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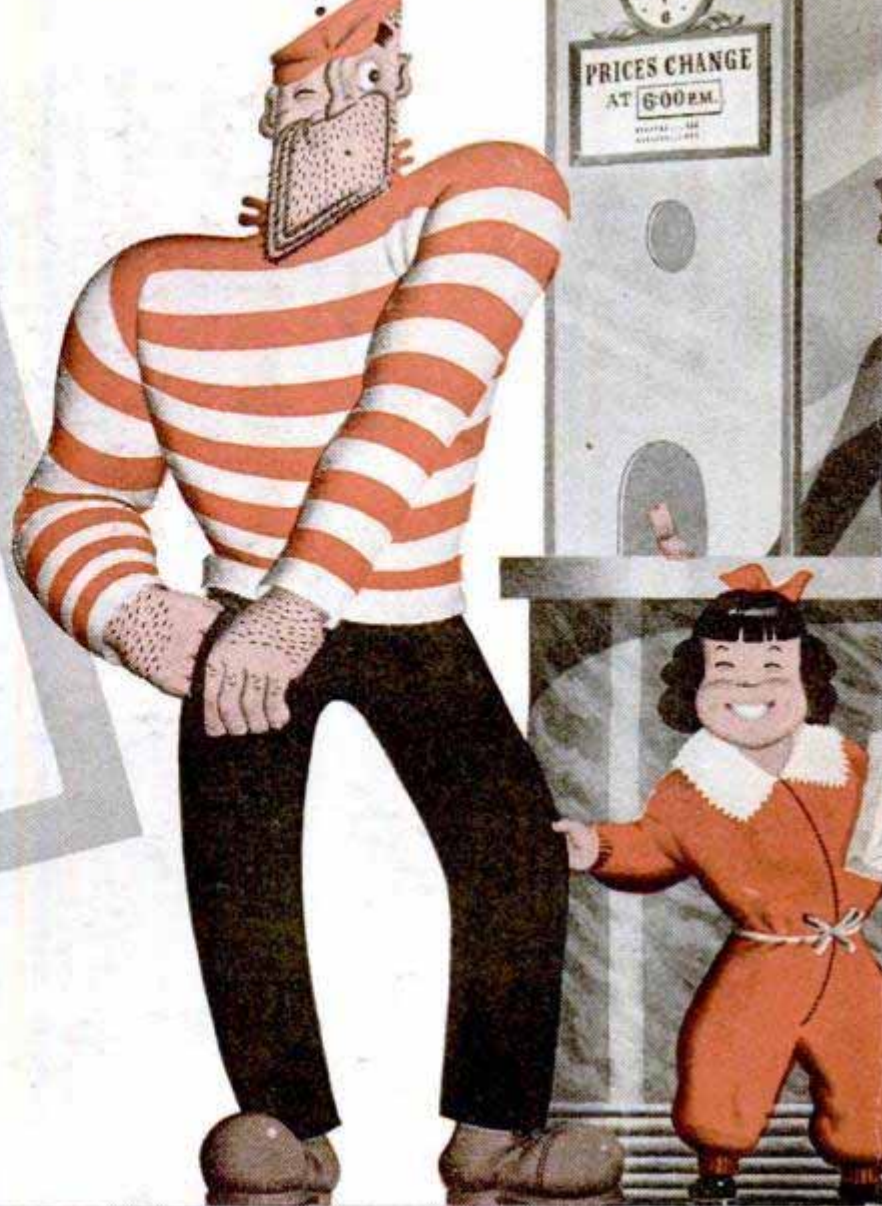
MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

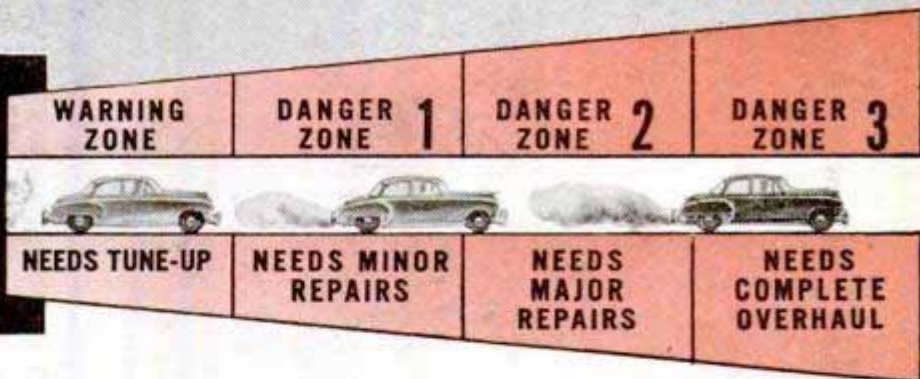
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the more you pay!



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When oil-pumping starts in your car, you can be pretty sure your piston rings are wearing out. And, unless you replace them, you can be very sure you are headed for costly Danger Zone No. 3.

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Leader in performance, features, value! Roto-Matic Control, Gearshift, Cruis-a-Day Tank.

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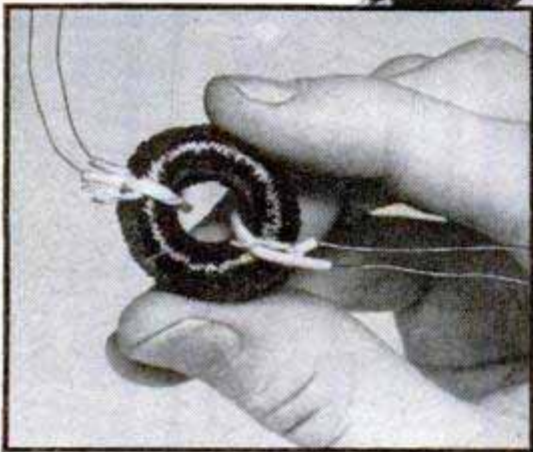
*Power ratings are O.B.C. certified brake H.P. at 4000 R.P.M. All prices are F.O.B. Factory and subject to change without notice.



CATALOG FREE! Write today for full-color catalog of complete Evinrude line for 1951.



IT'S "LOADED" WITH BETTER TELEPHONE SERVICE



Twenty of the Bell System's newest small loading coils—like the one at the left—are housed in the long black case, mounted in a cable splice. This type of installation permits the economical extension of city cables to serve out-of-town subscribers.

MANY more wires can be crowded into a cable sheath when the wires are fine. But normally, wires don't transmit as well when they are fine and closely packed.

Bell engineers long ago learned to make wires do better work by loading them with inductance coils at regular intervals. The coils improve transmission and let messages travel farther. But originally the coils themselves were large, heavy and expensive. The cases to hold them were cumbersome and costly too.

So year after year Bell scientists squeezed the size out of coils. To make magnetic cores

of high permeability they developed Permalloy. Tough but extra-thin insulation permitted more turns to a core.

New winding machines were developed by the Western Electric Company. Coil size shrunk to one-fiftieth. Some—like the one shown above—can be mounted right in cables themselves.

The 15,000,000 coils in the Bell System today mean thinner wires, more wires in a cable—more economical service for you. They demonstrate once more how Bell Telephone Laboratories work continually to add to your telephone's value.



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Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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



this month's cover

SOUTH OF THE BORDER, señor, some strange cargo is traveling by air these days. The blooded Argentine race horses pictured on the cover are commonplace "freight," according to Richard F. Dempewolff, eastern editor, who flew from Venezuela to Florida on one of Pan American's cargo carriers. The pilots who fly the Latin America freight run carry orchids, automobiles, boa constrictors, bananas, diamonds, emeralds, wild animals, tropical birds (and how they squawk), domestic cattle, cigarettes, chickens, helicopters and monkeys. In his article, "Tropical Tramps" Link the Americas, page 88, Dempewolff tells how 300 monkeys got loose from their cages and practically took over the plane. When one of these cargo ships lands, no South American is surprised at anything that might be peering out the windows. Horses, such as shown on the cover, ride in canvas stalls and behave themselves as long as they don't have to look at each other. Before the pilots discovered this, the animals rode in padded stalls

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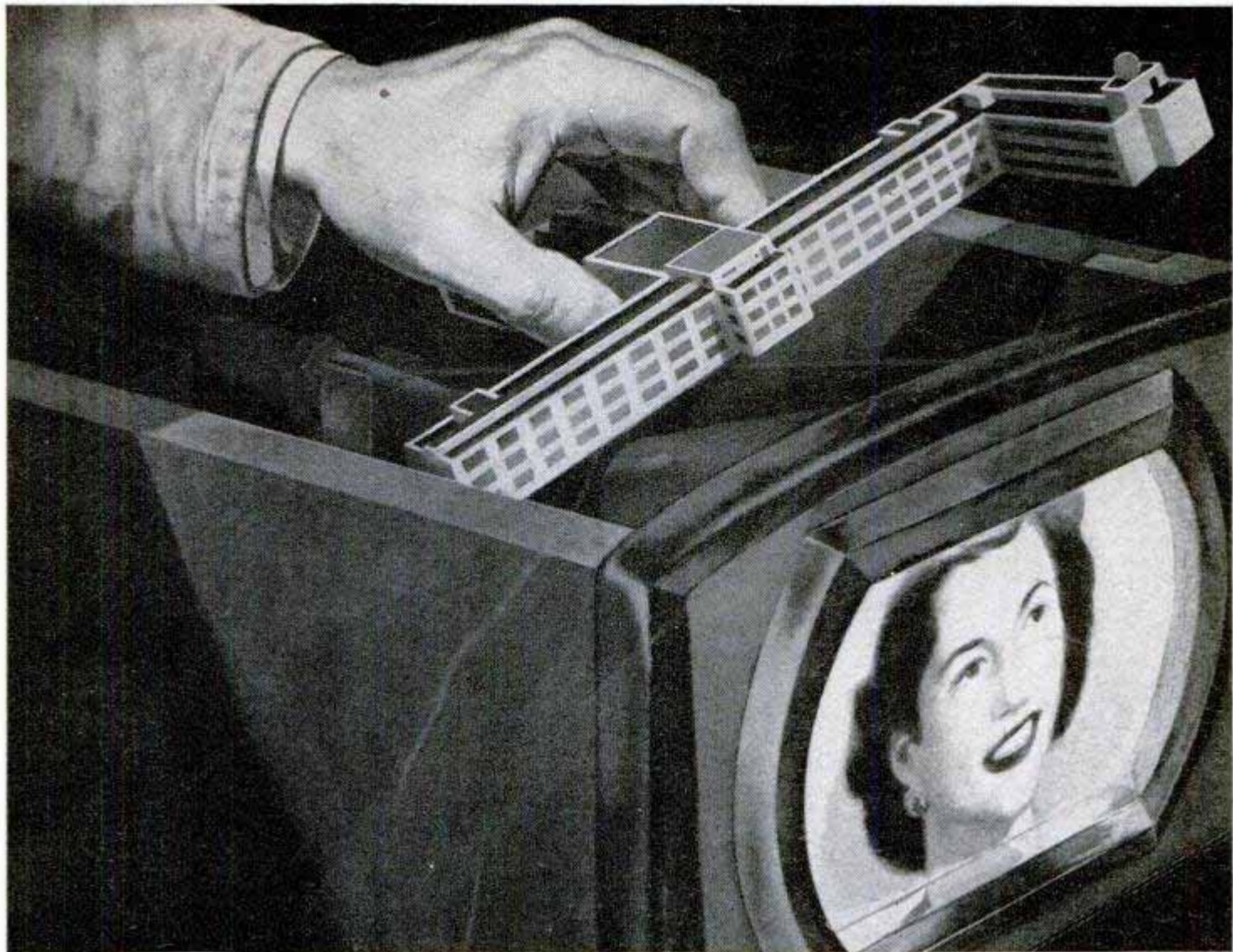
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THE EDITORS



HOW DO YOU LIKE YOUR NEW FORD? *Popular Mechanics* put the question to 1000 owners. Next month we bring you the answers in another of this series by Floyd Clymer on what the owners really think of their automobiles.



Letter to the Editor

While vacationing near the Gallatin River in Montana, my son and I spotted an abandoned miner's cabin deep in the forest (see photo). It obviously had not been used for many years. We thought you'd be interested to know that the miner, whoever he was, had among his reading material a 1913 issue of *Popular Mechanics* . . .

Fremont A. Chandler, M.D.,
6 N. Michigan Ave.,
Chicago 2.

Letter to the Editor

Your article on page 101, December 1950 ("Driver Take Your Choice—Life or Death on Ice"), should be on the front page of all newspapers. I have been a test driver for 46 years on the public highways and never had a single accident. Fifty to a hundred thousand miles per year, all kinds of weather, snow, mud and sand, and never was pulled out. Keep up the good work.

S. Carbaugh Allen,
33510 N. Hampshire, R. 5,
Plymouth, Mich.

Lightning Strikes Your Dinner

If you don't happen to have a refrigerator, shoot a bolt of lightning through your leg of lamb and put it on a pantry shelf. It will keep for years.

It's not quite that simple, of course. You don't have a bolt of lightning. But you

(Continued to page 8)

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This One



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(Continued from page 6)

may, very soon, stock your shelves with foods that do not require refrigeration; the first commercial machine to preserve foods electronically will go to work this year, and it may well revolutionize the packing industry. You'll read the story in our April issue, illustrated with full-color photographs of hamburger, grapefruit and vegetables that look as fresh today as when they were shot through with 3,000,000 volts and stored at room temperature four years ago!



Letter to the Editor

"Those Handy-Andy Eggbeaters" by Lt. Comdr. Arthur L. Schoeni, U.S.N.R., in the December issue, is jam-packed with interesting anecdotes of odd uses of helicopters by the Navy and Air Force. There seems to be no end to the ways in which civilian operators have put the sky-going "Mix-masters" to work as well.

For example: When the gridiron was wet before the Stanford-California game at Berkeley in November, a helicopter was flown back and forth over the field to speed evaporation and it was dry at game time.

The enclosed photo shows Pilots E. B. "Red" Carson and R. J. "Bart" Barton in front of a helicopter owned by the Arizona Helicopter Service, deep in Grand Canyon. The Arizona firm has been taking tourists into the canyon since last May. One may see more of the canyon interior in an hour's flight than may be viewed on the two-day mule-back trip from Grand Canyon Village to Phantom Ranch at the bottom of the mighty abyss.

Since this photo was taken in October, Carson has gone to work for Rick Helicopter, Inc., of Los Angeles, and is patrolling the maintenance lines of the Bonneville Power Authority in the Pacific Northwest.

A. L. Clark,
Great Falls, Mont.

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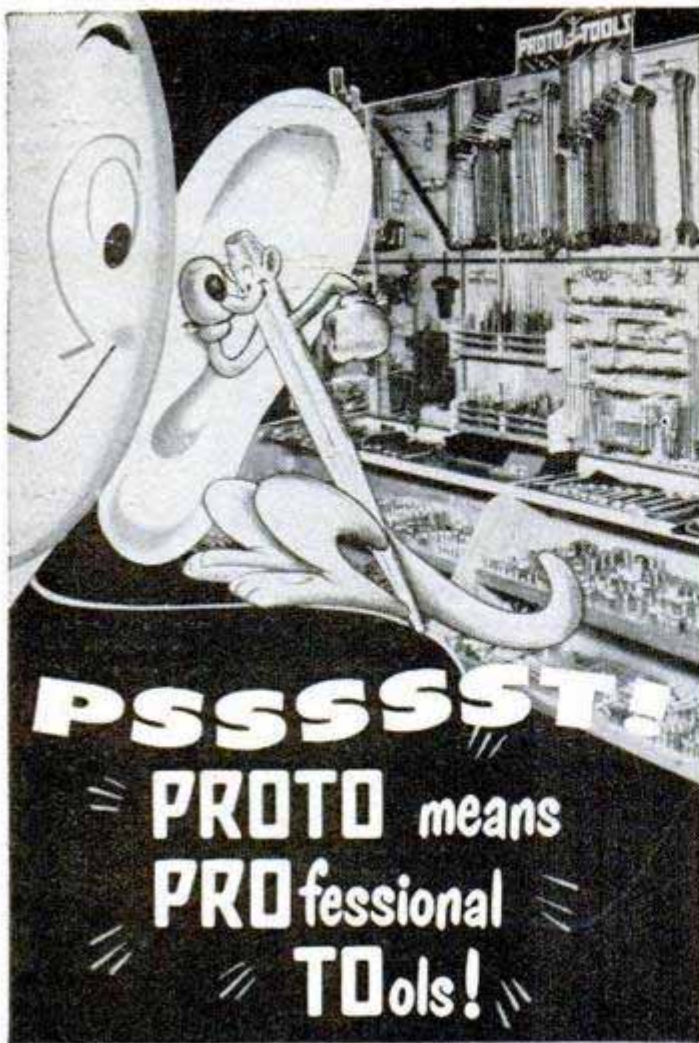
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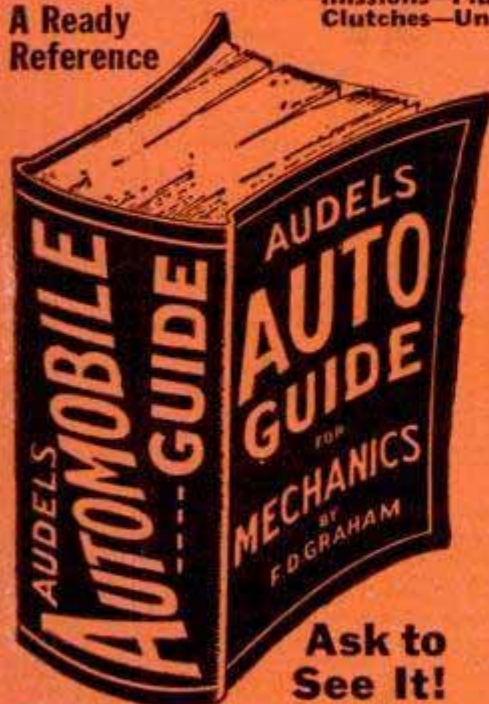
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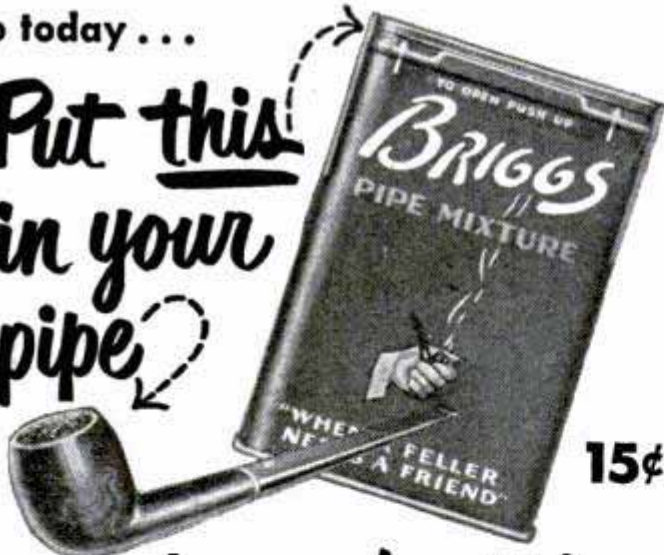
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"Hot" Flies

Houseflies tagged with radioactive compounds are helping science learn more about the travel habits of the disease-carrying summertime pests. Government entomologists experimenting at Corvallis, Ore., caught "hot" flies in baited traps 12 miles from their release point. They found that tougher, DDT-resistant insects from neighboring areas are apt to move into sections where nonresistant flies have been killed off. The insects were fed a syrup sugar containing radioactive phosphoric acid, making them easily identifiable by Geiger counter devices in the traps.

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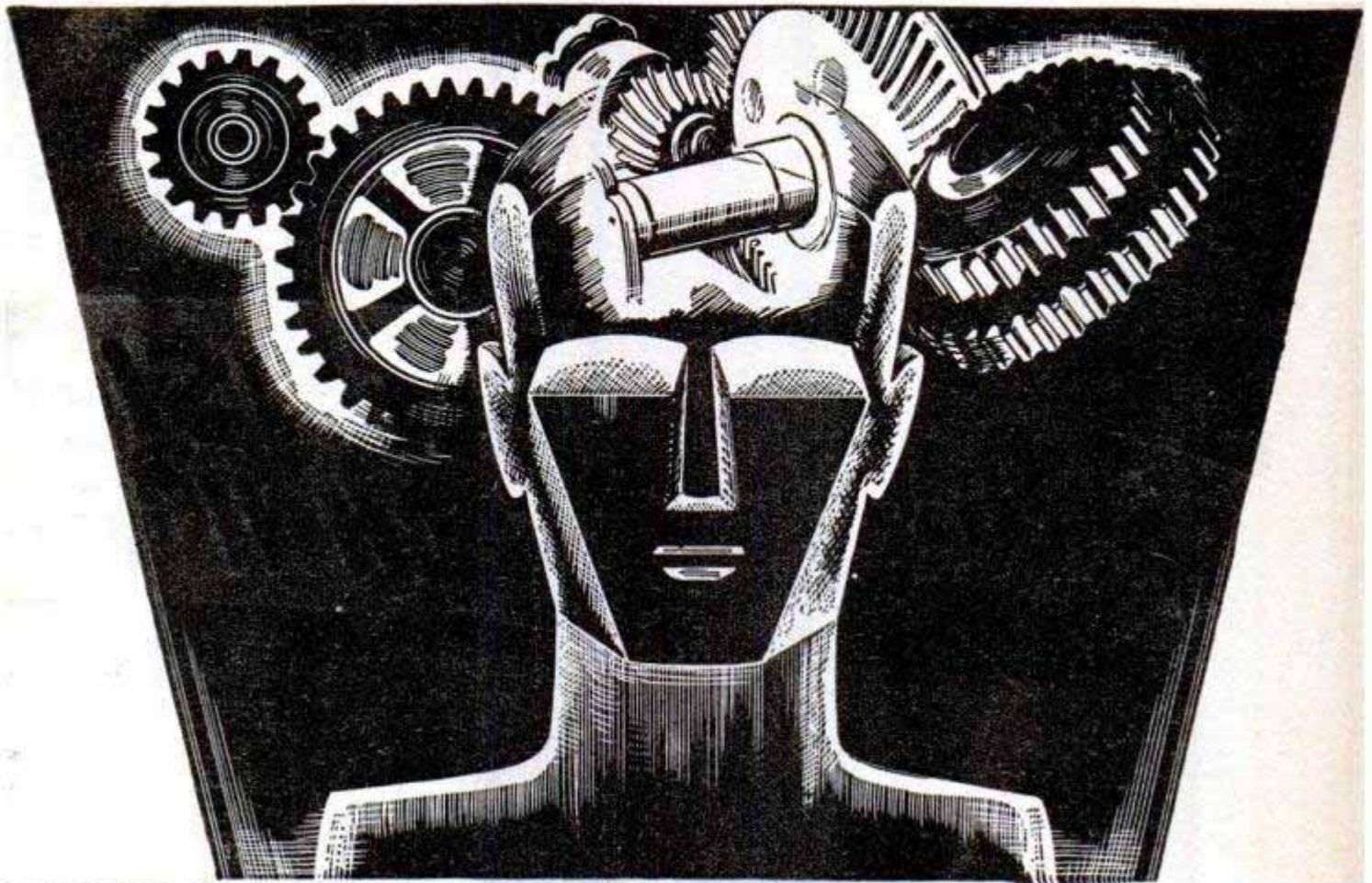
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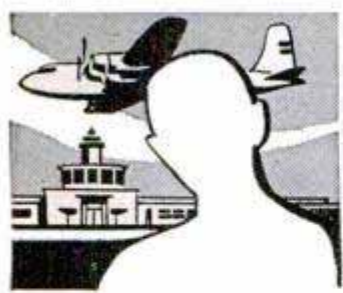
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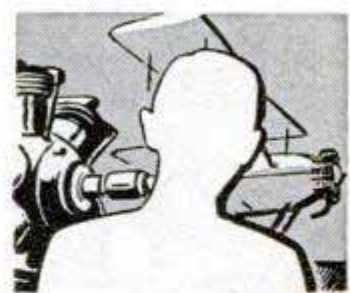
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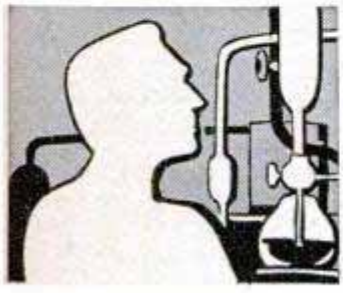
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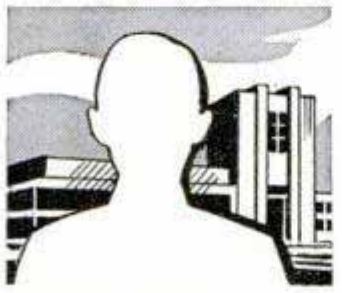
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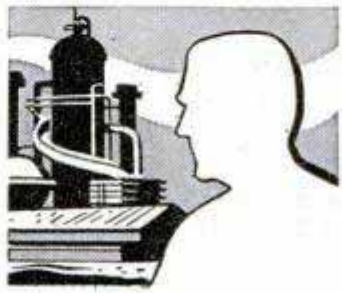
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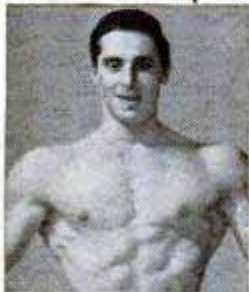
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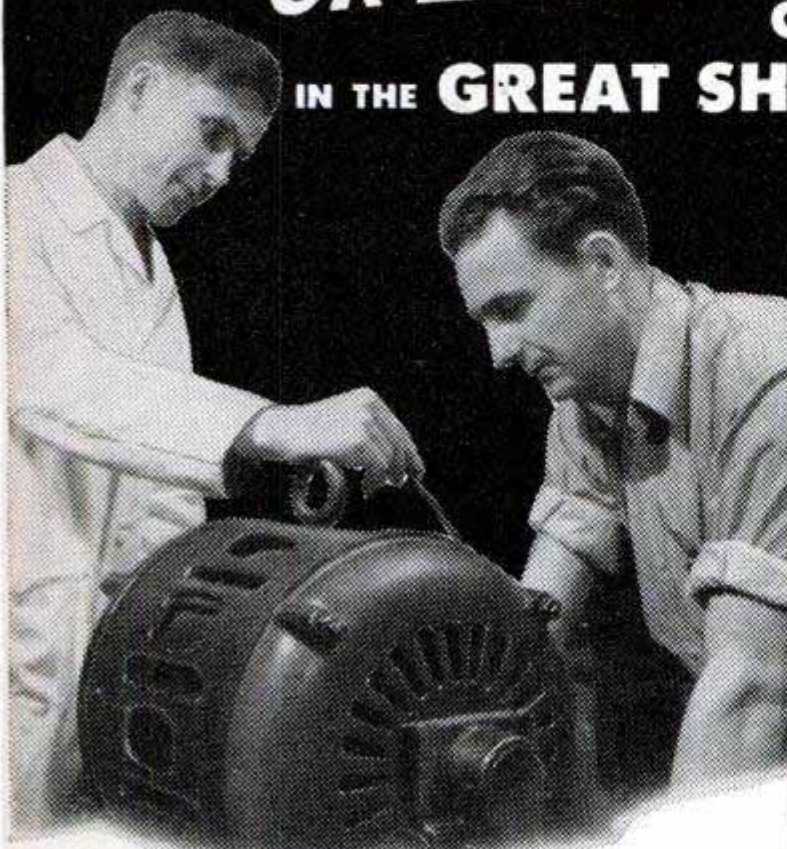
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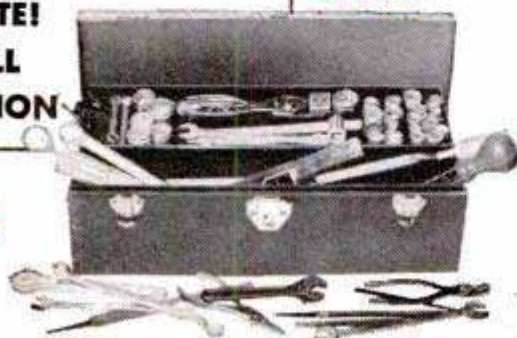
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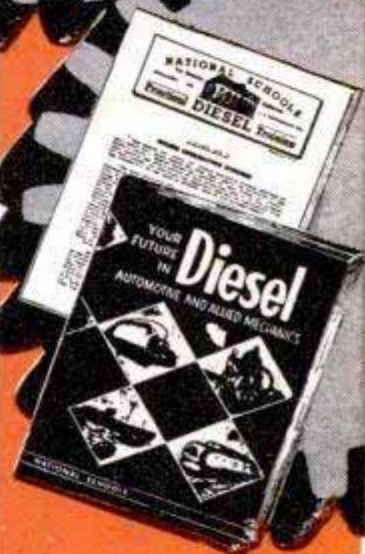
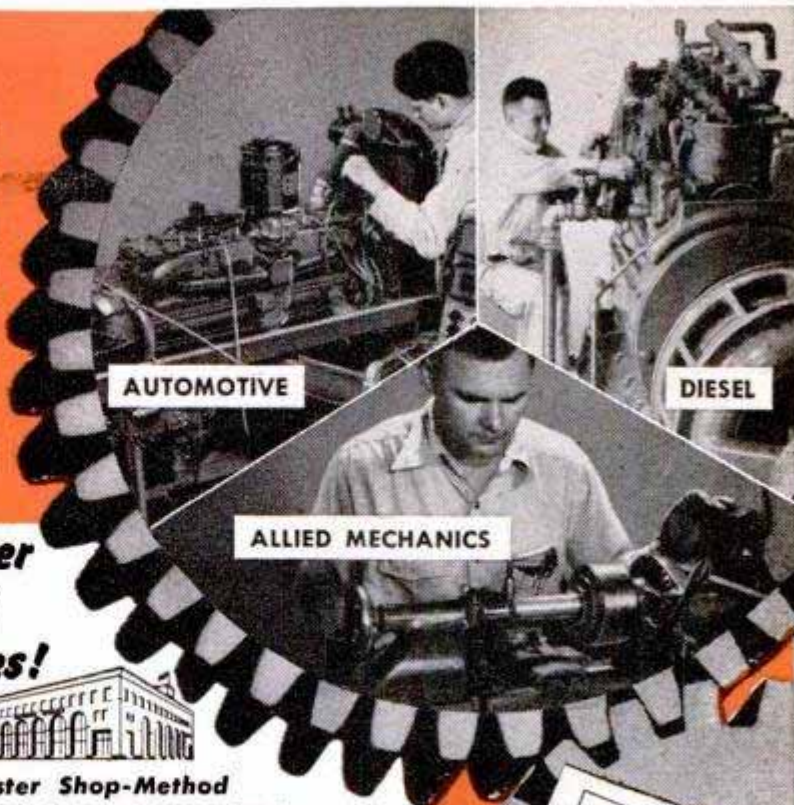
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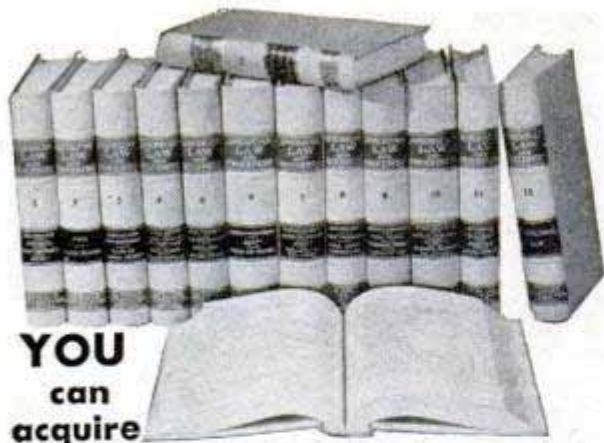
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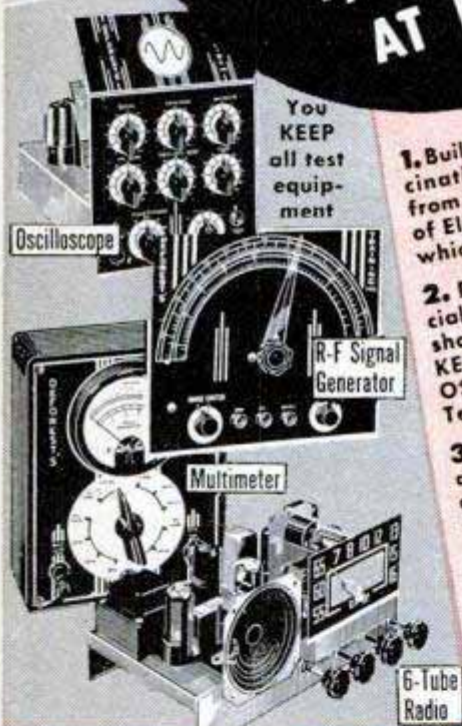
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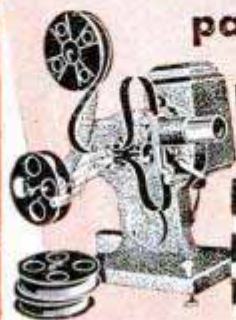
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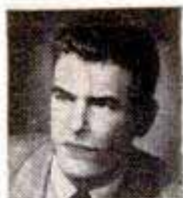
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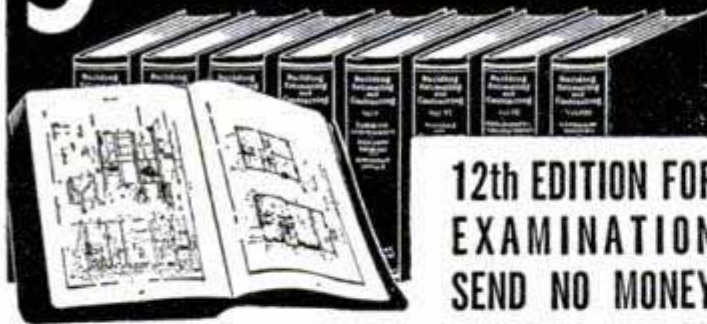
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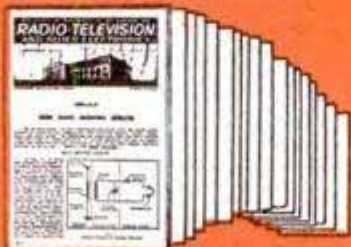
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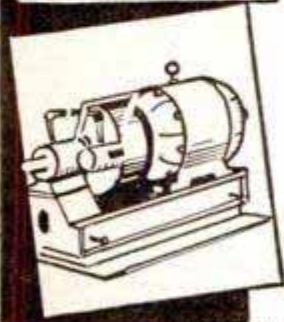
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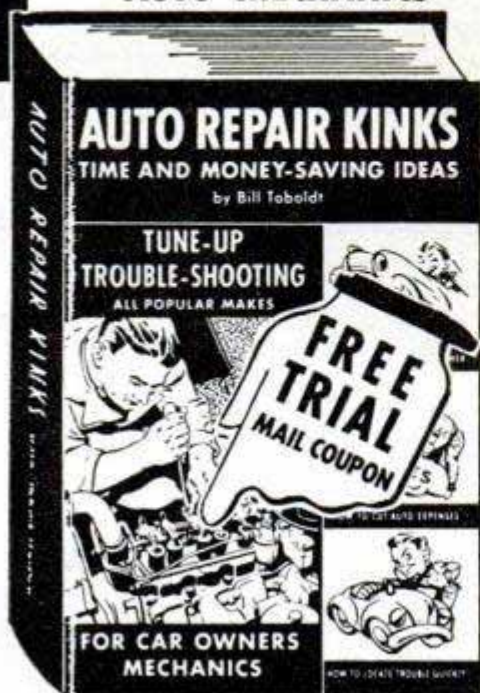
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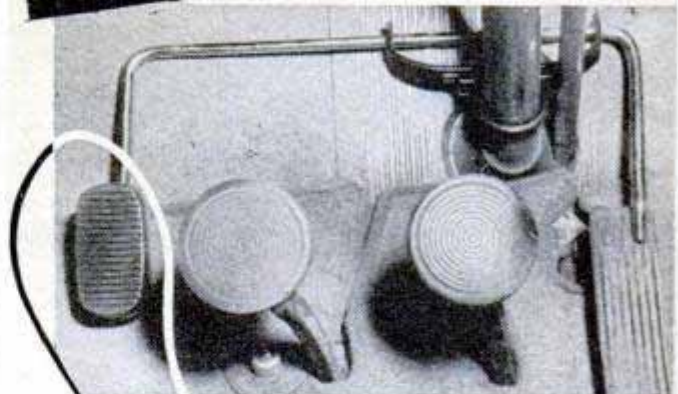
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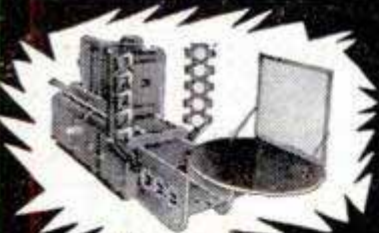
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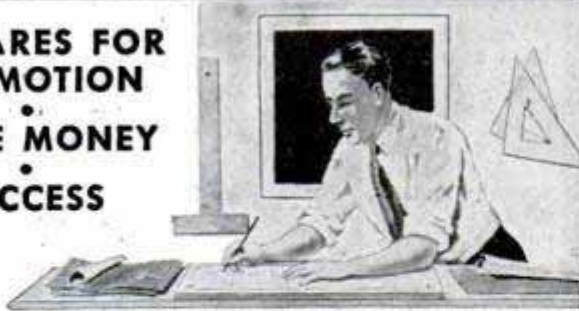
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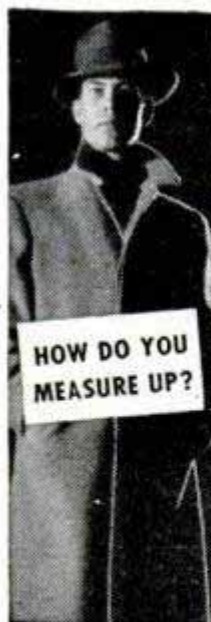
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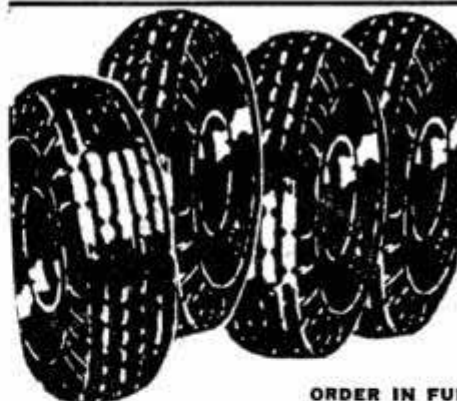
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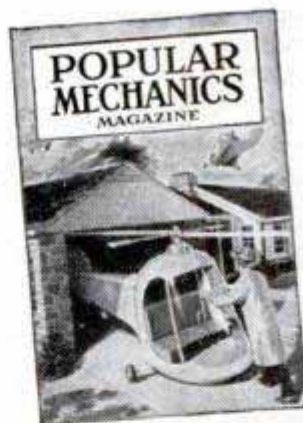


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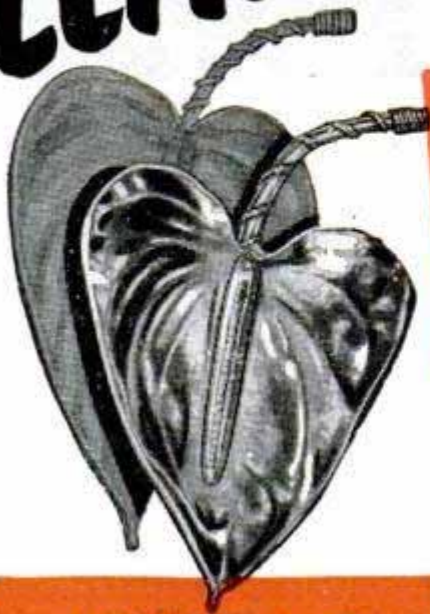
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THOUSANDS Of speed equipment items now ready for all makes of cars. See big catalogue offer on page 22.

MOTORISTS—Save gas! Free literature on proven automatic water vapor injector, giving 25% better mileage and performance. \$5.95 postpaid. Write today! Vaporizer Company, Box 7033B Station G, Los Angeles, Calif.

FLOATING Brake shoes for Ford, Mercury, Chevrolet, Plymouth, Dodge, DeSoto and Chrysler cars make brakes super powerful. They eliminate squeal, chatter, groan, fading brakes, "hard" pedal and scoring of drums. All models—\$4.00 to \$6.90. Make linings wear two to three times longer. Easily installed by yourself. Write for details. Super Brake-Floater Company, 4022 West Lake Street, Chicago 24, Illinois

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MIDGET Autos. Assemble yourself. Complete kits. Write David Redius, 653 State, Camden, N. J.

"SPEED Equipment bargains catalog." Hollywood mufflers \$4.50, duals \$16, racing cams \$29, dual manifolds \$9.95, racing heads \$23.50, water injectors \$6.95, custom accessories galore! (Free Power Handbook) with catalog, 25c. Almqvist Engineering, Milford 33P, Pennsylvania. (Dealers wanted.)

FREE Books. Don't miss the world's greatest automotive book offer by Newhouse. See page 22.

AUTO SUPPLIES AND EQUIPMENT

NEW And used guaranteed parts for civilian and army cars and trucks. Largest stock in America. Mail orders. Pioneer Auto Wrecking Co., 734 W. 13th Ave., Denver, Colorado.

BUICK Parts—Enjoy new-car pep and power in your old Buick. Same day service from world's largest stock of new (not rebuilt) Buick parts and engines. Ship anywhere. Write today. Robertson Buick Co., 1001 S. Wabash Ave., Chicago 5, Ill.

NEW Government surplus. Low voltage circuit tester in steel box cost \$202. Our price \$27.50. Will test batteries, starters, generators, voltage regulators, grounds, short circuits. Wilt Electrical Company, 7829 S. Racine Ave., Chicago 20, Ill.

AUTO And truck parts. New and used. Lowest prices. Complete stock. Prompt replies. Babbitt Auto Parts, 2833 Chicago Ave., Chicago 22, Ill.

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NEW Economy, power, methods. Free information. Neher Industries, La Verne, California.

AUTO Parts and accessories. Briggs Automotive Engineering of Chicago, P.O.B. 3454 Merchandise Mart, Chicago 54, Ill.

FOR Free descriptive literature on alcohol-water injection for cars, trucks, tractors write Shade, Webster, New York.

BRUSH Plating outfits connect to a battery. No tanks or shop required. Free particulars. Gunmetal Co., Avenue J, Decatur, Illinois.

GARAGEMEN: Build your generator or magneto tester, free circular. Abbott Supply Co., Quincy, Ill.

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INCREASE Gasoline mileage! Three to five miles per gallon. Guaranteed Turb-O-Vane Vaporizer also increases power; reduces carbon. Agents wanted. Turb-O-Vane, Box 1167, Stockton, Calif.

CHAMPION A-C Auto-Lite spark plugs. Rebuilt. Guaranteed 10,000 miles. 25c each, 23c sets of 6. Postpaid. Wholesale discounts available. State brand, type, quantity. Philip Minor, 5707 Arnsby Place, Cincinnati 27, Ohio

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SPONGES, Chamois—Buy direct, save 40%. Excellent quality English chamois 18"x17", \$1.30; 21"x22", \$1.95; large 7" wool sponge \$1.25. Other sizes available. Cuban Sponge Co., Joliet, Ill.

MOTORIST Save gasoline by Vacuumating overrich mixtures. Fits all cars. For free particulars write Vacuumatic, Dept. 1723, Piquette, Wix.

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OFFENHAUSER'S New catalog available. Send 25c. Complete line of speed equipment. Offenhauser Equipment Corp., 5054-P Alhambra Ave., Los Angeles 32, Calif.

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BUILD Your own trailer! Plans for all kinds. Illustrated catalog 10c. Jim Dandy, 125-M, Wausau, Wisconsin.

MOTORCYCLES, BICYCLES, MOTORSCOOTERS AND SUPPLIES

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HARLEY, Indian parts and accessories handbook, 15c. Bootz, 1700 East University, Des Moines 16, Iowa.

HARLEY-Davidson parts, accessories, repair manuals on all models. 24 hour service. Authorized factory dealer. Philadelphia Harley-Davidson Company, 857 North Broad Street, Philadelphia 23, Penna.

MIDGET Racer, less motor \$10; 1946 Whizzer \$15; 1938 Cushman \$35; James motorcycle \$45; Indian \$30; Smith motorwheel \$8; motorbike conversions \$5; 2 h.p. engine \$5. Four balloon tires \$3 (mail-order only). Send 25c for catalogue Number Thirty-Nine just out listing these and hundreds of other bargains, in new and used machines, parts, plans, war surplus, etc. (35c by first class mail). Midget Motors Directory, Athens, Ohio.

MOTORCYCLE Magazine — Worldwide coverage. Yearly subscription \$2.00. Sample 20c. Motorcycle News, 5424-A Sawyer, Chicago 25.

REBUILT Gasoline engines \$9.00 to \$30.00. Cauffiel Motor Industries, Temperance, Mich.

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HARLEY-Davidsons—All models and prices. Genuine late and old model supplies. Expert service. Send 25c for bulletin. Knuth's, 1753 Muskego, Milwaukee, Wis.

WHIZZER (All attachments) \$25; Cushman motorscooter, extra tires, \$20; Indian motorcycle \$30 complete; midget car \$35. Rush 25c (35c first class mail) for catalog #947 listing these and scores of other amazing bargains in motors, midget cars, motorscooters, motorbikes, motorcycles, etc. Associated, Box 1764-CS, Toledo, Ohio.

AVIATION

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PROPELLERS, Plans, supplies, for ice sleds, snow sleighs, air boats. Catalog 20c. Banks-Maxwell, Box 3301E, Ft. Worth.

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REAL Edison batteries. Long unconditional guarantee. 37 to 600 ampere sizes. Free interesting literature. Hawley Smith Co., Croton Falls 1, New York.

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BE Independent, be secure, have your own profitable business—earn \$20.00 and more a day making beautiful, fast-selling lamps at home. No equipment needed. Illustrated course teaches you quickly. Course, parts catalog, wholesale price list—only \$2. Gearon Co., Dept. 200-B3, 27 S. Desplains, Chicago 6, Ill.

MOTORS—1/100, 1/25, 1/4, 1/3 hp. Nationally known make. All a.c. At a sacrifice price. Write Mercury Electric Corporation, 719 Wyandotte, Kansas City 6, Mo.

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ELECTRIC Pencil: Engraves all metals \$1.50. Beyer Mfg., 10511-H Springfield, Chicago 43.

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LAMP Parts—Sockets, wire, harps, cords, bases, pipes—all parts to build and repair. 64 page catalog with charts and instructions 25c. Gyro Lamps, 5402P Clark, Chicago 40.

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WELDERS 110 Volt a.c., transformer welder in portable metal case. Push button, self activated heat controls. Welds, brazes, solders, cuts all metals. Easy to use. Simple instructions. Complete with flame weld torch, rods, flux, mask only \$28.50. Splendid for shop, farm, home repairs. 10 days trial. Also other models. Magic Welder Co., 241 MK Canal St., New York City.

BUY Direct from factory. Welding and cutting equipment. All makes of equipment repaired. Established 1913. Box 331, Hamilton, Ohio.

SPIT-FIRE Guaranteed world's hottest, most dependable alcohol blow torch. Write Robert Livingston, 1425 Scott, Williamsport, Penna.

RADIATOR Repairing books, supplies, equipment, gasoline torch. Write. Curfman Co., Maryville, Mo.

200 AMP. Welding generators. Brand new. \$25.00. Free literature. Thorndyke Mfg. Co., Pipestone, Minn.

"BUILD Your own" portable arc welder. Hobart generator plus your auto engine. Saves hundreds, get big paying jobs. Catalog free. Hobart Welders, Box M-312, Troy, Ohio.

BUILD Your own 100 ampere electroplating rectifier at a low cost. Stark-weather, Ottawa, Kans.

ELECTROPLATE Brass, nickel, chromium, baby shoes. Free literature. Electroplate, Box 293, Red Lion, Penna.

ACETYLENE Generator, 100#. \$2.00. Write Blueprint, Box 326, Hopewell, Virginia.

ACETYLENE Welding outfits, new \$45.00; used \$25.00; arcwelders \$46.50. Eagle Welding, Dept. PM, 5085 Broadway, Chicago 40, Ill.

GENERATORS, AAF types: L-3, 25 amps., 24v., \$12.95. P-1, 200 amps., 24v., \$13.95 f.o.b., no c.o.d. Aero Parts Supply, 8102 Lockheed, Houston, Texas.

MACHINERY, TOOLS, SUPPLIES

STEEL Boxes — Government surplus. Ideal for tools, valuable papers, etc. Size 10" x 3½" x 7" 30c each, six for \$1.50. Size 12" x 8" x 6" 65c each, six for \$3.50. Send check or money order to Wallace Steel & Supply Co., Ithaca, N. Y.

McCULLOCH Chain saw parts. Complete stock. Orders sent out same day. Barnett Equipment Co., South Glens Falls, N. Y.

PERFECTED Toolrak with ten interchangeable holders. \$2.00 postpaid. Davis Development Co., Box 670, Colorado Springs, Colo.

AUTO Conversions and parts. Marine manifolds for all engines. Your transmission converted to marine gear, propellers, shafts, struts, couplings, etc. Everything you need for your boat. Money back guarantee. Conversion Parts Company, 278 Adams Street, Boston 22, Massachusetts.

WATCH Makers lathe, gov't. surplus, complete with motor and foot pedal. Value \$225.00, like new, \$87.50. Public Sport Shops, 11 S. 16th Street, Philadelphia 2, Penna.

AUGER Bit. Sensational new design. See Barclay Co. advertisement on page 266.

PRECISION Cast small parts, jewelry, etc., in your own shop. Be a subcontractor. Lost wax process. Free equipment price list. Southwestern Specialty Co., Box 3506, Station A, El Paso, Texas.

CIRCULAR Saw blades—Longer runs without sharpening. 8" diameter \$2.29. Satisfaction guaranteed. Van Dick, Little Falls, New Jersey.

CHUCKS: Independent; Universal—threaded 1½"-8, 1"-8, 1"-10, 1"-12, or with adapter recess. The only complete line of bench lathe chucks built to heavy duty standards. Other chucks to 16" diameter. Write for quotation; free literature. No obligation. Westcott Chuck Co., 3600 Walnut, Oneida, N. Y.

POWER Tools. Build your own with Lewis castings. Save up to 80%. Complete castings, material and blueprints supplied for 23 woodworking and metalworking tools. Illustrated brochure, 10c. Write today. Lewis Machine Tool Co., 3217 Union Pacific Avenue, Dept. M, Los Angeles 23, Calif.

DRILL And reamer booklet 32 pages know how, plus time saving tap selector, plus tool catalog, all for 25c. Cost refunded on first order. See Barclay advertisement on page 266.

STAMPING Sets, 37 steel dies, both letters and figures. Government surplus, for marking metals, wood, leathers. ½" for home workshops, garages, gunsmiths, machine shops. Exceptional value, satisfaction guaranteed. \$2.98 postpaid. Numrich Arms, Dept. P.M., Mamaroneck, N. Y.

ONLY \$3.95. 2" Universal lathe chuck, \$14.00 value, check or money order. Har-Mur, 2349 Devon Ave., Chicago 45, Ill.

GOVERNORS And butterflies for autos or any gasoline-driven engine. Candee-Smith, P.O. Box 612, Riverside, California.

ROUND Stock and pipe jaw made for jaws of any standard vise \$1.00 plus Calif. sales tax. H. A. Johnson, 3921 La Cresta Ave., Oakland 2, Calif.

PUMP, Stainless steel, with 115v. 1/40 hp., 3450 r.p.m. motor, app. 12½" net, 4" x 8", app. 5 gpm, new postpaid, \$20.00. Socket sets, Waldren ½" drive, 21 pieces, ¼" to 1", new surplus, postpaid, \$18.50. Aero Parts Supply, 8102 Lockheed, Houston, Texas.

ENGINES, MOTORS, DYNAMOS

MOTORS ½ Horse \$15. ¾, \$22. 1, \$30. Compressors \$22.50. Other bargains. State your needs. Butler, 1885 Milwaukee, Chicago.

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

NEW 1 H.P. gasoline engines, 2 cycle horizontal. Original package. Shipping weight 23 lb. \$27.50 f.o.b. Jedway Corporation, Acton, Indiana.

REBUILT Gasoline engines \$9.00 to \$30.00. Cauffiel Motor Industries, Temperance, Mich.

DYNAMOTOR, PS225, 14v input, 375v at .150a, 4800 r.p.m., \$6.50 postpaid. 110v, 60 cycles motor with stainless steel liquid pump, 1/40th hp., 3450 r.p.m.; total weight 12½#, 4" x 8", app. 5 gpm, unused, \$20.00 postpaid. Aero Parts Supply, 8102 Lockheed, Houston, Texas.

BOATS, OUTBOARD MOTORS

OUTBOARD Motor parts, new—used, all makes. Rebuilt outboards. Standard and oversize pistons any make regardless of age. Our boring bar rebore cylinders 1½" to 2¾" diameter. Outboard motor magneto specialists. Estimates given, no charge. Outboard Motor Mart, Inc., 309 Atlantic Avenue, Boston 10, Mass.

CONVERT Fords and Jeep to 100% marine engines with Osco's world famous Convo-Kits. Deluxe catalogue 25c (coin). Oscomotors, 3627B Lawrence, Philadelphia 40, Penna.

TWENTY Plywood boat plans \$1.00. Catalog boat building plans 10c. The Rudder, 15 Murray Street, New York 7.

BOAT Kits: Outboards, inboards, hydroplanes, sail. A cinch to assemble. Minimum expense. Catalog, specifications, prices. 25c. Brooks Boat Company, Carrollton, PM, Michigan.

OUTBOARD Motor bargains—\$35.00 up. Send for free list! Save big money! Used parts for most makes and models. Crandall-Hicks, 911 Commonwealth, Boston, Mass.

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

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

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

THRIFTY, Easy-to-build boats—There are 9 new models of Roberts Kit-Craft boats. Priced as low as \$42.50, they range from 8 to 14 ft. Prams, cartops, skiffs, rowboats, sailing prams, speed hulls, runabouts. All brass fixtures—best building materials. Send 10c for new illustrated catalog. Roberts Industries, Inc., 103 Main St., Durham, Connecticut.

GET Our big 224-page low-price marine hardware and boat equipment catalog for 1951! Send \$1.00 to cover packing and mailing; refunded with first order. Garland Frasher Marine Sales, 540-J 31st Street, Huntington, West Virginia.

FULL Size, cut to shape boat patterns, blueprints, 7½"-38 ft. Illustrated "Build a Boat" catalog, 25c (coin). "How to Build Boats" book, \$1.00. PolyWog houseboat plans \$10. Marine catalog \$1.00. Marine Specialty Mfg. Co., 3107 Detroit Ave., Cleveland 13, Ohio.

"P38 Belly tanks", steel, \$9.95. Free picture. Bucks Auto Parts, Box 89, Merced, Calif.

BOAT Plans, patterns, kits. Rowboats, outboards, inboards, cruisers. Descriptive literature and 24 page illustrated book on boat construction 30c postpaid. Germain Boat Company, West Saginaw 3, Mich.

SAVE ¾ Cost. Assemble your own boat. We furnish parts. No experience necessary. Rowboats, cruisers. Illustrated catalog 25c. Midwest Boat Company, Menomonee Falls, Wisconsin.

220 PAGE Marine hardware catalog beautifully illustrated for \$1.00. Money refunded with first order plus 10% discount. Marine Products, 7 Longfellow St., Baldwin, Long Island, New York.

FORD & Jeep marine conversion kits, request catalog. Arthur Gershel, Dept. 0, 51 Chambers St., New York 7, N. Y.

ATHLETIC EQUIPMENT, BODY BUILDING COURSES

TALLER. Be one to three inches taller. A new scientific method for permanent height increase has now been developed. Free information. Natural Methods, Box

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

BARBELLS, Dumbbells, exercise equipment. Price list free. Superior Foundry, Box 549, Hopewell, Virginia.

GAIN Weight! Four exercises to increase weight. Complete \$1.00. Body Builders, 36 Nevada Street, Winthrop, Mass.

DEADLY Judo—Fiercest fighting technique. Trick knockouts. (Over 200 illustrated pictures.) Expert instructions; three volumes. Complete \$2.25. Variety House, Box 46-B Wall Station, New York 5.

TAXIDERMY

MODERN Taxidermist Magazine, Greenfield Center 2, N. Y. Devoted entirely to taxidermy, photos, articles, methods. Trial year's subscription, \$1.00.

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POWERFUL Astronomical telescopes easily made. Perfect lenses and instructions; 100X \$3.00; 100X and 200X \$4.00; 100X, 200X and 400X \$6.00. Full power, clear vision guaranteed. Instructions alone 10c. Suffolk Science Service, Riverhead, N. Y.

TELESCOPES, Binoculars, microscopes, big bargain catalog free. Brownscope Company, 24 West 45th Street, New York.

REFLECTOR Telescope kits, refractors. Free illustrated bulletin. Rake Instrument Laboratory, 612 Adams, Hoboken, N. J.

AMAZING Prices, brand new precision binoculars. Free trial. Folder, "Binocular Selecting," pricelist free. Prentiss Importers, Mercury Bldg., West Los Angeles 25, Calif.

SAVE 50% On new binoculars! Free catalog. Free book, "How to Select Binoculars." Write today! Bushnell's 43-M23 Green, Pasadena 1, California.

BINOCULAR Specialists, all makes repaired. Authorized Zeiss, Hensoldt dealer. Tele-Optics, 5514 Lawrence, Chicago 30, Illinois.

BINOCULARS, Telescopes, watches, guns. Buy, sell, trade. Schweer's, Donnellson, Iowa.

MICROSCOPES, Pocket pen type, 20 power, \$2.95; 40 power, \$4.95 postpaid. Pocket pen telescope, 6 power, coated lens, \$9.95. Public Sport Shops, 11 S. 16th Street, Philadelphia 2, Penna.

GIANT Astronomical telescope with 6 ft. tripod \$15.00, f.o.b. factory. 100 power. (10,000 area magnification). Clear vision, full power guaranteed. Ready for use. Suffolk Science Service, Dept. BT, Riverhead, N. Y.

WAR Surplus bargains, binoculars, telescopes, sextants, millions of lenses, prisms, reticles, eyepieces, objectives, etc. Mail 10c for big "Catalog CH." Send \$1.00 for Stock CH—10-piece lens kit and big instruction booklet. Edmund Salvage Co., Barrington, N. J.

BINOCULARS Reconditioned, cleaned and aligned, any make. Special, fast service, work guaranteed, \$11.50. Miller's Sport Shop, Dept. P, 142 North 8th Street, Philadelphia 7, Penna.

REFLECTING Telescopes, 60X, completely assembled \$25.00. Guaranteed observatory clearness. Free information. Skyscope, 475 Fifth Avenue, New York 17.

ASTRONOMICAL Telescopes, binoculars, microscopes, bought, sold, repaired. Books. Lists 10c. Rasmussen-Reece, Amsterdam, N. Y.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY, TRAPPING

MEN. Boys. Fishermen. Amazing reel. Makes kite flying easy—excellent for drying or reversing fishing lines. Make it yourself. Buy no materials, 25c. Self-addressed envelope brings easy to make plans. B. Mulligan, 657 Roscoe, Chicago 13.

FISHERMEN—Make your own sinkers with our molds. Free illustrated booklet. Reading Instrument Co., Box 78, Reading, Penna.

FISHING Rods. Make them right. It's easy with our detailed, illustrated booklet. Only \$1.00. Dreis-Davis Co., 419 Ocean Center Bldg., Long Beach 2, Calif.

190 PROFUSELY Illustrated pages antique and modern pistols, swords, daggers, armor, etc. 50c. Robert Abels, A860 Lexington Ave., New York 21.

NEW Book! Antique gun prices! Lists 2000 American revolvers, \$1. Pioneer Press,

NEW Richardson "Biu Glas" rod. At last a glass rod with the kind of action you want where you want it. Has the tip action you need for casting of light lures and the backbone in the butt end to set the hook. Will not fade in color. Find out why the new Richardson "Biu Glas" will give you more rod for the money. Write for free catalog. Richardson Rod & Reel Company, 3166 North Sawyer Avenue, Chicago 18, Illinois.

5000 BARGAINS, Firearms, binoculars, war relics. Catalog 40c. Smith Firearms, Runnemed, New Jersey.

FREE Crow hunting information, calling, Decoys. Toad Woodward, Lamar, Missouri.

PETS—DOGS, BIRDS, RABBITS, HAMSTERS, ETC.

ST. Bernards, Boxers, Hof Kennels, 5136 Cascade Rd. S.E., Grand Rapids 6, Mich.

"TREATISE On Breeding and Raising Canaries"—\$1.00. American Canary Magazine, 3449 North Western Ave., Dept. PM, Chicago 18, Illinois.

HAMSTERS—Superior strain, selected breeders. \$3.00 pair. Pet, in clearview, self-cleaning cage \$5.00. Free, illustrated booklet. Lakeview Hamster Colony, Newfield, N. J.

HAMSTERS. One pair virgin breeders plus 80 page manual and market folio for \$3.50 f.o.b. Live delivery guaranteed. Have market facilities. Free literature. Manual separately costs \$1.00. Pat's Hamster Farm, Waterford 3, N. J.

MAKE Big money! Raise Chinchilla rabbits. Cash markets supplied for your production. Write today! Rockhill Ranch, Sellersville 15, Penna.

INCREASE Your income by raising domestic rabbits. Small space needed. Ready market for delicious meat, fur and wool. Largest magazine in the industry tells you how. \$1.50 per year. Sample 15 cents. No stamps. Small Stock Magazine, Lamoni 20, Iowa.

EARN Up to \$400 monthly raising Angora or New Zealand rabbits. Plenty markets. Particulars free. White's Rabbitry, Newark 38, Ohio.

RAISE Rabbits. Profitable business. Literature free. Tayco Rabbitry, Hapeville, Georgia.

RAISE Guinea pigs. Money makers. Booklet free. Taylors, B426A, Hapeville, Georgia.

NATURALISTS Catalog 10c. Reptile bulletin 5c. Chameleon 45c. Turtle 45c. Salamander 45c. Quivira Specialties, Topeka 51, Kansas.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, EE1, Wisconsin.

BRED Female mink. Booklet, pen plans, \$1.00. Lake Ontario Mink Ranch, Gravel Road, Webster, N. Y.

A Practical beginning to successful rabbit raising. 48 page illustrated booklet. Dime. American Rabbit Breeders Association. 36 AR & CBA Bldg., Pittsburgh, Penna.

SEE Gulf Hamstery ad on page 22. Shows picture of hamster.

CAGE Birds, interesting, profitable. Circulars 10c. Poisal's Bird Farm, Box 1133, Sacramento, Calif.

TRAIN Your dog to be obedient and a better companion. Home correspondence course teaches you how. Features individual supervision. Thousands in use, it's simple. Send 10c for illustrated booklet. Canine League of America, Dept. PM-3, 258 Fifth Ave., New York City 1.

PLANTS, SEEDS, NURSERY AND GARDEN SUPPLIES

MULTIFORA Rose, the living self-repairing fence. For ornament, erosion control, windbreak, snow fence, other uses. A rapid grower. Raise from seed. Free planting guide. Woodlot Seed Co., Norway, Zone 4, Michigan.

AMERICAN Shamrock, honeysuckle, sarsaparilla, rooted, 60c postpaid. Flowercroft, Leesburg, Georgia.

GLADIOLUS—March special. Hundred blooming size \$1.49 postpaid. Robinsons, Sebastopol, California.

GINSENG. Goldenseal. Hundred seeds \$1.50; thousand \$5. Dozen plants \$1.50; hundred \$9. Growing, selling instructions included. F. M. Collins, Viola, Iowa.

PLANT The lawn you never have to cut. Free circular. Midget Grass Co., 3370 N.

GLADIOLUS—Spring special. Delicious yellow strawberries. Glad Haven, Sebastopol, California.

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OUR Patented machine creating new service business in fast growth field. Free booklet "Aiming at a First Year \$15,000 Profit" and letter of introduction to one of 60 successful plants operating near you. New yet proven. Price \$6750 in 24 payments. E. M. Co. Inc., 101 S. 44 St., Philadelphia 4, Penna.

MONEY In new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

INVISIBLE Reweaving—Big profit, big demand, easy-to-learn with low-cost complete course—nothing else to buy, ever. Details free, write today; Fabricon, Dept. N, 8342 S. Prairie Ave., Chicago 19, Ill.

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

BEAT Inflation. Wartime plans! Free book "372 Unusual Worldwide Businesses." Work home. Start sparetime! \$800 month reported. Publishers-MM, Carlsbad, Calif.

SAWDUST, Scrap wood, over 150 cash uses 25c. Lee, Box 502, Chicago 90.

HAVE Profitable home business. Get 101 ideas in new booklet. Only 25c. Write: Arco Sales Co., 505 W. 26th St., Chicago, Ill.

RAISE Earthworms. Easy, profitable. Send for free literature or send dollar bill for illustrated book. Money back guarantee. Earthworm Culturists, Box 710, Atlanta 1, Ga.

ELECTROPLATE Metals and non-metals with the Tyco Electro-Plater! Portable. Inexpensive. Free booklet. Tyco Metals, Box 13231-F, Houston 19, Texas.

START Profitable mail order business, over 100 ways. Send 10c full particulars. Patrician Studios, Bridgman, Michigan.

MADE Big money. So can you. Wamsteker, Box 34-A, Wynberg, Cape, South Africa.

BE Income happy. New local and mail selling opportunities. Free literature. L. Mallory, 266 South Court, Neillsville 3, Wisconsin.

ELECTROPLATING—Know-how, includes baby shoe, chrome and brush plating; other lucrative fields. Learn easily. Free booklet. Joseph B. Kushner, Electroplating Engineer, Stroudsburg 52, Penna.

DEFENSE Welding jobs pay. Welders needed. Train quickly. V.A. contract. Hobart Welding School, Box M-315, Troy, Ohio.

POPCORN Poppers, peanut roasters, candy floss, vending machines, new, used. Northside Co., Indianola, Iowa.

MAN! These are hot! Make \$6.35 on every sale. Sales are really easy. New adding machines in original factory cartons you can sell for only \$12.95 and you make over 45%. They're executive model portables, precision built, fully guaranteed. Send for life-size color photo with full details. Write today to Lightning Adding Machine Co., Inc., Dept. P-3, 1260 West Second St., Los Angeles 26, California.

FOR Successful mail order career, operate from New York individual office. Rent only \$12.00 yearly. Firms \$18.00. Co-operative Offices, PM-126 Lexington Avenue, New York 16.

MEN, Women. Grow mushrooms. Cellar, shed. Spare, full time, year round. We pay \$3.00 lb. We paid O. Babbitt \$4,165 in few weeks. Send \$2.00 for guaranteed market information, illustrated book and start. Washington Mushroom Ind., Dept. 125.

MONEYMAKING OPPORTUNITIES

MAKE Money! Raise birds in spare time. "Parakeet Breeding For Profit" and copy of cage-bird magazine, \$1.50. American Canary Magazine, 3449 N. Western Ave., Dept. PM, Chicago 18, Illinois.

START A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions paid for new and renewal subscriptions. You will be delighted to discover how much you can earn through this pleasant work. Start earning money at once! Clip this ad and send with your name and address to: International Circulation Division, Dept. PM, Hearst Magazines Inc., 250 W. 55th St., New York 19, N. Y.

PLEASURE. Profitmaking crepe paper, chenille, woodfibre, plastic fringe, into flowers, corsages, wreaths, dolls, decorative novelties. Complete supplies, kits, instructions. Proposition, Crafts catalog, 10c. Clevemodell, 4507TC24 Lorain, Cleveland, Ohio.

POLISH Floors! Free new plans and ideas. How to start your own money-making, lifetime business. Send postcard: McCanna Supply, 148M East 40 Street, New York 16.

"WATERLESS (Lanolin) Hand Cleaner." (Oil base.) Make, sell. No machinery. Build profitable business. Complete formula \$1.00. Ideal Service, Park Ridge 3, Ill.

DOLLARS Three ways with "Kitty-Kat" readi-cut baby shoes. Complete local and mail order plans. Write No-Co-Ro, Oakland 6-K, California.

PROFITABLE Mail order 10c. Copper Hill Sales Service, Copper Hill, Va.

UNPAINTED Bookends, plaques, novelties. Free list. Plastercraft Arts, 1611 E. Fifteenth, Cheyenne, Wyo.

BEST New mail order plans monthly. Beginners, old timers. Year \$3.00. Details free. Berberich, Box A6527, Pittsburgh 12, Penna.

BUY Nylons direct from mill. Make good profits on fast selling nylons. Quick delivery on any quantity. Write for confidential wholesale price list. Joy Hosiery Mills, Delawanna 13, New Jersey.

MAKE Seamless billfolds at home. Good income. No experience needed. Write to Max Products, HEM 805 East Walnut, Louisville 4, Ky.

RAISE Your business value, standing, as state notary public. Information. Stationers, Helotes 50, Texas.

MONEY Made easily at home. Details and free copy of trade publication. 25c. A Sales, 18-A City Terrace, Newburgh, N. Y.

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

ELECTROPLATE. Brass, nickel, chrome, baby shoes. Free information. Electroplate, Box 293, Red Lion, Penna.

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.

EARN Money at home! Home mail order plan shows how. Details free. Chambers Enterprises, Box 871, Augusta 1, Ga.

DISTRIBUTORSHIPS Open — Motor tuneup, tremendous profit possibilities, full or spare time. Deco, Box 463, La Crosse, Wisconsin.

MONEYMAKING Opportunities! Read mailorder man's magazine PMT. Sample 25c. Southwest Associates, 1309 N. Princeton, Albuquerque, New Mexico.

\$35 WEEKLY! Home! Two hours daily! Twenty seven unusual ways! Walsh, 894 Main, Buffalo 2, N. Y.

EARN Extra cash! Get quick profits. Make pearl and rhinestone jewelry! It's easy! It's fun! Sells on sight! For complete instructions and illustrated catalog send only 10c to cover mailing and handling to Immerman & Sons, 1812 C3 E. 13th St., Cleveland 14, Ohio.

NEW—Unusual opportunities in "Backyard Profits!" Interesting booklet free. Pickett's, Florence, Kentucky.

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

INDEPENDENT Income! Make leather belts, billfolds, purses. Big catalog and genuine steerhide keyholder, 10c. Tandy Leather Box 397E Tulsa, Okla.

LEARN How others earn money at home! Write—A. Sizemore, 4917 Kostner, Chicago 30, Ill.

PROFITABLE Fertilizer factory! Domesticated earthworms convert garbage. Huge garden harvests. Valuable booklet 10c. Aviry, 112-P Elizabeth, Wichita 12, Kansas.

10,000 NYLONS, Rayons, cottons, 9c pair, up. Sample razor blades, complete stock. List, 25c. Sibert Warehouse, Chattanooga 4, Tenn.

\$250 WEEK Reported! Free book "505 Odd, Successful Businesses." Work home! Expect something odd! Pacific-EE, Ocean-side, California.

QUICK Profits taking magazine subscriptions, handling greeting cards. Cassell Publishers Service, Westfield, N. J.

DOLLARS Make sense. Sell card table advertisement, receive \$130.00. 12 tables free. Unique Gift Club, Pine Hill, New Jersey.

DEFENSE Welding jobs pay. Welders needed. Train quickly. V. A. contract. Hobart Welding School, Box M-317, Troy, Ohio.

MAKE Money at home. Let me show you how to get \$1 to \$20 checks in your daily mail doing simple, spare time writing. Experience unnecessary. Details free. Herwell, 7016 Euclid, Cleveland 3, Ohio.

RESURFACE Butcher's chopping blocks with easy, fast-working, portable electric machine. Unique service in wide demand with little competition. Large steady profits from full or part-time work. Hill Machine Company, Box 677B, Rockford, Ill.

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

FORMULAS, PLANS, ETC.

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

WATERLESS Hand cleaner. (No ammonia.) Easily made. Good profit. 2 dependable formulas \$1.00. Nelko Chemical Service, Box 3462HC, Chicago 54, Ill.

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

FORMULAS, Trade secrets, for nearly everything. Catalog free. Creative Publishers, Winnetka 6, Illinois.

FREE Formula catalog, anything analyzed \$20.00. Western Chemical, Salem, Oregon.

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

CHEAP Automobile polish. Information 10c. Write James Lamont, Beacon, New York.

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

WRITE For Miller's Messenger listing newest 1951 formulas. Fifty years supplying the best. Miller, Chemist, Desk 1517, Tampa, Florida.

COLD Light! Simple formula makes brilliant glowing liquid. Instructions 25c. United Manufacturing Associates, 3605 Canyon Ridge, Fort Worth 3, Texas.

PLASTICS

PLASTICS—Wholesale, retail. We make our own full-color carving dyes. Casting plastic, jewelry findings, mold materials. Catalog, bargain lists, instructions, 10c. 25c airmailed. Gem-O-Lite, Box 686B, North Hollywood, Calif.

NEW Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Free folder. "Liquid Magic," shows fine things you can make and sell. Write today. Castolite, Dept. C-101, Woodstock, Illinois.

LUCITE. Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16". \$1.20; 1/8". \$1.40; 3/16". \$1.75; 1/4". \$2.08. Colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

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

HI-PROFITS. Internally hand carved plastics. Gift-jewelry. Free catalog. Pilot Plastics, 67 C, New York City 7.

PLASTIC: Sheets, cut pieces, and scrap in clear and colors. Rod, tubing, acetate, dies, jewelry findings. Send \$1.50 for 4 pound scrap assortment and fabricating manual. Regal Plastic Supply, 720 Main, New York 17, N. Y.

MOLDED Plastic letters for signs, house numbers, etc. Samples 25c. Plastic Exchange, Box 302, Bradenton 3, Fla.

LEARN Plastics at home. Small cost—Spare time. Complete experimental outfit and full instructions furnished. Details free. Plastic Projects, Box 5151-C, Detroit 35, Michigan.

CHEMISTRY

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

SAVE Money, chemicals, supplies. Catalog 10c. Laboratory Sales, Box 161, Brighton, Mass.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 15c. Established 1931. John H. Winn, 124A West 23rd Street, New York 11, N. Y.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

OH Boy! New Book of Science. Experiments, formulas, secret processes, together with catalog of laboratory supplies, only 25c. National Scientific Company, Dept. 16, 2204 W. North Avenue, Chicago 47, Illinois.

LABORATORY Apparatus, chemicals, microscopes, complete chemistry sets, minerals, uranium ore. 10c brings catalog. Porter Chemical Company, Hagerstown 1, Maryland.

URANIUM Ore sample, weighing scale, catalog of chemicals, apparatus, kits. \$1.00. Catalog only, 10c. Rex Laboratories, 2849-A Birchwood, Chicago 45, Illinois.

HELP WANTED

\$5 HOUR Easy! Sell name plates for houses. Free sample, order blanks. Write: National, 214 Summer, Boston, Mass.

AGENTS WANTED

MAKE Money calling on friends! Show nationally advertised greeting card assortments—new all-occasion assortment and laugh-packed barrel-of-fun assortment. Sells for \$1.00—up to 50c profit for you! Also personal notes, gift wrappings, stationery, gift items, others! Get two assortments on approval. Write Wallace Brown, 225 Fifth Ave., Dept. T-4, New York 10.

SELL Du Pont nylon uniforms. Complete line famous exclusive Hoover styled nylon uniforms for beauty shops, nurses, doctors, waitresses, others. Best quality, splendid values. Exceptional income. Real future. Equipment free. Write fully, Hoover, Dept. M-100, New York 11, N. Y.

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

SELL Wood photograph albums. 50% profits. Catalog free. Wood Album Co., 54 Jefferson St., Brooklyn, N. Y.

BE A money maker. Use your home as magazine headquarters. Liberal commissions. No experience—No capital needed. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

YOUR Own business selling army surplus, new clothing. Lowest prices. Enormous profits. Catalog free. Moro, 558-J Roosevelt, Chicago 7.

MAGIC Cleaner—Laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 4642 No. Central, Chicago.

PHOTO—Salesmen, agents. Sell beautiful hand colored plastic enlargements and sensational new photo compacts, rings, bracelets, lockets, etc. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

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

SELL Arcadian cigars. 100% imported Havana tobacco. Hand made. Steady, repeat profits. Free folder. Seco Cigars, 87 South Drive, Rochelle Park, New Jersey.

SCHOOL Seniors—Earn sensational profits selling classmates America's most beautiful graduation name cards. Largest selection. Outsells all others. Free sample kit. Printcraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

EXTRA Money! Free gift offers! Sell friends extraordinary 21 for \$1.00 metallic, humorous greeting cards. Gift wrappings, novelties. Big profits. Bonus. Experience unnecessary. Request feature all-occasion assortments on approval. Free samples name imprinted stationery, napkins, towels and free catalog. New England Art Publishers, North Abington 420-A, Mass.

CALENDARS, Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37, Ill.

POSITIVELY New—Over 100% profit. Two sided reversible neckties. Free details. Farrell Company, Dept. P-20, 1377 Van Zandt, Cincinnati 31, Ohio.

SIDELINE Salesmen. Power mower \$59.50. Sensation. Sales kit free. Rotacut, RM-2013, Excelsior Springs, Mo.

JEWELRY Factory desires salesmen, distributors, jobbers. Pickcraft, 19 Bank Street, Attleboro, Mass.

EXTRA Cash—Easy! Sell friends newest design 21 for \$1.00, dark card, novelty all-occasion greeting card assortments, gift wraps, animated books. Profits to 50c per \$1.00 box. Special offers. Bonus. Prompt service. Experience unnecessary. Write today for free samples name imprinted scented stationery, napkins, book matches, feature assortments on approval. Free catalog, selling plans. Elmira Greeting Card Co., 2309, Elmira, New York.

PERFUME Beads. Sensational sellers. Big profit. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

FREE Sample and information: Sensational new fisherman's article. Nelson Company, Dept. F, St. Paul 2, Minnesota.

MEXICAN Feather pictures. Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia-PJ, Apartado 9036, Mexico City.

FREE Uniforms as bonus! Biggest commissions! Sell famous direct-from-factory nylon uniforms to housewives, waitresses, nurses, others, full or part time. Exclusive styles. No experience or investment needed. Write today for free style book, sales guide. Upland Uniforms, 255 West 28th Street, Dept. G-4, New York.

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

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

55 HOUR Easy! Sell name plates for houses. Free sample, order blanks. Write: National, 214 Summer, Boston, Mass.

NEW Sponge wall cleaner. Erases dirt like magic. Wallpaper, painted walls, ceilings. Saves redecorating. Lightning seller. Samples sent on trial. Kristee 125, Akron, Ohio.

EASIEST Money you ever made! Big commissions selling work shoes guaranteed six months, exclusive cushioned shoes. Free outfit. Concordian Shoe, 8-B West Concord, Mass.

AT Last! Something new and sensational in everyday cards, 21 for \$1. Make extra money fast! Show satin, velour, metallic cards. Get orders easy. Big line \$1 assortments, scented stationery, personal matches, kiddie books. Imprints free. Two \$1 boxes on approval. Puro Co., 2801 Locust, Dept. 140-C, St. Louis 3, Mo.

FREE Water and our concentrates make flavors, lotions, shampoos, perfumes, cleaners, polishes. 125 products, free catalog. Qualco, E-20030 Russell, Detroit 3.

DO You need money? \$40.00 is yours for selling only 50 boxes of our 200 greeting card line. And this can be done in a single day. Free samples. Other leading boxes on approval. Many surprise items. Experience unnecessary. Free samples personalized stationery, napkins. Write today. It costs nothing to try. Cheerful Card Co., 177 White Plains, N. Y.

HIDE-A-KEY Ends lockouts! Everybody buys! \$1.00. Sample 50c. Merit, 6560 Sheridan, Chicago.

FREE Mexican novelty curiosities. Fast selling. Exceptional profits. Panamericana, Apartado 9318, Mexico City.

TAKE Large unit orders with wool and cotton uniforms, initial buckles, belts, badges. Choice 3,000 emblems. Prospects everywhere. Write Hook-Fast, Box 480-PM, Roanoke, Va.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

STRANGE "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 126, Akron, Ohio.

NYLON Uniforms. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P-3, 3936 Market, Philadelphia 4, Penna.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 7005, Cincinnati 25, Ohio.

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

DRESSES, 18c; Coats \$1.00, blouses 35c. Free catalog. Crown, 164-P Monroe Street, New York.

WONDERFUL Invention brings new relief to foot sufferers! Sell two pairs a day, make up to \$5.00 daily in spare time! Free demonstrator outfit for serious men, write to Owen Mason, "Velvet-eez," Chippewa Falls, Wisconsin.

WANTED—Purchasing agents. No money or experience required. Write Dept. C, Purchasing Manager, 2719 Lawrence, Chicago, Ill.

NYLONS Direct from mill. Free sample stocking. Guaranteed against runs. New process 100% DuPont nylon gives great strength and elasticity. Proportioned to fit, width and length to your size. That's why not all "51-15" are the same. Just show the stocking, you get orders. We deliver and collect. Advance cash plus 40% bonus. All year you sell our nylon hosiery, slips, gowns, neckties. Become crew manager, earn more money. Ergim Hosiery Mills, 992 Columbus Ave., New York City.

SUMMER Money maker. 1½ million dollars worth sold in 3 months last summer. Every lawn owner wants this product. Sales samples and complete sales kit supplied. Product approved by four leading universities. Barclay Co., Box 883, Plainfield 4, New Jersey.

BUY Thousands of nationally advertised products direct from manufacturers and distributors. Write for "Buy Direct and Save." Service Publishing, 1420-A Investment Bldg., Pittsburgh 22, Penna.

SELL New automatic floor waxer. Trigger on handle. Hands never touch floors or wax. Retail \$2.95. Profit 125%. Write Smith, Inc., Greenfield 34, Mass.

100% PROFIT Plus. Colette, patented wire device that automatically retracts and coils the telephone cord into a neat roll by the telephone. Eliminates all kinking and twisting. Quickly installed and a first class demonstrator. Also a model for electric ironing cords and other appliances. Over fifty thousand sold direct last six months. Send one dollar for two wholesale samples and selling details. Huff Sales Company, 911 Western Avenue, Seattle 4, Washington.

BIG Profits. Sell fast moving tarnish remover, cleans silverware and jewelry, no polishing. Agents sample \$1.00. 206 Corona, Long Beach, California.

COSTUME Jewelry, gifts, novelties; sparkling fast sellers. Watson, Barry 5, Illinois.

AMAZING New Telechron-timed defroster. Eliminates messy defrosting nuisance of electric refrigerators. Sell part or full time. Pleasant, fast, easy sales without canvassing. Big profits. Tremendous market. Send postcard for free information on this and other fast-selling Telechron-timed appliances. Miller-Harris, Dept. P3, 836 N. 4th St., Milwaukee 3, Wis.

WHERE To buy 800,000 articles direct from manufacturers. Including hundreds of scarce items. Sent free, "Your Profits Under the Spotlight." Glass Publishing Co., Ellwood City, Penna.

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

BIG Spring sales! Scat Wick Deodorant gets rid of unpleasant odors quickly. Sample Scat and Kitty \$1.00. Write for 16-page catalog of household items. Sunshine

FREE Sample nylon stocking of world's only nationally advertised hosiery line actually guaranteed against runs, snags or excessive wear, regardless of cause! It's amazing but true. Every weight from sheerest 15 denier to heavy 70 denier—all gauges to luxury 60 gauge. Amazingly low prices, starting at \$1.08 prepaid for sheerest 15 denier 51 gauge. Not sold in stores. Good Housekeeping guarantee seal. Also complete line men's hosiery guaranteed one full year or replaced free. Full variety lingerie in crepe, satin and nylon, featuring all nylon slip at \$2.95, satin slip at \$1.58, etc. Housecoats and robes. Kendex sales people will earn one million dollars this year. Get your share. No money or experience needed. Pay nothing now or later. Just show free outfits. Write orders. We deliver and collect. Advance cash plus huge bonus. Earn money spare or full time. Become manager; appoint others to sell for you; earn steady income on their sales. Man or woman—young or old, you can earn more money than you ever thought possible. Everything you need is furnished free and prepaid, including nylon stocking, samples of materials, sales books, 36-page salesmanual, color cards, etc. Simply write your name and address on postcard and mail to Kendex Corporation, Babylon 33, N. Y.

PAINTS—All kinds. 65c gallon up. Private label. Big profits. Certified Products, Louisville, Ky.

FREE Sample ultra-blue stock sign! 6c, sell 35c. 1000 slogans, 7"x11", comedy, religious, general. Lowy, 812-MM Broadway, New York 3.

SELL Amazing petal action floral everyday cards. Profits to 100%; send 65c for sample. Collins Sales Company, 5914 Hodgman, Parma Hts. 29, Ohio.

EXTRA Cash selling shoes direct in spare time. Advance commissions. Bonus. No investment. Experience unnecessary. Free outfit. Samples. Paragon Shoes, 739 Columbus, Boston, Mass.

FAST Profits—No investment. Send for big, free catalog. Plastic aprons, tablecloths, etc. 150 sure-fire items. We guarantee sales. Write The Holiday Company, Dept. M-3, 15-19 Pennington Ave., Passaic, N. J.

HIGH-GRADE SALESMEN

GET A line on this one. Hook up with real money-maker! Sell revolutionary, new Getzem Fish-Bait-Odors that lure fish by smell! Fish really "go for" Getzem. So do fishermen. That's why Getzem practically "sells itself." Fat profit for you on every sale! Plenty repeat business, too! Big season ahead. Act now! Send 50c for \$1.00 tube, or write for free money-making facts. Getzem, Dept. 27-C, 117 W. 67th Terrace, Kansas City, Mo.

HOTTEST Money-maker out! New idea ironing pad pays you up to 100% profit. Saves housewives time, labor, money. Minute demonstration. Fully guaranteed. Plastic clothes line, other sensational sellers. Free sample offer. Sheldon, 1223 South 23rd, Dept. 540, Milwaukee, Wis.

\$2600 NEXT 9 Weeks—Season starting. Sell calendars, specialties, matches. Prospects everywhere. Advanced commissions. Experience unnecessary. Samples free. Continental Calendar, 542-A South Dearborn, Chicago.

EARN Spare time extra money. Show amazing cushion comfort shoes. To \$3.25 commission per pair, plus big cash bonus. Experience unnecessary. Write for free catalog, full information. Tanners Shoes, 778 Boston, Mass.

SELL Art and commercial calendars. Advertising specialties. Over 1000 goodwill items. Diversified line. Highest commissions. Territorial protection. Send \$1.00 refundable deposit for prepaid initial set of samples. Standard Calendar Company, Madison, Illinois.

IS \$210 A week worth a penny postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator defroster "like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. PMC-3, 6 N. Michigan, Chicago 2, Ill.

SALESMEN—Sell our "Leader Specials," America's finest, biggest line of advertising specialties. Sensational sellers to all types of business. Big commissions advanced. Sensational sales plan nets you top earnings. Free outfit. Charms & Cain, 407 South Dearborn, Dept. 300, Chicago.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co.

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

A Fine income, your own nylons free! Show nylons, lingerie, men's socks with amazing free replacement guarantee against runs, snags, tears. Write for free sales kit. Group organizers invited. Rosalee Hosiery Co., Clifton 58, N. J.

AMAZING Discovery, Master Glaze, puts brilliant glass-like surface on cars. Free sample, information. Big commissions. Master Glaze, Dept. 704, 7720 Harwood, Milwaukee, Wis.

EARN Big money fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 533, Rochester, Ind.

\$5 HOUR Easy! Sell name plates for houses. Free sample, order blanks. Write: National, 214 Summer, Boston, Mass.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

WANT To make real money? You can positively make \$50.00 a day and up selling a brand new item going to every type of food and beverage store, factories, laboratories, hospitals, etc. First time advertised. Write for free details today. Johnson-Hartmann, 53 West Jackson Blvd., Dept. PM-3, Chicago 4, Illinois.

WANTED. Man to earn \$85 week and up. Long needed invention. Advertised in Saturday Evening Post. Full or part time. Exclusive territory. No investment. Free sample outfit. Write Red Comet, Inc., Dept. 889, Littleton, Colorado.

DISTRICT Mgr. calendars and specialties. Klingstedt's, 424-509 Schroyer S.W., Canton, Ohio.

SALESMEN Wanted in every state. Sell flying saucers, real recreation for the teenagers. Send one dollar for prepaid sample which will be deducted first dozen order. Mars Novelty Co., 117-5th St., Turlock, Calif.

NEW. Much needed auto specialty fills a great need. Every auto and truck owner will want. Whirlwind seller. Pays excellent profit. Literature free. See display ad on page 268 this issue. Bock Mfg. Co., 711 West Lake St., Minneapolis 8, Minn.

AD Matches! Sell amazing designs—20, 30, 40 and 240-light book matches. Big spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-15, Chicago 32, Illinois.

WRITE 3 Words—Collect \$7.65 on 10-second demonstration to merchants. Write on glass with amazing magic crayon—Presto! 5 color advertising message takes fire, glows like brilliant neon. Three sales daily bring \$22.95 profit. Rush postcard for details. Complete sales kit, free! Maxilume Co., 125 W. Hubbard, Dept. CL-83, Chicago 10, Ill.

BIG Cash profits for men and women introducing Flexiclogs, sensational new flexible footwear. Experience unnecessary. Nationally advertised styles for women, children, men. Excellent sideline, no investment. Easy to average hundreds of dollars weekly. Free sales helps and sample offer. Get details now! Flexiclogs, Dept. L-3A, New Holstein, Wisconsin.

EDUCATIONAL AND INSTRUCTION

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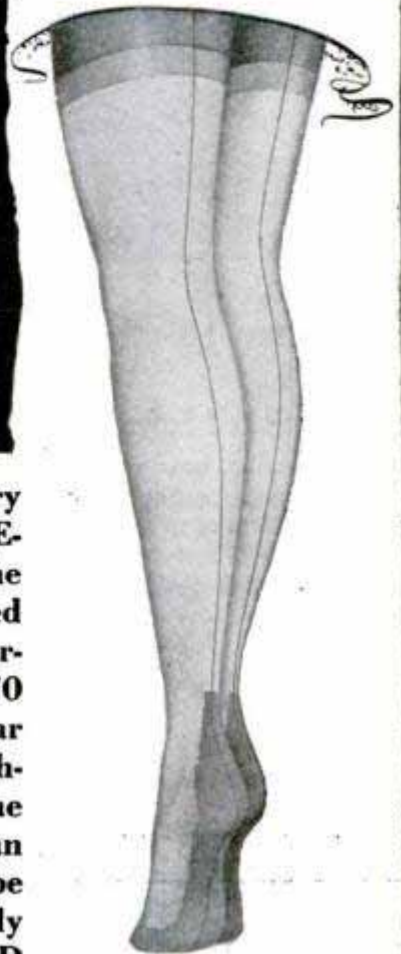
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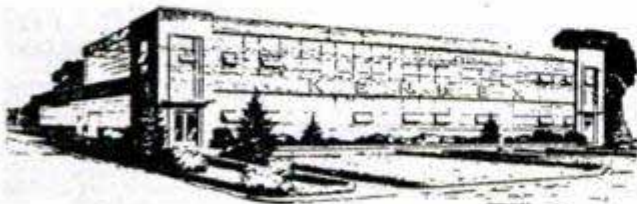
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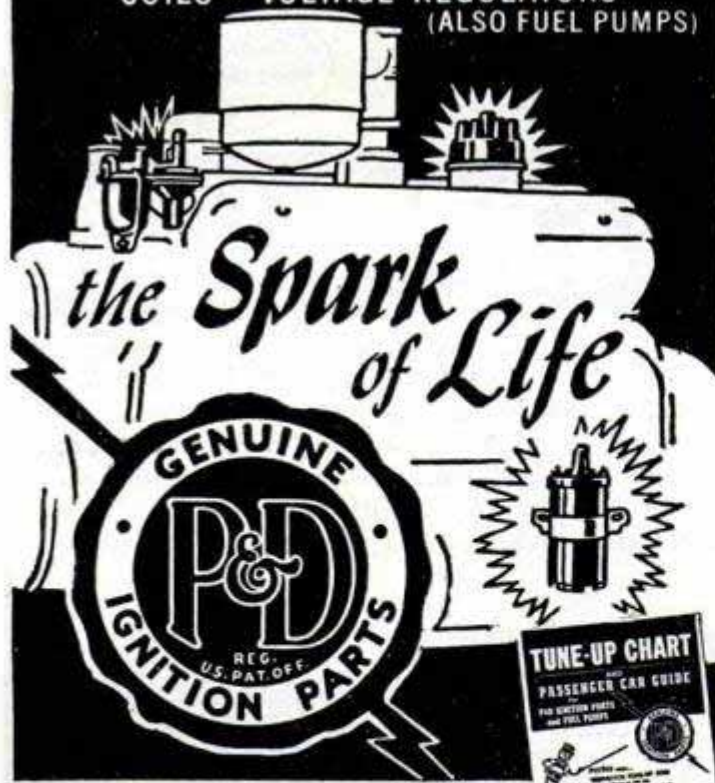
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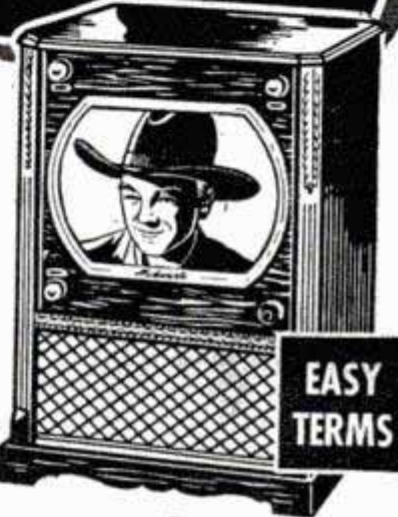
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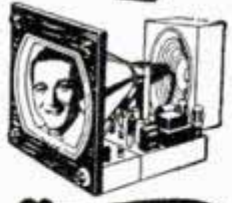


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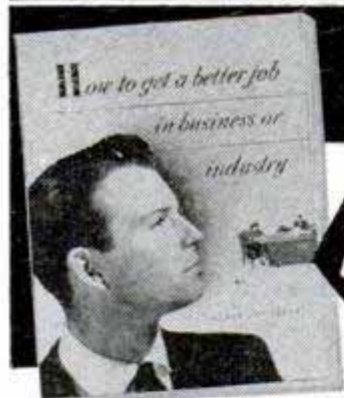
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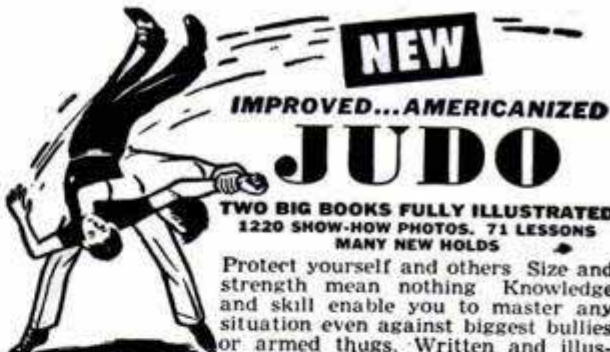
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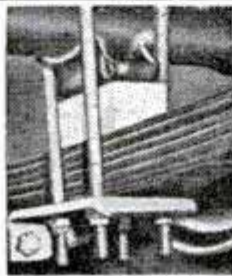
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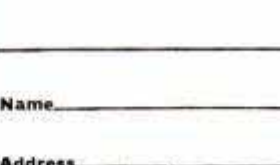
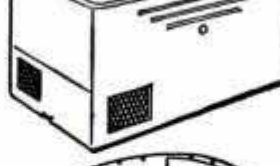
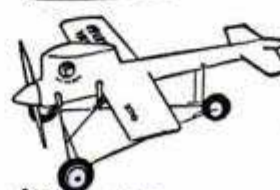
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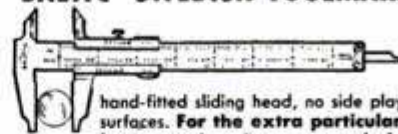
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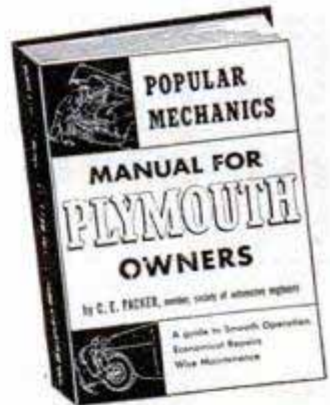
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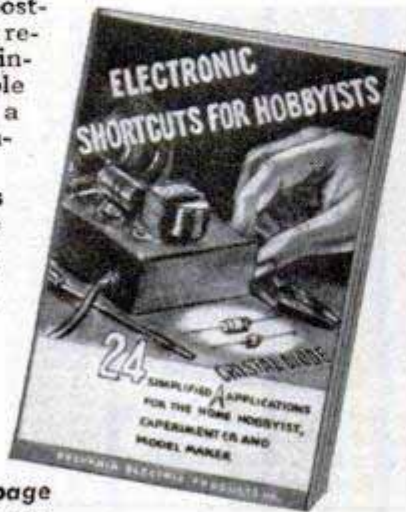


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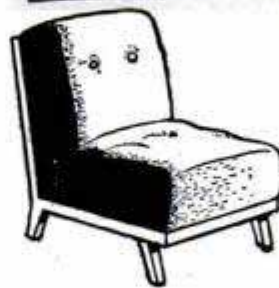
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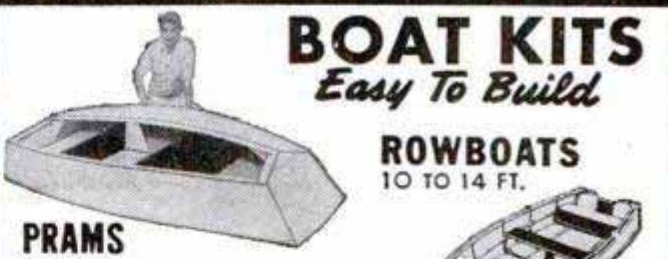
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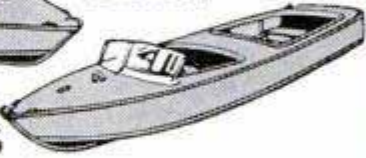
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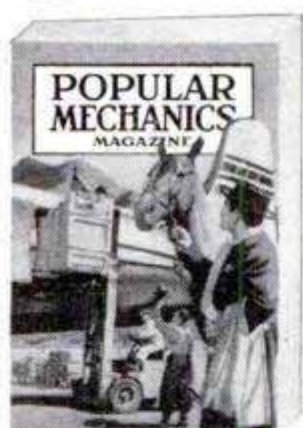
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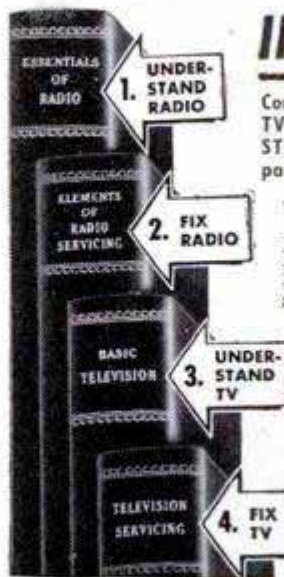
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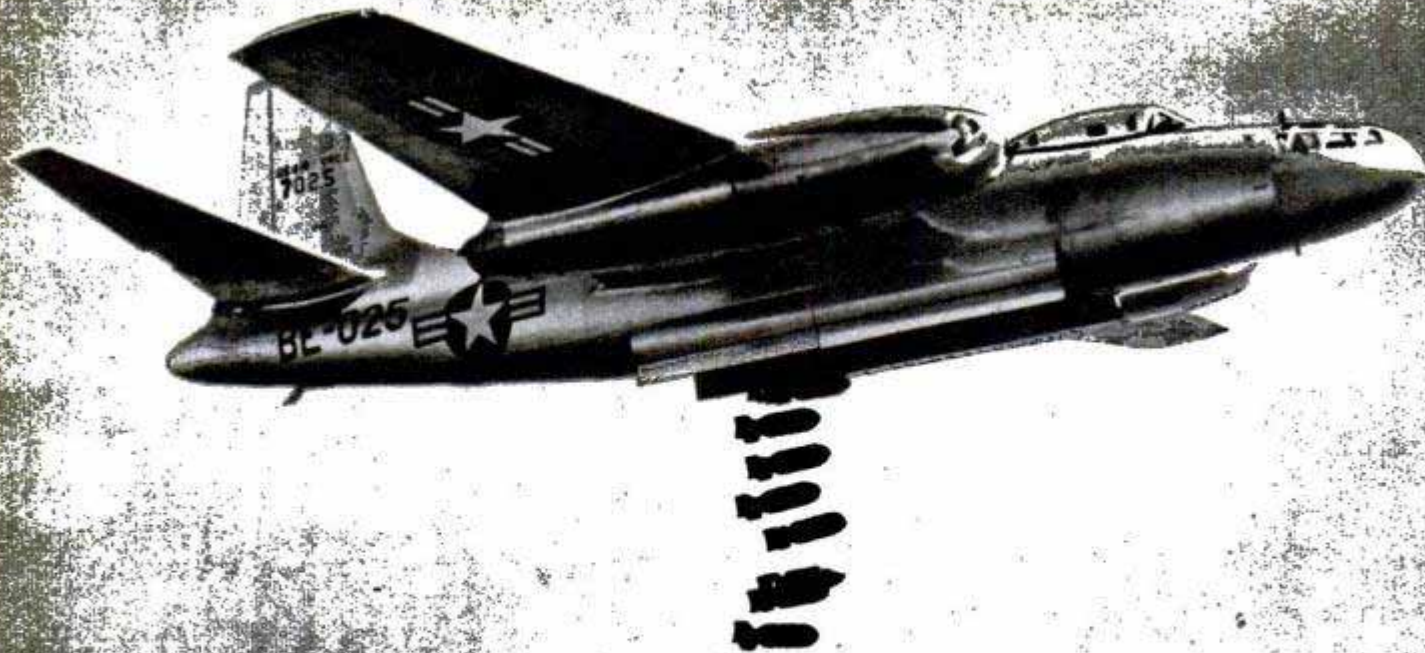
For the speedy new warplanes that can't afford to carry a surplus ounce, the USAF is training one man to navigate, bomb and operate the radar

SSN 1037-TRIPLE-THREAT MAN of the JET BOMBERS

By Thomas E. Stimson, Jr.



Three-man crew of a Boeing B-47 Stratojet, with triple-threat man in nose, a pilot in the overhead canopy and a copilot behind him



North American Aviation Co., photo

On the B-45, the bomb-bay doors retract into the fuselage, instead of swinging open in the air stream

In between times he makes photographs of the ground and, when necessary, fires defensive guns. He's one of the busiest men in the Air Force.

His friends sometimes call him a three-headed monster in token of his three main jobs. He's an SSN 1037 on the roster, the prosaic service rating that designates a highly trained graduate of the bombardment-radar-navigation school at Mather Air Force Base near Sacramento, Calif.

His three jobs were tied together because the big new jets can't afford to carry a surplus ounce. In a Boeing B-47 he sits in the

transparent nose, with the pilot above and behind him in the cockpit bubble. The co-pilot sits behind the pilot and serves as flight engineer and radio operator, in addition to helping fly the plane. The pilot is still nothing more than a pilot, though there's talk of calling him the "pilot-pilot-pilot" just to help his morale.

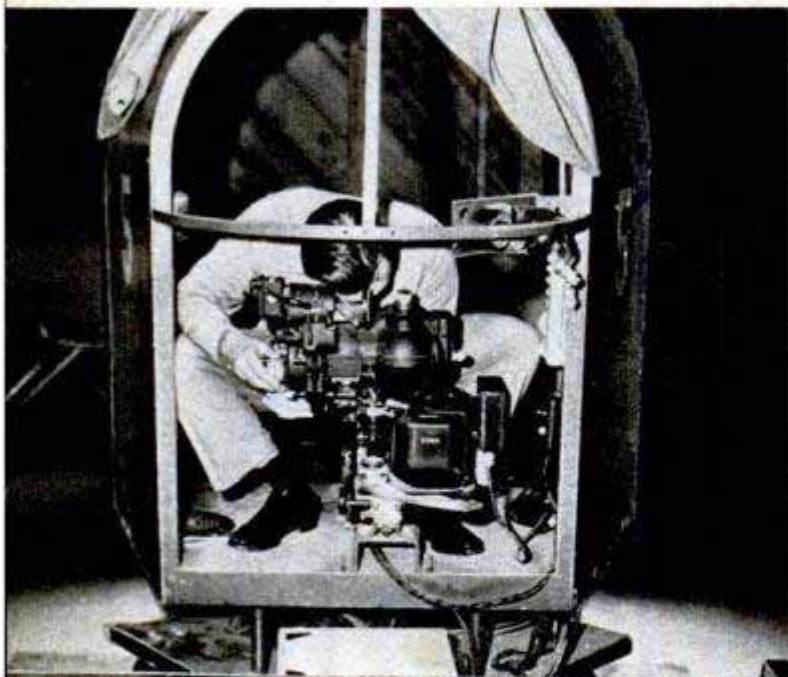
The triple-threat 1037s also are being assigned to the slower piston-engine bomber craft because there's no point, now, in carrying three men when one expert can handle all three jobs. Nearly all the new specialists are being assigned to the Strategic Air Command.

Most of the 1037s are veteran bombardiers or navigators with 1500 hours of flight time behind them when they enter the Mather school. There they get a brush-up in their specialty and then months of instruction and coaching in other subjects.

Their training is complete and intensive because of the need to make them the best bomb aimers in the world. In jets the aiming problem is especially tough. In fact, all kinds of problems that hardly exist at slow speeds become very serious at, say, 450 miles per hour.

There's less time for navigation even though navigation must be done much more precisely than in slow aircraft. Each slight error is magnified with distance. As navigator, the 1037 must remember that some of his instruments are subject to error just because they are flying fast. The reaction time of a bubble-type instrument.

Crouched over a Norden sight, in a mobile compartment similar to his station in an airplane, a bombardier simulates an actual run. A motion picture of target area is slowly moved across the panel in front of him





Bombing problems that barely exist at low speeds mushroom to become critical in 450-mile-an-hour jets

for instance, is just the same in a fast aircraft as in a slow one, and at high speed the fast aircraft covers more ground per unit of time.

In his capacity as bombardier, the triple-threat man has to work at top speed during the approach to the target, for he can be over the target and gone almost before he realizes it. During his approach he must identify the target, set the aircraft on the proper bombing course, train his sighting device on the target, and start the operation of the bomb-release mechanism—all before it's too late.

The time element is so acute that North American Aviation, Inc., engineers, to mention one group, are trying to devise electro-mechanical thinking machines that would automatically solve many of the bombardier's problems faster and more accurately than is possible by a human brain.

They are working toward automatic flight and bomb-control systems that would function almost without human guidance. The final military bombing goal, of course, is to be able to dispense with the airplane entirely and to mount on any big rocket a control system that could be told, in effect: "Deliver and explode this in a certain munitions plant, at such and such a street address, in such and such a city, on a certain continent."

A control system like that may be achieved in the future; meanwhile the jet bombardier has his hands full.

