra heavy. Also Double warmth. Fits Wood's Robe sleeping bag. **\$4.65**

NEW TARPS - HEAVY CANVAS

Mildew & Flame Resistant. Cheap Outside Storage. They are Really Moving at These Prices.

5' x 7' **\$3.95**

16' x 32' **\$29.95**

8' x 10' **\$8.50**

16' x 22' **\$20.95**

Rubberized Linen 7' x 11' NEW **\$5.95**

Only 3 lb. light weight yet waterproof! Ideal for outside car storage.

LORR RAIN REPELLER KIT

For keeping aircraft & automobile windshield clear and water free.

Includes ten applications of a chemical which creates a film on the windshield. The water cannot accumulate on this film and will roll off . . . with applicators, repellent tray and a complete book of instructions.

Nothing else necessary. Don't fly blind in the air or on the ground. Complete in strong cardboard box. Order this kit today . . . ONLY **\$3.25**

CONTENTS

1. Rain Repeller for 10 applications
2. 3 Bottles Rain Repeller Cleaner
3. Glass Tray
4. Applicator Frame and Glass
5. 15 Applicator Pads
6. 125 two-ply cleaning tissues.

AMO BOX

Made of heavy gauge steel with detachable lid that can be hinged, air tight. 18"x9"x13". Many uses: bait, fishing, refrigeration, on camping trip, tool chest, fire safe, etc. **\$1.59**

NEW SUN VISOR

17 1/2" long x 8" wide. Adjustable arm. Swivel head. Can be swung in any direction. Made of clear green plastic. Mfg. for Air Corp by Falcon Co. A very useful accessory for your Car, Truck, Tractor or Boat. SPECIAL **ONLY \$1.29**

NEW WHIST WATCHES

15 Jewel, waterproof stainless steel case Swiss movement. Radium face with choice of black or white dial. Leather wrist band. Guaranteed.

1 year. FX No. 2085 Our Price **\$16.95**

AIRCRAFT PILOT SEAT

The AAF's most adaptable seat, with 14 positions in 5" height adjustment, 5 position tilt adjustment from 65° to 90°, 12 position in 5" forward & reverse on tracks that can be easily mounted on floor. Swing-Away cushioned arm rest, also equipped with two shoulder and waist Safety Belts.

Made of Aluminum with standard Chrome-Moly tube frame. Ideal for deep sea fishing, Boats, Tractors, Jeeps, Trucks, Planes, etc.

This Executive type Chair is a Steel at **\$7.49**

CUSHIONS

Mid. for Aircraft seat, but can be used in trucks, autos, boats, tractors. Made to Gov't. Spec. of finest imitation leather, yellow pigskin col. filled with kapok. Will float. Same as shown in LIFE magazine saving a man from drowning.

New Back Rest 22"x16" x 1 1/2" thick **\$2.95**

Used Back Rest 22"x16" x 1 1/2" thick **\$1.95**

SEAT, New, 17"x16"x3" thick **\$3.49**

SEAT, Used, 17"x16"x3" thick **\$2.29**

GOGGLES

Aviators (AN-6530) Waterproof & Dusted for deep sea fishing, Boats, Tractors, Jeeps, Trucks, Planes, etc. Ideal for Motorcycling, etc. **\$1.69 ea.**

Same appearance as above, but with plastic lens, in clear color only. GO-2 **79c ea.**

Shrimp Nets

45 ft. x 45 ft. 2000 square feet of heavy, treated O.D. netting, manufactured for the Army. Heavy, durable & strong, used by Army for various purposes Shrimp, fishing, camouflage, acrobatics, etc. Textile worth many times the price **\$27.10**

AIR CORPS FLEECE LINED JACKET

D-1 TYPE

These have been reconditioned, cleaned, and brushed.

If you want a warm, rugged, full sheepskin felt, fleece lined collar, zippered front, leather jacket that has lots of outdoor wear left in it, that you can't beat for value **\$8.95 ea.** at this close-out price . . . You'd better write in fast, before they are all gone.

Ideal for Hunters, Farmers, Garage Mechanics, etc. Large Size Only.