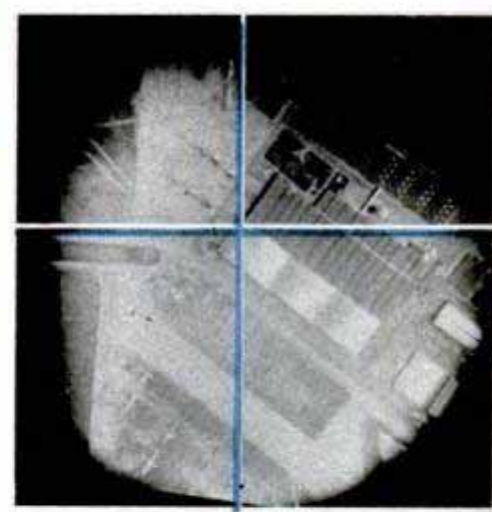
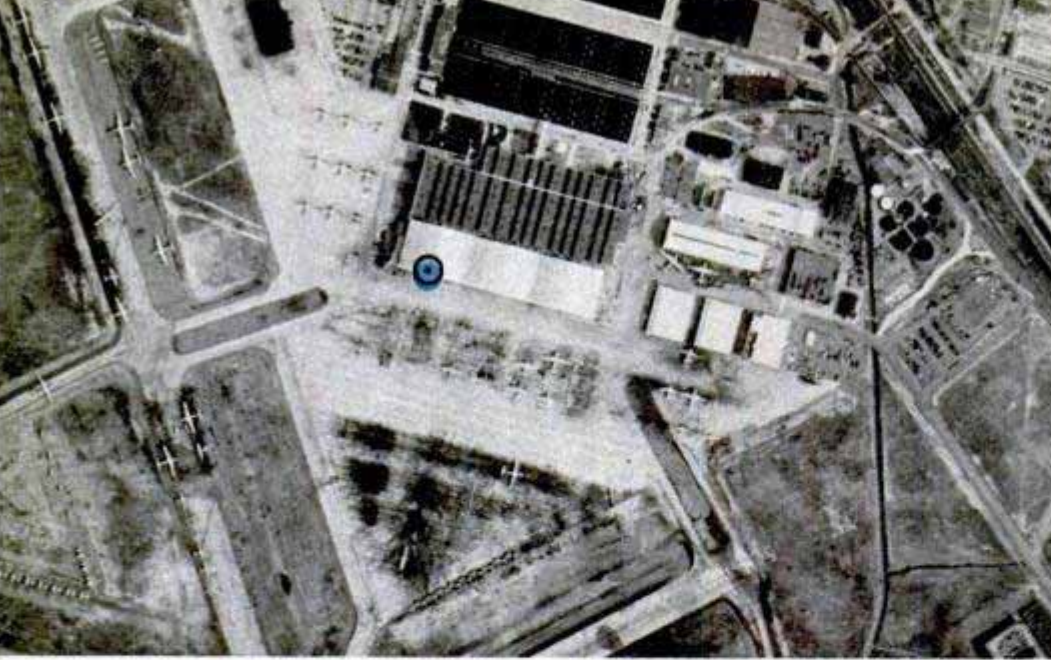
Another problem accentuated by high speed is that of getting the bombs to fall cleanly and immediately, as soon as they

have been released. A bomb that hangs in the bay even for an instant after being released may land beyond the target. And if it leaves the bay sideways or tail first it may be deflected to one side and veer away from the normal trajectory. Missiles weighing up to 500 pounds are apt to hang or tumble even at slow speed because of the uprush and turbulence of the air stream into the bomb bay after the doors are opened.

One suggested remedy has been to eject the bombs by shooting them out of the bay, another has been to open a scoop in



Specially built as flying classrooms, Convair T-29s carry the triple-threat airmen aloft for schooling



Aiming point circled in photo at left was radar bombed. The cross hairs, above, reveal hit would have been 165 feet off

the top of the fuselage so that the missiles would be blown down by the blast of air. A third has been to use a "spoiler" grid work at the front of the bay to control the turbulence. North American planned a spoiler for its jet B-45 and then solved the problem instead by retracting the bomb-bay doors up into the fuselage instead of allowing them to hang open.

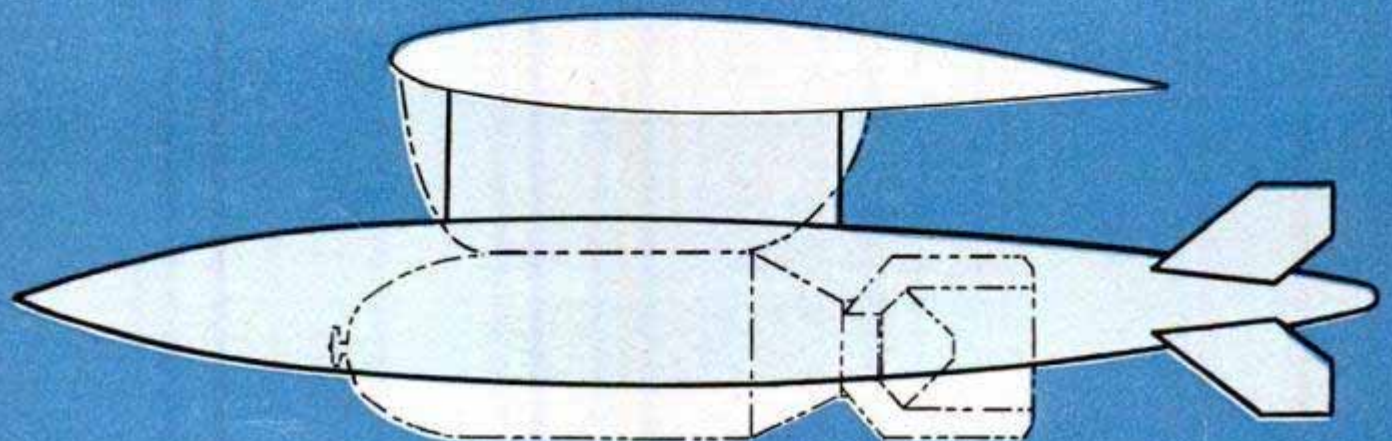
Some armament men point out the need to reshape the bomb cases themselves. They assert that it's stupid to drop stubby, old-fashioned bombs out of fast, modern aircraft. A streamlined and even needle-nosed bomb should fly truer, avoid any tumbling with the attendant risk of mid-air collision and detonation, and land closer to the mark. The bomb shapes we are using now are 25 years old and were designed for 200-mile-per-hour aircraft.

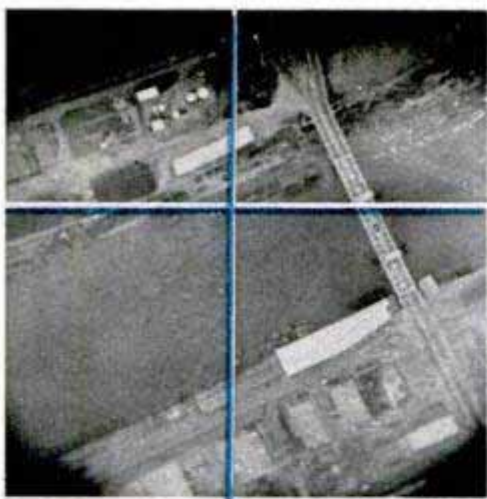
One company that has an answer is Douglas Aircraft. Engineers at their El Segundo, Calif., plant have created a streamlined shape that is fitted with large swept-back tail fins and that is stable and flies

true at speeds up to 1500 miles per hour. It was first used for external fuel tanks on the Douglas A2D Skyshark, built for the Navy, and is entirely suitable as a case for bombs, rockets, torpedoes, depth charges and other external stores that are carried under a wing or that are released from a bomb bay. About 30 miles an hour greater speed could be made by another Douglas aircraft, the Skyraider, if the pair of 2000-pound bombs that it carries under its wing on some missions were simply reshaped to the new design.

As a matter of fact, the whole idea of a bomb bay is out of date. A bombing aircraft would have greater range with the same load if the bomb bay were eliminated and if streamlined bombs were carried under the wing or fuselage. Not only would the aircraft be aerodynamically cleaner, its cost would be reduced by about six percent. External bombs would create a little more drag on the way to the target, to be sure, but this would be more than offset by the decreased drag after they were

Substituting streamlined bomb shapes for the typical stubby ones now carried under the wing and fuselage, as indicated by broken lines, would reduce drag enough to give some jets 40 miles an hour greater speed





Cross hairs, above, show radar bombing of bridge, from altitude of 20,000 feet, was a clean miss—460 feet away



dropped. The net result would be a greater striking range.

One of the newest instruments that helps the jet bombardier do his job is a radar set which can be described as a bombsight that looks down through clouds or darkness. This AN-APQ-23 instrument is also a valuable navigation aid. It is a complicated mass of electronic equipment that spreads over several parts of the aircraft. It operates in part on the principle of the World War II Norden bombsight, still the best in the world for visual bombing.

The bombardier feeds information into his radar controls similar to the way he adjusted his Norden to compensate for ground speed, altitude, time of fall of the bomb, expected wind effect and other data. He sets up the one point in space at which the bomb must be dropped to score a hit, and then carefully watches the picture that appears on his radarscope, ready to make adjustments if the cross hairs stray away from the target. The bombs drop automatically when the release point is reached.

Scanner, or antenna, of radar that allows bombardier to watch ground through either clouds or darkness



The 1037 students first attain proficiency in visual bombing before learning to operate the radar bombsight. One training aid is a wheeled vehicle built to duplicate a bombardier's compartment which can be maneuvered in front of a large white panel on the floor of a darkened room.

A motion picture of the ground is projected onto the panel so that the bombardier seems to see, spread out in front of him, the cities, rivers and other landmarks that he would see from a plane. He positions his compartment on the correct bombing run and then uses his Norden to hit a particular target when it moves into place before him. An automatic scoring device tells him how close he comes on each simulated bomb run.

Graduating to the radar bombsight, the student "flies" simulated radar missions in another classroom. Here with a so-called supersonic trainer, the student is required to guide himself to the target and bomb it by radar alone.

(Continued to page 246)

Using the supersonic trainer, a student simulates a mission of bombing and navigating entirely by radar





Jack-in-Bumper

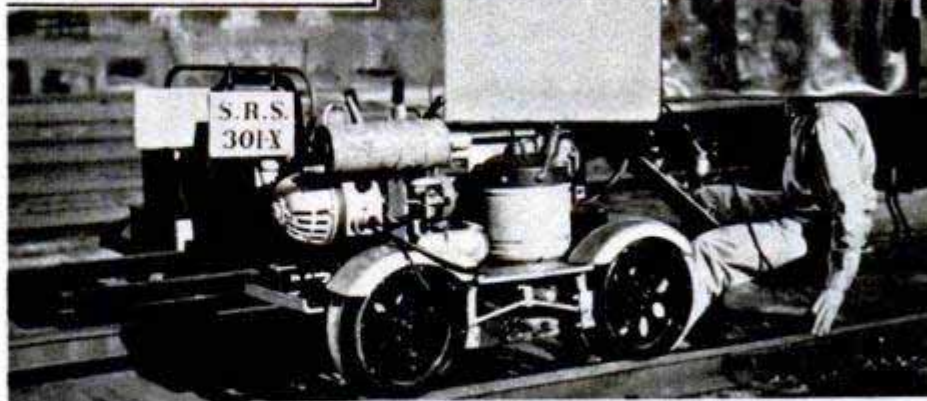
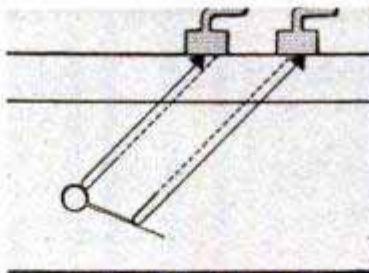
Wheel jacks are hidden inside the bumper guards of one new German car. The jacks, developed by a Berlin inventor, are built into each of the four bumper guards. The motorist merely turns a crank in the bumper guard nearest the wheel he wishes to raise. All four wheels can be lifted if necessary.

Flying "Raincoats"

"Raincoats" to protect the plastic radomes on jet planes are being tested by the Air Force. While flying 400 or more miles an hour the rain hit has an eroding effect on plastic. One of the best possibilities is neoprene, a synthetic rubber made by Du Pont, that can be sprayed on as a coating 10 to 12 thousandths of an inch thick. The radomes house radar equipment and cannot be made of metal because metal blocks the radar signal.

Silent Sound Spots Flaws in Rails

Cracks and defects hidden by joint bars on railroad tracks are spotted quickly and accurately by ultrasonic detection. A quartz crystal vibrates at a frequency ranging between $\frac{1}{2}$ million and 10 million cycles per second, sending these vibrations into the metal of the rail. When these vibrations, which travel across the metal much as light travels across space, strike the opposite side of the track they are reflected back to the instrument. If there's a break in the metal, such as a crack or flaw, the vibrations bounce back more quickly. By watching the cathode-ray screen on which the "pips" of the reflected sound waves are seen, the operator spots defective rail joints. The new system,



Sperry Rail Service, Sperry Products, Inc., Danbury, Conn.

Rail defects show up on cathode-ray screen under hood. Sound waves are reflected by bolt-hole crack, top, making twin "pips" on circular screen

mounted on a powered car, cuts down inspection time considerably because it permits inspection of the rail joints without removal of the joint bars.

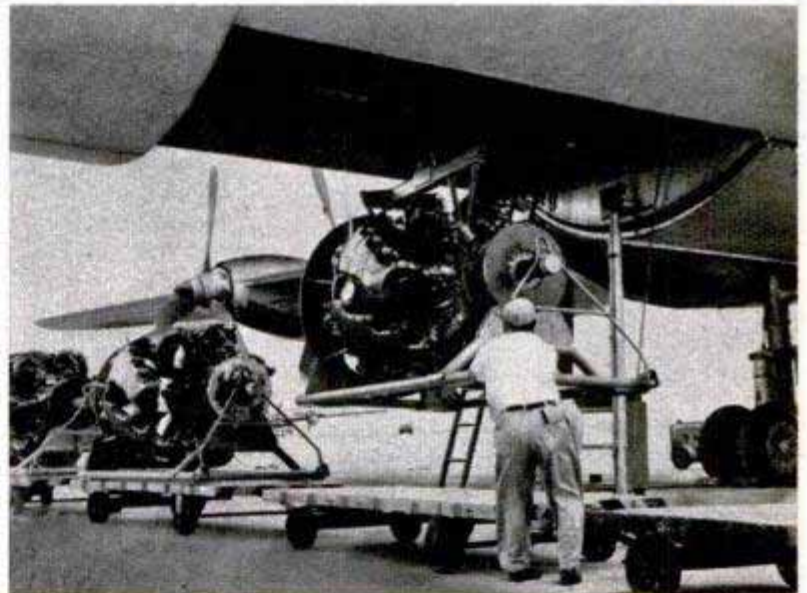


Cargo Model of B-36 Sets Tonnage Record

In one mission, an XC-99 has flown a record 200,000 ton-miles of cargo that would formerly have required 20 C-47s, the twin-engine "work horses" of the last war. A ton-mile is one ton flown one mile. The load, consisting mainly of 42 airplane engines weighing 2300 pounds each, was hauled from San Antonio, Tex., to Spokane and Tacoma, Wash., to Sacramento, Calif., then back to San Antonio, nearly 4000 miles. The XC-99 is Consolidated Aircraft's military-transport version of the B-36. The double-decked freighter has a 230-foot wingspan and is 182 feet long.

Surrounded by some of the cargo hauled on her record flight is the XC-99. The plane's gross weight at take-off was over 300,000 pounds. Below, some of the 42 engines being unloaded

U. S. Air Force photos



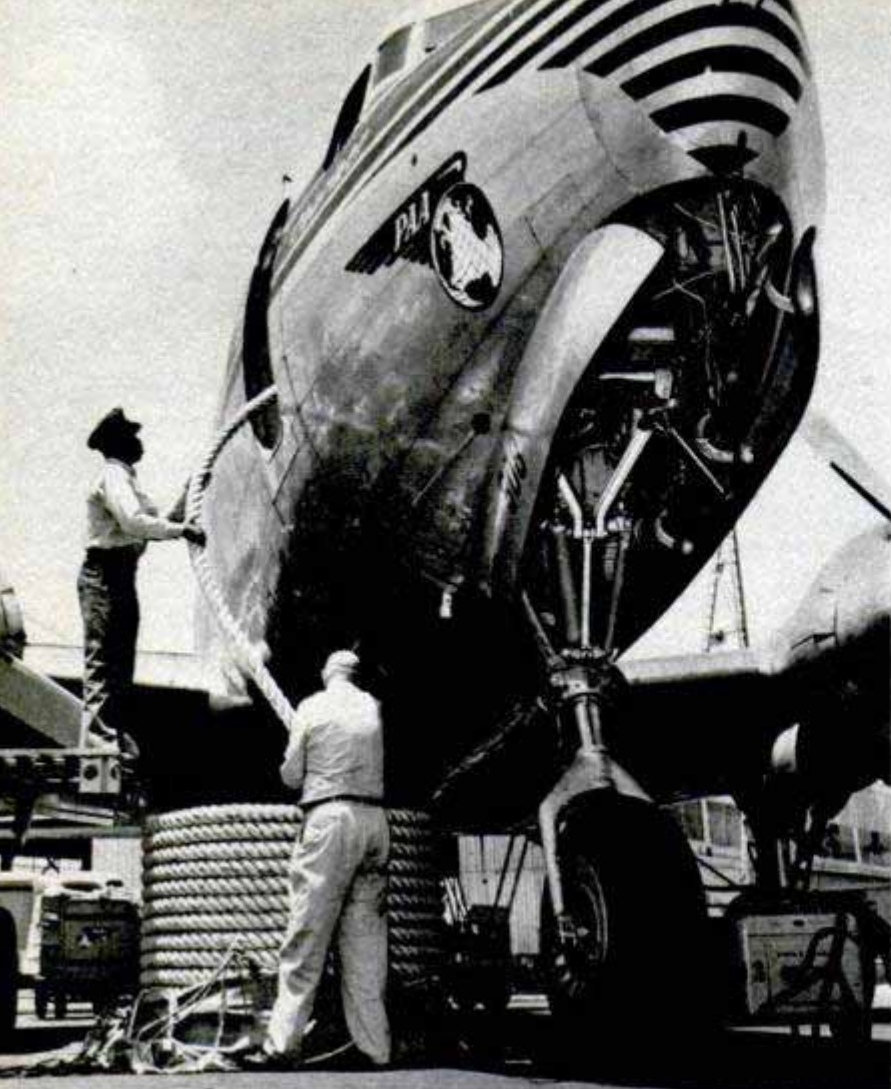
U. S. Navy photo

Alertness Indicator

Electronic pickups, strapped to the head of a test subject, relay a running tabulation of the individual's degree of alertness. Designed for Navy research into monotonous tasks of long duration, it has already been tried in aircraft and trucks and will soon be tested aboard a submarine. The indicator flashes a warning when the alertness level falls dangerously low.

"No Hands" Helicopters

Easing the helicopter pilot's constant two-hands and two-feet job, automatic controls have proved successful for both flying and hovering rotary-wing craft. Vertical landings and take-offs were made during the Piasecki Helicopter Corp., Morton, Pa., experiments, as well as automatic landing approaches through low ceilings.



CAPTAINS Quentin "Q-Ball" Pearson and Bill Nash hauled their big C-46 off the runway with a shattering roar. From the control tower at Maiquetia, serving Venezuela's capital city of Caracas, operators watched the pointed nose and deep bulging belly of the ship's fuselage shimmer as it caught the red rays of a rising tropical sun, giving her the mean look of a tiger shark against the coastal mountains.

In that belly was a fortune—in perishable orchids. Unless the dispatcher at San Juan or Miami crackled in over the radio at one of the plane's scheduled check points across the Caribbean and diverted the flight to some forgotten jungle strip to pick up a load of bananas, mine machinery, horses, monkeys, anteaters or gold dust, the fresh orchids would be in Miami by midafternoon. In any case, they'd be there in 24 hours, fresh as when they left the orchid-grower's garden in Caracas, their stems stuck in tiny food-laden test tubes with sponge-rubber collars.

For Pearson, Nash and some 50 other pilots flying the 10-plane



"Tropical

Pan American's pioneer freighters roam the skies between two continents toting a weird assortment of cargo—orchids and anteaters, race horses and cars

*By
Richard F. Dempewolf*

Cargo loaders have their problems. Bulky coils of 3-inch hawser, above left, had to be uncoiled, then recoiled inside the plane



Because they can't stand heat, a shipment of 20 penguins crossing the equator had to be given ice-water baths at every stop



Crating costs and time were saved when 200,000 pounds of furniture were flown to Puerto Rico to equip a hotel opening there

fleet of Pan American World Airways' Latin American Cargo Division, nothing is surprising; orchids, automobiles or boa constrictors—they've carried them all.

Ten years ago, air freight was an interesting dream for emergency shipment of small parcels. Heavy international cargo was pure fantasy. In 1949, however, Pan Am's "tropical tramps" hauled 34 million pounds of international revenue cargo a total of 20 million ton-miles. If you think it was automatic, it wasn't.

In Miami, where most cargo funnels through, Capt. Vic Wright, chief of the Latin freight runs, and Gus Alfonso, cargo trouble shooter, continually cudgel their ingenuity for new cargo ideas and ways to handle it when they've got it. It's one thing to take a Havana shipment order for a stone crusher, pronounced too big for an ocean freighter to handle because of inadequate stevedore facilities (which they did) and quite another to fit it through an airplane cargo hatch and fly it to its destination (which they also did). Toughest problem of all, though, has been to ferret out and pick up return cargoes from dollar-short Latin America, so the planes don't make expensive deadhead trips home.

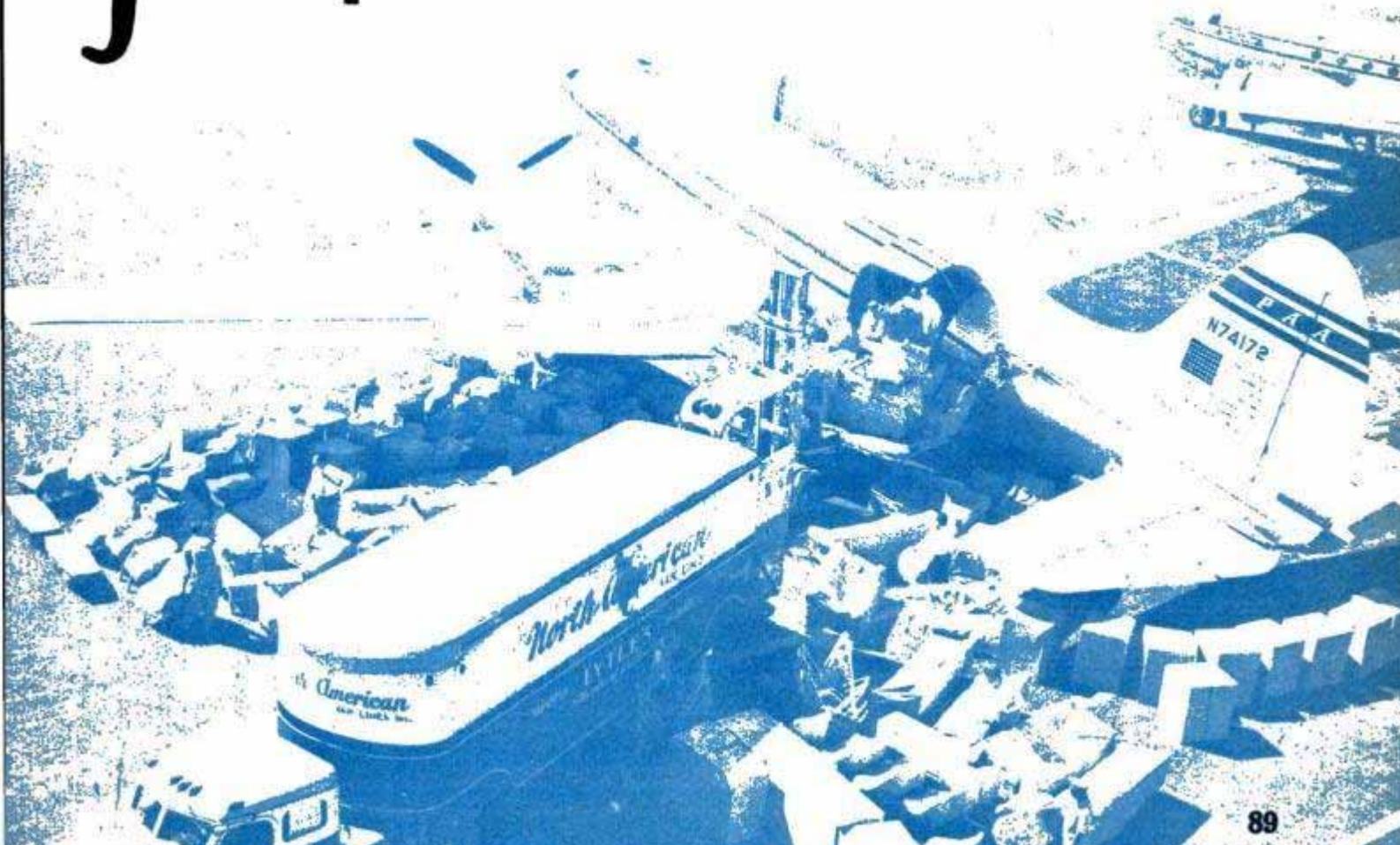
To turn this trick, Wright and Alfonso have set up the most glamorous, incredible "tramp" freight operation going. Here's how it works:



No desk-bound executive, Pan Am's Capt. Vic Wright follows the tough air-cargo problems the whole way

When Pearson and Nash lift their big Clipper from fields in Miami, New Orleans or Brownsville, Tex., they are on a scheduled hop. They'll be loaded to the astrodome with anything from the six-ton propeller shaft that was rushed to a stranded ship in Panama, to cigarettes, clothes, furniture, or the 210,000 false teeth recently shipped

Tramps" Link the Americas





Before orchids are put in tissue and boxed, below, their stems are inserted in tubes of liquid plant food, left. A sponge-rubber collar clasps the stem without pressure and seals the tube top



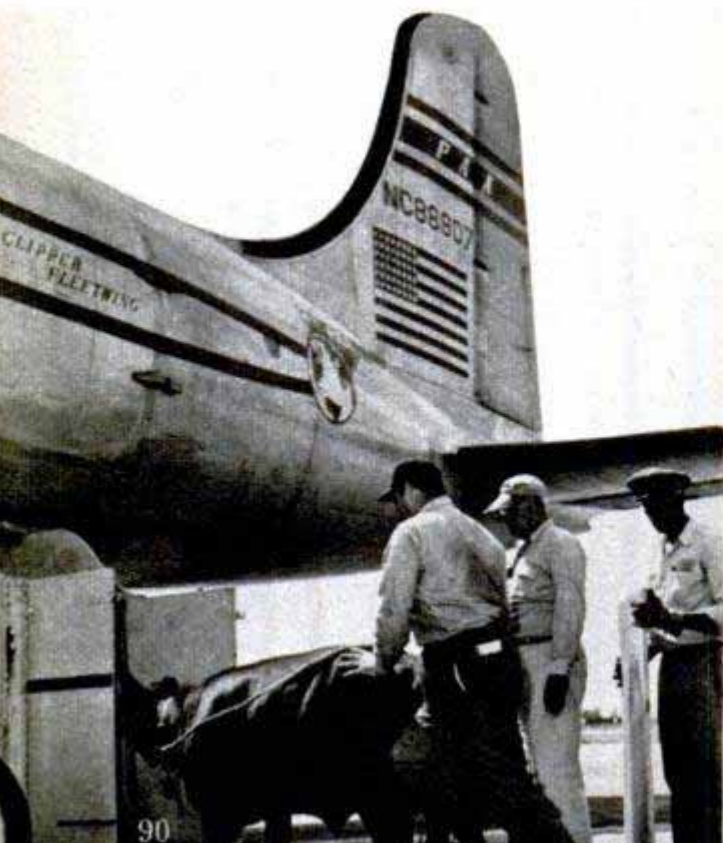
to an optimistic wholesaler in Brazil. Down they go over a scheduled course, dropping and picking up cargoes in Cuba, Puerto Rico, Trinidad and Caracas.

Once delivery is made, though, Pearson's plane disappears from Pan Am's roster of scheduled flights. He becomes a roving tramp of the airways, dropping in on palm-lined jungle-town air strips to pick up catch-as-catch-can cargoes for return to the States—gold and diamonds from the Guianas, race horses from Argentina, coffee from Brazil, bananas from almost anywhere.

Secret of the operation is a complex communications setup between cargo agents and the planes in flight—known simply as "O-X". At a huge nerve center in Miami, Teletypes are clacking an incessant barrage of cargo tip-offs from Pan Am agents throughout Latin America. If the agent in Bolivar, Venezuela, for instance, has unearthed a shipment of diamonds from the interior, he immediately radios Miami.

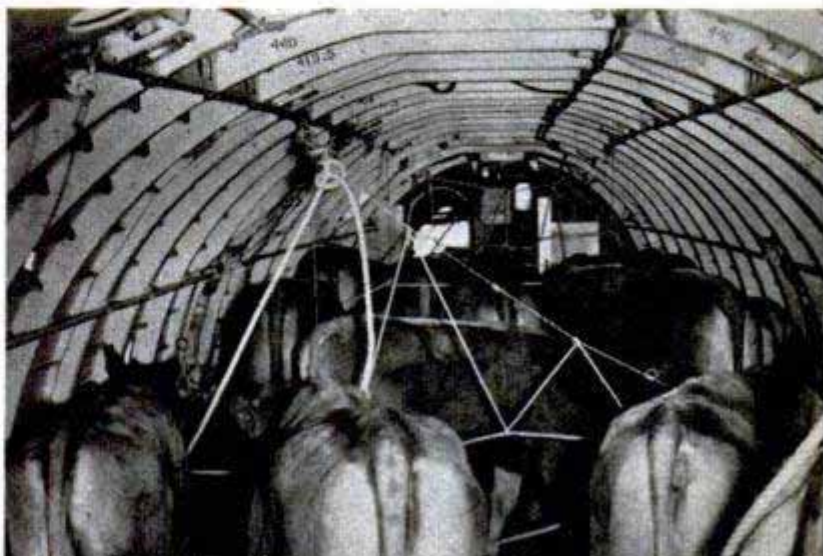
Pearson, meanwhile, has made his last delivery and is homeward bound. But everyone knows exactly where he is. At designated check points (there are eight between Caracas and Miami) he goes out over two-way radio to the nearest Pan Am radio center. Between Caracas and Cuba, his man is in San Juan.

From the clattering Teletype room the cargo message is rushed to operations, where a radio operator sits before a board with cards



Cattle ride easily on cargo Clippers, but coaxing them on board, left, sometimes develops into a difficult problem

Ropes between them and across their rumps are enough to keep cattle from bumping each other and getting excited



in sliding tracks. Each card represents a freighter in the sky at a specific check point—radioed to the Miami board by operators who have been in regular voice contact with the freighter pilots.

A glance at the board and near-by map tells Miami that Pearson's flight is closest to Bolivar. The O-X cargo message is immediately whipped to the San Juan radio operator, who will be talking with Pearson shortly. Within half an hour, Pearson, winging over the Caribbean, gets the news that he's been diverted, must return to Maiquetia for fuel and head for Bolivar to pick up a cargo.

Because there's no telling where or how often a plane will be diverted, the tropical tramps carry two or three pilots who will relieve each other along the way, so that no one exceeds the eight flying hours a day allotted by the Civil Aeronautics Administration. Though it's often rough going, these khaki-clad men wouldn't swap seats with "plush seat" passenger pilots. "We graduated from the plush runs," says Nash. "This is informal. We get more time at home after long hauls. Furthermore, we never know what's coming next."

Besides knowing how to fly, a freight pilot has plenty to think about. On a single round trip he may have to convert his plane from a box car to a cattle car to a fruit wagon to a refrigerator car, in order to accommodate the cargo of the moment.

One typical run left Miami recently with two pilots and 12,000 pounds of brassieres, cigarettes, electrical equipment, stoves, refrigerators, etc., for Caracas. Cargo delivered, they ferried to Trujillo where they picked up a load of wild animals. They were on their way home when O-X cut in:

"Go to San Juan for rush shipment," it said.

Around they turned, rigged up a stall and picked up a race horse. Then they were ordered to Buenos Aires to pick up seven more race horses. Wild animals and race



Map showing south-bound scheduled paths of Pan American Clippers. On way back they hit any point that has a northbound cargo, such as bananas, diamonds

horses delivered, they got another O-X to pick up a load of bananas in Colombia. So they stowed the stalls, scrubbed down the plane, and it became a fruit carrier back to Miami.

Good cargo pilots keep their ears open for business, and have authority to use initiative and judgment to carry anything anywhere. They've got to know customs forms, import licenses as well as cargo loading, stowing and unloading.

The technique of flying a loaded cargo plane has its own particular brand of hazard. Shifting cargo can break up the structure of a plane. In bumpy weather, one loose, heavy carton will knock more loose.

In their cardboard "apartment houses," a load of baby chicks moves up to the plane on a conveyor tractor





Like a waiter carrying a tray, the fork-lift truck moves a furniture shipment to a waiting cargo craft, where it'll be hoisted to the exact height of the loading hatch. Below, their speed and smooth riding make cargo airplanes popular carriers for animals like this husky alligator

If enough weight shifts to the tail, the pilot will stall out and go into a flat spin. "It happened in transport during the war," says Nash, "when men rushed to the tail for mattresses during take-off. The planes just nosed up and spun in. For a long time, no one knew why until finally one man survived a wreck and told authorities."

Of all cargoes, animals give the boys the most fun—and problems. Despite all precautions, they'll sometimes get loose. "Like the time," recalls Nash, "when we had a plane full of monkeys, birds and snakes. A boa constrictor in the belly compartment got out. We just locked the hatch, gave it the run of the plane, and let the woman trainer in Miami go in after it."

Even more staggering was the load of 300 monkeys coming in from South America in cages. One got out, unbeknownst to the crew. Then a dozen were loose, and were helping their friends out. In ten



minutes, the whole plane was a screaming bedlam of loose monkeys. The crew locked themselves in the cabin in self protection. "When the plane arrived," says a man who saw it, "there were monkey faces peering from every window watching the landing. It took the ground crew an hour to catch and cage them."

Horses are standard cargo to and from the race tracks and breeding farms between the Americas. They used to go in heavily padded wooden box stalls, into which they were marched from their vans, and hoisted aboard on a fork lift. Some race horses still go this way, if the shipper insists. "But we found out," says Nash, "that such elaborate equipment isn't necessary. As long as they don't have to look at each other, they'll behave." Now, most big livestock goes in canvas stalls. It's safe, keeps them from nipping each other and gives them a confined feeling. Furthermore, it cuts weight and saves the shipper money. The overhead is padded so highstrung steeds don't bash their heads when they toss.

Occasionally, a problem lands right in the skipper's lap. One plane load of 17 Holstein-Friesian cattle going from Toronto to Montevideo required watering at every stop. On the take-off at Belem, the plane staggered down the runway and the pilot barely got it off. He couldn't understand how the load got so heavy, until he did some paper work and found the cattle had taken

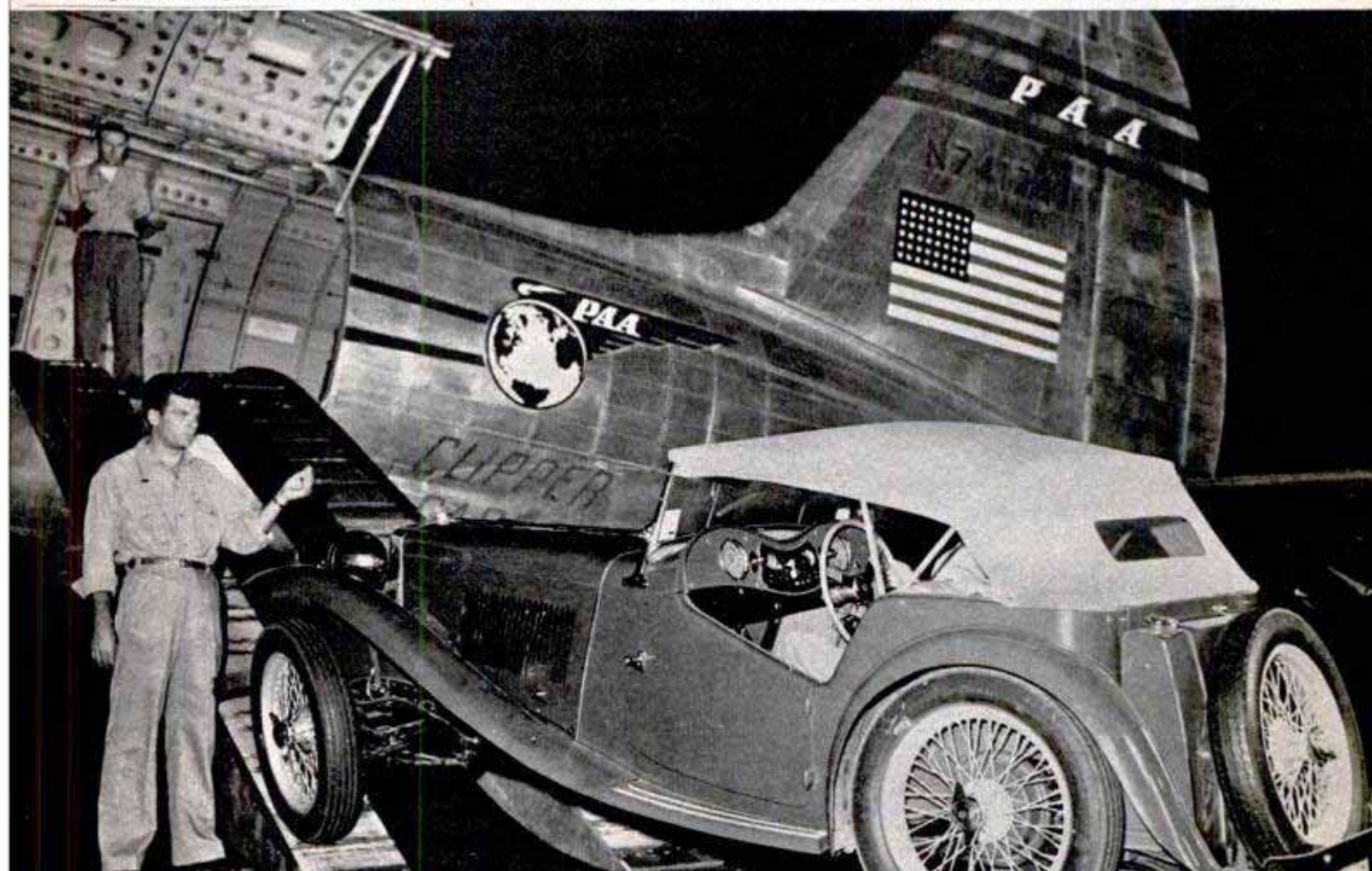


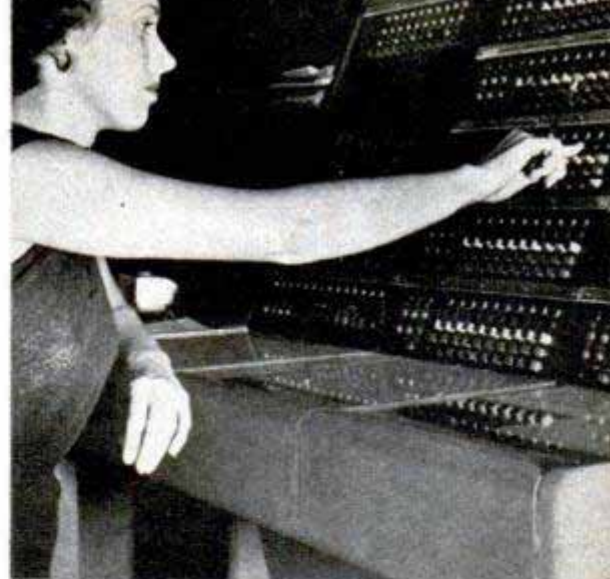
Only chicken wire prevented the escape of 10 macaws and five parrots who chewed their cartons to shreds

on several hundred gallons of water and quantities of feed—and all of it was still aboard! Since then, the straw and sawdust are changed at every stop.

Getting the animals on and off presents problems. It has taken 12 hours to coax a persnickety horse up or down a ramp. At the big Miami terminal, if they won't go

Special ramps that are easy to position have replaced fork lifts as the fastest method of loading automobiles





While the man at left checks schedule of an en-route craft, a co-worker finds its location on map. Right, the big switchboard at Pan Am's headquarters controls Teletypes handling orders from all over Latin America



up ramps, there's always the fork lift. But in the early days of air cargo, down in remote Latin airports, this wasn't always true. Sometimes there weren't even people around to help. "We finally got one horse off after dark at Maiquetia," recalls Nash. "Everything was shut by that time, but we found the door to the Post Office open, so left him there. I've often wondered what the postmaster thought next morning . . ."

Another pilot, who arrived at a jungle 'port after dusk with a cow to unload, found no one around—and no ramps, either. So he let the cow out on a 15-foot-high mobile-engine scaffold, which came just to the level of the hatch sill, and took off, leaving

(Continued to page 234)

At the operations desk, left, a man with a voice headset sends out orders diverting "tramp" freighters to new assignments. Cards in front of him represent C-46 planes and points from which they will next report in



Illustrating example in the story, diagram shows flight path and the sequence of orders when a Caracas-Miami bound plane got instructions in flight to switch back to Bolivar to pick up a shipment of diamonds

Snow-Cycle

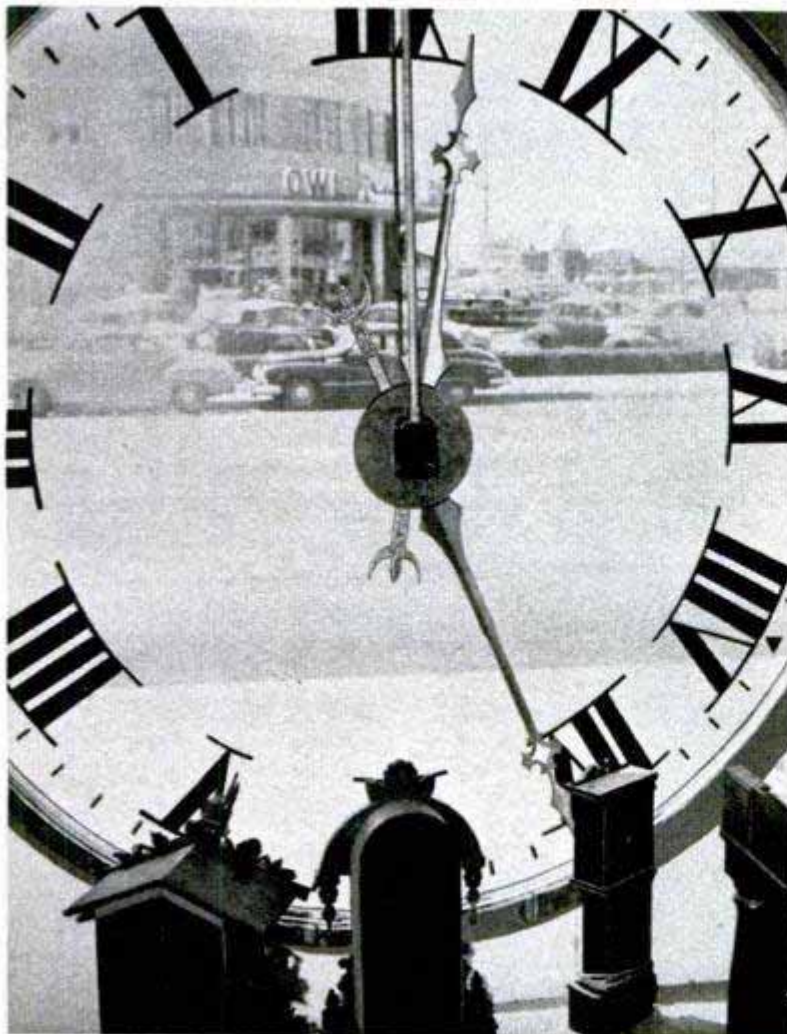
Roaring up the snow-covered mountain slopes of Bavaria is a unique snow-cycle. Invented by Dr. Fritz Riemerschmid, the little vehicle has a miniature tank-type track which spins beneath the chassis. The snow scooter is guided by two rudders which extend like outriggers along the sides.

Super-Smooth Elevators

Passengers hardly know when the car has stopped if an elevator is controlled by a super-smooth landing system that reduces travel time between floors. The new Westinghouse system permits cars to delay slowing down for a stop until they are only 20 inches from the floor. The car slows down so rapidly and smoothly that during the last half inch of travel it is moving only seven feet a minute—so slowly that passengers have difficulty detecting when the car has stopped. Another feature of the new system that speeds service is an automatic door opener that opens the doors simultaneous with the arrival of the elevator. By the time the elevator has stopped, the doors



are three-quarters open and passengers can move in and out immediately. Travel time between floors is cut $1\frac{1}{2}$ seconds which increases passenger-handling capacity by 10 percent.



Show Window Is Clock

You can look right through a huge clock into a store in Los Angeles because the clock face is the store's show window. Built as an attention-getter by the proprietor, a watchmaker, the giant clock is electrically operated. The dial is $6\frac{1}{2}$ feet in diameter but the works measure only $2\frac{1}{2}$ by 5 inches. Counterbalanced so they can be moved by the small motor, the $4\frac{1}{2}$ -foot hands weigh 3 pounds each, yet require almost no effort to turn them.

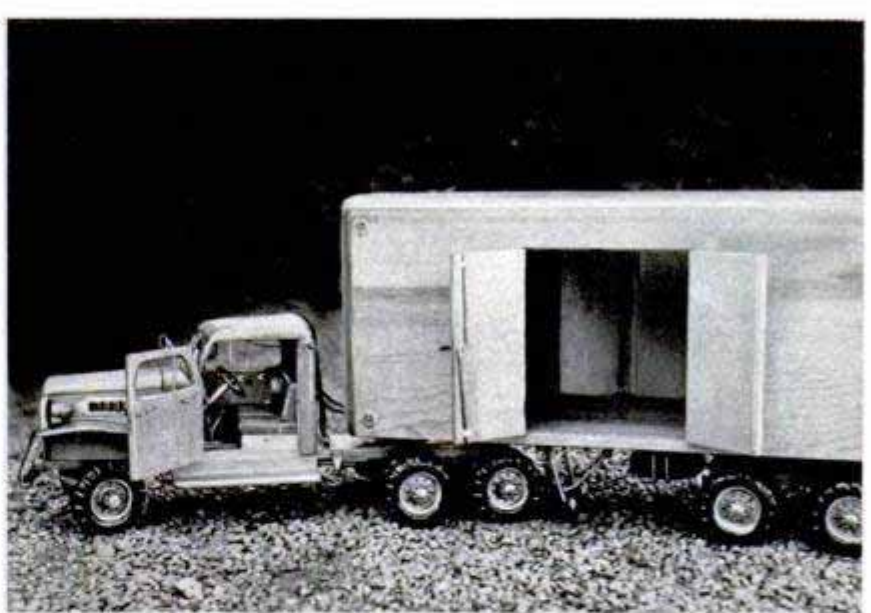
U. S. Has More Than Half Of World Crude-Oil Output

In contrast to the United States' 52 percent, Russia and her satellites have only eight percent of the world's crude-oil production, according to Dr. Gustav Egloff of the Universal Oil Products Company. The western nations control 75 percent of the ultimate reserves. Of the world's present refining capacity, the U. S. has 6.7 million barrels daily.

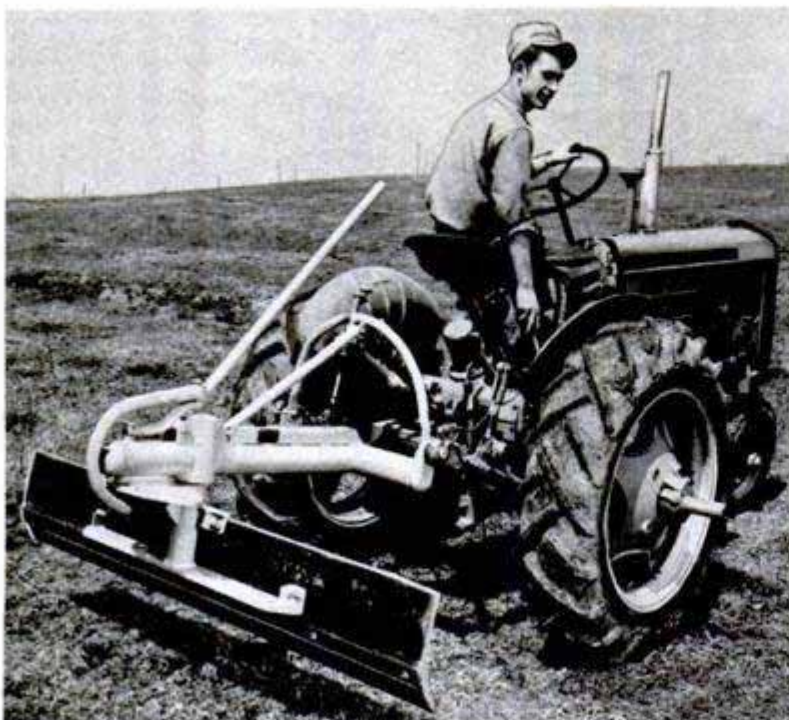
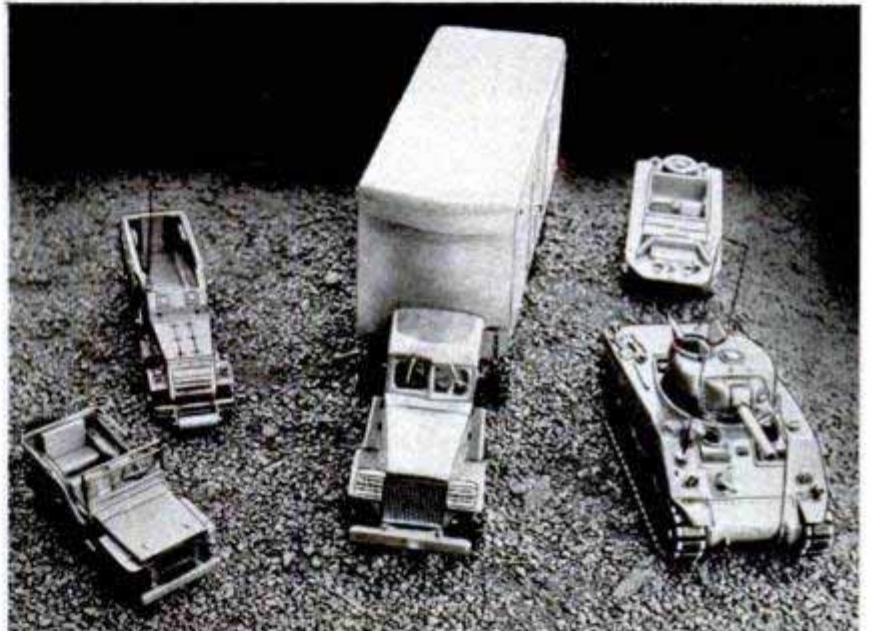


Army "Task Force" In Wood

After just one look at an Army vehicle, Leo Helmer of San Jose, Calif., can duplicate it in wood right down to the leaf springs and rivets. Helmer's battle fleet includes guns, Jeeps, radar trucks, tanks and tank destroyers. He spent 100 hours in building a radar truck alone. Its fittings include gears, brakes, a movable signal arm and wheels that are controlled by the steering wheel. Helmer bound tongue depressors together to form springs which will withstand 30 pounds of pressure. The fleet is made from pine scraps, welding rod and ten-cent store items.



Left, Helmer holds half-track tank destroyer made of sugar pine scraps. Above, into the radar truck went only \$2 worth of materials but 100 hours of work. Below is just part of realistic battle fleet



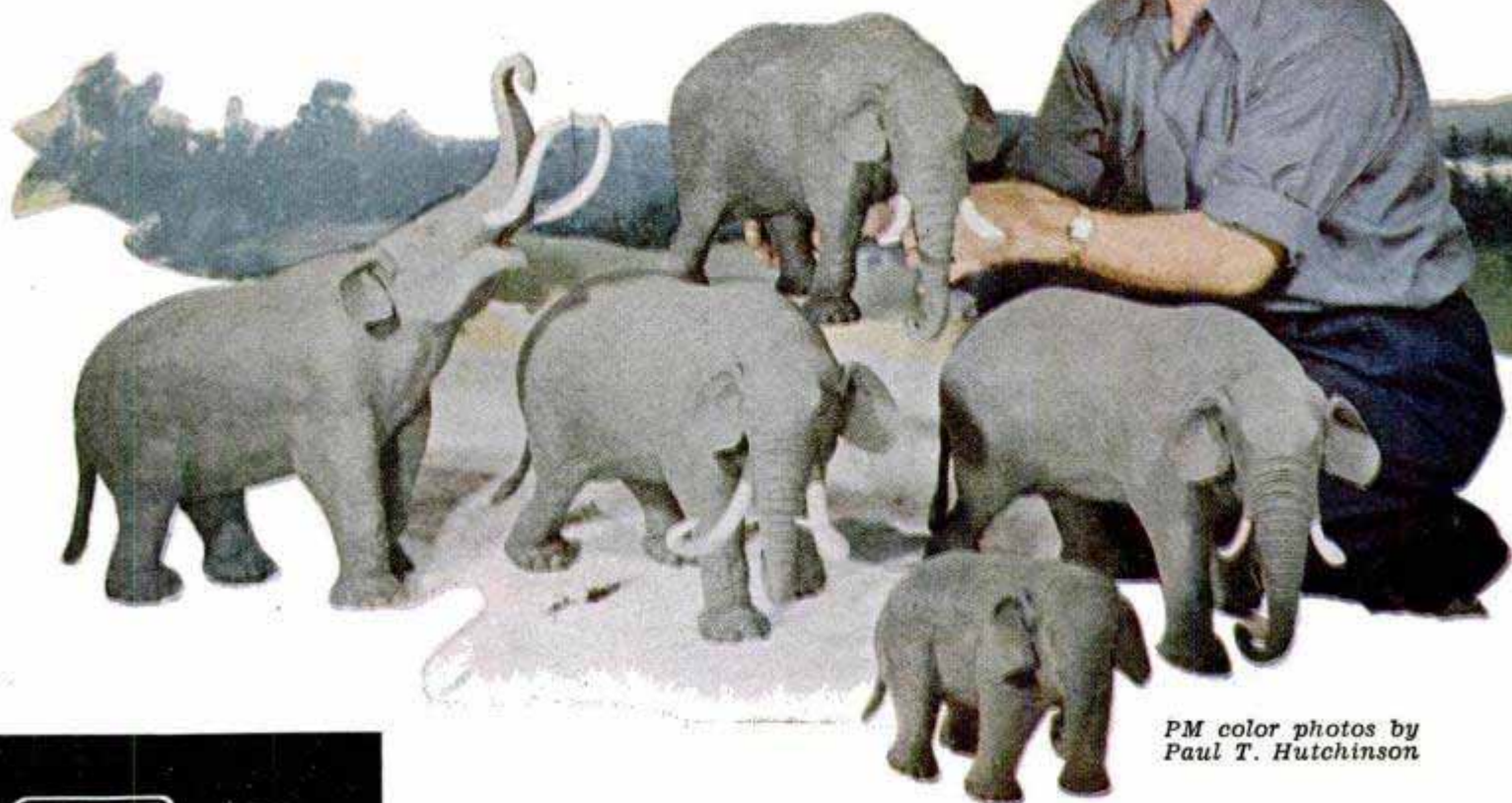
Danuser Machine Co., Fulton, Mo.

Bulldozer Blade For Farm Tractor

Hydraulically operated, a tandem-mounted blade converts a farm tractor into an earth-moving machine for terracing, ditching, grading, scraping and numerous other operations. Designed for one-man operation, the blade can be raised and lowered from the tractor seat. It swings in a full circle, can be shifted to the right or left, or given a half-turn for backfilling and bulldozing.

☐ Plane-to-plane refueling time is halved by a hydraulically operated pump that does the work of eight electric pumps now used by tanker aircraft and weighs 550 pounds less.

George Marchand is shown working on the large mastodon diorama that he made for the University of Michigan. It features a lighting system he developed that "paints" a realistic sunrise on the background



PM color photos by Paul T. Hutchinson



sculptor of a prehistoric world

TO MOST OF US, fossils are strange, uninteresting rocks with tongue-twisting names like *Michelinoceras* and *Terataspis*. But George Marchand, the artist of fossils, can "re-create" the world of millions of years ago, making models of fossils as fresh and beautiful as a Technicolor movie. Under his skilled hands, the dull, lifeless fossil has become the "glamor girl" of the museum.

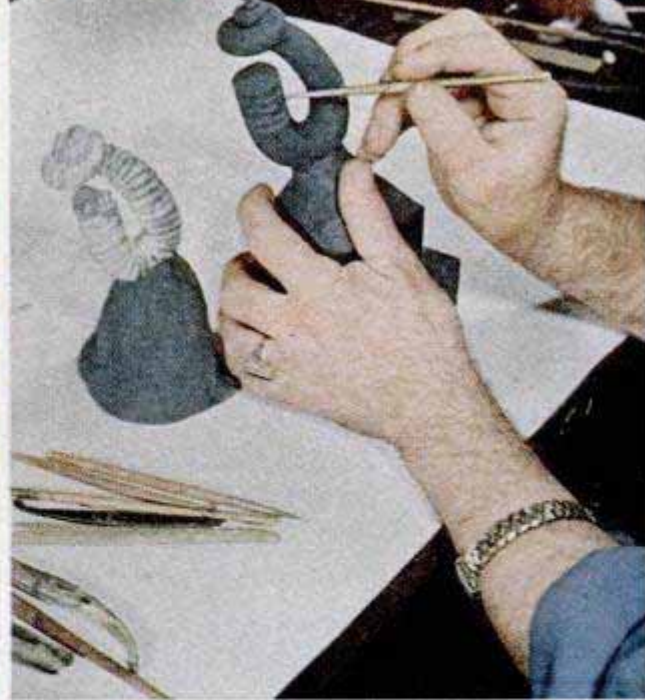
"Just because the fossil is dead and has been for many centuries," says Marchand, "is no reason for making the exhibit dull. We try to give the museum visitor an accurate picture of life as it was millions of years ago—and life is never dull."

Working with Irving G. Reimann, paleontologist at the University of Michigan, Marchand has turned out many dioramas of prehistoric life for the best known museums of the nation. Reimann does the research while Marchand converts the data

into plant and animal models with amazing realism.

Right now, these two experts are working on a series of 10 dioramas for the Chicago Natural History Museum. Each diorama shows life as it was during a different period of prehistoric time. These 10 exhibits represent more than three years of work and study, and when completed will provide a realistic view of life as it progressed from a period 300,000,000 years ago down to the comparative "yesterday" of a mere 75,000,000 years ago!

But the Chicago exhibits are only a few of the scores that Marchand has produced. He inherited his skill and interest in museum work from his father. Always on the search for new ideas in display methods, Marchand has brought many new techniques (some of which he guards with understandable secrecy) into the work and has become internationally known among



Left, Marchand makes a wax model of the coral fossil in foreground. Right, he shapes a fossil in clay

museum staffs. Universities like Harvard, Yale, Princeton and Michigan are customers of the fossil artist. Museums in Rochester and Buffalo, N. Y., Toronto and Chicago, to mention only a few, are proud to display his work. Despite what amounts to a seven-day week of work, it seems he can't keep ahead of orders for his displays.

In the construction of models of fossils and long-extinct creatures, Marchand and Reimann sometimes have to rely entirely on a few fragments found in fossil form. Often a mere imprint of the body in rock, preserved for millions of years, is the only clue available. But by drawing on a broad knowledge of paleontology, they are able

A coral reef of 350,000,000 years ago. Colors used are based on those of the fossils' modern relatives



to make accurate replicas of ancient life.

Marchand's techniques are varied. He uses rubber and wax for most of his models. Wire stiffeners are required for many of them. His best work is often in rubber, which he stains to any color desired. A talented painter as well as sculptor, he uses oils for most of his brush work. The backgrounds, painted on a curved backdrop, blend in so smoothly with the models in the foreground that the scene seems to stretch far, far into the distance. He produces an eerie, murky effect with his paints that heightens the underwater illusion in many dioramas.

Colleges find Marchand's rubber reproductions of small fossils excellent for classroom use. They can be handled without danger of breakage and eliminate the need for handling original specimens, which are sometimes fragile and often so rare as to be priceless.

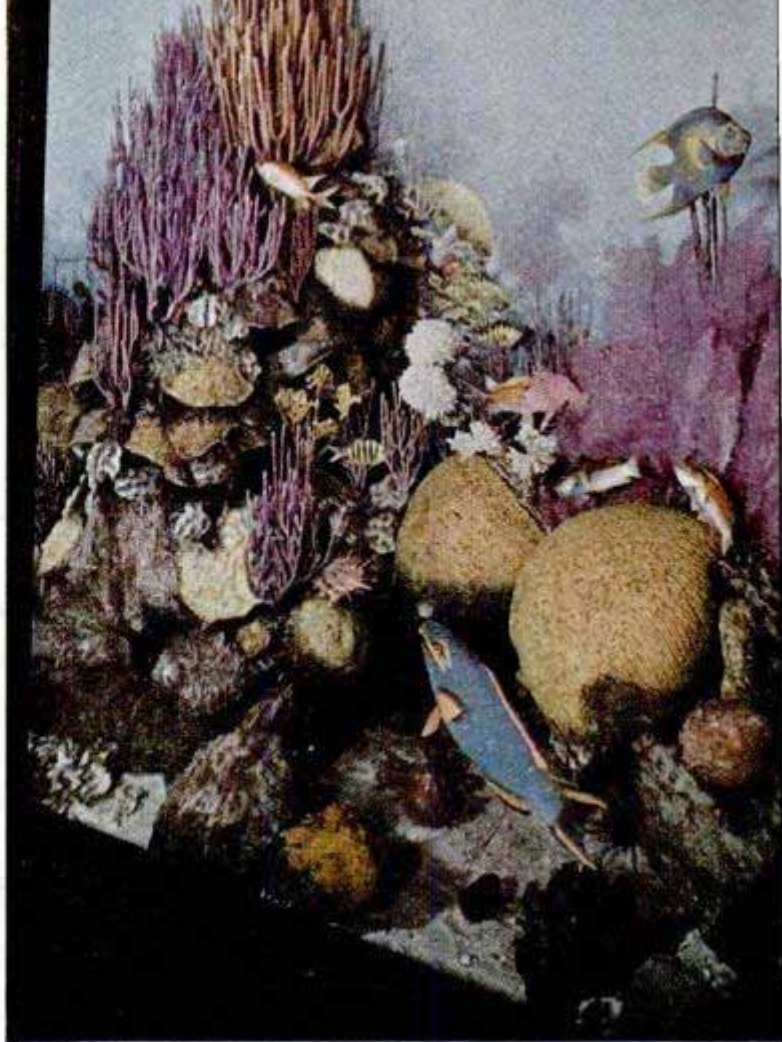
But it is in the diorama field where Marchand is at his best. He has given new life to the fossil-display techniques of museums. Not many years ago, the fossil display was just that—some lifeless rocks with hard-to-understand labels pinned under them. Today, in many museums, persons who don't know the difference between a Placenticas and a Silurian coral reef are attracted to Marchand's colorful displays which show, clearly and realistically, how the creatures that we know only by fossil remains lived millions of years ago. Museum directors of the nation know how important this interest is and are keeping Marchand busy with orders for his work.

Only on the subject of colors do Marchand and Reimann become slightly apologetic. There they admit they're guessing—there is no way to discover the colors of the original plants and animals. Fossils have no pigments, of course. So these two experts have carefully selected colors for their models after a study of the colors found today in the nearest known relatives of the fossils.

"We may be right or we may be wrong," explains Reimann. "But we do know that prehistoric creatures had color and we don't feel we should show them in dull monochrome. The colors we use are, we feel, reasonably close to what the plants and animals had long ago."

But not all of Marchand's work is with fossils. He has made many copies of modern plants and animals. A strict perfectionist, he challenges anybody to show him where his models are not true to life.

His test for quality is simple. He places one of his artificial flowers in a vase with several natural specimens. If anyone can tell which is Marchand's and which is Nature's without touching them, he considers



Above, Marchand went underwater to get the data for this modern coral-reef diorama. Below, this pair of rubber moccasin flowers is exactly like Nature's own





Reimann, paleontologist of the team, replaces a weird animal in this diorama of life 125,000,000 years ago

his work not satisfactory and rejects it.

One day he had a collection of his flowers on his workbench when a bee flew in through an open window. The bee headed straight for the flowers. After perching on the flowers for a few seconds the bee flew away in disgust. A friend who was visiting Marchand at the time was amazed.

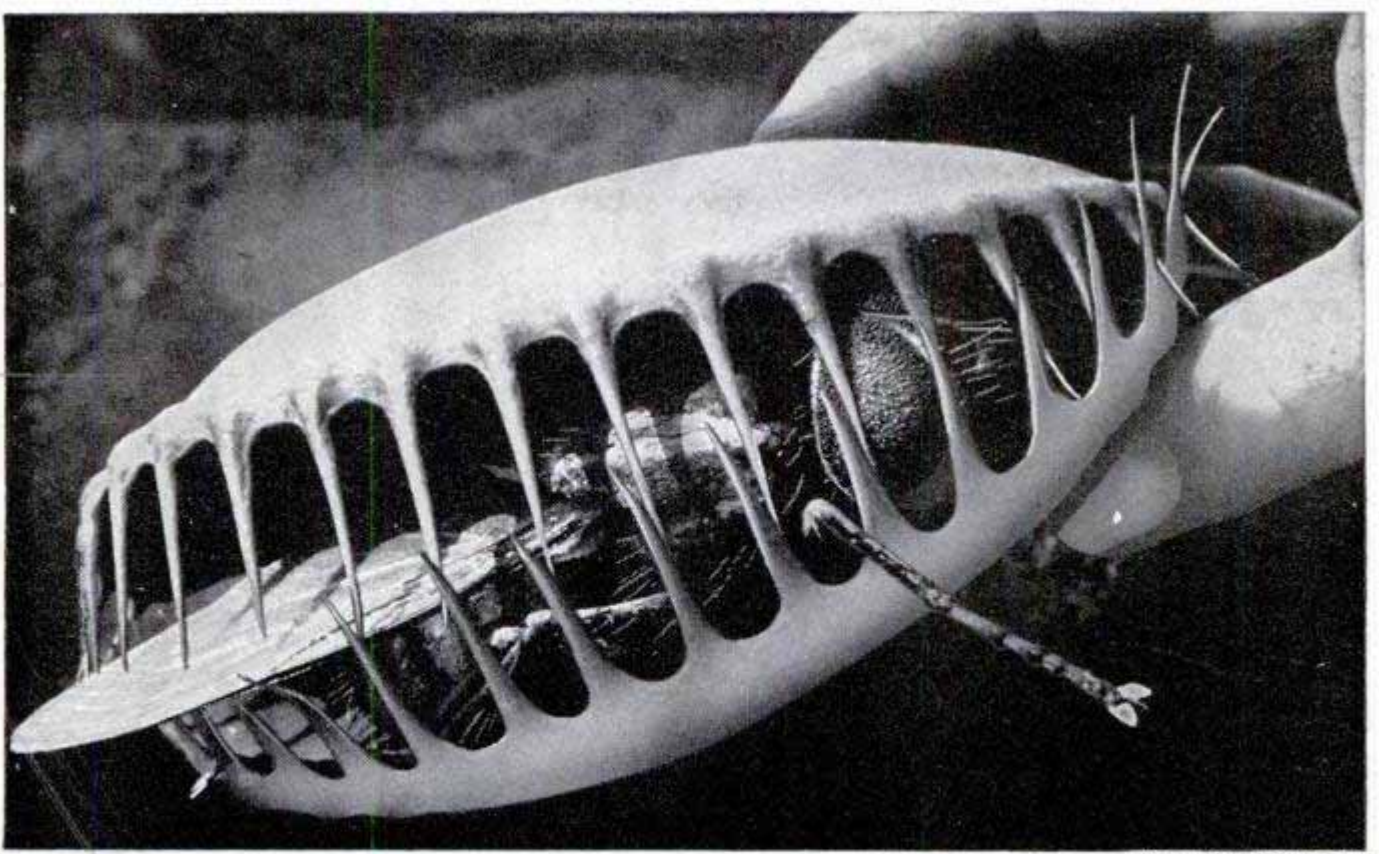
"I've seen everything now," he said. "When you can fool a bee with your flowers, you've reached perfection!"

Marchand admits that this was a lucky accident. He knows that bees are attracted as much by scent as by sight and that the bee was not really fooled. But it's a good story and it does illustrate the superb quality of his work.

In his striving for perfection, Marchand often goes to extremes. When he was commissioned to reproduce a modern coral reef, he decided that he'd better get a first-hand view of one. So he packed his bags

Left, these are rubber mushrooms. Those with the skull are poisonous. Right, painting the wax Placenticerias

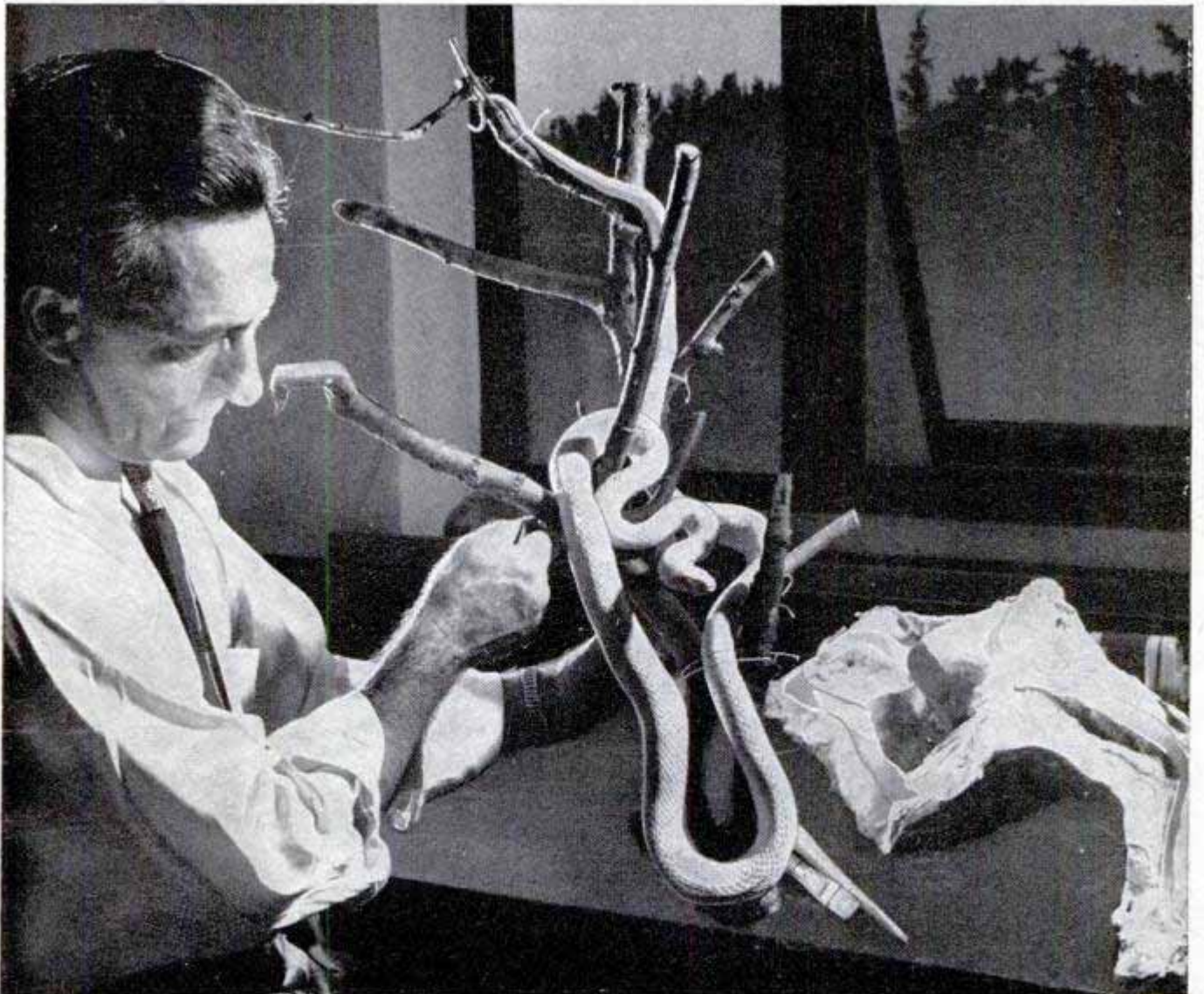




Photos by Alfred Eris

This enlarged model is of the Venus flytrap, a plant found in North Carolina. Note the details on the fly

Marchand works on a model of a snake that he cast in mold at right. A real snake was the pattern for the mold



and went to Bermuda. Donning a diving helmet, weighted belt and shoes, he went down to the bottom to see for himself. With oil paints and weighted brushes, he sketched the scene on a zinc "canvas" right there on the bottom.

"The sketch was nothing wonderful," he admits. "Painting underwater is mostly a matter of impressions. But I was able to take down enough of the scene so I could make an accurate coral-reef diorama."

That diorama is on display at the University Museum of the University of Michigan at Ann Arbor where visitors exclaim over its beauty.

Because Marchand's models are so natural in appearance, they are used frequently by photographic studios in New York and Chicago. Out-of-season fruits and flowers are a specialty with him. When a color photographer wants a wild flower in the middle of January, Marchand comes to his rescue.

In reproducing a flower, Marchand always starts with the original blossom. A plaster mold is made of each tiny filament, pistil and stamen. Then each part is cast in wax, celluloid or plastic. Delicate wax petals are reinforced with cotton fiber and hair-thin wires. The many parts are then assembled and colored to match the beauty of the original. Some "simple" flowers, such as daisies, require only 15 molds, but a milkweed, much more complex to reproduce, requires 45 different molds!

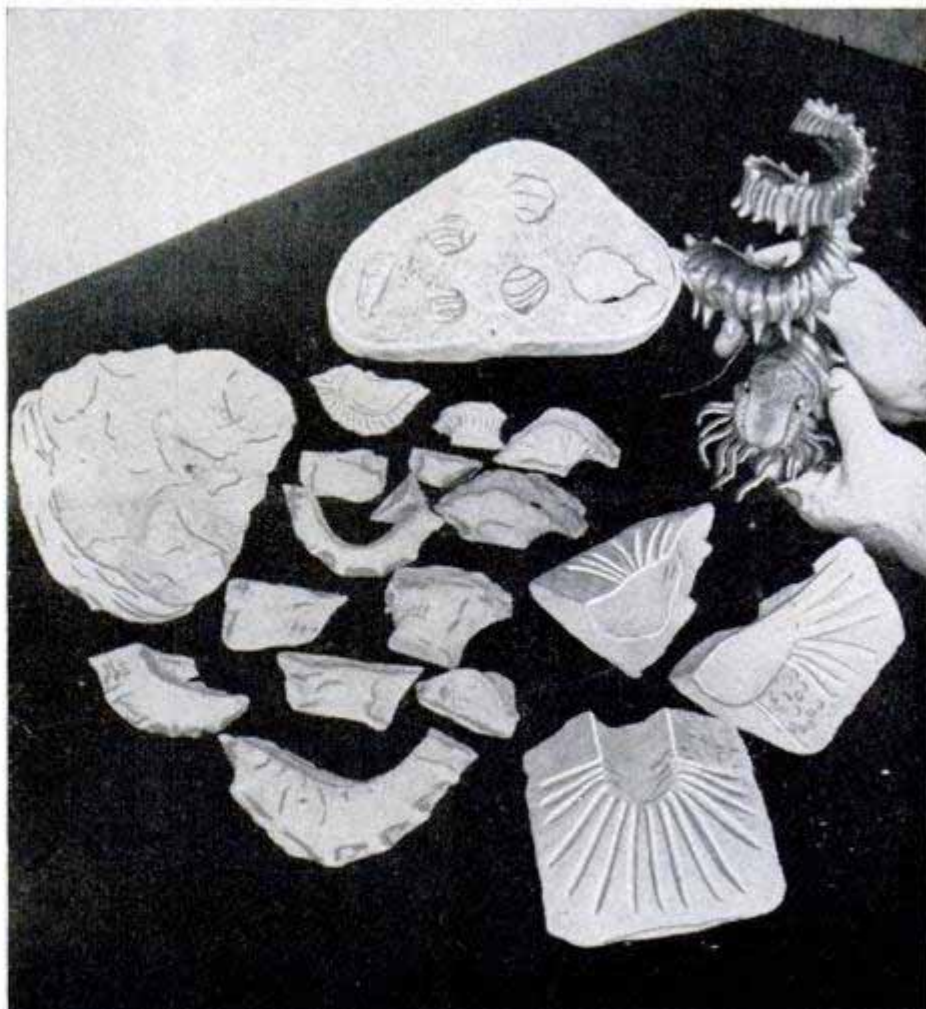
One valuable trick that Marchand discovered is an automatic method of enlarging molds. He pours the mold, using a liquid rubber. When the rubber

(Continued to page 234)



Photo by Alfred Eris

The two fossil experts look over a model of the *Terataspis*, which is a particular favorite of paleontologist Reimann. Below, the mold for this strange animal is made up of 26 pieces, some of which can be seen here





Detroit Listening Post

By Siler Freeman

THE ROUND of new-car introductions has now been completed by the manufacturers, with Chrysler and Oldsmobile the last to show their new lines. Chrysler's new engine was the big feature but the lack of large production will restrict it to the two highest-priced models at first. The schedules on the high-powered V-8 are set to go as high as 80 an hour but it will be some time before that is reached.

Buick's emphasis on the Special indicates that it is after the big market which it bracketed last year. The new body in that series, plus the higher-powered engine which it took on this year, should make it a big seller.

From an over-all viewpoint of the 1951 models, the trend toward a better ride seems to be the all-important feature in all lines and makes. Springing is emphasized and the Chrysler-made cars go even further than this in the new shock-absorber system.

Oldsmobile has changed from coil springs in the rear to leaf springs. This was brought about as much by cost considerations as by a better ride claimed for the flat springs. Buick, however, retains the coil springing in the rear, as does Nash. All the rest have gotten away from it in favor of the flat leaves.

Some high officials of automotive companies look for continued production of cars and trucks throughout the year. Some will only estimate it at "most of the year." But predictions of a goodly output the first six months and slightly more than a trickle afterward have now been modified by a "30 to 33½ percent reduction from the 1950 rate" and spread over the year. Only an all-out war, which few can foresee, would change this estimate.

As for the retail end of the business, the dealers are pictured by most of the factories as starting a new round which will lead to more of the prosperity which has made fortunes for most since the end of the last war. With schedules cut and new cars getting scarcer, both new and used-car merchants are enjoying a return of the seller's market.

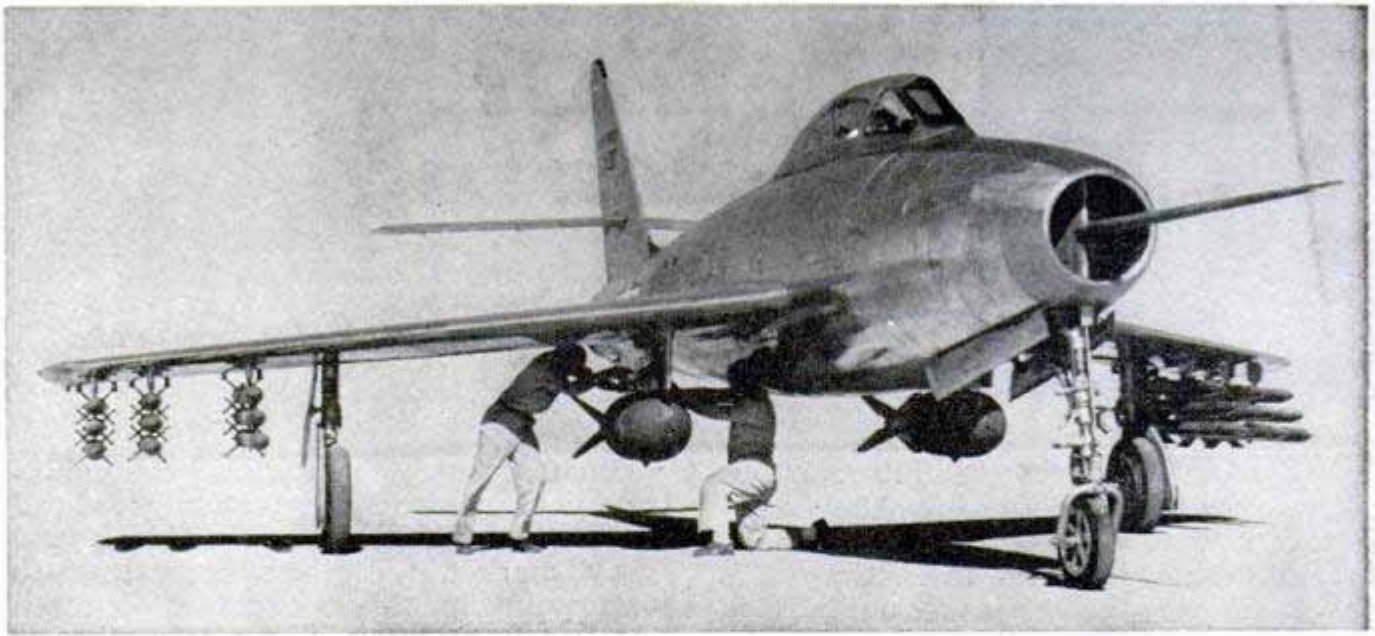
"Bootlegging," which stirred the industry a year ago when production got ahead of sales, is now replaced by the "black" and "gray" market. With the spring sales rush just coming in, this is expected to reach its peak. Scare buying was noticeable as long as a month ago and the profits of the dealers may climb to new heights.

The reduction in the number of cars and trucks to be made this year for civilian use has focused attention on the service side of the business. With the larger number of cars now in the field, this would be profitable except for the manpower problem which the dealers are already facing. Those in areas where airplane contracts have been placed report raids on their ranks for skilled mechanics. Many have been forced to boost wages to retain their staffs of workmen and bring back some of the over-age mechanics.

The parts problem is expected to get acute as defense programs cut into materials and production. It was a serious one in the last war, and dealer groups have been alerting Washington not to get into that fix again. They are said to have some sympathetic ears in the National Resources Board where ex-dealers have been put in key spots. Meanwhile, the expected "black-outs" of the new models are already showing up. One manufacturer has been shipping cars with veneered bumpers. A tangle with the car in front or back results in disappearance of the gleam. The rims of headlights are already a thing of the past, and other bright work will be coming off more and more.

Some sales managers have been trying to figure how the more somber look of the cars will affect sales. With good production and a lot of the older cars, with chrome intact, this may become a problem, they admit.

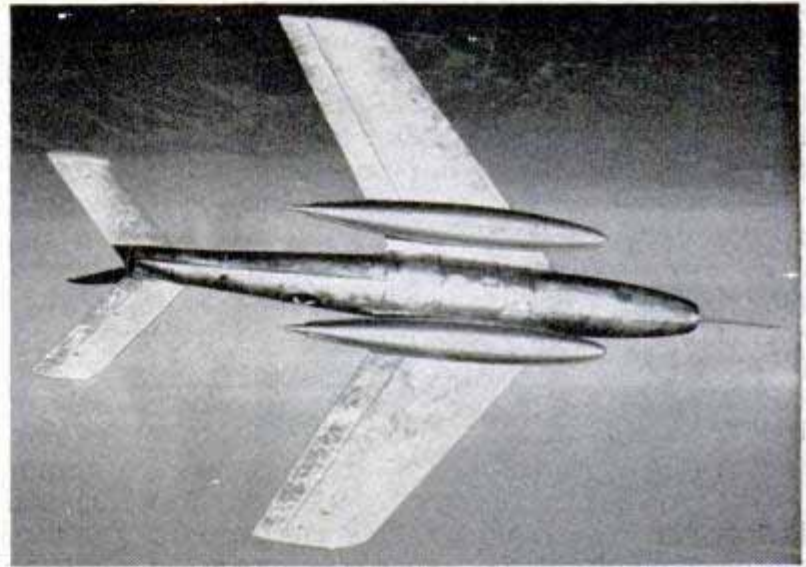
Substitutions are very much in order. Many parts now made of aluminum are being changed to cast iron. The Ford Company, which only last year changed from cast-iron pistons to aluminum, will probably soon go back to the old style, at a great cost.



Armorer's attaching a 1000-pound bomb beneath swept wing of new Thunderjet. Below, underside view of 450-gallon fuel tanks

Swept-Wing Thunderjet

Packing 24 five-inch rockets beneath its wings, a new swept-wing version of Republic's F-84 Thunderjet has a secret top speed estimated at well over 625 miles an hour. Depending on the mission, it can also carry either two 450-gallon underwing fuel tanks or two 100-pound bombs and 18 five-inch rockets. Its fixed armament consists of six 50-caliber machine guns. With external fuel tanks, the F-84F has a combat radius of over 1000 miles and a service ceiling above 45,000 feet. An earlier Thunderjet, the "E" model, has fought in Korea since December.



Allied Mfg. & Sales Co., 4700 Rice St., Chicago 51.

Hand-Operated Lift Truck

One man can lift, move and stack a 500-pound load easily with a hand truck that has a lever-operated hydraulic lift. Each stroke of the lever raises the lift more than an inch and it takes less than a minute to elevate the load to the maximum height of 54 inches. A foot pedal controls the lowering action which can be stopped instantly by releasing the pressure on the pedal.

Seaweed Indicator Aids Jet Tests

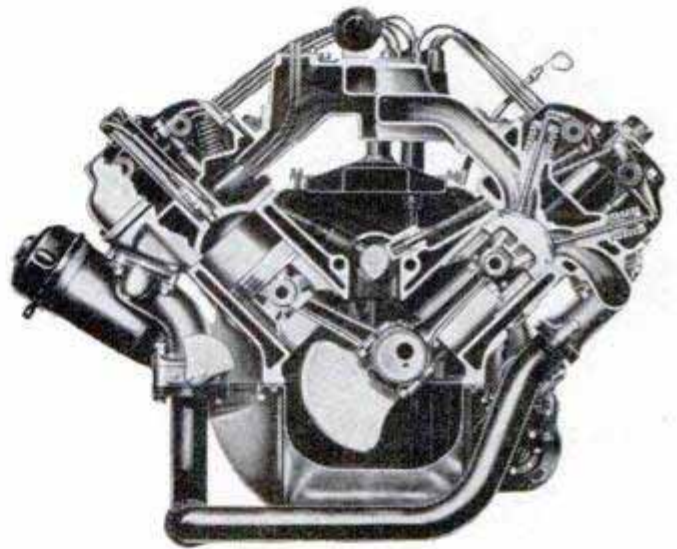
By detecting seaweed, a simple instrument in Lynn, Mass., is aiding in the testing of jet engines. When engines are under test, the laboratory uses 4,800,000 gallons of water per hour, drawn from a tidewater stream near by. This torrent of water carries seaweed which piles up on the inlets. Engineers have devised a seaweed indicator to solve the problem—lights flash on and bells ring when the inlet screen starts filling with underwater growth.



180-Hp. V-8 Engine For Big Chryslers

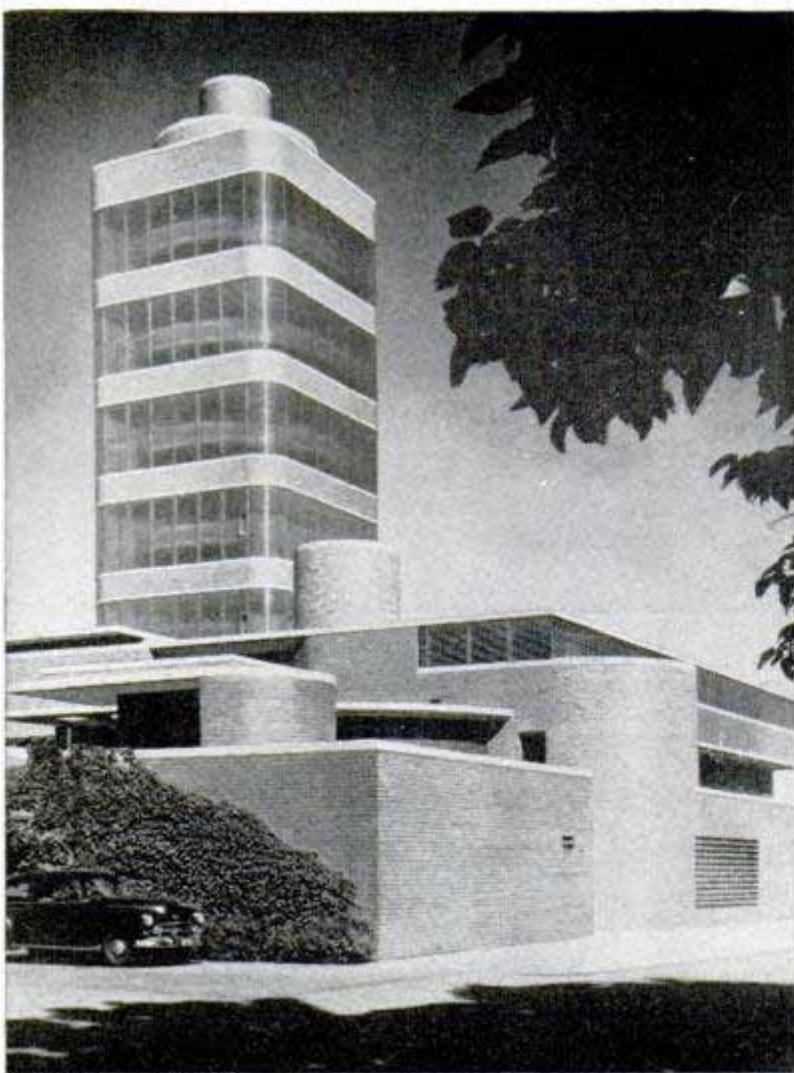
CHRYSLER has joined the growing list of automobile manufacturers who are using the torque-converter principle in an automatic transmission. Coupled with its new V-8 180-horsepower engine, Chrysler's 1951 line provides an unusual array of mechanical innovations. The Chrysler V-8 is the most powerful engine now in use on any mass-produced passenger car. It will be used at first only in the big New Yorker and Imperial models. The V-8 is the result of eight years of development. Its secret lies in the hemispherical combustion chamber, with overhead lateral-valve arrangement. The shape of the chamber is said to give better fuel utilization. The new engine has a compression ratio of 7.5 to 1 but uses regular fuel. Although it has only 2.3 percent more displacement than Chrysler's eight in-line engine, it develops 33 percent greater horsepower and 16 percent more torque. However, its weight is 8 percent under the former eight. Easy cold starts, smoother operation during warm-up period and improved hot starting are other features of the new engine. A newly developed heat-retainer plate permits the use of a more active thermostatic coil and also stores heat to allow the choke to cool down with the engine. Another feature of the new Chrysler line is power steering, another "first." The pressure of one finger and guidance with the thumb are all that is required to rotate the wheel with Hydra-guide power steering. Like the new engine, it is only available now on the Imperial and New Yorker models. Oriflow shock absorbers are another "first" on the 1951 Chrysler. This reduces driver fatigue and increases safety and comfort. For the first

The Chrysler '51 Imperial six-passenger sedan presents a lower silhouette and improved rear visibility. Below, cutaway of the new 180-hp. V-8 engine



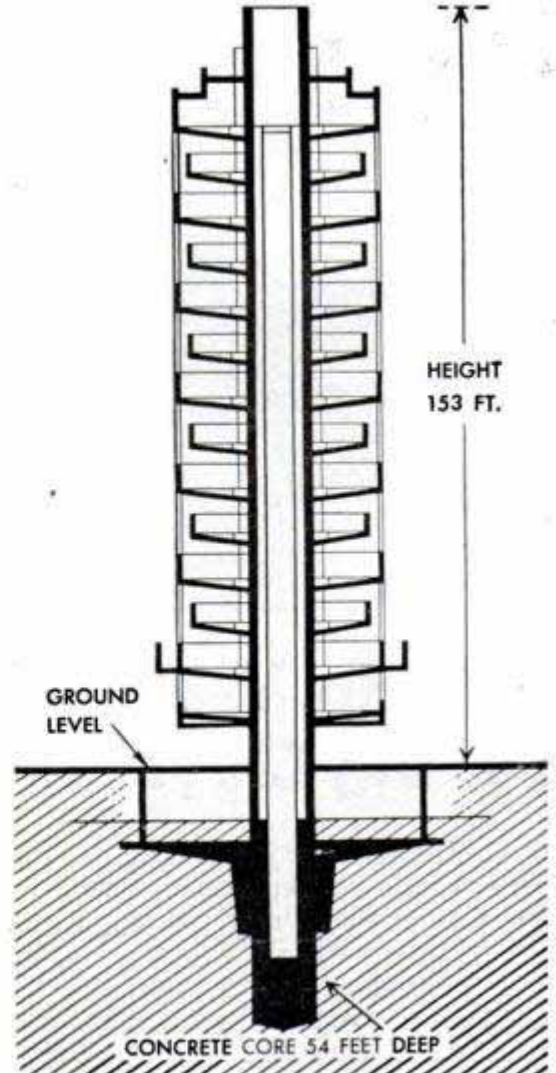
time, too, forced-air cooling is used on disk-type brakes. This feature is available only on the 1951 Imperials. It reduces internal brake temperatures up to 35 percent, according to the Chrysler engineers. As a result, brake lining wear is reduced up to 50 percent.

The new torque converter is available on all but the Imperial Eight sedan and limousine. In combination with the V-8 engine, it is said to have the most powerful starting and acceleration on the road. Driver operation is the same as with the regular fluid coupling and automatic transmission except that most of the driving is done in high range. Low range, however, is still available for engine braking, push starts and other emergency requirements. The Chrysler torque converter is of the four-element type. Impeller and turbine are hydrogen-braced assemblies of stamped-steel parts. The two stators are cast aluminum. The housing is welded on after the assembly of the elements. Thus, the converter is serviced as a complete assembly.



Johnson Wax Co. photo

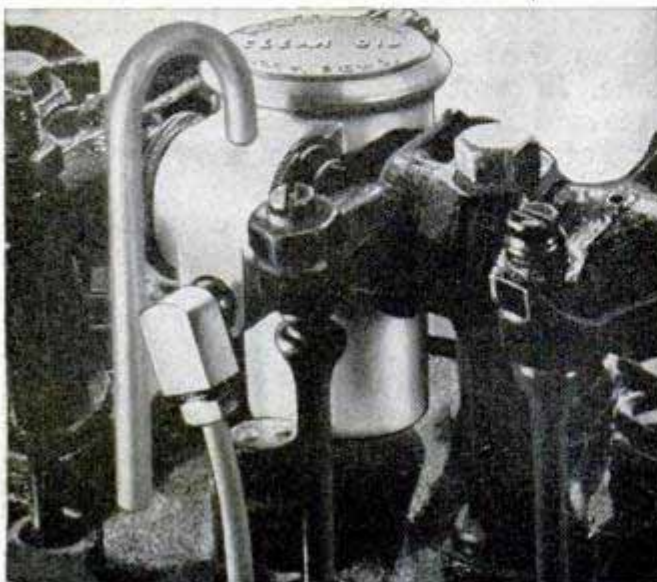
Unique "stem" base of tower, in background, is not visible from street. Right, skeletonized view of building



Tower on a "Stem"

Resembling a giant chalice, a 15-story tower at Racine, Wis., rests on a hollow concrete "stem" only 13 feet wide. There is no other foundation under its hanging walls of brick and horizontal glass tubing. It was designed by Frank Lloyd Wright for a wax firm's research and development facilities. The central core, of steel-reinforced concrete, has channels for the ele-

vator shaft, a circular stairway, pipes, wiring, fume exhausts and ventilating ducts. Forty-foot-square floors alternate with smaller circular floors, leaving space for tall laboratory equipment around the perimeter. Narrow strips of brickwork marking the square floors provide the only breaks in the glass outer surface, which consists of two-inch-wide tubing separated by rubber strips. The glass tubes would extend 21 miles if laid end to end.



Wolfer Corp., 3723 Wilshire Blvd., Los Angeles 5, Calif.

Oil Filter for Overhead-Valve Engine

Mounted directly on the rocker-arm shaft of the overhead-valve system, a small oil-filtering unit cleans the oil at the point of wear. The filter element stops particles as small as 39 microns in diameter and is easily replaced when dirty. At present, the filter is made only for Chevrolet engines.

Underwater Ear

Underwater sounds above the human-ear's range can be detected by wire with a porous coating. Scientists at Western Reserve University, Cleveland, made the discovery, which has possible application to submarine detection.

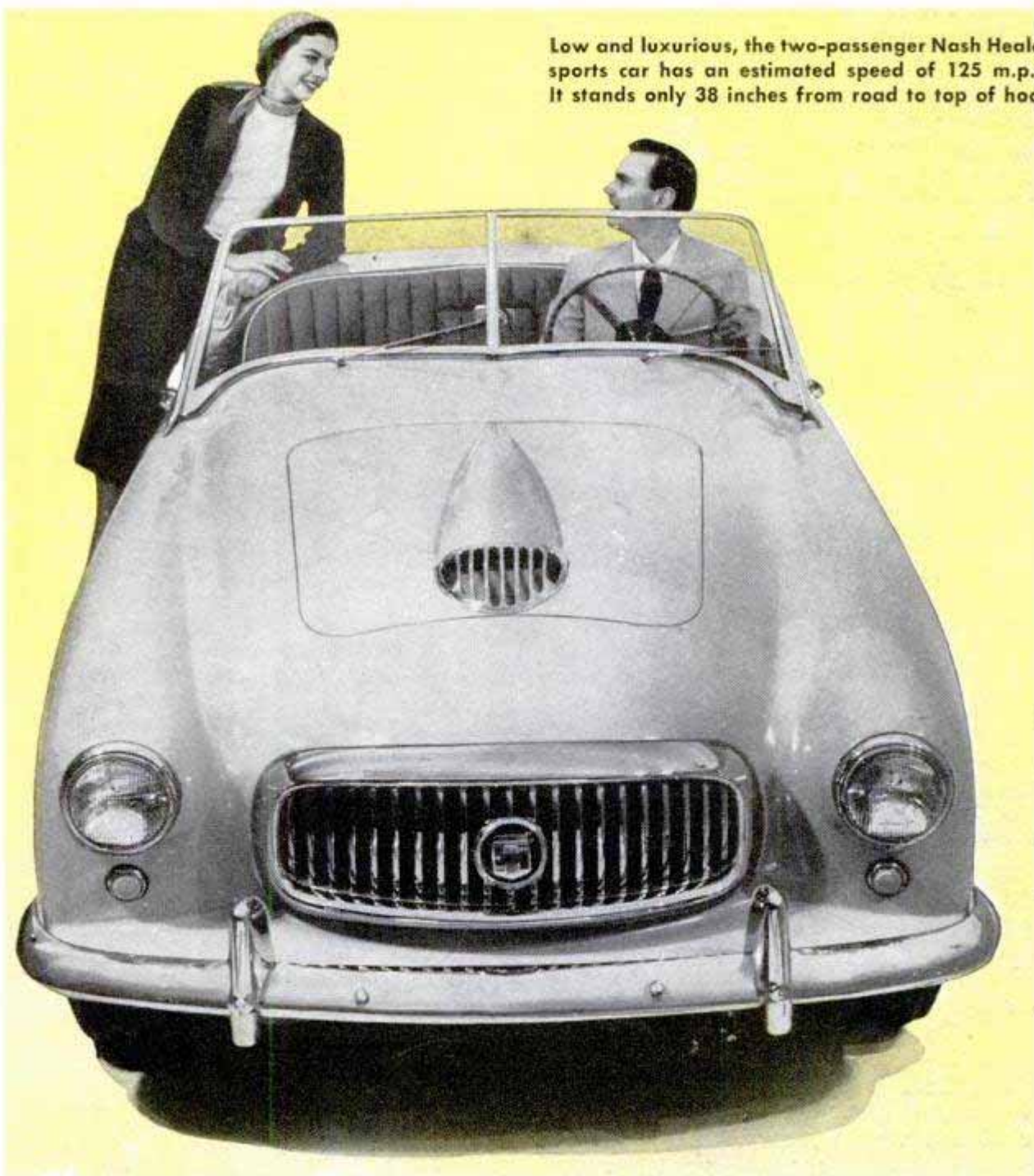
Nash **BUILDS** **A SPORTS CAR**

IF AMERICA'S new sports car, the 1951 Nash Healey, has a nautical line or two in its low, racy body there is a good reason. The car first saw the light of day on a tablecloth in mid-Atlantic. Bent over the tablecloth were the heads of two ocean-liner passengers: George W. Mason, president of Nash Motors, and Donald Healey, the noted British custom sports-car builder.

Healey told Mr. Mason he was coming to America to find an automobile engine for a sports-car body. The Nash president told him to look around, and drop in on Nash. Healey looked around and came back to the Nash plant in Detroit.

The chance meeting of these two automotive tycoons has resulted in the first American sports car to be introduced by a major auto maker since the

Low and luxurious, the two-passenger Nash Healey sports car has an estimated speed of 125 m.p.h. It stands only 38 inches from road to top of hood



mid-'20s. (Remember the Stutz Bearcat and the Jordan Playboy?) The two-passenger Nash Healey will also be strictly a luxury item and according to reports will sell for "\$3500 and up." It has an estimated speed of 125 miles per hour.

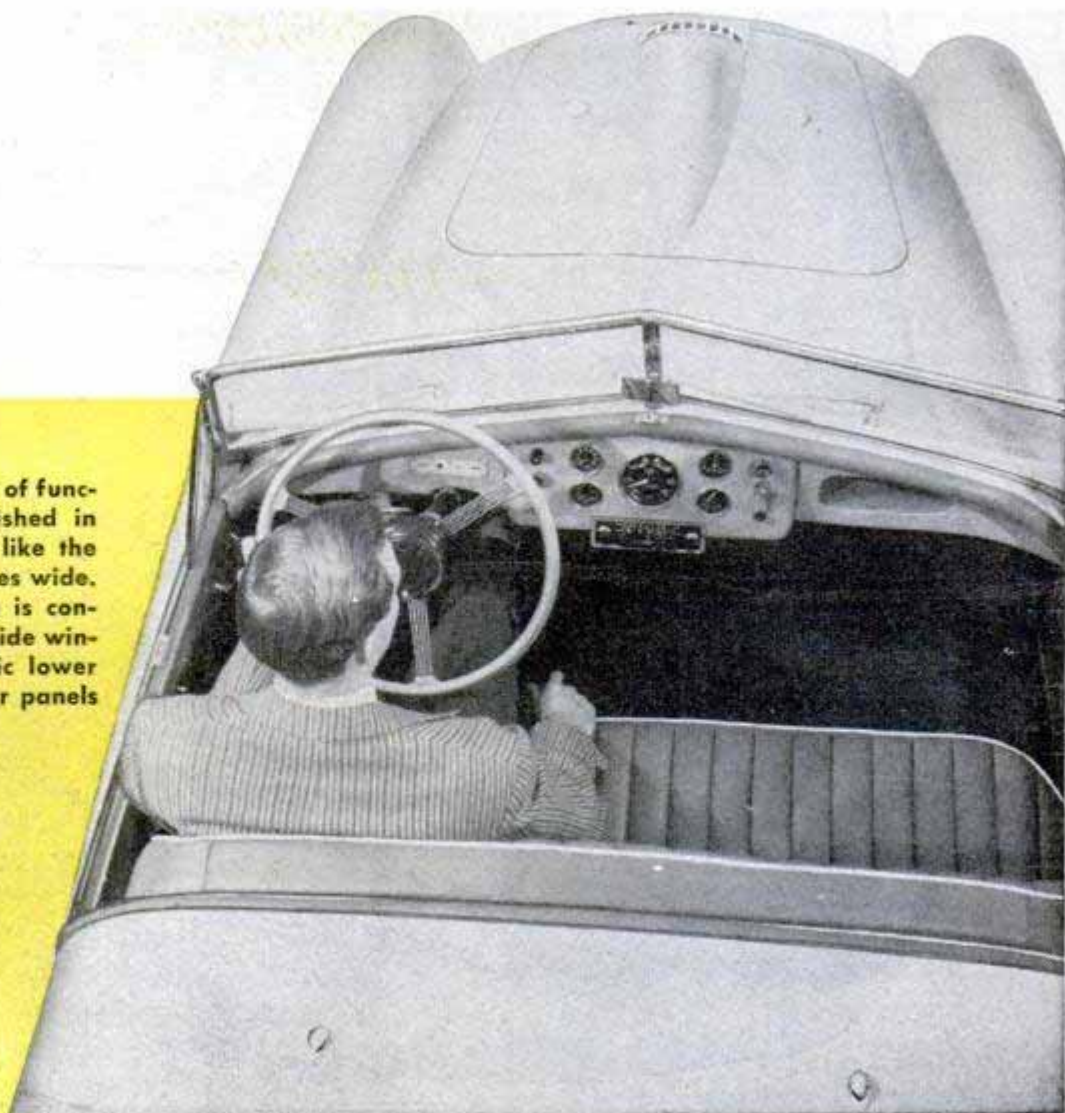
The front grille of the Nash Healey follows the familiar Nash Airflyte design. Its low streamlining is accentuated by a broad hood and car-long horizontal lines that flow gracefully from front to rear. The car measures only 38 inches from road to hood top. Body panels as well as many structural parts are made of aluminum. The car has a curb weight of about 2600 pounds, a wheelbase of 102 inches, over-all length of 170 inches and width of 66 inches. It has a turning radius of 17½ feet and road clearance of 7 inches. The instrument panel is of functional design with leather finish and the adjustable single seat is upholstered in high-grade English leather over latex foam cushions. Because of the low seat, the steering wheel is adjustable.

Bodies for the Nash Healey will be built by the Donald Healey Company in England which has been catering to the taste of European sportsmen for years. The engine (basically Nash Ambassador) and other mechanical parts are being built by Nash in

the U. S. The engine is a six-cylinder overhead-valve, high-compression job specially equipped with an aluminum racing head and other major modifications for high speeds. The new aluminum cylinder head offers a compression ratio of 8.1 to 1 with developed power of 125 horsepower at 4000 revolutions per minute. There are two S.U. horizontal British carburetors working in conjunction with an oversized sealed-in intake manifold. Passages of the latter are found directly in the main engine castings, water cooled on two sides, providing even gasoline distribution and improved temperature control. This temperature control makes it possible to use the more efficient higher compression ratios and thus squeeze the maximum power from the gasoline. The crankshaft is 100 percent counterbalanced, providing uniform load-carrying ability to meet the increased thrusts of the higher compression ratios on main bearings.

Another major feature of the car is its chassis utilizing the Healey "trailing arm" front-end suspension. This was developed by Healey to help his fast, low sports cars hold the road on curves and aid the driver in steering at all times. The front wheels are mounted on "swinging arms" pivoted ahead of the wheel center line. This arm is

The instrument panel of functional design is finished in fine English leather like the seat which is 53 inches wide. A folding fabric top is concealed behind seat. Side windows of hard plastic lower into the narrow door panels



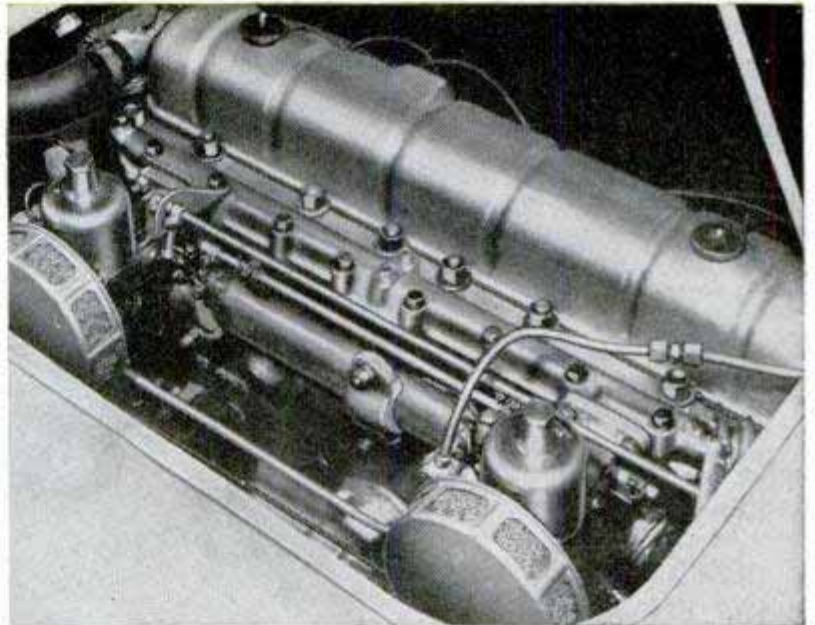
Long hood of Nash Healey gives continental look to the sports car which has an over-all length of 170 inches. The body panels and many structural parts are aluminum



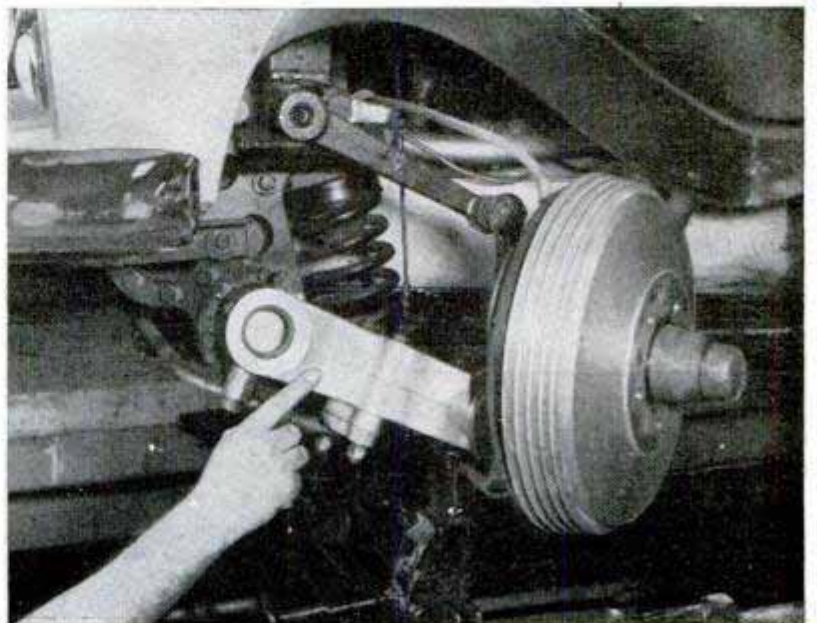
cushioned against a coil spring. In taking bumps, each wheel deflects vertically in an arc without change to tread or camber.

Rear suspension of the Nash Healey also employs coil springs combined with direct-acting shock absorbers mounted in towers attached to the chassis frame. This suspension is similar to that used in the Nash Ambassador with modifications in spring design and shock-absorber calibration to accommodate the weight and operating characteristics of the Nash Healey. It has a torque-tube-type drive, making it possible to use coil-spring suspension at the rear. Torque tube and propeller shaft of the Nash Healey are shorter than those used in the Ambassador due to the sports car's shorter wheelbase. With a rear tread of 53 inches, the rear-axle shafts and tubes are shorter. The car is equipped with hydraulic Duo Servo brakes and 6.40 x 15 white sidewall tires. Overdrive permits high road speeds with moderate engine speed. Structural members of the chassis frame, typical of English sports cars, are massive to withstand extreme stresses.

The Nash Healey has a folding fabric top located behind the seat with soft plastic rear window. The side windows are of hard plastic and lower into the door panels. Spare tires and luggage compartment are reached through a nearly horizontal rear deck.



Power plant of the sports car is the Nash Ambassador six-cylinder overhead-valve, high-compression engine equipped with two S.U. horizontal British carburetors. Below, experimental setup shows how front wheels are suspended on "trailing arm"





Bradley University photo

Each Player's Totals On Lighted Cage Scoreboard

Individual scoring and fouls by the powerful Bradley University basketball team registers on a lighted scoreboard. A red light flashes when any of his figures change. The board records field goals, free throws, total points and fouls.

Bearings That Run on Air

Question: What's the world's best lubricant? Answer: Air! Engineers at North American Aviation, Inc., lubricate bearings with a film of air $\frac{1}{1000}$ inch thick. A shaft mounted on these air bearings turns at the touch of a feather. It continues to turn long after a shaft on conventional bearings has been stopped by friction. The air is forced into the bearing race through tiny capillaries, $\frac{1}{3000}$ inch in diameter, causing the shaft literally to float on air. These air bearings are used in the engines of guided missiles.

Expandable Ladder For Packplane

Built like a collapsible gate, a portable folding ladder enables crewmen to get up into the Packplane's flight deck 15 feet above ground. The new plane applies the trailer-truck principle to air transport, with a detachable cargo-carrying fuselage below the flight deck. Special hooks on the end of the ladder fit any one of 10 pair of keyholes near the fins, tail booms, oil tanks, rudder and windshield. It folds to three feet for easy storage under the navigator's table where it is kept when the plane is in flight.



Fairchild Aircraft Division, Hagerstown, Mo.

Information not listed on articles in the index often is listed in the WHERE-TO-FIND-IT LIST, available without charge from Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11



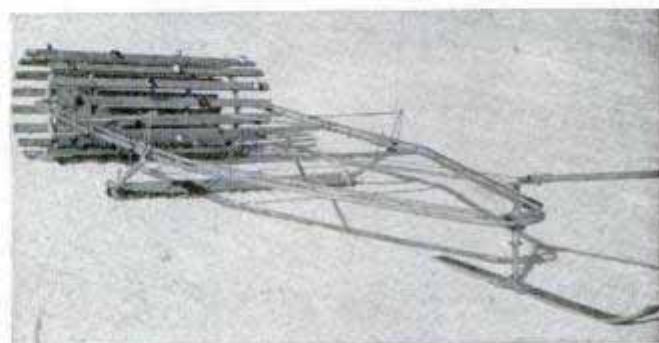
Fertilizing With Gas

Gas is being sprayed as a fertilizer in Cypress, Tex. Equipment rigged up by Chester Turner, shreds the soil several inches deep while hoses attached to the tiller's claws spew out almost pure nitrogen gas, which is quickly absorbed into the soil. The gas is anhydrous ammonia, a refrigerant that comes as a liquid in high-pressure containers but changes to gas when released into ordinary pressure. Though estimated to cost about half as much as commercial fertilizer, the gas is dangerous unless properly handled and it should not be employed without supervision by experienced operators.

Snow Packer for Ski Slopes

Snow on ski slopes is kept smooth and compacted by a slatted roller invented by Steve Bradley of Winter Park, Colo. Insuring an even, firm surface on snow-covered ski areas has always been an expensive operation because of the large number of skiers required to compact fresh snow by sidestepping up or down the hill. Bradley's roller enables one man to do the work of 10 such ski packers. An adjustable blade in front of the roller shaves off bumps and scatters the snow before the roller compacts it. This blade also acts as a brake. If the operator releases the blade-control lever, the blade digs into the snow, stopping the roller. This prevents runaways which could be dangerous on a steep ski slope.

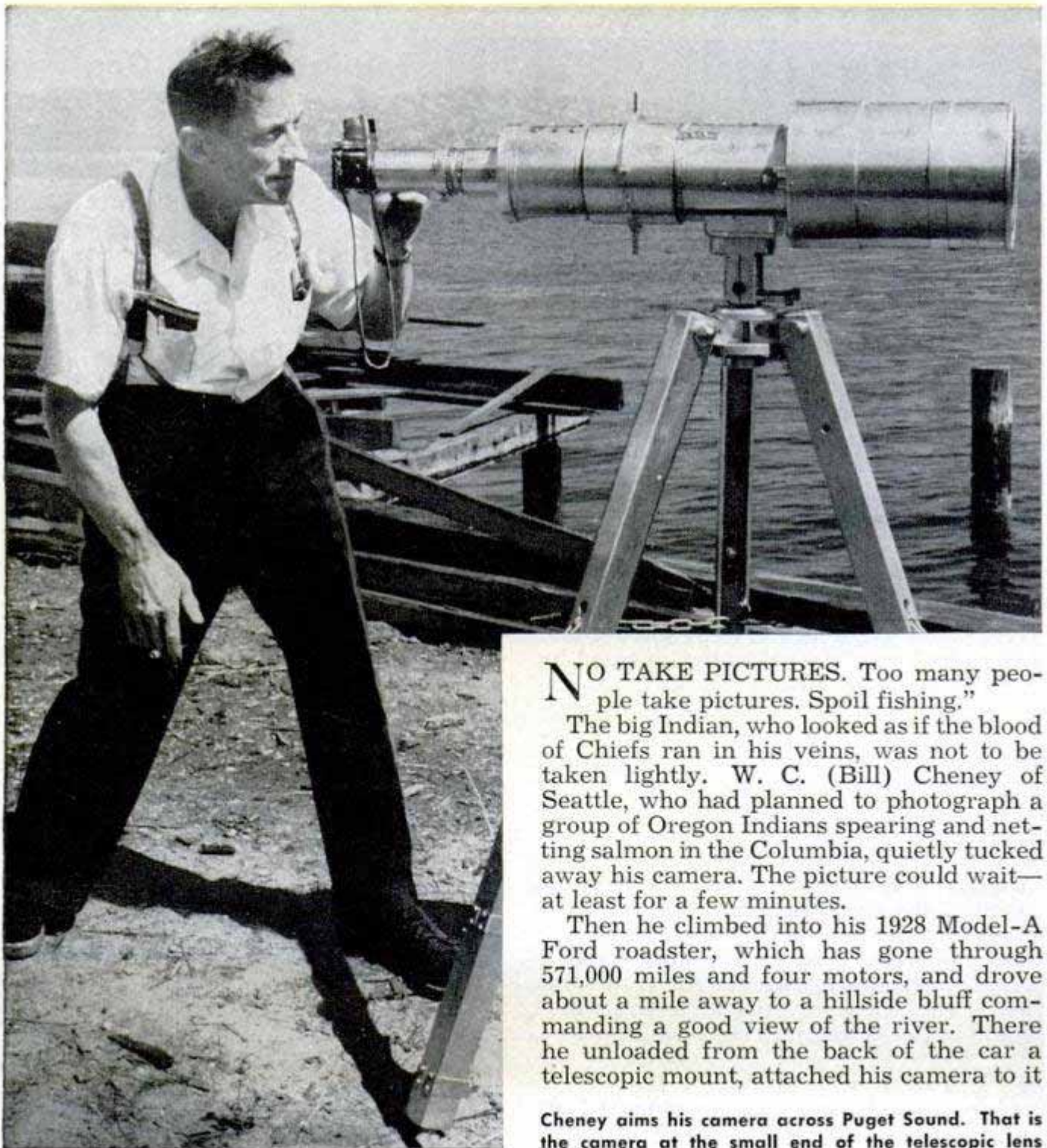
Plans have been drawn for the world's longest suspension bridge to connect Italy and Sicily across the Straits of Messina.



Folks around Puget Sound can't hide from Bill Cheney's camera. With its far-seeing eye he takes . . .

CLOSE-UPS FROM MILES AWAY

By Rafe Gibbs

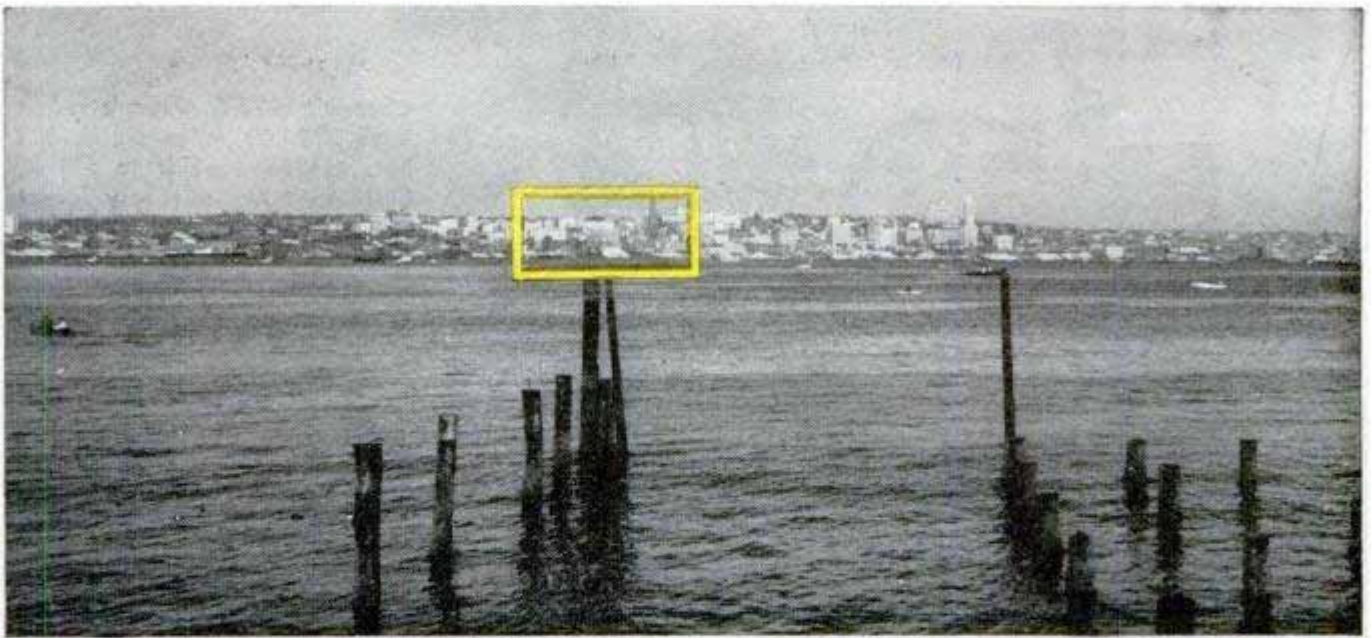


NO TAKE PICTURES. Too many people take pictures. Spoil fishing."

The big Indian, who looked as if the blood of Chiefs ran in his veins, was not to be taken lightly. W. C. (Bill) Cheney of Seattle, who had planned to photograph a group of Oregon Indians spearing and netting salmon in the Columbia, quietly tucked away his camera. The picture could wait—at least for a few minutes.

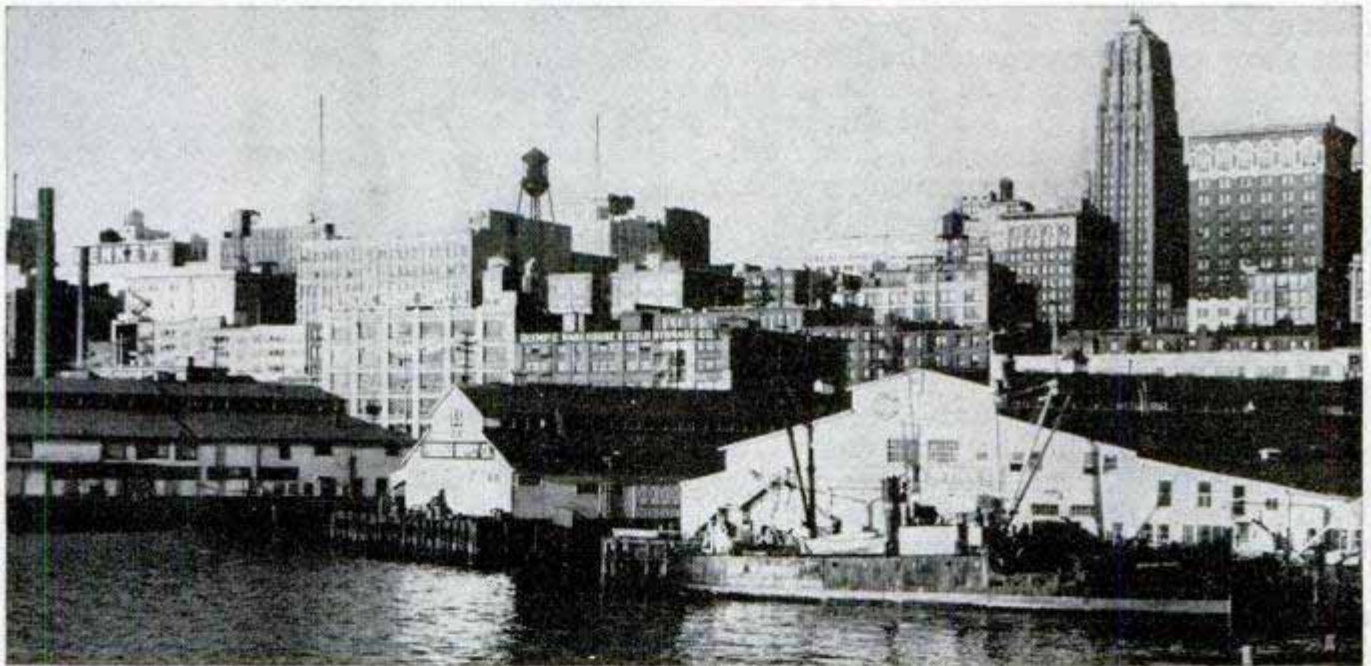
Then he climbed into his 1928 Model-A Ford roadster, which has gone through 571,000 miles and four motors, and drove about a mile away to a hillside bluff commanding a good view of the river. There he unloaded from the back of the car a telescopic mount, attached his camera to it

Cheney aims his camera across Puget Sound. That is the camera at the small end of the telescopic lens



Here's what the author's camera shot when aimed across Puget Sound at Seattle. Notice the outlined area

Here is the section outlined above as Cheney's telescopic camera saw it from a slightly different position



and proceeded to take detailed pictures of the fishing Indians.

Close-up photography at a mile is just a warm-up for Cheney. He gets good detail at three miles.

A machine-shop operator and manufacturer of custom-built furnaces and torches, 53-year-old Cheney has his establishment on the water's edge of Puget Sound. Across the sound, approximately three miles away, is the port side of Seattle. To the unaided eye, the scene is just a gray-blue-white melange of ships, docks and buildings. But peering through his telescopic camera, Cheney has been able on a clear day to pick out the headlines on a newspaper being scanned by a man on a street corner.

"Couldn't quite read the headlines, though," said Cheney modestly.

Watching a ship one day, two miles distant, he even spotted loose rivets. The looseness was not serious enough to merit a call to the captain of the ship, but Cheney figured—miles away—that the craft could do with a dry docking soon.

He has pictures of wild life, particularly motion pictures, which could only have been taken miles away when the subjects were utterly unaware that the eyes of man were upon them. His probing camera has reached from one mountain to another into an osprey's craggy nest and photographed the mother hawk feeding fish to her young. Also on motion-picture film are bald eagles swooping down upon jackrabbits and seals teaching the small fry to swim. In taking motion pictures of sea gulls feeding on herring in Puget Sound, Cheney has taken



Cheney's 1928 Ford roadster has over 570,000 miles on it, but he's too fond of it to sell it. Besides, it has a roomy locker he built into the rear to haul the photo equipment he requires

Below, here's a Cheney shot of the moon on a movie camera with the 14-inch lens. He prefers to shoot astronomical photos

close-ups from two miles away—close-ups that show even the eyes of the birds.

At night, the man with the far-seeing camera eye goes right out of this world. He photographs astronomical bodies. Actually, this is the primary purpose for which Cheney constructed his telescopic camera. Viewing and photographing earthly life and objects from great distances, he considers incidental—but fascinating.

He has no idea how many times he has photographed the moon or how often he has picked up one of a dozen magnifying glasses lying about his shop and studied the pictures in detail. Professional astronomers have declared that some of his moon pictures are the clearest taken on 16-mm. film.

"No," Cheney shook his head, "I have never observed any sign of life on the moon. But stillness is interesting, too. There is much to be learned from studying pictures of the moon. Here . . . notice these lines on this picture."

And Cheney pointed to lines on the moon which looked like the sectional markings on the outside of a cantaloupe.

"Ever place iron filings on a piece of paper, and hold a magnet beneath the paper?" he asked. "Well, then you know that the filings will quickly form into magnetic lines of force. I am convinced that the lines which radiate from the pole of the moon are caused by magnetic force acting on dust with magnetic properties. These lines, you will note, show no shadows. Therefore, they do not have great height. They appear, however, to be formed by grains set end to end—drawn into line by magnetic force."

Unhampered by astronomical theories and procedures of study handed down from



one professional astronomer to the next for many centuries, Cheney hopes some day to discover "something really big." And he may. Folks around Seattle who know him will tell you that quiet-mannered, philosophical man is a genius—and perfectionist.

Primarily to obtain better astronomical pictures, he has climbed to the peaks of major Western mountains 113 times. He has gone up 9671-foot Mount St. Helens in Washington 50 times. Once, on the spur of the moment, he drove to North Dakota to snap a picture of an eclipse of the sun.

The desire for perfection has kept Cheney refining and adding to his equipment for years. He figures he now has at least \$8500 in equipment. And that does not include the hundreds of hours of personal labor. Much of the equipment Cheney builds himself. He even constructs his own camera solenoids.

His first interest in photography came as a boy of nine in Oregon City, Ore. For convincing half the youths in Oregon City—or their parents—that they should subscribe to the "Youth's Companion," young Cheney received a box camera, kerosene darkroom lantern, developing kit, printing frame, roll of film and package of paper. He was started on Hobby No. 1.

Then a few years later he acquired

Hobby No. 2—probing the boundless mysteries of the universe. Utilizing an old camera lens and magnifying glass, he built his own telescope and continued with both hobbies throughout college and later years. Son of an engineer, he studied electrical engineering at Oregon State College and was also a student teacher there.

In 1946, he decided to merge the two hobbies. Using standard photographic lenses, he built a telescope unit to which he could attach a camera. That first telescopic camera was pretty simple—but it worked.

Its shell consisted primarily of two 30-cent cardboard mailing tubes. Cutting one tube lengthwise, Cheney "shrank" it, then taped it so it would fit snugly—yet slide—inside the other tube. Lens holders to fit inside the tubes were cut from soft-pine boards of apple boxes. Then came the lenses. They were not so primitive. At the front end was a 14-inch Ektar f:6.3 lens and at the rear a highly corrected 1 $\frac{3}{8}$ -inch f:0.9 six-element lens from a war-surplus range finder.

This equipment, with camera attached, was then fastened to a wooden 2 by 4, and Cheney started shooting the moon . . . with complications. The trick was determining the right location of the front lens to the rear lens. This required a lot of experimenting, sliding the rear lens back and forth until the best focus was obtained. The two photographic lenses, when properly adjusted, formed a compound lens and produced great magnification.

Cheney obtained some surprisingly good moon pictures through his cardboard tubes, but once a man like Cheney is able

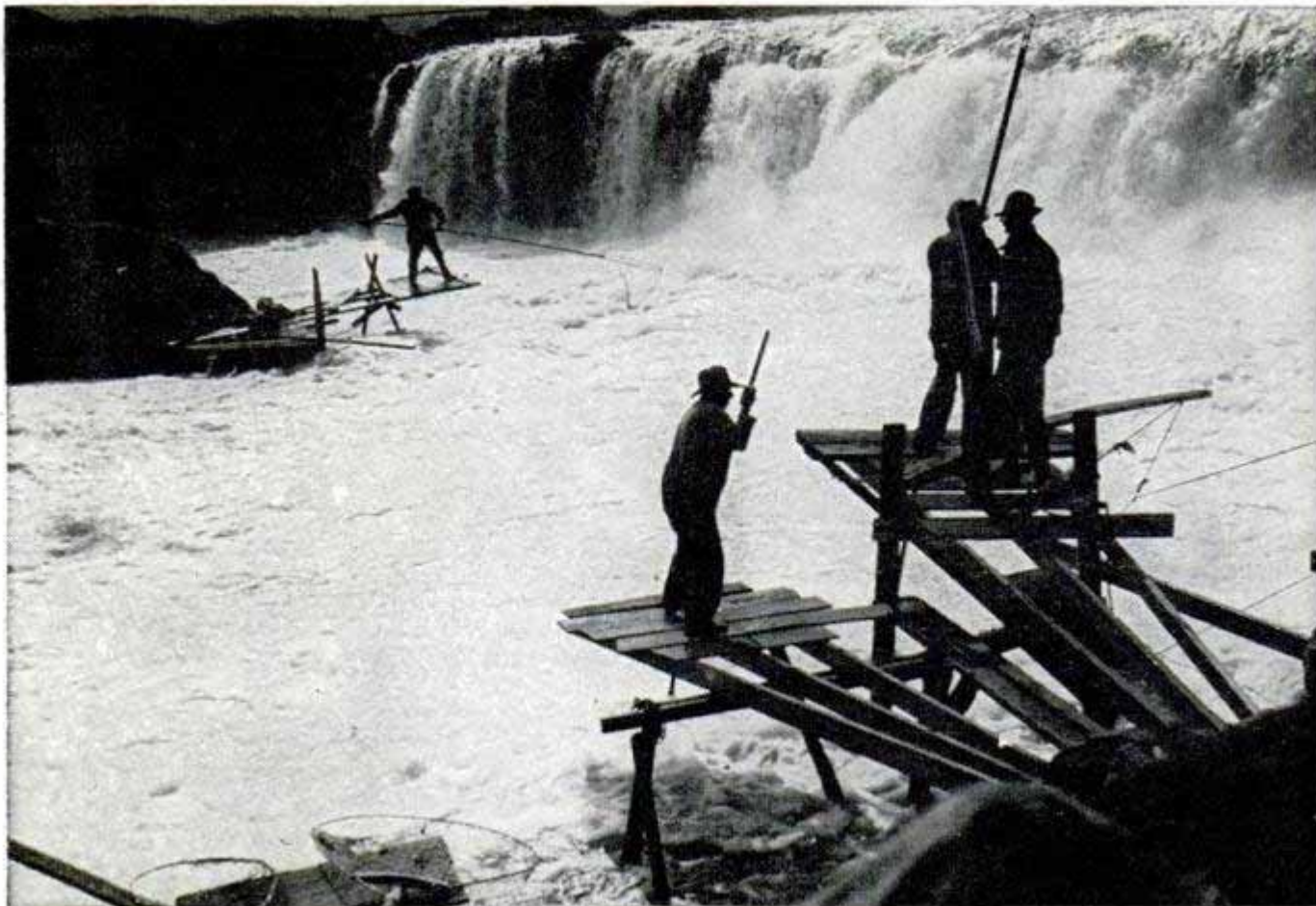


This series of three shots was taken from some motion pictures Cheney made across Puget Sound. Above, this is how the scene was photographed by a standard 25-mm. movie lens. The fishing parties are scarcely visible



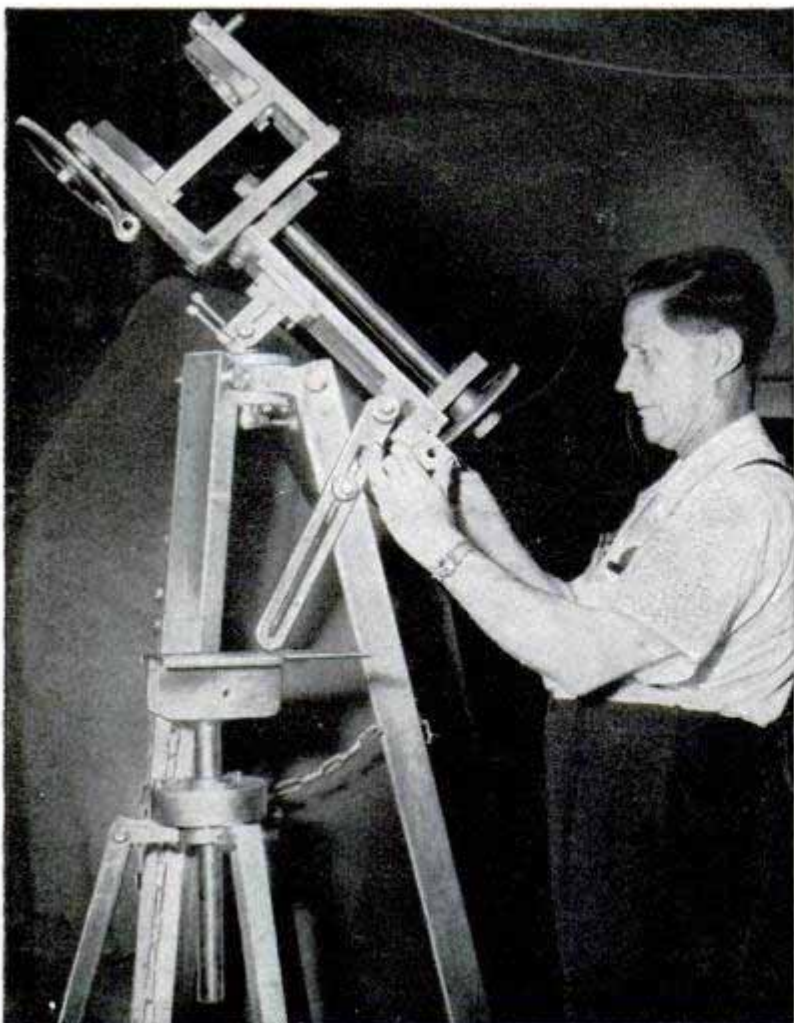
Above, with the 14-inch lens on the movie camera, the fishing boats are seen in more detail, but they still appear some distance away. Below, a real close-up is possible with the 38-inch lens on the camera. Cheney says that the boat was about three miles away when the photograph was taken





Photographs like this one can be taken without the subjects becoming aware if you are using telescopic equipment

Below, never satisfied, Cheney is now constructing this new telescopic camera mount for making 140-diameter enlargements



to photograph the giant craters on the moon—miles deep, miles wide—he wants to photograph the craters within craters. Tossing the cardboard tubes into the ash heap, Cheney set to work on a new telescopic camera.

Into the new equipment went the best material and thought. To avoid jerking in making adjustments, the tripod was provided with a ball thrust bearing. The ability to make quick adjustments easily is particularly valuable in taking distant shots of animals.

Utilizing in the new telescope a 24-inch Ektar f:6.0 lens for the front unit and the old range-finder lens for the rear unit, Cheney produced a device which enlarges images 72 times. You would think he would be satisfied with this, but he isn't. He is now building a new telescope to enlarge images 140 times.

"I feel that a man should build his hobby as near perfect as possible," said Cheney. "If perfection costs too much, he should get another hobby."

Cheney's hobby has been expensive, all right. That's one reason, he says, why he hasn't bought a new car in 22 years. The other

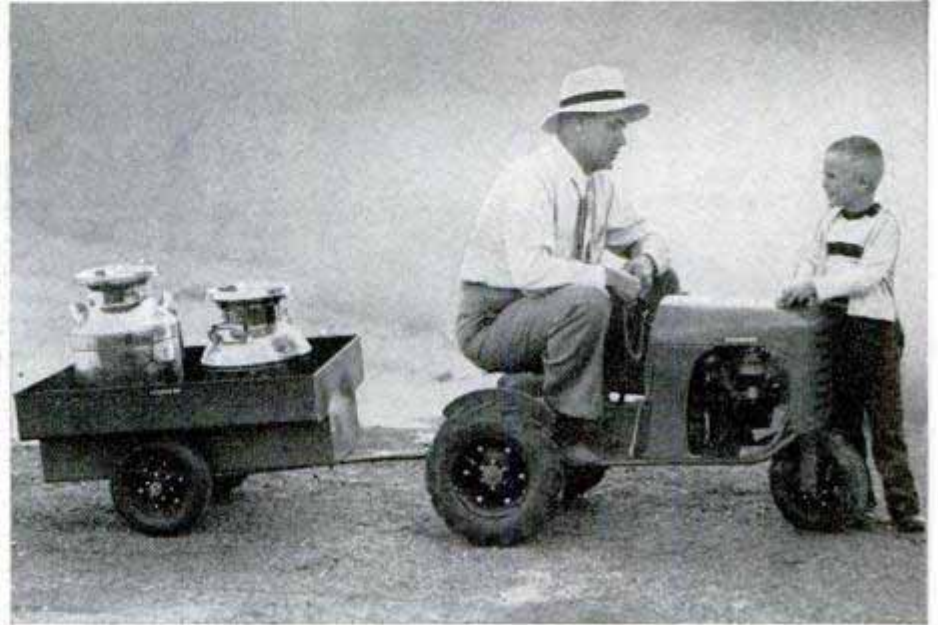
(Continued to page 258)



Standard Mfg. & Sales Co., Lebanon, Ind.

Pint-Size Tractor

Big enough to do a day's work, yet small enough to be a child's plaything, a tiny tractor that weighs only 154 pounds is simple and safe to operate. It cannot be upset or tilted on a pull. There are no belts, gears or hot exhaust pipes to injure youngsters. The two-horse-power engine operates through a reducing gear and differential to power both rear wheels. Its top speed is a safe $4\frac{1}{2}$ miles an hour.

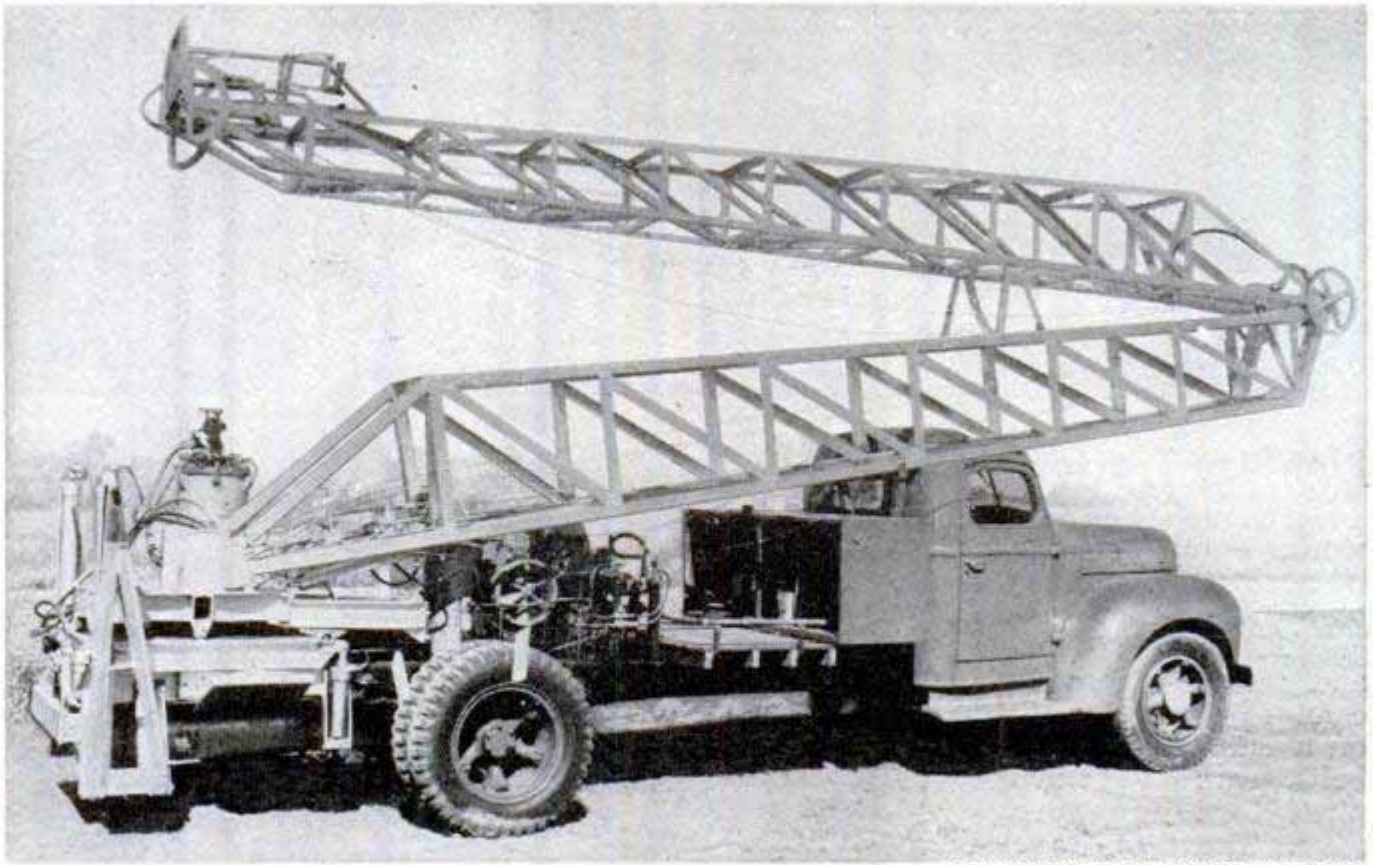


Unexploded Bombs Are Defused by Remote Control

Bombs are defused from the safety of a foxhole with a defuser used by West Berlin police to make unexploded bombs harmless. The defuser is fastened to the fuse at

one end of the bomb. Then, the bomb-disposal officer withdraws to a foxhole and pulls a steel wire that rotates a drum on the device, unscrewing the fuse.



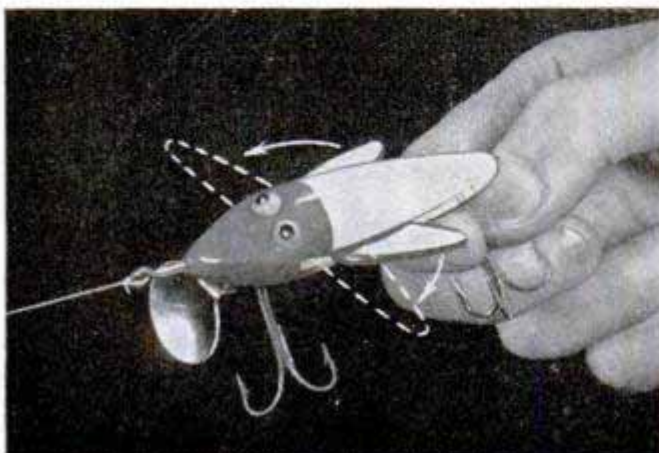
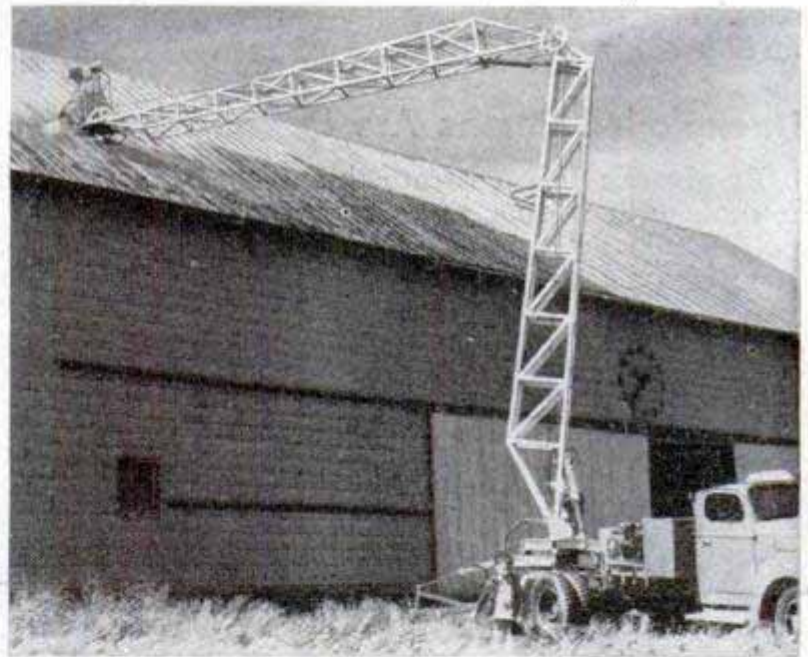


Lester L. Myers, Rt. 10, Ft. Wayne, Ind.

"Sky Hook"

Riding a platform at the end of a long mechanical arm, a painter can cover one entire side of a 50-foot building, including the roof, without moving from his perch. The arm is built in two 24-foot sections, hinged together and to a turntable on the truck on which the "sky hook" is mounted. Hydraulic controls on the platform permit the operator to swing the booms at wide angles and swivel the turntable. The operator has a working range of 50 feet vertically and a horizontal swing of more than 60 feet at a height of 25 feet. A four-cylinder engine on the truck powers a hydraulic pump as well as an air compressor for paint spraying. Paint is piped under pressure to the operator's platform.

With his mechanical arm, the painter has a vertical reach of 50 feet and a sidewise span of more than 60 feet. The seat is always kept level and paint is piped under pressure to user



Kentucky Bait Co., 2528 Greenup Ave., Ashland, Ky.

Flutter Bait

Large bass are said to be unable to resist snapping at a fluttering lure with movable wings that creates considerable commotion in the water as it is reeled in. As the line is jerked, it pulls forward on the wings, causing them to flip back as if doing the breast stroke. The lure is available in any of six colors.

Three of America's oldest houses, built about 3000 years ago, were unearthed at the foot of the Sierra Nevada in California.

Storm-Belt Microwave Keeps Trains Running

COMMUNICATIONS are as important to a railroad as locomotives. When they go dead, trains don't run on time. That's why the Rock Island Railroad, with tracks crisscrossing the midwestern sleet-storm belt, is turning to radio to eliminate wires that stretch and snap when coated with ice.

Tests are being run on a 105-mile section between Norton and Goodland, Kans., a storm-infested, ready-made proving ground. Frequent are heavy snow and sleet storms and extremely high winds, occasionally of tornado velocity. Electrical storms occur almost daily in summer. If microwave works here, it will work almost anywhere.

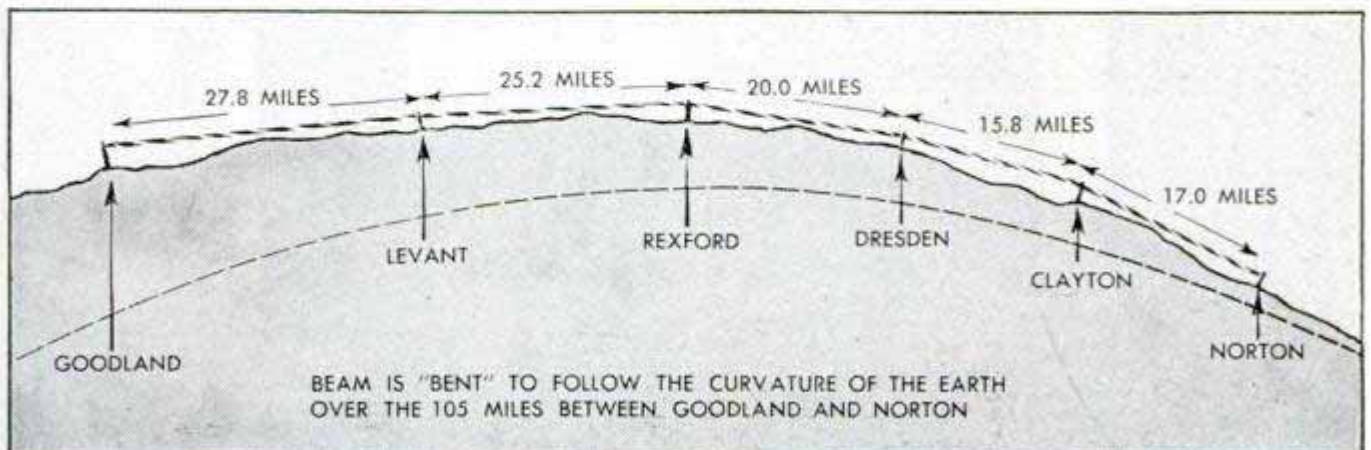
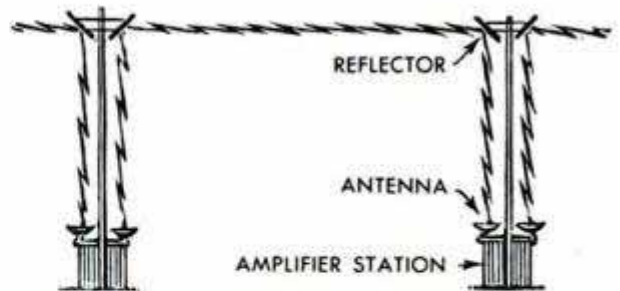
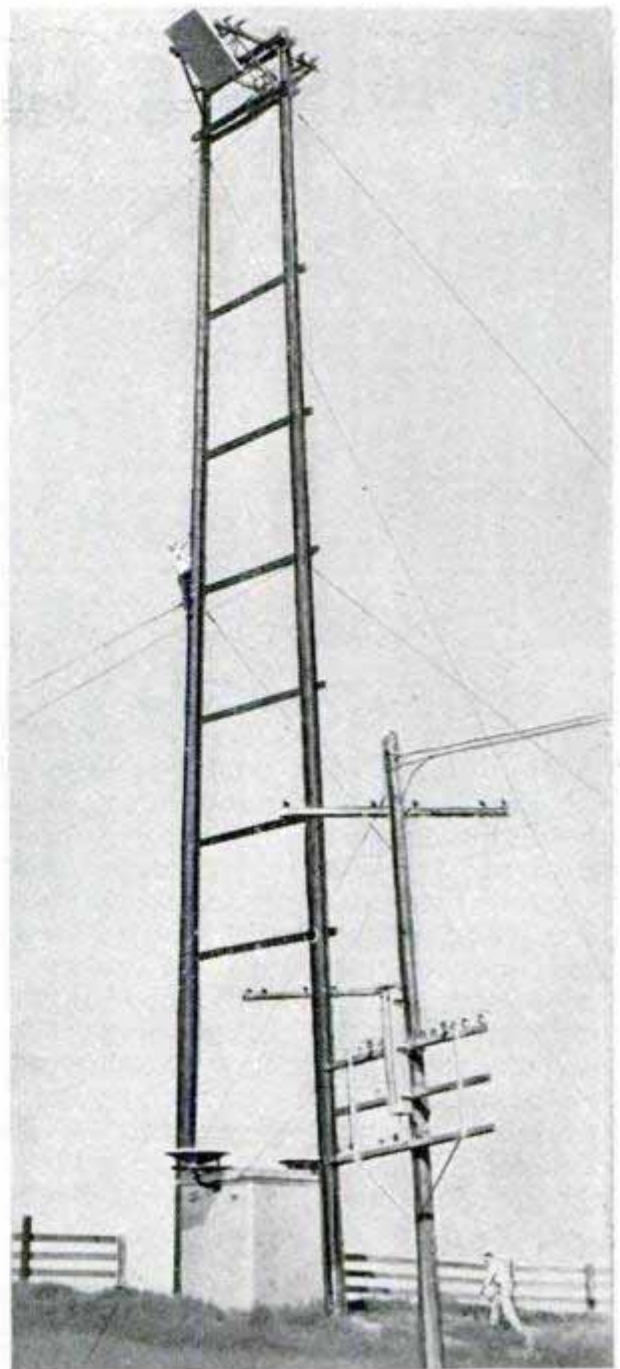
Because microwaves, like radar and television waves, travel in a straight line, they have to be "bent" to follow the curvature of the earth. To do this, four relay stations are used. These stations are automatic, requiring no attention. They also are switch centers, hooking into ground circuits for calls to stations between the relay points.

At each station a dishpan-shaped antenna is mounted at the base of the 100-foot pole. Signals from the antenna shoot straight up to strike a reflecting panel at the pole top. This panel reflects the signal at right angles, sending it horizontally toward the next station.

The system provides one local and four through telegraph channels, plus two voice channels for telephone. It can be expanded to handle up to 32 voice channels.

Cost is about \$600 a mile, compared with about \$1600 for an equivalent wire system. However, for reliable communications a dual system is required, raising the cost to about \$1000 a mile—still a substantial saving. When maintenance costs are added with allowances for sleet storms, microwave looks like the answer to a railroader's prayer.

Right, reflectors atop poles bounce signal horizontally as shown in diagram. Below, lower line represents (exaggerated) earth's curvature; wavy line is profile of terrain



I'm building the

Popular Mechanics PLYWOOD ranch house



Part V

By Tom Riley

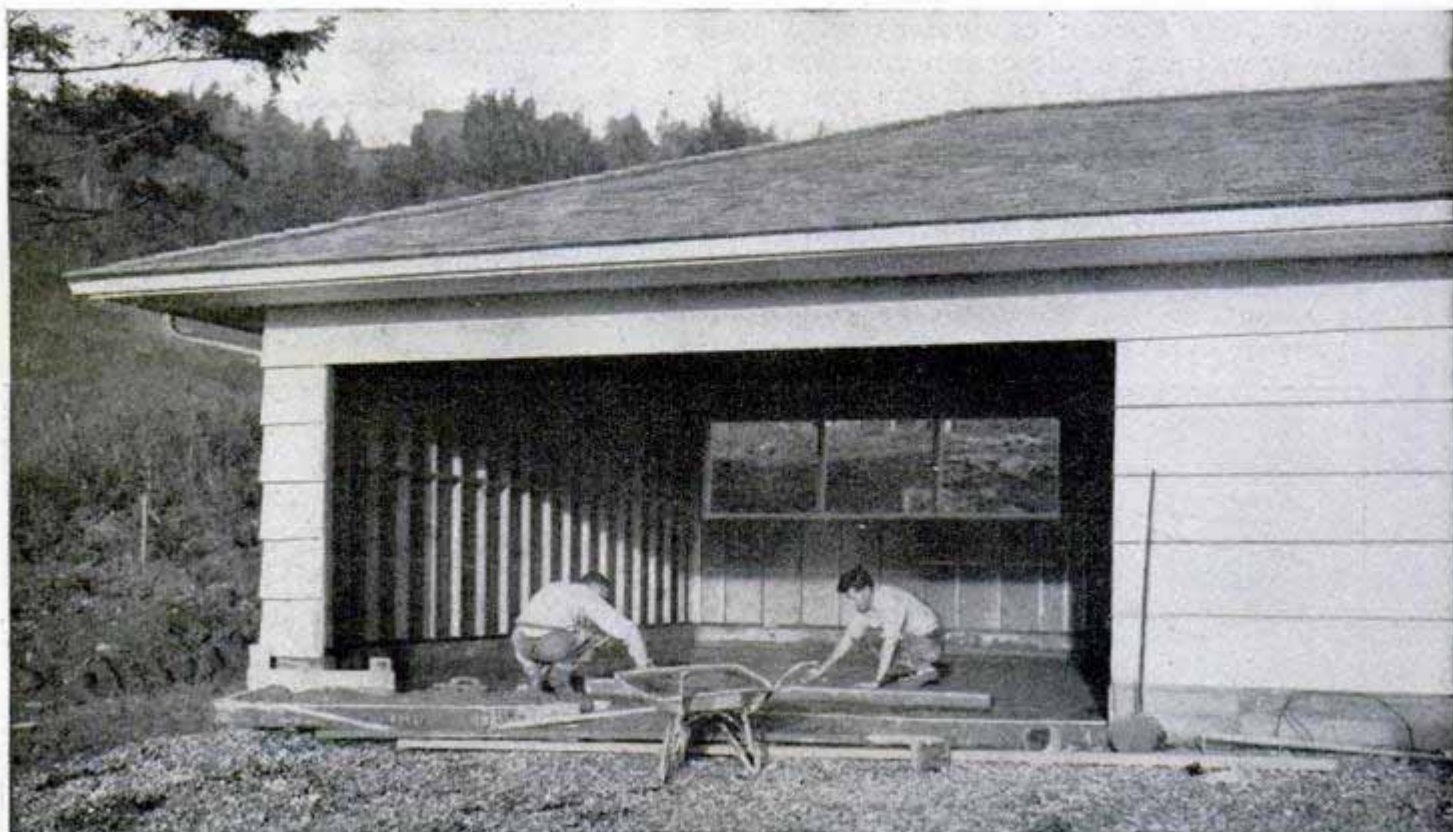
A CONTRACTOR would say that the Ranch House is now almost through the period of sub-trades. I have done the sub-trades myself—the wiring, plumbing, concrete finishing, furnace work and the like—your editors having insisted that this rank amateur try all of them to see if just anyone can do them in the modern way. I find the modern methods of doing the various sub-trades are actually the simplest for the amateur. Contractors and manufacturers alike have been working for speed of installation and this has resulted in simplified methods which are a great help to us amateurs.

Since his house lacks a basement, Riley assembles a soil-pipe section before placing it under the house

I also find that this is where you put modern convenience—livability—into your new home. In the sub-trades you can save money by using the latest materials. And the modern style will increase the value of your home.

The electrical wiring of the Ranch House is a good example. Look closely at most homes and you will find that they are wired in almost the same way as they were 25 years ago. But today you can use what electricians call the touch-plate or two-

Troweling the concrete floor of the garage is no trick—it's just hard work that is rough on your back



wire low-voltage system. This eliminates complicated switching circuits and gives you truly adequate light control.

In a low-voltage system, the lights in the various rooms are switched on and off by relays in a metal box up in the attic. The relays are activated by low-voltage current and push-button switches on the walls—it's as simple as a doorbell circuit. You run 115-volt wiring only to the light fixtures themselves. You string inexpensive doorbell wiring across the walls to the touch-plate switches, running it anywhere to have a switch at every entrance to every room in the house.

All switches are low voltage and non-shocking. You can have at every door double touch plates which, when you brush both buttons with a finger or elbow, turn off the light behind you and turn on the one ahead. I have installed a master panel in the large bedroom, a small panel with tiny buttons and indicator lights for each relay in the Ranch House. This means that I can turn any or all lights in the house off or on from my bed, and the indicator lights will tell me if any light has been left on.

The new wiring also means that such luxuries as turning on the coffee pot and radio from the bed can be had simply and inexpensively. I placed a small doorbell button alongside the telephone to turn off the radio when I'm talking. And, although you must buy a relay for each room's lights, the low-voltage system is not an expensive luxury because you save by not running heavy 115-volt wiring to the switches and

Riley saws narrow openings for floor registers that "wash" the windows with warm air for added comfort



Tom can always find work for his wife. Here, **Vinita** staples insulation on the kitchen-dining-room wall

not using metal switch boxes and their necessary accessories.

Finishing the concrete floors of the garage and breezeway is another job most contractors delegate to specialists. This is hard work but little more. In the *Popular Mechanics* book on how to build the Ranch House you will have a choice of two concrete floors for the garage, the smooth "stepped" finish and the rougher "floated" finish. The latter is less slippery when wet,

(Continued to page 256)

This attic relay box controls all the house lights, turning them on through low-voltage switch circuits



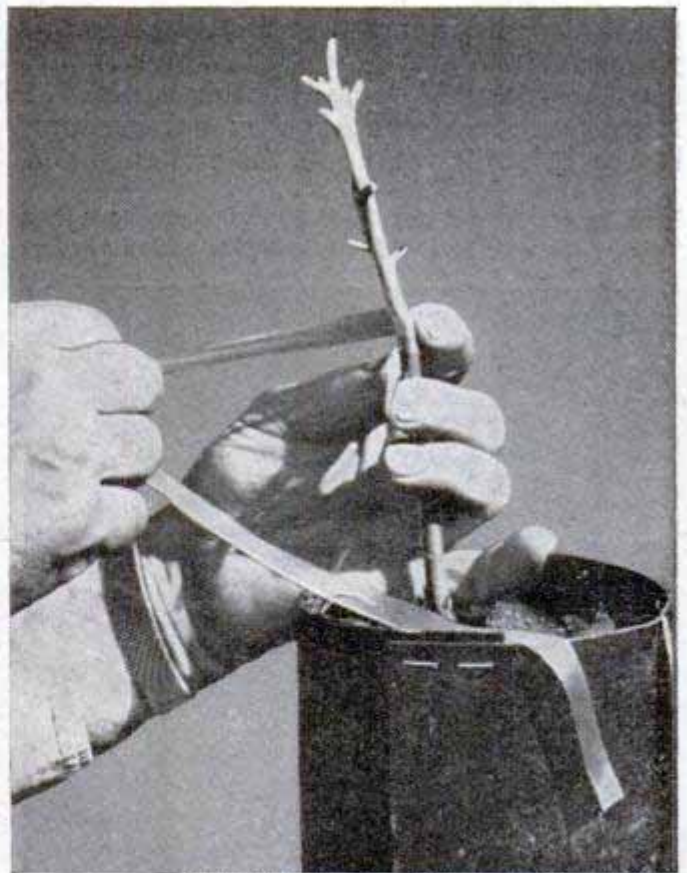


Arthur A. Allen, 3322 S.E. Concord Rd., Milwaukie 22, Ore.

Loom Can Be Folded for Storage With Work Intact

- Measuring 36 inches deep when in use, a new hand loom can be collapsed to 14 inches thick for storage or movement from room to room. It also can be folded small enough to be carried in a car. Work need not be removed from the loom when it is

collapsed. The folding loom, weighing only 50 pounds, is of the four-harness type and permits the weaving of materials from 30 to 50 inches wide. Supplied with the loom are long shuttles that carry enough yarn for the weaving of 10 inches of cloth.



Resin Industries, Box 1589, Santa Barbara, Calif.

Plastic Tape Grafts Seedlings

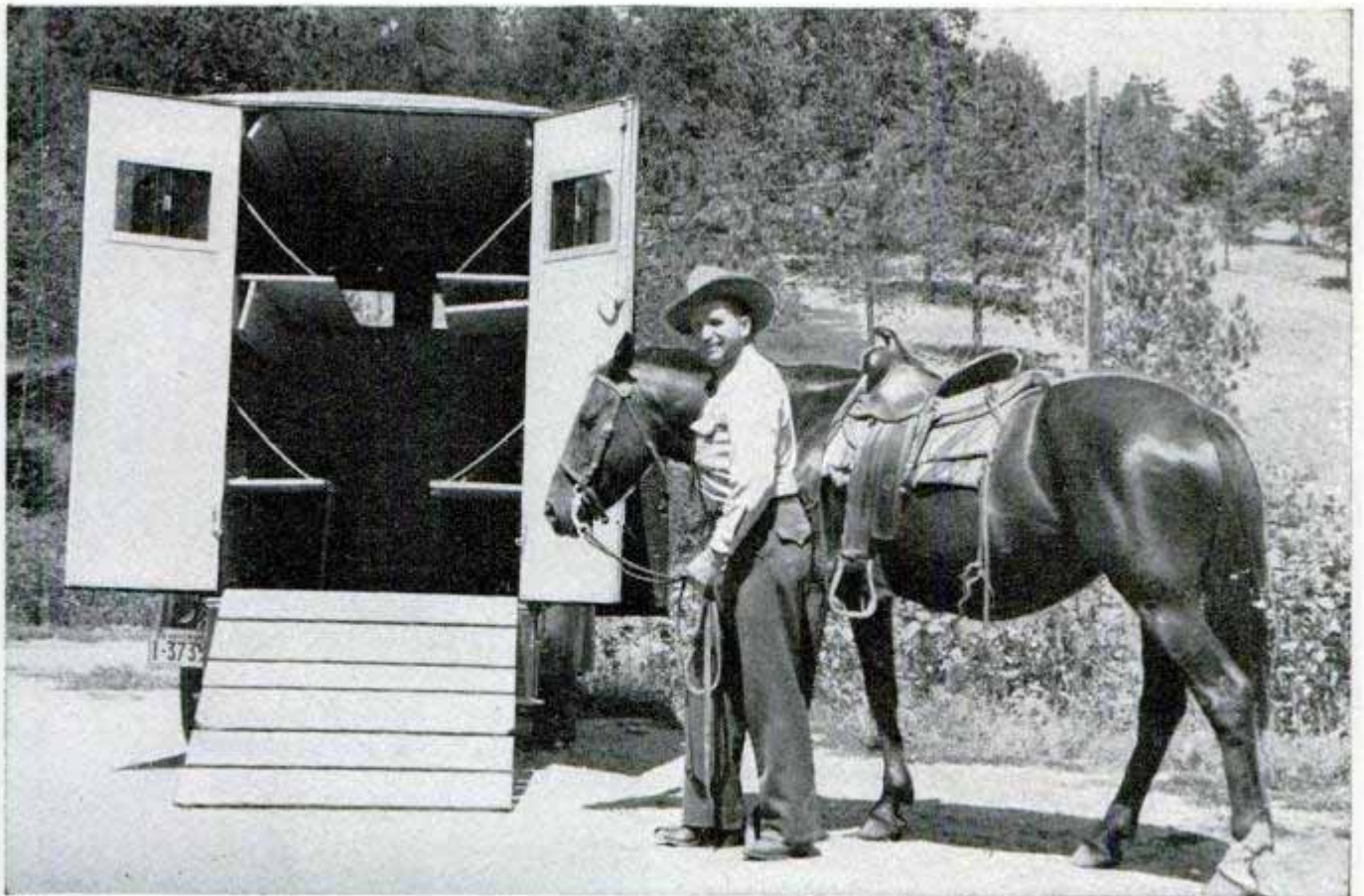
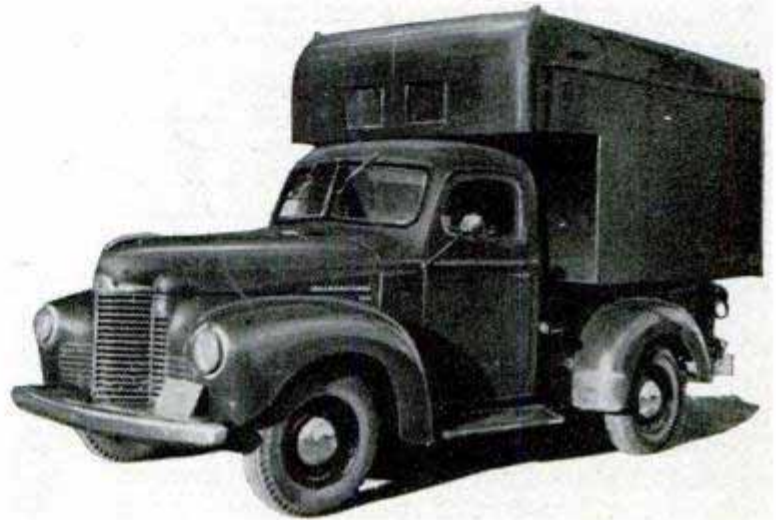
Tip grafting of seedlings is accomplished more easily with a Vinylite plastic tape that holds the seedling and budwood in alignment until union is completed. The

tape is also used to seal the cut made when the budwood is trimmed. The wraps are removed in about five weeks. Used in grafting young avocado trees, the method enables the grower to select fruit best suited to the land and climatic conditions.

HORSE-HOUSE TRAILER

THERE'S nothing like a trusty cow pony for giving a man a close-up look at grazing land, according to Lloyd Bruce, custodian of 750,000 acres for Uncle Sam. On the other hand, Bruce realizes that no horse can run from Denver to Dillon and back in a day, a feat that Bruce's job as range-management expert for the Department of the Interior often demands. So the ingenious horseman has come up with a novel idea—a horse-trailer house-trailer that fits the bed of a standard pickup truck. Not only does the vehicle carry Bruce's horse and duffle, but it is replete with hot and cold running water, a cooking stove, electric lights and bunk beds for four. Bruce loads his horse into the vehicle and drives to the area he wants to inspect. Then he saddles the still fresh pony and trots across the range. At night he folds down one or more of the bunk beds, depending upon the number of persons present. He cooks his meals over an insulated stove. The cabin can be lifted off the truck as a unit.

Top, Dillon serves a meal, cooked on cabin stove, to bunk mates. Right, unit fits on a standard pickup truck. There's space for the horse's head above the truck cab. Below, bunks fold down—when Dobbin is outside



FIVE MILES UNDER THE SEA

By Hakon Mielche

TAKE A LOOK at the globe. You will discover that only a small part of it is covered by land—only about one third of the surface of the earth. Looking at the remaining two thirds, the oceans, it soon becomes apparent that more than half of these wide oceans are deeper than 12,000 feet. That means an area as great as all the continents and islands put together is totally unexplored.

The exploration of those vast areas of the earth which are covered with water was first started about 70 years ago. It is expensive to equip seagoing expeditions. Completely new instruments had to be constructed and progress was slow toward further exploration of the deep seas—even to comparatively modest depths.

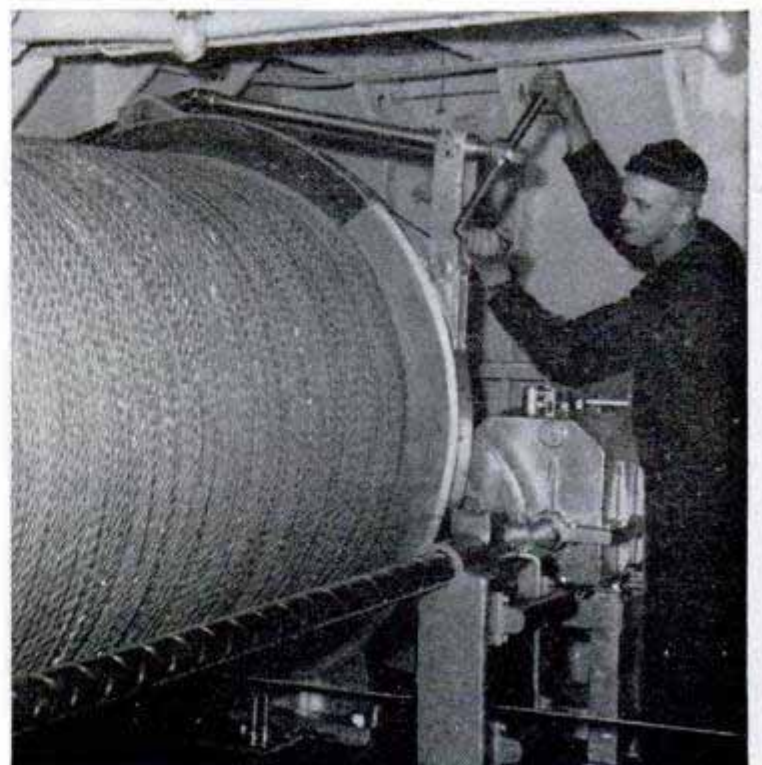
Although in our day we have quite a good knowledge of the sea and what lies at the bottom of it, to a depth of 6000 to 9000 feet, there is still a long way to the greatest depression measured on the floor of the sea—32,400 feet.

That which lies between 9,000 and 32,400 feet is—and this is said without exaggeration—just as unexplored as the continent of America was in A.D. 1493.

The very few attempts which have been made to send instruments down to these depths have had no greater influence upon our knowledge than the reports given by Columbus and his men after their first trip to the New World. But the "New World" in the sea, which as yet guards its mysteries in eternal darkness, is more extensive than all the continents and islands of the world put together.

What a playground for imagination!
What a wide field of activity for a modern

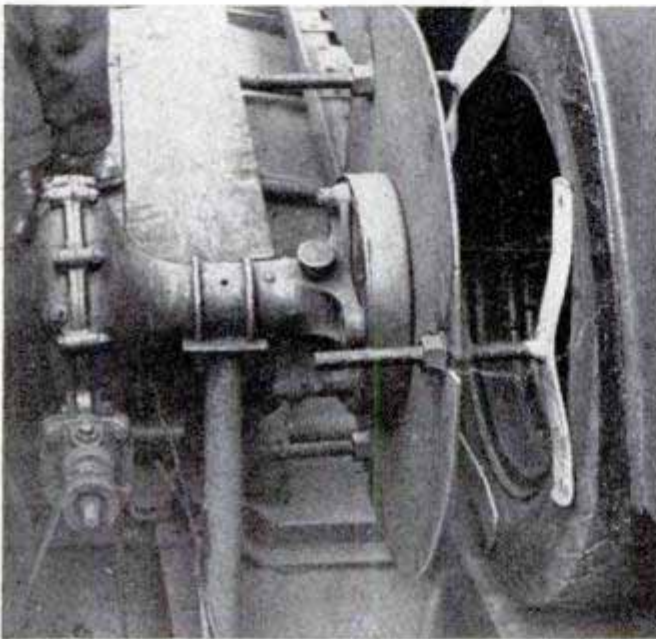
Main nerve of the Danish deep-sea expedition ship is the big winch (right) which holds 36,000 feet of steel wire. This wire will lower bronze sphere (on opposite page) to bottom of sea for making tests on earth magnetism. The sphere weighs one ton and will be lifted to Galathea (inset) by 10-ton winches





Power from the automobiles' rear wheels drives ferries above. They are steered by turning the car wheel, which brakes a propeller at the rear on the side of the turn and makes the one beside it run faster

Metal strips pressed against rear tires transmit drive from wheels through gearboxes to propellers

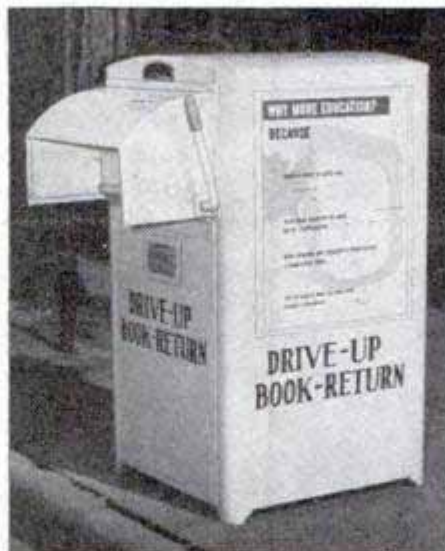


Turning of Auto's Rear Wheels Propels Ferry on the Thames

When A. H. G. Burgess of Putney, England, says he is going driving on the Thames, he means just that. Burgess built two ferries that rely entirely on the automobiles they carry for power and steering. After the vehicle is driven aboard, its rear wheels are jacked up clear of the deck and three metal strips are pressed against the sides of the rear tires. Each set of strips is bolted to a disk and linked by a shaft to one of two propellers at the rear of the craft. When the auto engine runs, the power is transferred from the rear wheels to the propellers. Cables lead from the front wheels to a brake drum in the driving mechanism. When the car wheel is turned, the brake is applied to the propeller on that side.

Drive-In Library

Library patrons can return books without stepping from their cars in Racine, Wis., where the public library has installed a "mailbox" on a convenient curb. The operator pulls back a handle to open a door, deposits his book and pushes back the handle. A spring-controlled platform then lowers the book gently to the bottom of the box. Another innovation at the Racine library is a private Teletype wire to the neighboring Milwaukee library. It places 1,000,000 books in Milwaukee at the disposal of the Racine reader. If a Milwaukee book is requested, the librarian orders it immediately by Teletype.



Patrons can reach through car window to return books. Right, Teletype instrument gives reader access to additional 1,000,000 books in Milwaukee

Answers to research questions also are sent by Teletype. During the first six months of operation, nearly 2000 messages were sent on the private wire.

WHAT'S NEW For Your Home



Selfix Products Co., 30 E. Adams St., Chicago 3.

SELF-STICKING HOOKS are as simple to use as a postage stamp. Just moisten the adhesive back and press in place. It will hold 15 pounds and sticks permanently to plaster, wood, glass, tile or metal



Argyle Mfg. Co.,
806 Coal St., Colchester, Ill.

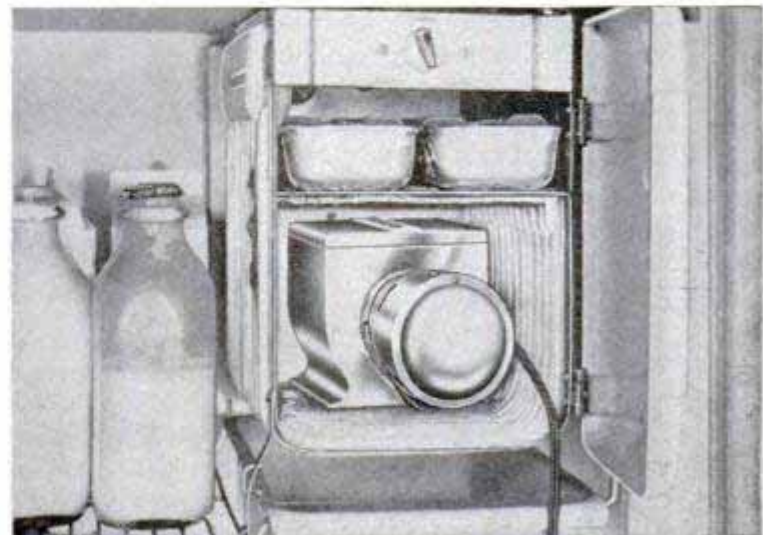
DRYING HAMPER, right, is the fast way to dry towels and lingerie in the bathroom. Its fan and heating unit force the warm air past the wet articles

ADJUSTABLE SHOWER, at left, can be raised or lowered to suit the user. It replaces any fixed shower head. A wall rack holds the nozzle securely

ICE-CREAM FREEZER, below, fits in a refrigerator's freezer. A motor-driven dasher blends the mix as it freezes. It makes a quart in 30 minutes



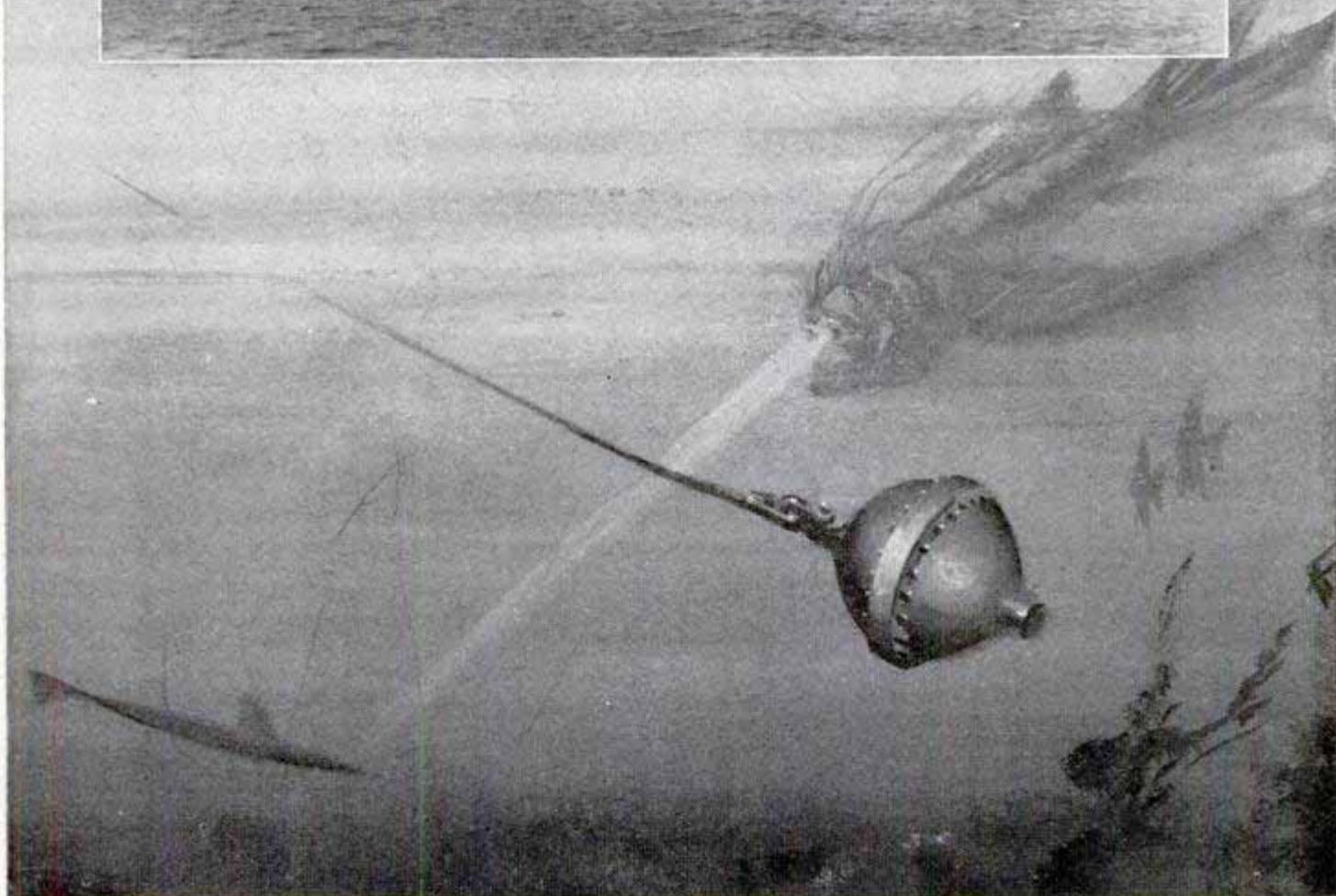
Lylton Distributing Co., 508 "E" St., San Bernardino, Calif.



Louisville Electric Mfg. Co., 3010 Magazine St., Louisville 11, Ky.

POPULAR MECHANICS

In quest of knowledge of the earth's last unexplored frontier and the weird life existing there, as deep beneath the ocean as Mt. Everest rises above it, a party of Danish scientists has embarked on a two-year voyage. This story was written by a Scandinavian author (right) as he sailed with the expedition





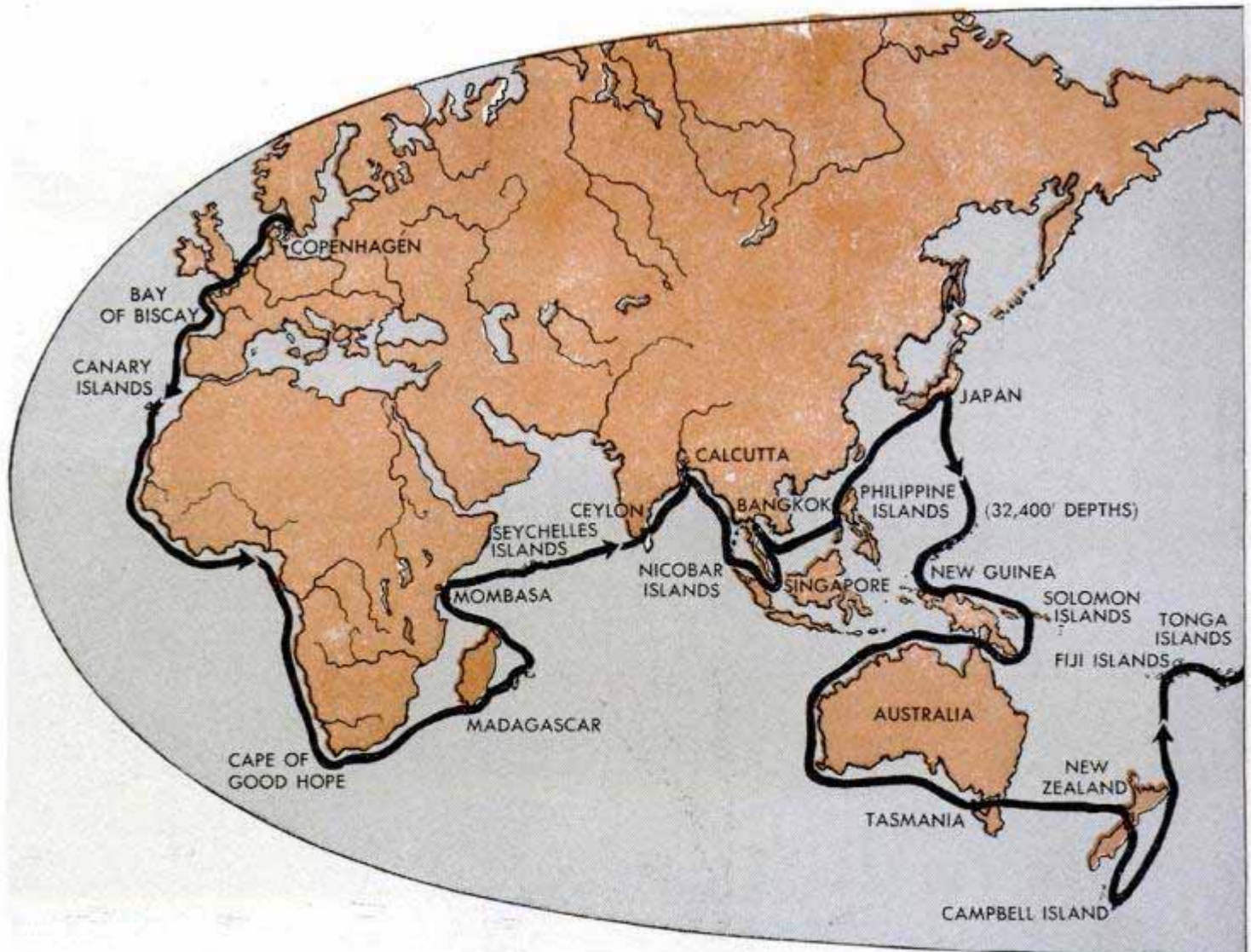
Expedition photographer uses life jacket with lung attachment which allows him to stay under 20 minutes

expedition, specially equipped for exploring the great depths!

For the first time in history a deep-sea expedition has started — on the 14th of October, 1950 — with the special purpose of visiting the ocean where it is deepest, and equipped with instruments which can penetrate to the hitherto impenetrable darkness at depths of over 30,000 feet.

It is not by chance that this expedition is Danish. Denmark has a tradition for exploring the seas. The first Danish sea expedition sailed round the world in 1845 on board the original Galathea. Since then many expeditions have crossed the oceans and brought home results which have become known far beyond scientific circles all over the world. Thus, for instance, when Prof. Johannes Schmidt solved the problem of the eel in 1928-30, and discovered that the Northern European eel swims all the way to the Sargasso Sea in the middle of the Atlantic to propagate there and die, whereafter the young immediately set out on the same trip back to the very lake or river from which the parents started out.

And now, a hundred years after the first Galathea unfolded its white sails, a new Galathea has gone forth under the red and white flag of the Danish marine, manned



by Danish sailors and scientists from all parts of the world, and with representatives from the press, radio and films on board. There are 100 men on the ship and they expect to return to Copenhagen in about two years.

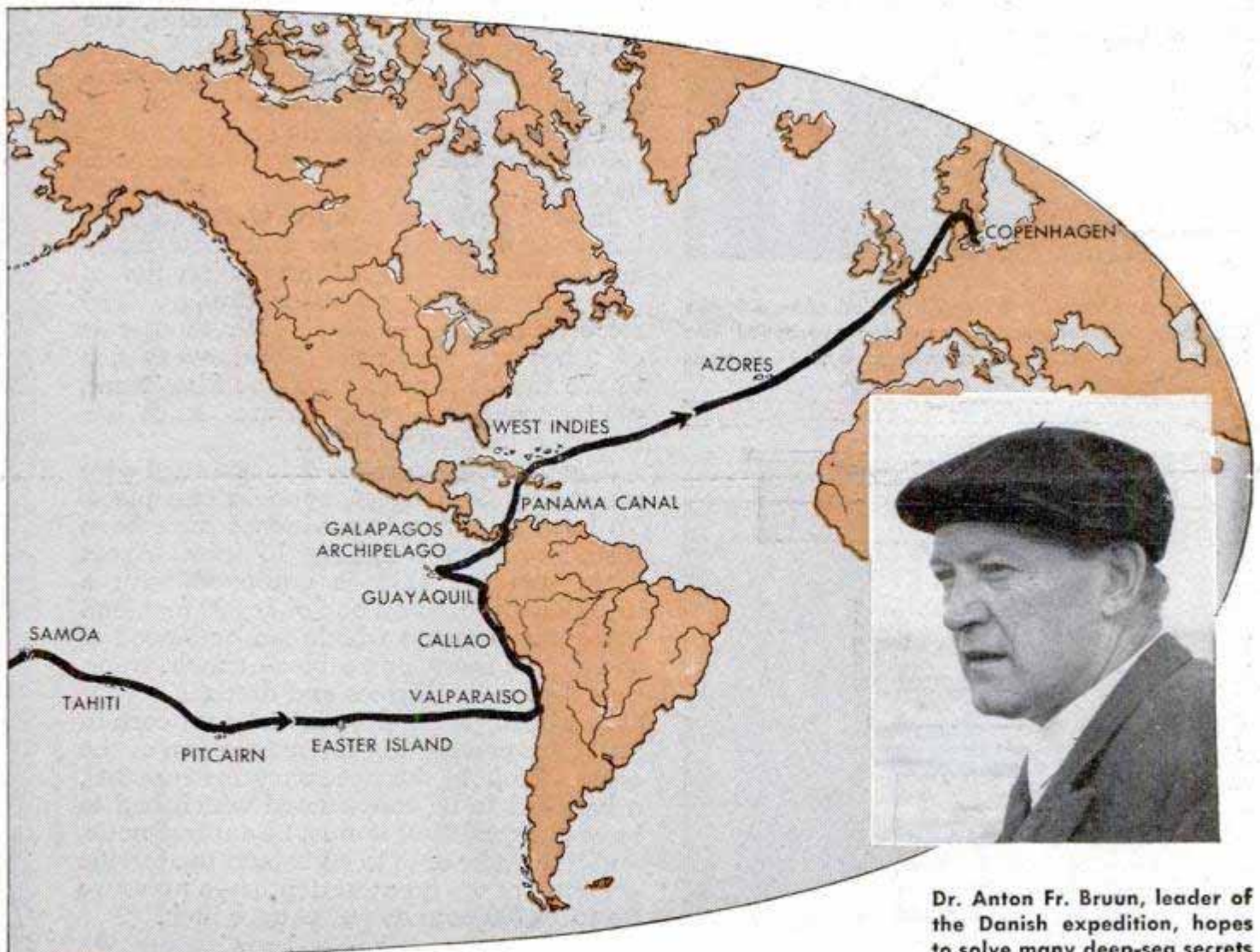
The route is planned from Copenhagen via the Bay of Biscay and the Canary Islands to the west coast of Africa, to be followed down to the Cape of Good Hope. From here sail is set towards the waters of Madagascar, Reunion and Mauritius. After a visit to Mombasa, course is set towards the Seychelles Islands, Ceylon and Calcutta, and further to the Nicobar Islands, Singapore and Bangkok. From Bangkok the trip goes to the Philippines, where the 32,400-foot grave, the deepest abyss measured anywhere in the world, will be thoroughly examined before proceeding further to Japan.

From Japan the Galathea will make for Indonesia, New Guinea, the Solomon Islands, and Australia, around which she will sail before visiting Tasmania and New Zealand.

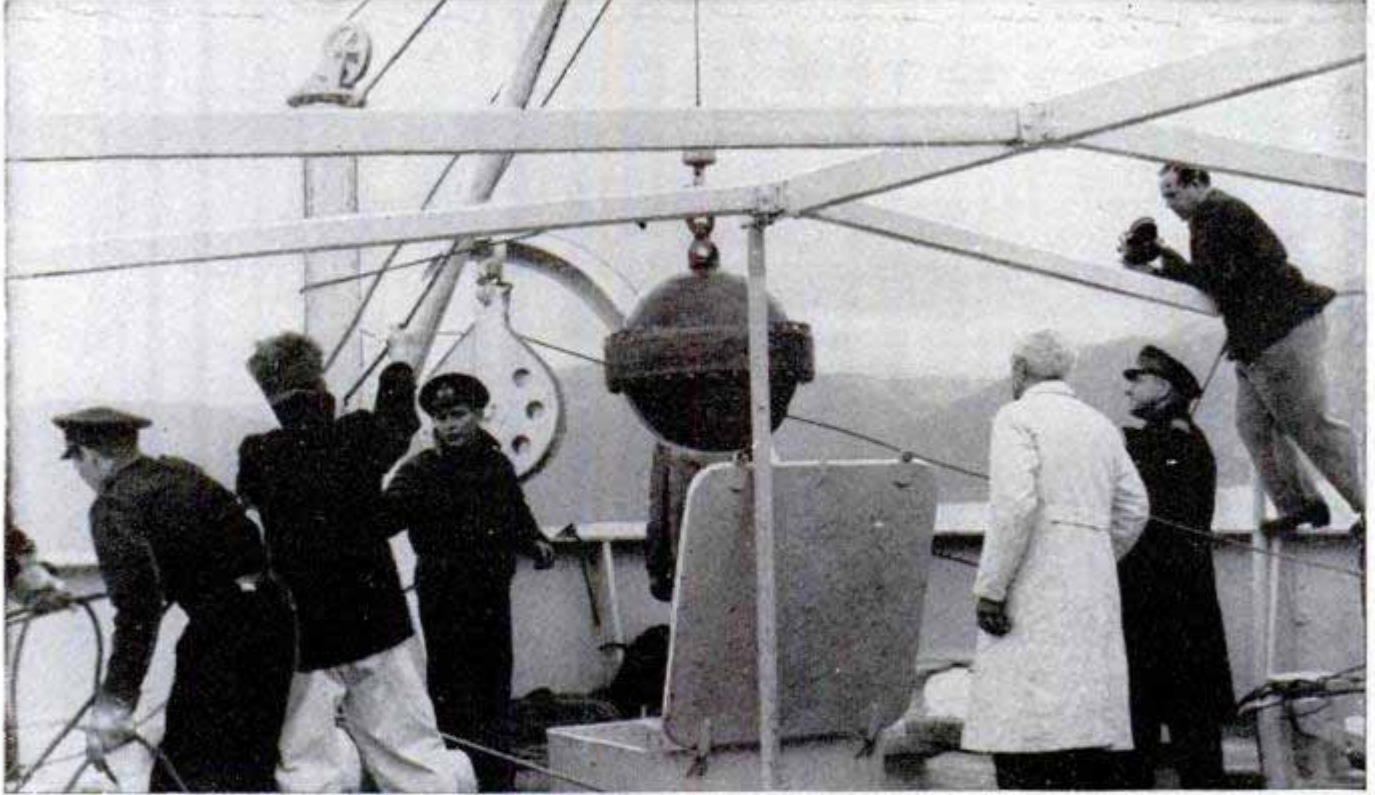
After a detour to Campbell Island the good ship sets course for the South Sea Islands, visits Fiji, and the great depths outside the Tonga Islands are due for an



Bronze ball holds instruments for measuring earth magnetism to determine if it increases with depth



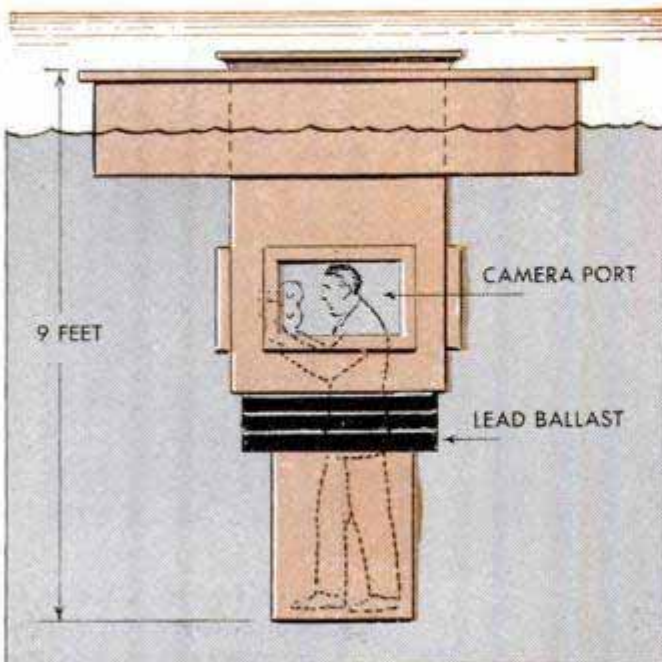
Dr. Anton Fr. Bruun, leader of the Danish expedition, hopes to solve many deep-sea secrets



Preliminary to world cruise, bronze sphere built for magnetism studies is tested off Norway shore



When a monster of the deep is pulled alongside the Galathea, a photographer can step overboard into floating tank which has camera port of thick glass



examination before the west coast of South America is reached via Samoa, Tahiti, Pitcairn and Easter Island. Visits are also paid to the ports of Valparaiso, Callao and Guayaquil. Then it is the Galapagos Archipelago's turn, and only then through the Panama Canal to the West Indies, the Azores and home to Copenhagen.

Before the return of the expedition, sensational news may be expected from it. There is no doubt that living things will be raised from the depths, never before seen in history.

In the ship's modern and well-equipped laboratory, the scientists and their many assistants will investigate the results of every draw with trawl or dredge. The storerooms will be filled with thousands of tubes of preparations, and every fish to see the light of day will be filmed and photographed in color before death has bleached its natural tones.

The main nerve of the ship is a steel wire measuring 36,000 feet, spun in one piece. To haul this wire two winches have been installed, each weighing 10 tons. Apart from this the ship is equipped with a 24,000-foot wire and one of 12,000 feet, and many instruments which can be placed at the ends of these long cables—trawls, traps, nets, hooks in all sizes and dredges.

It is also planned to investigate certain problems concerning the magnetism of the earth. To hold the necessary instruments, a ball had to be constructed which had to have two qualities; it must be antimagnetic, and it must be able to withstand the terrific pressure at the greatest depths—a pressure up to 14,700 pounds per square inch.

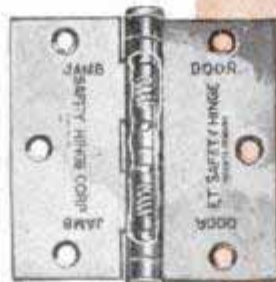
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Fresh'nd-Aire Co., 221 N. LaSalle St., Chicago 1.

BATHROOM HEATER, above, does any one of four jobs. It's a hair drier, left, or a clothes drier, right. It will heat the room on cool days and cool it with its fan on warm ones. It is held firmly on the wall by an adhesive-backed bracket

EMERGENCY HINGES provide a quick method of entering a locked room. A sharp push on the hinged side of the door separates the two halves of the hinge, enabling you to remove door without damage.

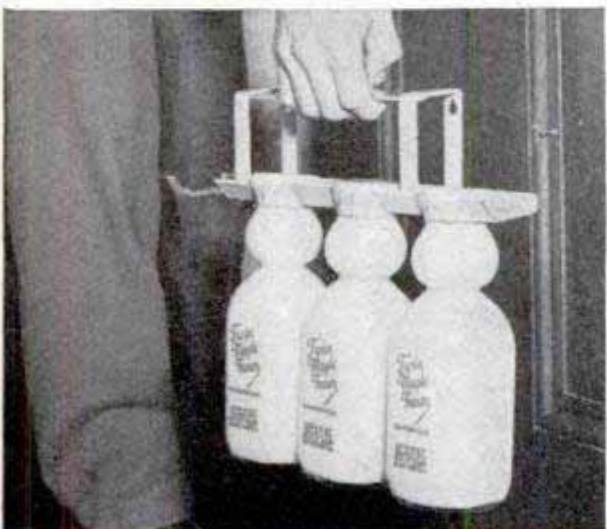


Safety Hinge Corp.,
Box 111, Cranford, N. J.

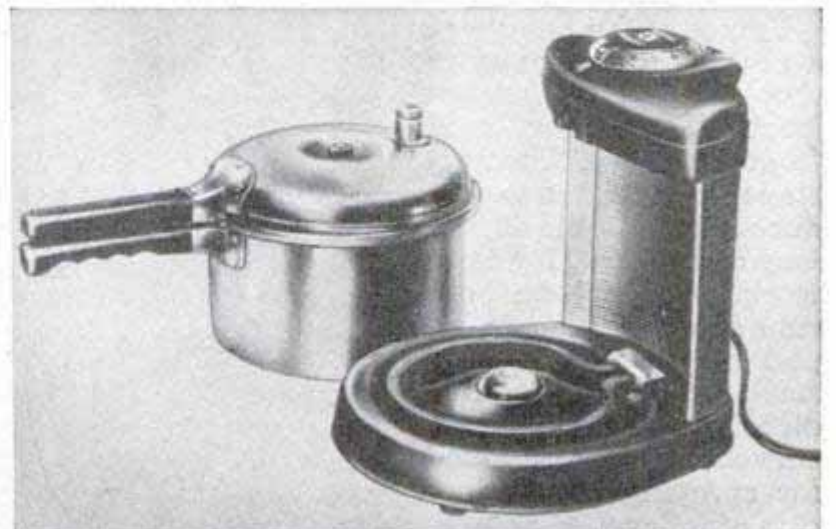


MILK-BOTTLE RACK holds four bottles up off the porch floor where they often are kicked over and broken. Hanging on two screws, the rack slips off easily to become a carrier when you take the milk inside. It holds any glass milk bottle

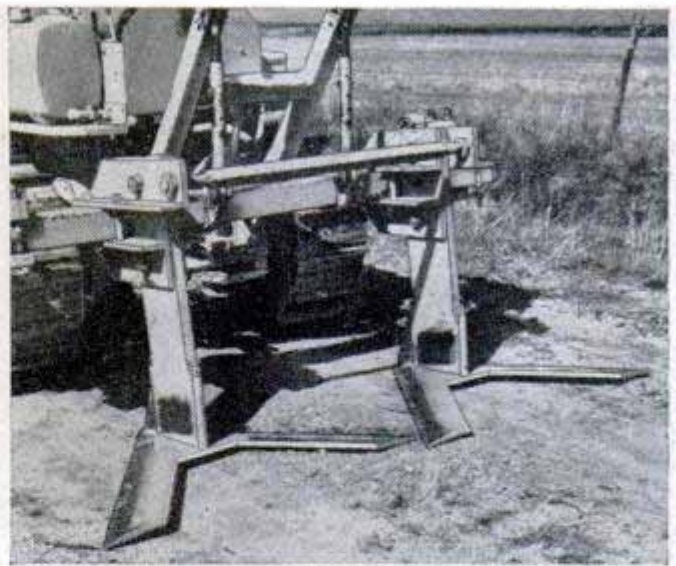
AUTOMATIC PRESSURE COOKER is kept at desired pressure by electric stove that shuts off heat when preset time elapses



G. E. Trombley & Associates, 58 Front St., Worcester, Mass.



Proctor Electric Co., 480 Lexington Ave., New York City 17.



Caterpillar Tractor Co., Peoria 8, Ill.

Brush Cutter

Slicing off unwanted brush just below the bud ring, a new brush cutter eliminates undergrowth and insures that there will be no new growth from a cut bush. The cutter, which is attached to a tractor, has twin,

V-shaped sweeps that combine to cut a 100-inch swath. The cutting edges are adjustable to protect grass roots, yet cut brush stalks to the ground. The attachment is designed for clearing big areas of Western range, but it can also be adapted for tillage of summer fallow.



E. Leitz, Inc., 304 Hudson St., New York 13, N. Y.



"Folding Fan" Flash Reflector

Folding compactly like an old-fashioned fan, a new reflector for flash bulbs can be carried in the pocket. The reflector is part of a new flash unit designed for a Leica camera. Made of dull-finish aluminum, it diffuses light evenly and can be used with all sizes of focal-plane bulbs. The complete unit, including batteries, weighs 9½ ounces.

Hand Pump Operates Garden Sprayer

Pumping the handle of a new garden sprayer shoots a controlled mist of insecticide or other liquid from the nozzle. The nozzle can be adjusted to produce a jet of liquid 40 feet long or a fine fog for close work. A neoprene hose runs from the pump to the pail of insecticide, or a small jar can be attached directly to the handle. A curved nozzle is supplied for spraying the underside of foliage.



Earl L. Chadwick Co., Box 480, Houston, Tex.

STUNT DRIVERS WILL DO ANYTHING TO PLEASE



In "Dive Bomber," a stunt man zooms his car up a ramp, through the air and crashes it smack on top of another

By Andrew Hamilton

SEVERAL MILLION spectators shriek their way into a pleasant state of delirium each year watching Joie Chitwood and his stunt drivers ram cars head-on, break through blazing barricades and skid a hundred feet on two wheels. The most amazing part of the show is not a particular stunt, but the fact that some day these death-defying feats may save your life.

Chitwood and his drivers present head-on collisions, scheduled in advance. These

crack-ups give science an opportunity to assemble data on the impact which a human body withstands during a highway accident.

Herman P. Roth, U.C.L.A. physiologist, is working with the Chitwood daredevils in a research project. With high-speed motion-picture cameras and other instruments, he is recording forces involved in a collision between two speeding automobiles.

From these experiments has come detailed information on the safety of the

Daredevils drop backward off a car speeding 50 miles an hour and slide along the track on special corsets





With a resounding crash, two cars collide head-on. Such scheduled "accidents" are providing data on auto safety features



Late-model car was mangled into a heap of twisted metal by a collision with a solid wall of ice. There was a driver inside!

Motorcycle driver crashes through a blazing barricade. He earns about \$200 a week for defying death with such stunts

modern automobile. Tomorrow's passenger cars may have revolutionary safety features because Roth's grinding cameras are recording crack-ups today.

Meanwhile Chitwood and his drivers, subjects of the research, go about the everyday business of risking their necks to earn a living.

Which is tougher—stunt driving before a thrill-hungry crowd or racing automobiles in big-time track competition? Chitwood, three-time Eastern AAA champion, has done both.

Joie gingerly feels a facial injury that required 50 stitches not long ago and says: "Stunt driving—every time!"

The reason?

"When you slide behind the wheel of a racing car, you plan to do everything possible to avoid a crash. But when you're stunting—jumping ramp-to-ramp, busting through blazing barricades, skidding on two wheels—you know for sure that a crash is coming sooner or later."



There are several automobile stunt troupes in the United States. Best known, probably, are the five Chitwood units that appear at carnivals, racing tracks and county and state fairs from coast to coast.

Chitwood and his daredevil drivers have also made several motion pictures, the latest being M.G.M.'s new "To Please a Lady," starring Clark Gable and Barbara Stanwyck in the story of a stunt driver who wouldn't quit the game.

There's a saying among throttle jockeys of the crash circus: "You don't have to be crazy in this racket, but it sure helps."

Stunt driving probably got started that way. One or two screwballs with more nerve than brains risked their lives for a few bucks to give the crowds a spine-tingling thrill. But Chitwood has put automobile stunting on a businesslike basis.

Before the war this 200-pound ex-football player, a full-blooded Cherokee, did a lot of driving on dirt tracks in the Midwest and East, competing seven times in the 500-mile Memorial Day classic at Indianapolis. In 1939, 1940 and 1942 he was Eastern AAA champion.

In 1940 Chitwood joined Lucky Teter's "Hell Drivers" as an understudy driver. Teter's luck ran out in 1942 while performing at an Army-Navy benefit show in Indianapolis. His car failed to negotiate a ramp-to-ramp jump and he was killed.

In 1945 Chitwood acquired some of Teter's equipment, hired some of his drivers and started the show afresh, naming it the "Auto Daredevils." He added showmanship, zip and dash. He combined chills

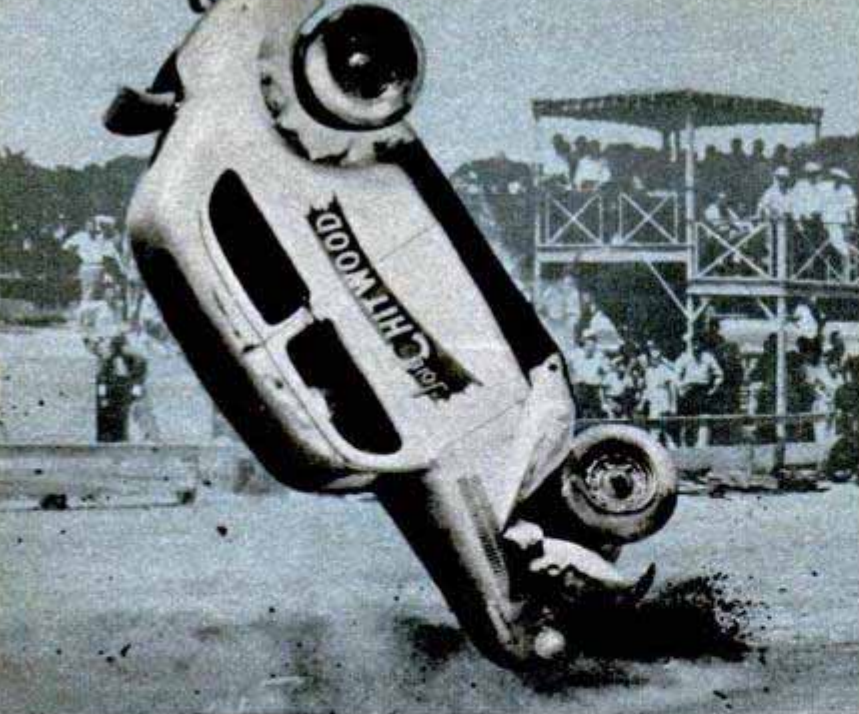


Show's clown "relaxes" the audience by wandering straight into path of oncoming cars, which pass on ramp with inches to spare



Chitwood, standing center among his drivers, has put courage on a business basis. Drivers wear colorful outfits designed by a Hollywood costumer. Below, finish of a motorcycle stunt shows driver, head down, escaping from blazing barricade of boards





One of Chitwood's drivers does a snap roll-over in an older car, which can usually survive six or seven crashes. His only protection in the car is a crash helmet and safety belt

and thrills with businesslike acumen in publicizing and running the organization. In four years, he has parlayed such ideas into the outstanding automobile stunt show in the United States.

Today, he has more than \$100,000 invested in equipment. His shows are as carefully planned as a three-ring circus. Drivers are costumed by a leading Hollywood designer. Stunts are worked out with blueprint accuracy. And the route of five units is plotted as carefully as a railroad train schedule.

Each of the Chitwood troupes is a self-contained unit of 60 men—20 drivers and 40 helpers, mechanics and promotion men. Three huge trucks are used to haul the ramps and other equipment; the stunt cars proceed under their own power. Each unit also contains a mobile machine shop for repair work.

The units move around the country from

early spring to late fall giving as many as three shows a day. Longest overnight hop ever made was a 700-mile jump from Indiana to Maryland.

"Automobile stunting requires a combination of courage, precision planning and split-second timing," Chitwood says. "Courage is a fine thing—but you can't get very far on nerve alone."

For example, in the hair-raising number called the "High Ski" or "Wingover," a driver comes roaring down the track at 50 miles an hour. The car's right or left wheels run up on a long, narrow ramp (30 feet long, three feet high at the far end). The car is thrown up on the opposite two wheels—remaining in delicate balance for 200 feet or more before settling down on four wheels again. The driver is able to control the car about 75 percent of the time by pressure on

the steering wheel.