FLYING SUIT or BLUE BUNNY SUIT

Swell for hunting, wnt. sports, skiing or "bundling". As coveralls for cold outdoor, or farm work. Made of 100% woven wool with extra Bannel inner lining giving double warmth & ability. Wiring so fine, flexible it does not interfere with movement. Can be used with or without heating or can be plugged into car. Only **\$3.49**

tractors, or truck battery, sizes 36 thru 44

Ski or Snow Jackets

Converted out of Bunny flying suits. Ribbed knit waistbands & wristbands. Zippered front and pocket. You'll wear 'em. **\$3.49**

& wear 'em. Only **\$3.49**

Trousers to match. Only **\$3.49**

COMPASSES

#151 Marching, lensitic, with luminous dial **\$1.59**

#152 Matchbox, both jewel & liquid floating dial **39c**

#154 Wrist Strap Compass **69c**

NEW 11 Jewel, Watch Pocket Compass **\$1.59**

New Navigators Magnetic Compass

#411 type D-12 size 7" dia x 4 1/2" deep Rubber lined - rotating bezel range rings calibrated in 1 degree from 0-360° with 2 parallel grid wires for alignment with N.S. line, East. **\$14.95**

Pressure Bottle

Steel - Tested to 3000 P.S.I. For spray painting, portable welding, etc. All have std. pipe port.

9 1/2" x 3 1/2" dia. **\$2.50**

14" x 3 1/2" dia. **\$4.50**

19" x 3 1/2" dia. **\$3.95**

19" x 5 1/2" dia. **\$7.95**

RUBBERIZED HAIR CUSHIONS

#8C1 16" dia. x 1 1/2" **69c ea**

#8C2 21" x 13 1/2" x 1 1/2" Canvas Cover **69c ea**

#8C3 22" x 15" x 1 1/2" **\$1.19 ea.**

#8C4 21" x 13 1/2" x 1 1/2" **\$1.19 ea**

The rubberized hair filling worth more than our price for entire cushions.

'Twas Made for the Air Force

THE BEST Loose Leaf BINDER

You ever saw a metal post cylindrical locking heavy duty 3 1/2" fabricated lined cover. End modification window. Ideal for price books, salesman catalogues, photo albums, students publications, Reference books, actual sketch books, etc. Will hold 500 sheets 8 1/2" x 11". A \$3.00 Value for Only **59c**

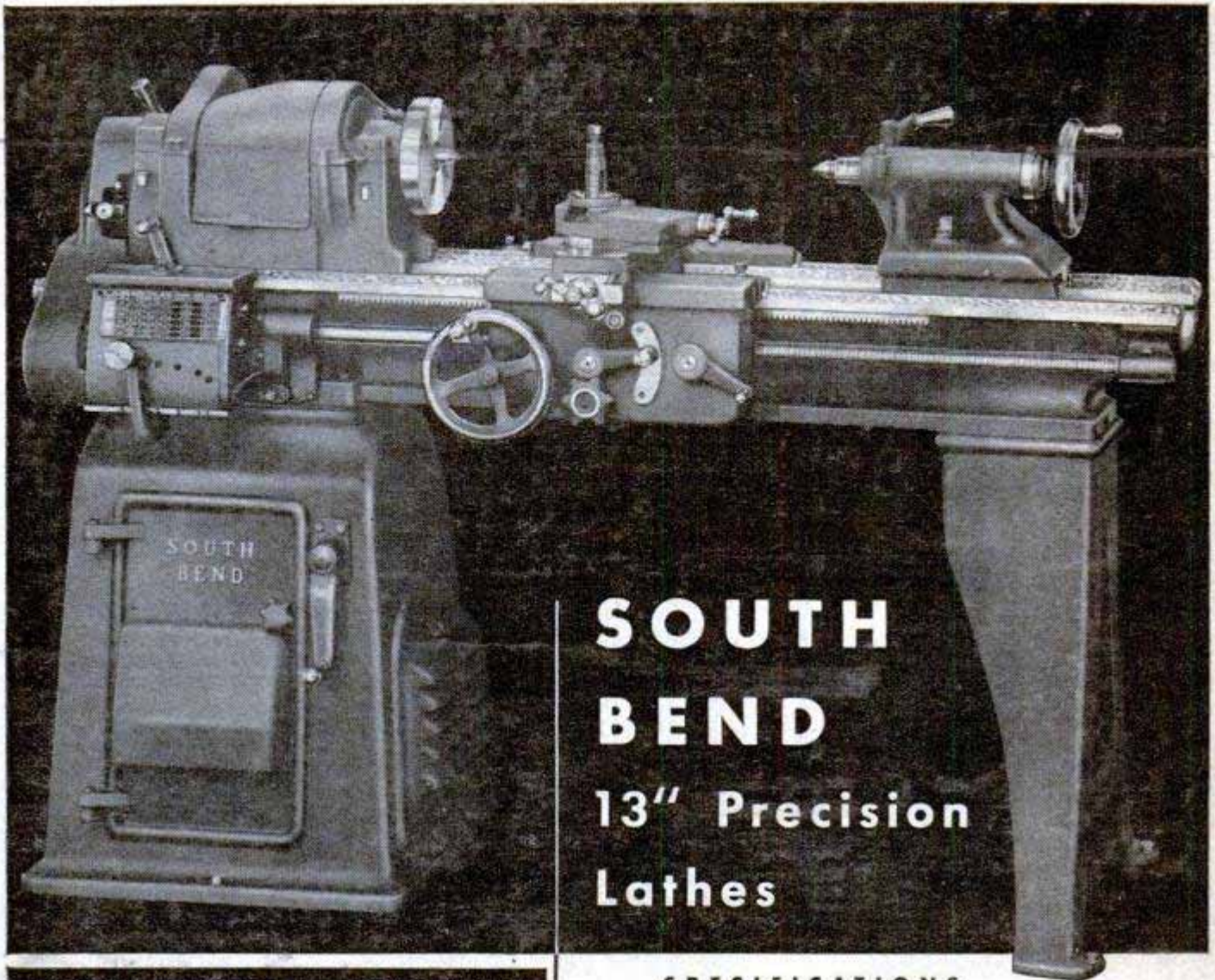
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13" Precision Lathes