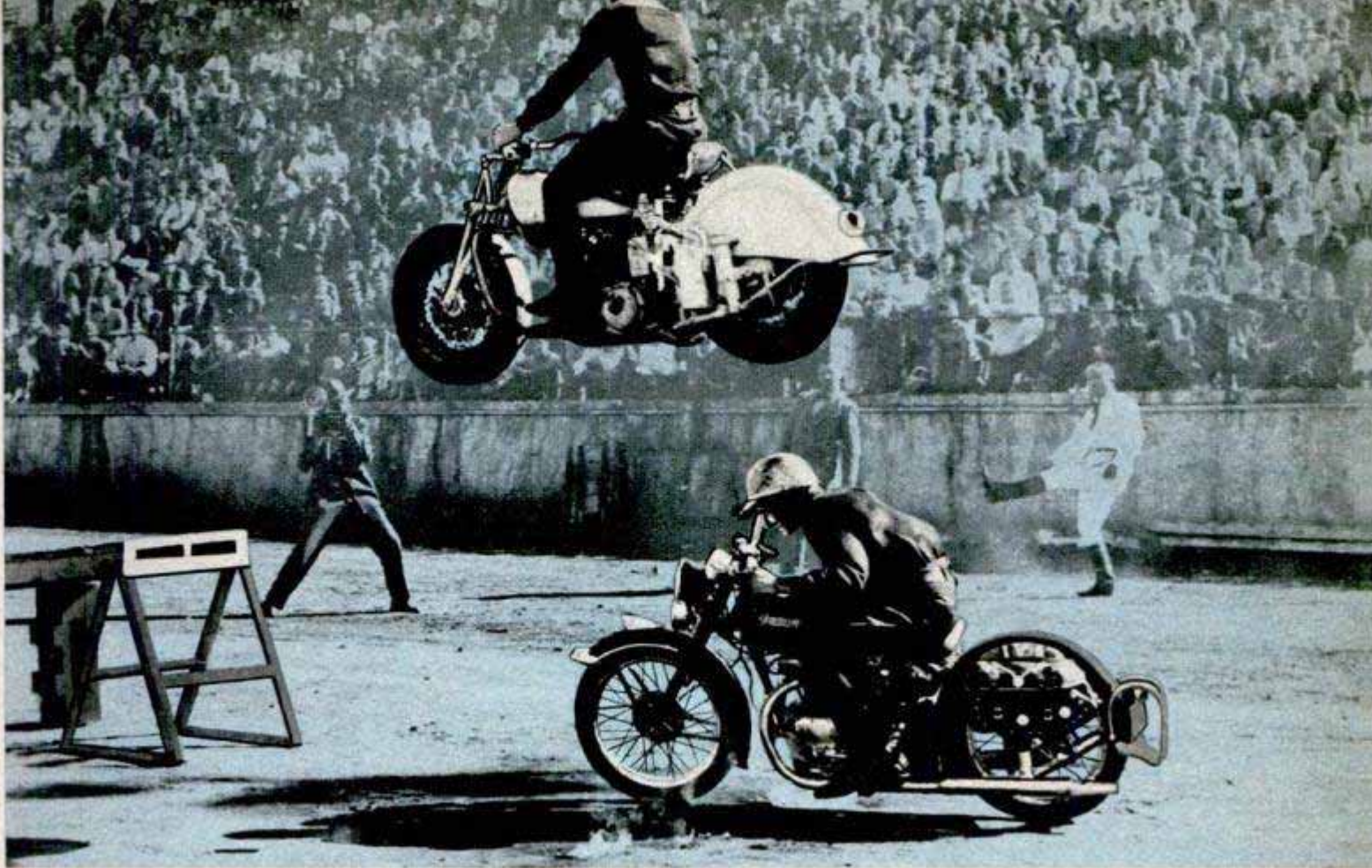
Then there's the stunt called the "Reverse Box." A wooden frame, a mere inch and a quarter larger than the car itself is placed on the track. The stunt driver approaches the frame, in reverse gear, at 30 miles an hour and skims through as neatly as you please.

One of the biggest thrills of the crash circus is the ramp-to-ramp jump in which Teter lost his life—thus giving Chitwood his start. Joie isn't at all superstitious about this stunt. In fact, he is so sure of his timing that he sometimes carries his six-year-old son, Joel, in the front seat with him as he "rides the ramps."

Two ramps (five feet wide and five feet high at the far end) are spaced from 40 to 80 feet apart, depending upon the kind of a track and the speed of the car before making the jump. Ramps are checked and re-

In one stunt a car hurtles up a ramp, soars across another car and lands on another ramp 80 feet away





Ramp-to-ramp by motorcycle is even trickier than by car. Rider must be perfectly balanced to avoid disaster

checked so that they will be correctly spaced and aligned for the speed at which the driver will hit them. One car comes zooming down the track at full throttle, roars up the ramp, hurtles through the air, thuds to the ramp at the other end. Just to complicate matters, a second car scoots between the ramps while the first is leap-frogging over it.

Chitwood drivers usually drive late-model Fords. They're stock sedans, just as they came off the assembly line.

The only concessions to safety are three: hub caps are removed so they won't pop off and "bean" somebody; a special metal

apron protects the front bumpers from gouging the wood of the ramps; and the gas tank is placed inside the trunk compartment to lessen the danger of fire.

Like the gruelling tests of men and equipment in the 500-mile race at Indianapolis, the night-after-night performances of Joie's thrill drivers tell automobile manufacturers wherein the new models may be improved. Design men and engineers at the Ford plant base future planning on monthly damage and repair reports.

"People just can't believe that an ordinary car, such as we use, will take such

(Continued to page 242)

Driver hits ramp at 50 miles an hour and careens 200 feet on two wheels before other two touch earth again



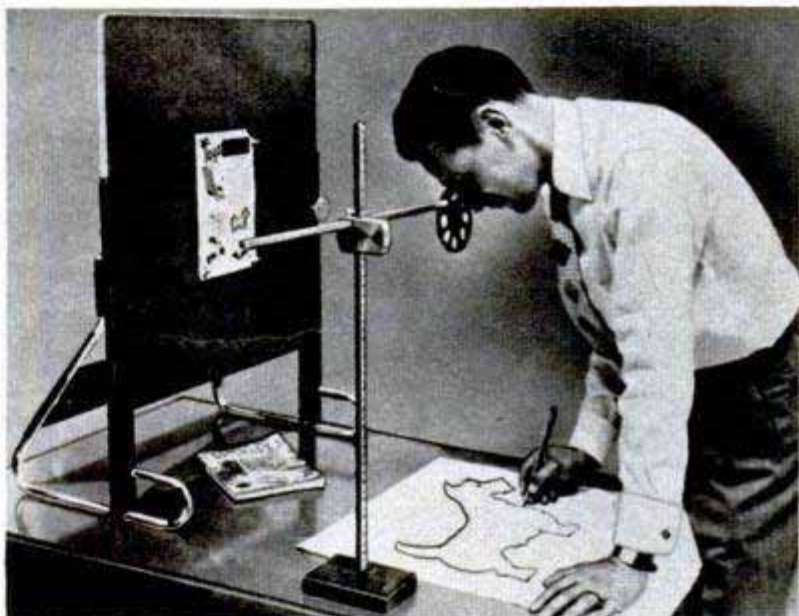


"Casey Jones" Auto

More than one citizen of Washington State has been amazed to see an automobile rolling across the countryside on the railroad tracks. It's a special car converted to rail use by the Great Northern Railway. Officials use it for quick inspections of the track between Seattle and Wenatchee, Wash. The rail-auto is capable of safe high speeds and gives inspectors a good view of the track. Special pneumatic tires, flanged on the inside, permit the conventional car to ride along the rails.

Copying "Lucy" Has Six Lenses

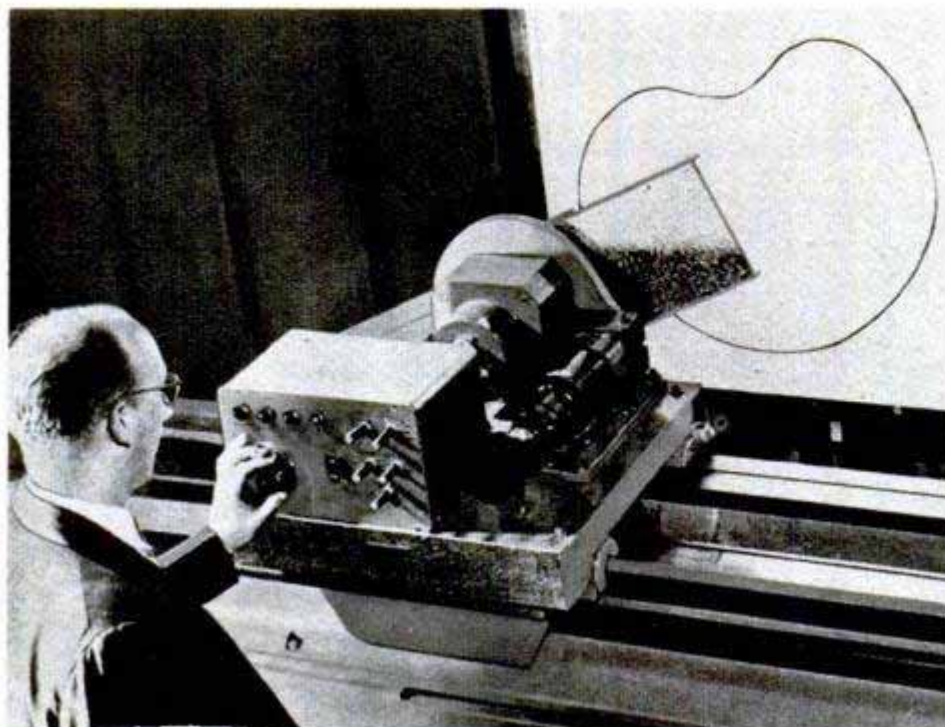
Enlarging or reducing the image as the artist wishes, a new camera "lucy" has six lenses mounted on a turret for quick and easy changing. With one eye the artist looks at the copy through a prism as the other eye looks down at the pencil. The two images are superimposed in the brain, enabling the artist to reproduce the original accurately. There are six lenses on the turret, each designed for a certain enlargement or reduction. Moving the eyepiece up increases the size of the image, lowering it decreases the image size.



Prisma-Scope Laboratories, 3151 East Colorado Blvd., Pasadena 8, Calif.

"Eye" on Cutter Follows Pattern

Irregularly shaped metal parts are cut automatically to the shape of a drawing by a contour-following machine that uses an electric eye to trace the pattern. The electric eye "looks" at the line to be followed through a microscope placed only a fraction of an inch away. As the scanning head moves along the lines of the drawing, the position of the cutting tool changes to reproduce the outline in metal to an accuracy within .003 inch.



General Electric Co., Schenectady 5, N. Y.



Telanserphone, 224 East 38th St., New York City.
Above, this transmitter automatically calls doctors by radio when the triggering slides, below, are inserted in it. Right, the small battery-operated receiver looks like a hearing aid



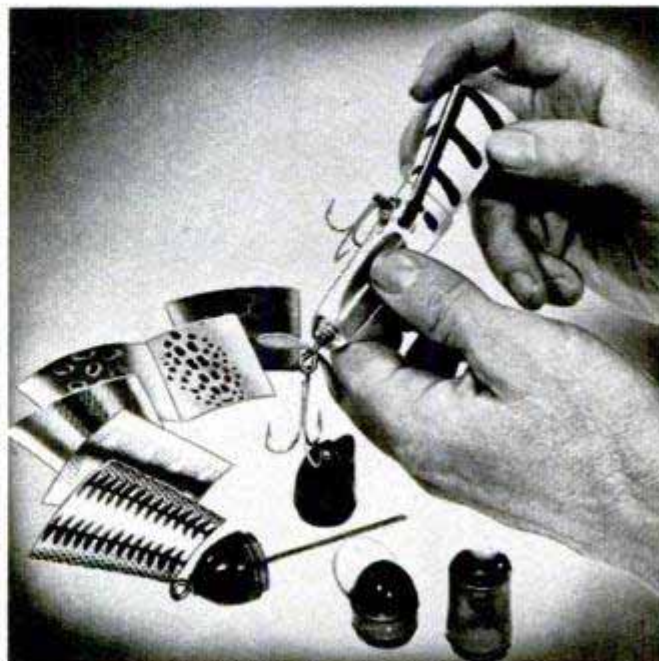
Radio Calls the Doctor

New York doctors who are relaxing at the beach or ball game are kept on continuous call by means of a new radio service. Each doctor who subscribes to the service is given a code number and a small receiver that looks like a hearing aid. When the doctor's office wants to talk to him his secretary merely notifies the call service. An audio slide (there's one for each number) is placed in a transmitting machine that broadcasts the code number automatically once each minute until the doctor responds by telephone. The small battery operated receiver will pick up the code signal within 25 miles of the transmitter, which is presently located atop a New York hotel.

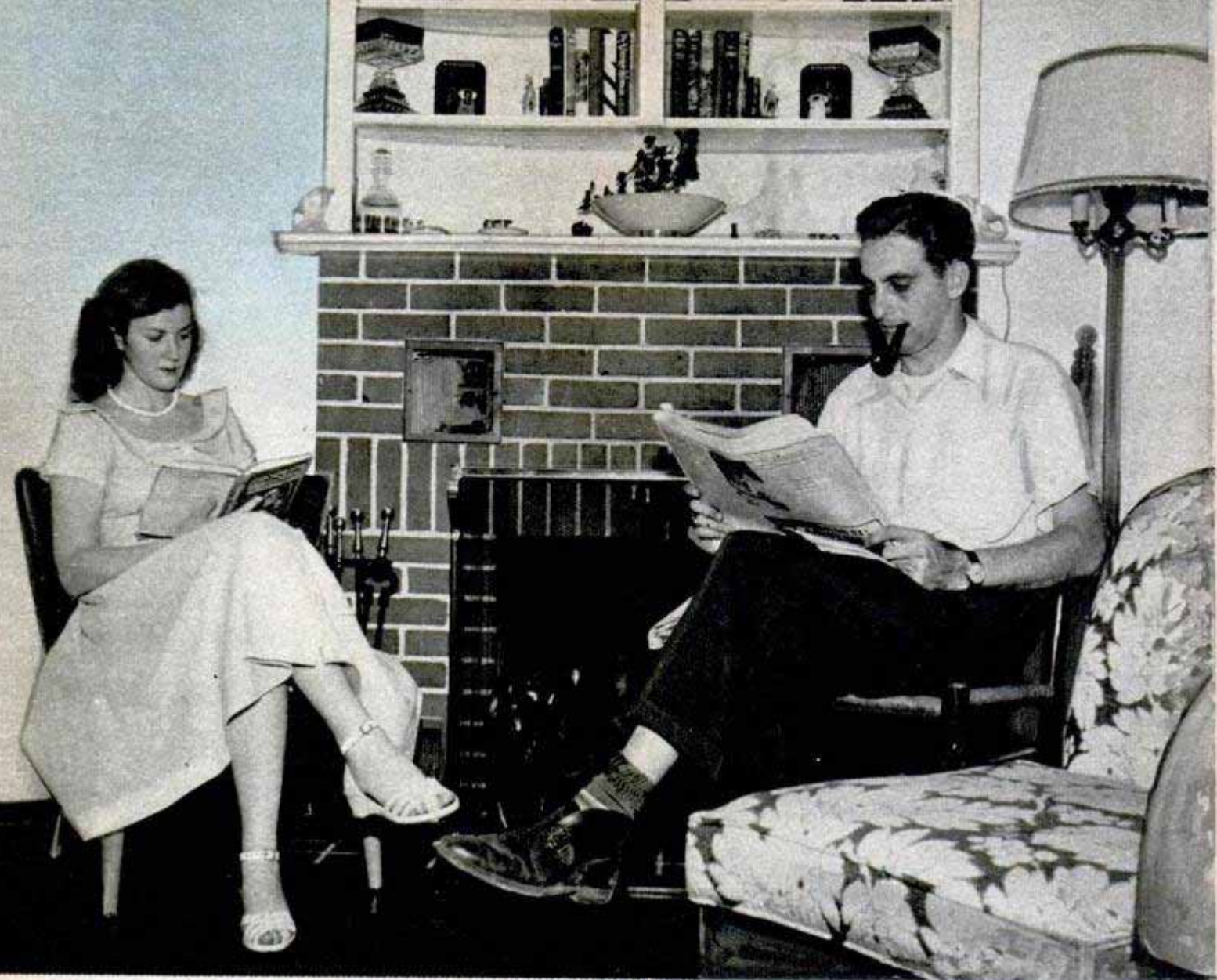
Convertible Lure

Fishermen make their own lures with a kit that can be made into more than 100 different bait combinations. Several detachable plastic parts, including a hollow body with seven interchangeable colored inserts, make up the kit. The four different heads provide any desired fishing action—top water, wiggler, popper, darter, underwater and others. When assembled, the lure is watertight for running on the surface. It can be made to run deeper by filling it with water.

What is probably the second oldest camera produced for photographic use—a Voigtlander made in Vienna in 1841—has been placed on display at George Eastman House at Rochester, N.Y.



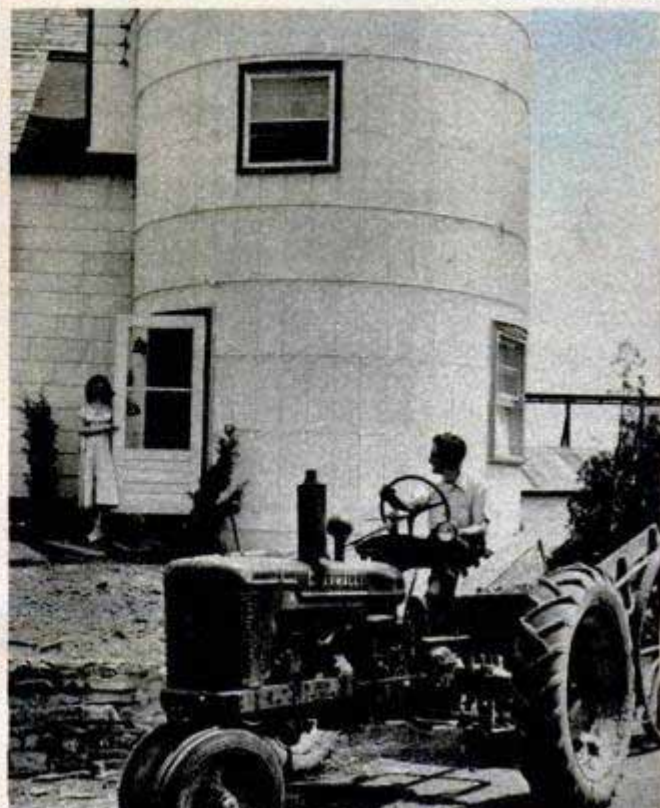
Nickel Tackle Co., Box 1827, Jacksonville 1, Fla.



Working fireplace along wall is the center of attention in the circular living room, which is 14 feet in diameter

Lighthouse-like circular staircase leads from first floor to the kitchen and bedroom on the two top floors

Buff rolls past his \$3200 house on his way to work again. Figure includes cost of kitchen equipment



AT HOME IN A SILO

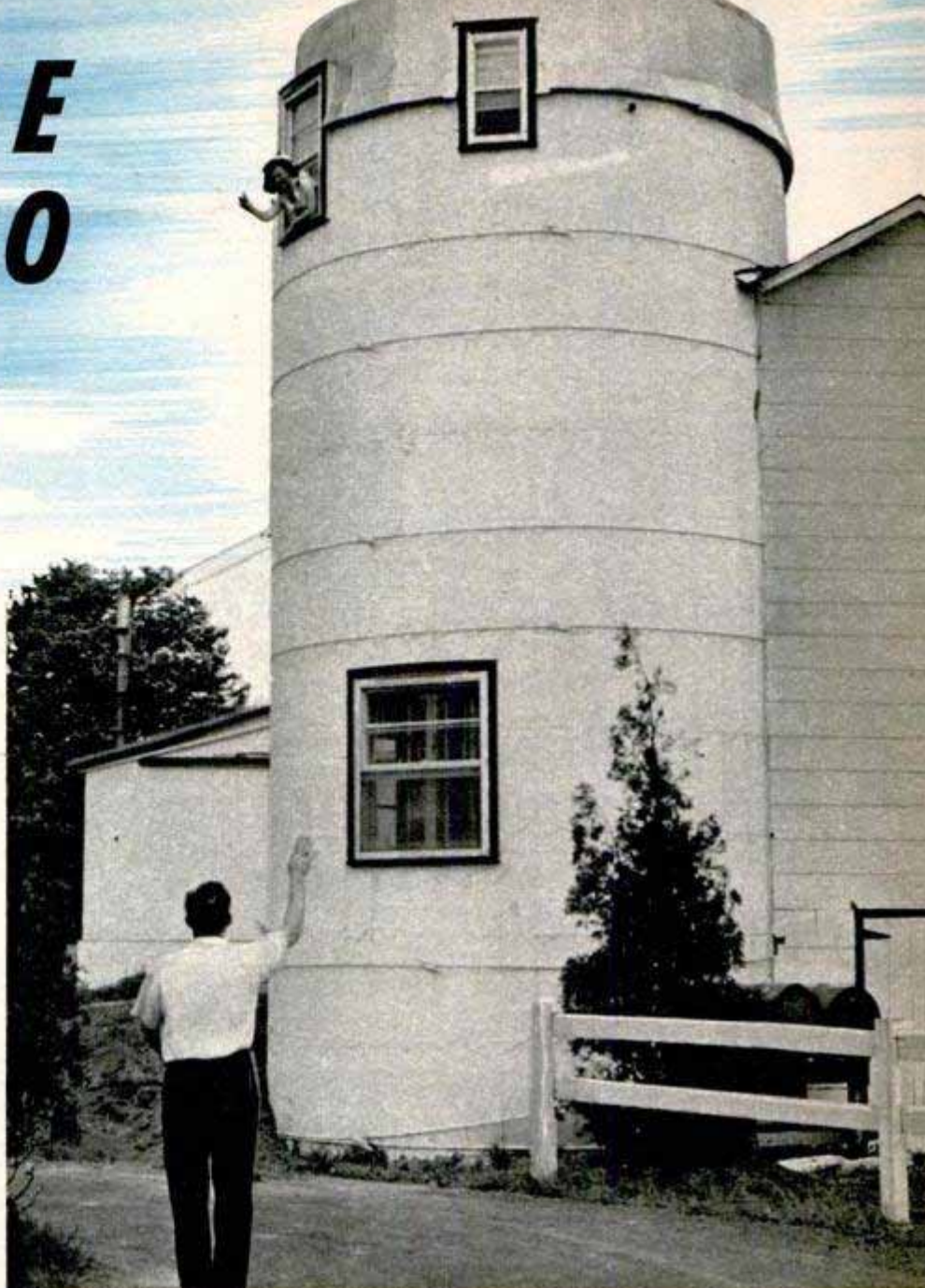
By Albert Pione

FACED with the not uncommon dilemma of the high cost of setting-up house-keeping, Mr. and Mrs. Albert Buff, imaginative newlyweds of Quakertown, Pa., solved their housing problem by converting a silo into an unusual apartment.

The silo, located on the farm of Mrs. Buff's father, has been remodeled into a three-room apartment complete with basement and fireplace. For this conversion, the Buffs spent a total of \$3200 which included labor, materials, copper piping throughout, an all-electric kitchen, oil heater, hot-water heater and an aluminum roof. The cost was kept low by the Buffs who did most of the unskilled labor. They cut all the lumber, nailed the plaster-board and did the painting.

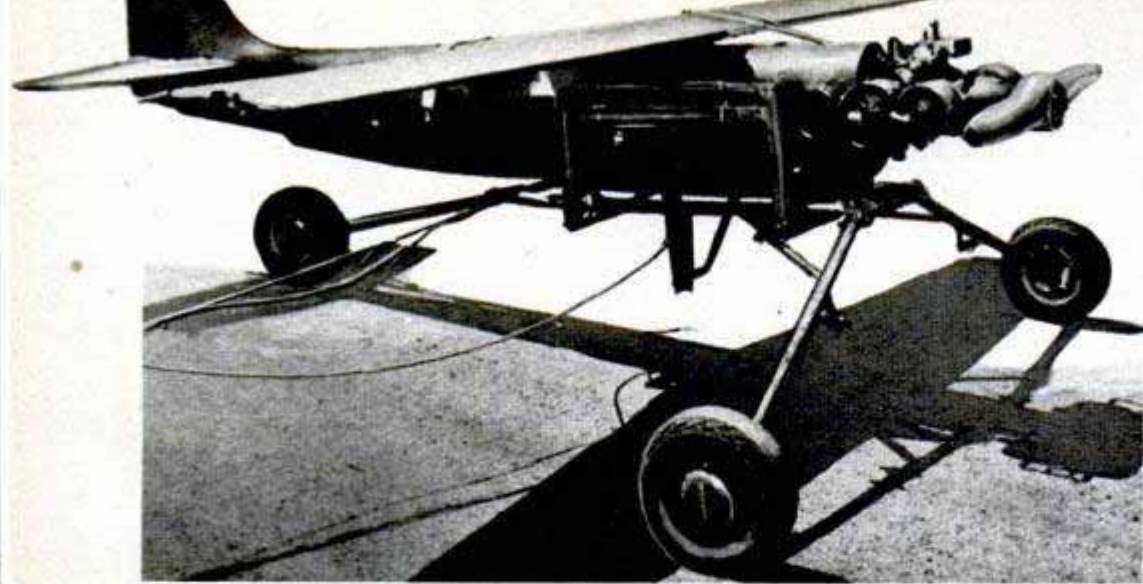
The silo-apartment is 32 feet high and 14 feet in diameter. It contains three rooms—a living room 14 feet in diameter, with a working fireplace on the first floor, an all-electric kitchen neatly arranged on the second floor and a bedroom on the third floor. There is an aluminum-tile shower stall on the second floor. In the kitchen the stove, cupboards and other equipment are arranged in a circular pattern and some items are recessed into the silo wall. The dwelling is warmed by an oil heater located in the five-foot-high basement. A circular, lighthouse-like, stairway leads to the second and third-floor rooms.

The Buffs, pleased with their silo-apartment, are planning to complete it by installing a sun deck leading from their second-story window to the barn roof.



Mrs. Buff is probably the only housewife in the world who welcomes her husband home from work with a gay wave through a silo wall. Below, kitchen is all-electric with cabinets arranged in a circle

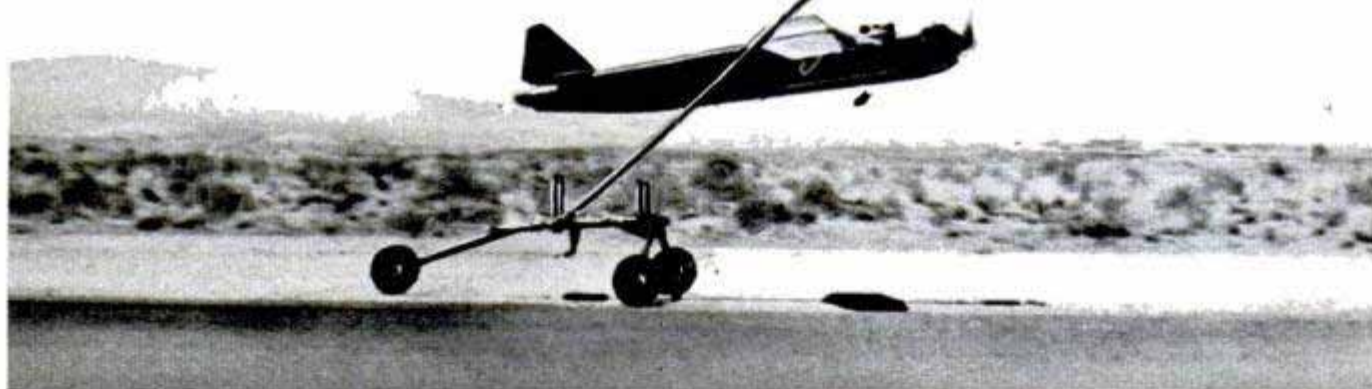




Power for the 300-pound target plane comes from a four-cylinder engine. Separated from its undercarriage at take-off, the plane lands by parachute

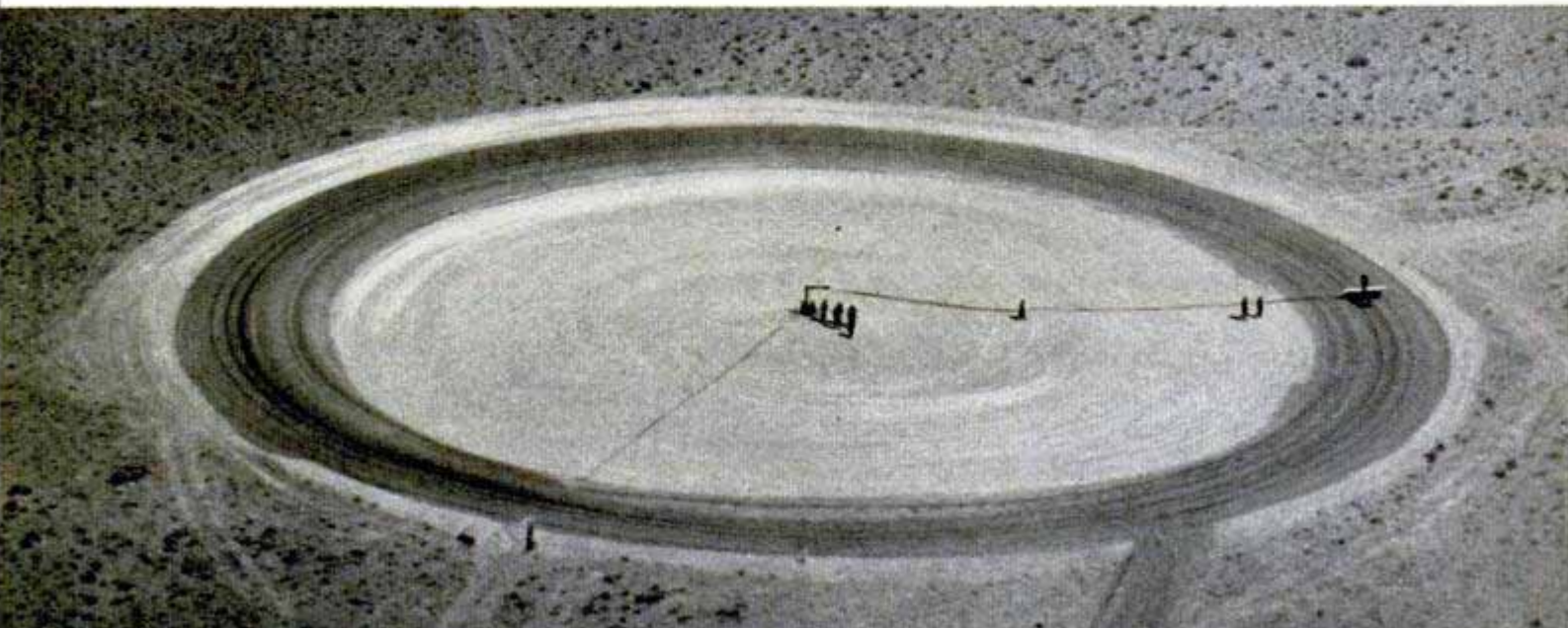
Radar "Eyes" for Target Planes

RADAR and a new automatic pilot now enable pilotless target planes to fly beyond the operator's sight. Designed to simulate a fighter plane for antiaircraft and flexible gunnery practice, the OQ-19 can make remotely maneuvered high-speed dives, steep turns and travel 220 miles an hour. The miniature craft, with wings spanning only 138 inches, is also pioneering a new launching technique. Instead of a rocket boosting it to take-off speed along a 60-foot ramp, the craft moves in a circle on a detachable wheeled carriage under its power and attains flying speed in less than five round trips. A 150-foot cable from the carriage to a center post holds the plane down until it is remotely released



USAF Air Materiel Command photos

Seconds after reaching its take-off speed of about 80 miles an hour, the pilotless craft, above, moves away from its undercarriage. A 150-foot cable to the center post holds plane on ground until it reaches flying speed



Pump Drains Engine Oil Through Dip-Stick Hole

Portable and fast acting, a new pump changes engine oil in less than two minutes. The device, which fits any five-gallon pail, can be used without crawling under the car. A metal tube is inserted in the dip-stick hole and 12 strokes on the pump handle draws out the oil and sludge. The pump hose is transparent to permit a visual check of the oil's condition. Producing a strong vacuum, the device can also be used to clean oil and fuel lines, as well as to drain oil from oil filters, water from radiators and gasoline from tanks.

Forest-Killing Disease Stopped by Knife or Poison

Oak wilt, rapid-spreading forest killer, can be stopped in its tracks with poison or a tractor-drawn knife, according to plant pathologists at the University of Wisconsin. By using radioactive iodine as a tracer, the scientists discovered that the disease often moves underground from tree to tree through natural grafts in a forest root system. The disease can be controlled by poisoning a ring of healthy trees around an infected stand or by cutting the



Chisholm Industries, Inc., 109 Central Ave., Lynn, Mass.

interlocking root systems with a tractor-drawn knife. Still a mystery, however, is the manner in which the disease jumps great distances. It has spread throughout the Middle West and as far east as central Pennsylvania.



Microwave "Interphone" Aids Motorist

Invented by an Italian engineer, a microwave communications system enables an automobile driver to "talk" to the people in the car in front of him. If a driver wishes to pass another, he simply presses a button on the dashboard control box. A microwave signal lights up a light on the dash of the car ahead and its driver responds by turning on a green taillight if it is safe to pass, a red taillight if not. Another modification of the device will automatically depress the headlight beams of approaching cars at the proper distance and lift them when the cars have passed.

Information not listed on articles in the index frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.

By Jack B. Kemmerer

THOUGH supersonic jets and sizzling rocket planes may be flashing through the skies, one of the most unusual planes in the United States today is a converted, wartime PBY-5A Catalina.

Ever hear of an airplane with a shower bath? Or one with French phones in every compartment?

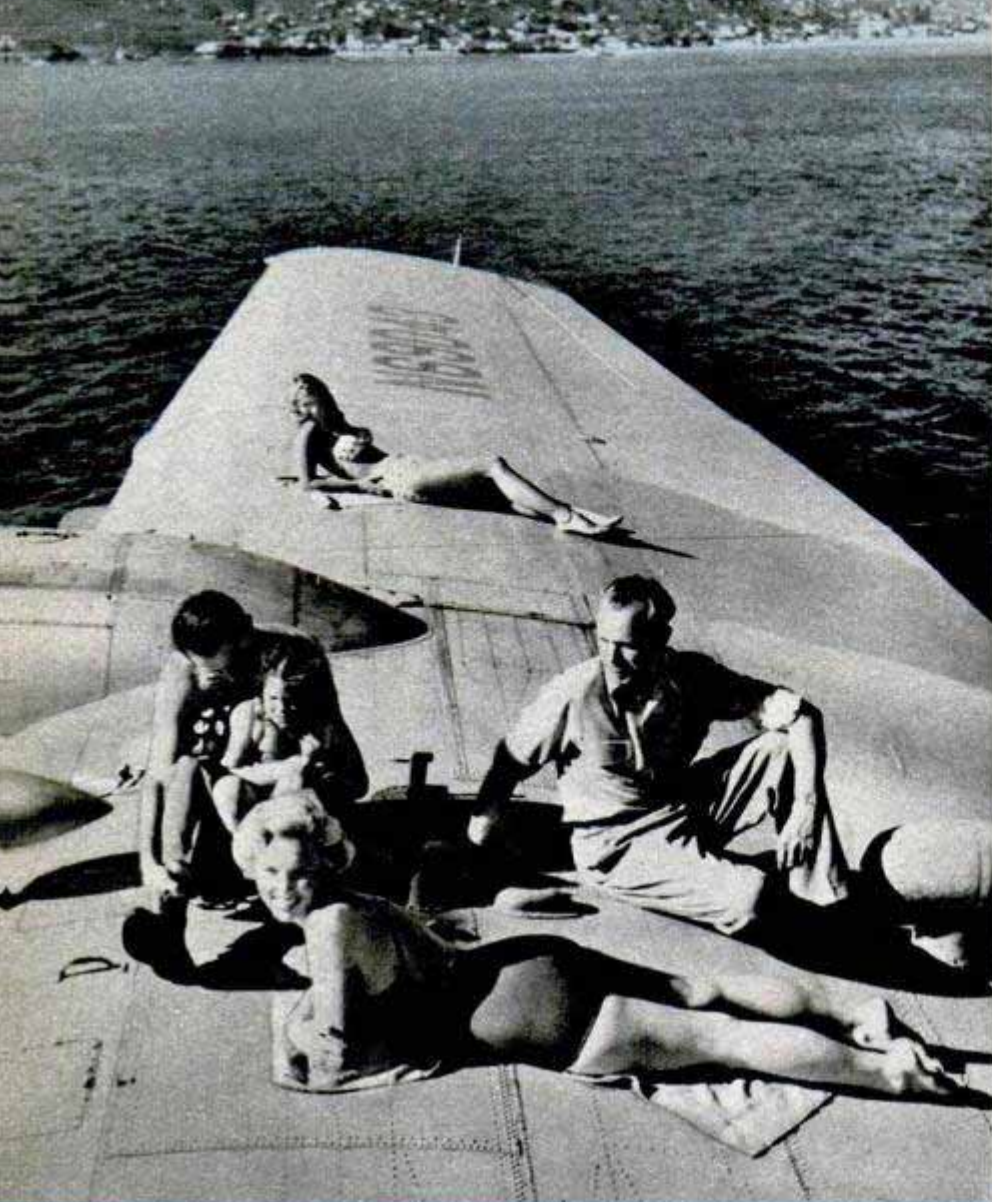
Or an aircraft with a fully equipped galley having a 10-cubic-foot electric refrigerator and frozen-food unit? Or a plane that has hot and cold running water with automatic pumps for drainage?

Or one that carries two 14-foot boats complete with 10-horsepower motors, fishing gear and walkie-talkies?

This luxurious sky-yacht—literally an apartment with wings—was designed and built by the Southern California Aircraft Corporation, Ontario, Calif. Glenn E. Odekirk, special assistant to Howard Hughes and also the executive vice-president of the new corporation, is the man responsible for building it.

In theory, of course, the Landseaire is still a PBY-5A Catalina with a completely new interior and a few changes made to the exterior.

The forward gun turret and the bombardier's window have been replaced by a graceful clipper bow.



Big wing, 104 feet long and about 15 feet wide, doubles as an exclusive sun deck when the luxurious sky-yacht rides at anchor

PBY penthouse

Clipper-bow replaces the forward gun turret and bombardier's window on the former war-plane, which has been converted into an apartment on wings



Changing the airflow over the vertical and horizontal stabilizers made a balanced-type rudder, thus giving improved directional control. Also, the trim tabs on the rudder are double their former size.

Other additions that amaze Navy flyers are the 14-foot boats attached under each wing where bombs and torpedoes used to hang. Each boat, fitting into a streamlined fairing near the leading edge of the wing, is raised or lowered from the plane's interior by an electric hoist.

A new stainless-steel firewall increases the fire safety of the engines. A single switch in the cockpit cuts off all fuel, lube oil and hydraulic fluid forward of this wall.

The flight engineer's controls in the tower were moved to the cockpit, making it possible for only the pilot and copilot to handle the airplane.

The airplane's interior rivals that of any modern seagoing yacht. Little remains that would be recognized by Navy pilots who flew the PBVs for hours upon hours patrolling the sea lanes in World War II.

Colorfully styled in blue, russet, tan and gray, the Landseaire has an observation compartment with the former gun blisters converted into wide, curved sight-seeing windows. In the compartment are a special bar, foam-rubber cushions, flight instruments, radio and French-phone intercom.

The special blister cost approximately \$3500. Excellent optical qualities without distortion were achieved by free-blowing the blister. It is as thick as the blisters used for military airplanes and is attached in the same manner as the plastic canopy on our latest jet aircraft.

Located in various compartments of the ship are three double beds and two singles. Standard equipment for the beds includes individual bed lights, radio switches and speakers, curtains, vents for an air-condi-



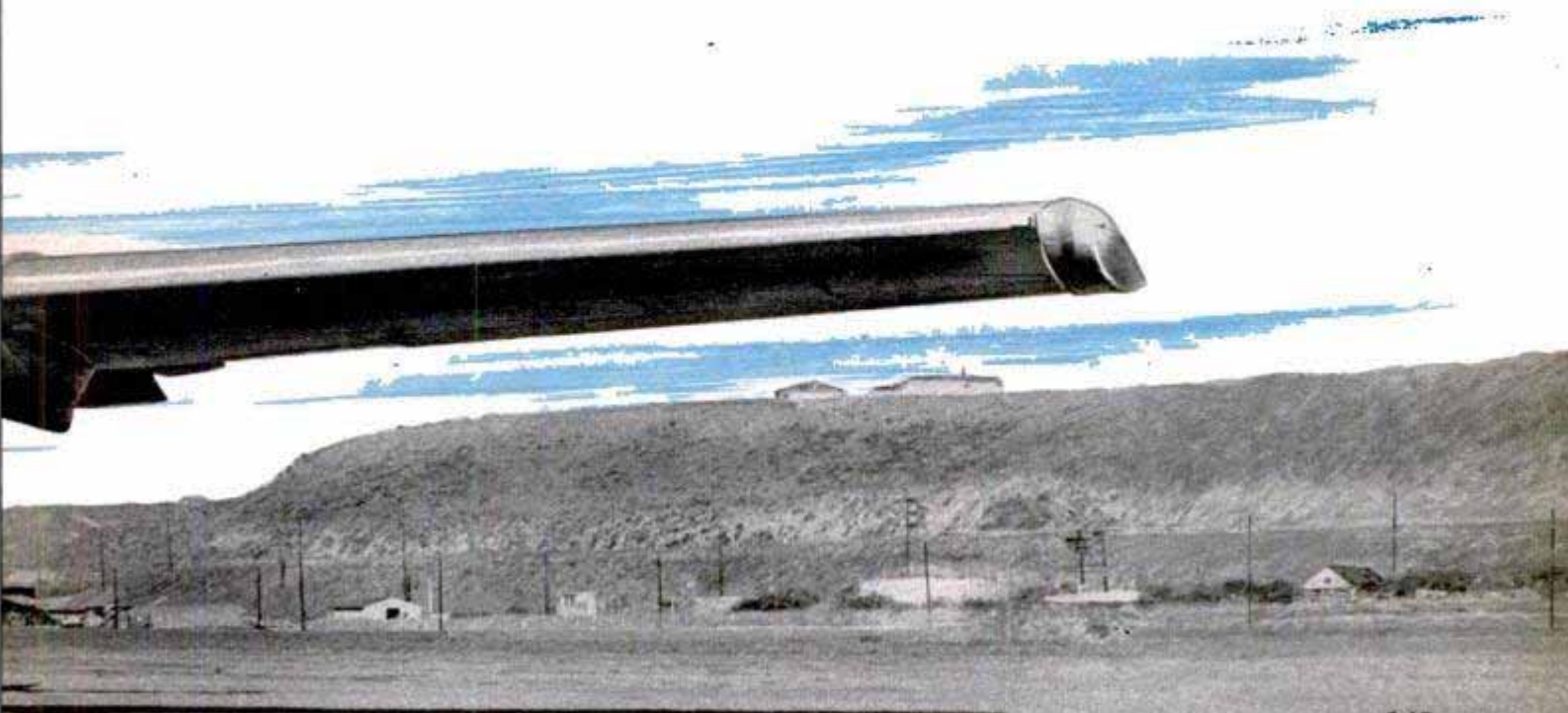
Curved blister made of plastic forms a big picture window for a long, undistorted view of the horizon

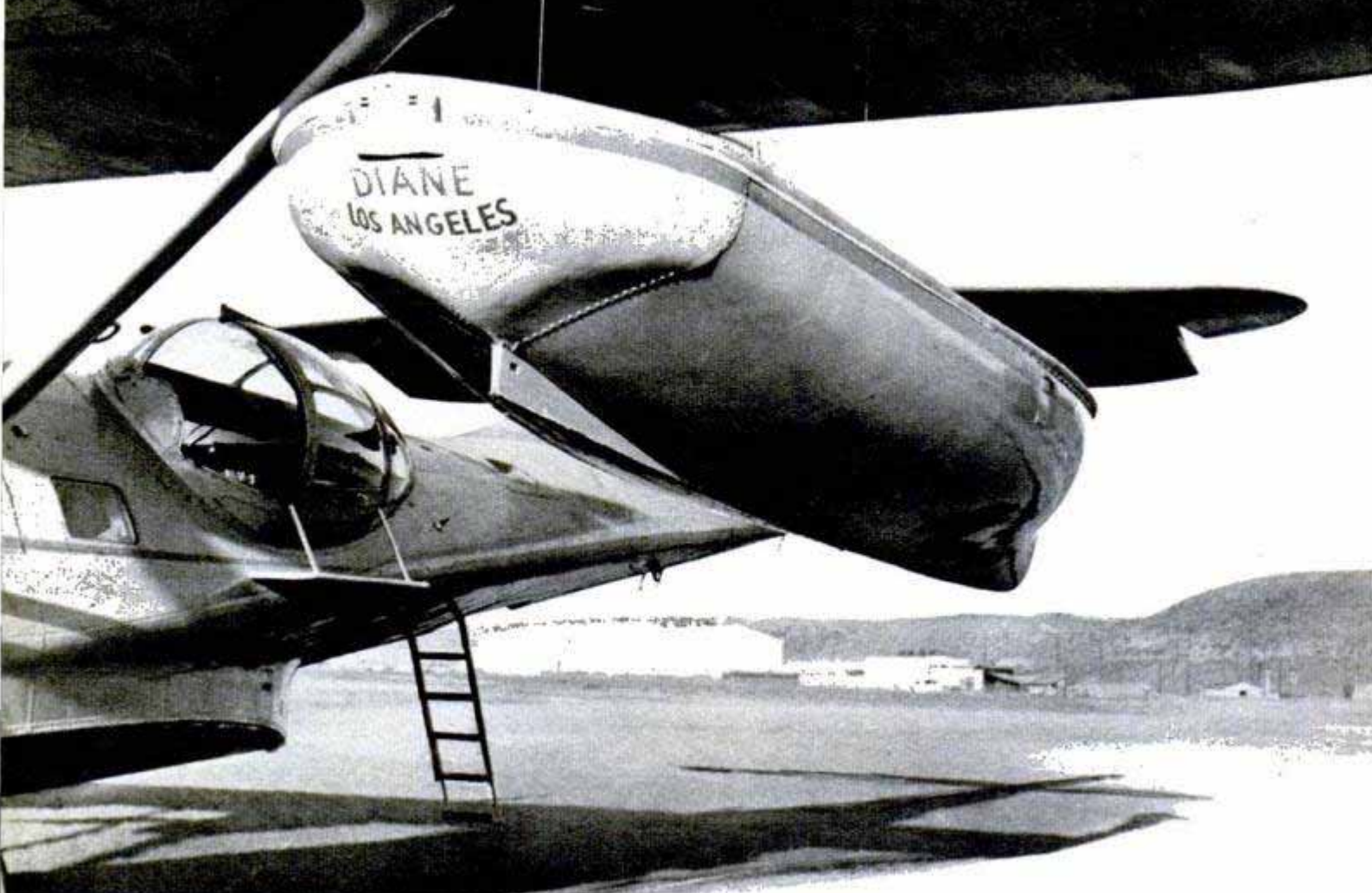
tioning system, and more French phones.

During the day the single beds in the observation compartment serve as lounge seats. In the combination dining and lounge room, one double bed converts into a large lounge and the other folds into two seats with a table between for card playing or work. The double bed in the forward compartment also folds into individual seats.

The shower bath, in waterproof plastic, runs hot and cold from the ship's tanks.

Finished in white porcelain and stainless





Outboard motorboats, attached under each wing, are raised and lowered by hoists operated from inside plane

steel, the compact galley rivals most modern home kitchens. The equipment consists of a three-plate range, oven, 10-cubic-foot refrigerator and frozen-food unit, ample cupboards with storage space and a stainless-steel sink with hot and cold running water. When the plane is airborne, the sink drains overboard, and at anchor it drains into a sump tank which is automatically pumped over the side when full.

The water for the sink is fed from a 10-gallon pressure tank. When the water reaches a low level, causing the pressure to drop below 20 pounds, a pump automatically refills it from large storage tanks.

Both the refrigerator and range have dual wirings and operate on 24 or 110 volts. These voltages are cut in and out by auto-relay switches. The 110-volt, 6000-watt, gas-driven, generating plant is located in the nose of the ship in the space formerly occupied by the bombardier and forward gunner. The compartment has been made fumeproof, soundproof and is insulated. With the exhaust of the engine discharging underwater, the operation of the plant is noiseless. All of the ship's equipment operates on 24 volts in the air but power is shifted to the 110-volt plant at anchor. A remote-control panel in the galley operates the plant and the sealed compartment remains closed except when the engine is

fueled. An exterior connection, installed in the wheel-well, provides a hookup for outside power when the ship is in the hangar.

The plane is equipped with the latest navigation and radio features, including a marine ship-to-shore telephone. And, to top it all off, the 104-foot wing, 15 feet wide, doubles for a sun deck when at anchor.

Off-duty, the pilot pours himself a cup of coffee in the galley while conferring on the French intercom



The Landseaire is equipped with Pratt and Whitney engines developing 1200 horsepower. The normal cruising speed at 10,000 feet is 160 miles per hour and fast cruising at the same altitude is 172 miles per hour. Maximum range of 3000 miles is possible if the plane is flown at 150 miles per hour. On a recent flight to Canada, the ship averaged 162 miles per hour at a fairly low altitude.

Additional planes of the Landseaire type will be equipped with Pratt and Whitney engines developing 1350 horsepower, and will have a normal cruising speed of 172 miles per hour.

Odekirk, a veteran pilot of more than 4000 hours, has his own ideas of what an executive-type private airplane should be able to do. After numerous flights, under almost every type of weather, he thinks this airplane is the answer.

"It seemed to us," Odekirk explained, "that no one has been getting real utility out of a private airplane. Normally, it's just a means of transportation in which you ride from here to there with varying degrees of comfort.

"So we decided to build a cruiser—an aerial luxury yacht—in which you can fly and land and live almost anywhere in the world with all the comforts of home."

The Landseaire is an ideal airplane for private flying because it is so versatile. Amphibious, it can land almost anywhere. The Southern California Aircraft Corporation has purchased 30 of the surplus "Cats"

Master radio has a speaker in every compartment. Later planes will be equipped with television sets

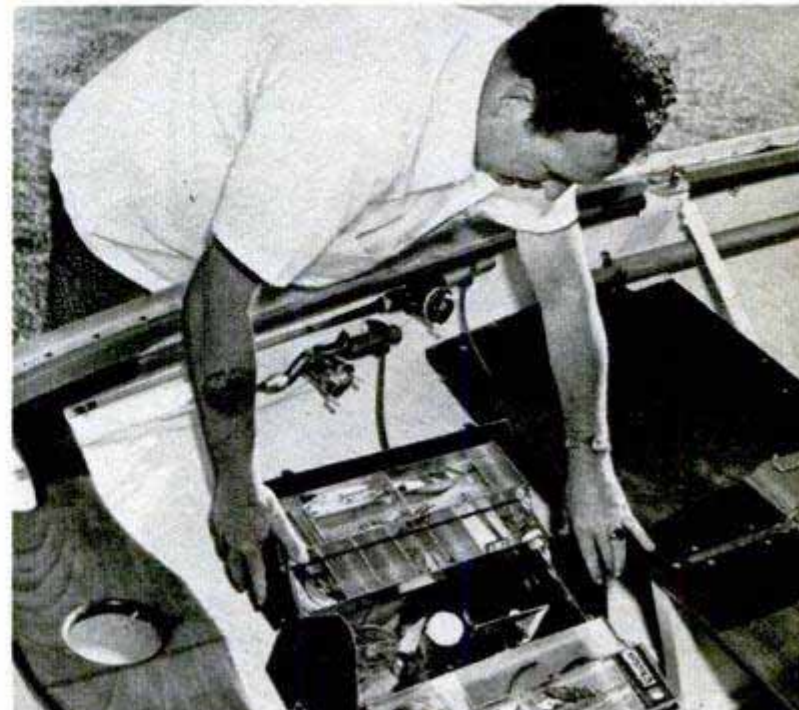


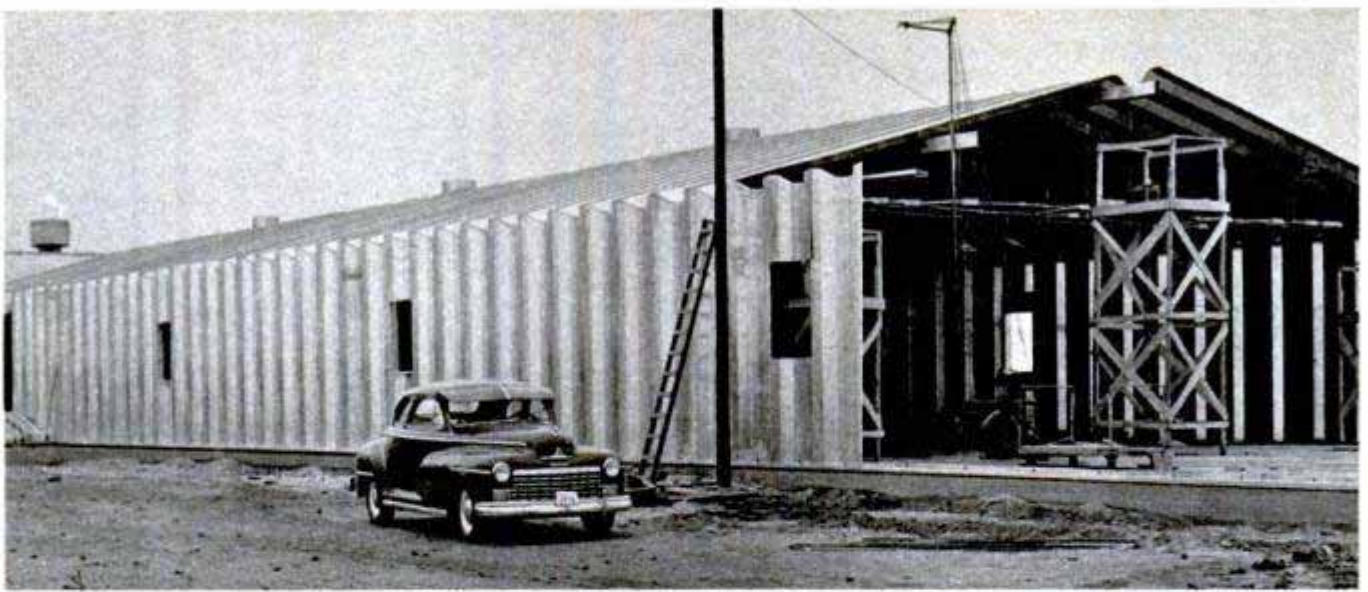
Inside or out, the plane is a luxury craft. The metal rack in the blister holds cameras for taking aerial snapshots

and is converting them into executive airplanes for individual and corporation use. The production line now converts one per month but this can be stepped up.

Interested in buying one? The luxurious land-sea-air yacht can be purchased, f.o.b. Los Angeles, for approximately \$225,000 completely equipped, including bed linen.

Complete fishing tackle, walkie-talkie and 10-horsepower outboard motor are standard boat equipment



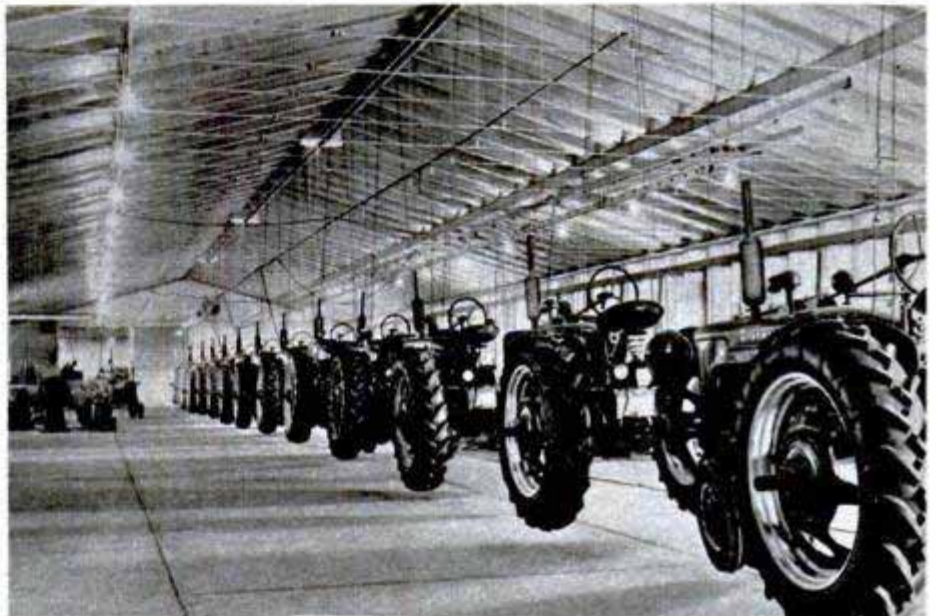


Behlen Mfg. Co., Columbus, Neb.

Steel Building Requires No Frame

So strong that 40 tons of tractors suspended from the roof did not cause any sag, a corrugated sheet-steel building supports itself with no frame or trusswork necessary. The steel is approximately $\frac{1}{16}$ inch thick, yet the $7\frac{1}{2}$ -inch-deep corrugations add so much rigidity that each panel becomes a support arch. The vertical panels and roof panels are bolted or welded together. There is virtually no limit to the size that buildings can be made with the corrugated steel.

Corrugated sheet-steel panels eliminate framework in building, above, because wall and roof panels are joined to form a continuous arch that supports itself. Below, roof holds up 40 tons of tractors with no sag



Little Giant

It took a veteran Kansas shovel operator 11 years of his spare time to make an exact scale model of a giant coal-mining electric shovel. The model, built to a scale of one inch to the foot, operates precisely as the real shovel does. It can be moved back and forth on its rails and is supported by four hydraulic jacks that keep it level at all times. There is even a workshop inside the model and on the workbench there's a miniature vise! About 30,000 rivets hold the model together. Five electric motors drive the shovel.

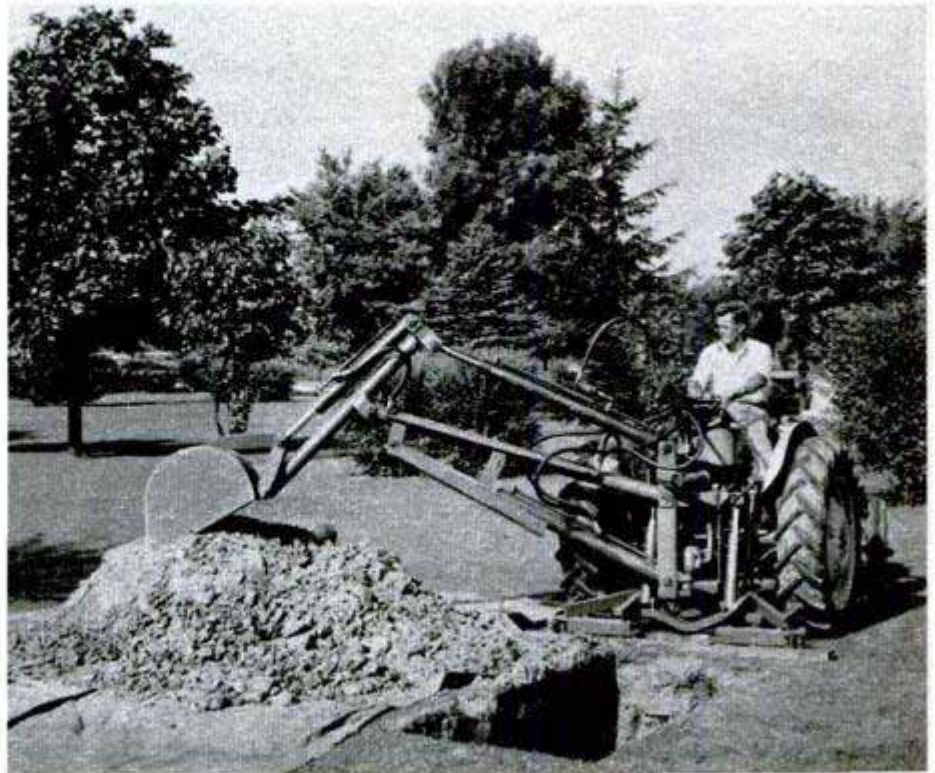
☐ Experiments indicate that Israel may soon be getting its oil supplies by processing sunflowers that grow wild in the Negev Desert.

Power Digger

Lightweight and easy to handle, a new power digger bridges the gap between slow hand labor and the job done by giant shovels. It is especially suited to limited spaces and can be used for excavating trenches, graves, culverts and for moving stones. The digger unit can be attached to the rear end of a tractor in 20 minutes, and its independently mounted hydraulic pump operates from the tractor's power take-off shaft. It reaches eight feet below ground.

141 Mold Remedies

Since 1942, when there wasn't enough penicillin to treat one patient, the number of mold remedies has grown to 141 and the monthly output to 16 trillion units. The basic seven on the list of antibiotics certified by the U. S. Food and Drug Administration are penicillin, streptomycin, chloramphenicol (also known as chloromycetin), aureomycin, bacitracin, ty-



Sherman Products, Inc., Royal Oak, Mich.

rothricin and terramycin. Certification means that the FDA examines each batch of the drug produced for identity, strength, quality and purity before it is shipped in interstate commerce.

Versatile Farm Implement Does Five Jobs at a Time

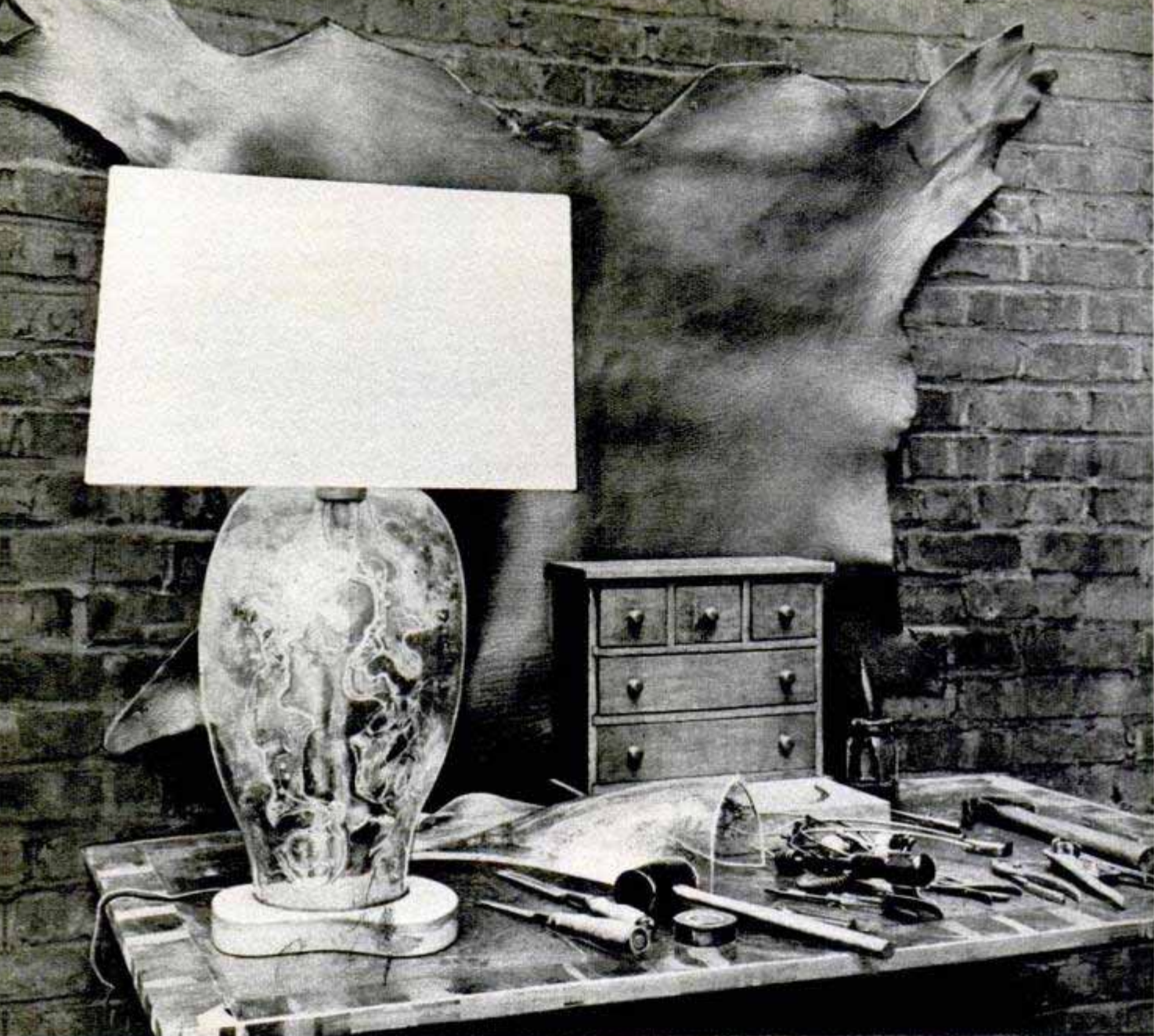
In one operation, a new farm implement does five or more jobs, leaving sod or grazing crops undisturbed. Some of the simultaneous operations are disking, harrowing, cultipacking, spreading slag, seeding with spreader and spreading ammonium nitrate. Oats have been the main crop planted in tests, but the machine will successfully

plant millet, peas, corn and other field crops as it is adjustable for depth of planting. In a test, the machine did a complete job of renovating, applying fertilizer and planting oats on 10 acres in 18 hours with a two-man crew. The machine was announced by the Agriculture Extension Service of Mississippi State College.

Left, close-up of the compartmented boots. Right, only a narrow furrow is left as the feet cut into the soil

Taylor Machine Works, Louisville, Miss.

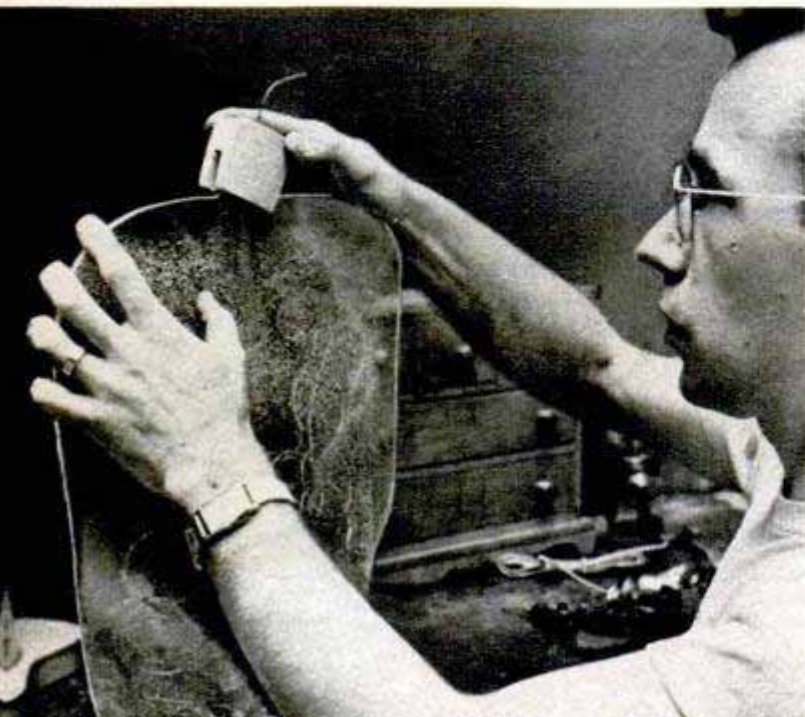




Above, that surrealistic-looking lamp is made of glass, coated on the inside to form nebulous patterns. On the wall is a steer hide that will be converted into scores of unusual items by the craftsmen. Below, when lighted from within, this plastic lamp produces a weird effect

HANDICRAFT

Even this old chemistry flask will be converted into something attractive by the Manhattan craftsmen





Rollers once used to print patterns on wallpaper are "raw material" for these experts who make them into lamp bases

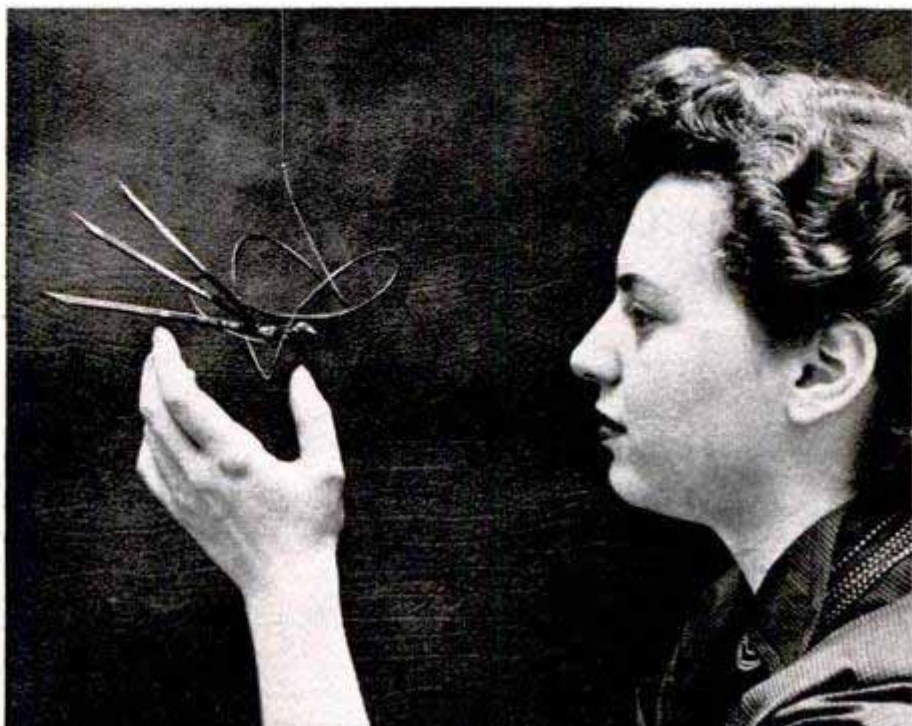
Right, a finished wallpaper-roller lamp ready for a shade and a customer. The raised parts that once printed the design are gold leafed

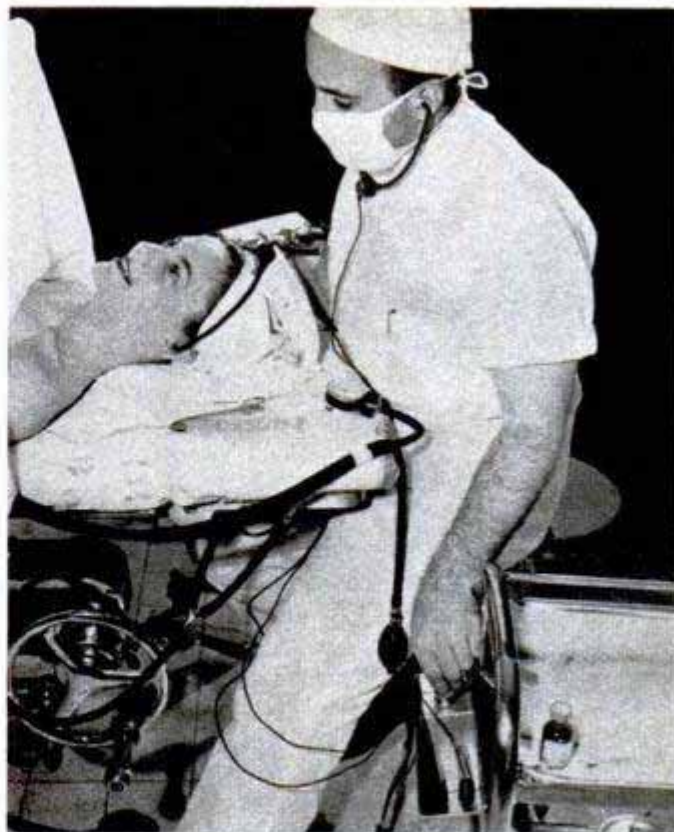
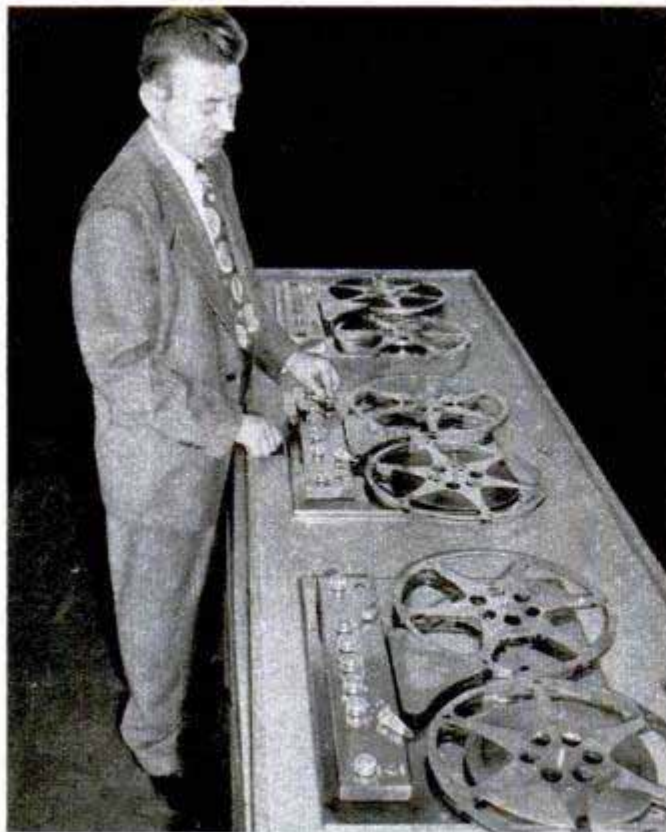
Below, right, this is a bird in flight as fashioned by a modern sculptor. The materials used are wire and strips of aluminum. Suspended in air, it is supposed to provide the feeling of flight



ON MANHATTAN

TUCKED away on Manhattan, heart of America's mass-production system, is a small shop where a craftsman's skill and imagination are as essential as they were in the days before production lines. Formed by several veterans, the shop has never hired a professional! Each worker was an amateur, who practiced his craft simply as a hobby, before joining the group. By pooling their skills, these hobbyists now produce furniture and decorative pieces that appeal to New Yorkers who prefer the unusual.





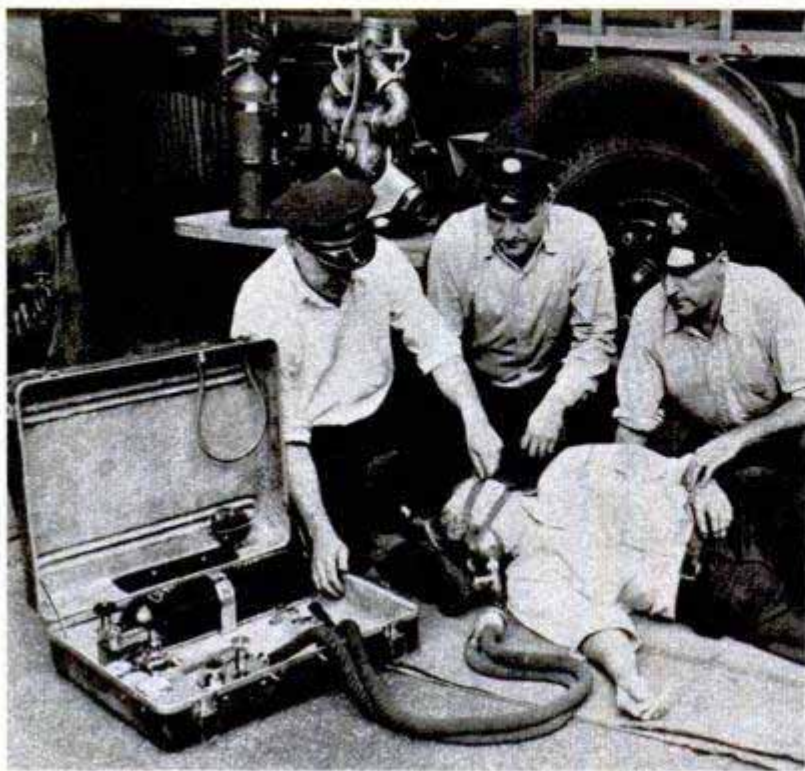
Joel Willard, 1959 W. 59th St., Chicago 36

Left, these tape-recording machines play relaxing music to calm the patient, right, in the operating room

Music in the Operating Room

Surgical patients relax before and during operations to soothing music that is "piped" directly to them through lightweight earphones. Used with spinal, local or regional anesthesia, the music occupies the patient's attention, lessening his worry and reducing tension. It also prevents him from hearing the clicking of instruments and the conversation of the doctors, two factors which cause apprehension when general anesthesia is not used. Designed

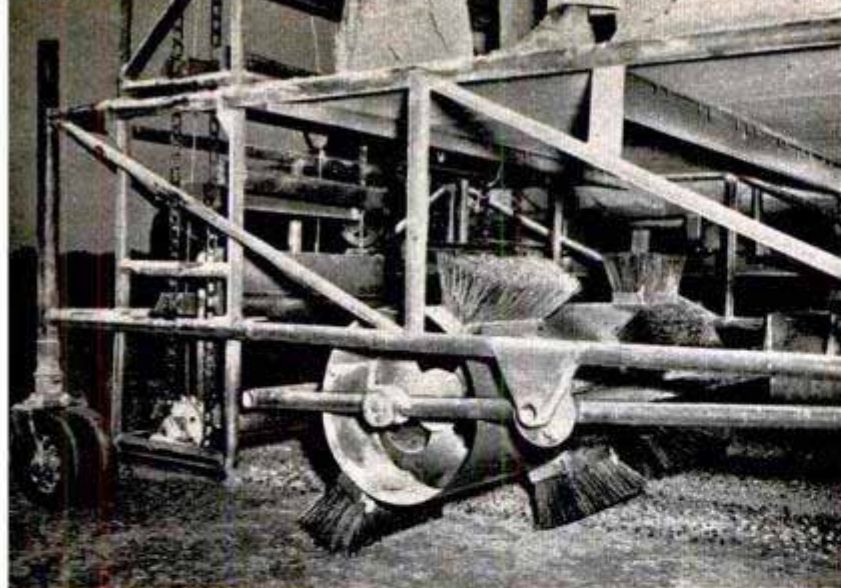
for the University of Chicago hospitals, the music-with-anesthesia system uses three magnetic-tape recorders to provide classical, popular or children's music, according to the patient's desire. These recorders operate all day in a special room, remote from the operating rooms. Control switches in each operating room regulate the type of music and volume. With 4800 feet of double-channel magnetic tape, each recorder plays for four hours without repeating any selection. The operating-room controls are handled by the anesthetist.



Mine Safety Appliances Co., 230 N. Braddock Ave., Pittsburgh 8, Pa.

Automatic Breather

Victims of any kind of asphyxiation can be treated with a new automatic breathing instrument which pours oxygen into the lungs in two different ways. A facepiece is connected by two tubes and dual valves to an oxygen tank. One valve, which administers oxygen under pressure at regular intervals, is designed for treatment of victims whose breathing has stopped. The other valve passes oxygen only when the patient inhales, and stops the flow when he exhales. The valves interchange automatically as needed. The two tubes make the apparatus suitable for use in any emergency in which a victim's breathing has been stopped or impaired.



Powered by a small air-cooled engine, sweeper brushes push dried potatoes toward elevator buckets that lift them into truck

In two weeks the combined elevator-sweeper, right, and another machine processed 17,500 hundred-pound bags of potatoes

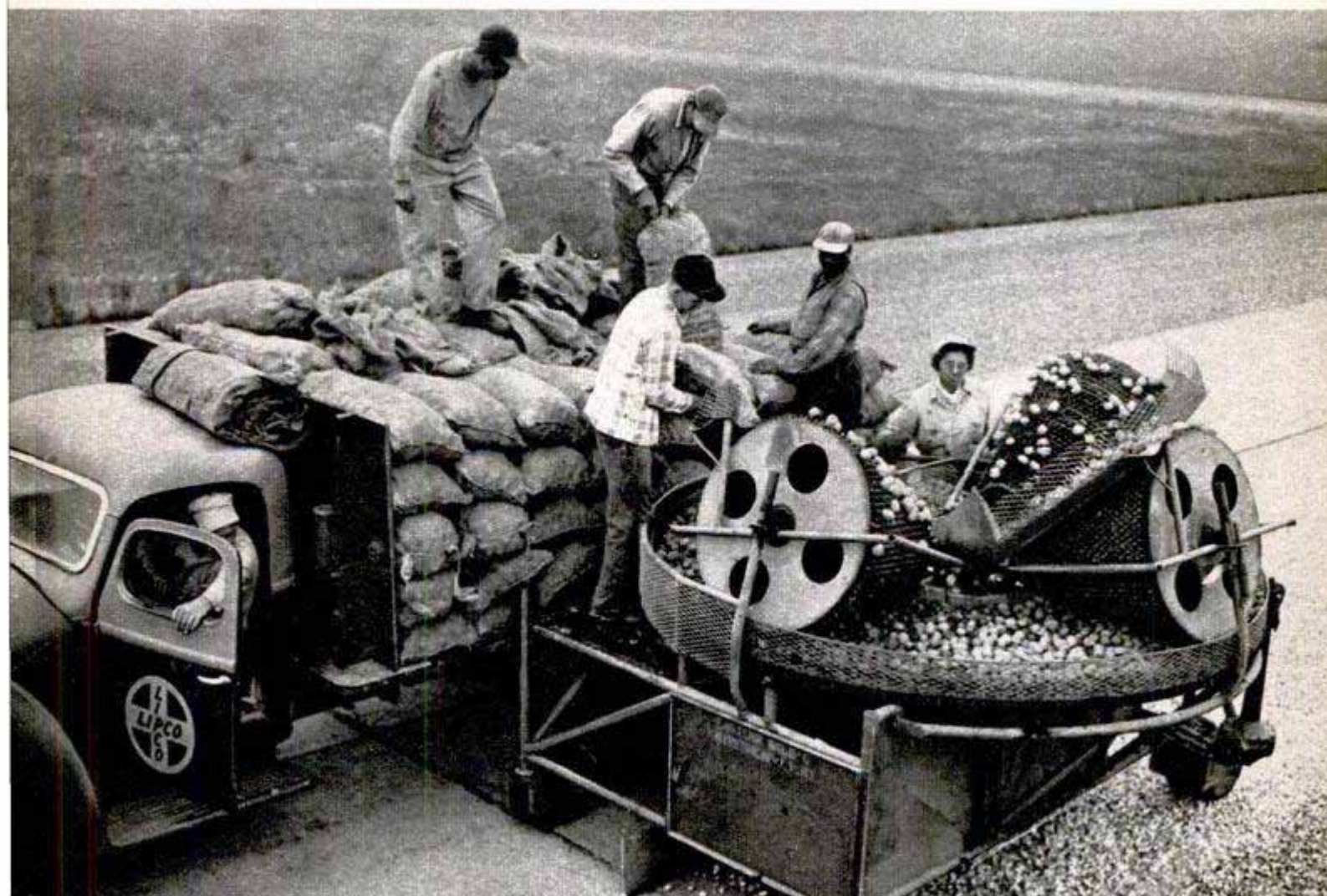


Chopper Converts Potatoes Into Animal Feed

POOR-GRADE POTATOES are mass processed for animal and poultry feed by two machines built by Harry Stafford and Ferris Talmadge of Easthampton, L.I. One chops the potatoes into small pieces and spreads them to dry.

Three or four days of sun reduces their weight 80 percent and they can be fed to cattle without further processing. Wire-mesh drums separate the tubers from debris. The other machine sweeps the dehydrated potatoes into elevator buckets that hoist them into a truck.

Revolving wire-mesh drums on cutter-distributor remove stones and debris before tubers are spread to dry




ONE RIVER BORROWS FROM ANOTHER

OUT IN CALIFORNIA engineers are going to pump water from one river, move it 117 miles south and dump it into another river so it can flow back north to its starting point! The amount of water involved would supply the needs of three cities the size of New York.

This watery merry-go-round may sound like so much wasted effort, but actually it's a long-distance water transfusion that will mean added fertility to thousands of acres of Central Valley farmland. Receiving the mammoth transfusion is the San Joaquin River that flows northward through Central Valley. This supplementary water is needed because far upstream the river diverts most of its water to two long-distance irrigation canals at Friant Dam, leaving only a comparative trickle for Central Valley farms.

Bureau of Reclamation engineers, seeking a source of water, knew that the Sacramento River poured billions of gallons into the ocean at San Francisco. Why not use this abundance as the remedy for the shrunken San Joaquin and thirsty Central

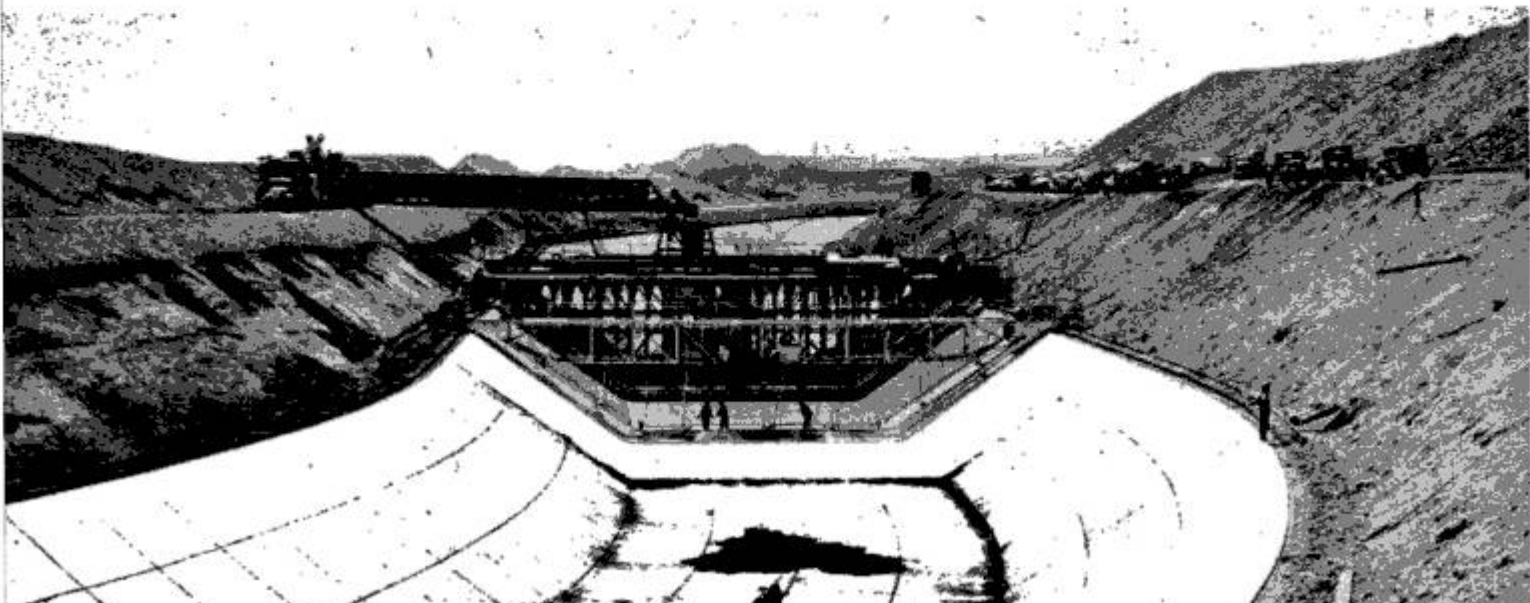


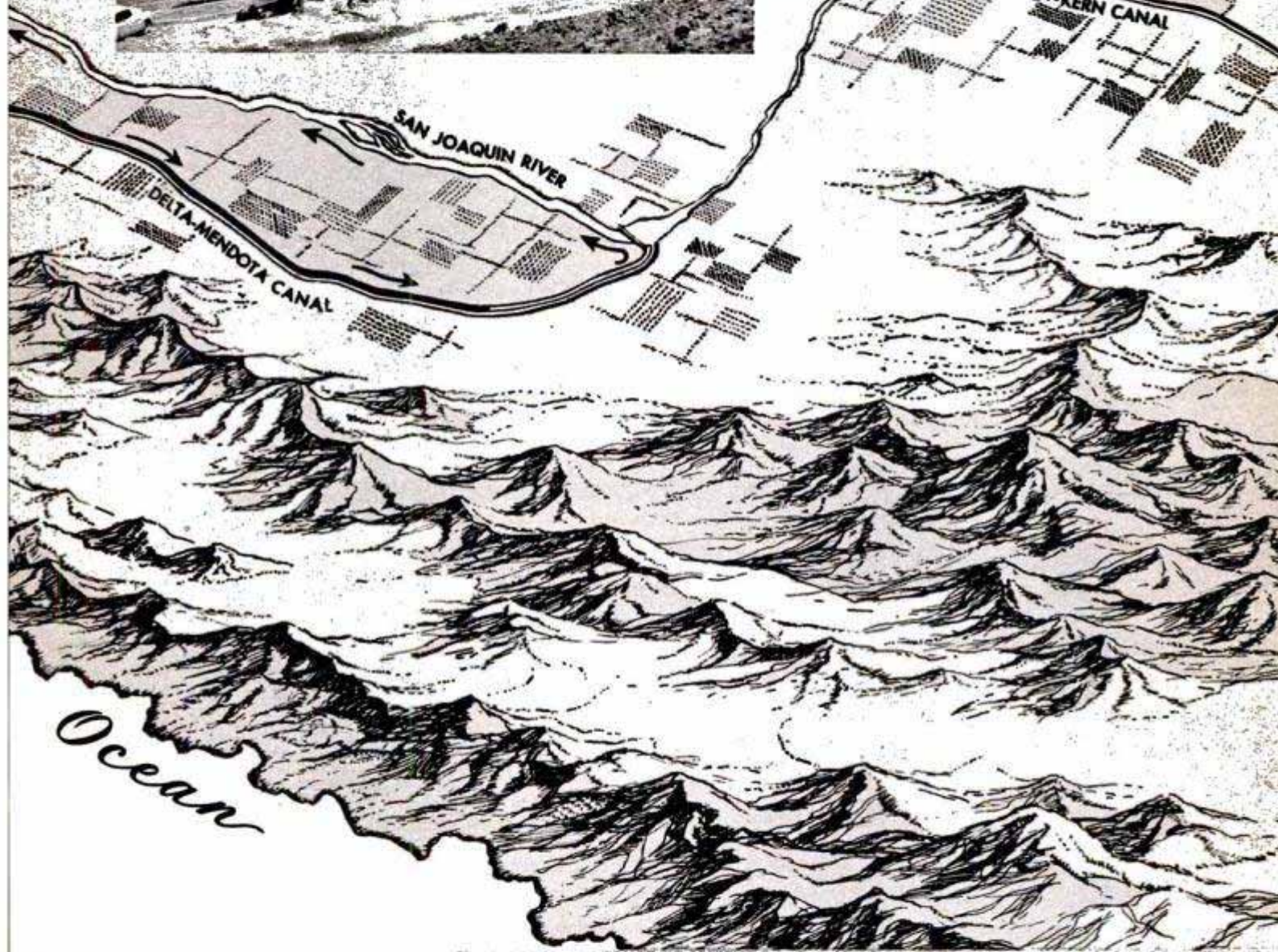
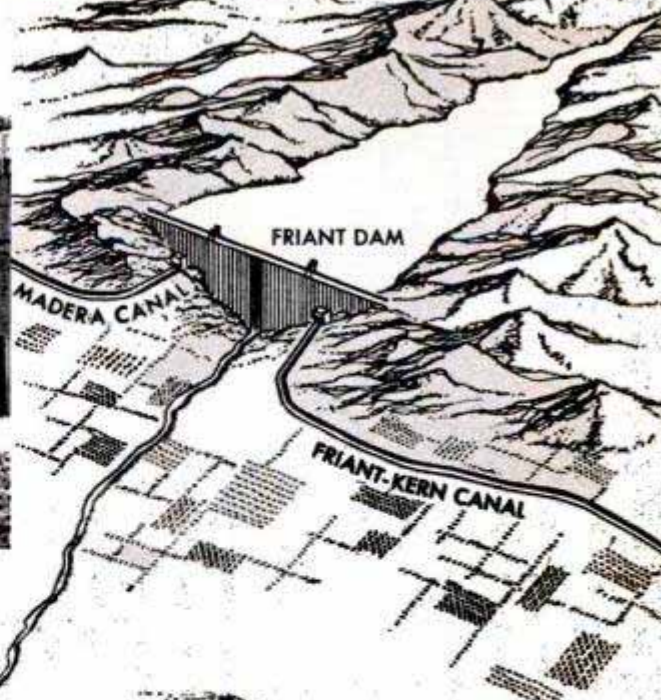
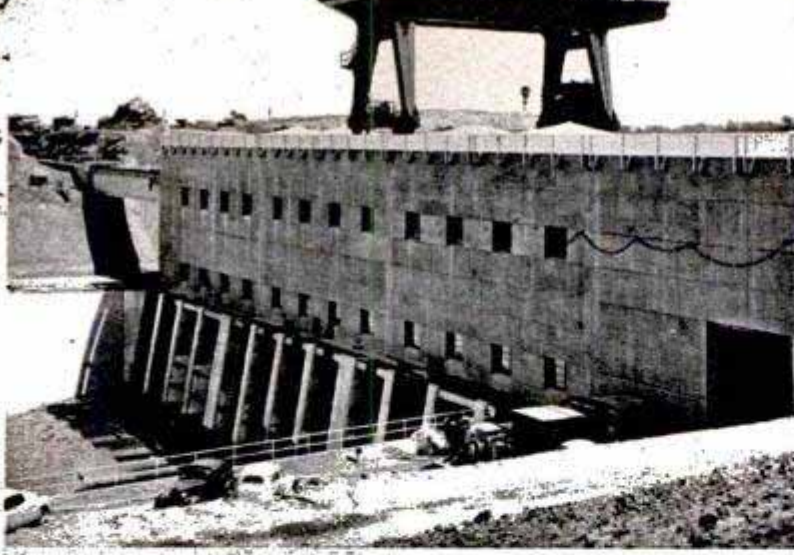
Arrows on drawing trace roundabout route taken by the water from Sacramento River as it is used to irrigate Central Valley. Inset shows the pumping plant

Valley? In a long-range program, which is scheduled for completion by July of this year, the bureau began the work of moving water from one river into another.

Heart of the project is a huge pumping plant on an inlet canal connecting to the Sacramento River. Six pumps will lift two million gallons a minute from the

Laying concrete for the Delta-Mendota Canal is a big job. It is 100 feet wide, 40 feet deep, 117 miles long

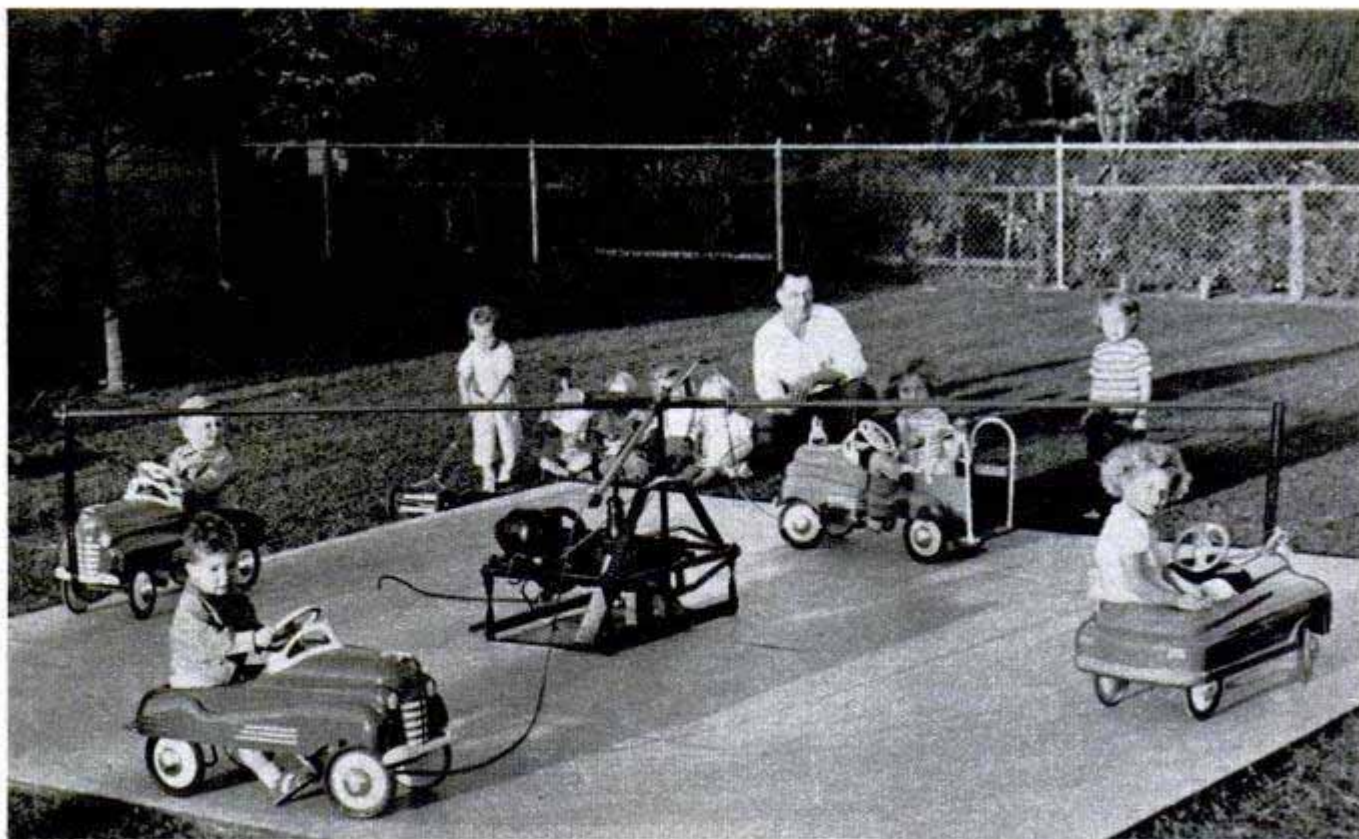




These three pipes carry the water from the river to the outlet works where it is dumped into the Delta-Mendota Canal

Sacramento, raising the water through 5000-foot-long concrete pipes to an outlet works atop a 197-foot hill. There the water will pour into the Delta-Mendota Canal in which it will flow south by gravity the 117 miles to the entry point on the San Joaquin. Entering the river, the water from the Sacramento will swell the San Joaquin, enabling it to irrigate Central Valley as it rolls north to the sea.

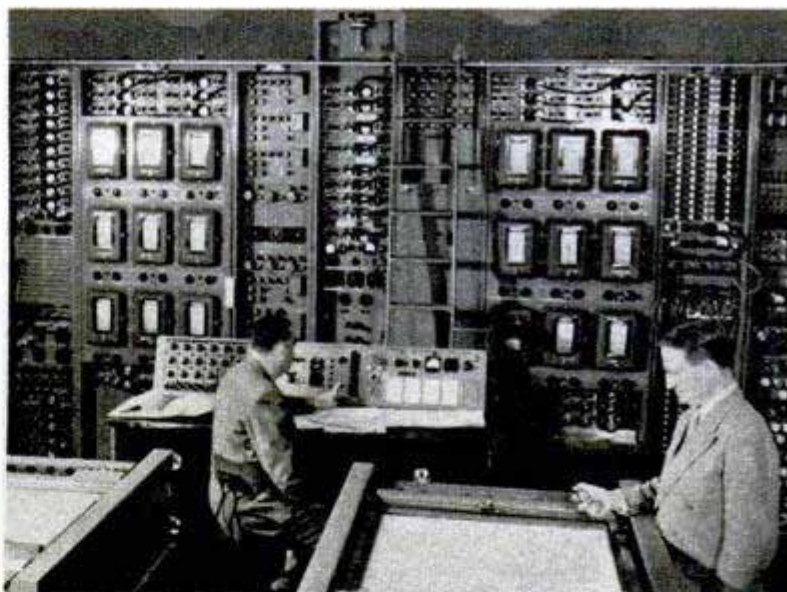




Back-Yard Merry-Go-Round

Toy automobiles, parts from cast-off machinery, an electric motor and pieces of pipe were used by Donald Giannini of Burlington, Wis., in making a miniature merry-

go-round for his three-year-old son, Dennis, and the neighborhood children. An old automobile transmission and threshing-machine gears serve as vital parts. It took Giannini and a helper four months to complete the job in their spare time.



Radio Corp. of America photos

Sensitive Computer Speeds Missile Design

Costly trial-and-error tests to determine how proposed guided missiles, airplanes and ships will perform are by passed by a new electronic computer. It permits the design of equipment, with only a minimum of experiments with small scale models, that would otherwise require expensive apparatus such as actual missiles, airplanes and ships. In less than 60 seconds it solves

problems that would take two mathematicians six months. Built by the Radio Corporation of America for the Navy, it has 4000 electron tubes, several miles of intricate wiring and parts accurate to better than one part in 25,000. Each of more than 600 electric relays in the multipliers operates in 1/10,000 second. The computer is so sensitive that it has to be housed in an air-conditioned room kept at a constant temperature of 75 degrees Fahrenheit and a relative humidity of not more than 50 percent.



PLASTIC IGLOO

Top, new plastic shelter designed for soldiers and equipment can be easily packed and delivered on small truck

Top, right, igloo is assembled from 12 identical and interchangeable panels. Shelter goes up in 30 minutes

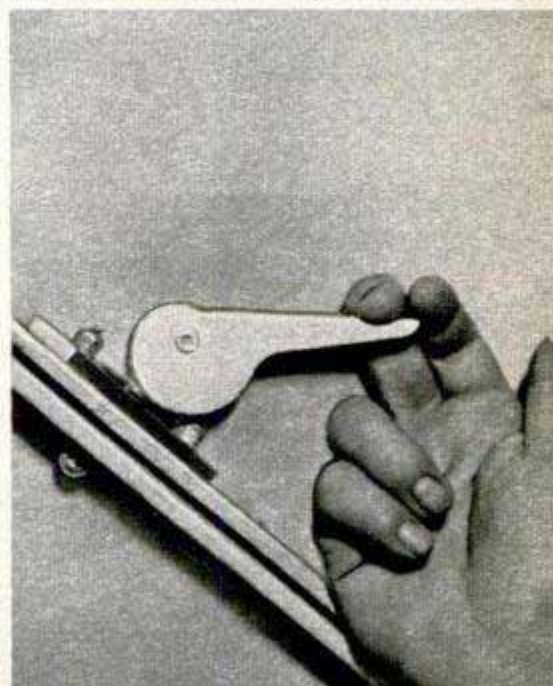
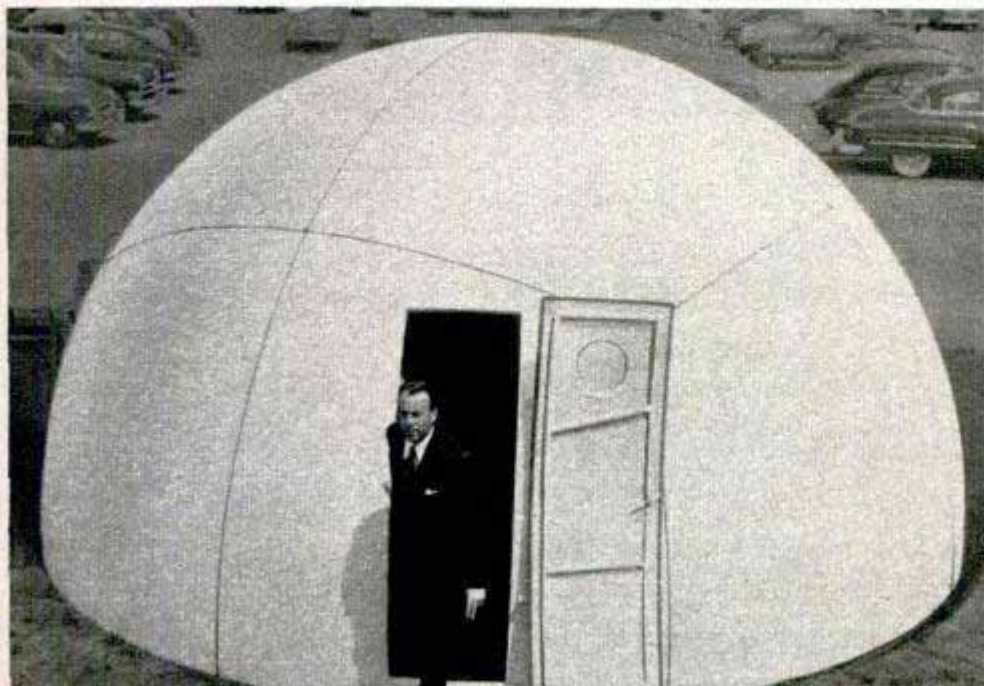
Right, panels interlock to form the dome. Walls are $\frac{1}{8}$ in. thick and have stiffener ribs for strength

Below, right, handle is pushed in and turned to lock panels together. This squeezes neoprene gaskets at joints

Below, completed 20-foot shelter accommodates 12 men comfortably. It is strong, lightweight, virtually airtight



East Coast Aeronautics, Inc., 896 S. Columbus Ave., Mount Vernon, N. Y.



YOU SPEND six months or a year perfecting a can opener that not only works, but seems to have every similar device beat by a mile. You test it. Your wife and your friends test it. Everyone is enthusiastic and you begin dreaming about bundles of green bills. You spend another few hundred dollars and many hours perfecting your invention so that nothing can possibly go wrong.

Then—wham! You come down to earth with a bang. You discover that someone patented the exact device 39 years and 5 months before you thought of it!

That's the sad story that occurs all over the United States almost daily. Is there a way to prevent it? You bet there is—Uncle Sam's Search Room at the Patent Office in Washington is always "eager and willing" to save you time, money and heartaches. If you feel the urge to apply for a patent on the greatest can opener of all time, then don't do it before a search has been made through the files of the Patent Office. There are just about 1000 patents on can openers in the Search Room files and chances are that your brain child is a pretty old hag even if you think it's flushed with youthful freshness!

The Search Room, a monument to American ingenuity, is a high-domed chamber in Washington's Commerce Building. Its stacks today bulge with over 2,500,000 U. S. patents, with more being added weekly. Next to the inventor's own workshop, no other room in the world is quite so important to him as the Search Room. Here, he can learn how to avoid pitfalls and how to spot the paths along which the "pot of gold" may be found.

Head of the Search Room is soft-spoken Elton H. Brown, who has been on the job some 27 years, and has seen over 1,000,000 patents filed in that time. He warns inventors that, before applying for a patent, they should have a search made to make certain the alleged invention is not shown in some prior patent.

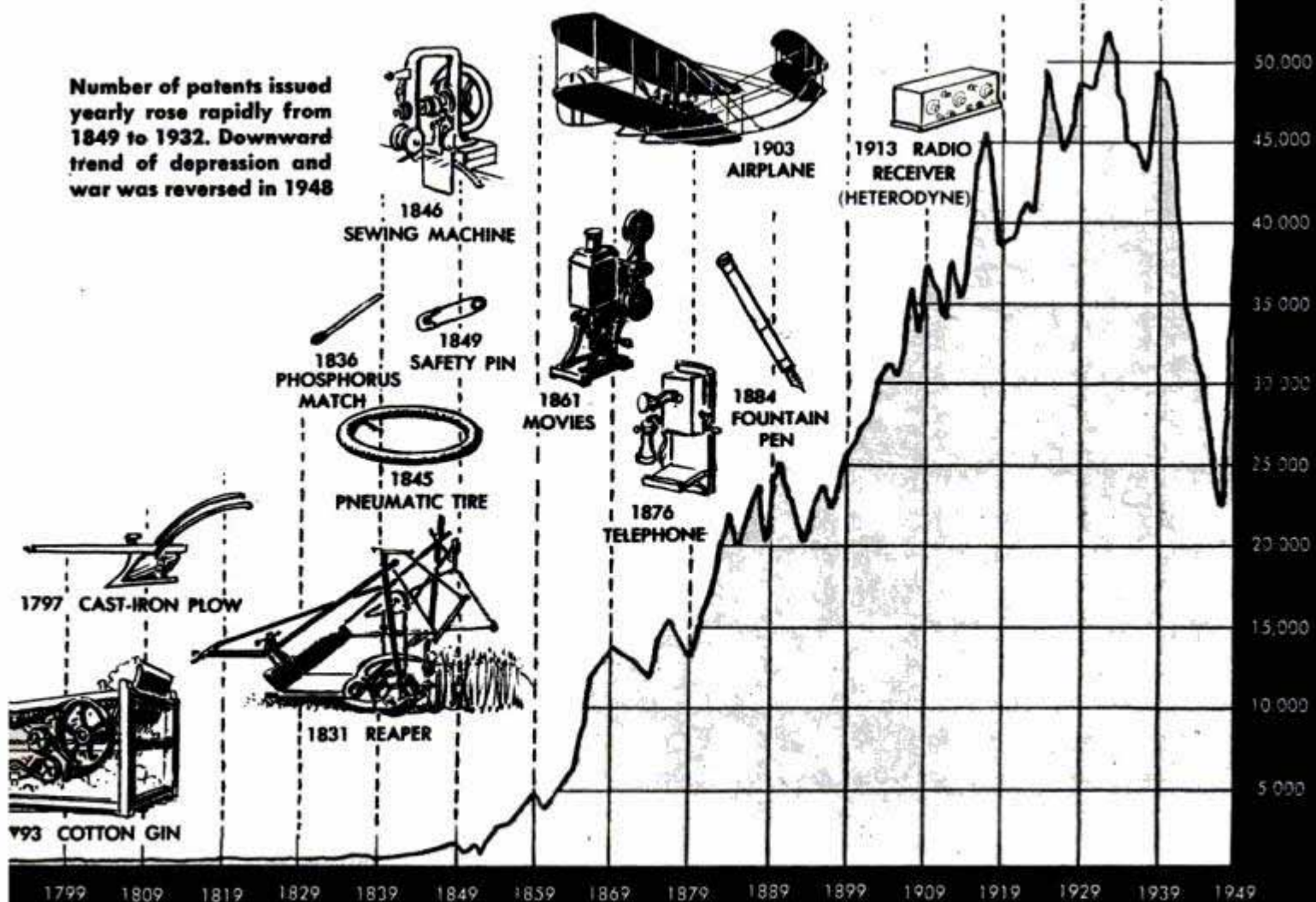
But even with the help of Brown and his staff, the job of looking for a particular device can be an all-day or all-week proposition. Take bottle openers, for example. About 1000 patents have been granted in 22 subclassifications. By the way, the Patent Office calls them "Receptacle Closure Removers."

If it's a wonderful idea for a spark plug that you have, take it easy—there are 1500

First stop of inventors is the Search Room of the U. S. Patent Office. Join the parade of inventive genius and you'll find that . . .

SOME

Number of patents issued yearly rose rapidly from 1849 to 1932. Downward trend of depression and war was reversed in 1948





Elton H. Brown, the head of the Search Room for 27 years, is consulted by inventor Ralph Holcombe, right

GET RICH, SOME DON'T

By Alfred Eris

Patent agents and inventors study pages and pages of words and drawings in the Patent Office Search Room

patents on spark plugs. If you want to look over the 1000 patents on can openers, you look for them under Class 30—Cutlery, Subclassification 3, where you'll find openers of the sweep-cutter type, shear, right and left-hand types, fulcrum-type side cutters and many others.

Gasoline-saving devices are favorites with inventors even though there are several hundred patents in this category already. Most involve putting water into the carburetor, and come under Class 123—Internal Combustion Engines, Subclassification 25—Water and Hydrocarbon. You must also check under 261—Gas and Liquid Contact Apparatus, Sub 126, for all sorts of carburetors, aerated nozzles, carbonizers and such devices.

If this sounds bewildering, you can understand why patent officials counsel inventors to hire patent agents or attorneys. Washington patent agents and attorneys usually fill most of the hundreds of seats in the Search Room each day. They work for free-lance inventors, for research departments of large firms, for small manufacturers and for patent lawyers all over the





Above, in the filing room each of 2,500,000 patents is indexed by classification and subclassification and can be located quickly by an expert. Below, government draftsmen who make drawings for inventors

country. All day long, harassed-looking patent agents and inventors trudge over to Brown's desk and ask for help in finding the right classification.

"I've got a new baby leash, Brownie," says one lawyer, "and—." Before he can finish the sentence, Brown answers "Fire Escapes — 227, Body Harness Sub — 49." That's all the lawyer needs to start his search.

Inventors new to the Search Room are bewildered by this business, but the old-time patent agents accept such pronouncements as just another sign of Brown's phenomenal memory for classifications. He has to know, for example, that Yo-Yos are tethered aerial tops, shoe trees are formers, safety pins are resilient pin fasteners. Ball-point pens are brushing and scrubbing instruments (they were originally developed for marking wet laundry). Playpens are fences, panel, inclosure! The most confusing of all are ice crushers, which you find under reciprocating, cooperating, comminuting surfaces!

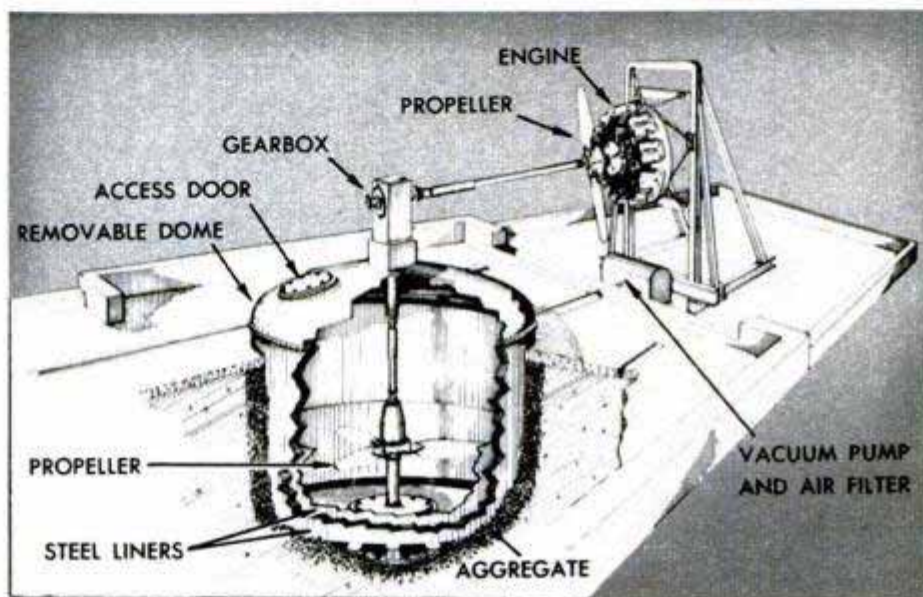
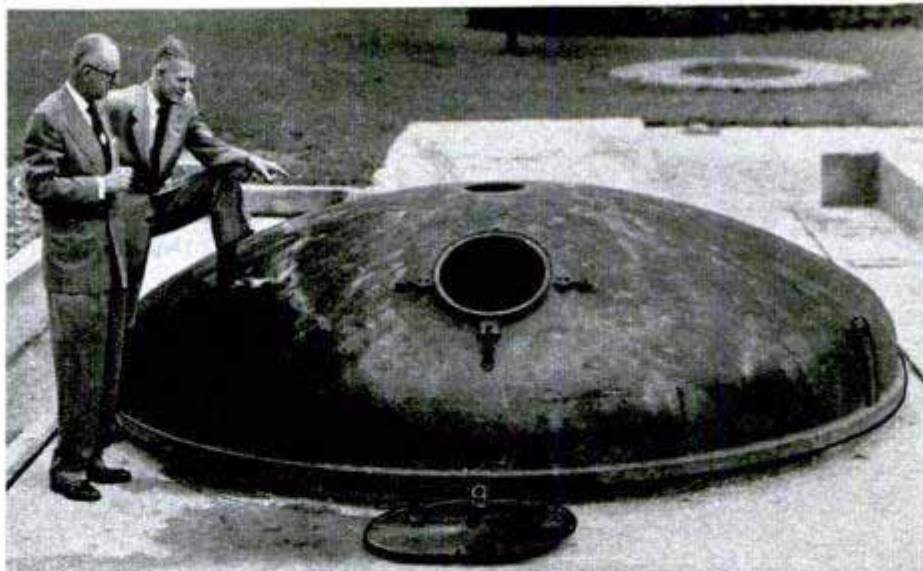
Inventors come in all shapes and sizes and, the Patent Office will reluctantly confess, in all temperaments, too. Brown is regularly accused of theft by suspicious inventors, who regard the entire adult population of the country with cautious eyes. "An inventor will sidle over and guardedly inquire about certain classifications," one official stated. "To help him, you ask what his invention is and he throws up his hands in horror! 'Oh, I couldn't tell

(Continued to page 248)



Propellers Tested In Buried "Spin Pit"

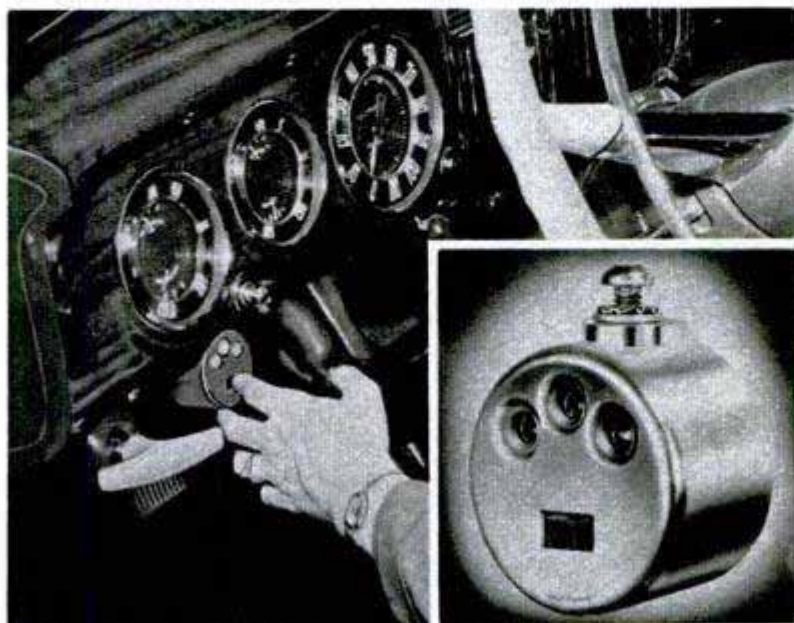
Propellers will be tested at supersonic speeds in an underground "spin pit" at Dayton, Ohio. First of its kind, it is a steel cylinder approximately 13 feet in diameter and 8 feet high, sunk below ground and sealed to a concrete base. It was built by the Aeroproducts Division of General Motors. The propeller will whirl horizontally on a shaft extending vertically through the cylinder's dome to a right-angle gearbox. In turn, the gearbox is driven by a shaft extending to the engine, which has a propeller mounted on it to act as engine load, cooling fan and governor. Ninety-nine percent of the air will be pumped from the test chamber so that relatively low horsepower engines will be able to rotate experimental propellers at extremely high speeds.



Plastic Filler Makes Wood Boats Leakproof

Sandwiched between the inner and outer planking of a new line of boats is a plastic core which prevents the craft from leaking no matter how dry the wood is. The core will not rot nor cause rot in the wood to which it is applied. No calking or puttying

is required to keep water from penetrating the hull, according to Penn Yan Boats, Inc., Hammondsport, N.Y. Unless pierced by something sharp, the plastic core will stay watertight even if the planking is stove in by an accident.

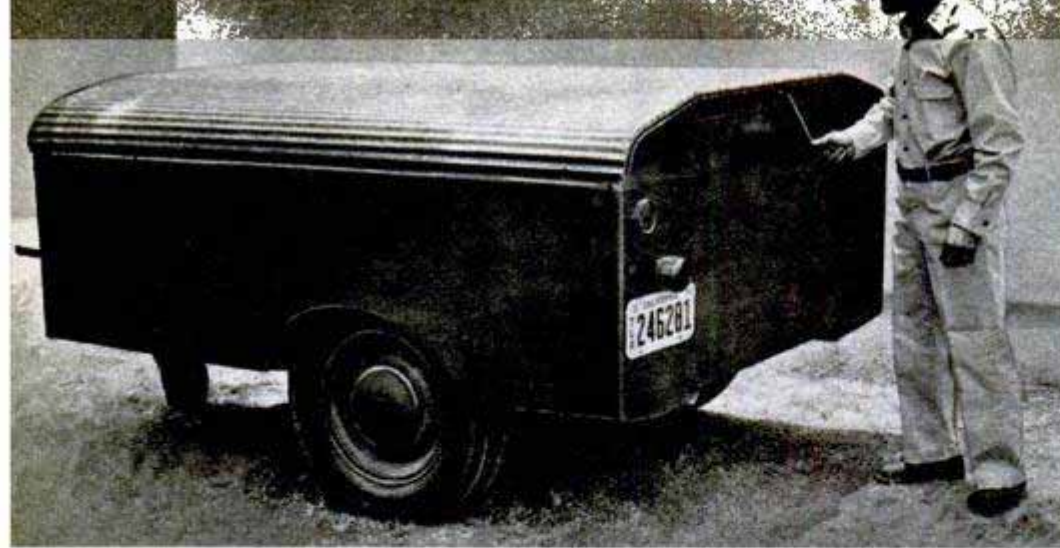


Myriatron Corp., Pontiac, Mich.

Battery Checker On Dashboard

Providing a continuous check on battery condition, a dash-mounted indicator shows water level, strength of charge and condition of each cell. By watching three lights, one for each cell, the motorist can tell the condition of his battery at all times. Installation is simple and the instrument draws less current than a clock.

☞ Average age of passenger cars on the road is 8.5 years compared with 5.5 years in 1941, according to a recent survey by the Automobile Manufacturers Association.



Before Sandage gives the crank a few turns, the trailer looks like an ordinary two-wheeler. The top is corrugated aluminum and the frame is made of angle iron, covered with a light-gauge sheet steel

**Photos from
Jack B. Kemmerer**

CAMP KITCHEN on Two Wheels



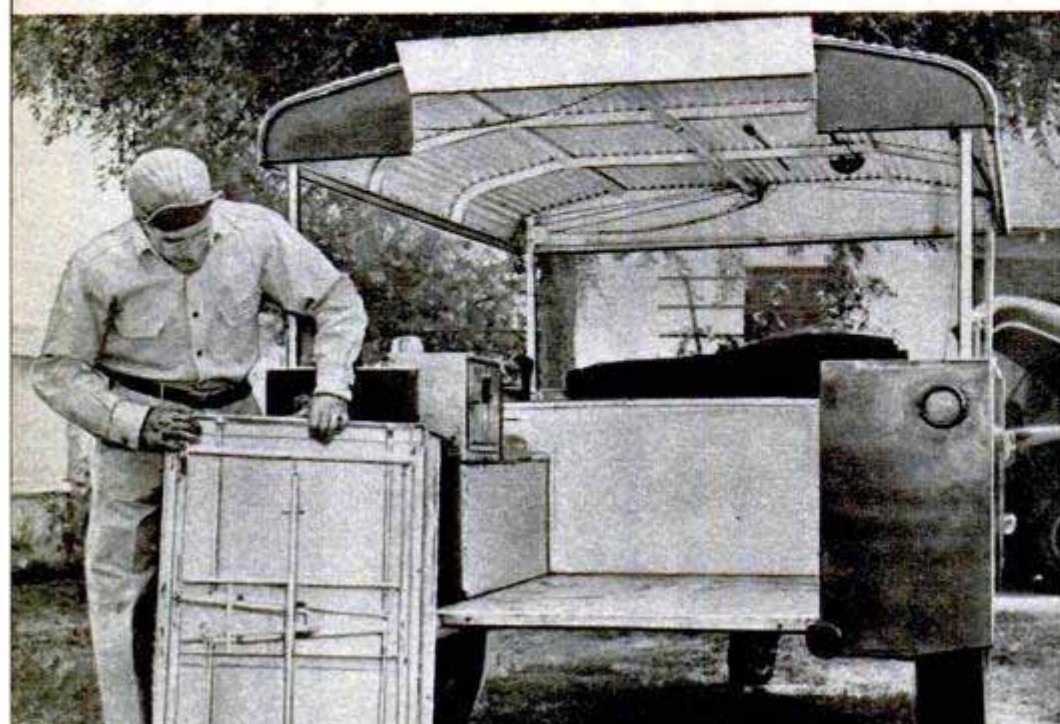
A TWO-WHEEL trailer that becomes a covered cook shack in a few minutes has been built by Ned Sandage of Los Angeles, Calif. In addition to a complete kitchen, it includes a folding steel table and a steel floor for the tent.

Sandage, his wife and five-year-old daughter are ardent outdoor enthusiasts and take every opportunity to go hunting and fishing. One of their biggest headaches was carrying and setting up an efficient kitchen. The trailer looks like an ordinary one, with a solid top, until Sandage turns a crank. Operating a sprocket and chain-drive system, it raises the top of the trailer to a height of six feet.

The trailer tail gate is removable and is quickly transformed into a sturdy table by unfolding legs attached to the inner side. Surplus air-

When top is lifted to six feet, above, both the tail gate and center of the floor are removed

Unfolding four legs hinged to tail gate's inner side quickly converts it into a dining table





With the trailer floor out there is plenty of room in the cook shack for an adult. Mounting the wheels on aircraft suspension units does away with need for an axle

craft suspension units were used to hang the wheels, making them independent of each other and eliminating the need for an axle. The center section of the trailer floor can be removed to provide a floor between the two cots in the tent. In transit, the space beneath the trailer floor is used for storing the cots, the tent and extra luggage. With the center section removed, an adult can walk upright in the trailer, which has a complete camping kitchen, a stove, oven, icebox and built-in cupboards. Special racks hold three five-gallon cans for fuel and water. A tent hooks on one side of the trailer and the open ends and opposite side

have canvas covers in case of bad weather. The body frame is made of angle iron, covered with light-gauge sheet steel, and the top is corrugated aluminum. Weighing 800 pounds empty, the trailer is 5 feet wide, 7 feet long and 52 inches high when the top is lowered. An airplane tail wheel on the front keeps the trailer on even keel and makes it easier to move when unhitched from the car. It is small and light enough to be taken into areas where a standard large trailer would have to be left behind. By purchasing all the materials, except tires, from surplus stores, Sandage was able to keep the total cost to \$125.

Close-up, below, of the wheel-suspension system. Right, camping outfit is completed by hooking a tent to one side of trailer. The open ends and opposite side of trailer are fitted with canvas covers

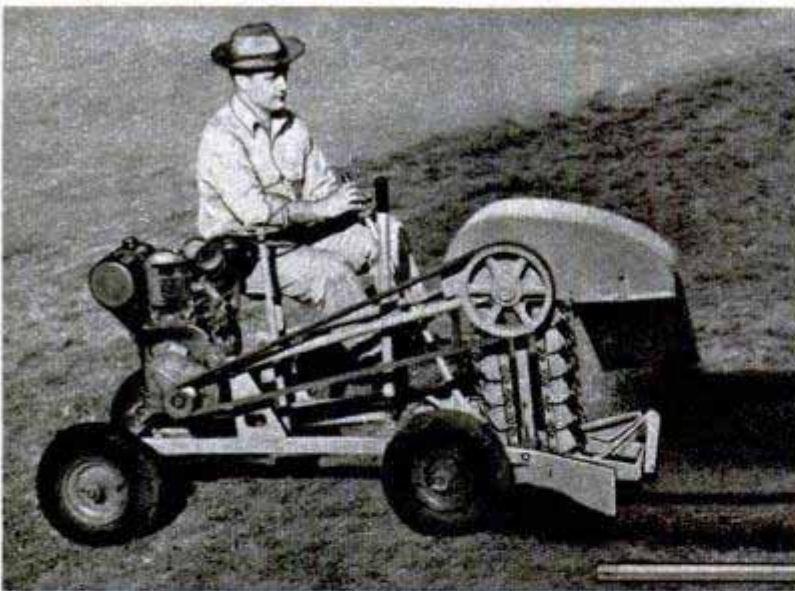




Lightning-Proof Boat

Boatowners can protect their craft from lightning with one or two short pieces of aluminum tubing and a few feet of copper wire, according to J. M. Wallace, Westinghouse engineer. Wallace experimented in a high-voltage laboratory to discover how much protection was needed for his own 32-foot pleasure boat. He built a three-foot model of the craft and hit it with 3,000,000-

volt man-made thunderbolts. Unprotected, the craft caught fire. When he added aluminum tubing to the mast and stern light, and connected these lightning rods by copper wire to the propeller shaft, the lightning was harmlessly grounded. Wallace points out to boatowners that a lightning rod provides a cone of protection with a base diameter equal to its height. This rule can be used to figure the number of rods required to protect a boat of any size.



Charlie's Machine Works, 625 Birch St., Perry, Okla.

Compact Ditch Digger Weighs Only 550 Pounds

Weighing only 550 pounds, a compact ditching machine digs trenches 4½ inches wide and 30 inches deep on a single pass. Wider ditches can be dug with multiple cuts. Powered by a six-horsepower gasoline engine, it does the work of five men and it will operate within a foot of fences and buildings. Its steel buckets are self-cleaning and empty into a chute which deposits the spoil on either side of the trench. The digging mechanism is raised and lowered hydraulically.

Three-Decker Paint "Sandwich" Resists Worst Weather

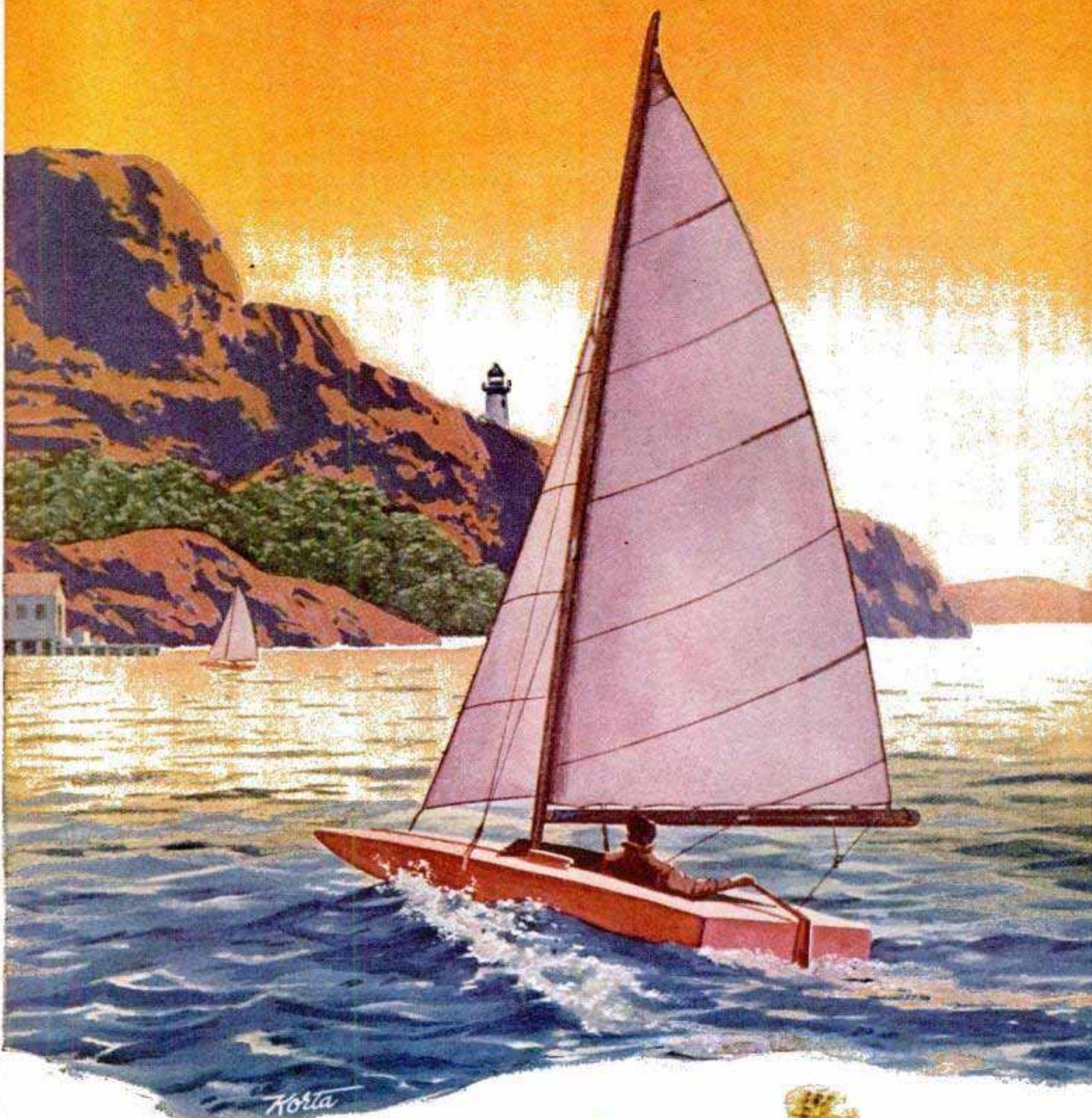
Use of a three-decker paint "sandwich" wards off Nature's toughest blows including sub-zero cold, desert heat and salt spray. Developed by Westinghouse to protect outdoor transformers, it consists of a special primer base coat, followed by a layer of mica flakes embedded in a syruplike plastic. The flakes resist attacks of moisture and oxygen, principal causes of rust, and

increase the middle coat's heat resistance as much as 10 times. A finishing coat shuts out ultraviolet light from the sun's rays. The triple coating withstood 10,000 hours of continuous salt-water spray exposure before showing any signs of deterioration. Ordinary finishes were 50 percent gone after only 2000 hours of continuous exposure under the same spray.

the

POPULAR
MECHANICS

CRAFTSMAN



Yours to enjoy when the lake breezes blow, this trim 16-ft. sailing scow is a simple plywood boat which you can build in your garage. Get an early start by beginning now. For construction details turn to page 194

Announcing the new "'51 Kidster"—sleek sidewalk runabout for car-minded youngsters. Plans on page 190 show you how to build it



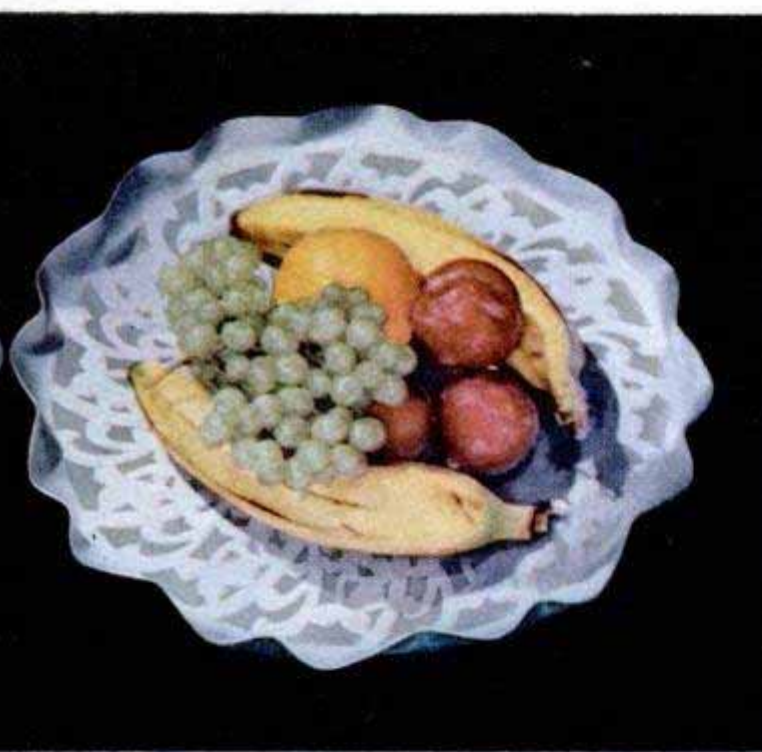


CANDY DISH

TRY YOUR HAND

EVEN THOUGH your hobby may be woodworking, just take a look at what can be made with metal. We're sure you'll be eager to try your hand at duplicating some of these beautiful and practical items. This fascinating hobby of metalcraft still requires some woodworking tools, such as a jigsaw, hand grinder and vibrating tool. To get you started, patterns and details for both etched and pierced work are given for some of the projects shown but you'll soon be working up your own ideas and designs.

Etched tray: An important step in duplicating the etched aluminum fruit tray pictured below is to see that the metal is thoroughly clean after it is cut to shape. There are several cleaning agents that can be used, depending on the finish desired. Fine



ETCHED FRUIT TRAY



SERVING TRAY



PHOTO ALBUM

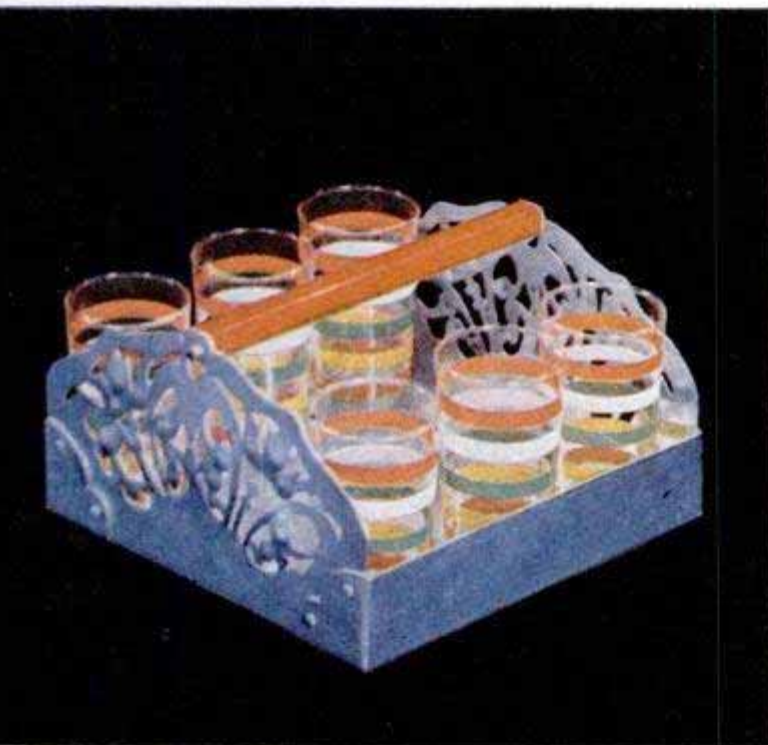
By Clifford B. Hicks

YOU'RE in for a look even before you open the cover of this unusual photo album, for what you see through the windows is actually the title page. Tempered hardboard is used for the front and back covers, the outer surfaces of both being padded and covered with the new quilted plastic material. Details show how the front cover is first hinged, drilled for ledger bolts and the windows jigsawed. Acetate is cemented over the windows and a filler of cardboard is fitted before the inner surface is covered with plain sheet plastic. Corners of the covers are protected with metal, crimped as shown

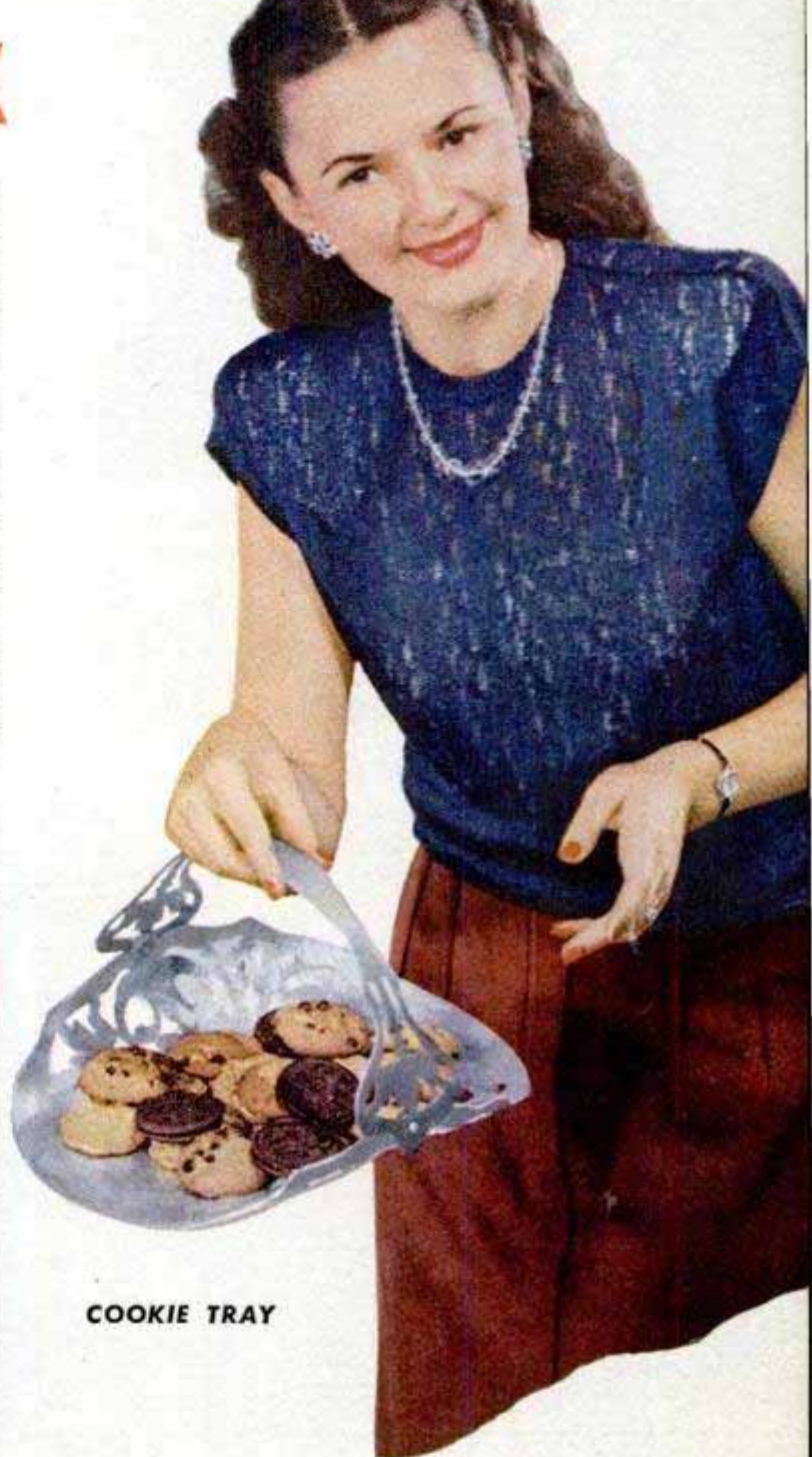
AT METAL WORK

steel wool gives a shiny finish, while caustic soda produces a pleasing satin finish, but you can even use common scouring powder. A wire scratch brush, provided it is very fine, also can be used to clean the metal, the important thing being that you avoid touching the surface after it is clean.

Next in importance is the type of asphalt paint that is used to block out the design. Ready-mixed screen paint can be used but better results can be expected if you mix your own. Screen paint has a tendency to dry hard and chips easily in scraping off any overruns. Also, as the paint is brittle, the heat set up by the etching acid is apt to cause it to peel off the metal. A good homemade asphalt paint consists of powdered asphalt, 1 part, wax, 1 part, turpentine, 1



BEVERAGE TRAY

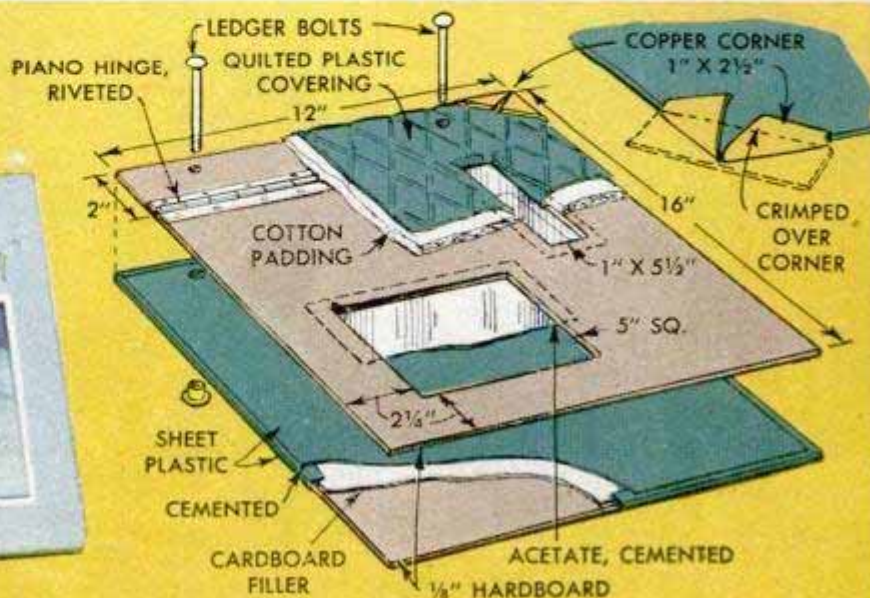


COOKIE TRAY

PM color photos by Paul T. Hutchinson

By Albert P. Belanger

in PLASTIC

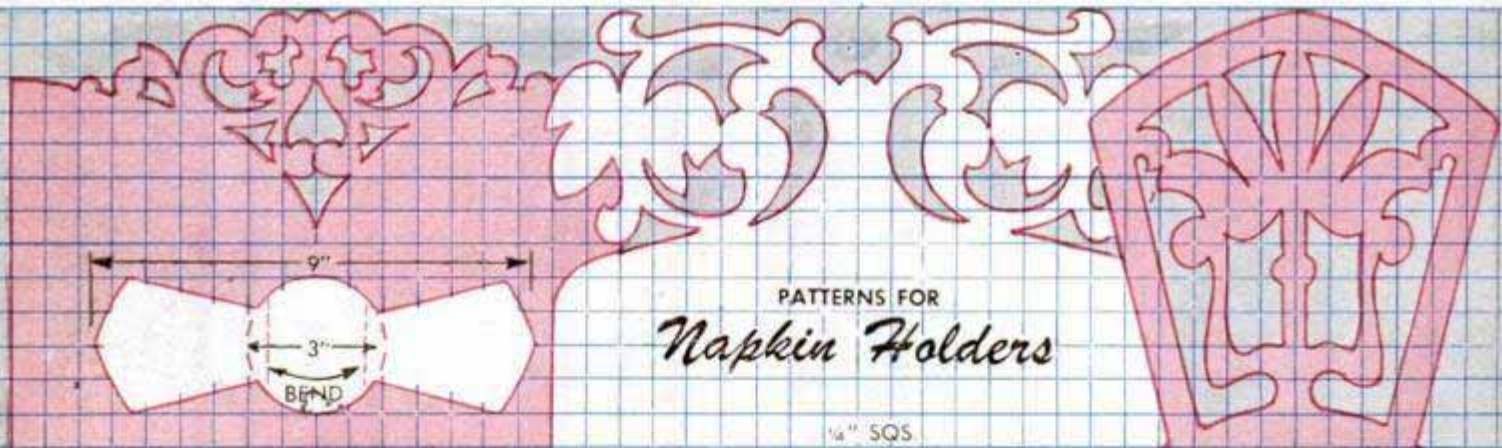




Scalloped brass plate shows how "etching" can be done with vibrating tool. Embossed flower in copper plate is raised by dishing background. Same pattern is used in aluminum plate as brass one, except it is jigsawed

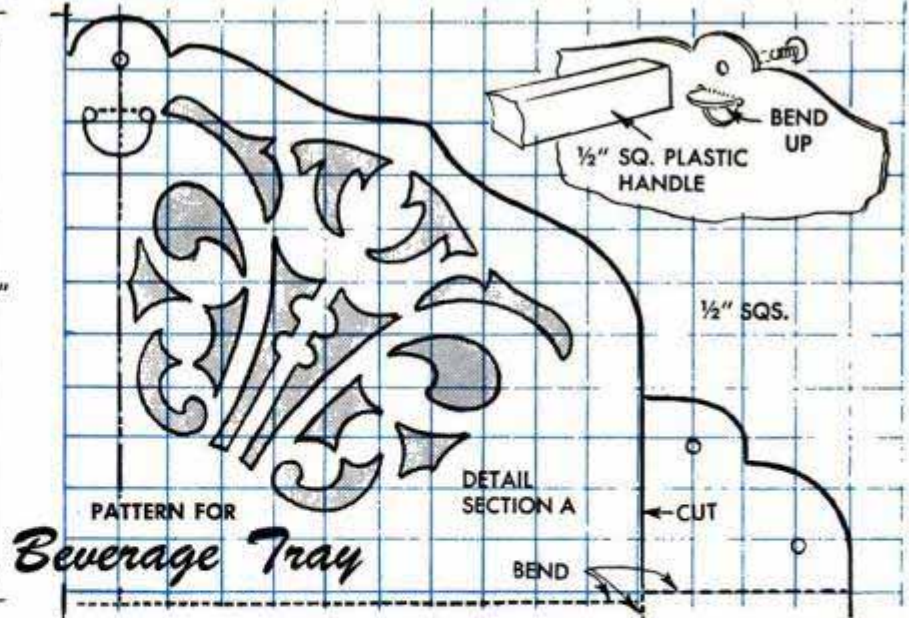
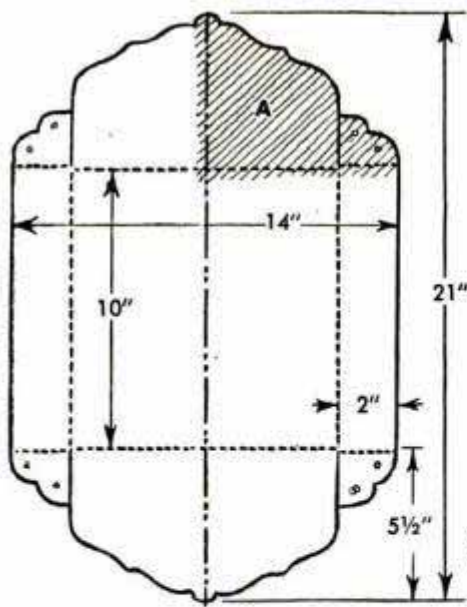
part, and varnish, $\frac{1}{10}$ part. Heat the wax to the boiling point. Then add the powdered asphalt and stir. While stirring, add the turpentine and varnish. When mixed well, set aside to cool. Store the paint in a tight container until ready to use. If you find it too thick, a little turpentine on your brush will thin it to the proper working consistency. Best work can be done with camel-hair brushes, which come with round, square or pointed tips in many sizes.

Transferring the design: Carbon paper is used to transfer the design to the metal. A full-size segment of the complete tray pattern is given on page 170. This, as well as patterns for all the other projects, can be purchased completely drawn if you do not care to make your own. Ordinary typewriter carbon paper is not recommended, as it prevents the paint from adhering and does not permit a fine-line impression. For this reason, it is imperative that you use



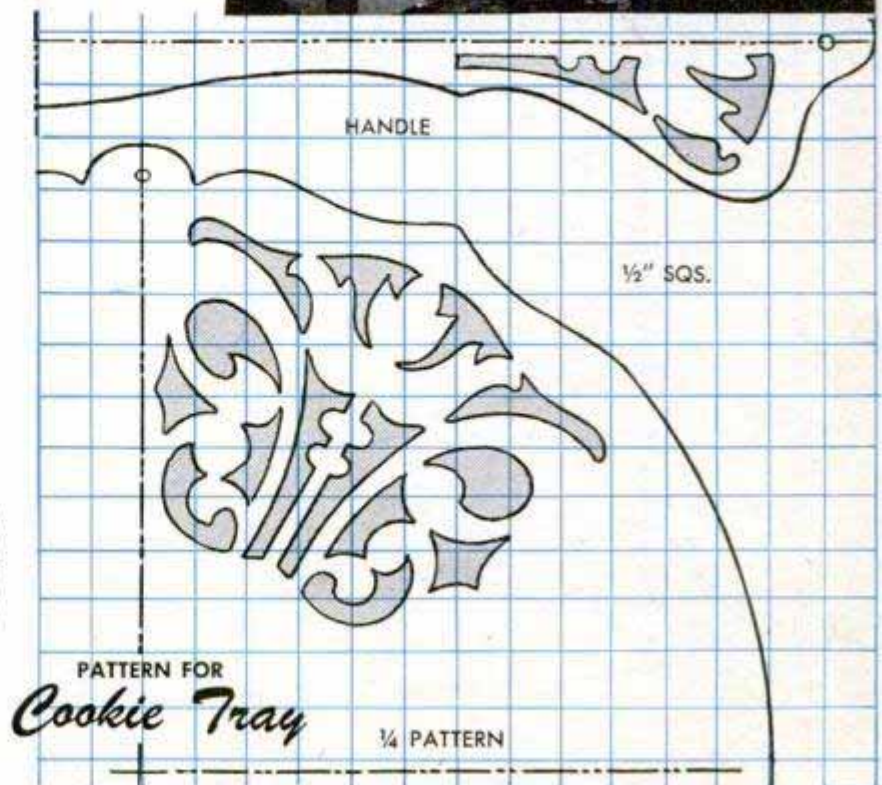
These half patterns for napkin holders are enlarged on paper ruled in an equal number of $\frac{1}{4}$ -in. squares

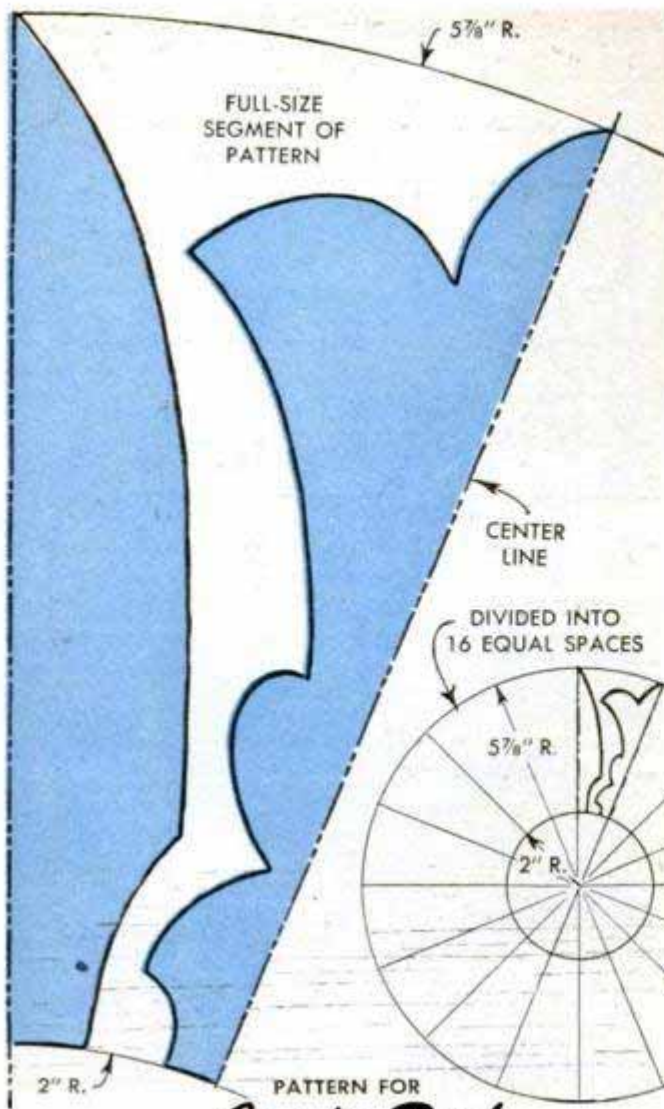




the type of paper used by china painters. In tracing the design, avoid touching the clean metal, as any finger marks will prevent the etching acid from working properly. Pressure from the hand should also be avoided. To keep the hand off the work, make a steady rest like the one shown in the series of etching steps on page 171.

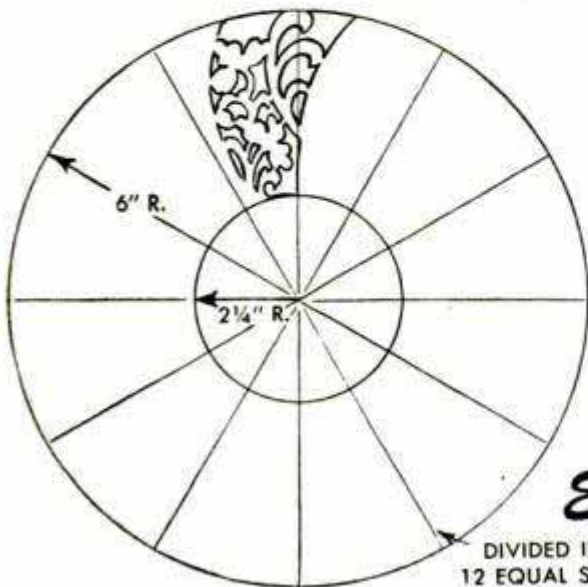
Applying the asphalt paint: The paint should be applied evenly but not too thin, so that the acid will not lift the paint. There are two types of etching—in one the background is etched, in the other the design is etched. In the case of the fruit tray, the background is etched, which means that the paint is applied to the design. The back of the tray, of course, must also be completely painted. While not pertaining to the particular design of the fruit tray, there are several stunts worth knowing in applying the asphalt paint. Instead of using a brush to make small dots, use the round end of the brush handle, dipping it in paint applied to a piece of glass and bringing it straight down onto the metal. Similarly, a square dot is applied with a square stick. A spatter pattern may be applied by dipping a toothbrush





PATTERN FOR
Candy Dish

These segment patterns of the candy dish and etched tray are presented full size, ready for tracing directly from the magazine page. In each case, the complete pattern is made by merely stepping off the segment pattern on a circle divided into the proper number of divisions. Carbon paper is used to transfer the pattern lines



PATTERN FOR
Etched Tray



in asphalt paint and flicking it onto the metal by rubbing a stick over the bristles. Coarse lace, starched and pressed flat and then coated lightly with paint, produces an interesting border pattern when pressed onto the metal.

Etching the metal: Hydrochloric (muriatic) acid is used to etch aluminum. Nitric acid is used to etch brass, while a combination of nitric and sulphuric acid (nitric, 2 parts, sulphuric, 1 part) is used to etch copper. *Caution: as these acids are highly injurious to both skin and clothing, handle them carefully and play safe by wearing rubber gloves.* Hydrochloric acid in its full strength works too fast and overheats the metal to a point of boiling off the paint. Therefore, it must be diluted to the proportions of acid, 1 part, and water, 1/2 part.

Even these proportions may be found to be too strong, and it is well to have water handy to add to the acid to slow it down. Where there are fine details in the design, it is better to etch the metal slowly. If you do not have a glass or hard-rubber tray large enough to hold the metal disk,

you can make a suitable tray of wood and coat it with asphalt paint to make it leak-proof. The design should not be etched too deeply, and the acid should be agitated so that it will work evenly. A large turkey feather is excellent to keep the acid in motion, but avoid touching the work as it will leave marks. When etched to your satisfaction, the acid is poured off and flushed safely down the basement drain. Then the metal is washed in running water for at least 15 minutes.

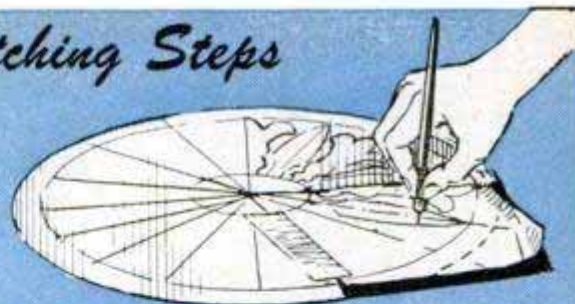
Cleaning after etching: The asphalt paint is removed from the metal by rubbing with a cloth saturated in turpentine, kerosene or carbon tetrachloride. The metal can be left as is or polished with fine steel wool or pumice stone, depending on the finish desired. Completing the tray by crimping the edges is done with a wooden tool which is merely placed over the edge of the metal and pulled upward.

Jigsawing metal: Patterns are given for the napkin holders, candy dish, beverage tray and cookie tray, all of which are jigsawed from aluminum. The same blades are used as in cutting wood, although the secret of attaining a smooth cut is to keep the blade oiled and be sure not to force it. Paraffin oil has been found to be the best lubricant for sawing aluminum but any light machine oil is recommended for metals in general. The design can be drawn on paper and cemented directly to the metal with rubber cement or it can be transferred, as before, with carbon paper. If a vibrating-type tool fitted with a small ball-point tip is available, go over the lines on the metal with the tool. This overcomes the possibility of rubbing off the lines when sawing and makes the lines easier to follow. If the metal is of light gauge, a piece of cardboard cemented to the underside of the metal will help considerably in preventing burrs from catching on the edge of the saw table. Waxing the underside of the cardboard aids in controlling the saw cut.

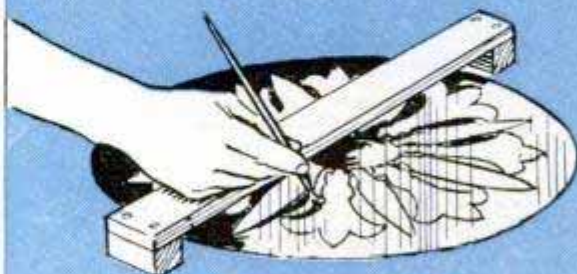
As detailed, the cookie tray is sawed from a 12-in. disk and is given a hammered finish with a ball-peen hammer. Two opposite edges are bent upward for a distance of about 2 in. and the tray handle is fastened to the upturned edges with $\frac{1}{8}$ -in. aluminum rivets. In the case of the beverage tray, the jigsawed fretwork on the ends is embossed after being cut. This is done by placing the cutout ends on a rubber kneeling pad or a piece of thick felt and hammering the design outward. Use a round-nose punch, which can be improvised by using a hinge pin. The corners of the tray are held with small rivets.

The pattern for the candy dish is laid out complete by dividing a circle into 16 equal

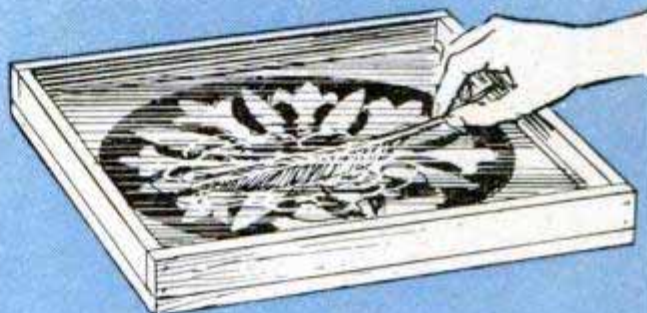
Etching Steps



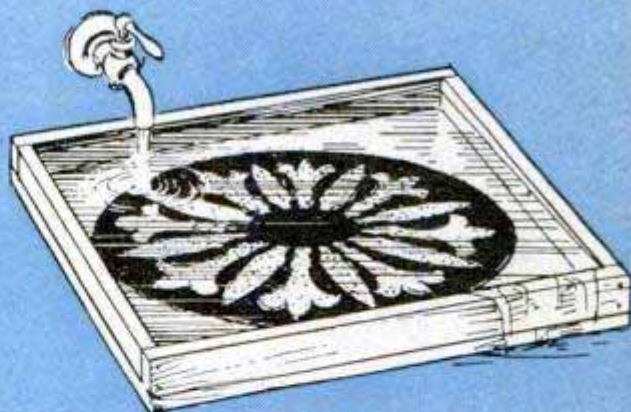
1st APPLY THE DESIGN WITH CARBON PAPER



2nd BLOCK OUT DESIGN WITH ASPHALT PAINT



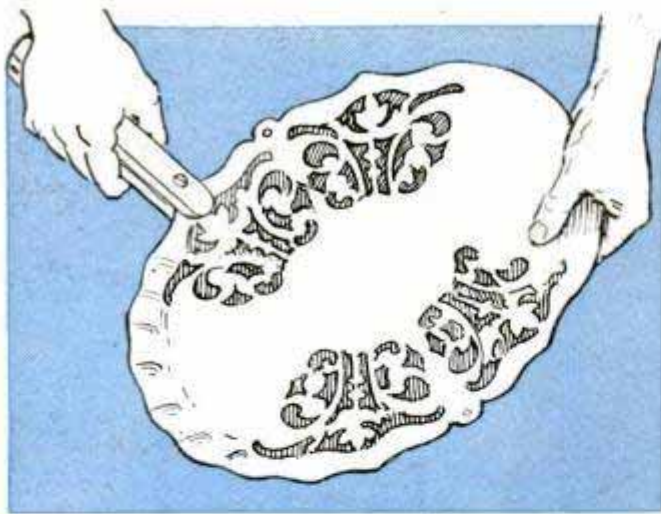
3rd AGITATE ACID WITH A TURKEY FEATHER



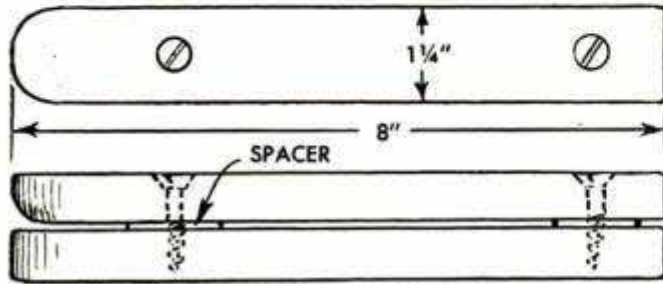
4th RINSE ETCHED PLATE IN RUNNING WATER



5th REMOVE THE ASPHALT WITH TURPENTINE



Crimping Tray



WOODEN CRIMPING TOOL

divisions, as indicated, and then tracing the full-size segment pattern 16 times on the circle pattern. Then the metal is cut, and the leaves of the design are "tooled" on the inner surfaces with a ball-peen hammer to emboss or raise the metal on the outside. Finally the leaves are bent upward, leaving a 2-in. radius at the center of the disk to serve as the bottom of the bowl. Overlapping edges of the leaves are riveted to-

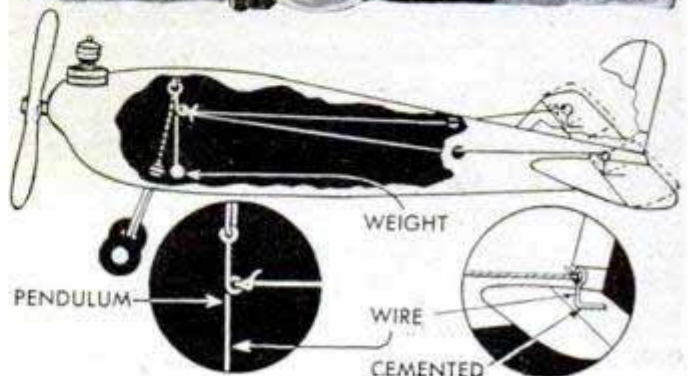
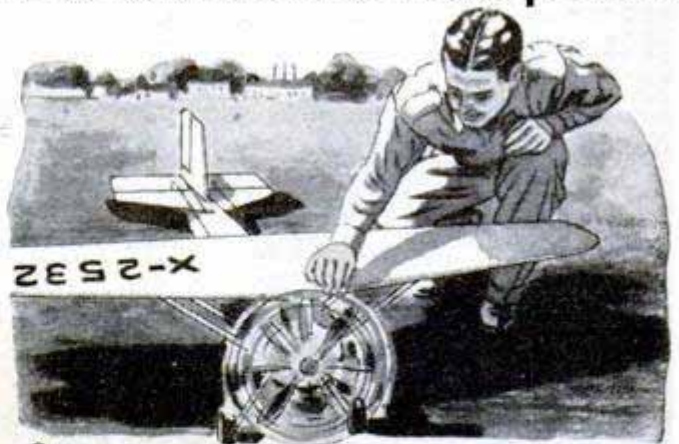
gether and the points are curled downward as shown in the color photo.

Decorative ceramic tiles can be combined with copper or other metals to produce many attractive and useful items, such as the wall plaque shown in the color photo at the bottom of page 168. The tiles, which may be purchased at most large department stores, come in a variety of designs and sizes and range from inexpensive domestic tiles to the more costly Italian, Mexican, Dutch and other imported varieties. If preferred, plain glazed tile can be used and decorated with ceramic-type paints sold at most dime stores. The over-all dimensions of the plaque depend on the size of the tile and the width of the border desired. The plaque pictured was made by framing a 6-in. tile with a sheet of copper 10 in. square. Brass or aluminum also can be used, 20-ga. being about right. The recess for the tile should equal its thickness, and one way of forming the recess is to cut a square block of wood about $\frac{1}{16}$ in. larger all around than the tile. Then, after the corners of the sheet metal are mitered to leave a tab for soldering, the block is clamped in position and the metal is bent up around it. When three sides have been formed, the clamp is removed to permit bending the other. The sides are flared outward to the point where the corners meet neatly and then the tabs are bent over on the back and soldered. The tile is held in the recess with a white mortar which is allowed to ooze up around the four sides. As in the original plaque, the mortar also can be run up the mitered corners of the metal to emphasize the flare of the sides.

Pendulum Controls Model-Airplane Elevators to Avoid Steep Dives

After watching my 6-ft. model airplane suddenly nose over into a steep dive and crash on several occasions, I hit upon an idea of using a pendulum to stabilize the plane. The pendulum is linked to the elevators and swings forward whenever the nose of the plane drops, thus pulling the elevators upward and raising the nose of the plane. This, in turn, causes the pendulum to return to a vertical position with relation to the fuselage and allows the elevators to lower to a neutral position. Note in the detail that the pendulum is suspended from the top of the fuselage just to the rear of the nose. It is made by attaching a 2-oz. fishing sinker to a length of wire and pivoting the wire to the top of the fuselage with a staple. L-shaped wire brackets are cemented to the top surfaces of the elevators and these are linked to the pendulum with lengths of string or fine wire passed through holes in the fuselage.

Herbert E. Fey, New Braunfels, Tex.



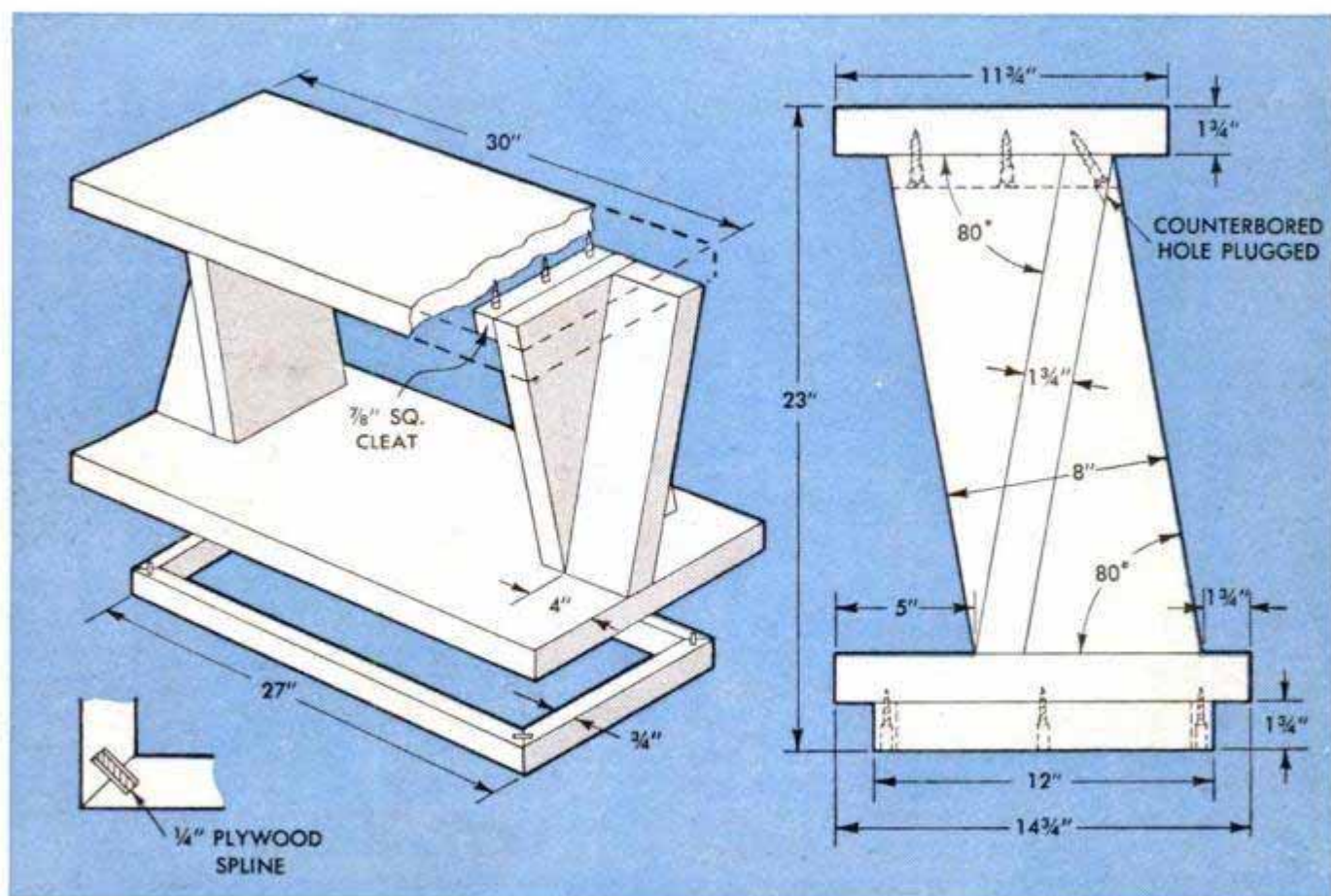
Functional END TABLE

By Roland Cueva

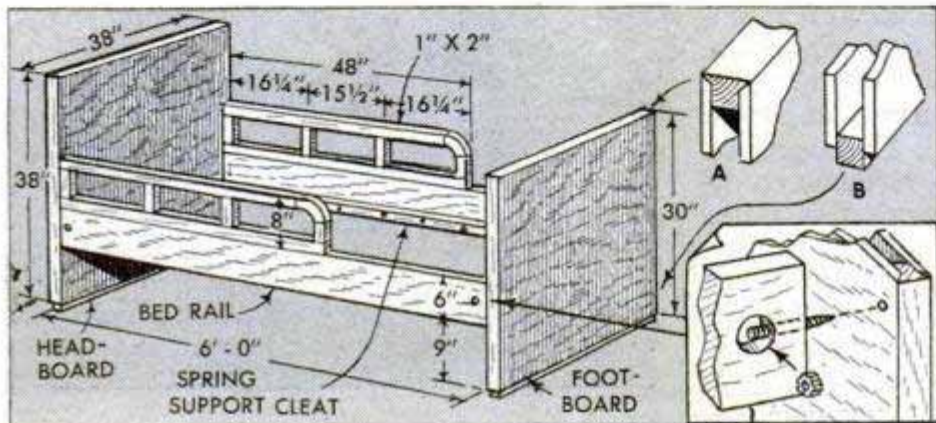
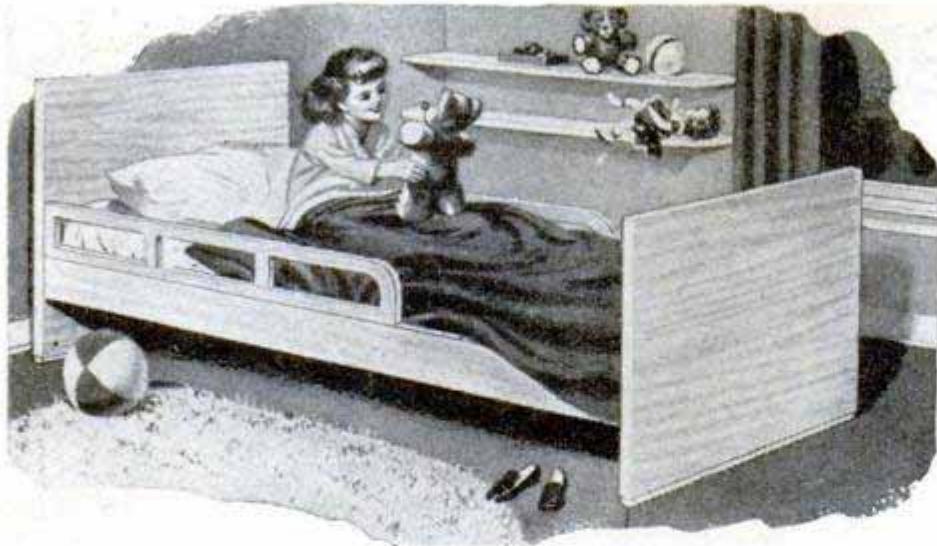
NO POWER TOOLS required—that's the story on this striking modern end table. Assembled from standard widths of 2-in. pine, the table features an offset side as well as a straight side, so that it fits snugly against a sofa or easy chair having either straight, slanted or flared arms. The top of the table is cut to length from a 2 x 12 while the bottom is made from a 2 x 15. If the 15-in. stock is not available, two lengths of narrower stock can be doweled and edge-glued together to attain the desired width. The slanting uprights, the outer ones of 2 x 4 and the inner ones of 2 x 8-in. stock, are all cut at an 80-deg. angle. The uprights are assembled with finishing nails or countersunk screws driven through the inner faces of the 2 x 8s and through the underside of the bottom. The base of the table is made in picture-frame fashion with miter joints at the corners that are reinforced with plywood splines. The table top is mounted on two cleats which are fastened to the uprights. All joints are glued, and visible nail or screw holes are filled with wood putty or plugged.



This modern end table fits neatly against either a straight or slanted chair arm. The table is made of pine and finished in the natural color with clear shellac and wax, or it can be lacquered as desired.



Attractive Youth Bed for Growing Child Built Sturdily to Withstand Rough Use



Designed to take a standard spring and mattress, this inexpensive, ruggedly built bed will give your youngster sleeping comfort well into his teens. Both the headboard and footboard are made by covering wooden frames with $\frac{1}{4}$ -in. plywood. Note in detail A how the top and side frame members are miter-rabbeted to conceal the end grain of the plywood. Miter joints are used at the corners. Detail B shows how the bottom frame member projects to form a base. The 1 x 6-in. bed rails are attached to the head and foot boards with hanger bolts, as in the lower right-hand detail. The guard rails are made up in sections of 1 x 2-in. stock, doweled and glued together. Each guard rail is screwed to the bed rail and headboard for easy removal.—Wallace W. Buffmire, Evanston, Ill.

Water-Color Pellets Mark Trail on Unfamiliar Waterway

Splattering shore-line rock formations with bright-yellow water color is a stunt used by one fisherman to aid in finding his camp without difficulty when venturing out on unfamiliar waters. This is particularly helpful when fishing lakes which are dotted with islands and have their shores broken with numerous small inlets, thus providing few natural check points and tending to confuse the newcomer. Several glass pill vials are filled with the paint and tightly corked, the number of vials being estimated by the distance to be traveled. Then, as the boat passes an island or rounds a point, one of the vials is thrown at a prominent rock on the shore. Although the vials can be thrown by hand, a sling-shot will fire them with sufficient force to insure breakage and, after a little practice, with surprising accuracy. Water colors are



used instead of oil-base paints because the rain will wash them from the rock, leaving the scenery unmarred.

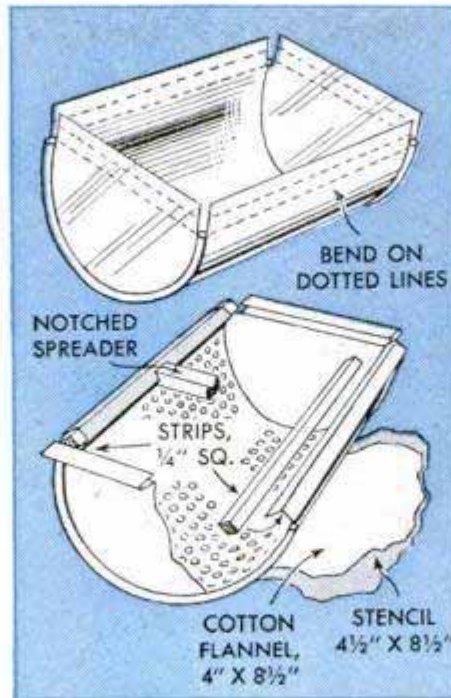
Sprinkling With DDT Powder Rids House Wall of Wild Bees

Ridding a house of wild bees that have established a honeycomb inside one of the walls can be done by sprinkling a pound of 50-percent DDT powder between the studs. If access to the area between the studs cannot be had at the top of the wall,

it then may be necessary to remove a section of the siding. This should be done well above the point where it is thought the bee colony, or swarm, is located. After you are reasonably sure that the bees are dead, attempt to remove the honeycomb.

Improvised Duplicator for Printing Club Notices

Just the thing to print announcements for the small club where the cost of a duplicating machine is prohibitive, this little duplicator is made at the expense of only a few pennies. The drum is fashioned from a fruit-juice can, both ends of which are left intact. The side is cut along the seam and the ends and sides are cut away as shown in the upper detail and bent along the dotted lines, the sides being formed into U-shaped channels as in the lower detail. The tabs at the ends are folded to provide handles. With a $\frac{1}{16}$ -in. bit, holes are

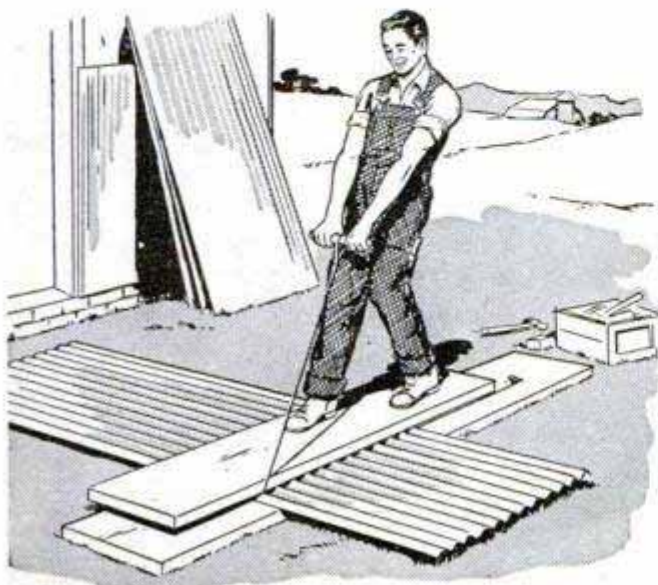


drilled from the inside through the sides of the drum, spacing them $\frac{1}{4}$ in. apart and ending the series of holes about $\frac{5}{8}$ in. from the ends of the drum. After the burrs on the outside of the drum have been filed smooth, a piece of cotton flannel is stretched over the outside and the ends are held in the U-shaped channels with $\frac{1}{4}$ -in.-square wooden strips. The flannel is painted on the outside with duplicator ink until it nearly shines, and the stencil, which has been cut previously, is stretched over the flannel. The wooden strips are removed from the channels, the ends of the stencil inserted and the strips replaced. Then the

parts are locked in place with a small wooden spreader which is notched at each end. To provide a smooth base for printing the paper, use a piece of plywood slightly larger over all than the sheet or card. First, try out the duplicator on scrap paper, printing a few sheets with a rolling motion of the drum. If the impression is too heavy, keep running trial copies until the excess ink is used. If the printing is too light, apply additional ink to the inside of the can so that it will soak through the flannel. It is a good idea to wrap the duplicator in wax paper before storing it for any length of time.—Ted Houk, Seattle, Wash.

Baling Wire Quickly Cuts Sheets of Corrugated Roofing

Having to cut a number of sheets of corrugated metal roofing, I found that a length of baling wire did a faster and easier job of



cutting the metal than ordinary tin snips, although the cut edges may not be as smooth. First, one end of the wire is tied securely to a 10d nail driven in a plank and the other end of the wire is fitted with a wooden handle. This can be done by twisting the wire around a short length of 1-in. dowel or broom handle. After the wire is stretched flat, lengthwise along the plank, the roofing is laid over the wire. Then a second plank is placed on top of the roofing with one edge along the cutting line. By standing on the plank while pulling upward and back on the baling wire, I sheared the roofing along the edge of the plank. Keep your weight on the roofing when nearing the end of the cut, pulling the wire almost directly upward at this point. The edge of the roofing should be at least 1 ft. from the nail which anchors the baling wire to the bottom plank.

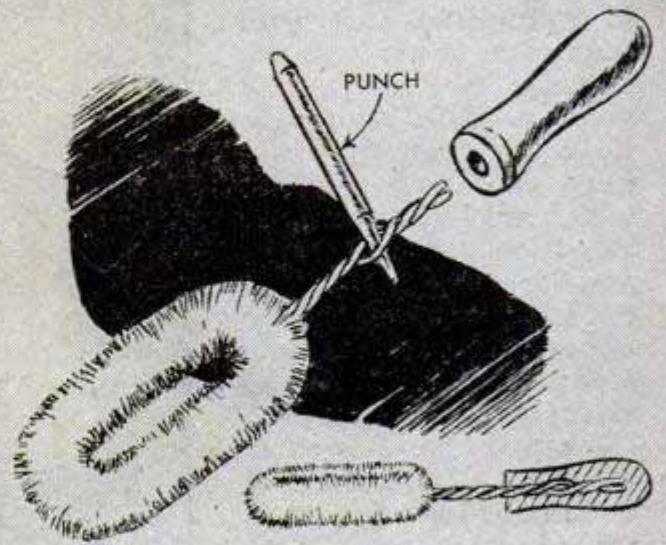
M. W. Willsey, Vandevort, Ark.



PAPER BAG

CURTAIN STRETCHERS ARE STORED compactly and free from dust by inserting them in a cardboard cylinder of the type used to ship linoleum rugs. Ends of the cylinder are covered with paper bags

LOOSE HANDLE ON HOUSEHOLD BRUSH can be tightened easily by removing it and spreading twisted wire of the brush tang with a punch or large nail. When replaced, the handle will fit snugly over the tang



PUNCH

Solving HOME



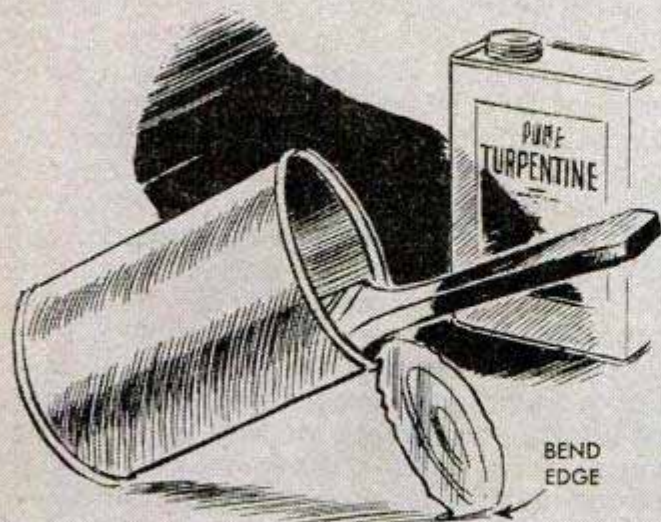
SCRAP BOARDS NAILED TOGETHER provide long-burning fireplace "logs." With one or two nails, fasten together several pieces of lumber which otherwise would be suitable only for kindling



EMERY CLOTH

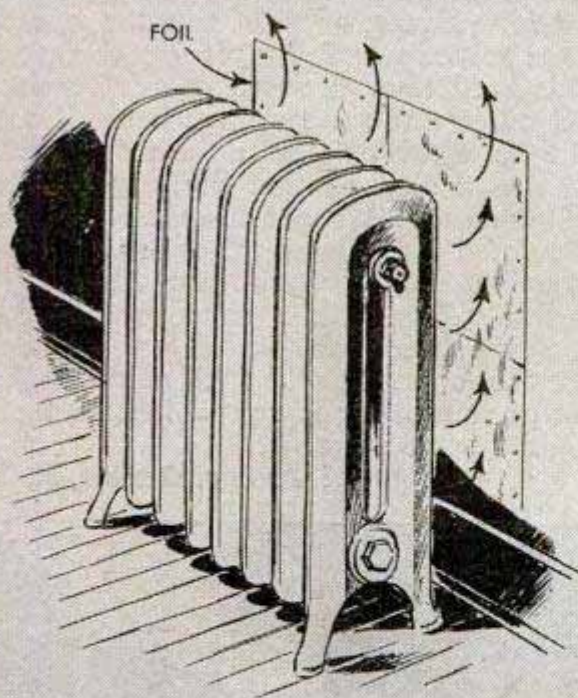
OPENING A STUBBORN JAR CAP is done in a jiffy with the aid of an emery-cloth "clamp." Just wrap a strip of emery cloth around the jar cap, grasp end of strip with pliers and twist jar to loosen the cap

DON'T SPOIL A PAINTBRUSH by standing it vertically in turpentine. Instead, select a tin can having a lid and bend it to support the can at an angle, so the brush will lie flat and keep bristles straight

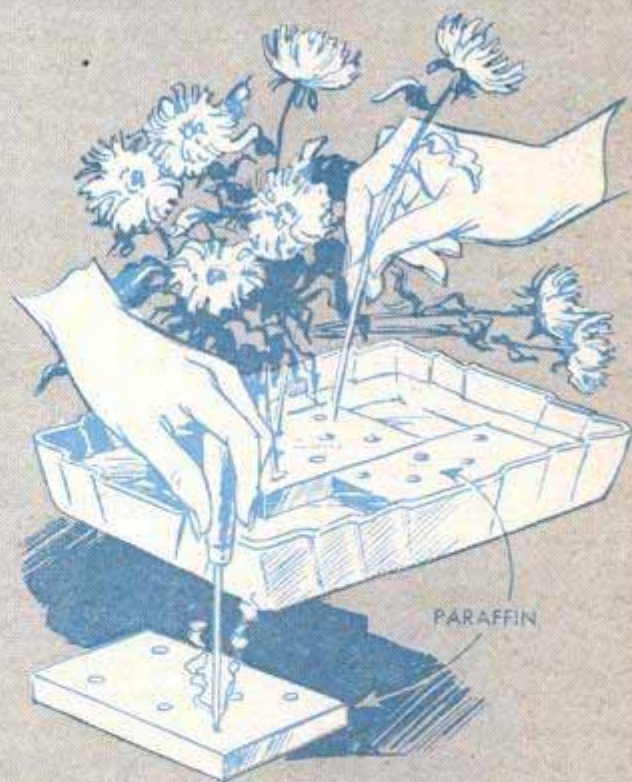


PROBLEMS

CLOSET-SHELF CAPACITY is increased considerably by stringing cord or clothesline between screw eyes driven into walls. Rope shelves are handy for hats, dress boxes and other small items

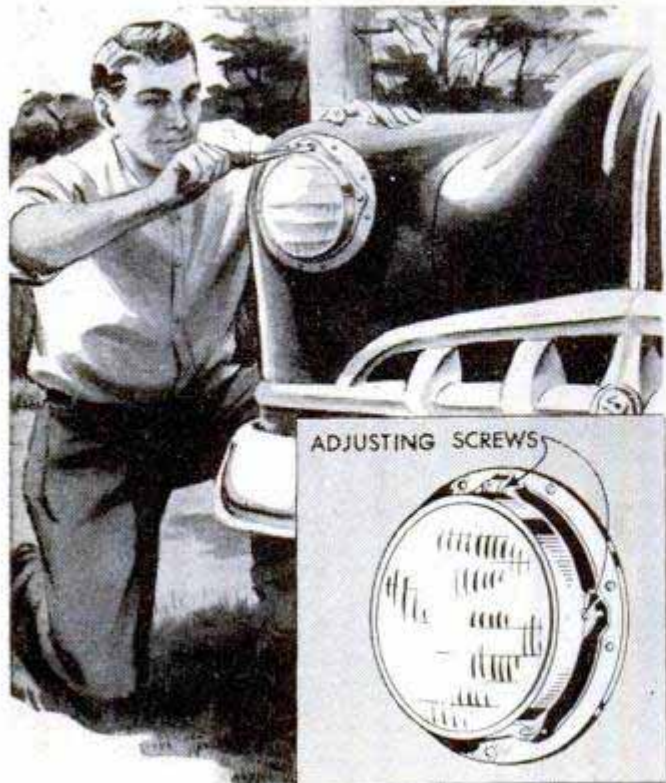


TO REFLECT MORE HEAT FROM RADIATORS, tack or glue aluminum-foil sheets to the walls directly behind them. Heat which normally would be lost through the walls is reflected into the room by the aluminum



FLOWER FROGS OF PARAFFIN form a substantial base and can easily be cut to any desired size and shape for a particular vase or tray. Punch holes through cake with heated end of ice pick

High Beams Tilted Downward For Emergency Driving



When one of the low beams on your car headlights burns out on the road, it isn't necessary to risk driving with one headlight or blinding an oncoming motorist with the high beams. Instead, temporarily tilt both headlights downward so the high beams will serve as low beams, thus allowing you to drive safely until a replacement for the burned-out light can be obtained. To tilt the beams downward, remove the headlight rim from each light and back out the top adjusting screw. Check the beams to make sure that they are low enough and, if desired, set the side adjusting screws to throw the beams slightly to the right.

Paths of Atomic Particles Observed With Continuous Cloud Chamber

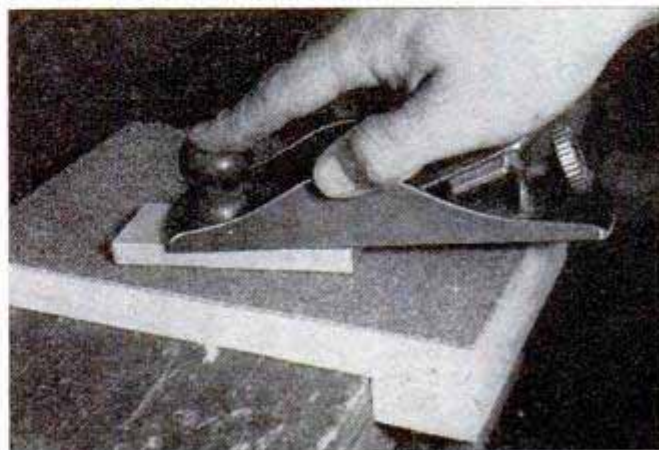
A continuous cloud chamber which permits you to observe the paths of atomic particles is an interesting experiment that can be set up at home or in the school physics lab in just a few minutes. The particles form "vapor trails" in artificially produced "clouds" within a glass chamber which is essentially the same as a device now used by physicists. To make the chamber, first obtain a glass jar having a screw top. The common refrigerator jar in which some foodstuffs are sold will serve the purpose but, if possible, the diameter of the jar should be greater than its height. Also, it is preferable that the lid of the jar contain a rubber ring to form a positive, efficient seal. Cement a strip of $\frac{1}{4} \times \frac{1}{2}$ -in. felt to the inside of the jar to form a ring

around the bottom, fitting the felt in the corner where the bottom joins the sides and fastening it in place with rubber cement. Cement a black-velvet disk to the inside of the jar lid and screw the lid tightly on the jar. The velvet should cover most of the inner surface of the lid. Next, pour rubbing alcohol (containing propyl alcohol) in the jar to cover the felt in a pool $\frac{1}{4}$ to $\frac{1}{2}$ in. deep. Then set the jar upside down on a cake of Dry Ice which is larger than the diameter of the lid, and warm the glass bottom of the jar with the hands, from time to time, so the alcohol in the felt will vaporize. The alcohol vapor moves downward from the warm upper surface until it meets the colder air caused by the Dry Ice, thus producing a supersaturated atmosphere. It is through this atmosphere that atomic particles, traveling at speeds approaching that of light, form streaks of tiny droplets, or vapor trails. To see the vapor trails, train a strong light from a movie projector or powerful flashlight on the black velvet. Sometimes the trails can be seen best through the sides of the jar and at other times through the end of the jar. Operation of the chamber can be maintained for an hour or so with a slab of Dry Ice 1 in. thick. When the alcohol has evaporated from the felt ring, the jar is simply inverted so the alcohol again saturates the ring.

Planing Board Holds Small Pieces

The problem of holding small pieces of wood for planing or light sanding operations is solved neatly by placing the work on this sandpaper-covered board. The latter is made like an ordinary bench hook, having a cleat on the underside which serves as a stop against the edge of the workbench top. A sheet of coarse sandpaper is glued to the top surface of the board to keep the work from sliding while light cuts are taken with a sharp plane. Although the board may be made to any desired size, one that will take about half a sheet of sandpaper is convenient to handle and easy to store.

John M. Avery, Dexter, N. Y.

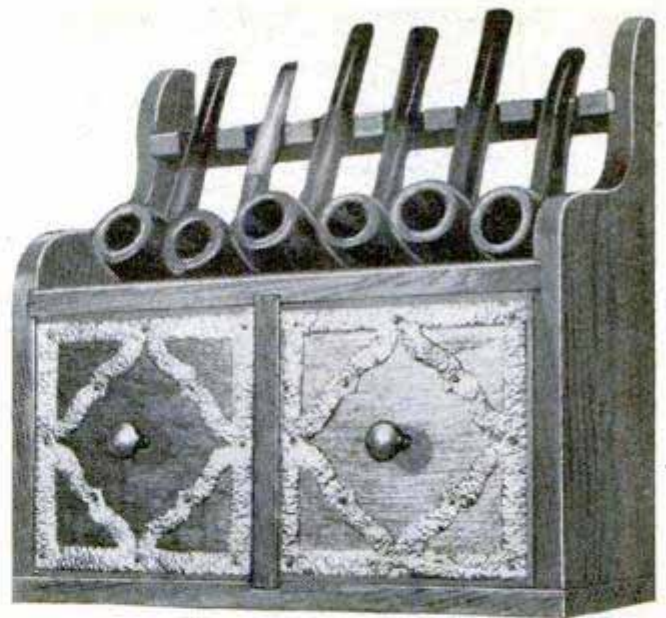


WALL PIPE RACK

combines humidior

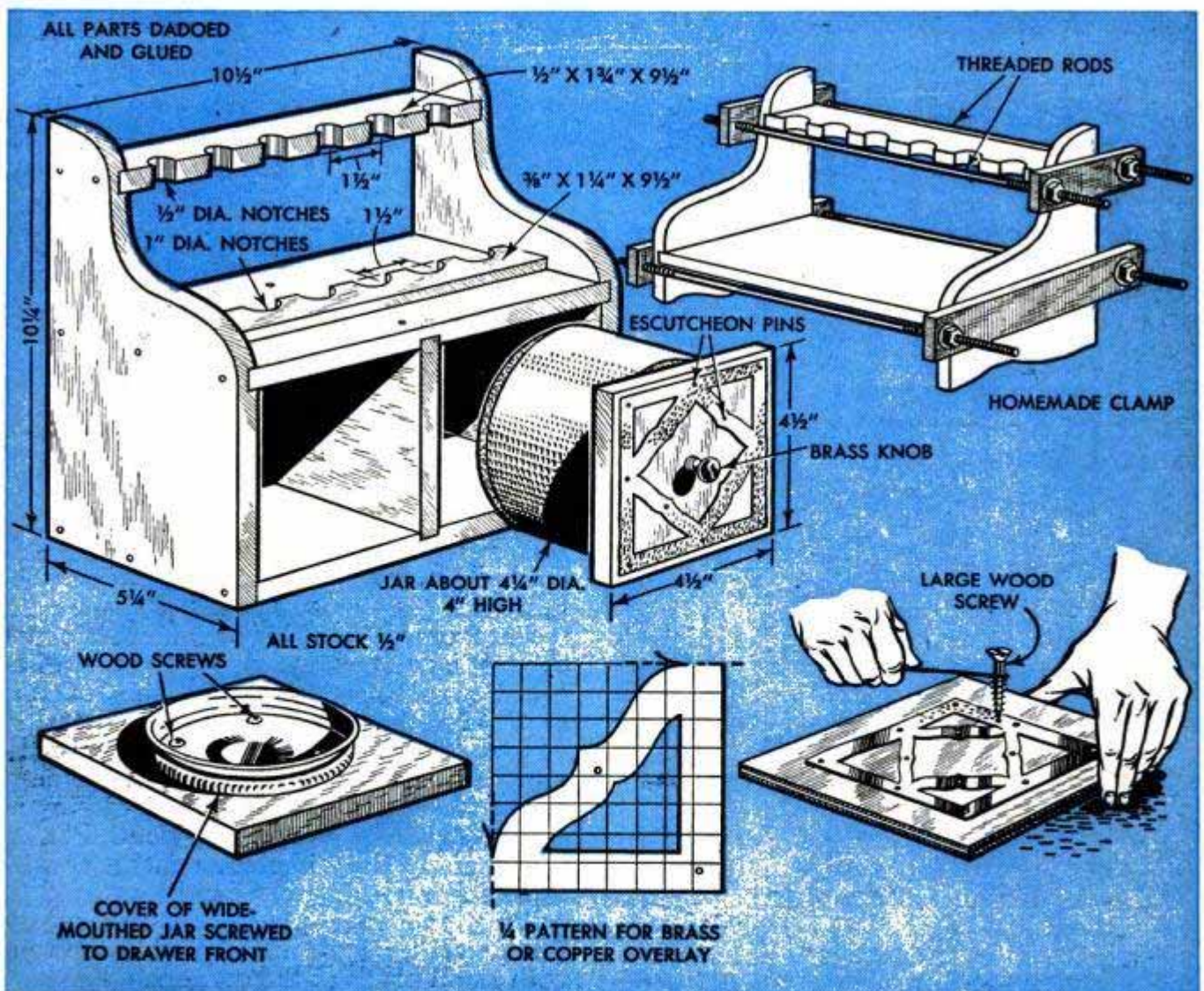
By Bertram Brownold

THIS combination pipe rack and humidior solves the storage problem for pipe smokers. There's a glass humidior behind a false drawer front, a single drawer for accessories and a rack for six pipes combined in a small cabinet. The drawer fronts are ornamented with copper overlays having diamond-shaped cutouts and a hammered finish. The finish is applied with the point of a wood screw held by a twisted wire as in the lower right-hand detail. Either copper-foil stock or colonial (red) brass may be used. Lay out the pattern for each overlay on $\frac{1}{4}$ -in. squares. Use a high-grade cabinet wood such as cherry, birch or mahogany for all wooden parts. The two members which, when assembled, form the pipe rack are notched to suit the individual stems and bowls of the pipes. The notches are cut on a jigsaw after which the side



The back of each drawer compartment is drilled to permit attaching the rack to the wall with screws

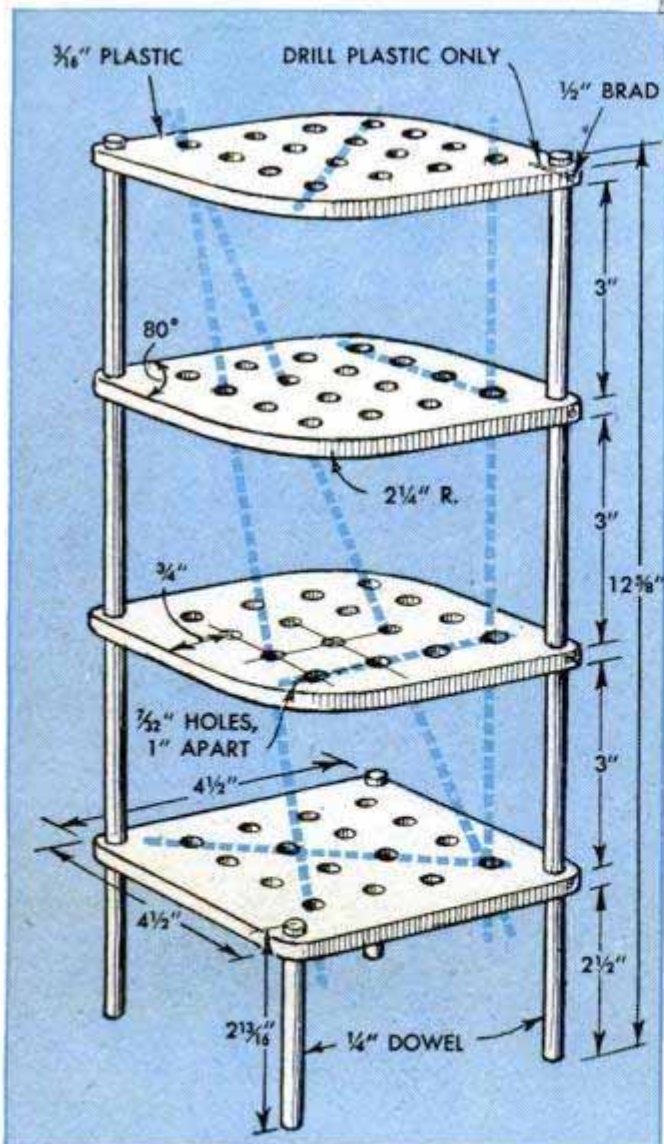
members are scrolled and grooved to take the top of the cabinet. The top is grooved at the center to take the divider between the drawers. Clamp the parts as in the upper right-hand detail until the glue is dry. Attach the lid of a large screw-top jar to the back of the right-hand drawer front.



1 EVENING PROJECTS



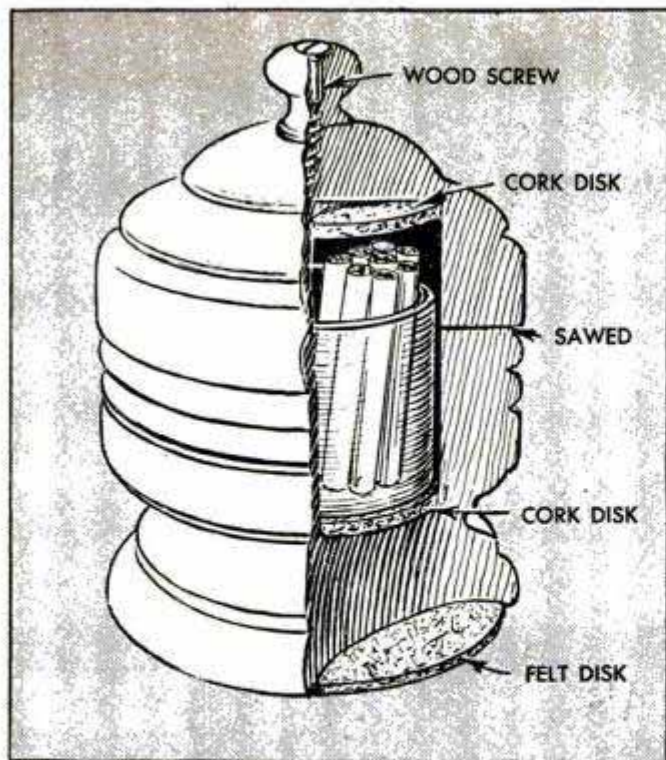
Ticktacktoe



CRAFTSMEN who like relatively simple projects that can be completed in an evening, or over a week end at the most, will find these six projects ideal. Five of the items are highly suitable for gifts or party prizes and all of them can be made from materials which are readily available.

TICKTACKTOE

This four-in-one version of a children's popular game is a good example of a project that provides an excellent gift. The object of the game is to align four pegs in a row, using any combination similar to the ones indicated by the dotted lines at the left. Each player has 32 pegs of a color different from those of his opponent. Wooden or plastic golf tees will do for the pegs. The four tiers of the board can be made of clear or colored transparent plastic. The tiers may be cut square or diamond shape, making the acute angles 80 deg. The diamond shape facilitates inserting the pegs in the center holes of the lower tiers. Perfect alignment of the 16 holes in each tier with those in the other tiers can be assured by drilling the four pieces simultaneously. The dowel uprights are pinned to the tiers with small brads at the corners.



CIGARETTE HUMIDOR

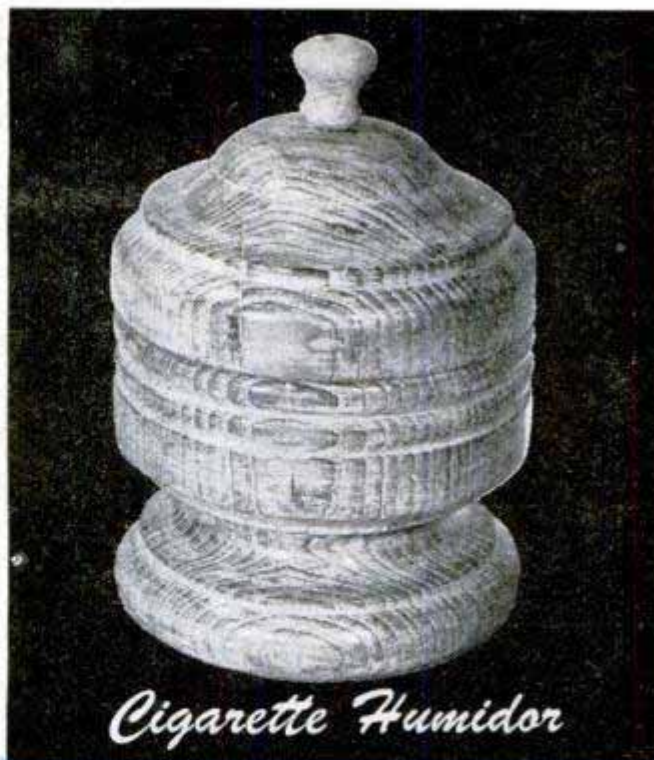
A crown finial, removed when modernizing a stairway newel, or a similar turning cut from an old pedestal table, forms an unusual cigarette humididor. After the turning is sawed in two, as shown in the detail, use an expansive bit to drill both the top and bottom sections to receive a glass container. The latter is simply a jar or tumbler which has been cut slightly shorter than the length of the cigarettes. The rim of the container, which should extend about $\frac{1}{4}$ in. above the edge of the hole in the bottom section, is ground smooth.

BAKING HOT PAD

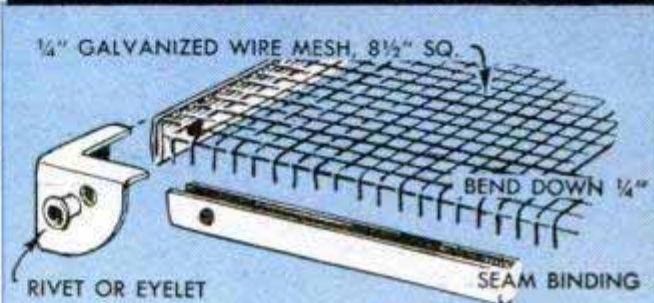
Just the thing for cooling cakes and pies or for setting hot casseroles on the table, this hot pad is made from wire mesh, linoleum seam binding and a few scraps of sheet metal. The wire mesh is cut to size and all edges bent downward $\frac{1}{4}$ in. Then the seam binding, or strips of sheet metal $\frac{3}{4}$ to 1 in. wide, are folded double and drilled for riveting to the legs. The sheet-metal legs are bent to the shape indicated, the joint being mitered at the top of the flange and soldered, if desired.

COMBINATION BASKET AND BOWL

Here's an interesting lathe project that consists of a bowl-shaped turning cut in half along its diameter and held together in two different ways by an interlocking ring. It can be used as a fruit bowl when the halves are locked in their normal, edge-to-edge, position, and will serve as a basket for artificial flowers if the halves are set on end and locked face to face with the ring. To shape the bowl, turn a wooden disk 2 in. thick to a suitable diameter—9 in.



Cigarette Humidor

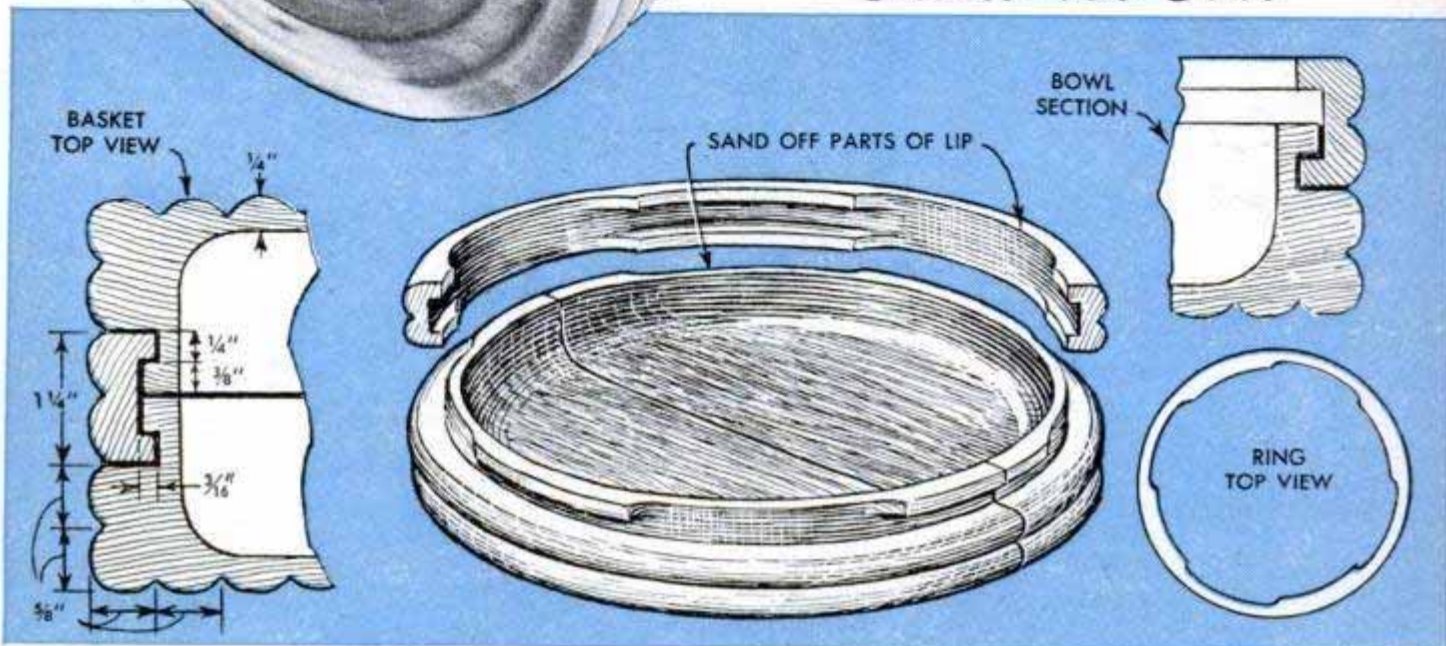


Baking Hot Pad





*Combination
Basket-and-Bowl*



was used for the original—and then turn beads on the edges and face. The $\frac{3}{16} \times \frac{3}{8}$ -in. lip around the top of the bowl is also turned at this time. Remove the turning and temporarily glue the beaded side to a piece of waste stock with paper between. Remount on the faceplate and dish out the center. Portions of the lip are sanded off as shown in the center detail, and the bowl is cut in half. To make the ring, a disk of $1\frac{1}{4}$ -in. stock is screwed to the faceplate and turned to fit over the lip of the bowl. Note that sections of the ring lips are sanded off to match those of the bowl lip.