NOW - 1" Collet Capacity

Catalog No. 145-B 13" x 5' Quick Change Gear Lathe with 3 phase, 60 cycle, 220 volt, A.C. motor and drum switch; f. o. b. factory **\$1332.25**

South Bend 13" Precision Lathes now offer even more advantages where close-tolerance machining is required. They are economical, accurate, fast, and versatile. The new headstock with increased collet capacity permits a greater variety of collet jobs. Substantial savings in capital investment, floor space, and labor cost often result from their installation.

The Quick Change Gear model is popular for production operations, maintenance and service work. The Toolroom model has sufficient capacity for a large variety of toolroom work—its accuracy insures perfect results. Numerous tools and attachments are available for special jobs. Other South Bend Precision Lathes are made with 9", 10", 14½", 16", and 16/24" swings. Also Precision Turret Lathes with ½" and 1" collet capacities, a 14" Drill Press in bench and floor models, and a 7" Bench Shaper. Immediate deliveries can be made. Time Payment Plan is available.

SPECIFICATIONS

SWINGS: 13-1/8" over bed and saddle wings; 8-3/4" over saddle with chip guard removed.
BED LENGTHS 4, 5, 6, and 7 feet
DISTANCE BETWEEN CENTERS 16 to 52 inches
MAXIMUM COLLET CAPACITY: 1" (Collets interchangeable with South Bend 10"-1" collet, Series 1000, 14½", 16", 16/24" Lathes)
SPINDLE BORE 1-3/8 inch
SPINDLE SPEEDS: Eight 34 to 875 r. p. m.
POWER LONGITUDINAL FEEDS: 48 R.H. or L.H., .0015" to .0841"
POWER CROSS FEEDS: 480006" to .0312"
THREAD CUTTING: 48 R.H. or L.H. pitches . . 4 to 224 per inch
CROSS SLIDE TRAVEL 8-1/8 inches
TAILSTOCK TOP SET-OVER 15/16"

Write FOR THIS CATALOG NO. 73

Describes and illustrates new South Bend 13" Precision Lathes with 1" maximum collet capacity. Includes complete specifications and prices.