POP-OUT SPICE SHELF

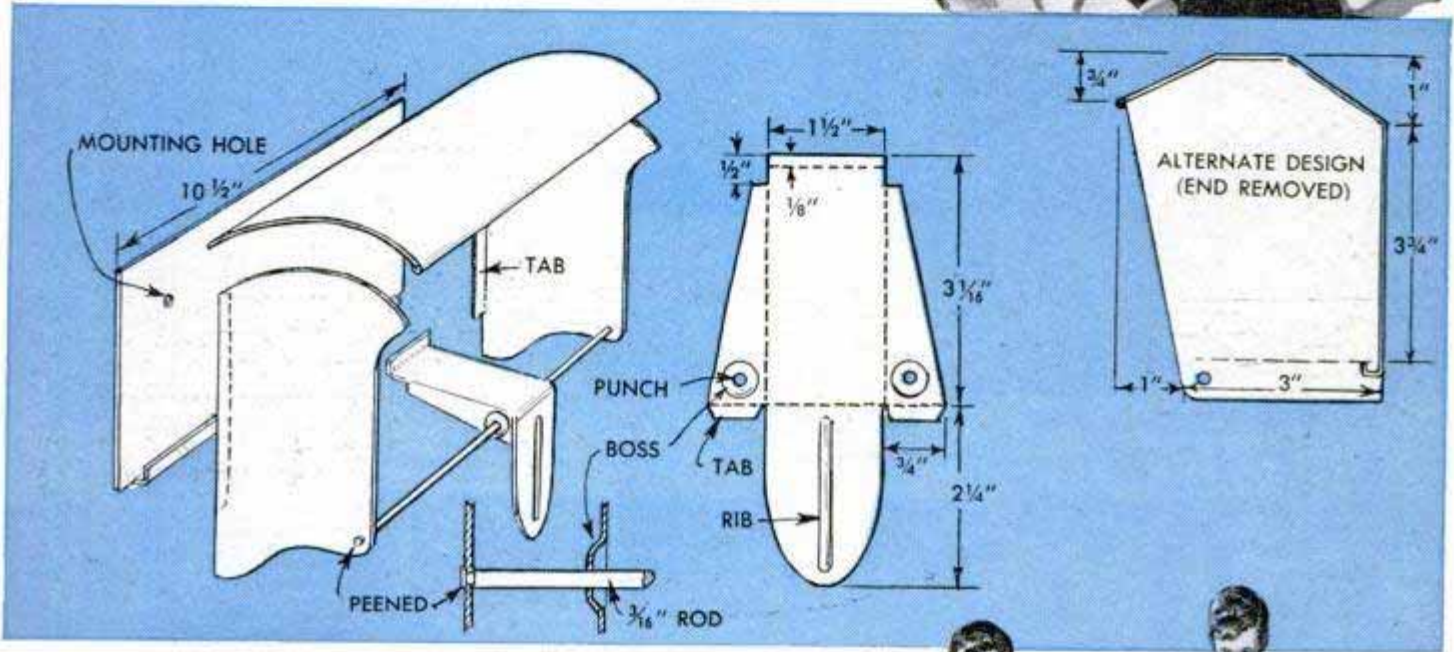
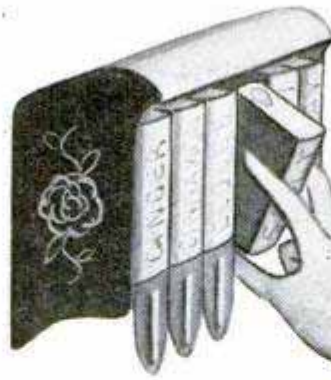
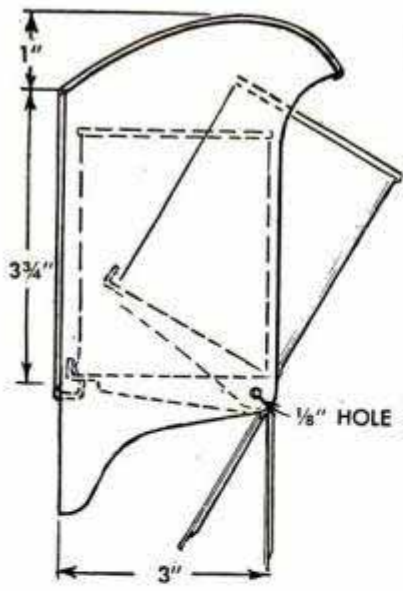
Attractively enameled to match your kitchen, and possibly enhanced with decorative decals, this little shelf conveniently dispenses six or more spice cans. Housed in a soldered sheet-metal cabinet, each can is set on an individual tilting rest which brings it outward and into your hand when you push on the tab at the bottom of the rest. A channel bent on the lower edge of

the cabinet back provides a stop for the rests, which are pivoted on a length of rod or tubing. Tenons turned on the rod allow inserting the ends through the sheet-metal sides of the cabinet and peening them over to hold the rod in place. If tubing is used, the ends are simply inserted through holes in the sheet metal and swaged.

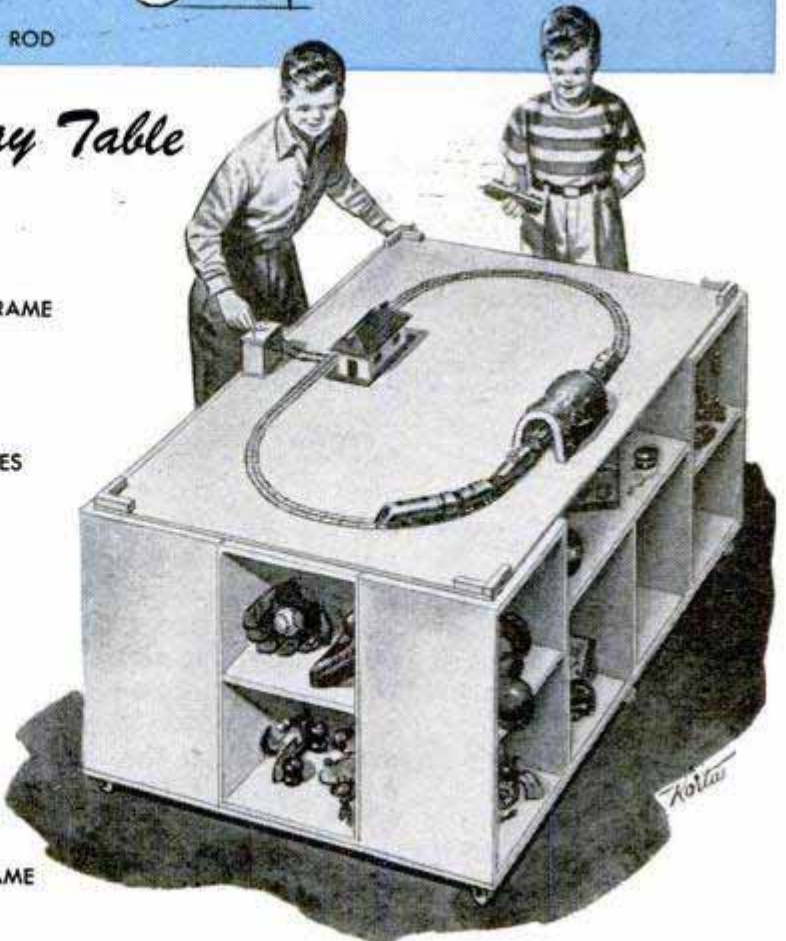
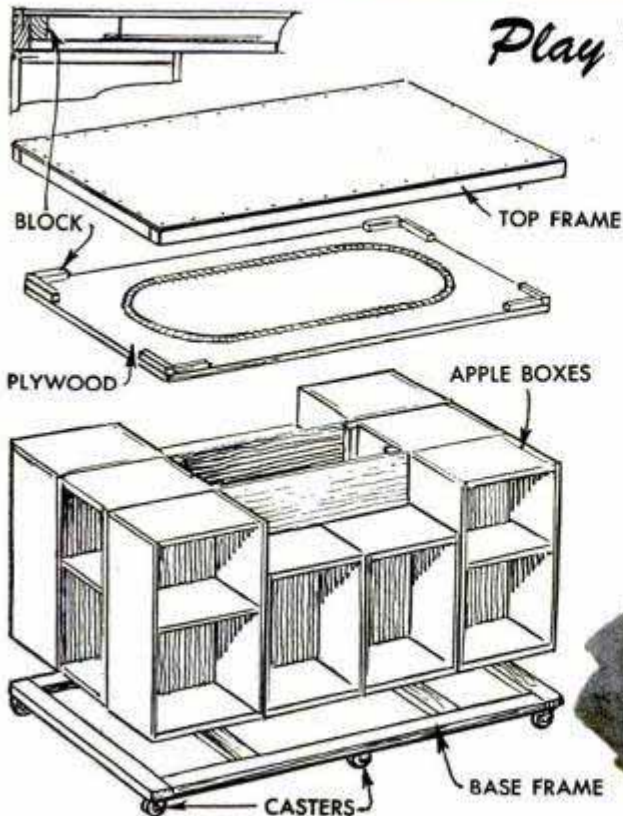
PLAY TABLE

Apple boxes combined with two table tops, a permanent one of plywood and a removable one of hardboard, provide an inexpensive play table that includes generous storage space for toys, a permanent layout for a toy train and a play top. The boxes are assembled on a base made of 1×3 -in. wooden strips and fitted with six large casters. Hardboard is used to back the center shelves and also to cover the table-top frame. Note how the latter rests on corner blocks and fits over the edge of the plywood. If desired, the center portion of the hardboard can be supported with blocks or cleats which rest inside the track oval.

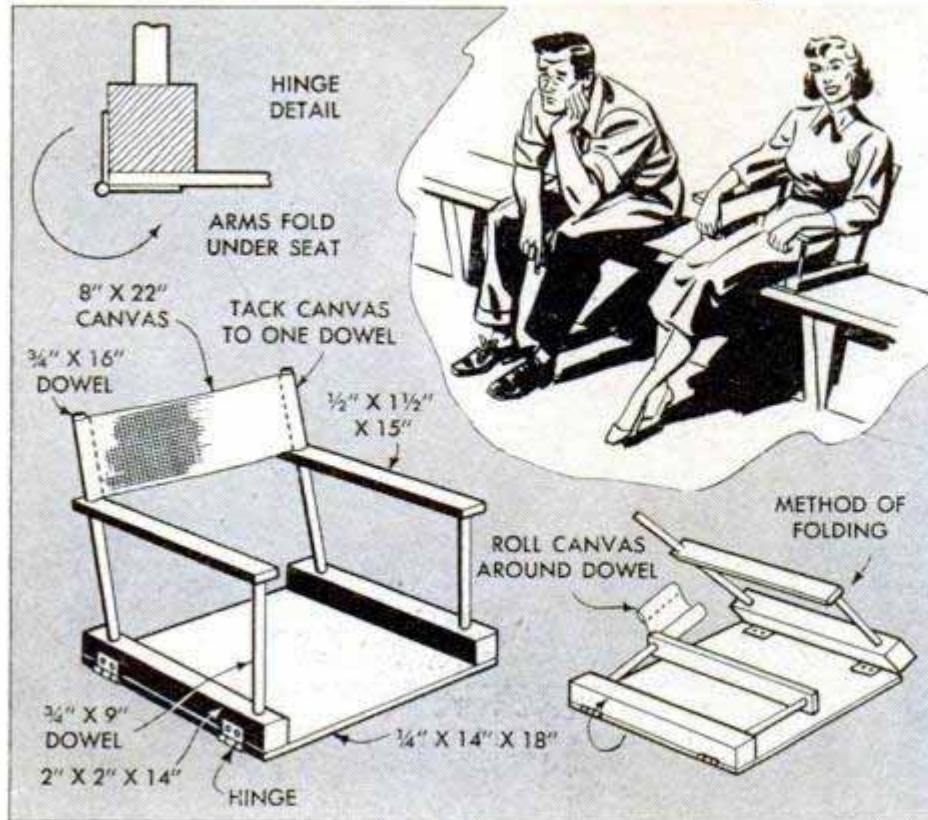
Pop-Out Spice Shelf



Play Table



Portable Bleacher Seat With Canvas Back Adds Comfort to Plank-Type Bench

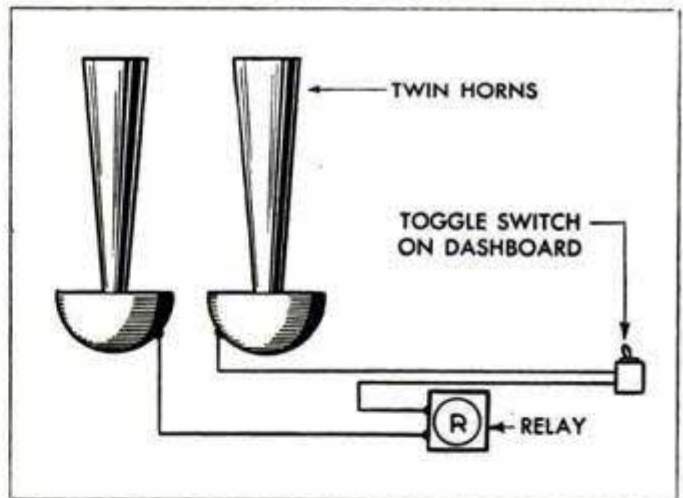


You will be sure of comfort at sports events if you come outfitted with one of these folding seats. The seat, which is simply set on top of the usual plank-type bleacher bench, consists of a plywood bottom having two hinged arms and a canvas back. The arms, which fold outward and under the seat, are made by drilling a length of 2 x 2-in. stock to take two dowel uprights, the longer, or rear, one at about an 80-deg. angle. The armrest is drilled to fit over both dowels and is nailed flush with the top of the front upright. The canvas back is hemmed to slip over the rear dowels and is rolled around one of them when folding the seat. — Sumner Veazey, Santa Barbara, Calif.

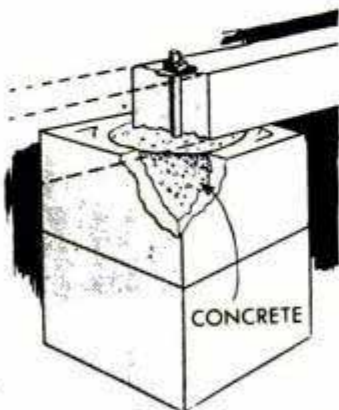
Switch on Dashboard Reduces Noise of Twin Horns

One motorist, who found that the twin horns on his car were so loud that they startled rather than merely warned pedestrians, installed a switch in the horn circuit to cut out one of the horns for city driving. When on the open highway, the switch is closed to obtain the full blast of both of the horns. As shown in the wiring diagram, a toggle switch is wired in the lead which connects one of the horns to the relay. The switch is mounted in a convenient location on the dashboard, preferably near the ignition switch, so that it can be snapped quickly to either position.

A. J. Seymour, Jr., Salmon Falls, N. H.



Chimney Blocks Form Piers for Supporting Small Buildings



desired height and fill the center hole with crushed stone and concrete. It is not necessary to use mortar between the blocks, as

concrete piers for supporting small buildings can be had without going to the trouble of making wooden forms if chimney blocks filled with concrete are used to support the sill. Just build the block pier to the

the concrete fill will hold them in place. The anchor bolt for the sill should be set in place before completely filling the hole.

Victor H. Lamoy, Upper Jay, N. Y.

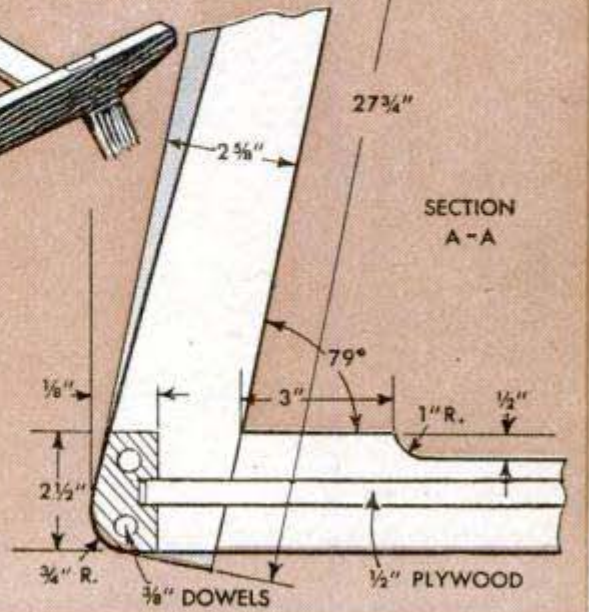
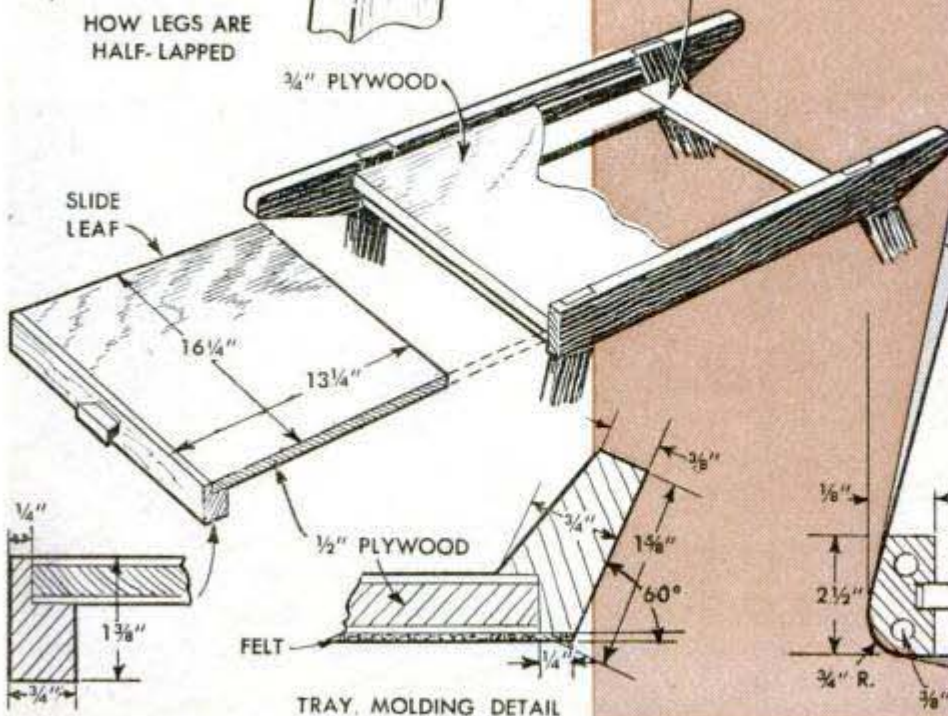
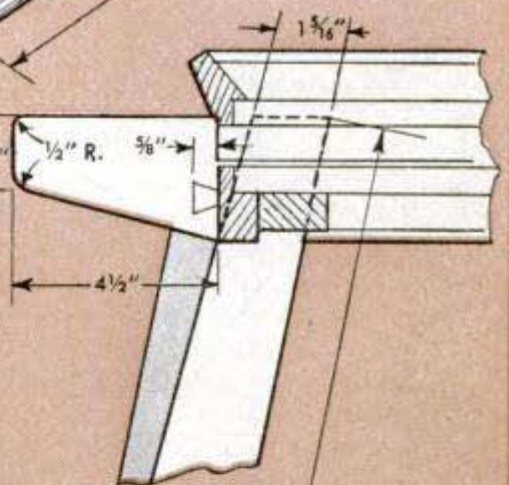
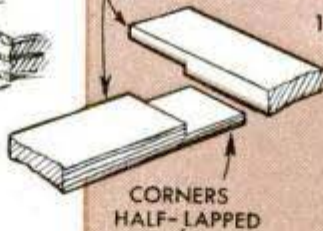
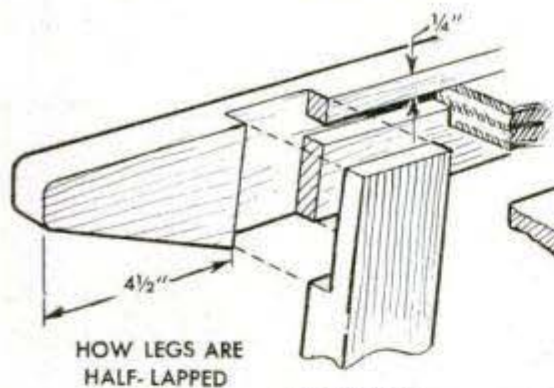
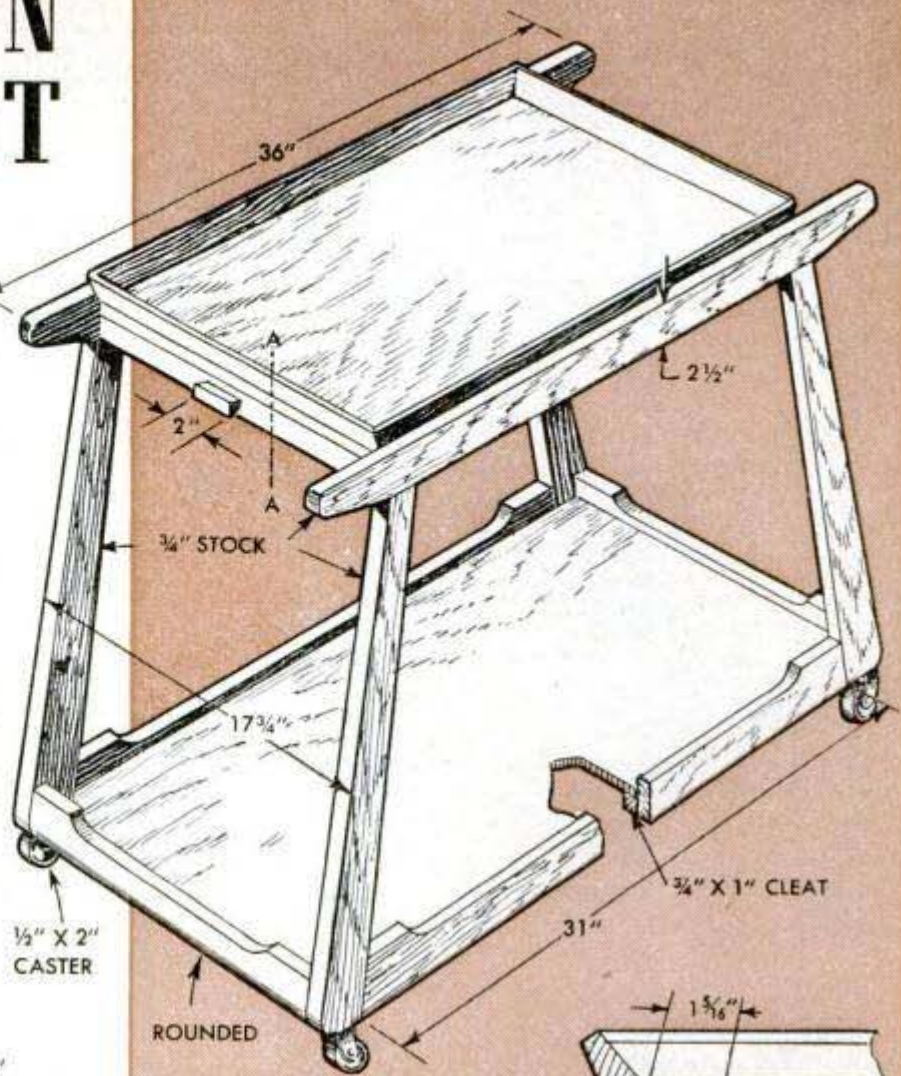
Gasolineproof Aluminum Paint

For painting outboard motors and other parts that are exposed to spilled gasoline, ordinary aluminum-paint preparations usually will be washed away within a short time. A paint that will withstand the effects of gasoline for a considerable length of time and also a maximum amount of exposure to the weather can be had by mixing aluminum powder or paste with lacquer.

MODERN TEACART



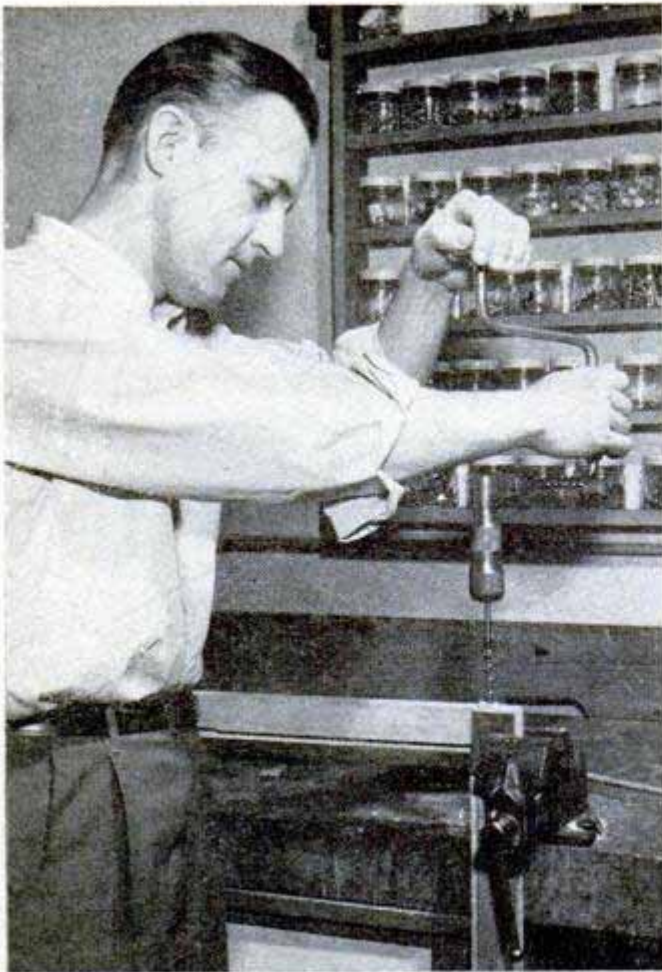
A modern take-off on the conventional large-wheel tea wagon, this modified version retains all the features of its prototype—including lift-off tray, portability and pull-out shelves. The shelves slide on a half-lapped frame which is edge-screwed to the side members $\frac{5}{8}$ in. below the plywood top of the cart. The latter, which is rabbeted to fit grooves in the side members, is notched to fit over the slanting, half-lapped legs



How to Make

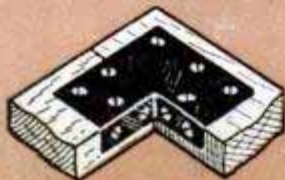
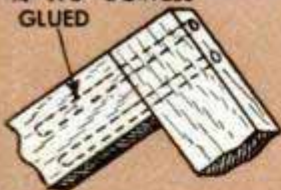
ONE OF THE most practical home-workshop projects is making your own storm sash and screens. In addition to the cash saving, there are several other advantages to be gained by doing the job yourself. For example, you can make the convenient divided storm sash with a hinged lower section, sealed inside storm sash which prevent condensation on metal casements and screens with sturdy, durable frames. All homemade storm sash can be sealed with various types of weather stripping to prevent air leakage. These special features are not ordinarily available in the regular product.

The details at the lower left show six different methods of corner-joining sash frames. Of course, the same methods can be used in joining screen frames of either the full or half-length type. Of all the types of joints suggested, the doweled joint, the splined miter and the miter joined with corrugated fasteners get the highest recommendation. Material for the stiles (vertical members) is available ready-cut to recommended sizes, usually $1\frac{1}{8}$ x $2\frac{5}{8}$ -in. sectional size, in clear white pine. By ripping the bottom and top rails and the center muntin of screen frames from standard $1\frac{1}{8}$ -in. stock lumber, you can obtain a stronger, more rigid frame at less cost per unit. This is done simply by making the bottom rail 3 to 5 in. wide instead of the usual $2\frac{5}{8}$ in. The lower left-hand details on the facing page show average sectional sizes of the three cross members with $\frac{1}{2}$ x $\frac{1}{2}$ -in. glass rabbets. Rabbets of the same size are cut on the stiles. Now, note in the circled detail how the rabbeted parts are joined at the corners, using dowels and waterproof glue. The raised section between the inner



Typical corner joints

PREFERRED METHOD
 $\frac{1}{4}$ " X 5" DOWELS
GLUED

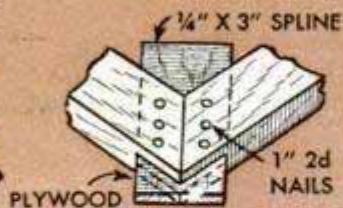


METAL CORNER BRACES
RECESSED FLUSH
(T-BRACES USED TO
JOIN MULLION)

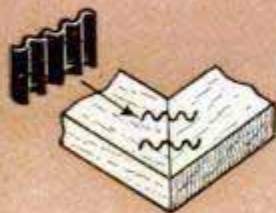
3" No. 12 F.H. SCREWS
OR $3\frac{1}{4}$ " 12d BARBED
BOX NAILS



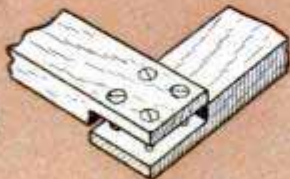
BUTT JOINT USING
SCREWS OR NAILS
AS FASTENERS



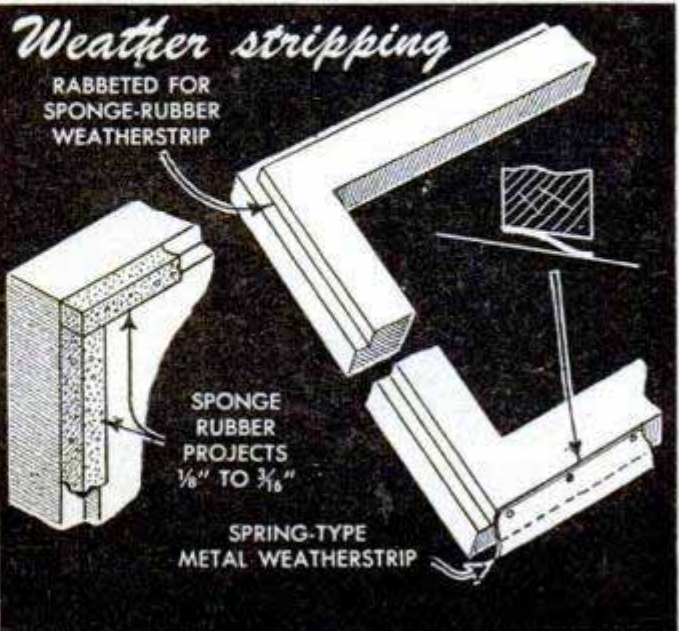
SPLINED MITER JOINT,
USE WATERPROOF GLUE



MITERED FRAME
JOINED WITH
CORRUGATED FASTENERS



HALF-LAP JOINT GLUED
AND FASTENED WITH 1"
No. 7 SCREWS

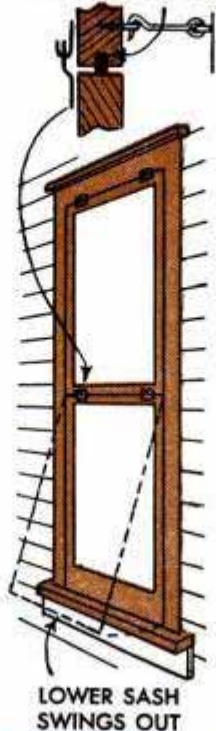


STORM SASH and SCREENS

face of the rabbet and the back face of the stock is cut away to permit the rail to butt against the stile. The same method of joining can be used when making screen frames which are rabbeted for the screen molding, as will be seen from the sectional details on the following page.

Pictured and detailed at the right is the special storm sash with a lower section pivoted on hangers, or hinges. As you can see, it is quite simple to make and on second-floor windows the use of a hanger permits installing and removing the lower half from the inside. By making a matching screen frame, it is not necessary to remove the upper half of the outer sash during the summer season. Be sure to use a sponge-rubber or a spring-type metal weather strip between the upper and lower sash as shown in the detail. This prevents seepage of water at the open

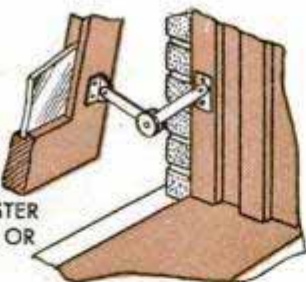
SPONGE-RUBBER STRIP IN GROOVE. SPRING-TYPE WEATHERSTRIP ALSO USED



LOWER SASH SWINGS OUT

Storm-sash hardware

STORM-SASH HANGERS (SIMILAR ONES ON SCREENS FIT THE SAME HOOKS)

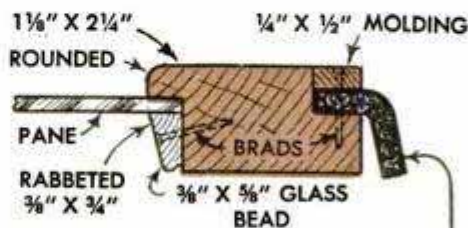
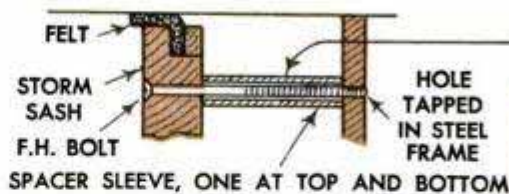


FRICTION-TYPE STORM-SASH ADJUSTER HOLDS SASH OPEN OR CLOSED

Hanging divided storm sash

A divided storm sash arranged so that it may be removed and installed from the inside is a great convenience. By attaching the lower half with hangers and making an interchangeable screen frame, it will not be necessary to remove the upper half of the sash during the summer season

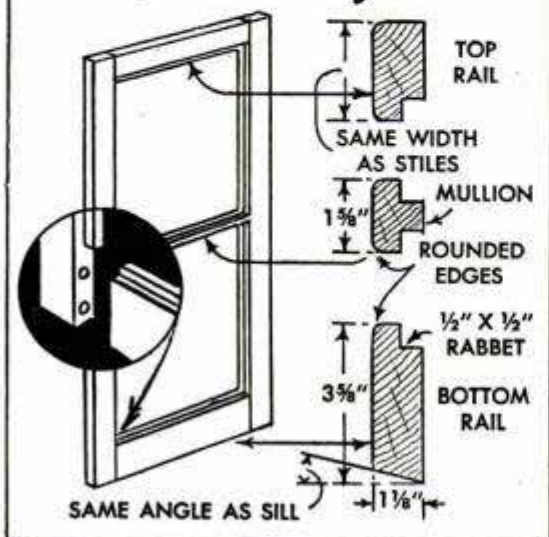
Casement storm sash

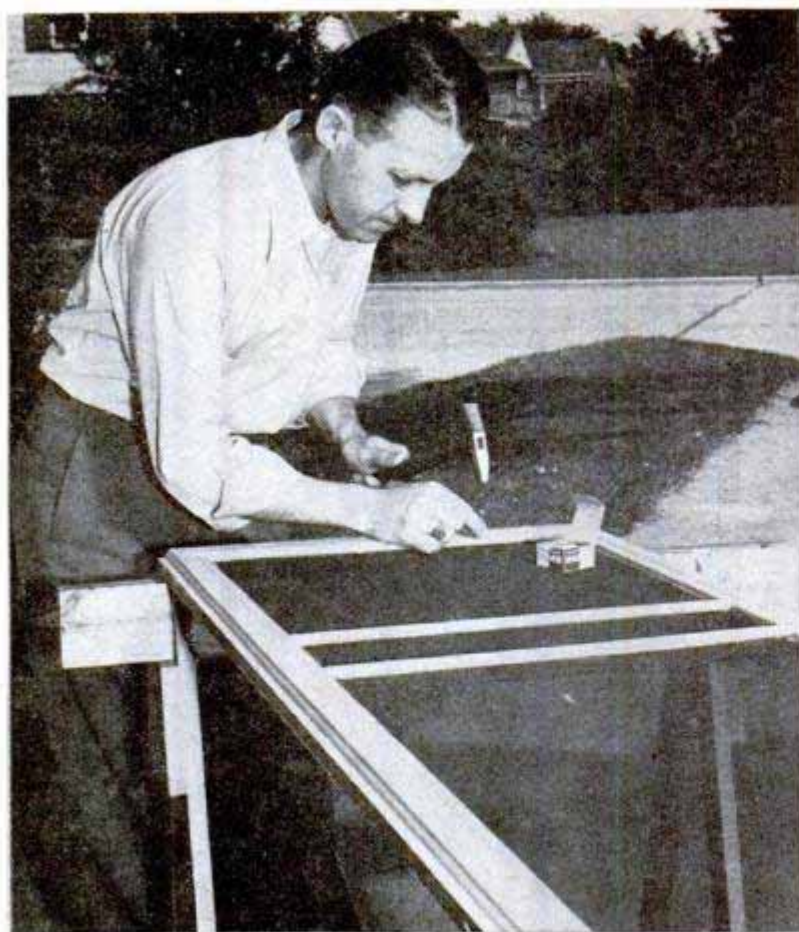


1/4" X 1 1/2" FELT STRIP ALL AROUND

STORM SASH MUST HAVE 5/16" CLEARANCE ALL AROUND

Frame sizes

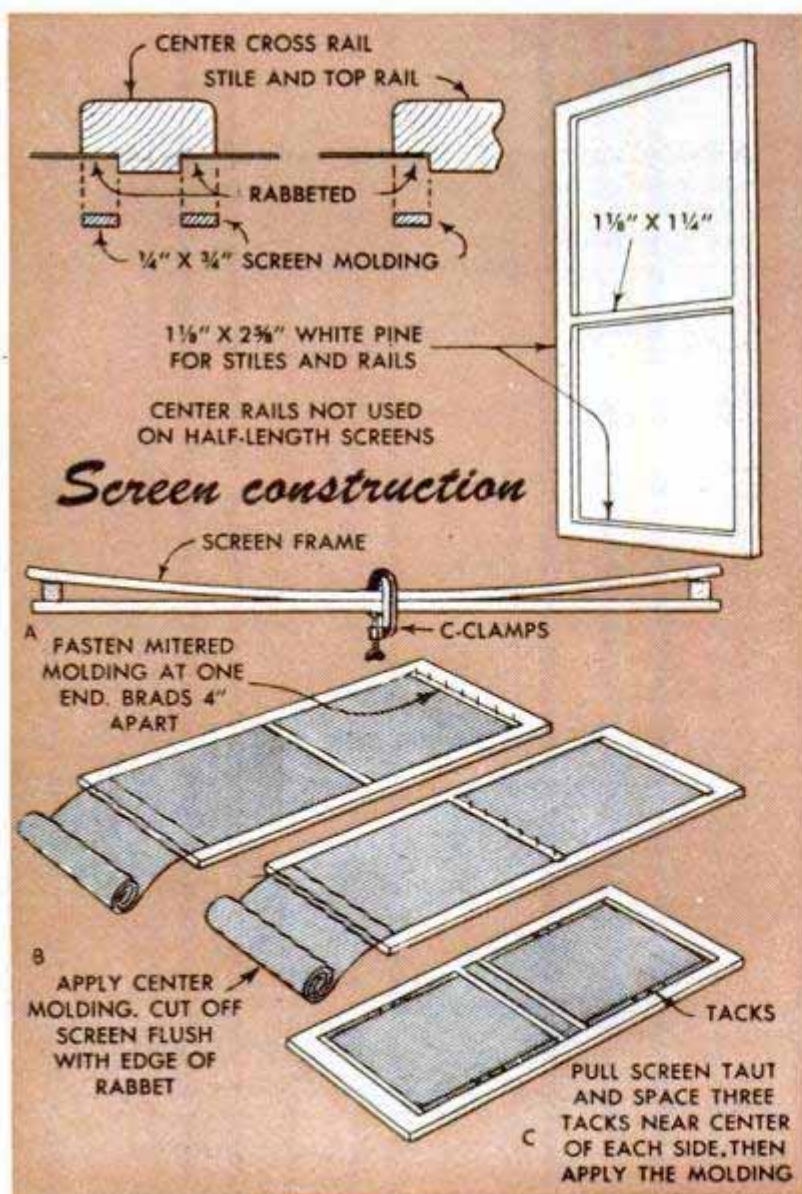




joint. Also, it's a good idea to install the friction-type sash adjuster on the lower half of the sash so that it may be opened and held at any desired angle during mild winter weather. This special mild type of sash adjuster is shown in one of the details on the preceding page.

It is usually possible to fit storm sash over metal casement windows by installing them on the inside of the frame as in the lower right-hand details on the preceding page. Note that the special sash is attached with spacer sleeves and long bolts which turn into holes tapped into the casement muntin. The edges of the storm-sash frame are trimmed down to allow $\frac{5}{16}$ -in. clearance all around then rabbeted to permit the installation of a felt weather stripping. This is held in place with $\frac{1}{4} \times \frac{1}{2}$ -in. molding strips attached with small brads. The glass is held in place by a bead instead of putty, as shown in one of the cross-section views.

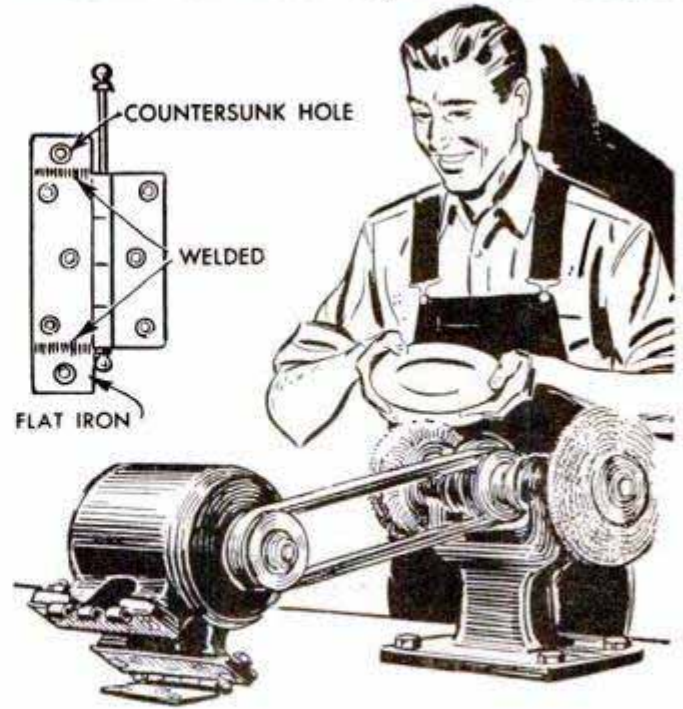
After outside storm-sash frames have been finished and assembled, apply a priming coat of paint and permit it to dry thoroughly before installing the weather stripping and glass panes. The latter should be cut to fit in the rabbets with clearance all around. Lay a thin line of putty in the corner of the rabbet, set the pane, drive glazier's points spaced 6 to 8 in. apart and then putty the joint. Be sure, before applying the finishing coats of paint, that the putty is thoroughly dry, as otherwise the paint will peel. The details at the left show the procedure in making full-length screen frames. The method of making the half frame is the same except that the center muntin is omitted, of course. Although making and fitting the doweled joint takes more time, this type of joinery is by far the most durable on woodwork exposed to weathering. Note that in the detail of the assembled frame, the width of the lower rail is given as the same as that of the stiles and top rail. A stronger and more rigid frame will result if the lower rail is ripped at least 3 in. wide. Details A, B and C show how to attach screen wire to the frames. Priming and painting procedures are the same as outlined for storm sash.



Loose-Pin Hinges Provide Motor Mount for Driving Power Tools

If you drive several power tools with a single motor, here is an inexpensive floating-type motor mount that permits shifting the motor from one tool to another in a few seconds. A 4 x 4-in. loose-pin hinge is needed for each tool to be driven by the motor, although not all of the hinge leaves will be used. Select identical leaves from two of the hinges and weld small flat-iron tabs to the ends of the leaves. Drill and countersink holes in the tabs to permit fastening the hinge leaves to both sides of the motor base with flat-headed machine screws. Then screw matching hinge leaves to the top of the workbench or table, locating them so that the motor pulley will be in line with the machine pulley when the motor is set in the mount. The weight of the motor provides floating tension on the belt as shown in the illustration.

Nathan Green, Silver Spring, Md.



Sponge Fitted to Hose Speeds Bathing Dog

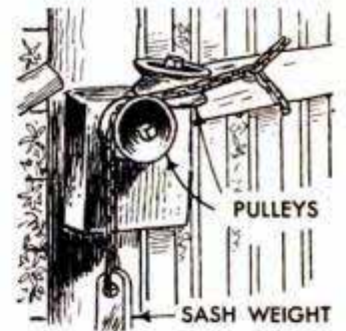


With the aid of a garden hose and a large sponge, you can bathe a dog quickly with little danger of getting your clothes wet. First, cut a narrow slit part way through the sponge and press the sponge over the garden-hose nozzle. After applying a liberal amount of soap to the sponge, turn on the water and adjust the nozzle for a gentle spray. The sponge is removed before rinsing the dog.—Bess Ritter, Yonkers, N. Y.

Garden Gate Closed Automatically By Sash-Weight Balance

Attached to a gate with a length of chain guided by two V-pulleys, an ordinary sash weight automatically closes a yard or garden gate. The pulleys are bolted loosely to a wooden block which is mounted on the gatepost, one of the pulleys being fastened to the top of the block and the other to the side. Then the sash-weight chain is attached to the gate and drawn across the pulleys.

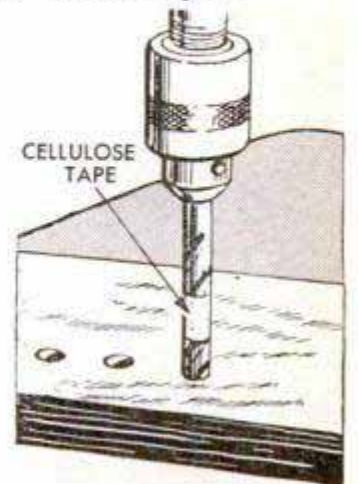
A. M. Wettach, Mt. Pleasant, Iowa.



Tape Marks Hand-Drill Depth

When using a hand drill to bore a number of holes to the same depth or a single blind hole to a predetermined depth, use cellulose tape as a guide. Wrap the tape around the bit so that the lower edge of the tape is the desired distance from the tip of the bit. Then simply drill until the edge of the tape is flush with the surface of the work.

Harrison Neustadt, Miami Beach, Fla.



"KIDSTER"

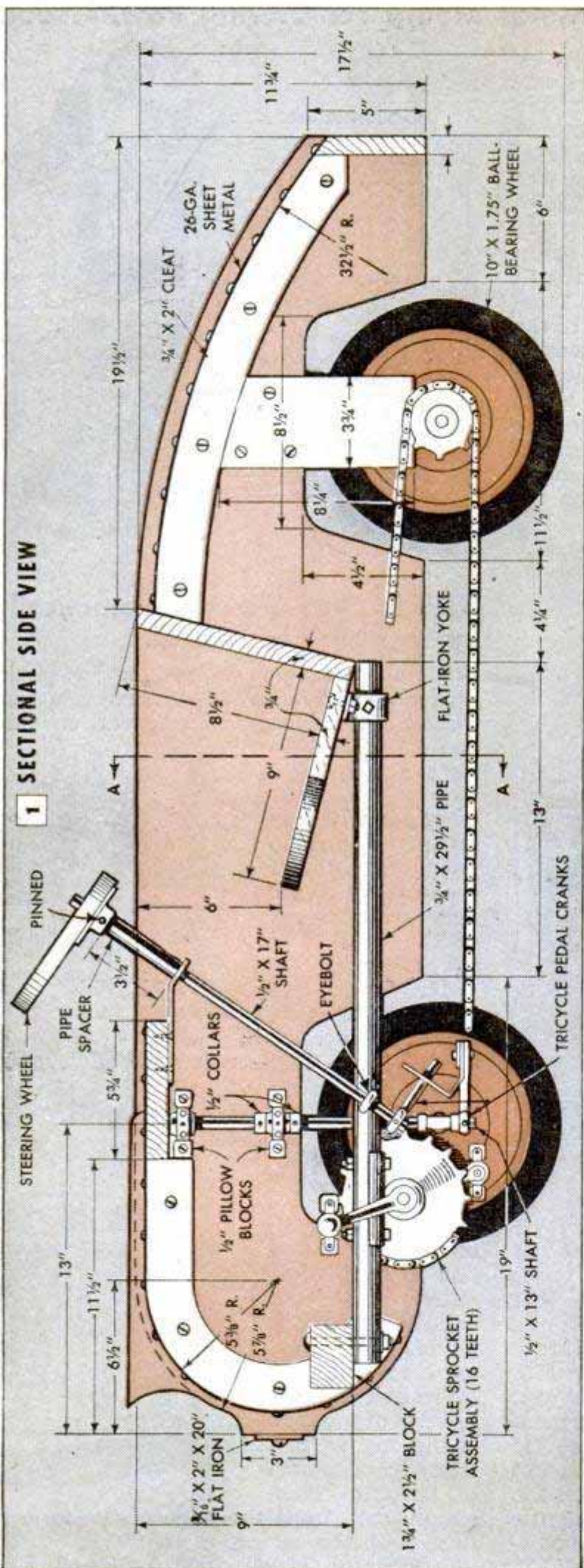
By Marvin Hartley

DAD WILL have little trouble "selling" the family small fry on the features of this sporty, pedal-driven auto—one look will be enough. They'll be quick to see the real headlights, plastic windshield, rubber tires and airplane-type steering wheel. Built from common parts and stock lumber, the car features a chain drive, using a standard tricycle sprocket bolted to a pipe support.

Fig. 1 gives the dimensions for laying out the sides on 1 x 12-in. pine stock. Cleats for supporting the sheet-metal hood and rear deck are screwed and glued to the inner faces of the sides $\frac{1}{2}$ in. down from the top edge. Mounting cleats for the pillow blocks which carry the rear axle are centered in the wheel openings. Remember to make a right and left-hand assembly. The sides are joined together at the front with a heavy cross member, to which the pipe support is bolted, and at the back with a 1 x 6 board. Long flat-headed screws are used to fasten these cross members, the rear member being 16 in. long, and the front one 14 $\frac{1}{2}$ in. long. The seat board and back are also screwed in place at this time. The final wooden piece to be added is the 1 x 6-in. board that supports the windshield and steering-column bracket. However, you may find it more convenient to fasten this in place after the pillow blocks for the steering assembly are installed.

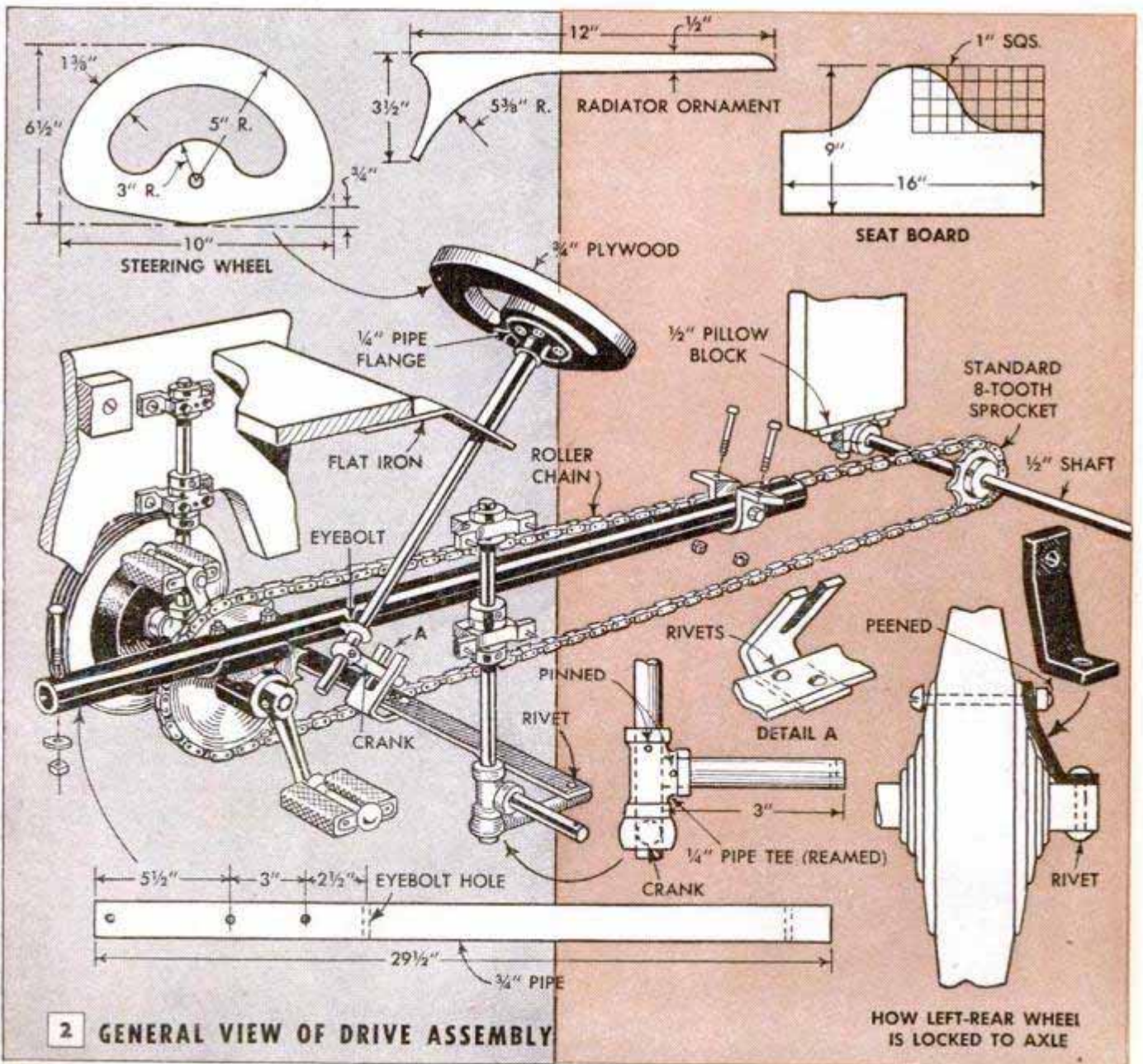
Fig. 2 shows the chassis assembly at a glance. The $\frac{3}{4}$ -in. pipe support for the car is drilled at the points indicated for mounting the tricycle sprocket, the eyebolt for the steering column and the bolts which anchor the pipe to the body. A U-shaped yoke, bent from flat iron, is used to fasten the rear end of the pipe to the bottom of the seat.

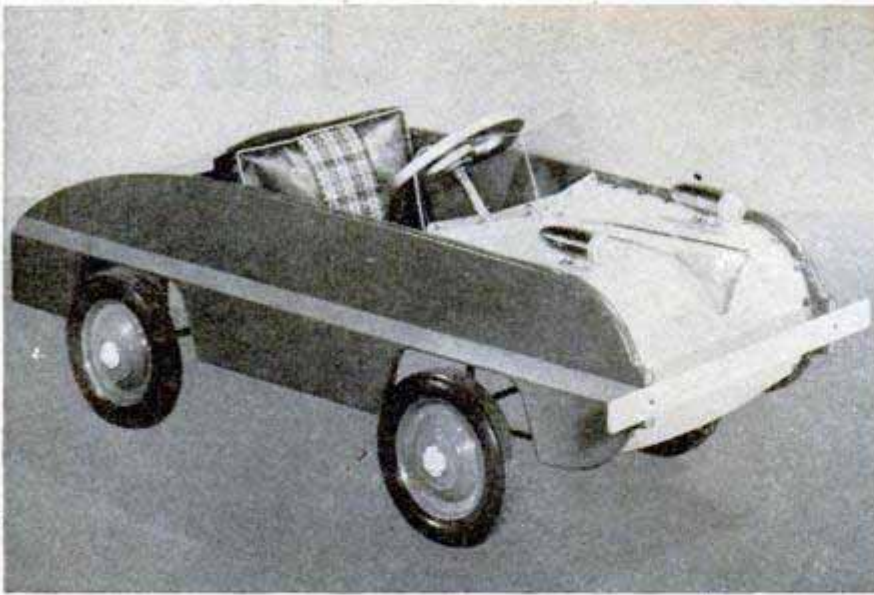
Lengths of $\frac{1}{2}$ -in. cold-rolled shafting are used for the steering assembly, the steering column and the front and rear axles. Details in Figs. 2 and 3 show how "knuckles" for the front wheels are improvised from $\frac{1}{4}$ -in. pipe tees. These are drilled or reamed out and then cross-pinned to lengths of $\frac{1}{2}$ -in.



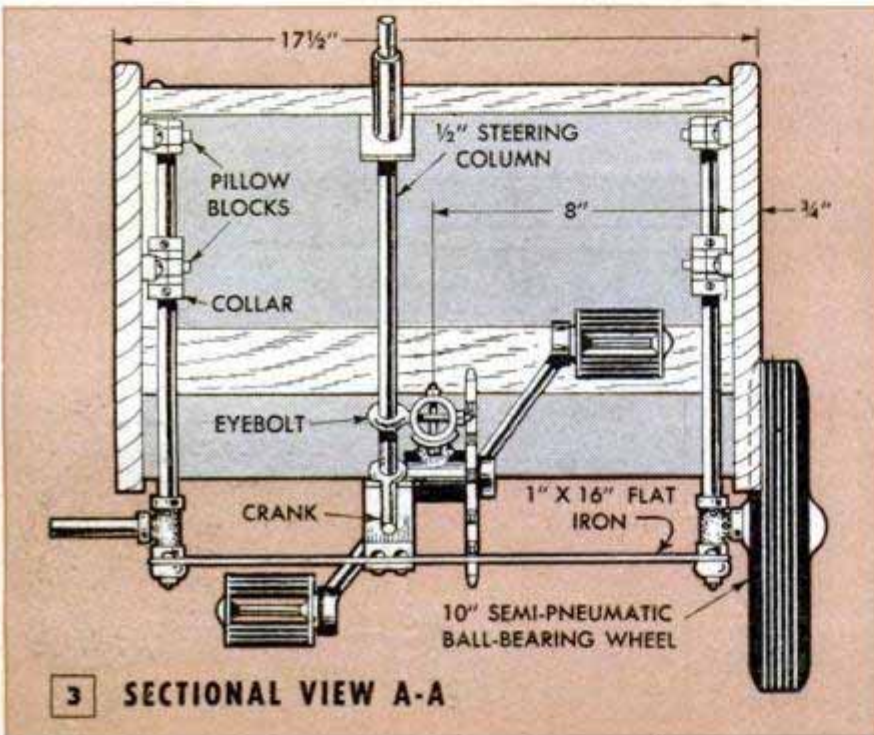
PEDALMATIC

FOR '51

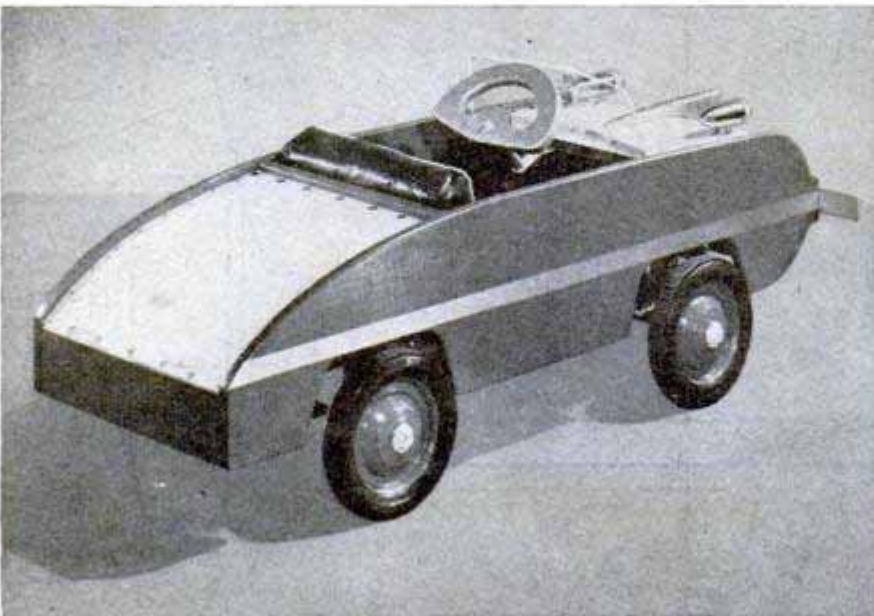




The wooden radiator ornament is screwed to the hood from the underside, while two roundheaded screws hold the flat-iron bumper in place



Like a tricycle, braking is done with the pedals, and if the driver has difficulty reaching the pedals, a back cushion can be provided



rod, 3-in. lengths being provided for the wheel axles. Note that the tees are pinned about $\frac{3}{4}$ in. from the ends of the vertical lengths to permit attaching radius arms to the lower ends. Cranks taken from tricycle pedals were used for these on the original car, although you can make them from bar stock, drilling and tapping each one for a setscrew. Note that a third crank is used on the steering column to engage a slotted bracket riveted to a flat-iron radius rod. Two collars, one above and one below the lower pillow block on each side of the car, hold the steering assembly in place. The lower end of the steering column is supported by an eyebolt, while the upper end is held by a flat-iron bracket. A pipe spacer placed over the upper end of the shaft holds the column in place. The pipe flange, to which the steering wheel is fastened, is drilled out and pinned to the column. Pillow blocks, which provide bearings for the rear wheels, are screwed securely to the ends of the mounting cleats provided, and an 8-tooth standard sprocket is fitted to the axle in line with the tricycle sprocket. Slotted mounting holes in the latter provide takeup of the roller chain. Any 10-in. semi-pneumatic, ball-bearing wheels can be used. Details in Fig. 2 show how the left wheel is locked to the rear axle.

The sheet-metal hood and deck covering are attached to the cleats with oval-headed screws and cup washers, spaced about 2 in. apart. The windshield consists of two pieces of clear plastic 5 x 8 in. which are fastened to the body at about a 2-in. slant with pieces of metal angle. The lights used are battery-operated headlights purchased at a bicycle shop, and are attached to the hood by driving the mounting screws into wooden blocks fitted under the sheet metal.

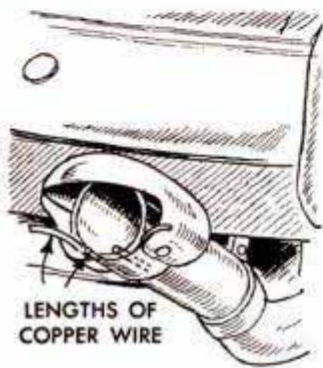
Plastic Food Bags Shield Sockets While Cleaning Ceiling Fixture

When one housewife cleans the rather ornate ceiling fixture in her living room, she covers each of the lamp sockets with a plastic food bag. This insures that no soap and water will remain to short-circuit the sockets when the fixture is turned on or cause corrosion which would, in time, be likely to damage the sockets and wiring. With the sockets completely protected by the plastic bags, plenty of cleaning solution can be used to do a quick and thorough job. However, it still is necessary to make sure that the wall switch is turned off to prevent any possibility of electric shock.

Ed Packer, Chicago.



Wire Under Exhaust Deflector Prolongs Tail-Pipe Life



As most exhaust deflectors clamp tightly to the end of the tail pipe, moisture collects between the two parts with little chance for evaporation. This frequently causes the end of the tail pipe

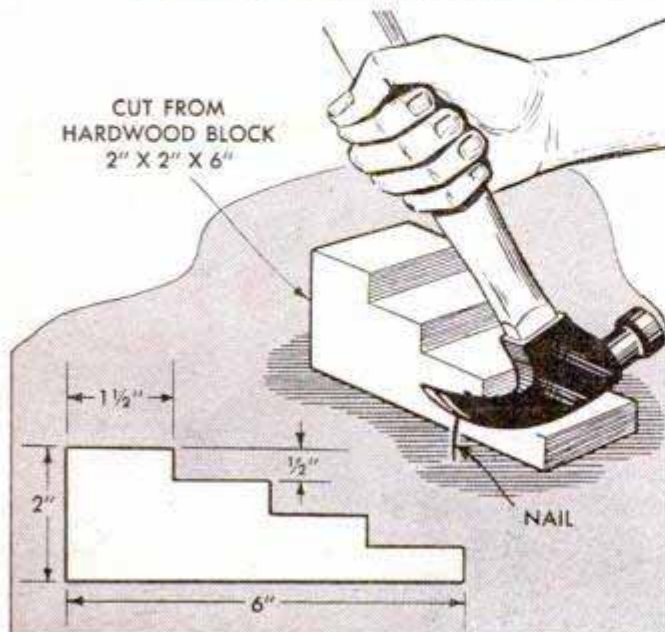
to rust off within a comparatively short time. To prolong the life of the tail pipe, insert four lengths of copper wire between the deflector and the tail pipe when attaching the former. The wires serve as spacers which hold the metal surfaces apart, thus permitting sufficient air circulation between the two parts to keep the area reasonably free from moisture and, in this way, minimize rusting.

Clinton R. Hull, Costa Mesa, Calif.

Block Simplifies Pulling Nails

Pulling rusted nails and spikes from old lumber is no problem if this stepped block is used as a rest under the hammer. Each step raises the hammer $\frac{1}{2}$ in. and, if the nail is too long to be pulled straight out with the hammer on the first step, the second or third step is simply slipped under the hammer. A hole drilled through the first step will permit hanging the block from a nail when it is not in use.

Archie N. Brunton, Gisborne, N. Z.



Tubing Holds Eye Glasses in Place

Those who wear shell-rim glasses while working or participating in sports will find that a length of rubber tubing temporarily fitted to the glasses will keep them from slipping out of place or falling to the ground. A



length of $\frac{3}{8}$ -in. tubing is pressed over the end of one bow of the glasses. Then the tubing is stretched lightly around the back of the head and pressed over the other bow.

Robert A. Groff, Elmira, N. Y.

Determining Amount of Seed

If directions tell you to plant so much seed per acre, here is how to find the area of your garden in fractions of an acre. Just multiply the length of the land by the width, and multiply the answer by .000023. Thus, if the garden is 100 ft. long by 100 ft. wide, its area is .23 acre. Then multiply the number of pounds of seed per acre by .23 to arrive at the quantity needed.

W. F. Schaphorst, Newark, N. J.

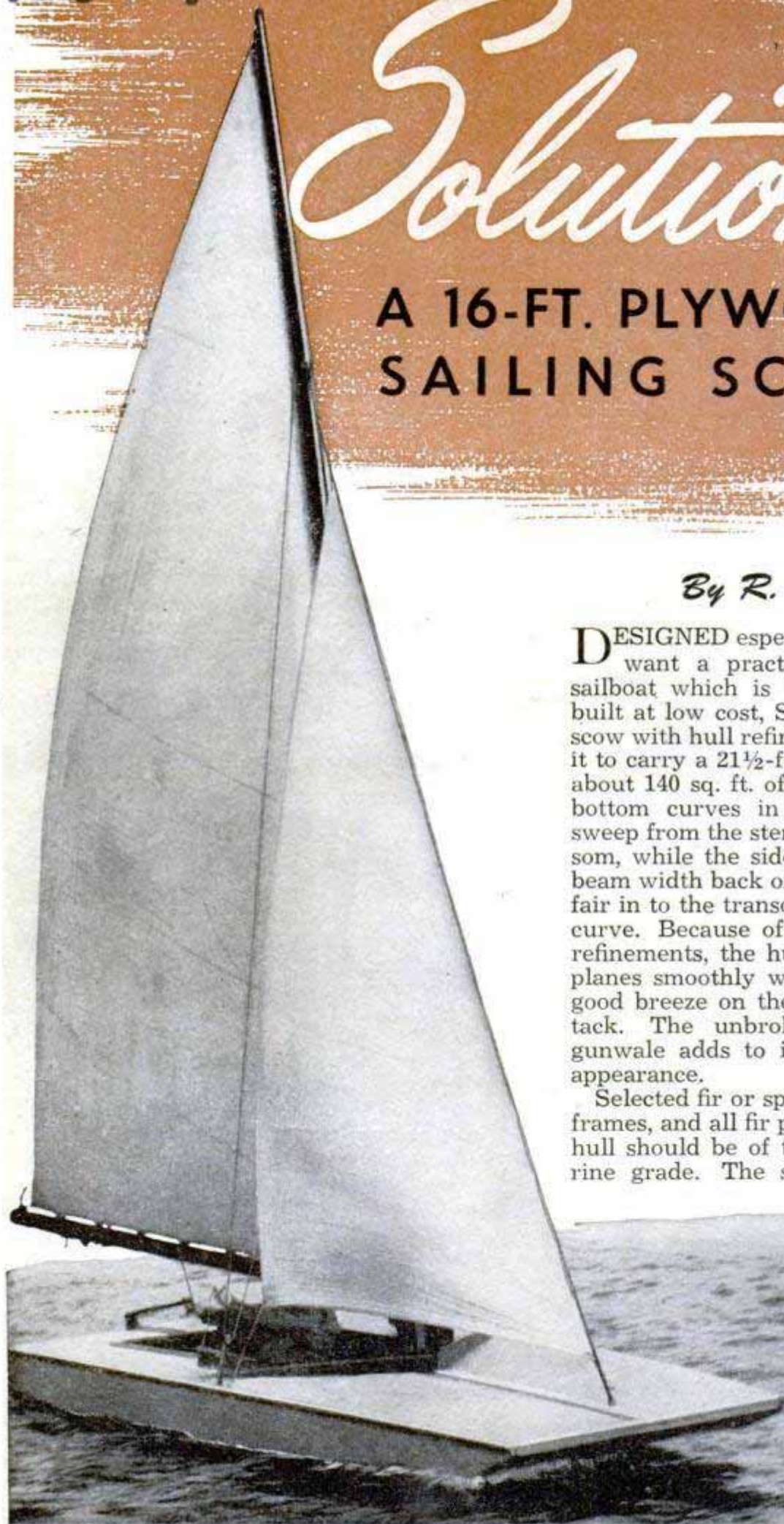
Solution

A 16-FT. PLYWOOD SAILING SCOW

By R. Howell

DESIGNED especially for those who want a practical, unpretentious sailboat which is easily and quickly built at low cost, Solution is simply a scow with hull refinements that enable it to carry a 21½-ft. stepped mast and about 140 sq. ft. of sail. The plywood bottom curves in a long, unbroken sweep from the stem block to the transom, while the sides curve out to the beam width back of midships and then fair in to the transom in a smooth, flat curve. Because of these construction refinements, the hull rides easily and planes smoothly when you pick up a good breeze on the long reach of the tack. The unbroken curve at the gunwale adds to its trim, seaworthy appearance.

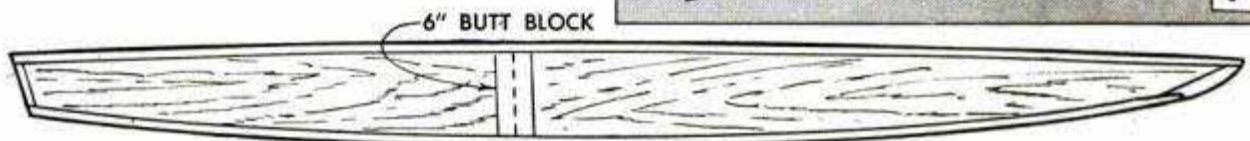
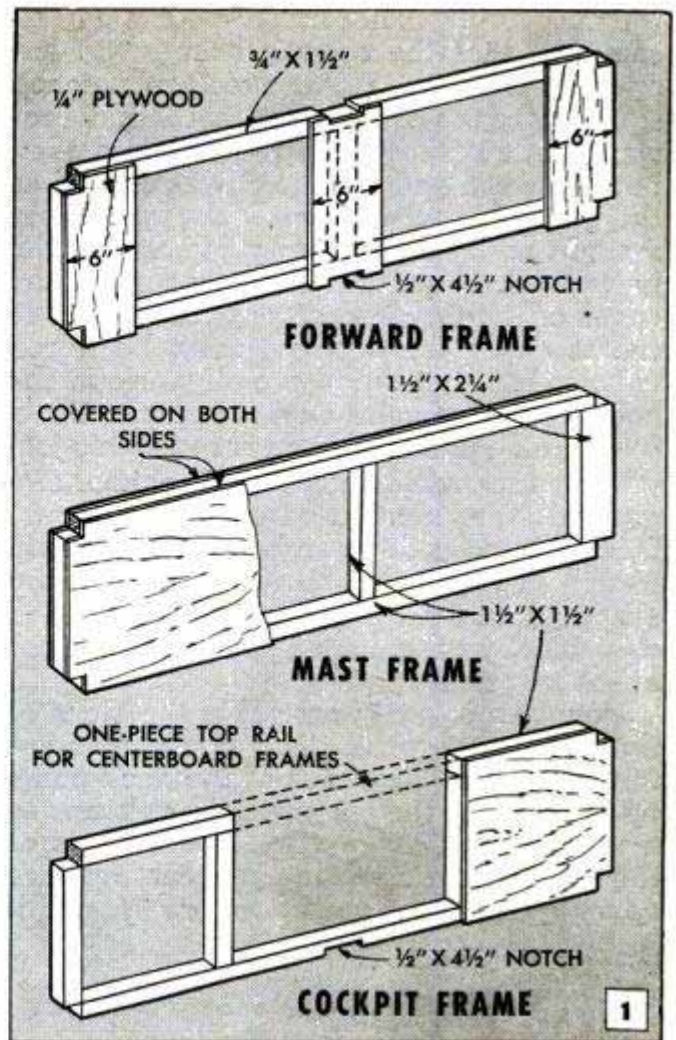
Selected fir or spruce is used for the frames, and all fir plywood used in the hull should be of the waterproof marine grade. The solid stock for the



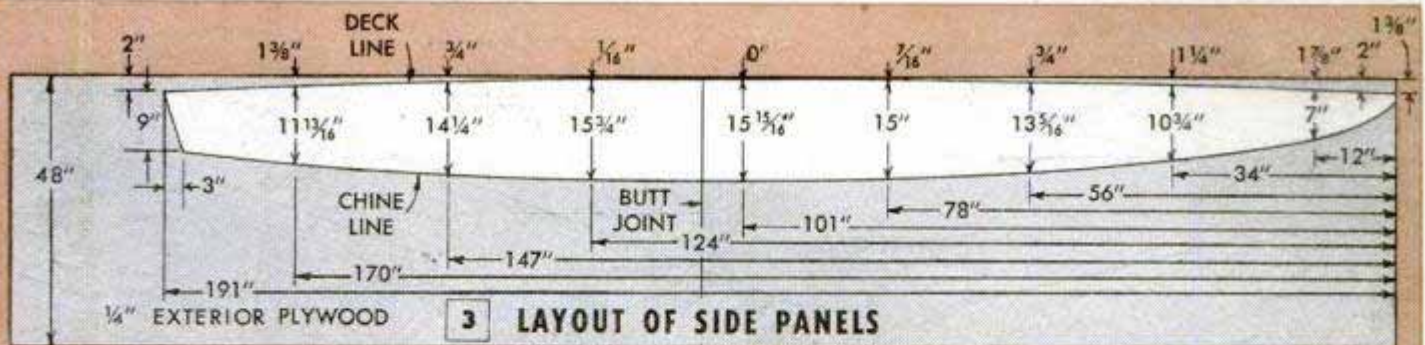
structural members should be clear and straight grained.

The first step is to lay out and cut the side panels, Fig. 3. Note that both side and deck panels are cut from four 4 x 9-ft. sheets of 1/4-in. plywood. To lay out the sides of the hull, two sheets are laid on the floor, end to end, and marked according to the drawing. Stations for the eight frames also are marked. The deck panels, Fig. 4, are laid out from the waste plywood after cutting the sides. To do this, it is necessary to flip over the panels, end for end. Being made up of two separate pieces, the deck and side panels are butted together and joined with butt blocks, as indicated, gluing and screwing them in place. Be sure to assemble the side panels so that one is right hand and the other left. After the glue is dry, clamp the panels together and plane the edges so that both units are identical in size and shape.

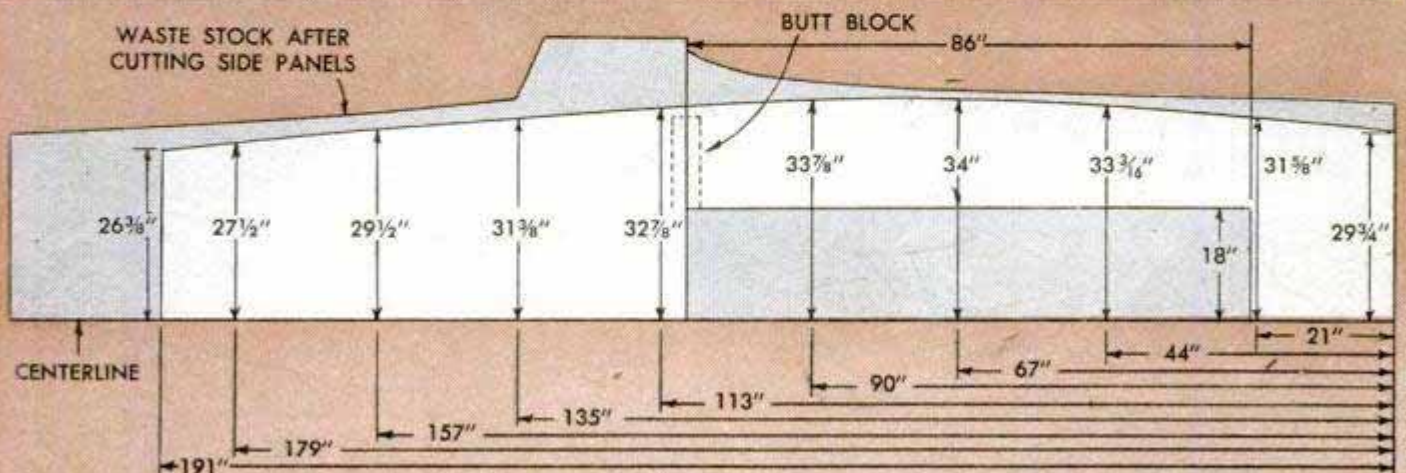
Fig. 1 details assembly of the frames. Scrap plywood left from the panels is used to serve as gusset plates in covering the frames. In the case of the mast frame, both sides of the frame are completely covered to give sufficient strength to support the mast. The headstay frame is a solid 8-in. board, notched top and bottom. Note that



2 SIDE-PANEL ASSEMBLY



3 LAYOUT OF SIDE PANELS



4 LAYOUT OF DECK PANELS

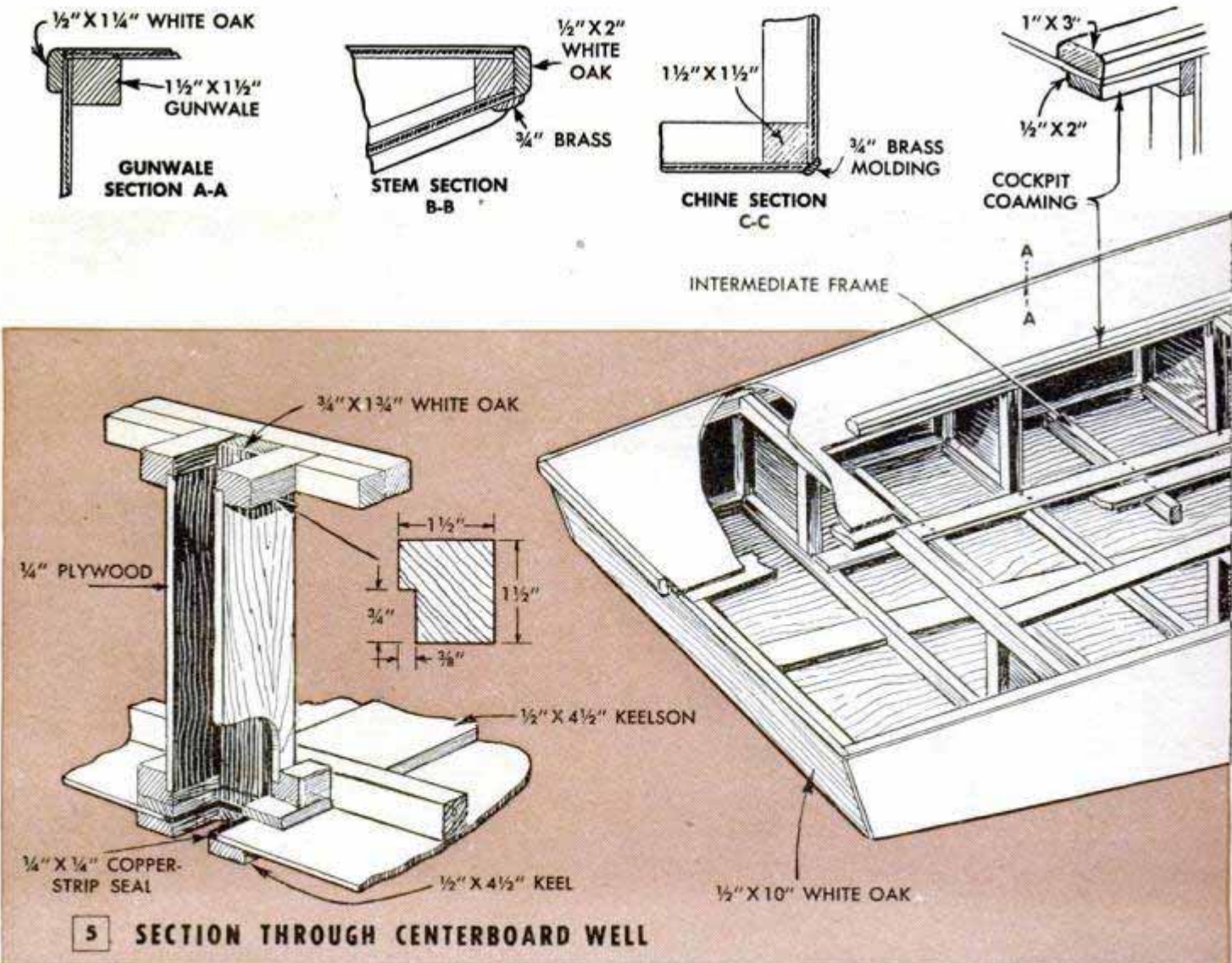
the mast frame is not notched for the keelson, and that the cockpit frames are left open at the top. All frames are notched squarely at the corners for chines and gunwales, but it should be remembered that, both forward and aft, the chines as well as the gunwales actually meet the notches at a slight angle because of curvature of the parts at these points. For this reason, the edges of the fore and aft frames, including the faces of the notches, must be faired (planed) so that the plywood panels fit the chines and gunwales on a flat plane. Use a block plane and fine wood rasp for this job.

With the frames completed, chines and gunwales are next fitted to the inner surfaces of the side members of the hull. Notice in Fig. 2 that these conform to the shape of the sides and are fitted with a nose block at the stem and a vertical cleat at the transom.

Now, temporarily assemble the sides of the hull to the deck. The side panels are forced to take the curve of the deck panel by drawing in the ends with bar clamps or a twisted rope loop. The lower edges of the panels are held the correct distance apart by clamping a strip across the width

at a point directly under the deck butt block. In this way, the butt block and the strip act as spreaders which force the side panels to take a uniform bend in each direction from this point. When this is done, the frames can be fitted to the chines and gunwales individually.

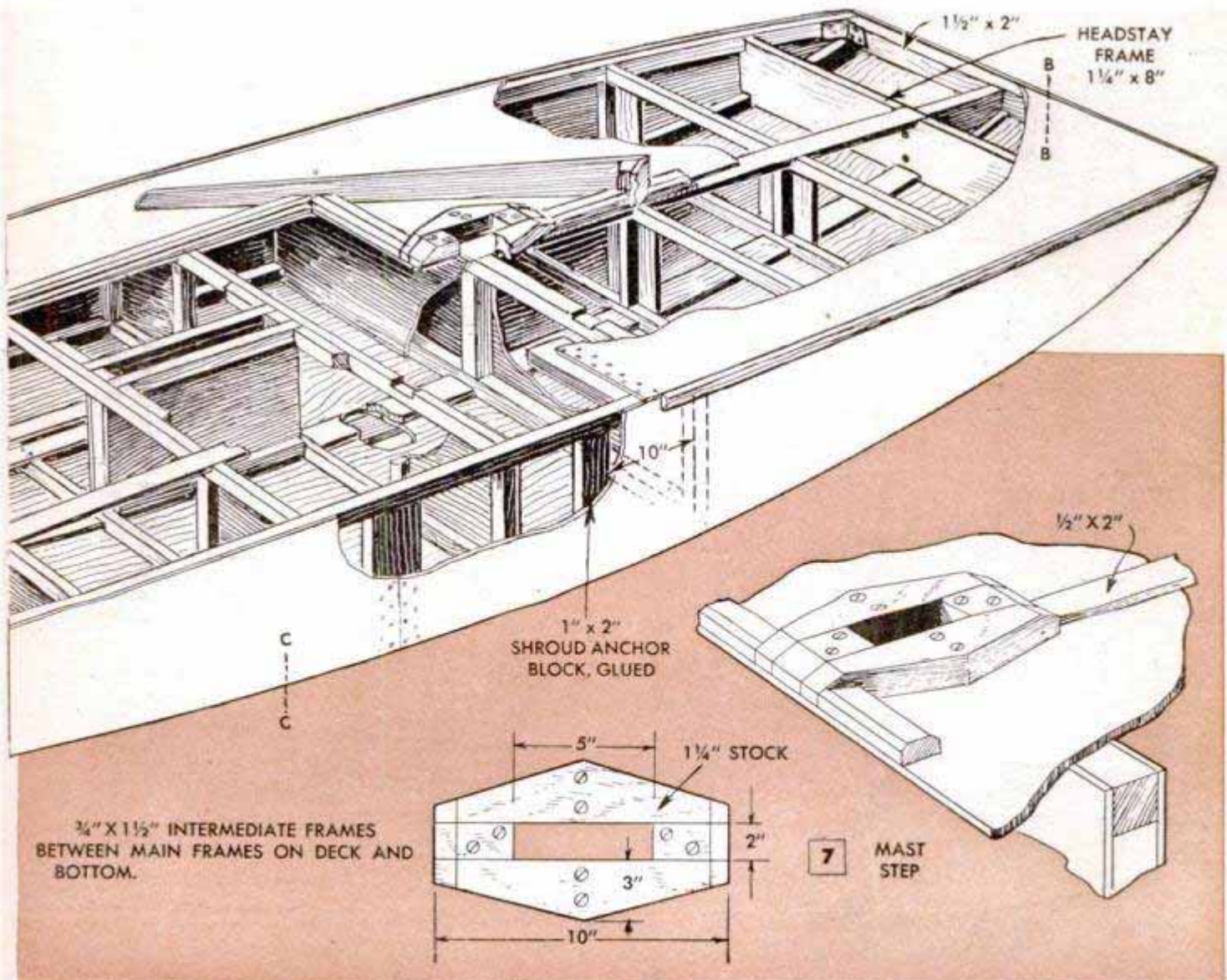
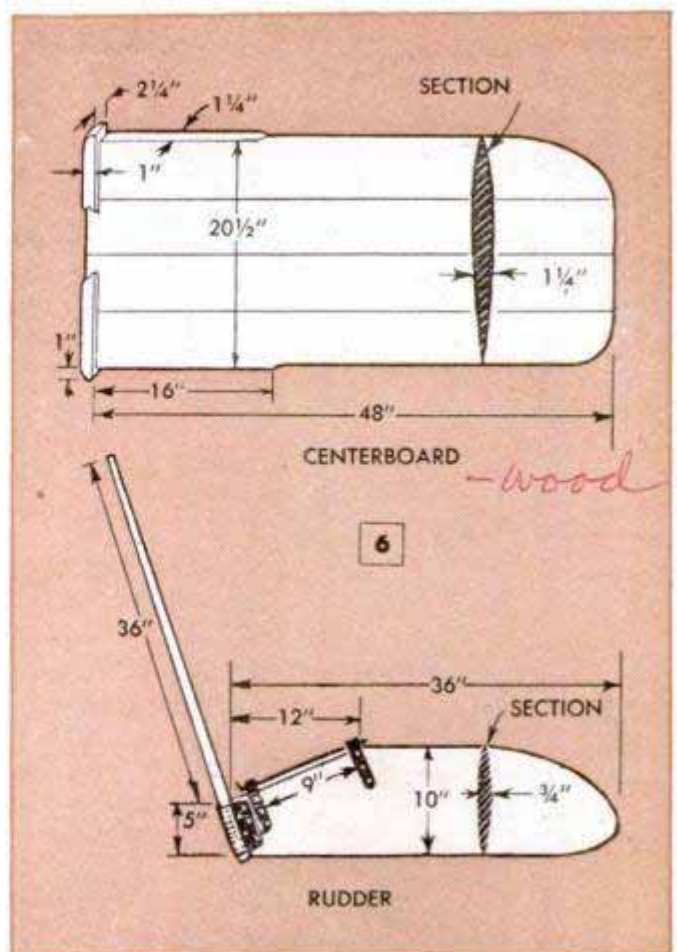
After fitting the frames and the keelson, the bottom panels can be installed. First, turn the assembly over, place on a level floor and block up the stem and transom until these parts check square and true. Plane all exposed surfaces and edges so that the curves are uniform, then locate the bottom panels with the edges centering on the keelson. Plane the edges to get a tight fit. Remove the panels and apply marine glue to all joining surfaces. Then replace the panels in the order removed and fasten with screws driven in flush. After the glue is dry, attach the keel and turn the hull over. Remove the deck panel so that you can install the deck beams, intermediate frames and the filler block between the headstay and stem piece. After these parts are installed as in the cutaway view shown below, cut the opening for the centerboard and fit the parts of the centerboard well as



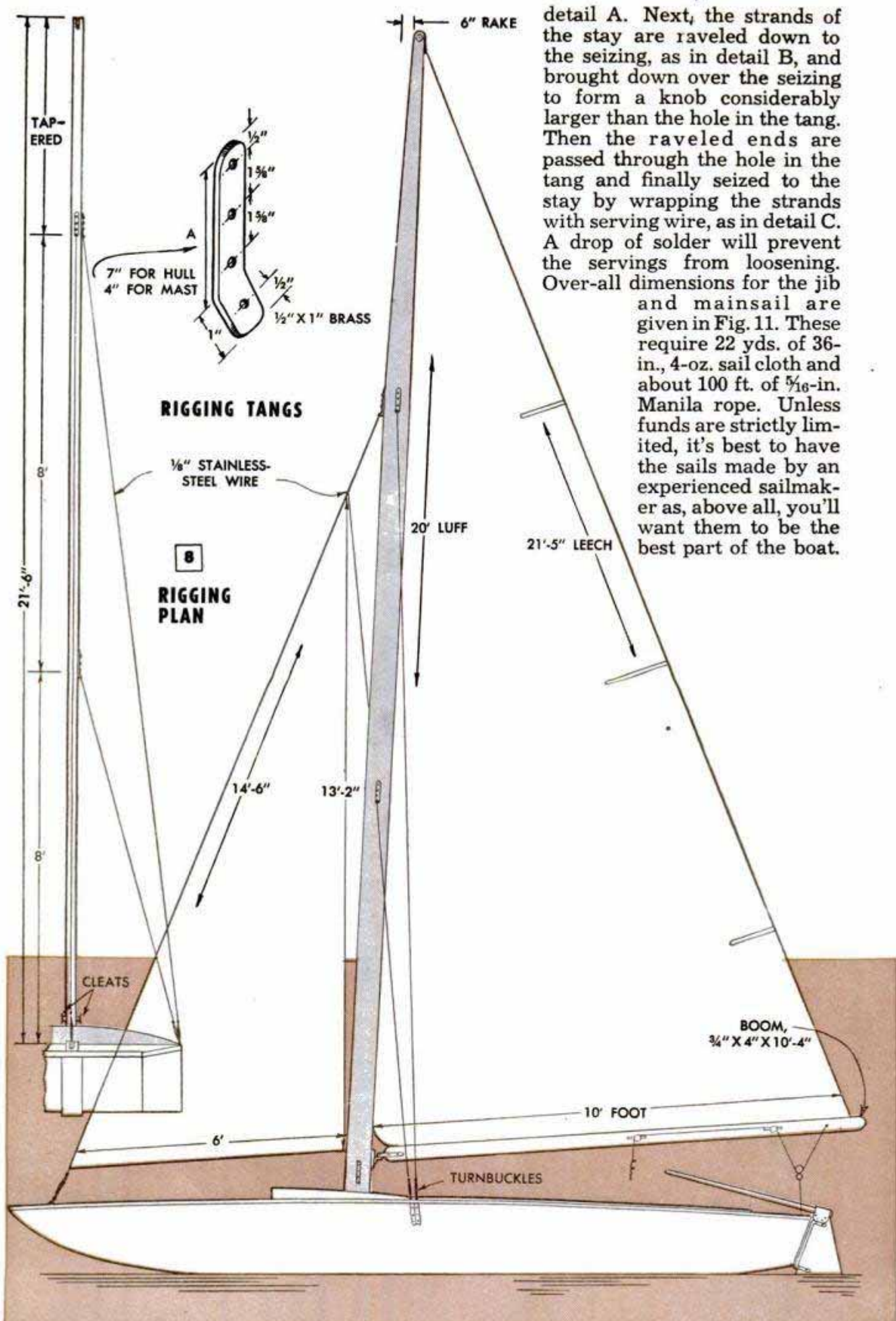
5 SECTION THROUGH CENTERBOARD WELL

in Fig. 5. Special care must be taken to build a watertight joint around the lower opening of the well. Set all the joining parts in marine glue and be sure that all joints fit tightly. The copper sealing strip, Fig. 5, serves the dual purpose of providing a watertight seal at the joint and also protecting the wood against wear from the centerboard. Finish the hull by adding the oak transom, cockpit coaming, deck splashboards, mast step, Fig. 7, rudder and centerboard, Fig. 6, and the moldings and rub rails as shown in sections A-A, B-B and C-C, Fig. 5.

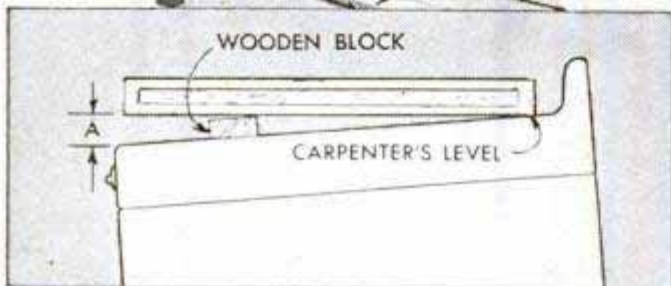
The mast, Fig. 11, is of box-section construction with filler blocks spaced as indicated. Sides of the mast are faced with $\frac{3}{8}$ -in.-thick stock, which is applied with cold resin glue. The mast has a 6-in. rake aft from a point 16 ft. above the deck. Figs. 8 and 10 show the method of attaching the mast stays to the mast and to the deck tangs. Fig. 9 details the gooseneck which carries the boom. To anchor each stay to the tangs, first insert the end through the hole in the tang and seize it tightly, using several turns of No. 16-ga. copper wire at a point about $1\frac{1}{2}$ in. from the end, as in



detail A. Next, the strands of the stay are raveled down to the seizing, as in detail B, and brought down over the seizing to form a knob considerably larger than the hole in the tang. Then the raveled ends are passed through the hole in the tang and finally seized to the stay by wrapping the strands with serving wire, as in detail C. A drop of solder will prevent the servings from loosening. Over-all dimensions for the jib and mainsail are given in Fig. 11. These require 22 yds. of 36-in., 4-oz. sail cloth and about 100 ft. of $\frac{5}{16}$ -in. Manila rope. Unless funds are strictly limited, it's best to have the sails made by an experienced sailmaker as, above all, you'll want them to be the best part of the boat.



Kitchen Range Set on Even Keel By Means of Carpenter's Level



As it is important that a kitchen range be level, particularly when it comes to baking cakes and pies, much time and effort are spent in trying to level the range. Often this is done by a hit-and-miss method of slipping blocks of various thicknesses under the legs. To take guesswork out of leveling the range, just set a carpenter's level on top of the range and prop it with a piece of wood as shown. Move the wood inward or outward until the bubble is centered in the glass and measure the distance, A, between the top of the range and the underside of the level. Then cut a wooden prop to this thickness and insert it under the low leg.—James E. Cronin, Ferguson, Mo.

Hacksaw-Blade Straightedge For Cutting Paper



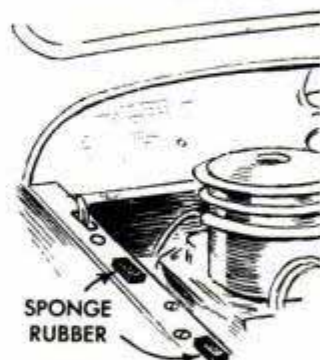
When cutting paper with a stencil knife, try using an ordinary hacksaw blade as a straightedge. The teeth of the blade tend to grip the surface of the paper to provide a

nonslip straightedge, and the knife cannot accidentally cut into the hard steel of the blade. If the straightedge is held firmly in place, several sheets of paper can be cut simultaneously without danger of their slipping out of line.

Walter Gabriel, Omaha, Neb.

Replacing Rubber Hood Cushions

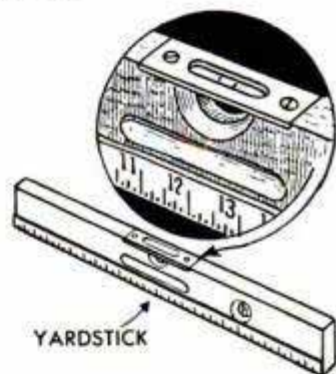
If the rubber tabs that cushion the hood of your car have deteriorated to the point where they are no longer suitable, they can be replaced satisfactorily with small squares of sponge rubber. Mount the squares several inches apart along both sides of the hood, as shown, fastening them in place with gasket or tire cement.



Yardstick Tacked to Level Provides Handy Tool

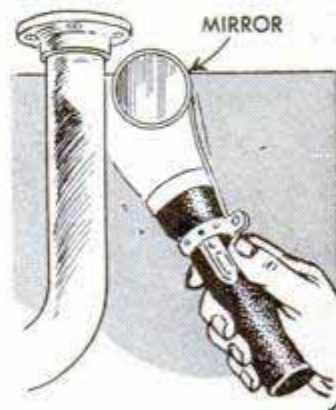
Tacking a yardstick to one side of a carpenter's wooden level combines a rule and level in a single timesaving tool. After cutting off the yardstick to the desired length, tack it slightly above the lower edge of the level so that it does not interfere with the operation of the instrument.

Jack Hatfield, Pasadena, Calif.



Flashlight Fitted With Mirror "Sees" Around Corners

Clamped to a flashlight, a bicycle mirror directs the beam at an angle and also reflects the object at which it is directed. Thus, it is ideal for working on plumbing and making repairs on the car, as you can see exactly what you are doing even though the work ordinarily would be hidden from view. The mirror, of course, is easily adjusted to the desired angle.—H. Leeper, Canton, Ohio.

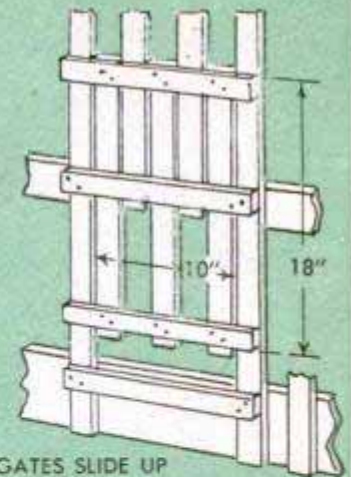




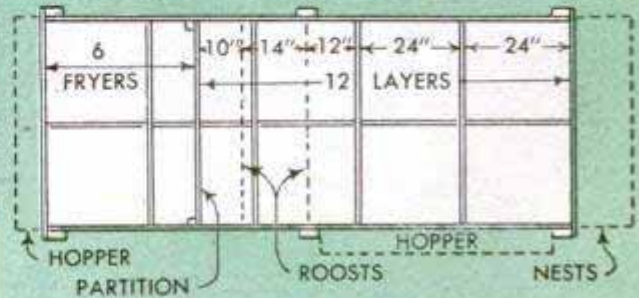
BACK-YARD EGG AND FRYER PLANT

By Hi Sibley

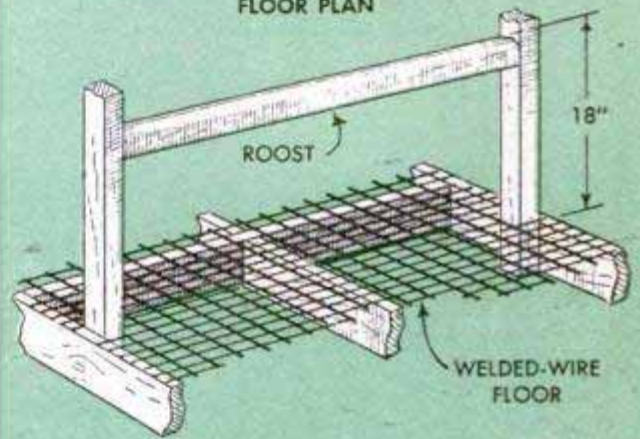
EGG AND MEAT production in a minimum of space is permitted by this compact back-yard poultry plant. The wire-floored structure is fitted with roosts, feed hoppers, nests and a sanitary dewdrop watering system so that the chickens can practically take care of themselves in the outdoors during the warmer months. In cold weather they should be protected with a tarpaulin spread over the exposed parts of the structure, or the unit can be moved inside the garage or other outbuilding. Details of the fittings and framing show that construction is a simple carpentry job. The corner and center uprights and the floor frame are of 2 x 4-in. stock. Other framing members and rafters are 2 x 2s. Coat wooden parts with a creosote solution.



GATES SLIDE UP



FLOOR PLAN

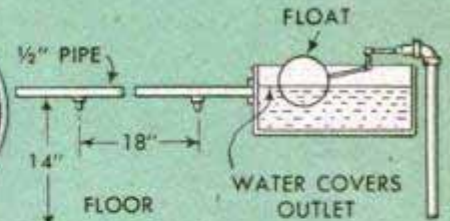


ROOST

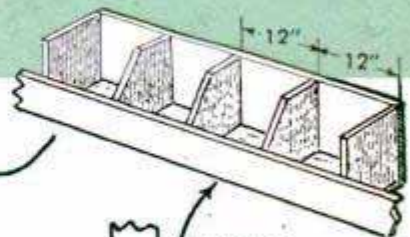
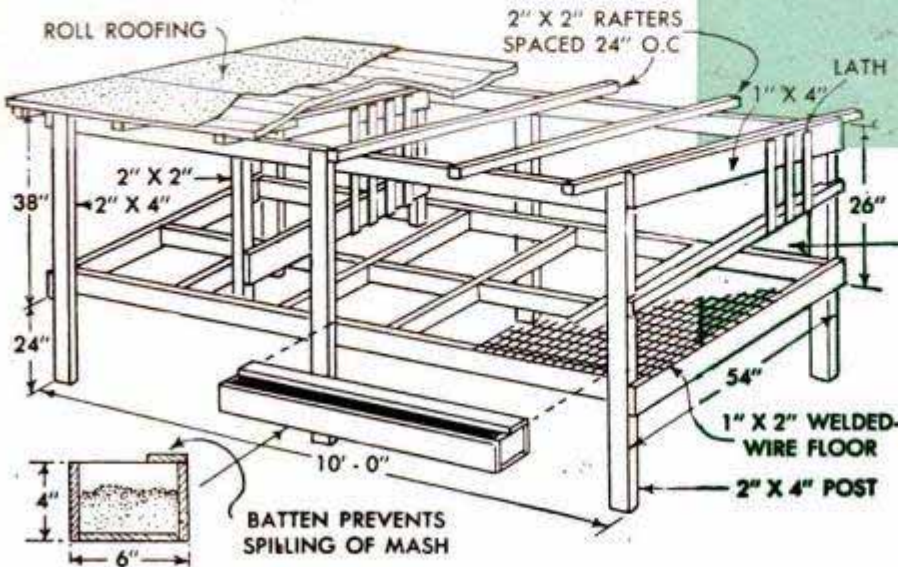
WELDED-WIRE FLOOR



DEWDROP NIPPLE

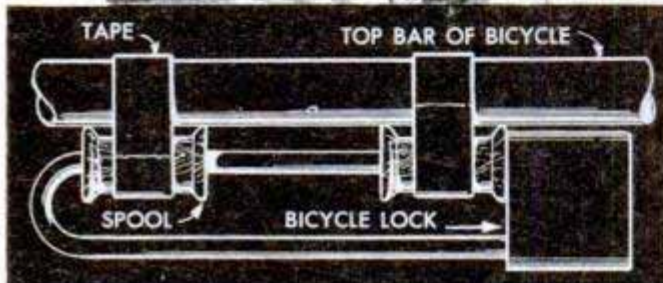
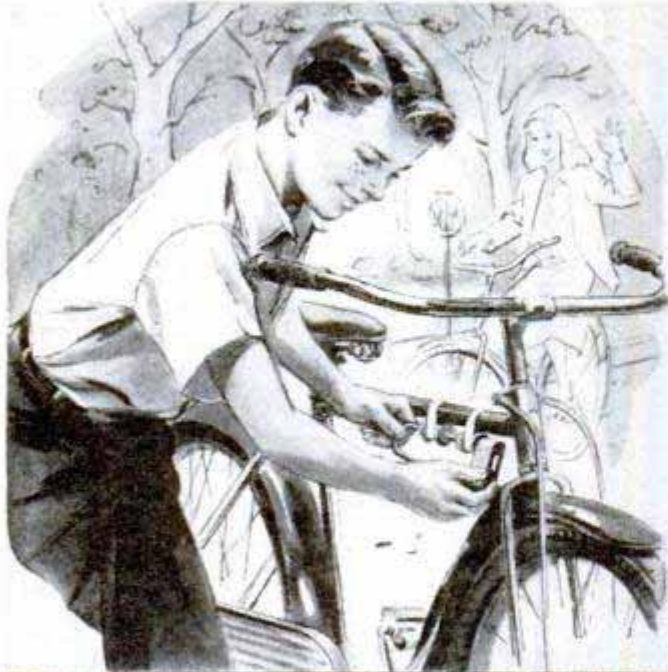


AUTOMATIC WATERING SYSTEM



NEST SECTION

Handy Carrier for Bicycle Lock Fits Under Horizontal Bar

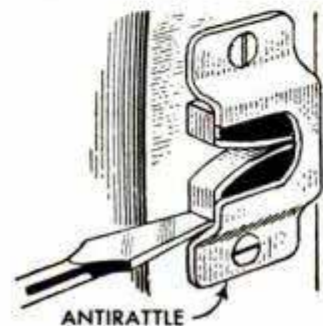


A bicycle lock won't rattle and scratch the frame if it is carried in this convenient rack when not in use. To make the rack, tape two wooden thread spools to the underside of the horizontal frame bar. Then slip the shackle through both spools and snap the lock closed to hold it in place. If the holes in the spools are too small for the lock shackle they can be enlarged by drilling with a twist drill.—W. P. Augustine, Walkerville, Ont., Can.

Boiling Prevents Dish Cracking

Crazing of earthenware dishes frequently is prevented or at least minimized by placing the new dishes in a pan of cold water and bringing the water to a boil. Allow it to boil for a minute or two.