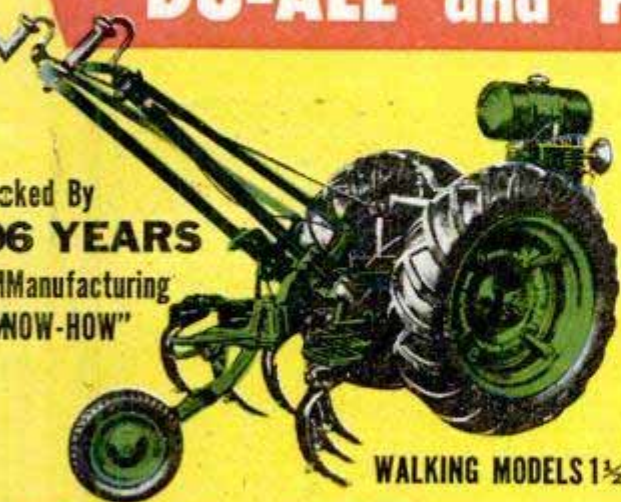
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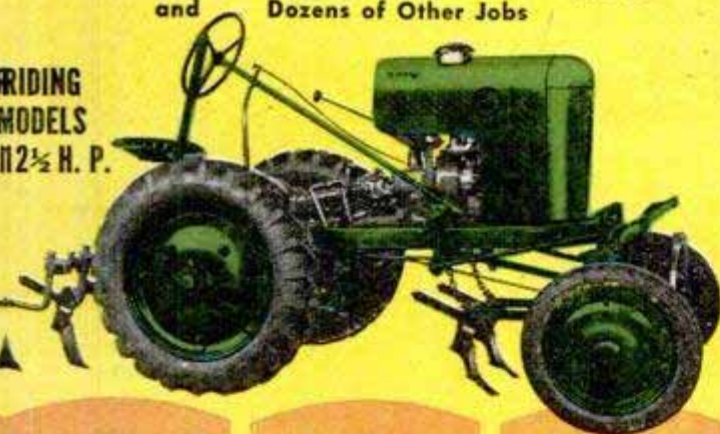


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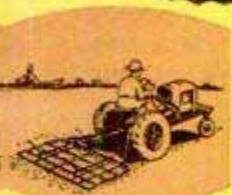


MOW

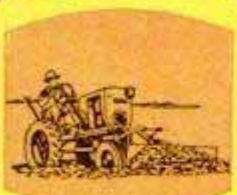
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and Many Other Jobs - Winter and Summer

**DO DOZENS OF JOBS
QUICKLY AND EASILY
WITH JUST ONE TRACTOR!**

Shaw tractors are always ready to plow, cultivate, bulldoze, harrow, mow, haul, rake, seed, spray, disc, saw and do scores of other jobs on a minute's notice. A child can operate these amazing machines and the low-cost Jiffy Hitch attachments are quick and easy to change.

IDEAL TRACTOR FOR GARDENS, SMALL FARMS

If you're gardening, farming, maintaining a golf course, chick hatchery, orchard, estate, cabin camp, truck farm, park, etc., you need a Shaw Du-All or Peppy-Pal. You'll get more jobs done, at lower cost, in a fraction of the time. You'll get top-quality work out of these dependable, efficient Shaw tractors.

SOON PAYS FOR ITSELF - CHEAP TO OPERATE

The remarkably low initial cost of Shaw tractors and attachments plus the low operating costs (only a few cents an hour) makes Shaw the buy of the year. It will soon pay for itself in time and labor-saving plus helping make extra profits for the man who job-contracts or likes to earn spare-time money.

ECONOMICAL TO BUY - TOP QUALITY MATERIALS

From big heavy duty tires to the smallest engine pin you receive only first quality materials—carefully and sturdily constructed, thoroughly inspected and tested for longer service and low maintenance. Precision engineering and efficient power utilization assure top performance on the toughest job.

FULL GUARANTEE - PROMPT SHIPMENT

Every Shaw tractor carries a full year's guarantee against any defect in workmanship or material. Check the many features of Shaw tractors—many different models ranging from 1½ to 12½ horsepower, variable speeds, power turn, forward and reverse, Timken roller bearings, Ross steering device and scores of other important features. Mail the coupon below, select and order your Shaw tractor for early delivery.

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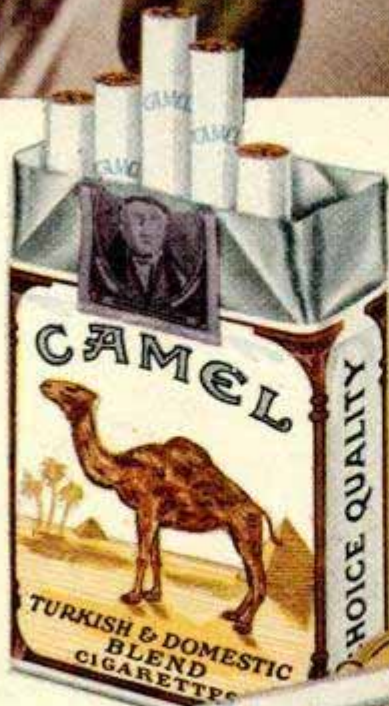
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In a recent 30-day test of hundreds of Camel smokers, noted throat specialists reported **NOT ONE SINGLE CASE OF THROAT IRRITATION** due to smoking **CAMELS!**

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