Correcting Car-Door Rattle



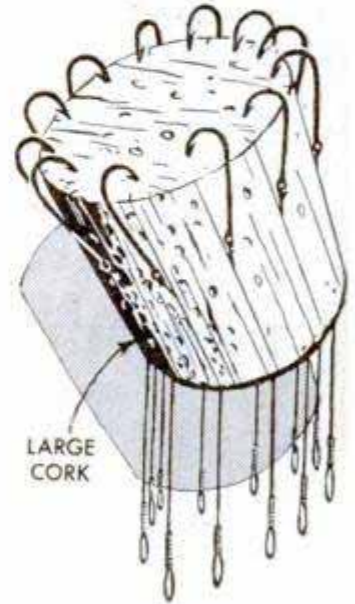
If a car door rattles and does not seem to fit as well as it originally did, the trouble may be due to worn anti-rattles. If the anti-rattles are of the type shown in the drawing, the in-

serts can be interchanged to renew their grip on the door. Remove the inserts with a screwdriver blade by pushing inward and prying them out. Then simply replace them with the bottom insert on top.

Charles Wesley Shutt, Alma, Mich.

Cork Provides Fishhook Holder

Large corks of the type used on vacuum bottles form safe and compact holders for several fishhooks fitted with leaders. Draw evenly spaced lines lengthwise on the sides of the cork, spacing them about $\frac{1}{2}$ in. apart. Then, with a razor blade, cut slits along the lines to a $\frac{1}{2}$ -in. depth. To use the holder, merely embed the barbs of the hooks in the top of the cork and press the leaders into the slits.



Homer E. Lee, Bedford, Ind.

Retaining Appearance of Suede

To keep suede shoes and accessories looking like new, it is best to clean them frequently. Before putting the items away after wearing them, go over the suede with a cloth moistened in vinegar. Then rub with a stiff brush or sponge.

Blanche Campbell, Las Vegas, Nev.

Improved Bottle Opener

When you are unable to find a bottle opener, you can improvise one quickly by using a common nail and a piece of wood. Drive the nail into the wood so that the head projects about $\frac{1}{4}$ in.



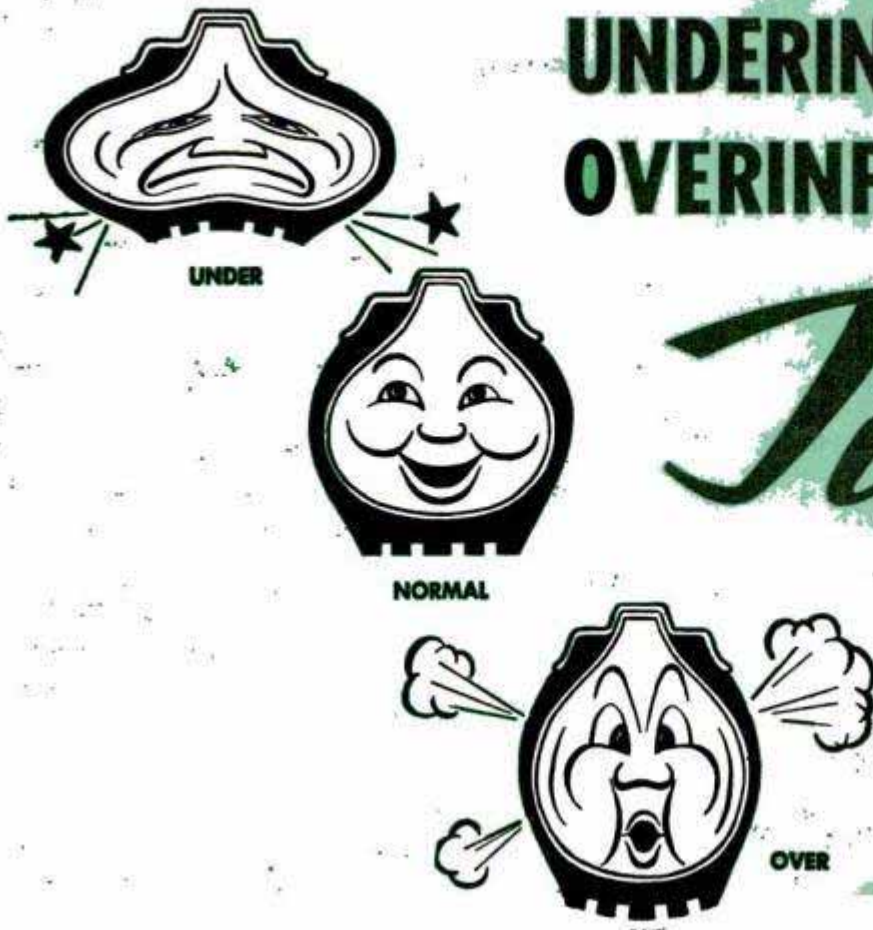
and hammer over the end so it won't pull out. Remove the cap by hooking the nail-head under the edge of the cap and pressing downward on the end of the wooden handle.

Federico Strasser, Santiago, Chile.

☐ Dropping a piece of lemon peel into the dishwater will soften the water, remove traces of fish or onion odor, and result in a high luster on china and glassware.

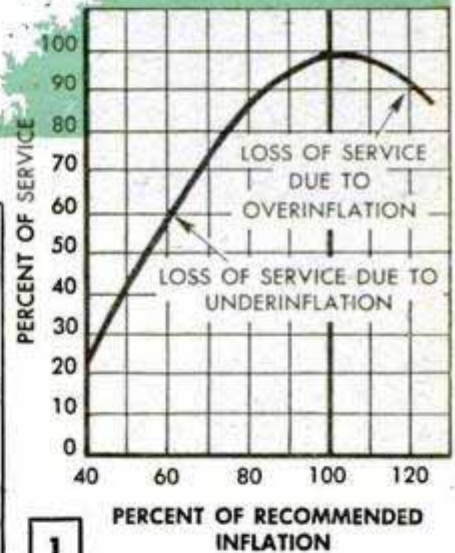
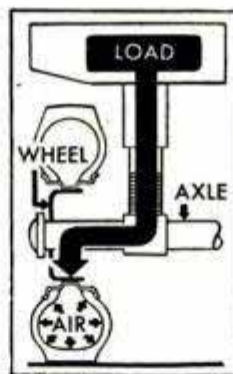
UNDERINFLATION & OVERINFLATION OF

Tires



By S. V. Neibardt

Tire failure resulting from under or over inflation can be both costly and dangerous. Save money by making it a habit to check your tires once a week the year 'round



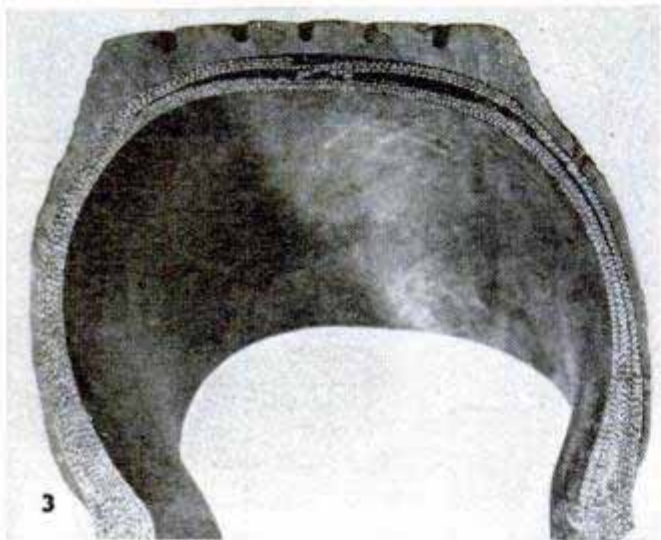
DID YOU ever have a tire suddenly go flat without any apparent reason, or experience a bad blowout that endangered you and your family, and then wonder what caused it? Punctures, stone bruises, glass cuts and other causes of external tire damage are readily observed, but serious fabric breaks and tread separations due to under or over inflation rarely show on the outside of the tire. A study of the simple graph in Fig. 1 will emphasize the importance of checking the air pressure in the tires at regular intervals. Careful drivers carry a tire gauge as a standard item in the tool kit, so that regular checks can be made at the proper time when the tires are cold. Driving at a fast clip generates considerable heat in the tires because of the flexing of the sidewalls and road friction at the treads. The heat expands the air in the tube and may raise the reading on the gauge as much

as 3 lbs. if the reading is taken while the tire is still warm. Never deflate the tire under these conditions, however, as the pressure will return to normal when the tire cools. A slow leak in the valve, often difficult to detect by ordinary methods, may cause a loss of 2 to 4 lbs. pressure in a few hours. In some tires a loss of 2 to 3 lbs. pressure may not cause a noticeable deflection of the sidewalls and for this reason the owner should never rely on a casual examination of the tires to detect a condition of underinflation. It's always best to use a reliable tire gauge.

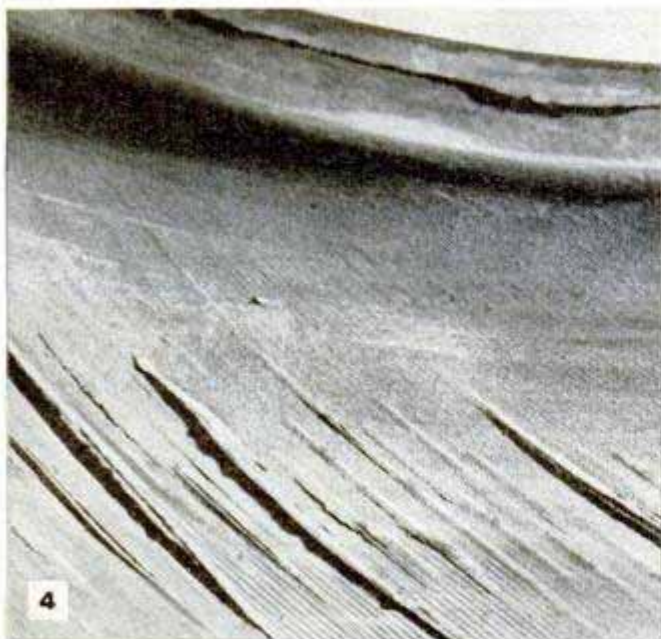
Fig. 2 shows graphically what happens to the tread of a tire when it is run for a time underinflated. What you see is the almost complete absence of wear at the center of the tread. What you don't see are the separation of the fabric layers and the breaks which may develop at the center of



This tread wear is caused by running the tire under-inflated. Note the absence of wear at center of tread



From the outside, you can't see ply separations and breaks in fabric that result from running tire under-inflated. Ply separations are costly to repair

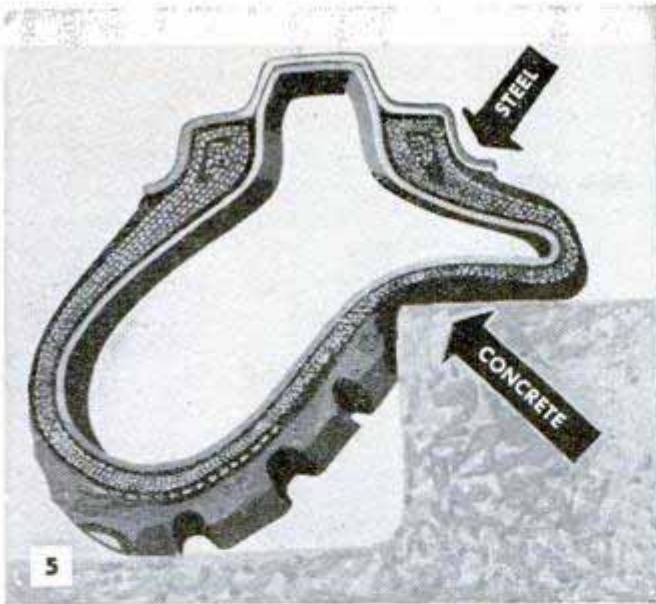


Flex breaks and ply separations in inner sidewalls often cause hazardous blowouts which can occur without warning. Note diagonal direction of the breaks

the tread, Fig. 3, and also flex breaks in the sidewalls, Fig. 4. The latter are a common cause of serious blowouts which may occur without any warning to the driver. When an underinflated tire is forced to fold over an obstruction as in Fig. 5, the sidewall break shown in Fig. 6 may result. In an older tire the damage may appear on the outside of the sidewall as in Fig. 7. A sharp fold in the sidewall, such as that pictured in Fig. 5, also may pinch the inner tube sufficiently to cause an immediate break, or one that is delayed only a short time.

In overinflated tires, the tread gradually takes on a high crown due to abnormal wear and stretching of the fabric. Only the center of the tread contacts the road, reducing the load-carrying area and greatly accelerating wear at the point indicated by the arrow in Fig. 8. Such a condition greatly reduces the ability of the tire to dissipate road shock, as the normal resiliency is reduced by the undue tension caused by over-inflation. Also, the tread and sidewalls are more easily cut and snagged by sharp objects. The tire cannot flex and fold over ordinary road irregularities. The possibility of serious fabric breaks, due to the inability of a "hard" tire to absorb impact, is greatly increased, as is the wear on other parts of the car, such as shock absorbers, kingpins and wheel bearings. The most costly and hazardous breaks resulting from continued overinflation are those pictured in Figs. 9 and 10. It's a good idea to examine the treads of older tires closely at regular intervals to detect the type of break shown in Fig. 9. The end result of such a break in the tread is the dangerous blowout pictured in Fig. 10. If you discover this type of tread break in time there is a good chance that it can be repaired at reasonable cost by a reliable tire-repair shop. But when the escaping air blasts away a portion of the tread as in Fig. 10, the cost of the repair may be more than the cost of a new tire.

It should also be kept in mind that other precautions against excessive tire wear, such as periodic checks of wheel alignment, cross changing of the wheels and good driving practices, will be largely offset by costly wear resulting from continued under or over inflation. All these special precautions must be carried out on schedule if tires are to give maximum service. It's a good idea to replace the valve cores and dust caps after the tires have gone 15,000 to 20,000 miles, or before, if there is reason to suspect slow leaks. When replacing the valve core, be sure to screw the new one down far enough so that the top end of the plunger will clear the dust cap when the latter is tightly in place. Use a valve-core wrench for this purpose and, after inflating the tires, don't forget to replace the caps.



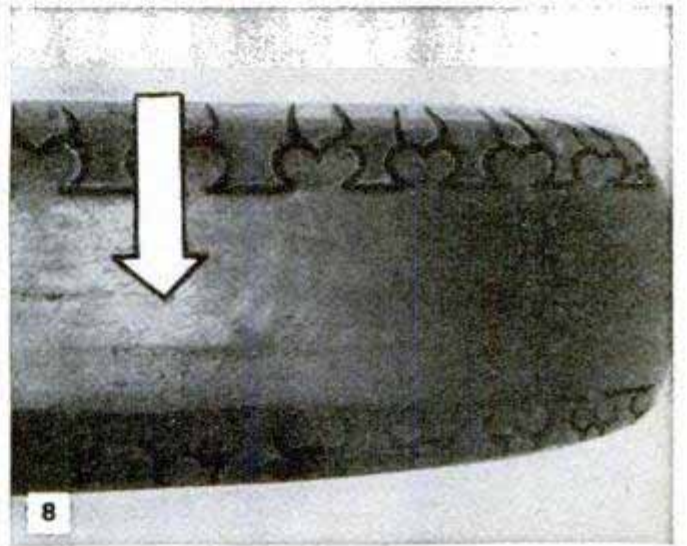
5 Don't drive over curbs, railroad tracks or any other straight-sided obstruction, especially with old tires



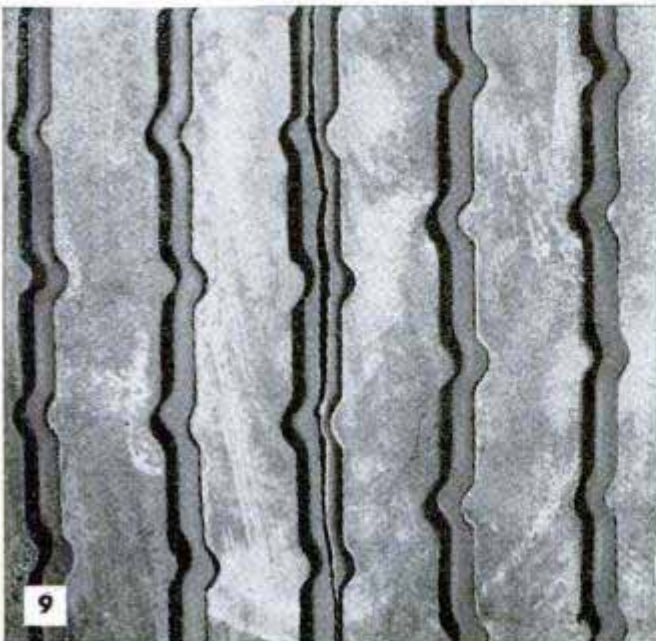
6 Here's what may happen inside the tire when you drive over a high obstruction or back onto the curb



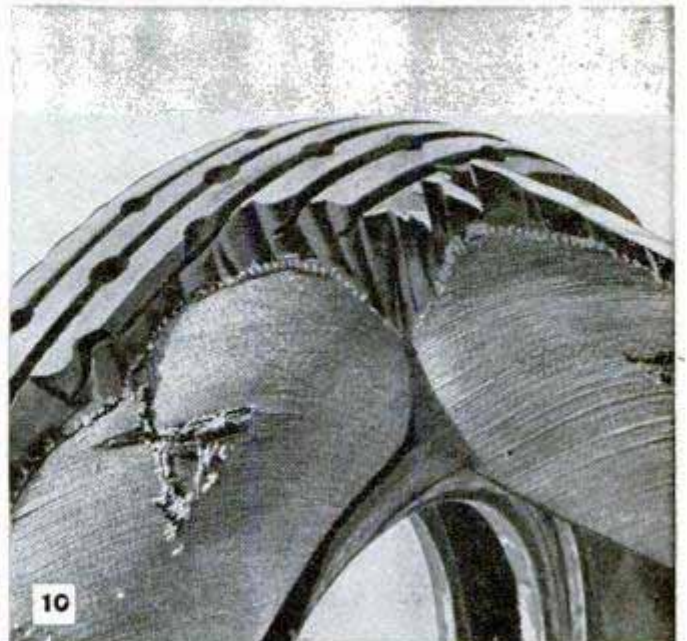
7 In older tires, breaks may appear on outer sidewall. A sharp fold in sidewall may also pinch the tube, causing an immediate break, or at best a delayed one



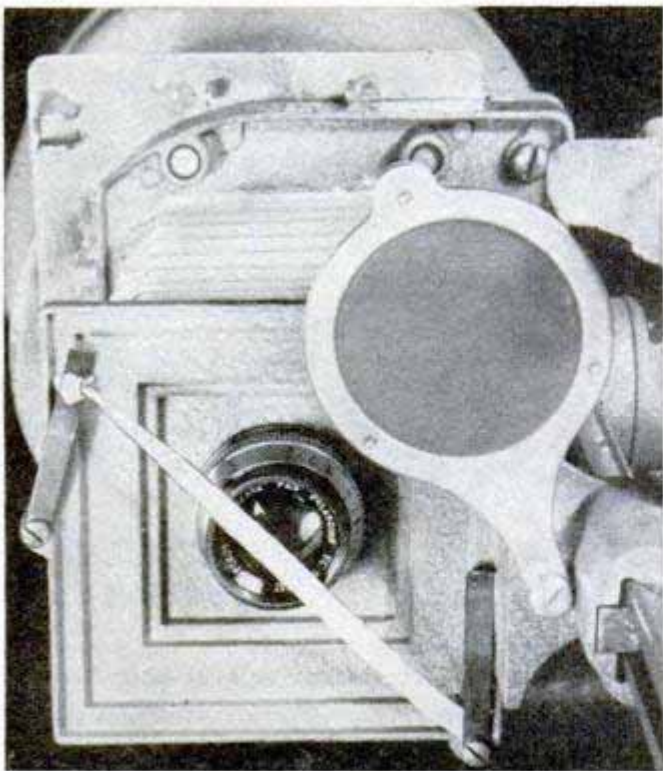
8 Overinflated tires gradually take on a high crown, because of abnormal wear and stretching of fabric. Arrow indicates point where wear usually is greatest



9 Continued overinflation results in tread breaks like that shown above. It is extremely hazardous to drive on crowded highways with tires in this condition



10 The inevitable end result of a tread break like that pictured at the left is a blowout like this. Sudden escape of the air has torn away a part of the tread



Rubber Band Across Enlarger Lens Facilitates Sharp Focusing

Fastened to the lens board of an enlarger so that it bisects the lens, a large rubber band forms an excellent focusing aid. When the rubber band casts a double image on the easel, the enlarger is out of focus. After focusing, the rubber band is simply moved alongside the lens barrel where it will remain until again pulled over the lens.

H. Klein, Pittsburgh, Pa.

Storing Spare Photoflood Bulbs In Individual Wall Racks

By using metal lamp-shade holders to provide individual racks, one home photographer safely stores his extra photoflood bulbs on the darkroom wall.



Each holder is bolted to an angle bracket which, in turn, is screwed to the wall. The bulb is simply set in the holder as pictured. For storing reflector-type photofloods, a larger angle bracket is used so the holder will be far enough from the wall to allow sufficient clearance for the top of the bulb.

For storing reflector-type photofloods, a larger angle bracket is used so the holder will be far enough from the wall to allow sufficient clearance for the top of the bulb.

John J. Rea, Urbana, Ill.

Spoons Measure Photo Chemicals

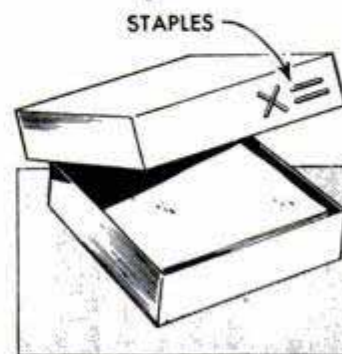
When mixing photo solutions, it is not necessary to weigh each powdered chemical if the same formula is frequently used. To save time, equip your darkroom with plastic measuring cups cut to hold the desired weight of each chemical.



Grind or cut the edges of the cup until it holds the exact quantity by weight. Each spoon should be labeled to identify it.—Hugh Lineback, Stillwater, Okla.

Staples Identify Print Paper

Selecting the right print paper is easy if each box is marked with staples to designate the size and grade of the contents. Work out your own identification code, and drive the staples through the front of the box cover, positioning them horizontally, vertically and diagonally in various combinations.



Warning on Loaded Film Tank

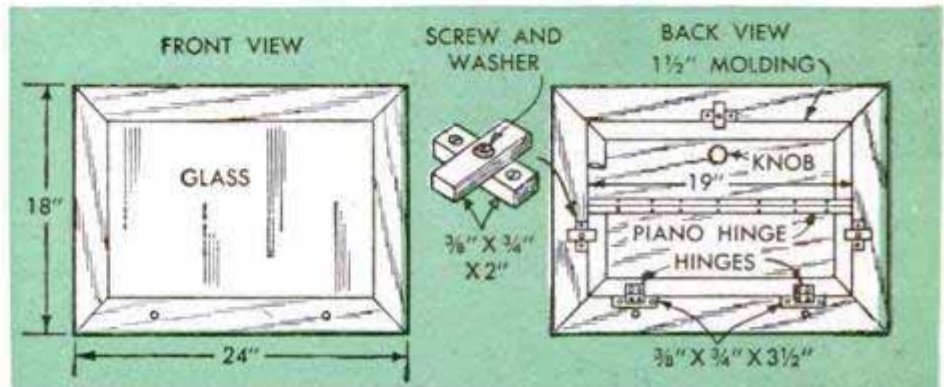
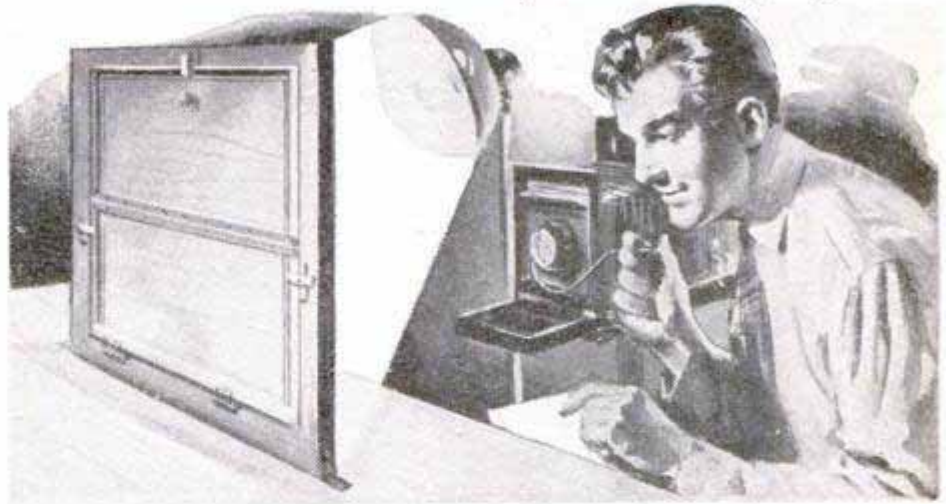
Sometimes film processing is interrupted when the tank is loaded and ready for the developer, and it may be a day or two before you get back to the darkroom. When this happens, it is easy to forget that the tank is already loaded, and opening it with the darkroom lights on will result in spoiling the film. Next time you have to set aside a loaded film tank, don't take chances. Just tear a section from the paper film backing, and press the paper over the agitator spindle to serve as a reminder that there is undeveloped film in the tank.

C. A. Lewis, Saskatoon, Sask., Can.



If investing in a standard copying easel does not seem worth while, an inexpensive one can be made quickly by fitting an ordinary picture frame with a hinged back. Although an 18 x 24-in. frame is detailed, any convenient size can be used. The back is made in two sections which are hinged at the center as well as at the bottom of the easel. In this way, the upper section may be dropped to permit inserting the work or the entire back may be opened for cleaning. Half-round molding is nailed to the three outer edges of the plywood or hardboard back panels, and the butting edges are joined with a length of piano hinge. The lower panel is hinged to the bottom rail of the frame with two butt hinges, small cleats being fastened to the rail to shim out the lower hinge leaves. Wooden turn buttons at the sides lock the lower panel in place, and a single turn button at the top holds the upper panel closed. A knob or small drawer pull is mounted on the upper panel. If you wish to set up the easel permanently, it can be held upright with two angle brackets screwed to the

Picture Frame Fitted With Hinged Back Provides Inexpensive Copying Easel



edges of the frame and to the table top. However, if you want to store the easel after each use, simply drill the lower frame rail to permit bolting two lengths of angle iron or other suitable base to the bottom of the easel. A coat of flat-black paint or lacquer applied to the inside surfaces of the hinged back will minimize reflection.

Pocket Fastened to Camera Case Holds Tab for Quick Film Identification

There is no danger of forgetting the type of roll film with which your camera is loaded if the tab from the end of the film package is kept with the camera. To do

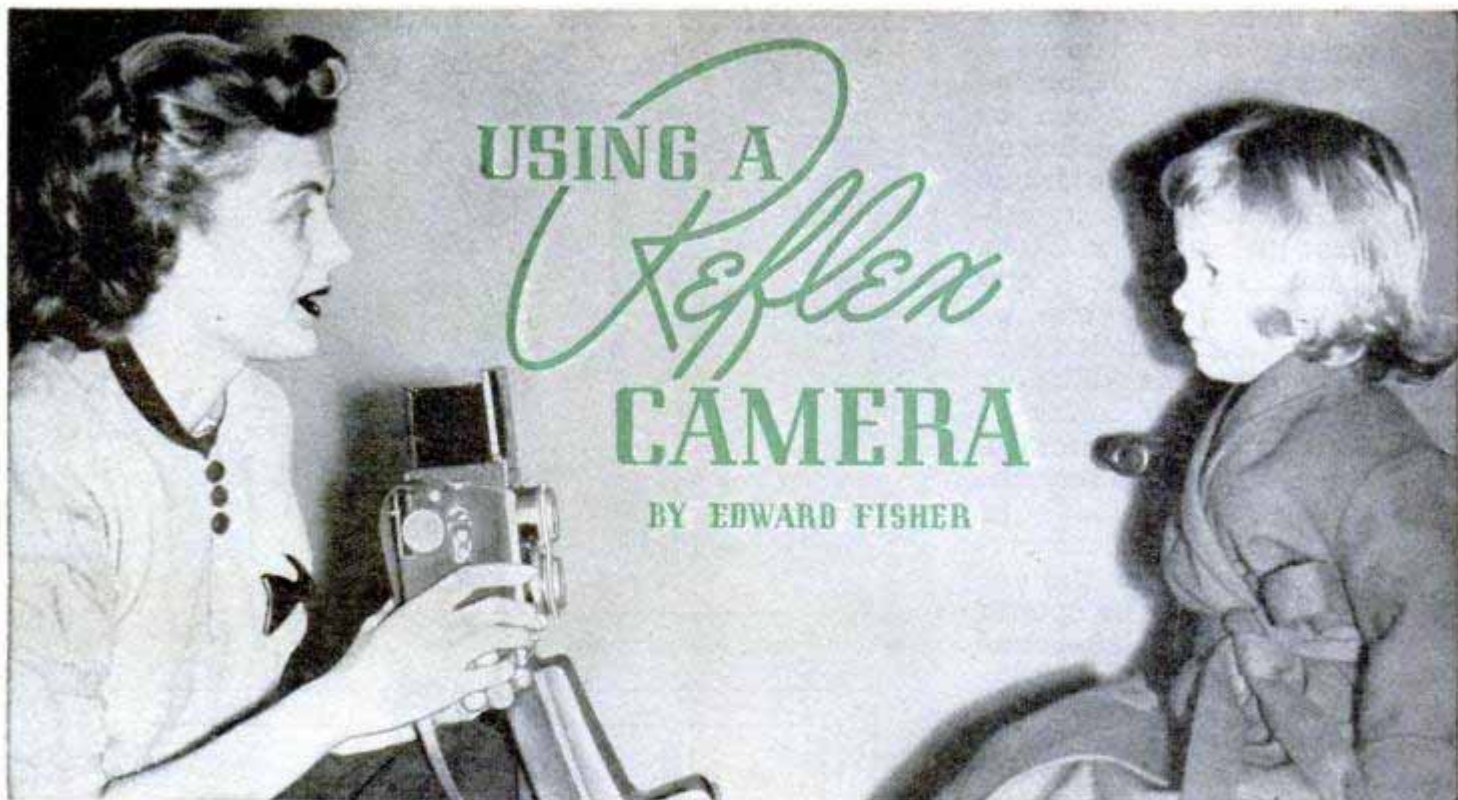
this, sew or cement a leather pocket to one side of the camera case. The pocket, about $\frac{1}{2}$ in. larger over all than the cardboard tab, is cut out, as shown in the photo, so the identification on the tab can be seen at a glance. The cutout at the bottom of the pocket aids in removing the tab when another type of film is used.

Walter E. Burton, Akron, Ohio.



Safe Lens-Cleaning Methods

Before cleaning a lens with tissue, a camel's-hair brush or an air syringe should be used to remove all grit particles which rubbing might grind into the lens. Then, if you use lens cleaner, apply it to the tissue or a soft, lintless cloth, rather than to the lens, as otherwise the fluid is liable to run into the lacquer or cement of the lens mount, causing it to loosen. Use care in reassembling unscrewed lens elements as slight damage may result in costly repairs.



USING A Reflex CAMERA

BY EDWARD FISHER



1

Above, follow directions in all details for loading camera and be sure that film is properly aligned so that it will not jam in the guides. Below, most photos can be taken with the reflex camera still in its case



2

USUALLY, the instruction pamphlet furnished with any new camera points out its features and explains, in general, its basic operation. But, from there the amateur is left on his own. However, there are a number of camera techniques, not covered in manufacturers' instructions, that will prove helpful in getting the most from the camera. If you are just becoming acquainted with the use of a reflex-type camera, the following tips are worth knowing and can be put to good use as you become more proficient and more shutter-minded. Popularity of the twin-lens reflex is due largely to the fact that the picture can be viewed on a ground glass to the very moment the shutter is snapped. This, together with the opportunity of viewing the shot right side up, although reversed, makes it easy for the beginner to get good composition right at the start, as is not often the case when the picture must be viewed in an upside-down position.

It is important to remember that the correct way to load your reflex is to attach the leader to the takeup spool first and load from top to bottom as shown in Fig. 1. In this way, there is less chance of later jamming the film in winding it onto the takeup spool, as you can align it properly between the guides before closing the back.

Not always realized by the amateur photographer is the fact that the leather neck strap on the camera case has a definite part in the taking of a picture. Adjusted to support the camera at the most convenient viewing distance, the strap serves as a means of steadying the camera against the body. Forming the habit of pressing down

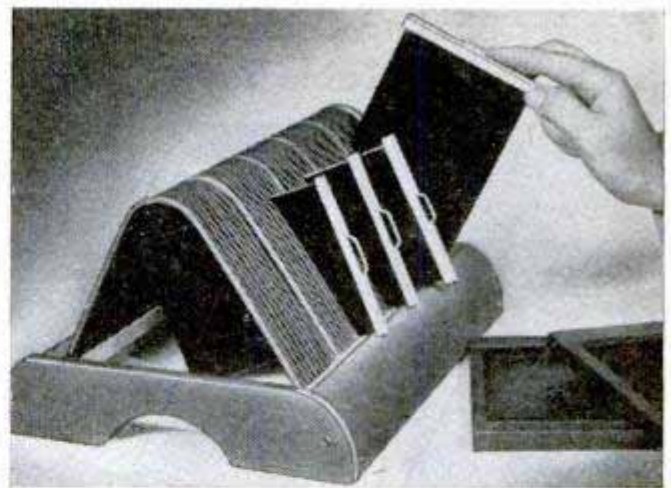
lightly on the camera case, Fig. 2, at the moment the shutter is clicked pays off in sharp, clear pictures. To provide a more convenient means of pulling down on the camera, some photographers equip their reflexes with a short handle (one similar to a wooden file handle) that has a threaded stud to fit the camera tripod socket. The drop front on the camera case also plays a part in getting the best possible shot by serving as a lens shade when the picture is made in sunlight above reflective surfaces.

A trick sometimes used for critical focusing and also when the subject is dimly lighted, is to remove the ground glass and rub a little castor oil on the underside of the glass, Fig. 3. This produces a transparent spot on the opaque glass which intensifies detail in the image.

A good stunt worth remembering when taking overhead "periscope" shots is illustrated in Fig. 4. Here, the camera is merely held in an inverted position while it is focused and clicked in the usual manner.



Above, to obtain an image of greater brilliance, coat ground glass with castor oil. Below, to shoot over the heads of people, or to get dramatic composition in high-angle shots, camera is held in this position



Film-Holder Slides Easy to Find When Kept in Record File

One photographer found that a vertical phonograph-record file provides a handy addition to his darkroom. When unloading film holders, he simply drops the slides between the wires of the record rack so they are within easy reach for replacing in the holders. In addition to its convenience, the rack holds the slides off the table top where they are less likely to be contaminated by spilled darkroom chemicals.

Bamboo Provides Overflow Drain For Washing Prints

A short section cut from a bamboo fish pole forms an inexpensive and easily made overflow drain for washing negatives and prints in an ordinary sink. The bamboo, which should be about the same length as the depth of the sink, is whittled at one end to fit snugly in the sink drain. A series of holes is drilled around the upper end of the bamboo and a single hole for flushing out the hypo is drilled at the lower end, level with the bottom of the sink basin.



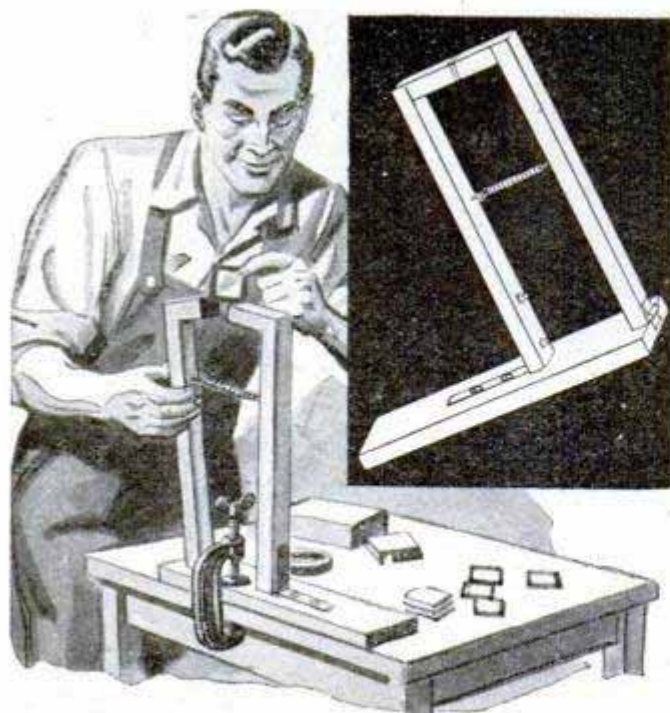
J. A. Leason, St. Paul, Minn.

Dusting Color Transparencies

Objectionable dust particles are quickly removed from color slides with the aid of a vacuum cleaner. Fit the crevice attachment to the cleaner hose and pass the tool slowly over both sides of the slide. Be careful that the tool does not touch the film. The vacuum cleaner also comes in handy for dusting the slide projector.

Henry Perina, Berwyn, Ill.

Vise for Binding Color Slides Is Clamped to Table Top



As inexpensive as it is easy to build, this slide-binding vise clamps to the top of a table or workbench where it holds the slide members in a convenient working position. The arms of the vise are of 1-in.-sq. stock, and the jaws are held closed with a short length of screen-door spring. Only the outer arm is hinged to the base, the inner arm being rigidly mounted with an angle bracket. The faces of the jaws are covered with felt to prevent marring the slide

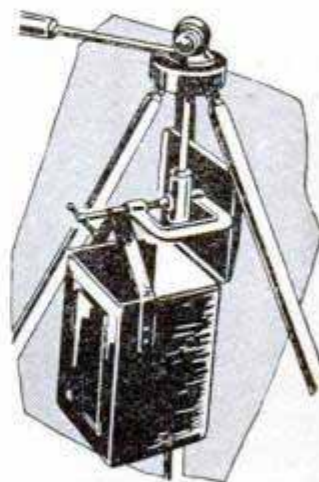
glasses. The original vise was made about 14 in. high with a clearance of several inches between the jaws and spring, thus allowing plenty of room for wrapping the binding tape around the slide members.

Karl H. Goldman, Marenisco, Mich.

Accessories Hung From Pan Head

Hanging a camera case from a pan-head handle provides an out-of-the-way container for storing film packs and accessories. This is especially handy when shooting outdoors where there is no place to keep these items except in your pockets. Just

tighten a small C-clamp over the pan-head handle and use the handle of the clamp as a hook for the camera-case strap.



Bath-Spray Hose Washes Negatives

One photographer uses a bath-spray hose to wash roll film without taking it from the developing tank. With the hose nozzle removed and the cover off the tank, the hose is simply inserted in the tank stem and the water turned on.

John C. Malocsay, Denver, Colo.

The Craftsman Book Shop

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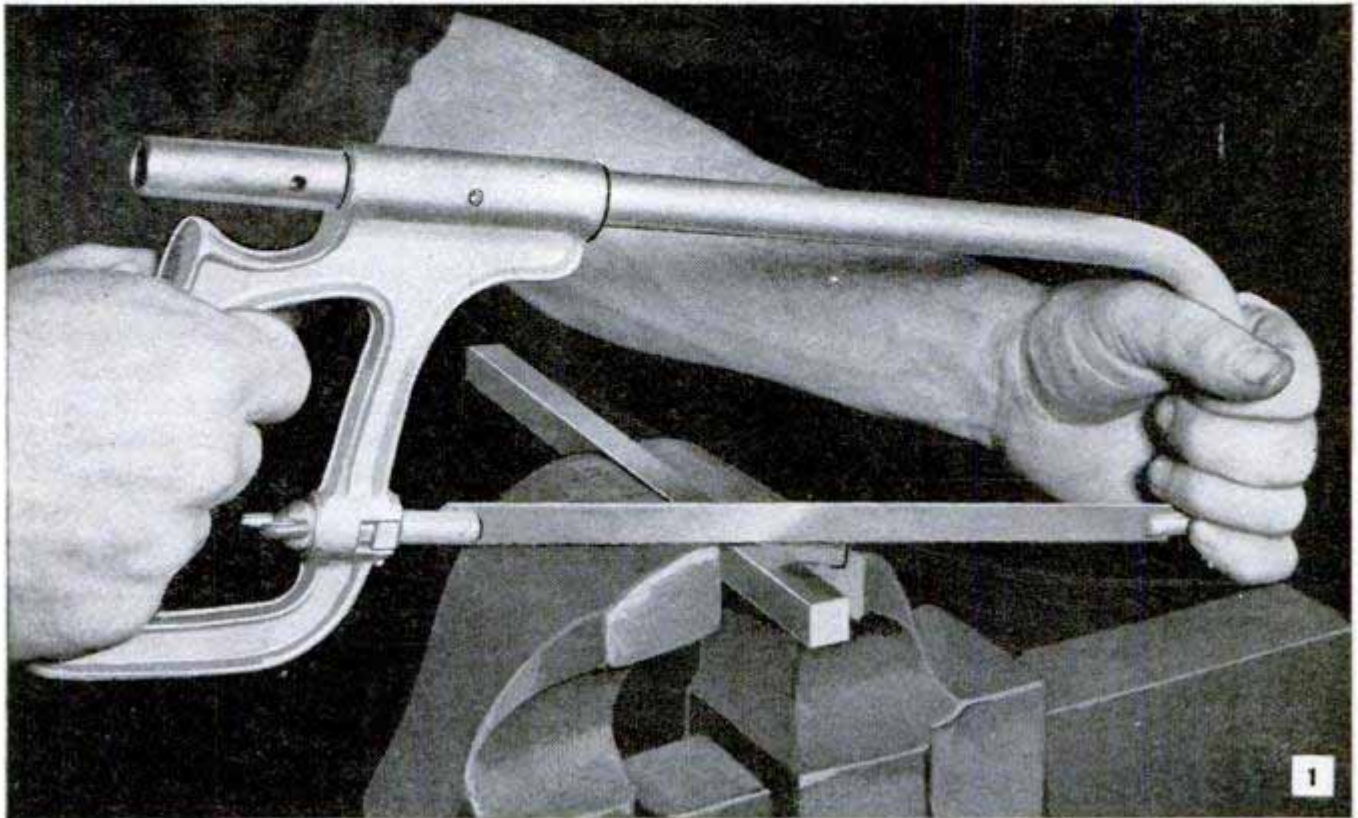
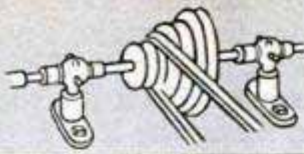
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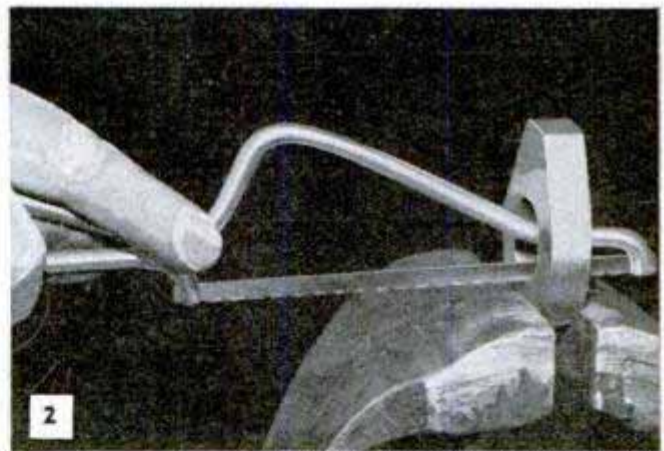


Better Results With **HAND HACKSAWS**

Select the right hacksaw blade
for the job and use it in a
frame of approved design

By E. R. Haan

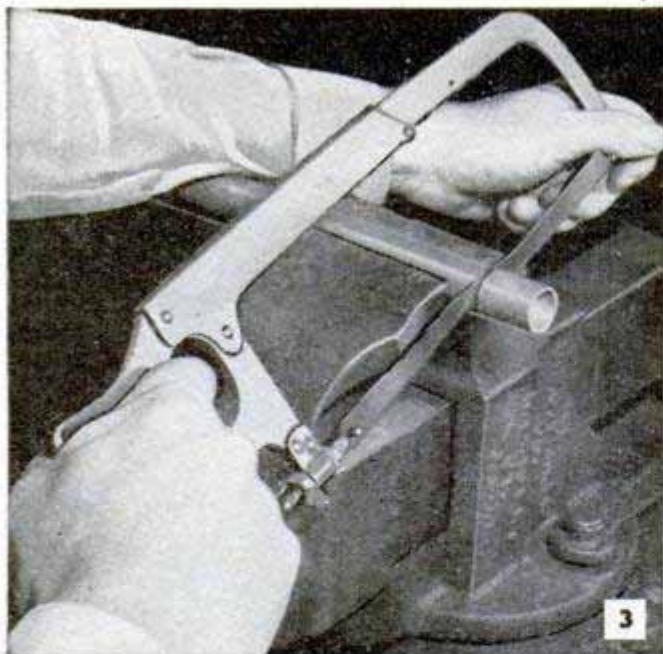
ACCURATE alignment of the frame and positive control of the direction of cut are the two essential requirements in hand hacksawing. That's why choice of a good-quality hacksaw frame of proper construction and proportions is important. The standard hand-hacksaw frame, one type of which is pictured in Fig. 1, must have all the features of proper balance, ample work clearance and a pistol-type grip contoured to give a natural easy handhold. The studs and pins which take the blade ends should be adjustable to face the blade in at least four directions and there should be provision for drawing the blade to the correct tension, either by means of a wing nut or



Photos courtesy W. O. Barnes Co., Inc.

a cam arrangement in the frame. For best results on average work, the lower end of the handle should be on the cutting line of the blade or slightly below it. This position of the handle utilizes the natural thrust of the arm to the fullest advantage on the cutting stroke and also facilitates positive control of the direction of cut. In addition to a variety of frames that are more or less standard, there also are a number of special frames designed for various purposes. One of these, made for working in drilled holes, is shown in Fig. 2. Similar hacksaw frames are available for working in holes as small as $\frac{5}{8}$ in. in diameter.

Inserting blade in frame: Most hacksaw blades are $\frac{1}{2}$ in. wide, .025 in. thick, and are available in 10 and 12-in. lengths.



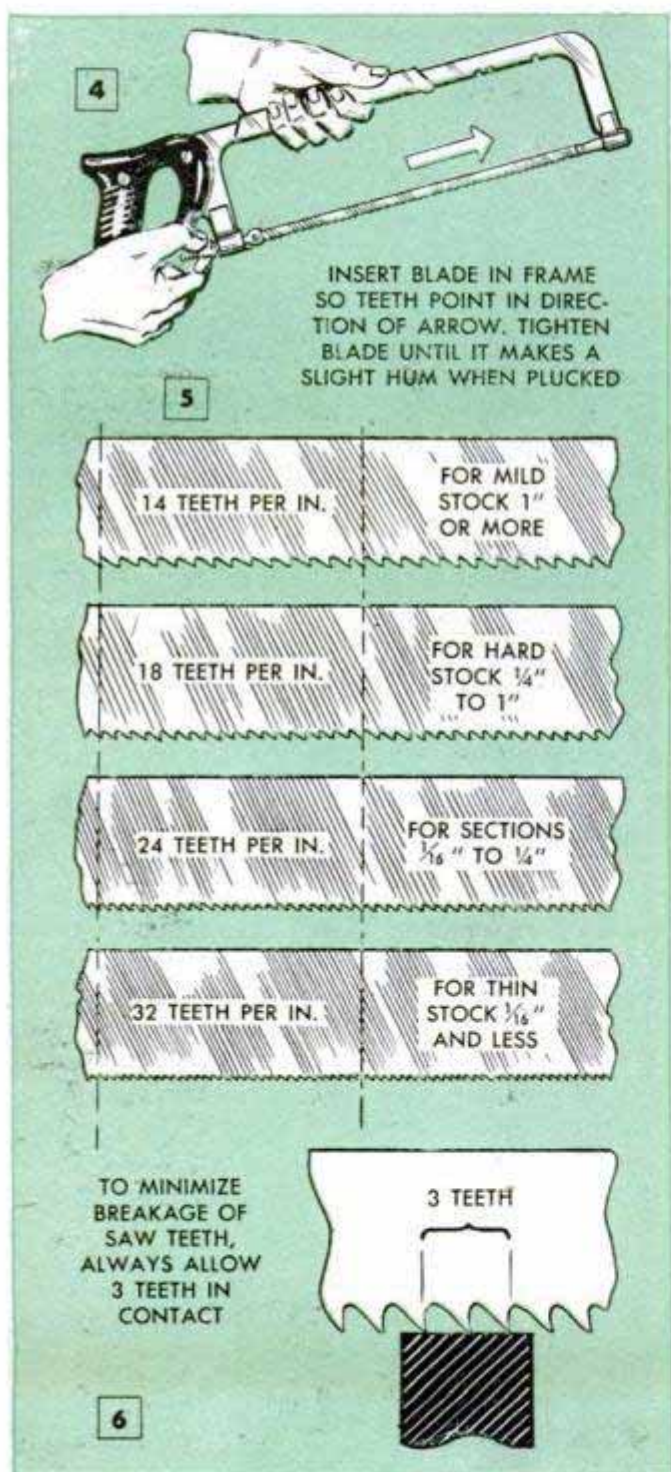
Blades are inserted in the frame so that the teeth point away from the handle, Fig. 4. Tension on the blade should be sufficient to hold it true in the cut. When the blade warms it will expand along the length and lose some of its original tension. Before tightening the tension nut, or the cam, be sure that the blade rests flat against the milled sides of the studs and that the pins are fully engaged.

Types of blades: Hacksaw blades are made for a variety of purposes and differ in toughness, hardening and tooth spacing. Ordinary blades are edge-hardened along the line of the teeth to a point just below the gullets (spaces between the teeth), leaving the back of the blade softer and more flexible. Blades of high-speed steel generally are more wear resistant and capable of cutting much harder metals. They also are more resistant to breakage of the blade itself.

Blade hardness: Besides the flexible, general-purpose blade, there are all-hard, stiff-backed blades of various gauges which many mechanics and toolmakers prefer. Although these blades are capable of making smooth cuts in very hard metals, they are rather brittle and break easily in materials that tend to flex. Both flexibility and hardness are combined in some blades made for special purposes. This type of blade is shown in Fig. 3. It is the best one to use where the cutting strains are severe.

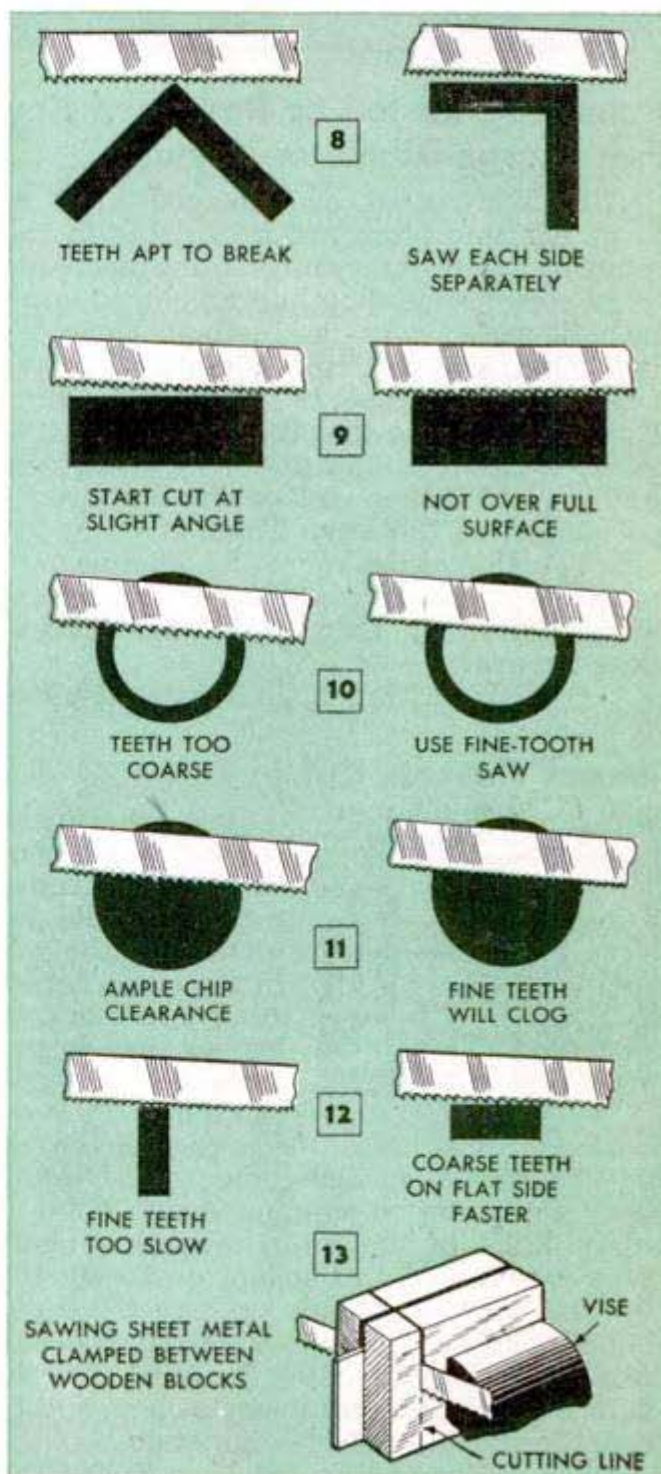
Tooth spacing: Tooth spacing is one of the important points in job selection of hand-hacksaw blades. Common blades come in four general tooth spacings: 14, 18, 24, and 32 teeth per in., Fig. 5. The coarser blades are usually recommended for cutting work of fairly large cross section in mild steel, cast iron, brass and bronze, and also for cutting aluminum, copper, hard rubber, fiber and certain other materials requiring ample chip clearance. Blades of 18-tooth spacing are advised for cutting hard materials such as tool steels, bronze, drill rod, etc. Blades of 24 and 32-tooth spacings are used to cut metals of thin cross section such as $\frac{1}{8}$ -in. angles, tubing and pipe. The finest blades are used to cut thin-walled tubing, conduit, sheet metals less than 18 gauge in thickness, and small rounds, such as $\frac{1}{8}$ -in. drill rod. In choosing a blade for the job, the important thing to remember is that at least three teeth should engage the metal simultaneously as in Fig. 6. This avoids stripping the teeth, or damaging the work, and gives a smooth cutting action similar to that of a file, Fig. 10. For solid rounds and bars, use the coarser blade, Figs. 11 and 12.

General cutting technique: Grip the work in a vise and scribe the cutting line close to the vise jaws, Fig. 7, to prevent the work



from flexing and pinching the blade. Notch the edge at the scribed line with a file so that the cut can be started easily on the line. Don't start the cut across the entire surface of flat work, as the blade will skid sidewise because of the large number of teeth engaged. Start the cut at a slight angle with the surface as in Fig. 9. Hold the saw with both hands as in Fig. 1, and apply sufficient pressure on the cutting (forward) stroke to cause the teeth to engage uniformly. Relieve the pressure on the back stroke. To hold the cut to a scribed line use a long, sweeping, straight-line stroke that utilizes nearly the full length of the blade for cutting. Timing of the cutting speed should be about one forward and one return stroke in one second. Faster sawing with ordinary blades may produce sufficient heat to draw the temper from the teeth. Short, fast strokes increase the risk of breaking the blade and make it more difficult to follow the scribed line. When a blade breaks after long use, don't try to complete the cut with a new blade. It will bind because the teeth have a wider set than that of the worn blade. Turn the piece over and finish the cut from the opposite side. In cutting angles the job will be done faster if each leg (side) of the angle is cut separately as in Fig. 8. By sawing each leg individually, you can use a coarser blade than could be used if the legs were sawed straight through edgewise. Use the same technique when sawing flat stock up to 1/4 in. thick. Grip the piece in the vise with the jaws bearing against the edges, not the flat sides, and start the cut by notching the edge of the stock at the scribed line with a file. Don't neglect this step whenever the cut must be started on a corner. It also is helpful when starting the cut on a round, as the notch serves to guide the blade on the first few strokes until it has cut deeply enough to be guided by the sides of the cut itself. The notch will also help to prevent the blade from skidding and damaging the surface of the material adjacent to the cut.

Use very light pressure when sawing thin materials. To cut thin sheet metals, it's a good idea to clamp the work between two pieces of wood as in Fig. 13, and saw through all three pieces as shown. This eliminates bending of the thin stock, as well as vibration, and breakage of blades. To make a cut along the edge of a large piece of flat stock, where the total depth of the cut will be deeper than the distance from the edge of the blade to the frame, set the blade holders, or studs, at right angles to permit the saw frame to clear the edge of the stock. This same position is used where there is insufficient clearance above the cut. Slots can be cut by using two or more blades side by side in the saw frame.



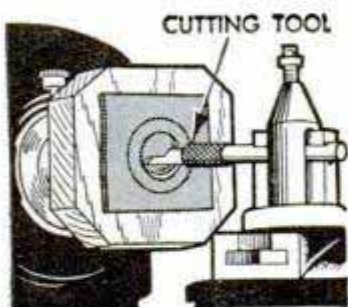


Removing Rusted or Damaged Key From Large-Diameter Keyway

Although rusted or damaged keys in large shafting often are impossible to remove by any ordinary means, one mechanic in a farm service shop has developed what he believes is a sure-fire method. He welds two lengths of flat steel together edge to edge to form an offset bar about 36 in. long. Note in the photo that the shorter piece is wider than the longer one. The end of the longer piece is then tack-welded to the exposed end of the key. Thus, striking the offset portion of the bar with a hammer removes the most stubborn key without damaging the shaft. Usually one sharp blow does the trick.

L. H. Houck, Jefferson City, Mo.

Round Gaskets Cut in Lathe



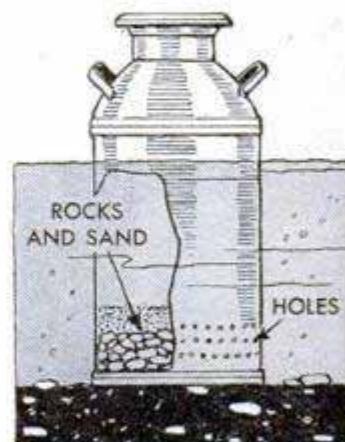
One mechanic solves the problem of cutting true, round gaskets by setting up the job in the shop lathe. A square block of hardwood is attached to the faceplate and the gasket material is cemented to the face of the block with the special cement used to attach sandpaper to sanding disks. Then a sharp knife of the interchangeable-blade type is mounted in the tool post with the bevel edge of the blade up, and the knife handle perpendicular to the surface of the work. By simply feeding the knife straight in, it is possible to cut gaskets clean and to exact inside and outside diameters.

Norman Fraser, New York City.

Norman Fraser, New York City.

Spring Water Cleaned of Sediment By Utilizing Perforated Milk Can

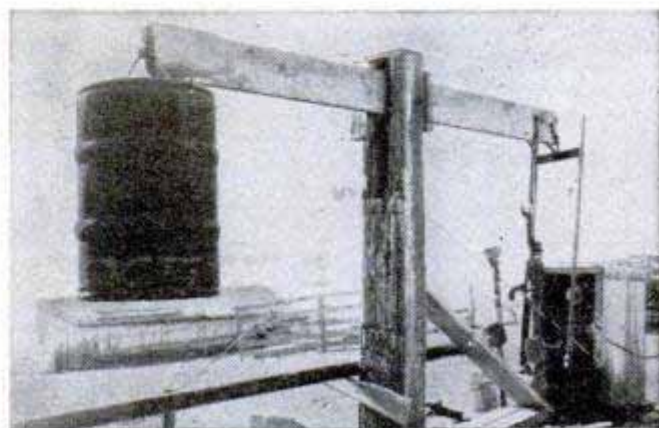
To obtain clean, clear water from an open spring, one farmer made a simple, efficient filter from a milk can. First, he punched three rows of equally spaced holes near the bottom of the can with a 10d nail, and then filled the can with small rocks to a point just below the top row of holes. He poured clean sand on the rocks and the weight of sand and rocks caused the can to sink to the bottom of the small pool at the edge of the spring. While such a filter cannot remove

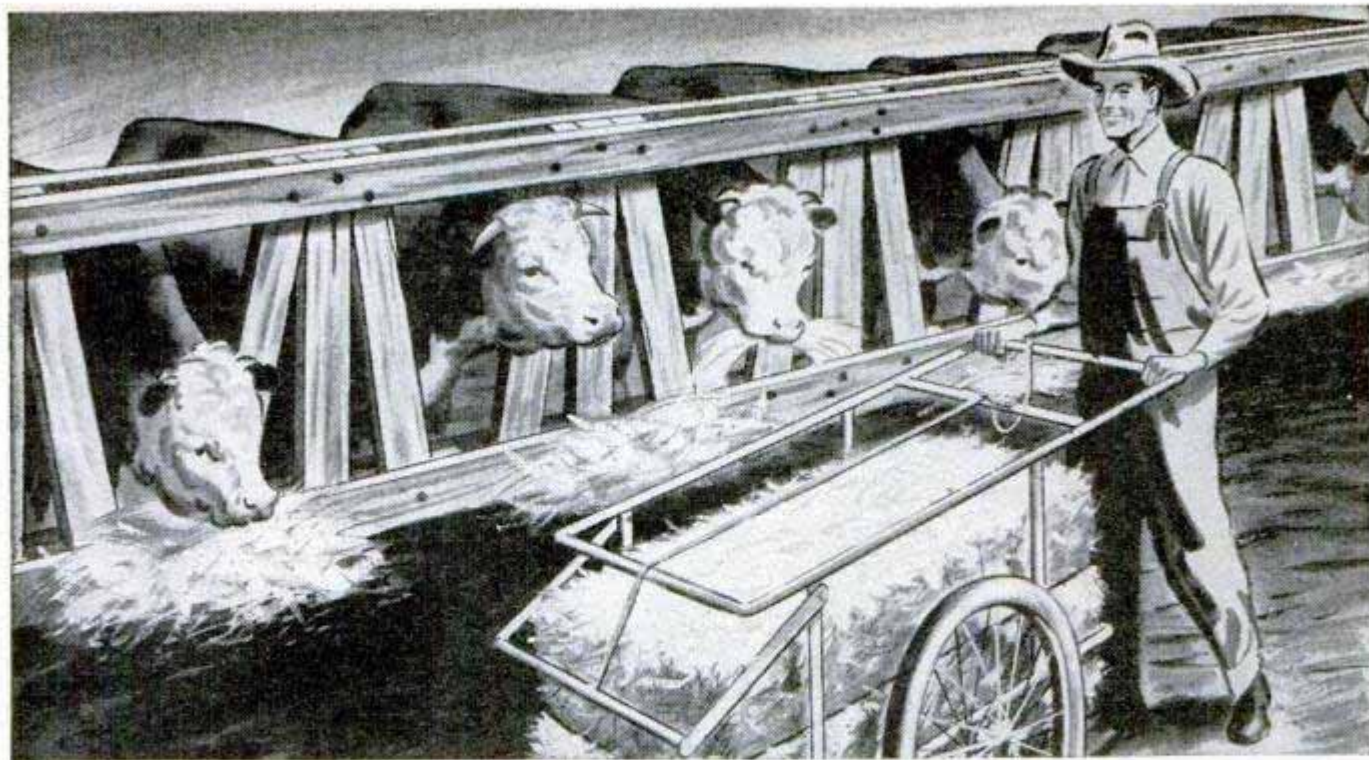


chemical impurities from the water, it does filter out all sediment, dust, leaves and twigs which tend to collect in open springs. The can cover is always replaced after dipping water from the container.

Counterbalanced Pump Jack For Deep-Well Operation

By counterbalancing a conventional pump jack, one farmer found that a 1/4-hp. electric motor would operate a cylinder-type deep-well pump without overloading. As a counterweight, he used a 30-gal. oil drum filled with small stones and attached to one end of a hardwood walking beam. The beam is pivoted at the center on a 1-in. rod passing through two posts which are set in the ground side by side and spiked to a spacer. The opposite end of the beam is attached to the metal crossarm of the pump-jack lift by means of a clevis. The latter is passed through a ring welded to the lift crossarm and fastened to the end of the beam with a clevis pin secured with a cotter key. Several holes are drilled through the bottom of the drum so that rainwater will drain out.





BALED-HAY CART saves heavy lifting

FARMERS, poultrymen and feed dealers who have occasion to transport individual bales of hay or straw will have regular use for this unusual bale cart. It straddles the bale and carries it suspended in a welded frame in a manner similar to a lift truck. The method of loading the bale is pictured in Fig. 1, and construction details and dimensions of the cart are given in Fig. 2. Note that the complete frame is made from $\frac{3}{4}$ -in. pipe with all joints welded and that it consists of two similar frames, one above the other with pipe spacers welded between. The lower frame has one open end, permitting the cart to straddle the bale when loading. While it is possible to mount bicycle wheels on stub axles as indicated, a stronger straddle-type mounting is shown in the lower left-hand detail. Note that the sharpened metal spurs on the hinged bracket at the front of the frame are welded on at an angle of about 30 deg. so that when the bracket is lowered the spurs will engage the bale and support it in the horizontal position with ample ground clearance when the cart is tilted for transport, as in one of the illustrations at the right.



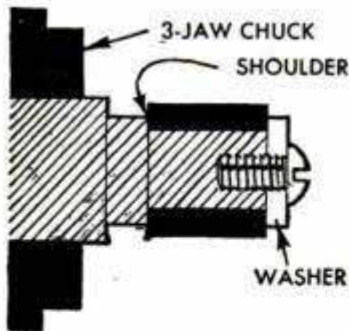
Portable Buzz Saw Is Gasoline Powered For Cutting Cordwood or Building Cabin



Here is a portable 10-in. buzz saw that can be carried in the car right to the job. It is ideal for cutting firewood and also is an excellent tool when building a cabin where electricity is not available. The saw, which weighs about 60 lbs., is powered by a 1½-hp. gasoline engine. The engine is mounted in an angle-iron frame with the saw-arbor bearings bolted to the top members of the frame. The blade rotates between two lengths of angle iron which provide a suitable rest for cutting cordwood. The saw can be chained to a tree trunk, as shown in the photograph, or it can be bolted to the underside of a table for crosscutting lumber. — Keats K. Vining, Grand Rapids, Mich.

Finishing Bushings Speeded by Locking on Special Shouldered Mandrel

Confronted with the problem of finishing a quantity of oversize bronze bushings in a limited time, one machinist devised a special mandrel on which the work is held by end pressure instead of internal pressure



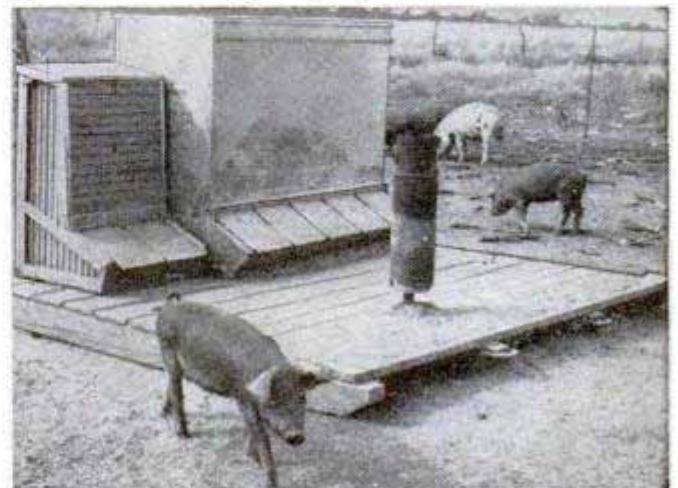
as on an expanding or tapered mandrel. The mandrel is made by running two shoulder cuts on a short piece of cold-rolled steel which has a diameter slightly larger than the outside

diameter of the work. On bushings and similar work, the first shoulder cut should be of a diameter somewhat greater than the inside diameter of the bore. This provides clearance for the cutting tool at the finish end of the cut. The second shoulder cut is made about .005 in. less than the over-all length of the work and is undercut approximately 1 deg. The diameter of this cut is finished to a smooth, slip fit in the work. The outer end of the mandrel is tapped for a machine screw which holds a faced washer of a diameter slightly greater than the inside diameter of the work. In use, the mandrel is held in a three-jaw chuck.—Harry J. Morris, New York City.

Sled-Type Platform Holds Hog-Feeding and Oiling Equipment

To achieve easy portability of his hog-feeding and oiling equipment, one farmer mounted oilers and also self-feeders for both minerals and dry feeds on the same platform. The latter is fitted with four heavy skids so that it may be moved from one lot to another with a tractor. Heavy clevises for attaching a pull chain are bolted to the two center skids. A 2 x 10-in. plank is spiked across the skids at the front and rear ends of the platform to give added strength and rigidity for towing.

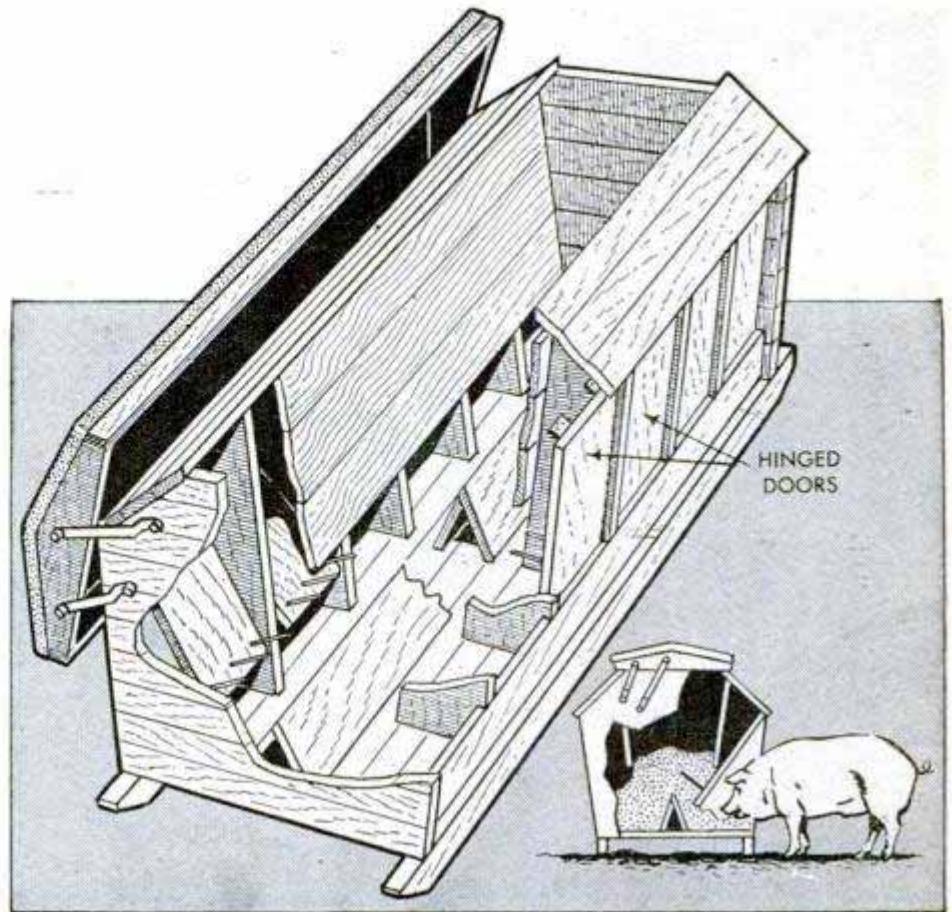
☐ Rubber stamps are cleaned quickly by pressing modeling clay against the type.



5/11/52

Weatherproof Self-Feeder Handles Small Grain

Just the thing for ground feed, this large-capacity hog feeder has 12 individual feed hoppers each of which is fitted with a hinged self-closing door. A heavy lid that runs the full length of the bin protects the feed from weather. The lid swings sidewise on pivot arms of flat iron. This arrangement permits it to be opened easily by hand, but prevents it from being blown open by high winds. As the hogs push open the hopper doors, long spikes driven through the lower portions of the doors automatically agitate the feed. A triangular-shaped divider set in the center of the bin floor directs the flow of feed toward the feed hoppers. The divider, which is not fastened to the floor, can be removed easily to facilitate cleaning out the bin. The feeder is mounted on skids, and the lid,



which can be covered with galvanized sheet metal or roll roofing, may be fitted with two sash handles on the front edge if desired.

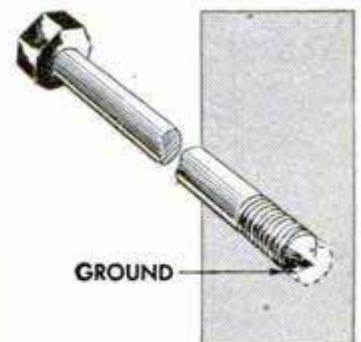
Floor Plate on Farm Tractor Provides Nonslip Platform

Made from one piece of steel floor-plate stock, this nonslip platform makes it easier to mount to the tractor seat, and also provides space for a toolbox, small drums of lubricating oil, grease guns, etc. The rear edge of the platform is cut away at the center to allow movement of a power-take-off shaft and to permit the drawbar to swing without interference. The supporting flat-iron brackets are bolted to mounting pads on the tractor-axle housings and can be easily removed.



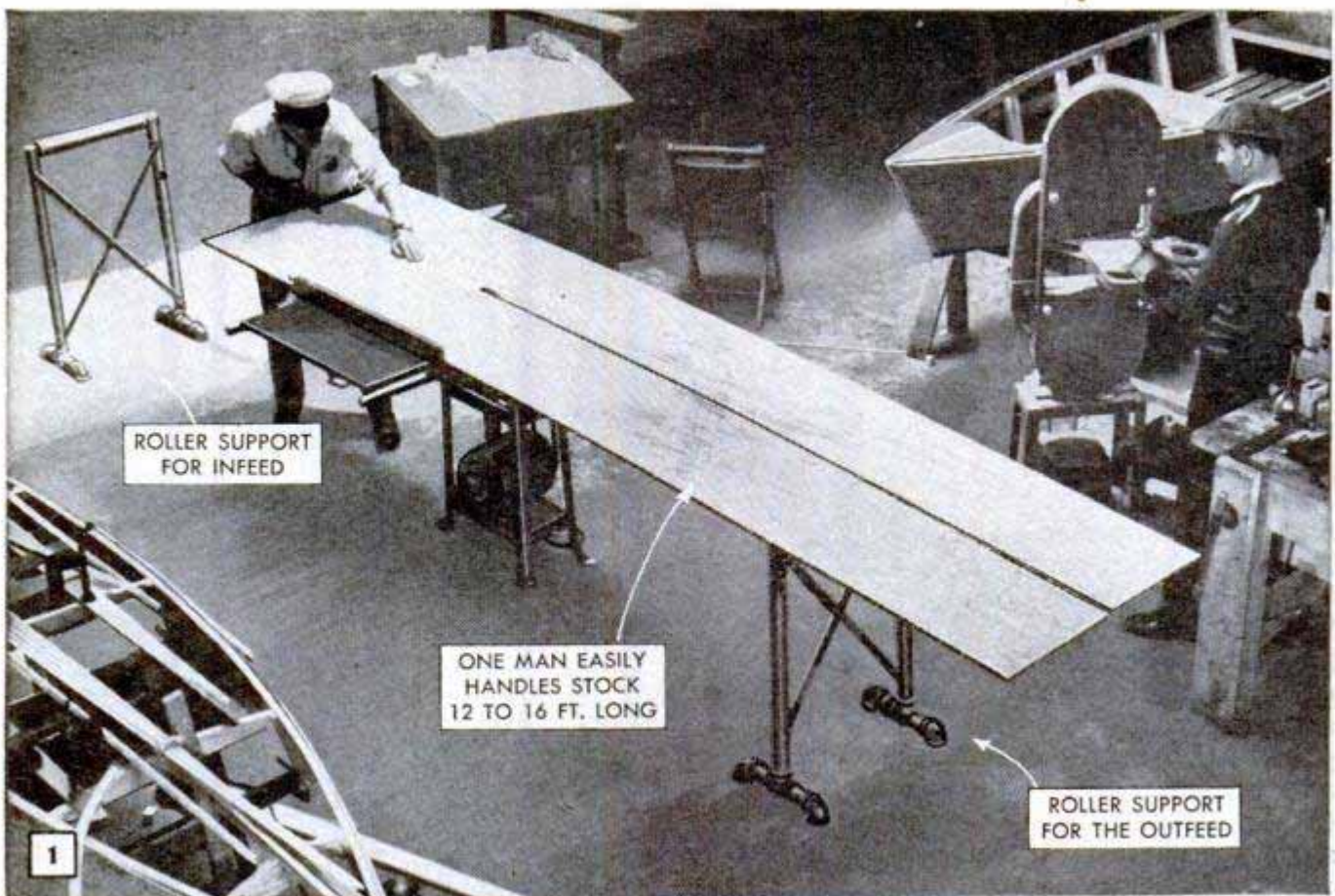
Pointing Ends of Generator Bolts Helps Starting in Bracket

To save time when reassembling car generators, one mechanic grinds a point on the ends of the long through bolts. This aids in aligning and starting the bolts in the end bracket which otherwise is a tedious job. A very shallow point ground or filed on the end of the bolt usually will do the trick.



Sharpening Disk Harrow

By welding a nut to a pulley and then turning the pulley onto the threaded end of a disk-gang shaft, the disks can be rotated slowly for sharpening while the gang is raised off the ground. The gang is simply anchored in the up position and the pulley is belted to the tractor drive. The disks are sharpened individually by holding an emery wheel against the edge of each one while the gang is rotating.



ROLLER SUPPORT FOR INFEED

ONE MAN EASILY HANDLES STOCK 12 TO 16 FT. LONG

ROLLER SUPPORT FOR THE OUTFEED

1

INFEED AND OUTFEED ROLLER SUPPORTS ARE A PRACTICAL SOLUTION TO HANDLING BIG WORK ON SMALL SAW TABLES. A TYPICAL SETUP IS SHOWN ABOVE, AND A UNIT EASY TO MAKE IS SHOWN BELOW. SAME SUPPORT CAN BE USED WITH A SIDE ROLLER FOR CUTOFF WORK AS IN FIG. 11

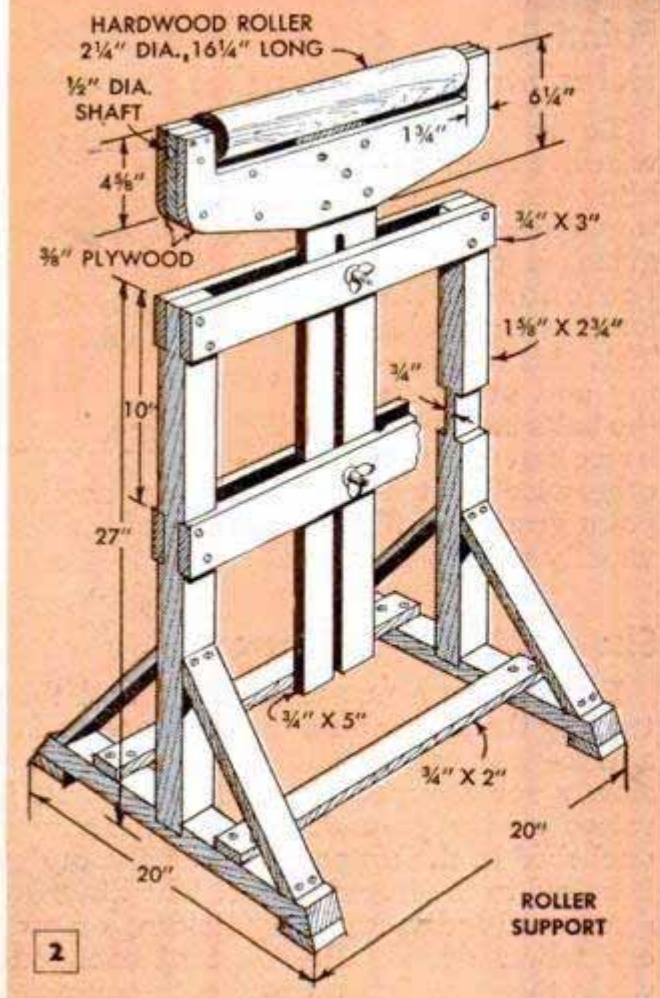
HANDLING BIG

By Sam Brown

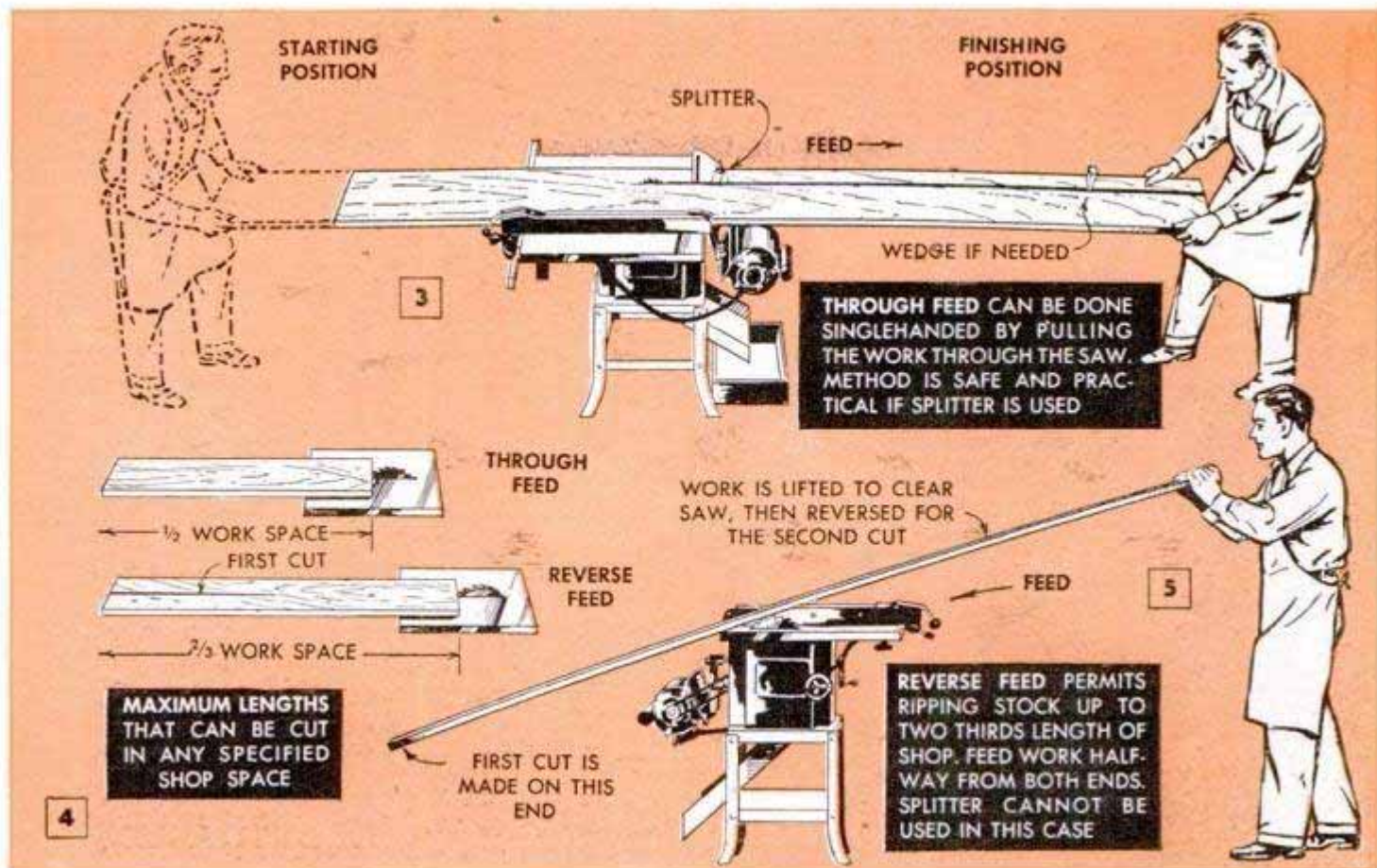
WHILE the small table on the average circular saw provides adequate support for most of the work done in the basement workshop, occasionally there are times when an extra-large panel or long board must be ripped or crosscut. Trying to do this singlehandedly in cramped quarters is not only difficult but hazardous. However, there are improvised setups which give big-saw capacity to home-shop machines with the added features of convenience and safety for the operator.

Along with these setups, however, there are a few important points to remember when handling oversized work in either crosscutting or ripping. First, use a blade with standard ripping or combination teeth which have been correctly sharpened and set. Never use a hollow-ground (planer) blade because of the danger of a kickback should the blade suddenly bind in the cut. Also, wherever possible, use both the guard and the splitter with which the machine is equipped. Finally, it is important to adjust the blade so that it projects no more than $\frac{1}{2}$ in. above the top of the stock. This helps to hold the cut open and prevent binding, and aids in steadying the blade in heavy cuts.

Ripping long boards: Fig. 1 shows how



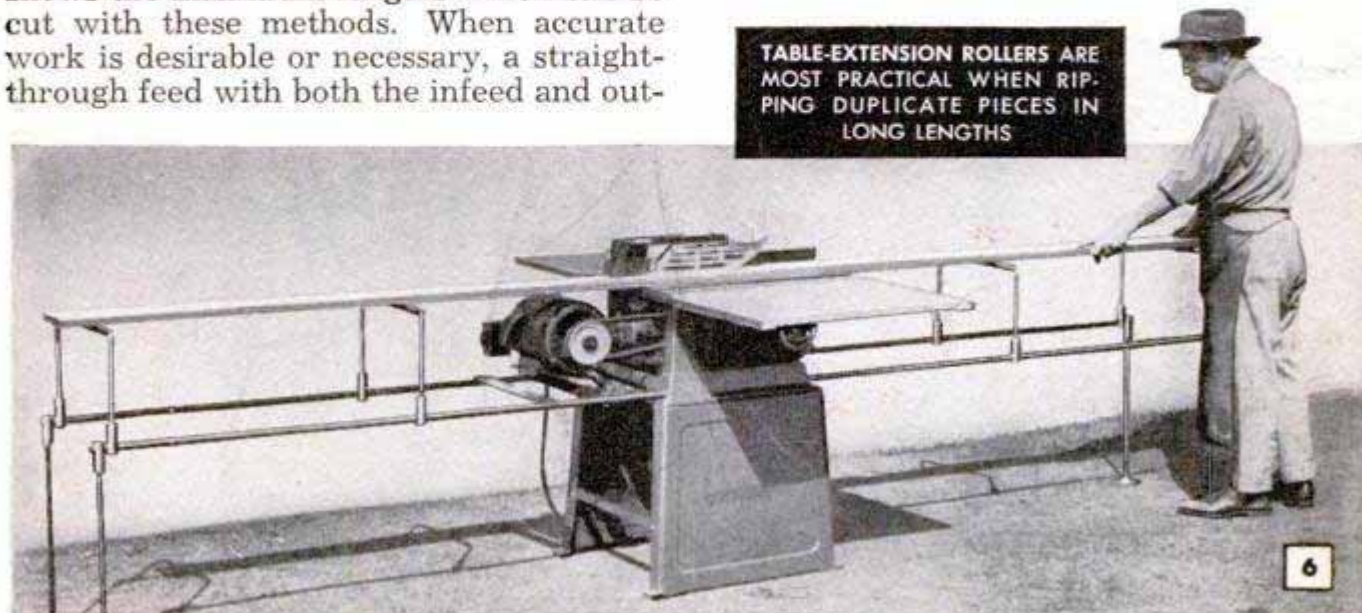
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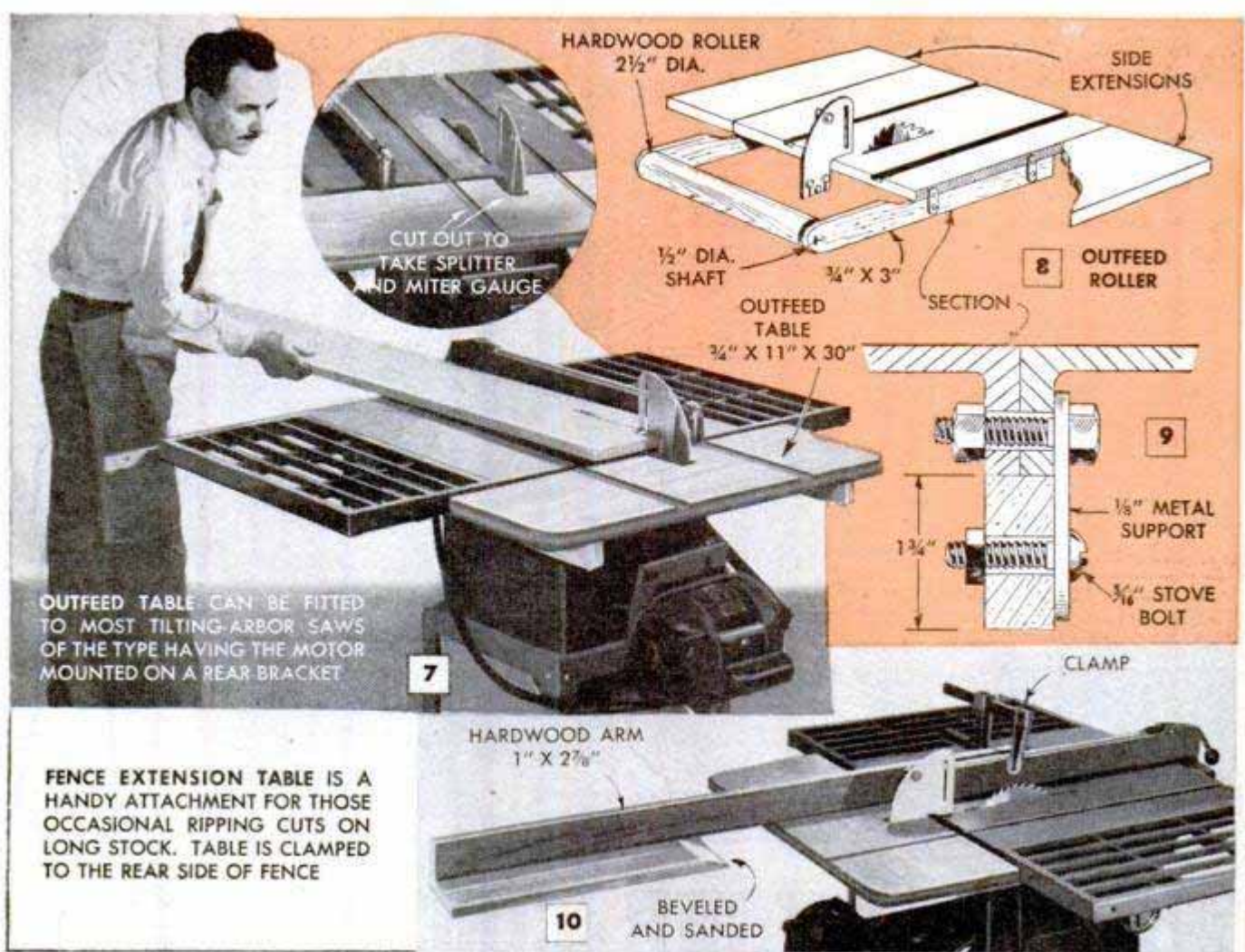


WORK ON YOUR CIRCULAR SAW

two simple roller supports build big-saw capacity into the small machine. Although the infeed and outfeed supports in this setup are made from pipe and fittings, adjustable supports to serve the same purpose can be made from stock lumber as in Fig. 2. Ripping long stock without any supports can be done in two ways. One is the infeed-and-pull-through method detailed in Fig. 3. The other method is the reverse feed, Fig. 5, where the ripping cut is run half the length from both ends of the stock. Fig. 4 shows the maximum lengths which can be cut with these methods. When accurate work is desirable or necessary, a straight-through feed with both the infeed and out-

feed ends of the board supported, as in Figs. 1 and 6, is the most practical, especially when it is necessary to rip duplicate pieces in long lengths. When making a support such as that in Fig. 2, it's a good idea to make allowance for sufficient range of adjustment to accommodate long work on the bandsaw and jointer as well. A short outfeed table, or a roller, attached directly to the saw table, as in Figs. 7, 8 and 9, is helpful not only for ripping long stock but for dadoing and molding operations. On





OUTFEED TABLE CAN BE FITTED TO MOST TILTING-ARBOR SAWS OF THE TYPE HAVING THE MOTOR MOUNTED ON A REAR BRACKET

FENCE EXTENSION TABLE IS A HANDY ATTACHMENT FOR THOSE OCCASIONAL RIPPING CUTS ON LONG STOCK. TABLE IS CLAMPED TO THE REAR SIDE OF FENCE

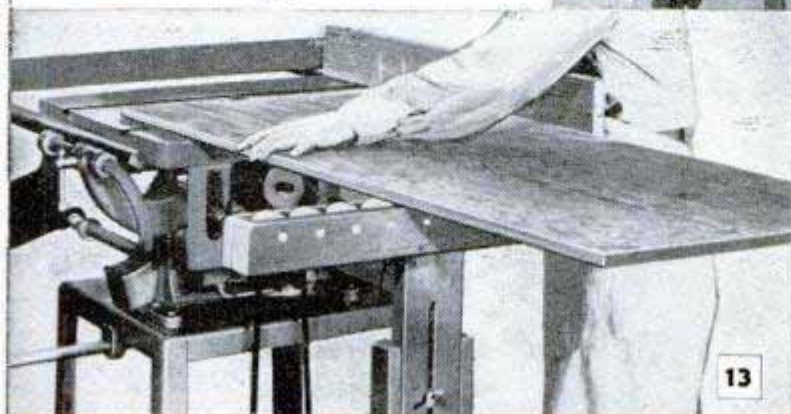
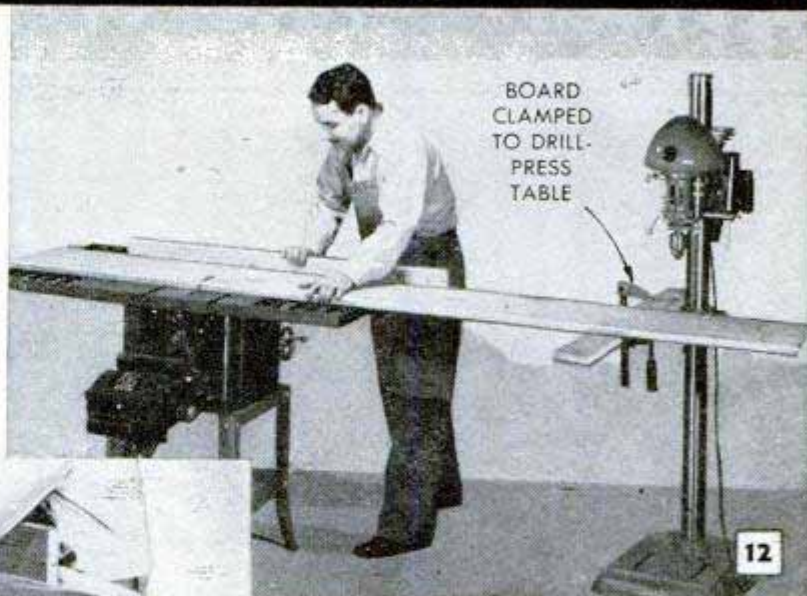
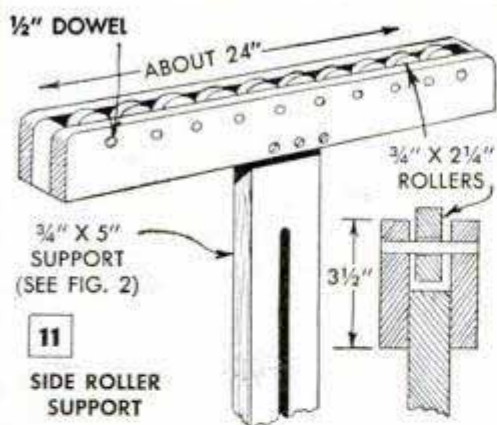
tilting-arbor saws having the splitter support back of the table, it will be necessary to cut an opening in the auxiliary table to permit the splitter to swing with the blade through the tilt range. Both the table and roller can be mounted in various ways, depending to some extent on the type of saw table. Another type of outfeed support, which is especially useful for ripping an occasional piece of long stock, is pictured in Fig. 10. It is clamped to the ripping fence in the manner shown.

Crosscutting long stock: This is somewhat more difficult, especially where the cutoff must be made near the end of wide stock. Clamping a supporting strip to the drill-press table as in Fig. 12 offers a simple solution to the problem of cutting an occasional long piece. A better method is use of the roller unit detailed in Fig. 11 and pictured in use in Fig. 13. This unit is designed to interchange with the roller support detailed in Fig. 2. An extra-long miter gauge with a ball-bearing roller to support the overhang makes it easy to handle long pieces when the cutoff is made near the end as in Fig. 15. This unit consists of a long guide board fitted with two miter gauges and an outboard roller that rides on the under edge of the saw-table extension as in Fig. 14. Of course, the length and construction of the unit must be

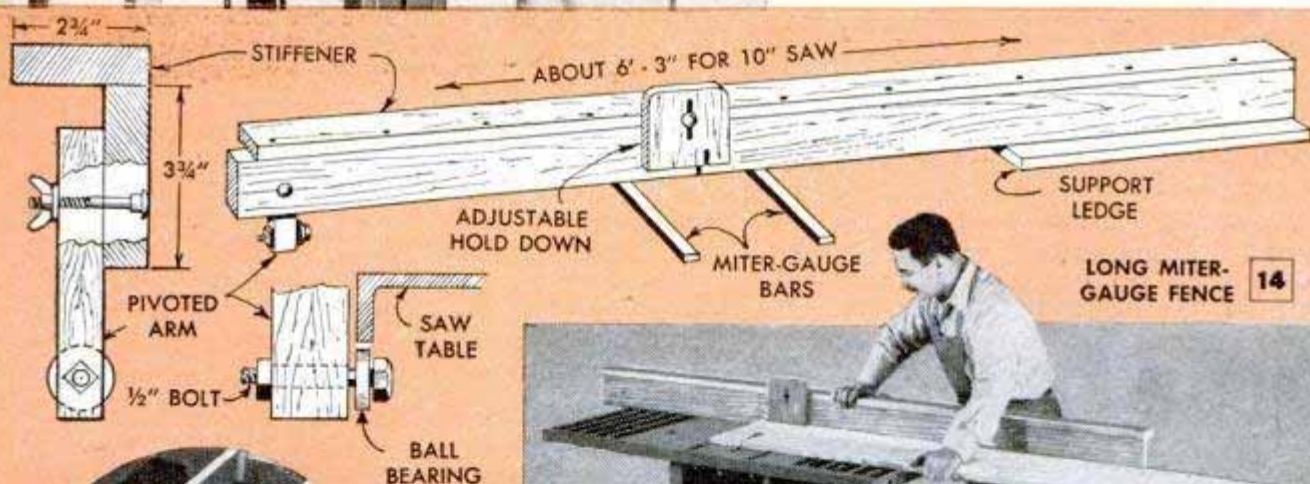
adapted to the machine on which it is to be used. Care should be taken to position the miter gauges with the guide bars exactly the same distance apart so that they do not bind in the table grooves. Another adaptation which will work out satisfactorily on some small saw tables is providing an outboard miter-gauge groove, or slot, by attaching a rabbeted strip to the outer edge of the table, or the table extension, as in Fig. 16. Screw a long guide board to the miter gauge and you have the setup pictured in Fig. 17, which enables the operator to stand well to the left of the saw table and crosscut long boards without any additional support. If the edge of the saw table is not machined, then cut a full-width groove in the center of the strip for the miter-gauge bar.

Trim cuts: Ordinary supports of the type already described are suitable only for ripping and cutting off stock of medium standard widths. On bench-type saw tables the length of the miter-gauge grooves will permit cutting off stock up to 12 in. wide. In some cases you can cut off stock up to 18 in. wide by reversing the miter gauge and placing the back edge of the material against it. But when wider stock, such as plywood panels or solid stock glued up to wide widths, must be trimmed, the miter gauge cannot be used. Figs. 18, 19 and 20

Outboard Support Is Needed For Long Cutoffs



FOR OCCASIONAL JOBS A BOARD CLAMPED TO THE DRILL-PRESS TABLE PROVIDES A SUITABLE OUTBOARD SUPPORT. THE SIDE ROLLER, LEFT, IS BETTER AND CAN BE MADE INTERCHANGEABLE ON BASE DETAILED IN FIG. 2 BY USING SAME SIZE SUPPORT

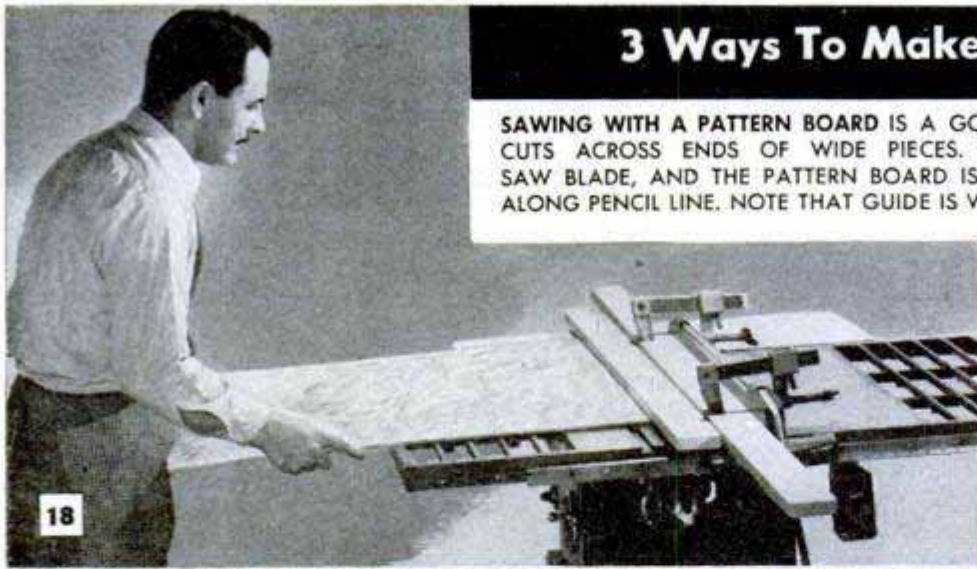


ABOVE, LONG MITER GAUGE WITH SUPPORTING LEDGE AND HOLD-DOWN TAKES A 6-FT. OVERHANG WITHOUT USE OF ADDITIONAL SUPPORTS. TWO MITER GAUGES ARE NEEDED FOR ACCURACY

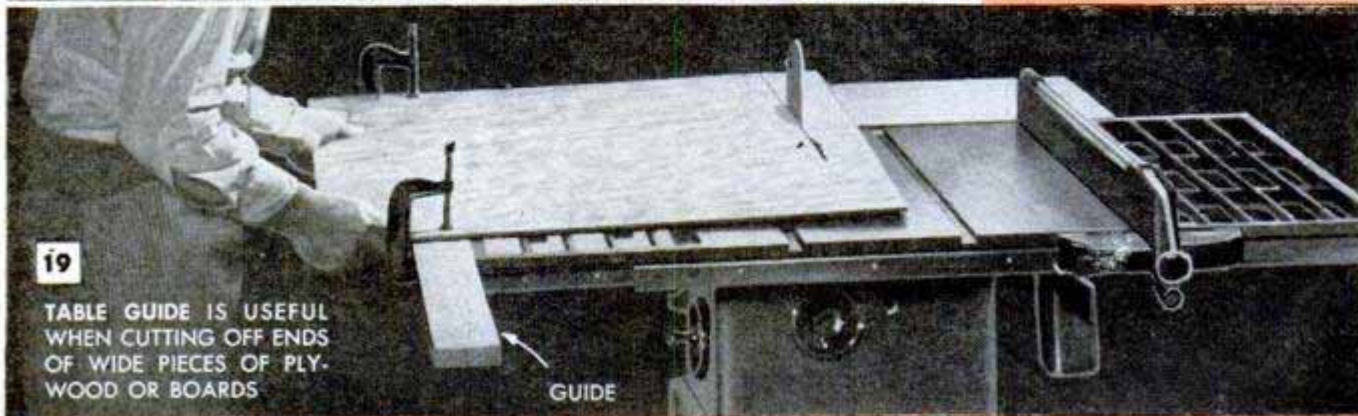
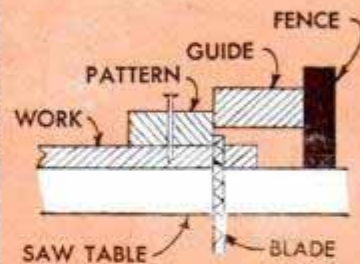
LEFT, OUTBOARD MITER-GAUGE SLOT ENABLES OPERATOR TO CUT OFF LONG BOARDS WITHOUT OTHER SUPPORT. CENTRAL LOCATION OF MITER GAUGE PERMITS OPERATOR TO STAND AT LEFT OF SAW TABLE TO GUIDE WORK WITH EASE

3 Ways To Make Trim Cuts

SAWING WITH A PATTERN BOARD IS A GOOD METHOD OF MAKING TRIM CUTS ACROSS ENDS OF WIDE PIECES. THE GUIDE IS FLUSH WITH THE SAW BLADE, AND THE PATTERN BOARD IS TACKED TO WORK WITH EDGE ALONG PENCIL LINE. NOTE THAT GUIDE IS WIDER THAN WASTE STOCK



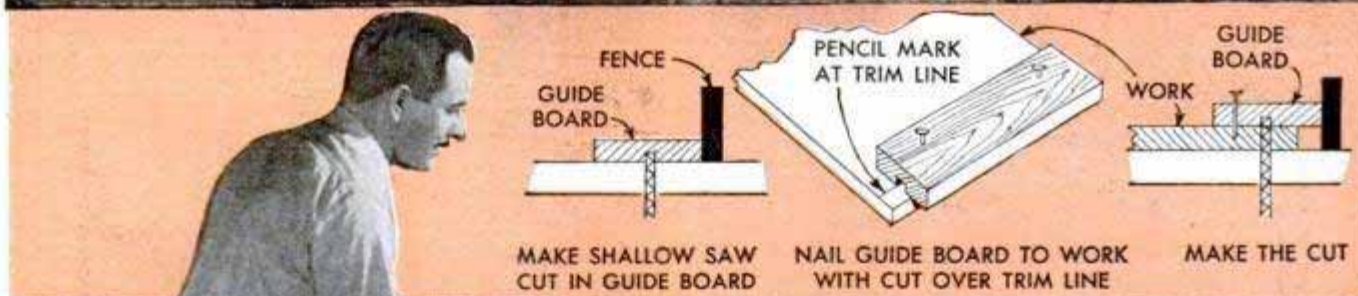
18



19

TABLE GUIDE IS USEFUL WHEN CUTTING OFF ENDS OF WIDE PIECES OF PLYWOOD OR BOARDS

GUIDE



MAKE SHALLOW SAW CUT IN GUIDE BOARD

NAIL GUIDE BOARD TO WORK WITH CUT OVER TRIM LINE

MAKE THE CUT



20

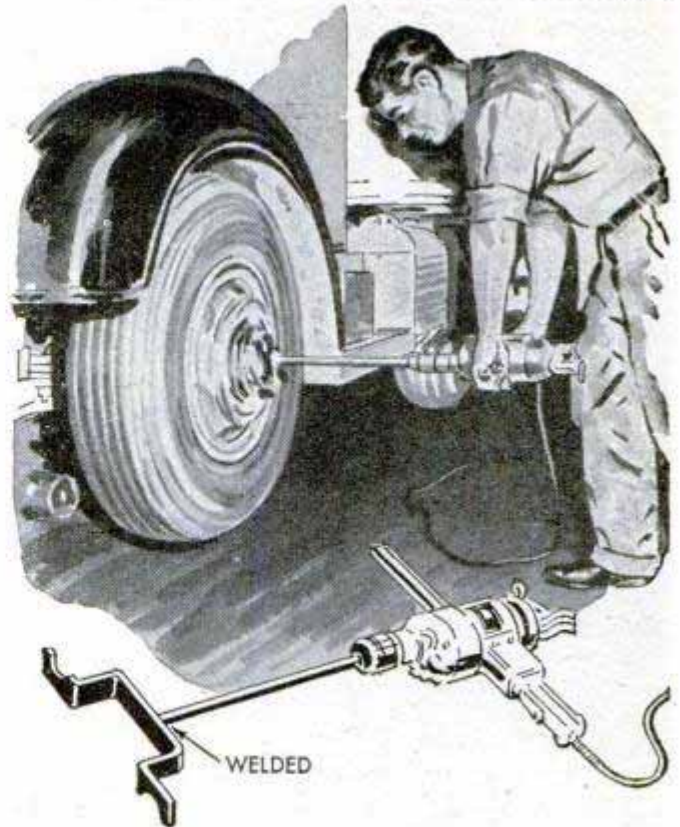
USE OF THE GUIDE BOARD IS SIMILAR TO PATTERN SAWING. LENGTH OF THE GUIDE IS SLIGHTLY LESS THAN WIDTH OF WORK

show three ways to solve this problem. The procedure is similar to pattern sawing in that a pattern or guide board is used on top of the stock. This is guided either by a strip clamped to the ripping fence, Fig. 18, or by a strip clamped to the work which rides along the left-hand edge of the saw table as in Fig. 19, or simply by a strip attached to the work as in Fig. 20. Of the three methods, the first is the most commonly used as it produces the most accurate work and is best for duplicating a number of pieces. Of course, the limited width of the guide, Fig. 18, makes it possible to trim only narrow widths from the ends of the stock. For making cuts across

the ends or near the center of wide panels, the table guide, Fig. 19, generally gives the best results. Always use the splitter with the table guide, and hold the work firmly against the edge of the table to prevent it from twisting or being thrown upward by the saw blade. The splitter cannot be used with either of the other methods, so make sure that the teeth are sharp and have a medium-wide set. The procedure in Fig. 20 requires a separate guide board for each piece of varying width. A shallow groove, or a saw cut, is made lengthwise on one face of the guide. Then the guide is attached to the work with one edge of the groove flush with the trim line at both ends.

Spinner Chucked in Electric Drill Drives Truck Wheels for Balancing

Truck tires can be easily balanced by the use of this simple spinner tool which is chucked in a portable electric drill. The driving member is made from flat cold-rolled steel bent as shown in the detail and notched to engage the lug nuts on the wheel knob. A $\frac{1}{2}$ -in. rod is welded to the spinner for chucking in the electric drill which will rev up the wheel to about the equivalent of a speed of 60 m.p.h. At this speed any out-of-balance condition is easily detected and, by adding balancing weights on the light side of the wheel, it is easily corrected. Spinning the jacked-up wheels at this speed also discloses any tendency to shimmy resulting from loose kingbolts or slack tie rods connecting the wheels with the steering gear.



Portable Farm Anvil



This lightweight anvil is just the thing for field repairs and small jobs on the farm, as one man can easily carry it short distances or readily load it on a pickup truck for longer hauls. The anvil is a short length of railroad rail which is fitted with a horn, the latter being made by welding a section of automobile axle to one end of the rail. Lengths of channel and angle iron welded together provide a stand for the anvil, and a piece of wide channel welded between the two legs forms a tool tray.

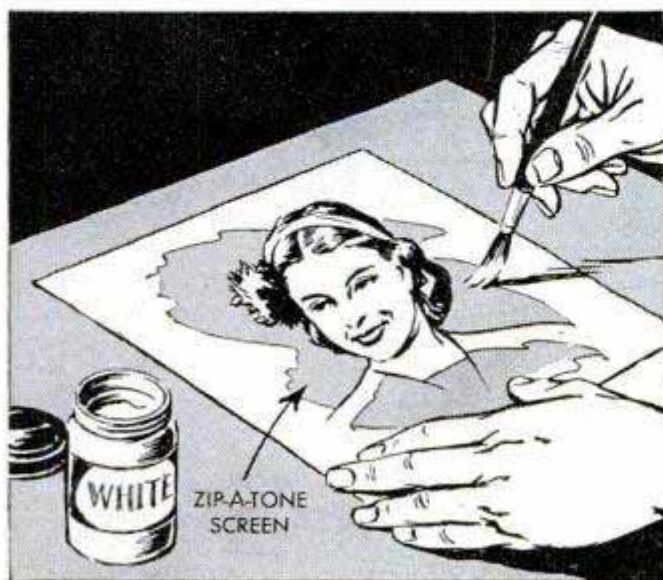
latter being made by welding a section of automobile axle to one end of the rail. Lengths of channel and angle iron welded together provide a stand for the anvil, and a piece of wide channel welded between the two legs forms a tool tray.

Improved Barn-Door Latch

A serviceable barn-door latch can be improvised quickly from a strap hinge and screw hook of the type used to hinge heavy gates. Loosely bolt the strap hinge to the door, as shown in the drawing, and drive the screw hook into the frame so that the loop at the end of the hinge can be dropped over the hook to hold door closed.



Dusting Zip-A-Tone With Talc Permits Loose Brush Effect

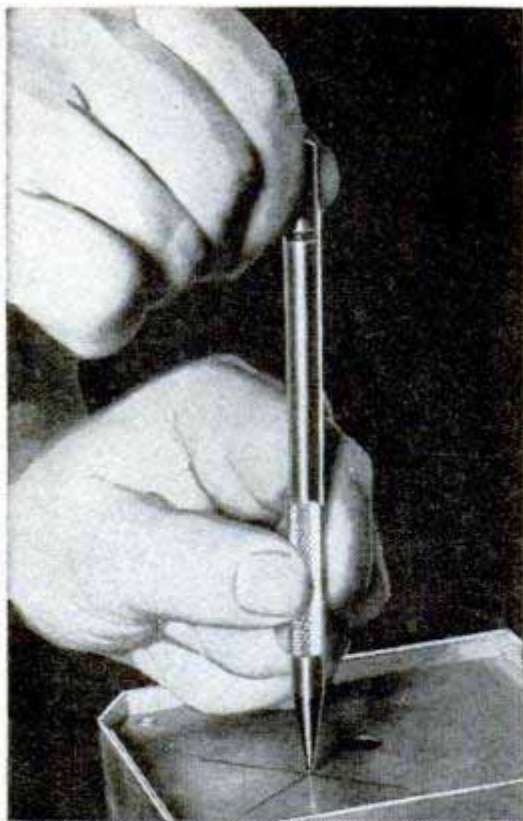


To obtain "free flowing" brush effects on Zip-A-Tone, or similar overlay screens, rub down with burnisher in the usual manner and dust the surface with talc. The dusting process permits the use of water color directly on the Zip-A-Tone where dry-brush or other effects may be obtained, or the background or other areas can be blocked out with white paint.

Lacquer Protects Car Wiring

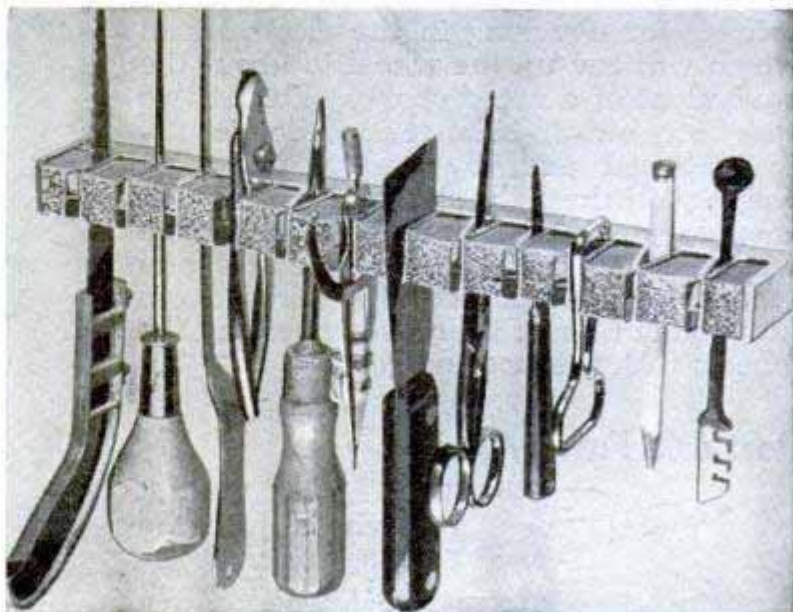
Try applying a coat or two of clear lacquer to the exposed wiring in your car, particularly near the engine. The lacquer will prevent acids and moisture from damaging the insulation, thus prolonging the life of the wiring.

SHOPPING



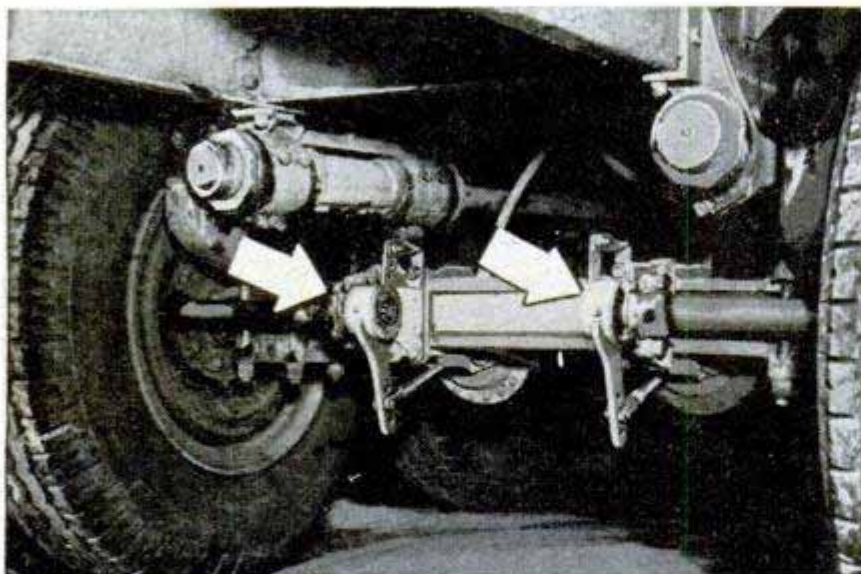
Lakelin Products Co., 2316 Rugby Rd., Dayton, Ohio.

PRECISION CENTER PUNCH has been especially designed for modelmakers, tool and diemakers, machinists and others who do precision layout work on small parts. Only slightly larger in diameter than an ordinary pencil, it can be located on fine layout lines with extreme precision. The point is driven by raising the spring-loaded head and releasing it. The degree of indentation is determined by distance the head falls



R. K. Products Co., Dept. P-4, 731 S. W. Front Ave., Portland, Ore.

SELF-ADJUSTING TOOLHOLDER is just the thing in small home workshops where storage space is limited and hand tools must be stored on wall racks. Not only can tools be stored in this holder, but also a variety of kitchen utensils, each item being held securely and always in full view. Sponge-rubber "springs," held in U-shaped clips which slide in a channel, provide constant grip and easy release for various tools from putty knives to pliers



Brakemaster Corp., 205 W. Wacker Dr., Chicago 6.

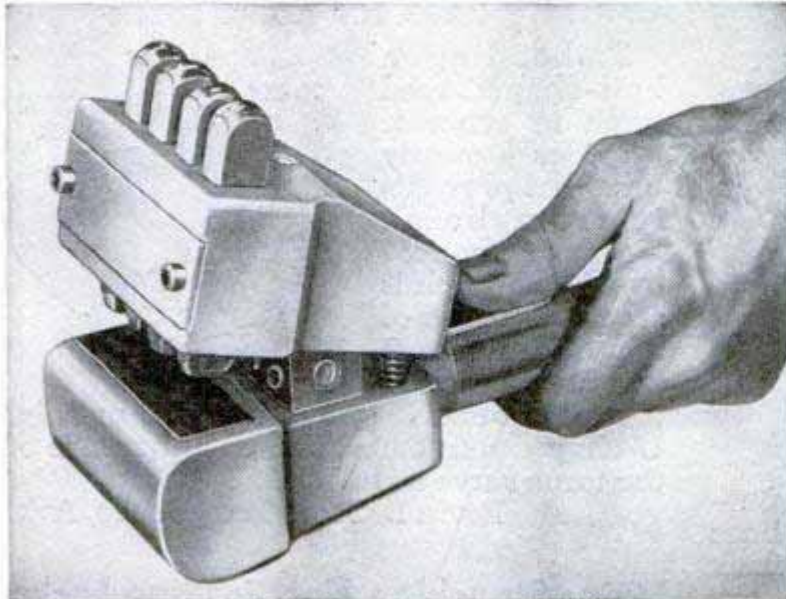
AUTOMATIC BRAKE ADJUSTER maintains equalized braking action on heavy trucks, trailers and busses, and reduces tire-tread wear by as much as 25 percent. The unit, one of which is attached to each wheel, advances brake shoe automatically to compensate for lining wear, thus eliminating frequent inspection and adjustment. The unit is mounted on the splined camshaft of cam-actuated air brakes, and the power arm is connected to the push rod from the air-brake diaphragm. As the brake lining wears, a ratchet mechanism takes up slack



General Scientific Equipment Co., 2700 W. Huntington St., Philadelphia 32, Pa.

HEADREST GOGGLES, designed for welding, cutting, and brazing operations where complete eye coverage is unnecessary, are extremely lightweight and comfortable to wear for long periods of time. The novel headrest feature distributes the weight uniformly. Adjustments permit the goggles to be worn over glasses and also adjusted so that the lenses are the correct distance from each eye

FOR TOOLS



M. E. Cunningham Co., 83 E. Carson St., Pittsburgh 19, Pa.

METAL STAMP HOLDER that operates like a small edge clamp has a multiple holder for individual metal stamps, which can be arranged in any combination desired. Specially designed springs retain the stamps in the holder, but permit rapid changing. When unit has been placed in position over edge of sheet metal, each individual stamp is struck a light blow with a hammer. Because of unique design, the impressions cause minimum distortion



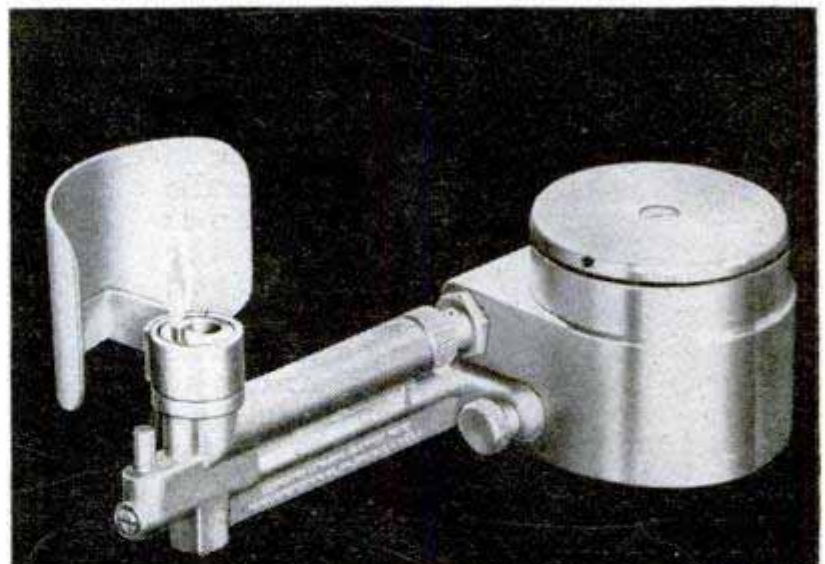
Speed Specialty Co., 5314 Mt. Royal Dr., Los Angeles 41, Calif.

VACUUM-SEALED UNIT that supplies moist air to your auto-engine carburetor is said to give more miles per gallon of fuel and also a smoother operating engine as a result of better fuel-air mixtures. No water ever is added to the chemicals in the container as they are continually reactivated by moisture from the air. The unit is mounted on the carburetor in such a way as to replace the idling-adjustment pin, or screw, found on most types of cars



Gabb Mfg. Co., Windsor Locks, Conn.

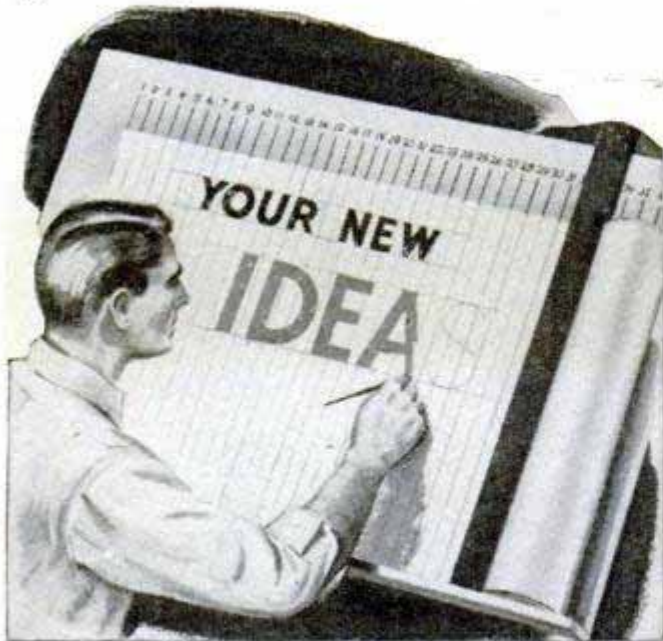
SPARK-PLUG SOCKET WRENCH has been especially designed for removing spark plugs from deep seats, such as those found on modern aircraft and industrial engines. By a novel application of the ordinary snap-ring retainer, a holder is provided for lifting the plug clear after it has been unscrewed. This feature speeds up plug changing and minimizes the possibility of dropping and damaging plugs when removing or inserting them from deep seats in the cylinder head. Unit comes in several sizes and fits ordinary square-nosed socket drivers either of regular or ratchet type



Hanau Engineering Co., 1231-33 Main St., Buffalo 8, N.Y.

AUTOMATIC BUNSEN BURNER with a pilot unit lights at a touch to a full, regulated flame. The on-off valve is controlled by a hand rest which makes it possible to use both hands to support the work over the flame. When the hand is lifted from the rest, the flame goes out, leaving only the pilot burning when burner is not in use. This feature reduces fire hazard to the minimum and will prove especially valuable in shops and laboratories where burners of this special type get intermittent use

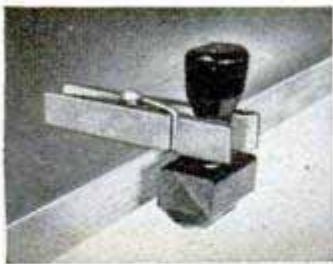
Vertical Lines on Drawing Board Speed Sign Painter's Work



One sign painter increased his work output considerably by ruling vertical lines on his drawing board. The heavy black lines, which are spaced 1 in. apart, are numbered along the top of the board to provide a permanent yardstick for measuring the length of paper to be cut from the roll. In addition, the lines form a series of vertical guides for laying out lettering, as they can be seen faintly through the paper. A 2-in.-wide cleat nailed along the lower edge of the board holds the roll of paper in place.—Paul H. Will, Chicago.

Clothespin Holds Rubber Stamp

Fastened to a shelf, a spring-type clothespin forms a convenient holder for a rubber stamp. A wood screw driven through the



spring coil holds the clothespin in place. The handle of the stamp is gripped by the clothespin jaws, which extend over the edge of the shelf, and the stamp is released

by pressing together the arms of the clothespin. Several clothespins fastened to a shelf in this way will provide a rack for a number of different stamps.

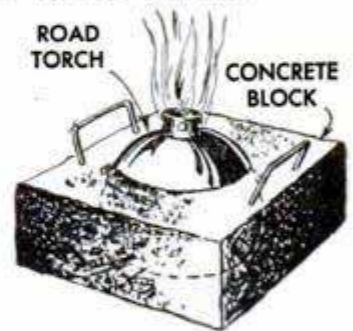
Fast-Cutting Router Bits Made From Broken Drills

The next time you break a drill bit close to the top end of the flutes, don't throw it away, as you can make an excellent router bit from the shank end of the broken drill. Simply grind away one flute and then grind

a straight cutting edge across the end at an angle of about 5 deg. with the axis of the drill. When grinding, dip the bit frequently in water to prevent overheating. To do good work, a router bit made in this way should be rotated at a speed not less than 5000 r.p.m.

W.T.M. Concrete Concrete Base for Road Torch

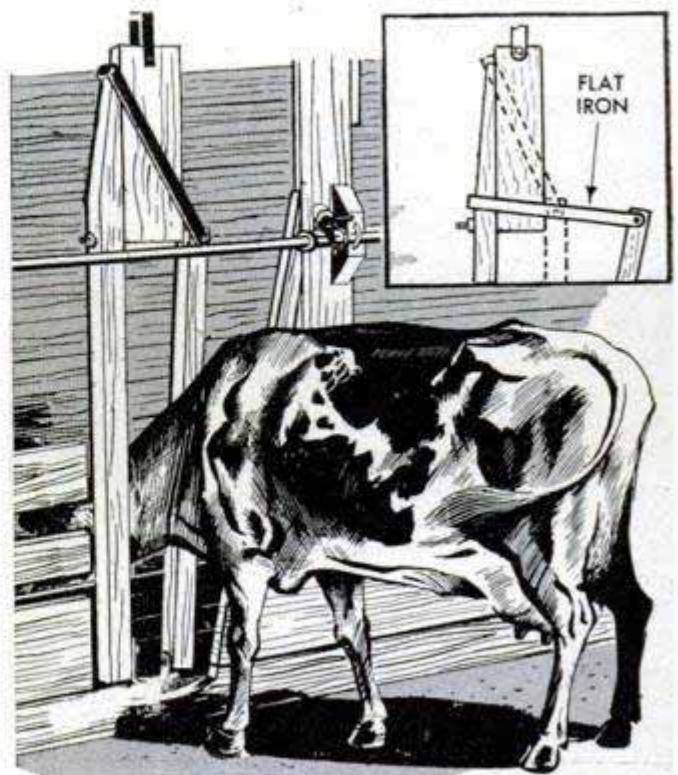
Embedding a ball-shaped road torch in concrete provides a sturdy base that prevents it from being blown or knocked over. The torch is set in the center of a wooden form and the concrete is poured around it to a depth of 2 or 3 in. U-shaped rods embedded on either side of the torch serve as handles.



Ervin L. Strayhorn, Beebe, Ark.

Dairy Stanchion Has Positive Lock

Swinging on a pivot at the bottom, this homemade dairy stanchion is locked in place by raising the flat-iron locking bar which is pivoted at the top of the movable stanchion member. When in the raised position, the top end of the locking bar slips over the offset at the top of the stationary bar. The stanchions are made of 2 x 2-in. oak, with the inside edges well rounded, and supported by a 2 x 6-in. piece suspended from the barn ceiling. The entire stanchion turns easily, giving the cow plenty of feeding movement.

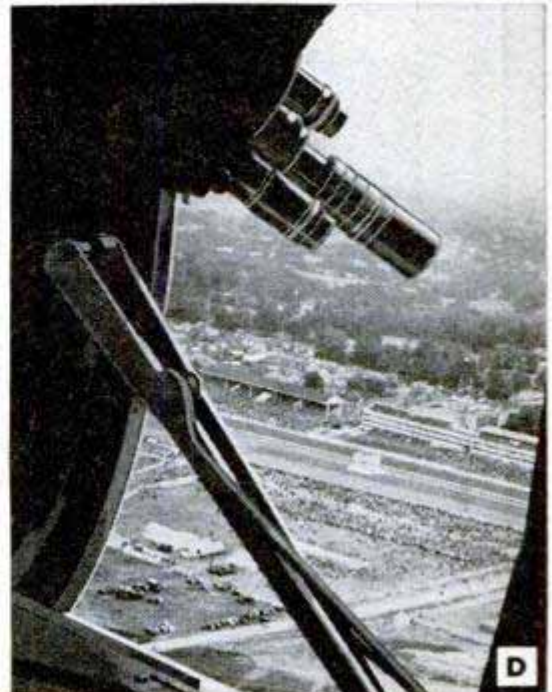
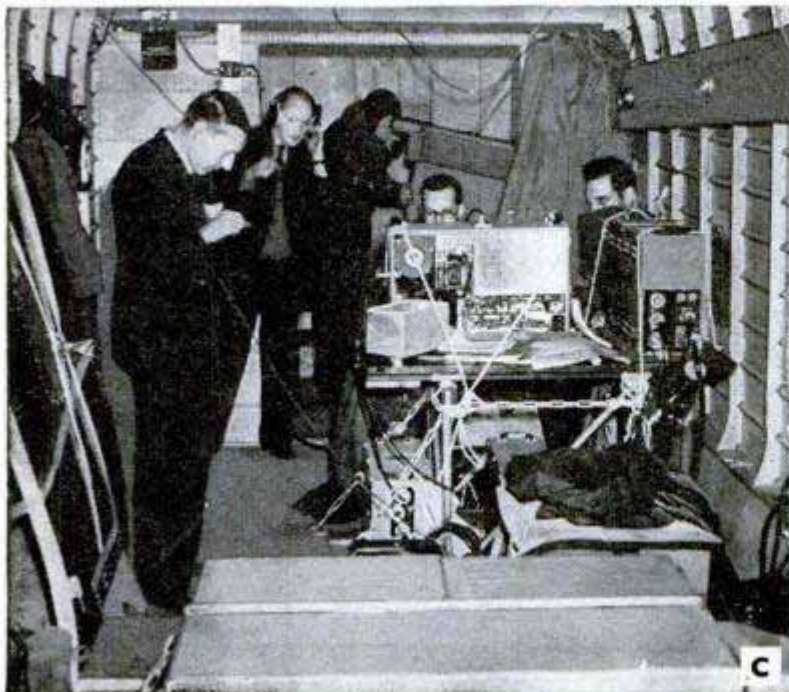
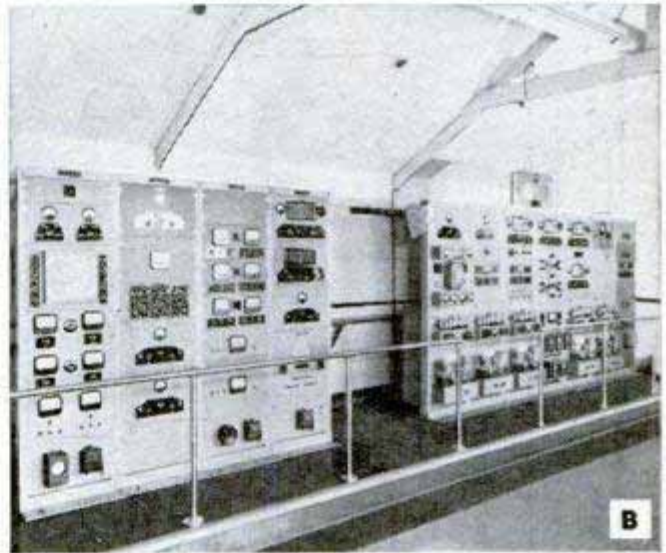
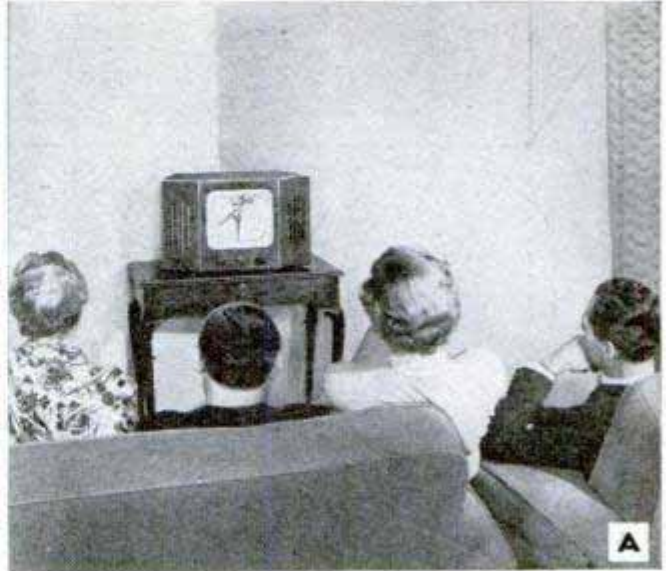


TELEVISION IN ENGLAND

THERE are no private broadcasting stations in England; all stations are operated by the government as a state monopoly. However, sound-relay companies have been licensed, paying a yearly fee for permission to relay the B.B.C. radio-broadcast programs. The subscribers pay a small fee and the radio-program service goes to them by means of coaxial cables and relay stations. TV service is relayed at present to selected subscribers at Hayes, Middlesex, only until the government permits relayed TV service all over the country.

The service is transmitted to the subscriber's home by means of two coaxial cables. With the new E.M.I. Relays Ltd. service, which includes TV programs, photo A, the subscriber has a choice of either the TV programs or any of the four regular sound-broadcast programs. Each town will have its own master receiver, amplifier and relay system as illustrated in photo B. The system provides trouble-free reception as the master receiver is in a selected location.

British TV set owners recently had a grandstand seat at an important experiment in air-to-ground TV transmissions conducted by the Bristol Airplane Company Ltd. Photo C shows the TV transmission equipment in the Bristol freighter during one of the flights. Photo D was taken as the freighter flew over Ascot.



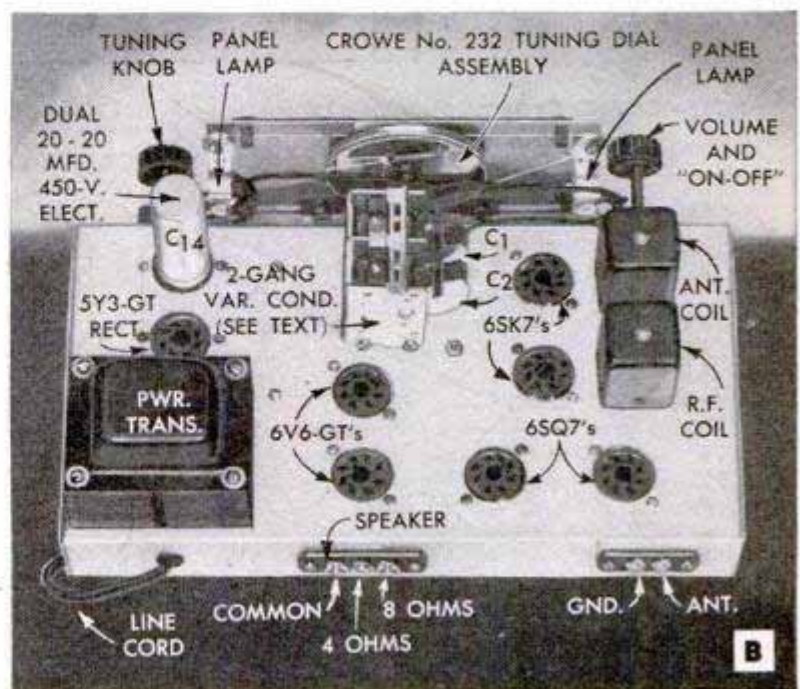
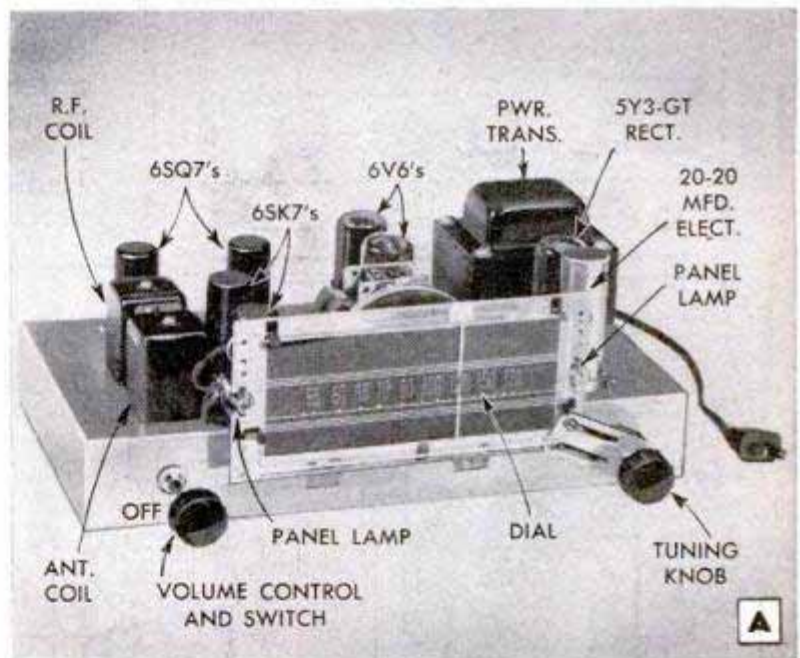
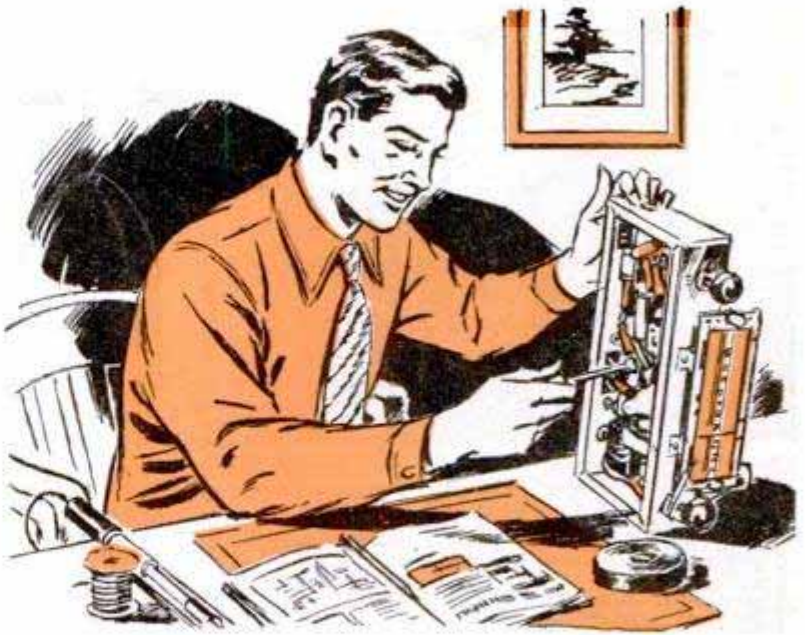
T.R.F. BROADCAST RECEIVER

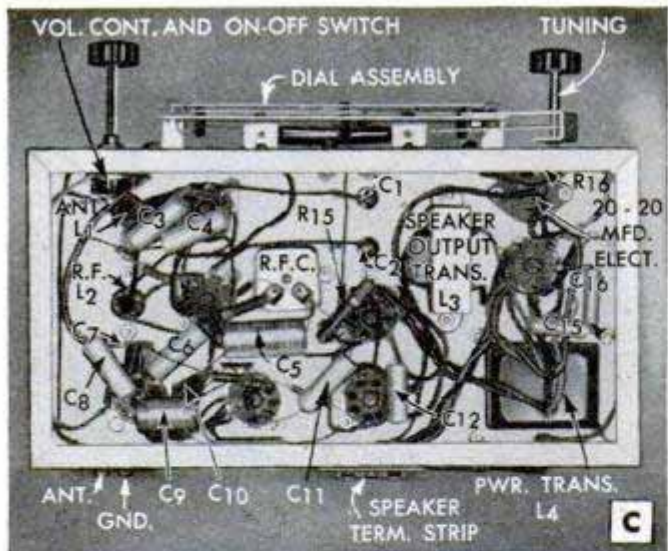
By L. M. Dezettel

FOLLOWING a trend of increasing interest in high-fidelity sound reproduction, this new model of the popular annual Little Giant student receiver is designed to meet the requirements of students and experimenters with limited pocketbooks. A complete home high-fidelity system involves several expensive components such as a special audio amplifier, speaker and a tuner. However, very satisfactory high-quality reproduction of broadcast music can be achieved inexpensively with just a specially designed receiver. The receiver described here approaches the high-fidelity results obtained from more expensive equipment but is easy to build from standard parts available from any radio supply house at a cost of about \$30.00.

This receiver will pick up the standard broadcast signals, pass the full band width of the transmitted signal and reproduce the audio portion of it through a push-pull power amplifier stage, with an order of fidelity not ordinarily found in the average receiver today. It can be installed in a cabinet, or made a part of a custom installation. It needs only a short external antenna and a good quality 10 or 12-in. PM speaker to be complete.

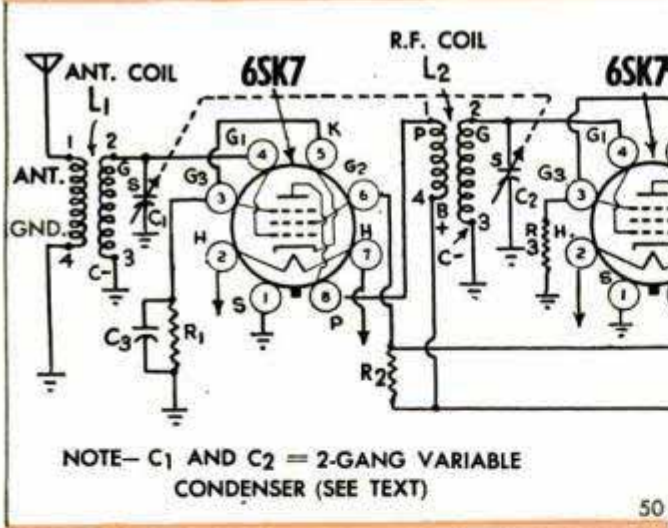
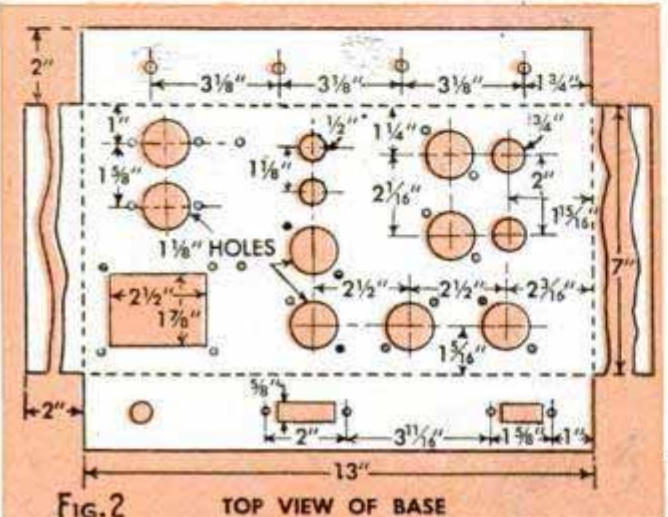
The simplified wiring diagram is given in Fig. 1, and the standard-size chassis-base details are shown in Fig. 2. Photos A, B and C show various views of the completed receiver. The schematic circuit diagram appears in Fig. 3. The dial is a standard Crowe assembly. This assembly includes a combination broadcast and short-wave dial scale. However, a dial scale with the broadcast band only is available separately. The Meissner coils are of standard construction and available almost anywhere. These coils are designed for 365 mmfd. variable condensers. As two-gang variable condensers of this value are now difficult to obtain, use the new standard two-gang 498.8 mmfd. variable condenser with trimmers, for C1 and C2, and merely remove four of the rotor plates from the





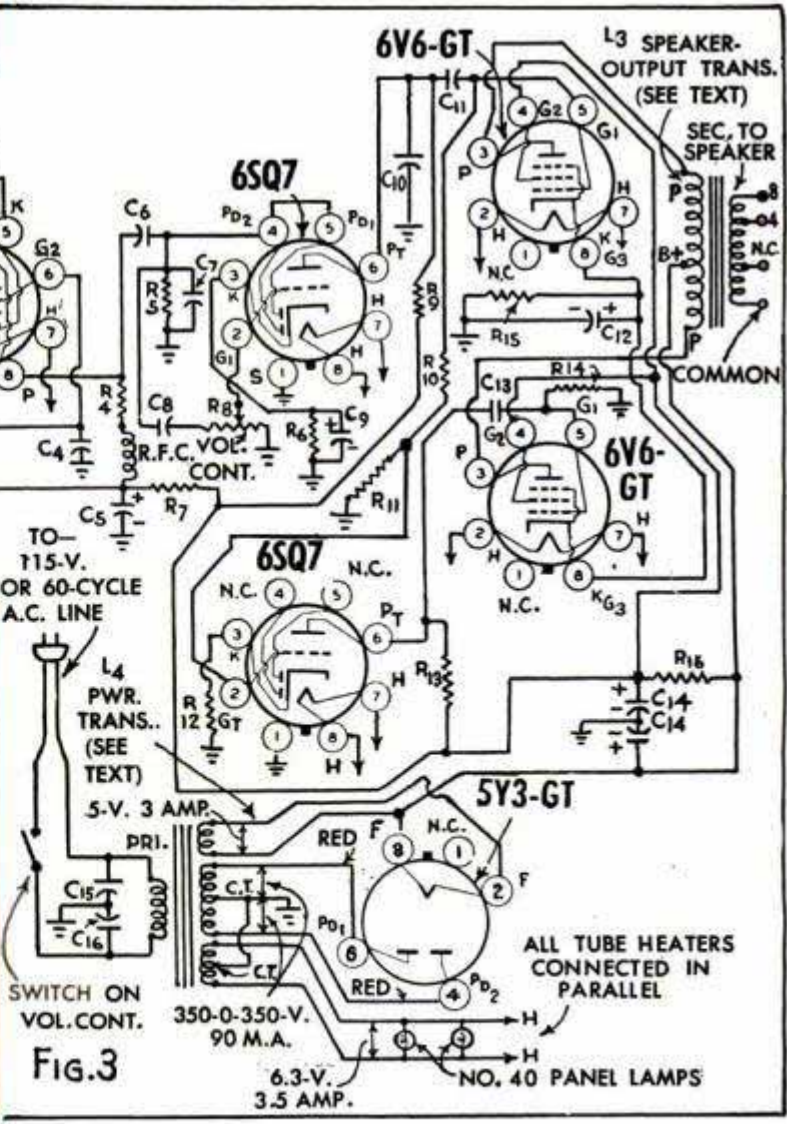
front and rear sections with a pair of pliers, beginning from the outer ends. Remove rotor plates only. Move each plate back and forth gently near the brass crossbar until it falls out of its groove in the rotor shaft. Output transformer L3 can be either a Thordarson T-22S56, or a Stancor A-3870.

Use rosin-core wire solder only, and keep all leads as short as possible. The power transformer L4 can be a Thordarson TS-24R04 or a Stancor P-6012. Final adjustment of the receiver is very simple. The two trimmer condensers on the two-gang variable condensers are used to adjust at the high-frequency end of the band. The low end of the band will track very close without any adjustment. Adjust the trimmers for obtaining the correct reading on the tuning scale and place the traveling pointer for approximately correct calibration. Tune in a station at the high-frequency end of the band and adjust both trimmers for maximum volume. In or near large cities where there are several broadcasting stations, use a 10 or 15-ft. indoor antenna for best selectivity and to prevent overloading. Detailed student material list R-399 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



RESISTOR CHART

R1	1000 ohms, 1/2-watt carbon
R2	12,000 ohms, 1/2-watt carbon
R3	1500 ohms, 1/2-watt carbon
R4	18,000 or 20,000 ohms, 1-watt carbon
R5	220,000 ohms, 1/2-watt carbon
R6	4700 ohms, 1/2-watt carbon
R7	28,000 ohms, 1/2-watt carbon
R8	1- megohm volume control (audio taper)
R9	220,000 ohms, 1/2-watt carbon
R10	470,000 ohms, 1/2-watt carbon
R11	22,000 ohms, 1/2-watt carbon
R12	4700 ohms, 1/2-watt carbon
R13	220,000 ohms, 1/2-watt carbon
R14	470,000 ohms, 1/2-watt carbon
R15	270 ohms, 2-watt carbon
R16	1800 ohms, 2-watt carbon



FAULTY INSTALLATIONS OF TV-ANTENNA SYSTEMS

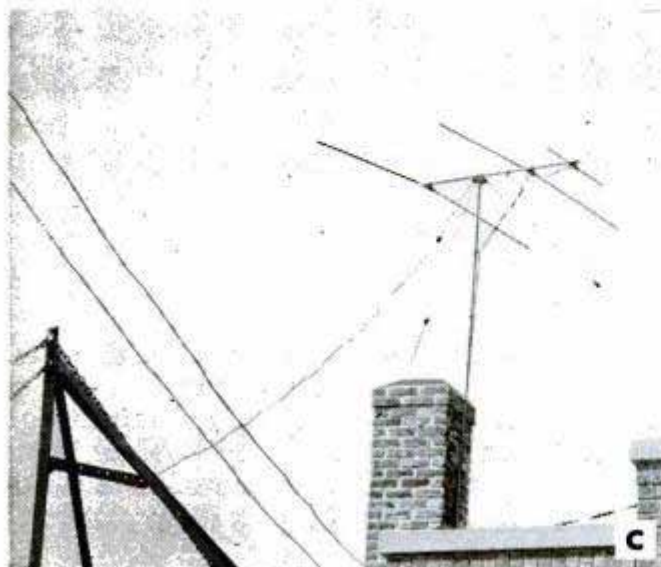
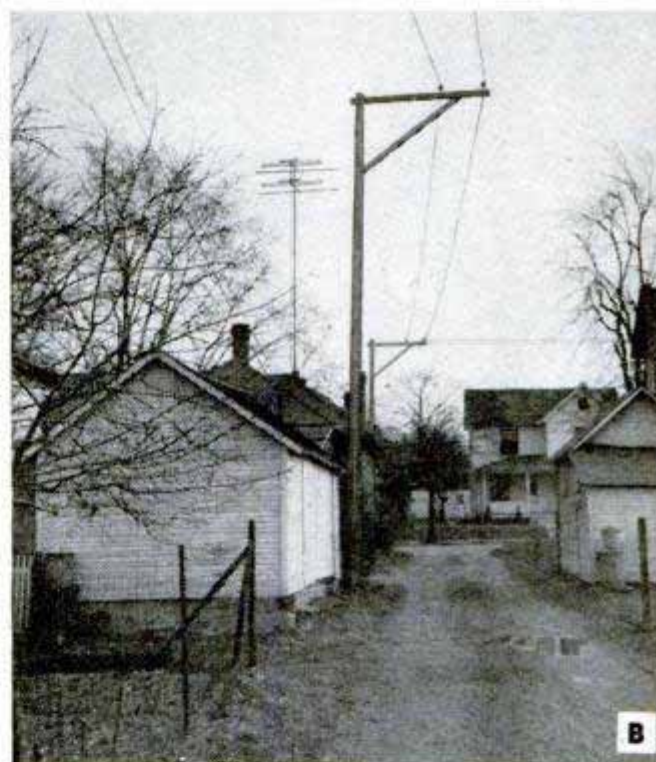
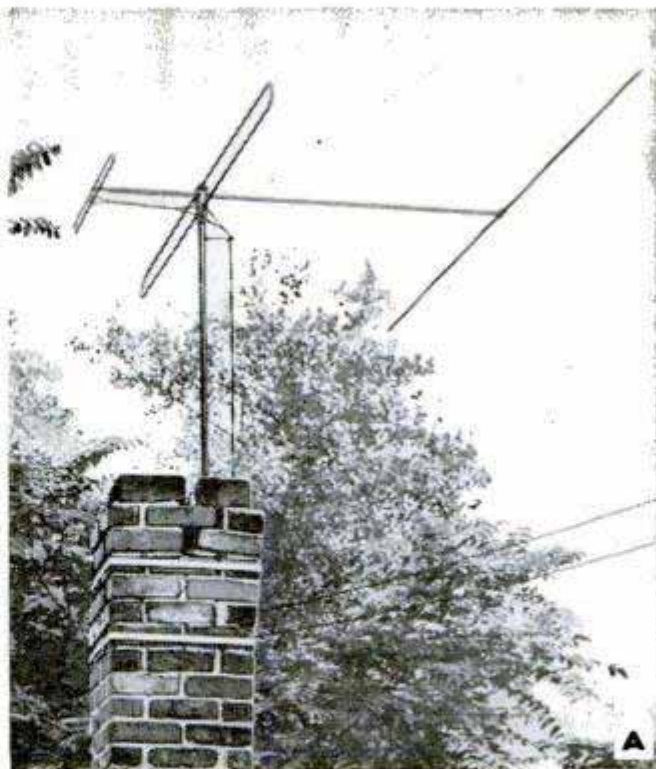
By **George MacDonald**

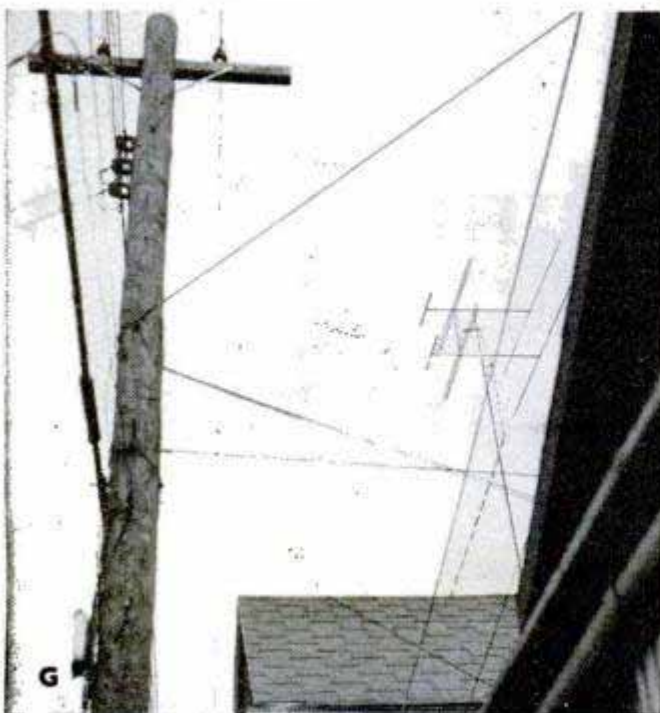
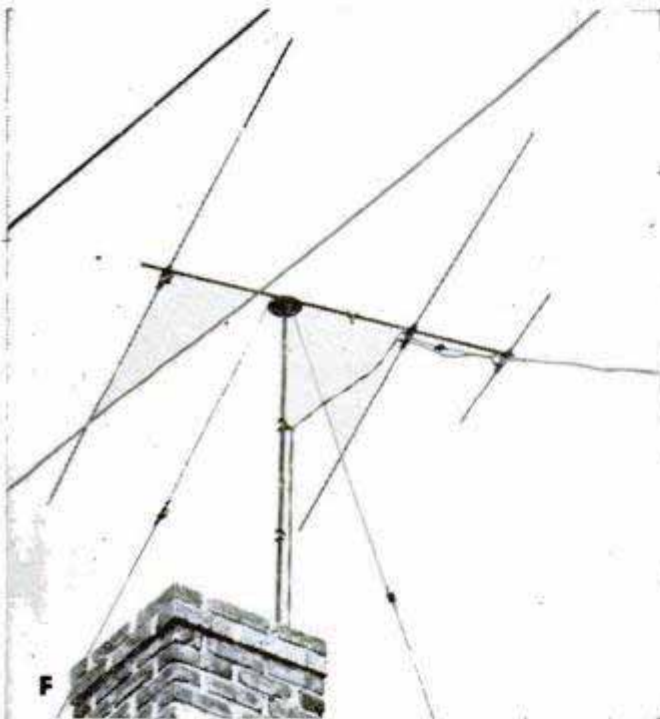
Senior Safety Engineer, National Safety Council

WHEN TV SETS first came on the market, the dealer made arrangements as part of the purchaser's contract for an engineered antenna installation. In fact, this was almost mandatory before a set could be sold.

In the past two years, competition has become greater in this field. Originally handled by specialty appliance-radio-TV dealers, television receivers are now also sold by department stores, hardware stores, music stores and even drugstores. Through some of these mediums—unless the work is turned over to a service organization—the set is sold with an outdoor-antenna kit without installation charges, a condition which appealed to the general public. As comparatively few new owners had the necessary experience to cope with the TV-antenna-installation problem, accidents began to occur.

Unlike ordinary outdoor radio-antenna systems, TV antennas are of special design and in many locations, especially in fringe areas, they must be higher than ordinary radio antennas. Until recently very little information on TV-antenna installation has been available to the general public. Installers, who had never been on a roof before, fell off ladders and otherwise injured themselves. As a result of faulty installations, TV antennas fell on power lines and caused interruption of service. In locations where it was necessary to elevate the antenna considerably, extensions were added to the masts provided in the kits without adding the necessary guy wires to support





the higher masts. Others made the mistake of trying to strap the antenna mast to a chimney that was badly in need of repairs as illustrated in photo A.

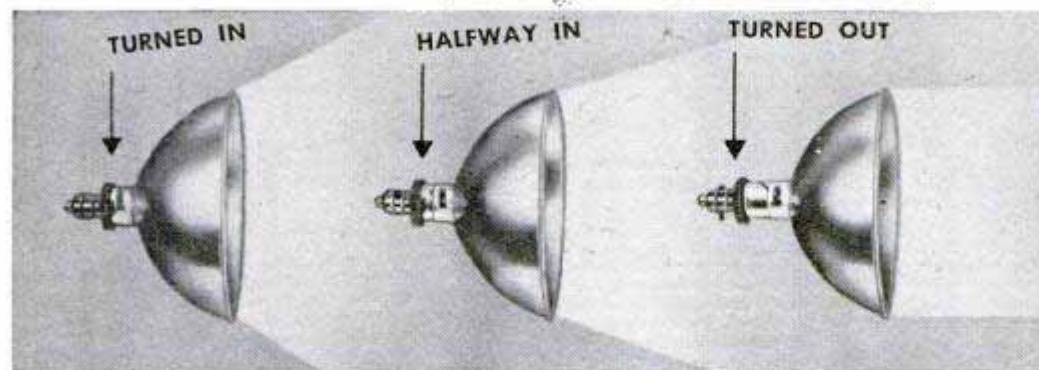
Some of these hazards can be eliminated by sizing up the job before actual operation. For example, the installer should note the type of antennas on adjacent buildings, the relative height of the masts, how they are oriented, and the type of guying or support needed relative to the wind and other local weather conditions. In addition to the physical conditions of the working area, the installer should carefully check the immediate area for energized wires and should determine the most usable spot for the antenna as far away from contacts as possible. With this same thought in mind, he should route the transmission line from the antenna accordingly. Local building-code provisions dealing with structures and electrical installations must be observed.

Photo B shows where the power-and-light company relocated its high-tension wires to extend beyond the arc of the high TV-antenna mast should it fall. Photo C illustrates how a loose guy wire can fall across power lines. Photos D and G show examples of high antenna masts erected with no thought to measuring clearances from power lines. The same condition exists in photo F, even though the antenna is only a few feet above the chimney.

Accidents, personal and otherwise, can be avoided by using common sense. The installer in photo E is just asking for trouble. For elevation while erecting the antenna, he apparently intends to stand on a stool on the edge of the chimney. When installing a rotating device on a TV-antenna mast always check to see that there is sufficient clearance for the elements at all points of the compass. Don't fail to secure eyebolts and make sure that you use enough guy wires. In some cases, the installer failed to use good mechanical judgment and over-tightened nuts, bolts, and guy wires so that the threads were stripped. In one location, the installer failed to secure the guy-wire turnbuckles by threading a wire through them. Becoming unscrewed as result of vibration caused by the wind, they released the guy wires and permitted the antenna mast to fall.

The installation of television antennas is no more hazardous or difficult than installing any other type of roof antenna, but it does require some thought and attention to details in order to avoid the mistakes described and illustrated in this article. Every experienced set owner, radio amateur and serviceman knows that any roof-antenna job requires the observance of safe practices. Ladders must be carefully placed to prevent falls.

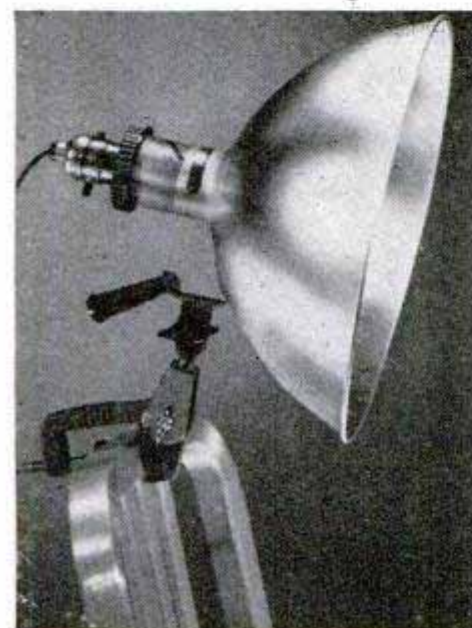
How to make wide- and narrow-beam flood shots with one lamp



wide beam for general still work

moderately narrow beam for your movies

extra-narrow beam for glamour shots

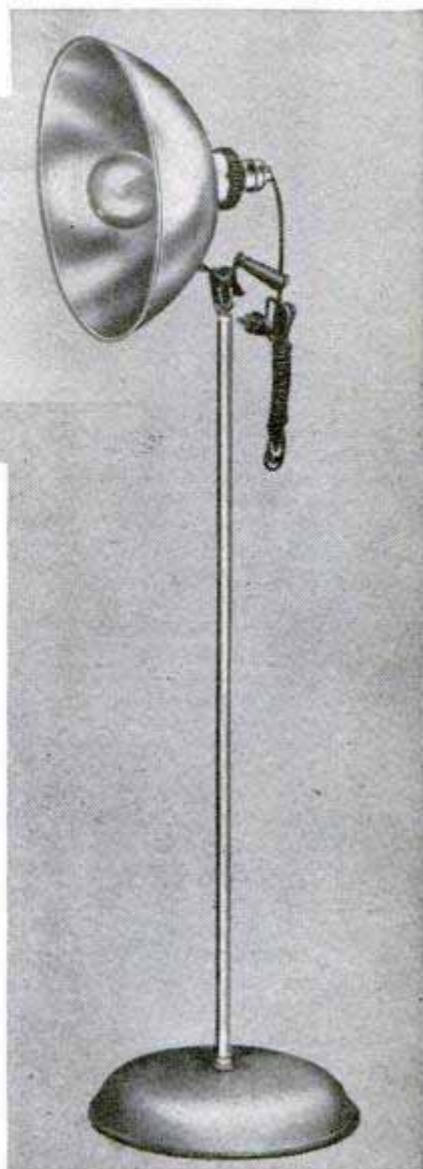


Kodak Vari-Beam Standlight (right)

As you see above, the versatile Kodak Vari-Beam system is mighty handy. 12-inch reflector with a #2 flood lamp gives powerful illumination . . . convenient handle aims the lamp . . . telescopic column adjusts height from 3 to 5½ ft. . . special rubber rim on heavy base protects furniture. \$15.

Kodak Vari-Beam Clamplight (left)

Lamp unit has all the features of the Vari-Beam Standlight unit, but is mounted on flexible bracket. Padded clamp attaches quickly and securely to chair backs, table tops, and tubular surfaces. \$9.75.



Why 2 flash units are better than 1

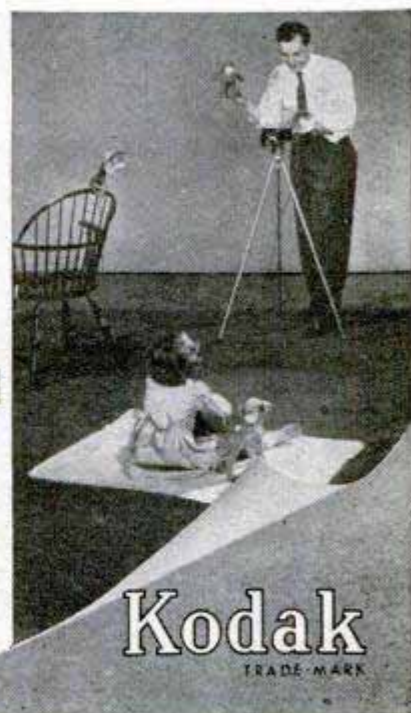
Flash pictures taken with multi-flash illumination have a more pleasing, natural look. You eliminate possibility of burned-out highlights and dense shadows in flash shots this easy way:

Start with the KODAK FLASHHOLDER connected to camera—easy to attach. New model with handy data on back of reflector, \$11.50.

Then connect a KODAK FLASHHOLDER EXTENSION UNIT, MODEL B. Attach to a chair for side lighting. More than one unit can be used. \$12.75.

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Spiro-Seal steel section on the 10-Up oil ring develops a special compensating action that minimizes friction on the power stroke. Then, as the piston rises in cylinder, Spiro-Seal lessens its contact thus insuring adequate wall lubrication for exceptionally long life. This is one of many Rameco originations which make possible the control of oil in worn engines through STABILIZATION rather than pressure. See your repair shop displaying the RE-POWERING Sign... or write for free booklet. Send postcard to Ramsey Corporation, Dept. 3764, St. Louis 8, Missouri.

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Sculptor of a Prehistoric World

(Continued from page 102)

has set, he soaks it in kerosene and, for some reason which he can't explain, it doubles its size in every detail. Even the tiniest portion of the mold expands to twice its original size. By repeating the process, pouring a new mold and soaking it, he can enlarge the original mold any number of times he desires. Using this technique, he can enlarge an acorn to pumpkin-size with no loss of detail.

He often uses live animals as models. When he makes a mold of a frog, he anesthetizes the animal and slaps a plaster kimono around it. When the anesthetic wears off, the frog struggles out of the hardened plaster and scampers away no worse for wear, leaving an accurate impression of its body. Marchand uses the same technique with snakes and other small animals.

"So far as we know," says Marchand, "Reimann and I are the only free-lance team in the country doing this sort of work. It's highly specialized, of course. Others reproduce nature scenes, but they usually feature taxidermy. We do no taxidermy. Instead, we try to reconstruct the life of geological periods so ancient as to be almost unbelievable. In our modern exhibits, we require that the models be indistinguishable from the living counterparts."

Next time you visit your favorite museum, look around for Marchand's work. He needs no signature or by-line—if you find a fossil diorama that is so real that you can't believe your eyes, then it's a good bet that Marchand made it!

"Tropical Tramps" Link the Americas

(Continued from page 94)

the animal standing there. How the field attendants got it down the next morning has never been adequately explained.

How to load, carry and care for all kinds of cargo are constant worries of Alfonso and Wright. It's still a trial-and-error business, they point out. But already an amazing array of machinery and techniques facilitates the moving of tons of freight through the big terminal.

No longer do the chicks and cigarettes go in heavy crates. Chicks, which must be freshly hatched so no food will be required (they'll be delivered in 24 hours), go in light cardboard "apartment houses." Cigarette packs go in featherweight net bags.

Heavier items like mine machinery or

(Continued to page 240)

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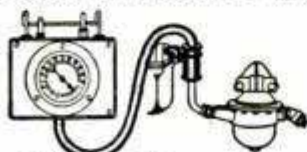
Care and Feeding of Engines

BY S. P. CORP

FINDING THE MISS

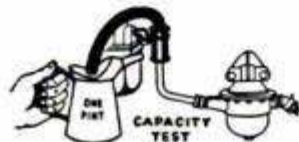
High speed misses are not always corrected by new coils. A stone bruise or dirt in the gas line may let through enough gas for low speeds but not for continued high speed driving. These two tests are then indicated:

Pressure Test: Disconnect fuel line at carburetor and connect pressure gauge as shown. Idle engine until maximum pressure shows—from 3 to 5 lbs. Stop engine and if pressure falls quickly, check fuel pump valves and diaphragm.



PRESSURE TEST

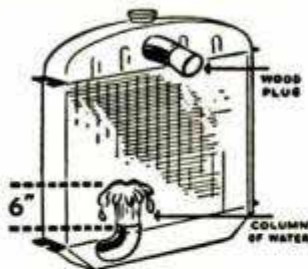
Capacity Test: Connect short hose to fuel line; place other end of hose in a pint measure. Then crank engine enough to prime pump and fill hose. Pour out fuel in measure and crank engine for 15 strokes of the pump. It should deliver 5 to 6 ounces of fuel if pump is O. K. and fuel line is clear. If not, check for restriction in line between gas tank and fuel pump.



CAPACITY TEST

STOPPED AT FRONT LINE

If Old Man Winter has fouled up your cooling system, the first warm weather will usually reveal this sad fact. To locate the trouble, remove top and bottom hose from radiator and fit wooden plugs as shown, after draining radiator. Fill radiator and leave cap off. Then remove bottom plug and see how high water squirts. It should be 5 or 6 inches if core is not clogged. If radiator is clogged, give it a thorough reverse flush and use a good radiator cleaning solution. Be sure to drain the radiator immediately before the loosened sediment has a chance to settle. There's nothing more annoying than to be miles from home on a vacation trip and have overheating trouble. Guard against it now!



WOOD PLUG
COLUMN OF WATER
6"

GET SET FOR SPRING!

When warm days come and birds return and buds bust forth with surging power—what about your car? Will it surge with power—or go pfft? Get set for spring with new Sealed Power Piston Rings—the best rings built! Sealed Power MD-50 Steel Oil Ring is the world's finest—the only ring with the Full-Flow Spring—controls oil even in badly tapered and out-of-round bores! Ask for free booklet, "7 Ways to Save Oil." A card will bring it—just address Sealed Power Corporation, Dept. G-3, Muskegon, Michigan. For triple wear, get Sealed Power Chrome-Faced Rings.

Clinic



for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Shotgun "Sweats"



Q—I know this question is a little out of line with home problems, but last fall when bringing my shotgun inside the house after a day's hunting in cold weather, the metal parts became coated with moisture and rust spots appeared. What caused this and how can I prevent it?
L.A., Huron, S.D.

A—After carrying your shotgun for several hours in temperatures below freezing, the metal becomes very cold. When you bring the gun indoors, into warmer air, moisture in the warm air condenses on the cold metal surfaces; just as it does on the surface of a glass tumbler filled with cold water on a warm summer day. It is not safe to rely on the ordinary gun case to prevent the entrance of warm, moisture-laden air, that is, under these particular conditions. A better way is to make a full-length plastic cover with all seams folded in and sewed with two rows of stitching. The seams can be cemented, of course, but two rows of stitching will serve equally well. Fit a long drawstring at the open end so that the cover can be slipped over the muzzle, pulled tightly about the gunstock just back of the grip, and tied securely to prevent the entrance of warm air. Placing the cover over the gun before taking it inside and tying the drawstring tightly around the stock will prevent condensation of moisture on the bare metal. Use a thin, flexible plastic of the type used for draw curtains and window draperies.

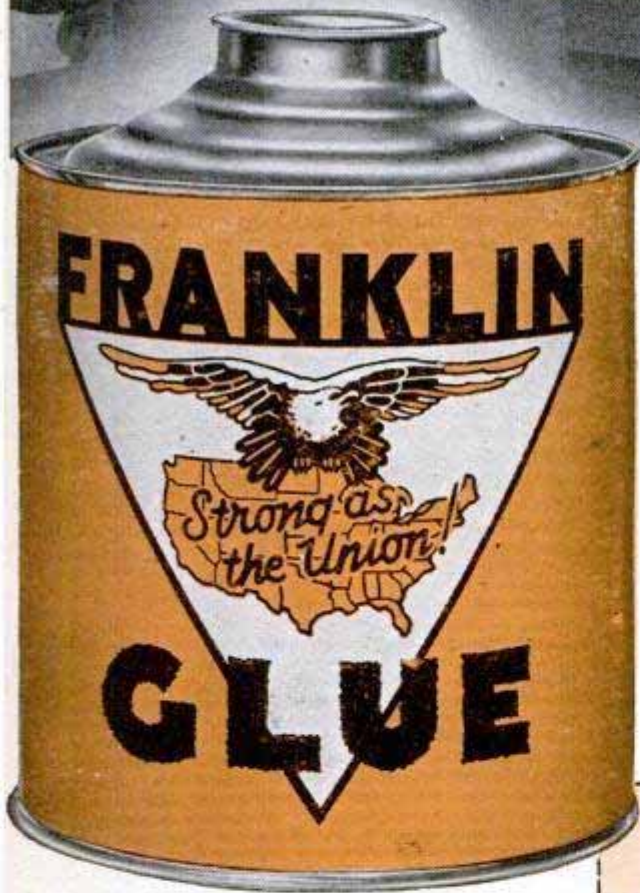
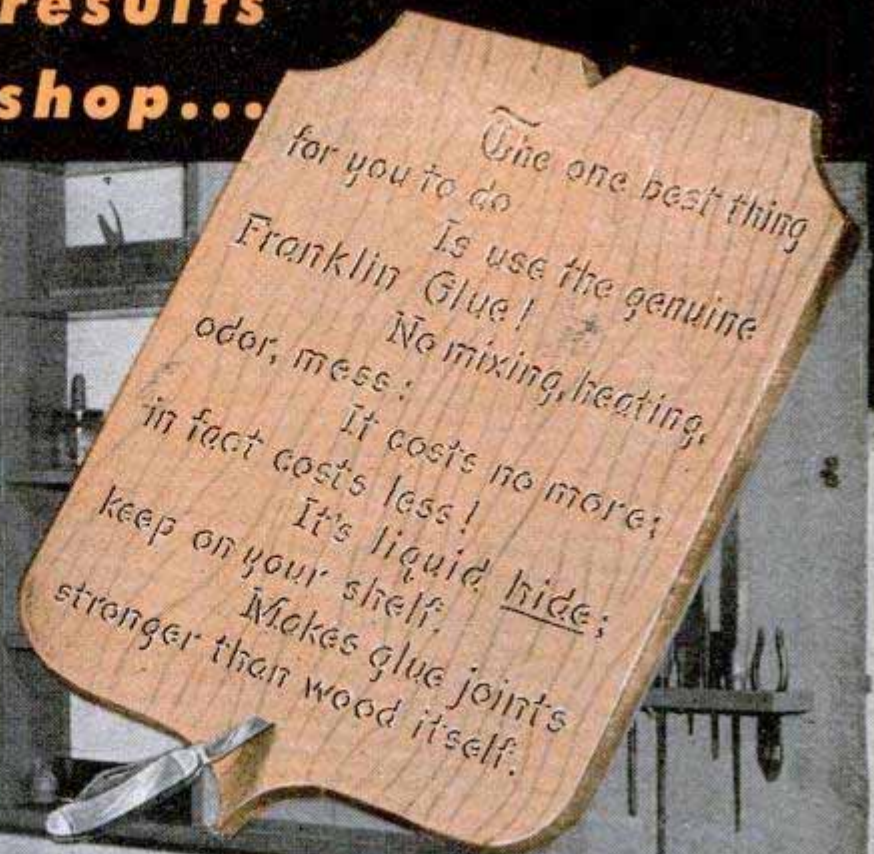
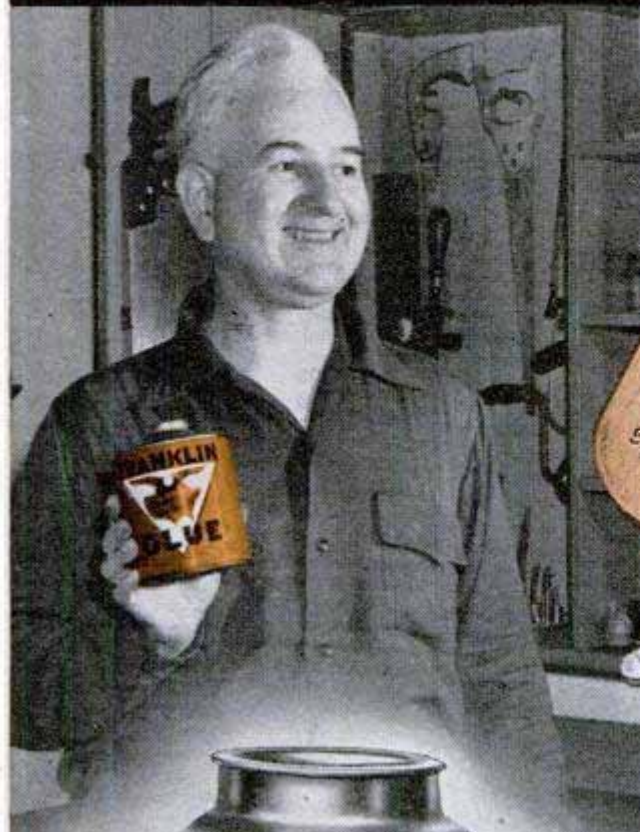
Old Furniture Finishes

Q—What kind of finish was used on the home furnishings made by our early American colonists? How did they achieve that unusual reddish-brown color on pieces made of pine? I'm not referring to painted pine, but to the clear finish which colored the wood without hiding the grain. How long has white lead been used?—A.Y., Albany, N.Y.

A—The type of finish used varied with the period. One of the earliest finishes known to have been used on pine was made by mixing a small quantity of Venetian red with fresh skimmed milk. It is quite possible that this produced the reddish-brown finish you are referring to, although it should be remembered that nearly all woods change color, and, to some extent, grain characteristics, in

(Continued to page 238)

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Genuine HIDE glue, strongest known. Easy to use . . . no mixing, no heating. No odor. Eliminates chilled joints. Actual laboratory tests prove Franklin Glue holds more than 4000 lbs. per sq. in. and shows 100% wood failure. Spreads thin, goes farther. Costs no more than ordinary glues. Ideal for all home uses. If your dealer cannot supply you, send this coupon with 20¢



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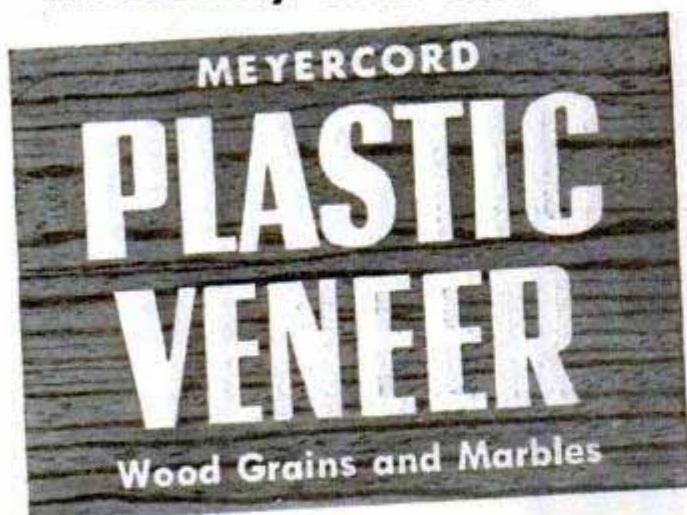
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| <input type="checkbox"/> Rhododendron Burl | <input type="checkbox"/> Breche Rose Marble |
| <input type="checkbox"/> Mahogany Crotch | <input type="checkbox"/> Jaune Benou Marble |
| <input type="checkbox"/> Mahogany Stump | <input type="checkbox"/> Mexican Onyx |
| <input type="checkbox"/> Striped Mahogany | <input type="checkbox"/> Brazilian Onyx |
| <input type="checkbox"/> Straw Zebra wood | <input type="checkbox"/> Rose de Brignole Marble |
| <input type="checkbox"/> Carpathian Burl | <input type="checkbox"/> Skyros Marble |
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(Offer good in continental U.S.A. only)

(Continued from page 236)

the aging process. This is especially true of white pine, which darkens on exposure to light and air. Over long periods the reds and browns in this wood greatly intensify, resulting in the aged patina so highly prized by collectors. In a later day, a form of liquid wax was quite widely favored by cabinet-makers. In your reference to the use of white lead we assume you mean its use as a pigment in paint. Although industrial production of white lead for this purpose is only a little over 200 years old, the basic pigment, or basic carbonate of white lead, has been in use for centuries.



Finishing Plywood Edges

Q—I'm building a simple project of $\frac{3}{8}$ and $\frac{3}{4}$ -in. fir plywood, and I'm having trouble getting a smooth varnish finish. How can I seal the surfaces so that the liquid finishing materials will not absorb and leave some areas flat and others shiny? Also, how does one finish the exposed edges smooth and square?
W.B., Scarsdale, N.Y.

A—This wood requires a special sealer to provide a surface for building a satisfactory varnish or enamel finish. After sanding the wood smooth—don't use a coarse sandpaper on fir, as the scratches are difficult to remove—apply the sealer according to the directions on the container. After the sealer is thoroughly dry, apply finishing coats of varnish, or enamel, as desired. In cabinet construction and in some other types of work where this wood is used, it is a common practice to design the unit so that there will be no exposed edges of plywood in the completed product. However, if the design of the project is such that certain edges must be exposed, they will require a special finishing treatment. First, the edges are sanded perfectly smooth and a sealer is applied and allowed to dry. Follow the sealer with a natural wood filler (if the wood is stained, the filler must be colored to match) rubbing the material into the grain and openings between the several plies with a coarse cloth. Certain types of crack fillers and paste white lead also can be used for this job, depending, of course, on the type of finish that is to be applied. After the filler is dry, sand lightly with fine sandpaper and apply the finish.



Efflorescence On Masonry

Q—My home is about one year old and recently I have noticed a peculiar, crystallike substance or "growth," forming on the surface of the basement wall. Surface of the blocks seems to be crumbling as a result. What is this, and what can I do about it? Can I paint or plaster over it?
F.F., Akron, Ohio.

A—If we judge correctly from your description, the crystallike coating "growing" on your basement wall is what is known as efflorescence. It appears on the surface of brick, concrete-block and monolithic-concrete walls when certain salts contained in the masonry are activated in the presence of moisture and force their way to the surface. There are a number of suggested remedies, none of which can be considered a positive cure in all cases, but which have been reported to give fairly satisfactory results. Perhaps the simplest of these is to remove all the coating and loose particles with a stiff wire brush, then coat the affected surfaces with a zinc-sulphate solution. Homeowners who have used this method report that it has proved quite reliable as a cure for the trouble.



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3. Grooms Hair Perfectly!

Lucky Tiger keeps hair in place easily . . . without making it look greasy. For that natural look, use Lucky Tiger.



2. Kills Dandruff Germs*

Lucky Tiger goes farther than the hair tonics that merely remove loose dandruff. Lucky Tiger actually kills on contact the germ *pityrosporum ovale**, a common cause of infectious dandruff.

LUCKY TIGER Hair Tonic

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THIS DEAD BLADE still looks new but it blurs rain, smears muck, streaks glass. DEAD blades make dead drivers!



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WHAT LASTS FOREVER? Nothing does. This is especially true with Windshield Wiper Blades—even though made of finest natural rubber. Corrosive windshield film, wind burn and hot sun BAKE the life out of wiper blades, often in six months or less. DEAD blades cause dangerous windshield smear. DEAD blades make dead drivers. Make sure your car has live, new windshield wipers.

Change Your Wiper Blades

Next time you buy gas, change to LIVE,

NEW ANCO BLADES . . . RAIN-MASTER for Flat windshields . . . CLEAR-FLEX for Flat or Curved windshields. They fit all cars—wipe quicker and cleaner than any other blades.

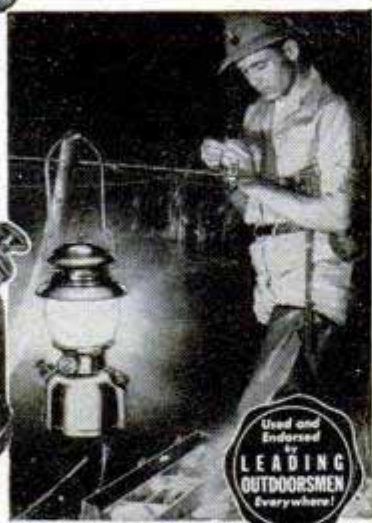
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NEW Coleman FLOODLIGHT LANTERN

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refrigerators are put on a big pallet in the warehouse, hoisted on a fork truck and driven out to the deck level of the plane like a waiter would carry a tray. Automobiles and animals may go up ramps under their own steam, or be loaded by the fork lifts. For four-legged layovers in Miami, Vic has even arranged what he calls the "horse hotel" where the animals can be bedded down, fed and watered. Valet service includes currying and rub downs in a private stall. "But you have to be a horse to stay there," he says.

Alfonso is continually looking for new tricks that will eliminate packaging weight. Furniture can go without crating. The plane is rigged with pads like a super moving van, the furniture is hauled up from the store, is loaded as is, and delivered the same way. Alfonso sent a single shipment of 200,000 pounds of beds, dressers, vanities, chairs, sofas and floor lamps to outfit the entire Caribe Hotel in San Juan, saved the owner the extra cost of crating and uncrating, plus valuable time.

Orchid growers were leery of planes, since their valuable plants "go to sleep" if they're chilled and wither if they're out of water. Up came the boys with the idea of slipping the stems in test tubes of liquid plant food, which is retained in the tube by a sponge-rubber collar that fits over the stem and caps the tube. Today, Gonzalez-Lugo, a single grower in Caracas, ships 30,000 of the plants that way each year. The pilots don't fly too high when they carry orchids, so the delicate flowers are not chilled.

Occasionally, the boys gnash their teeth over a job they've taken on—but that is becoming an increasingly rarer situation.

The most recent barrage was leveled at Alfonso when he accepted a shipment of 2364 feet of three-inch hawser which had to be rushed to a tugboat en route to Venezuela with a valuable tow. The hawser arrived in Miami in two massive coils, neither of which would have gone through a barn door, let alone a cargo-plane hatch.

Chagrined cargo handlers had to uncoil every inch, pass it through the hatch and recoil it inside. At the delivery point in Kingston, Jamaica, the same process was repeated in reverse.

Whatever the cargo, the tropical tramps can probably handle it. They have boomed the business from nothing to a point where thousands of tons of anything that will go through a cargo hatch is pouring through the southern gateways to any place south of the Gulf with a landing strip big enough to take a C-46. And now they're bringing substantial cargoes back home.

Here is something you don't know about your own automobile

Let's say you're driving your car on a level road at 40 miles per hour. Do you know that *half* the power generated by your motor never reaches the rear wheels; doesn't help your car go farther or faster or climb a steeper hill?

And do you know why? Because automotive engineers have proved that 50% of that motor's power is used to overcome *friction*.

Therefore any lubricating oil which further *reduces* this internal friction can't help but deliver the same power with *less* gasoline.

That's exactly what Macmillan Ring-Free Motor Oil does. And we don't just think it's true — we *know* it's true. Here's how we proved it beyond question:

There is a machine called the Dynamometer. It is a scientific way to measure the power an engine delivers to the rear wheels. Cars of all makes, models and ages — cars that had been using *every* nationally known brand of motor oil — were used in this nation-wide test. Hundreds and hundreds of them! And what was the result?

The same thing happened every time: When the oil in these cars was changed

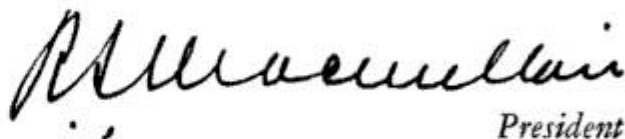
to Macmillan, *the same power was developed with an average of 8% less gasoline.*

That means, at an average price of 25¢ per gallon, you can save 2¢ on every gallon of *gas* — simply by changing your motor *oil*.

What's more, 1094 certified road tests proved that, when the *oil* in an average car is changed to Macmillan, you get 1.3 more miles to the gallon of *gasoline*.

You can't laugh off proof like that — proof that makes dollars-and-sense! Especially when, on top of all this, Macmillan Oil actually *removes carbon from your motor* — cleans your motor as you drive.

Ask for this fine motor oil at any one of the more than 35,000 dealers in America where you see the sign of the big red "M." It means Money in your pocket, Mileage in your car.



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President

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IT HOLDS

The Jacobs Manufacturing Company
West Hartford 10, Connecticut

Stunt Drivers Will Do Anything To Please

(Continued from page 137)

punishment," Chitwood says. "After each show, hundreds of curious men, women and kids pour down to the track to inspect our rolling stock—to be sure it's what we claim it is."

In other types of stunts, however, in which cars are deliberately crashed, rolled over or demolished, older prewar models are used. They are purchased in the city where the Chitwood troupe happens to be appearing. Fenders are removed, glass is taken out of the windows and doors are tied shut.

In a number called the "Roll Over," the stunt man wears a crash helmet and safety belt. He guns the car down the track and hits a ramp slightly higher than that used in the "Wingover" stunt. The ramp throws the car clear over on its side. From then on, it's a crashing, twisting, end-over-end mass of metal hurtling through the air. The driver throws himself flat on the seat, grips the steering wheel with one hand, the glove compartment with the other.

Old cars are crashed in this manner until their motors won't fire any more. Most cars cannot take more than six or seven consecutive crashes in one performance. One tough old buggy in Salem, Ind., lasted for 15 crashes.

When two cars have been reduced to smoking junk they are stacked approximately 50 feet from one end of a broad ramp. This is the spectacular "Dive Bomber" stunt. A third old car zooms up the ramp, sails through the air and lands on the other two.

Where do the men come from who risk their necks night after night in this fashion? Many of them are veterans of the automobile racing tracks, some are Hollywood stunt men and circus performers, some are high-school youngsters with a thirst for thrill and adventure.

Joie Chitwood started out as a welder; Pierre Armand was a fighter in the French underground; Hal Kent was a student at the University of Virginia; "Snooks" Wentzell was a Hollywood stunt man; and "Flash" Wardlow was a motorcycle racer.

A couple of years ago a beardless youth followed one of the Chitwood troupes all over Pennsylvania, begging to be allowed to join up with them. He'd do anything, he said—grease the cars, help move ramps, change tires.

"You finish high school, get your mother's permission and then we'll see," Chitwood

(Continued to page 244)

THIS 5 ROOM ALADDIN READI-CUT HOUSE \$1642 FREIGHT PAID

SAVE 4 PROFITS ON LUMBER, MILLWORK, HARDWARE & LABOR

The Aladdin Read-Cut System of Construction enables you to save 18% lumber waste and up to 30% labor costs, and guarantees you will receive the highest quality dry lumber and a COMPLETE house as specified. You can buy your **COMPLETE HOUSE, ALL IN ONE SHIPMENT**, direct from our mills and save the in-between profits.



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Every hour you can put in on the construction of your Aladdin home means a saving to you of from \$2.00 to \$3.00 per hour on its cost. That means a **SAVING** of from \$15.00 to \$18.00 for every day you work on it! . . . Depending on the size of the house, the carpenter work sums up to from three hundred hours to twelve hundred hours. . . . **WITH MOST**

OF THE SKILLED LABOR ALREADY PERFORMED when you receive your Aladdin Read-Cut, what an opportunity you have to bring down the cost of your new home to practically a pre-war level. Our drawings and instructions cover everything from the foundation up, so you can save any part, or even all labor costs.

BUILD IT YOURSELF AND PAY YOURSELF THOSE HIGH WAGES



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You get **ALL THE LUMBER** cut to fit by fast machinery-production line methods—marked and numbered, ready to erect practically without the use of a saw; also siding, flooring, interior trim, all millwork,

doors, windows, mouldings, glass, hardware, nails, roofing, paint and complete drawings with instructions. Many Aladdin home buyers erect their own houses.



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Dept. 201, 55 West 44th St., New York 18, N.Y.

said, thinking he'd given the lad a polite brushoff.

Last summer the boy showed up again with a diploma and his gray-haired mother. Now he's one of the youngest members of the Chitwood troupe and has learned to perform some of the stunts.

He does the "Slide for Life." Buckling on a corsetlike arrangement, he stands on the rear bumper of a car as it speeds down the track at 50 miles an hour. Slowly he lowers himself to the track by a rope and then skids along on the corset. It's tricky and dangerous—but crowd-pleasing. In another stunt he lies on the hood of a car as it crashes through a blazing barricade. Now he's working on a motorcycle ramp-to-ramp jump.

Most stunt men belong to the International Stunt Men's Union of America and are paid wages to scale. A man working on the ramps earns \$65 a week. A stunt man gets \$200 a week and up.

An important factor in the success of Chitwood's crash-and-smash shows has been his combining of thrills with humor. When a crowd gets all keyed up over a spine-tingling stunt, it needs a safety valve to relieve the tension. Chitwood's troupe includes "Crash" Roberts, one of the world's most famous outdoor clowns.

He has a small car which blows up. He pretends to get his foot caught in one of the ramps as two cars whiz by. He falls down in front of a speeding car—and scrambles to safety in the nick of time. The crowd eats it up.

One of the newest and most spectacular stunts is the "Ice Wall Crash." This is usually done at night for maximum effectiveness—and only before the largest crowds because it is expensive.

The rear end of a car is fitted with rockets, which spew out colored fire. The speeding car also knocks down a row of electrical switches which set off ear-splitting dynamite caps. As a climax, the car plunges head-on into a solid wall consisting of a triple row of 100-pound ice slabs.

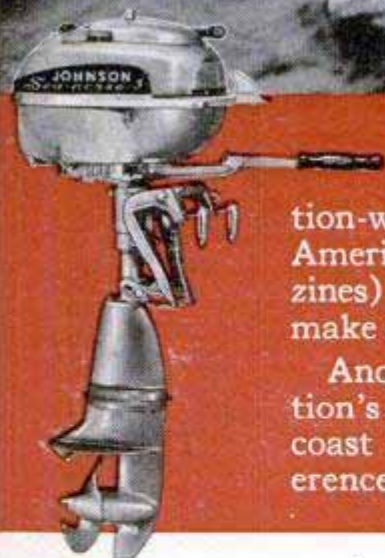
The spectacular CR-R-UNCH as metal meets frozen water always brings "ohs" and "ahs" from the crowd. It ruins the car.

Chitwood is continually seeking ways to improve his show. His latest idea—and it's a thriller—is a ramp-to-ramp jump with a full twist in the air. Lucky Teter had the original idea, Chitwood has improved it. Soon you'll see it performed.

A madman as a stunt driver, Chitwood is a model motorist on the highway.

"I take no chances with the crazy driver you meet on the road," he says. "Why a man could get killed if he isn't careful!"

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THAN ANY OTHER MAKE**



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Johnson leads by 82%!

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FREE HANDY CHART. Describes the four versatile Sea-Horses for 1951. Your copy sent free. WRITE today!


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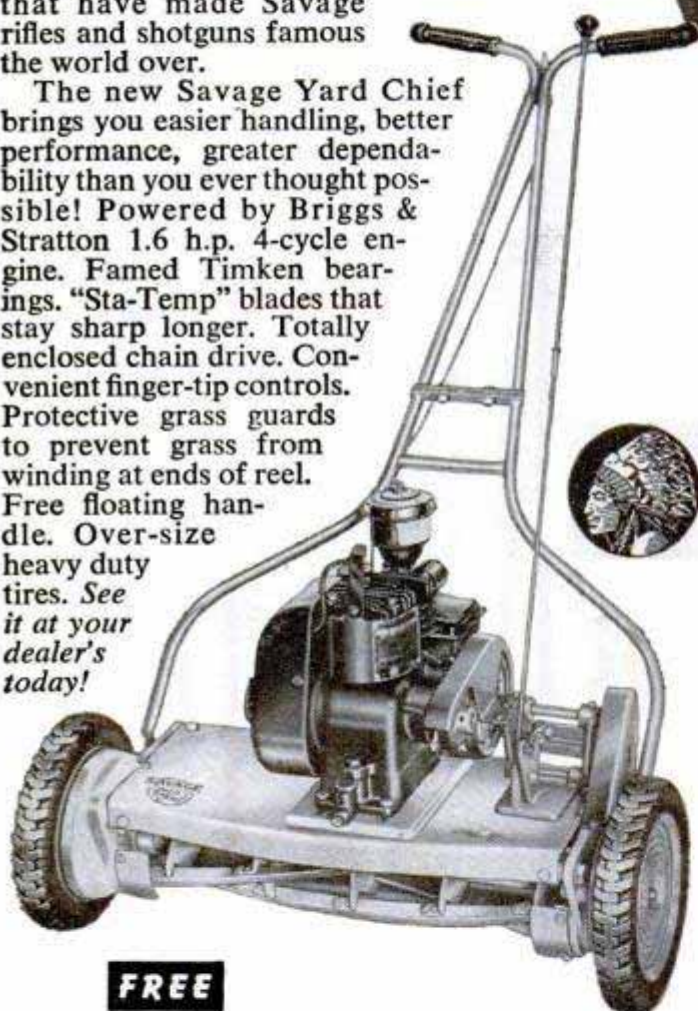
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SSN 1037—Triple-Threat Man

(Continued from page 85)

The trainer consists of the complete radar apparatus with the student seated in front of it, plus a large shallow tank of water on the bottom of which rests a scale model of the terrain over which the practice mission is conducted. Projecting down into the water from a movable carriage is a scanning head that radiates supersonic waves. These are reflected back to the head by the surfaces of the model, producing the same image as would radar itself. The scanner moves over the model in keeping with the way the student "flies" his course. Thus the changing picture that the student sees in his scope is virtually what he would see in his scope in a real aircraft.

Before a Mather student is graduated he makes 25 actual flights as navigator, 25 as bombardier and 16 flights on which he navigates and bombs solely by radar.

Training flights are flown in B-25s and C-54s and in the new, specially designed 240-mile-an-hour Convair T-29 that is built from the wheels up as a flying classroom. Radar, radio and navigation can be taught simultaneously to different groups in the plane. Equipment on board includes four astrodomes, 14 navigator tables and half a dozen complete sets of controls for loran, radio compass and radio altimeter.

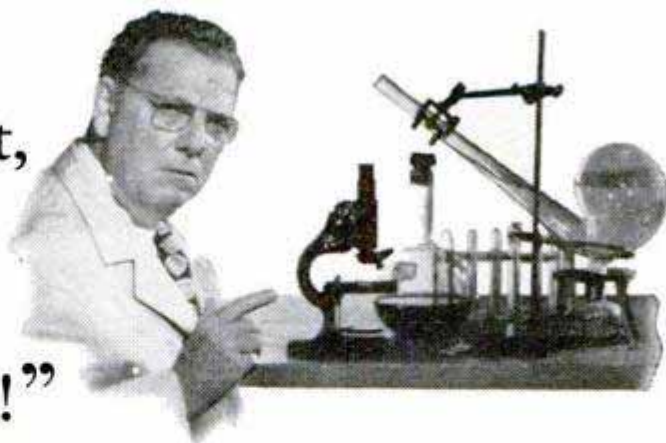
Previously, a student bombardier got flight training by dropping practice bombs on a target marked out on the ground. Mather students drop a few such practice bombs, just so that they can watch them hit, but most of their missions are flown against actual military or strategic targets.

The Mather school uses 48 military and industrial targets in all. Seven are in nearby Sacramento, often referred to as the most-bombed city in the world.

It's much more realistic, and better training, to tell a triple-threat student that he is to bomb a certain air base, bridge, or chemical plant located in a particular city. The student has to navigate to the proper area, identify his target, and bomb it just as he would on a wartime mission. His visual or radar bombsight doesn't drop a bomb when the release point is reached; it trips the shutter of a camera that is trained on the target. Cross hairs on the film show where the bomb would have landed if it actually had been dropped.

This year the Mather school is trying something new. Having determined that a student can be competent in three specialties, it is beginning to train a few groups of accomplished pilots. They will be superspecialists, able to take over almost any job on a long bombing mission.

“As a Scientist,
I say we must
destroy it or it
will destroy us!”



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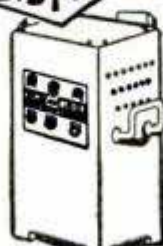
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Some Get Rich, Some Don't

(Continued from page 160)

you that. I don't have it patented yet!"

"Then there's another type," says another member of the staff, "who won't ask directly about his invention. He beats around the bush until he's sure you're reasonably trustworthy. Then he divulges his great secret, nervously asking, 'Aaaah, this won't go any further, will it?'"

Inventions seem to run in batches—like epidemics. Suddenly there are scores of applications for card shufflers (brought about by the Canasta craze) or Christmas-tree holders, fishing-pole holders, electrical switches or insulating bags. Often an important event or a public figure will stimulate inventors. When Lindbergh, in 1927, mentioned the trouble he had with ice forming on his wings, there resulted a wave of ideas for de-icing—most of them impractical.

"It's amazing," remarked one agent, "how many inventors rush into making models and machines without a prior search. They then find out, later, that they must almost completely revise or scrap their models. A search would have revealed similarities and given them hints which they could incorporate in a model. I don't think anyone should ever file for a patent without a prior search."

Another agent, asked if he could detect foolish and worthless inventions, sadly shook his head.

"I wish I could tell which inventions would click and which wouldn't. I've seen it happen again and again—someone shows me a device that, in my opinion, wouldn't amount to a row of beans. It would work all right, but, in my opinion, just wouldn't sell. And then I've seen it sell a million right after that!"

In his 27 years at the Patent Office, Brown has seen some of America's "greats" come and go, gaining valuable information from the Search Room. He recalls Glenn Martin, coming in to check his early ideas many years ago. There was Charles Duryea, inventor of the automobile. Oscar Ulysses Zerk, who scored an outstanding success with his lubrication fittings, was another. But perhaps the most successful of them all is William S. Gubelmann of Convent Station, N. J.

Virtually every typewriting, calculating and bookkeeping machine in use today owes some of its design to the ideas of the little-known Gubelmann, who has an awesome string of victories in the courts. He began working on a model of the typewriter in 1884 and five years later made his

(Continued to page 250)

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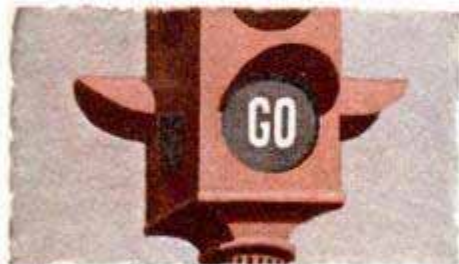
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CHAMPION

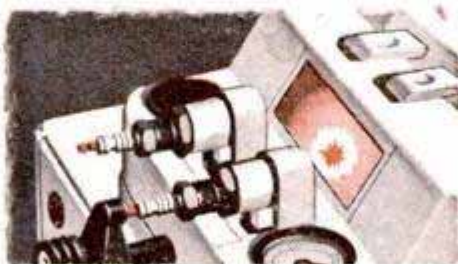
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first patent application. Since then, his patents have been challenged literally thousands of times. The Patent Office has approved as many as 800 claims on just one of his patents and he has had to cope with 350 disputes on a single patent. Altogether, Gubelmann today holds some 5000 claims granted on his patents, making him the father of all calculating machines in use today. His income has been derived for about 50 years from royalties on the licensing of his patents by such firms as International Business Machines and it has totaled, to date, many millions of dollars.

Gubelmann, you see, is one of those who got rich. For every one like him, there are thousands whose dreams are shattered because somebody has beaten them to the draw! A careful study in the Search Room will help prevent such heartaches and may also guide you to a success as fabulous as that of William S. Gubelmann.

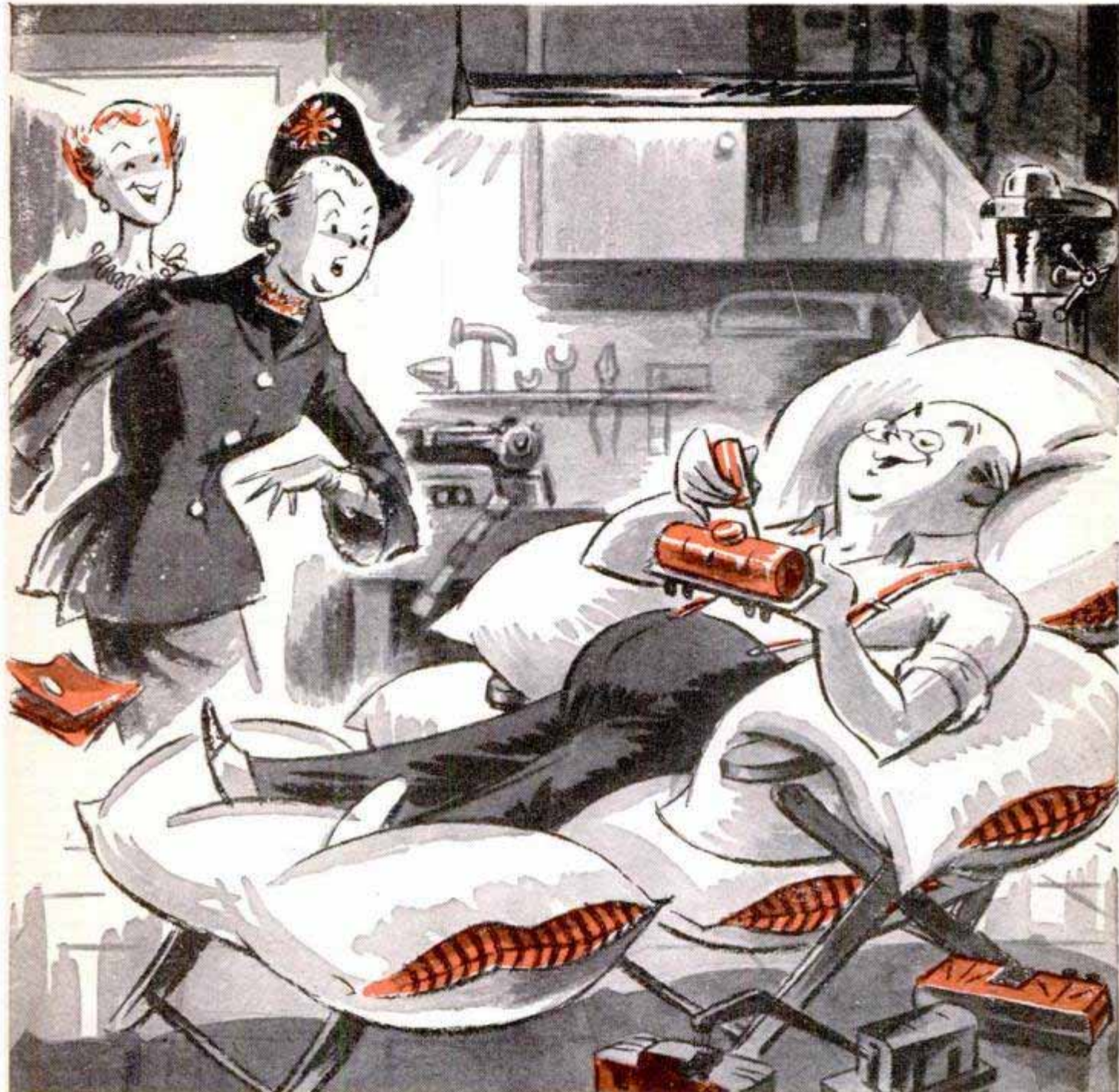
Five Miles Under the Sea

(Continued from page 128)

Such a metal did not exist. The scientists turned to leading experts in the U. S. A., England and Sweden, but without result. There was therefore only one thing to do: invent a metal with the required qualities. This was done by a Danish engineer, Boerge Lunn. Of this new metal—Galathea-bronze—a ball was cast with a diameter of 36 inches, weighing about one ton and with four-inch-thick walls. It was cast in two halves which, when fitted together, are completely waterproof. The instruments will be fixed in this ball before it is lowered to 30,000 feet below the surface to register the oscillation of the magnetic needle on photographic paper.

There is great doubt as to the results of this investigation. The magnetism of the earth is an unsolved problem. No one knows positively whether magnetism increases or decreases nearer the center of the earth. The English Nobel prize winner, P. M. Blackett, has formed the theory that earth magnetism decreases towards the center. To prove his theory, Blackett has carried out measurements in mines as deep as 6000 feet, but because of the ore content in the ground, these measurements cannot be relied upon. In the great depths of the open sea, however, there is still hope for exact results. These will be of the utmost importance to theoretical physics. Blackett's theory is in strict opposition to ordinary opinion, according to which earth magnetism should increase nearer the center of the earth.

(Continued to page 254)



"MARFAK MADE HIS CAR RIDE SO CUSHIONY HE'S SPOILED"



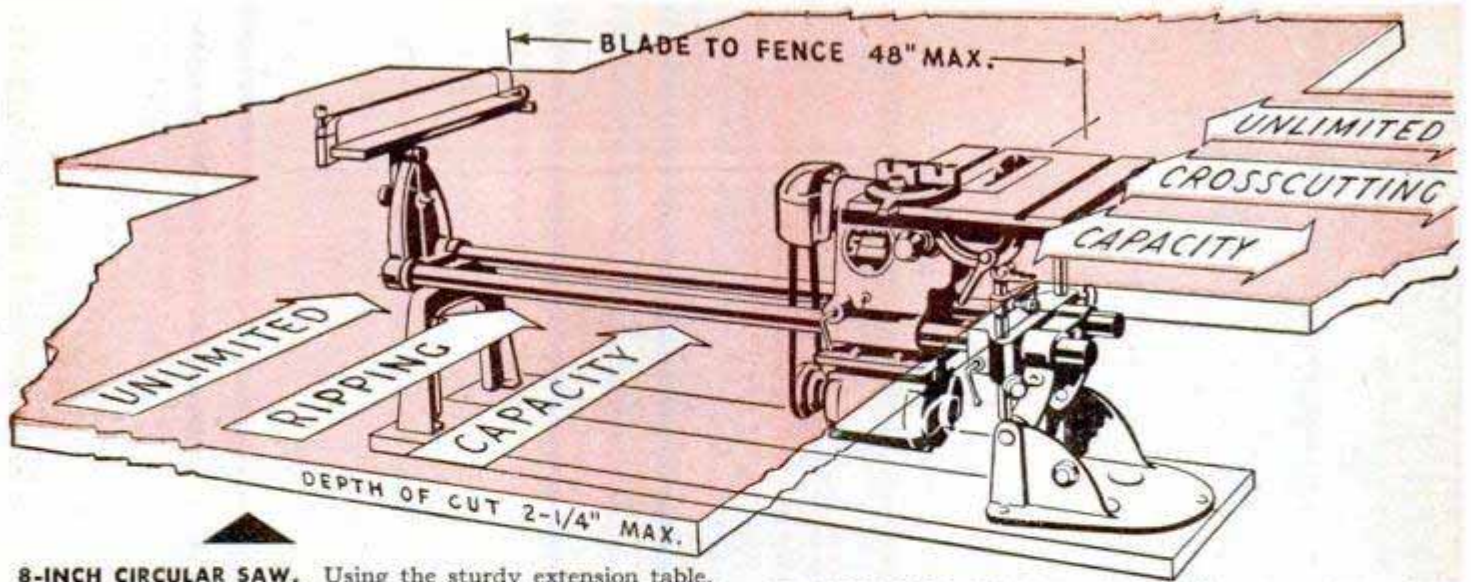
That "cushiony" feeling lasts far longer—with *Marfak* chassis lubrication. *Marfak* is scientifically compounded to resist jar-out and squeeze-out. It *clings* right to vital chassis points when the going's wet. *Marfak* lasts 1,000 miles or more! Today, get *Marfak* lubrication from your Texaco Dealer, *the best friend your car ever had.*

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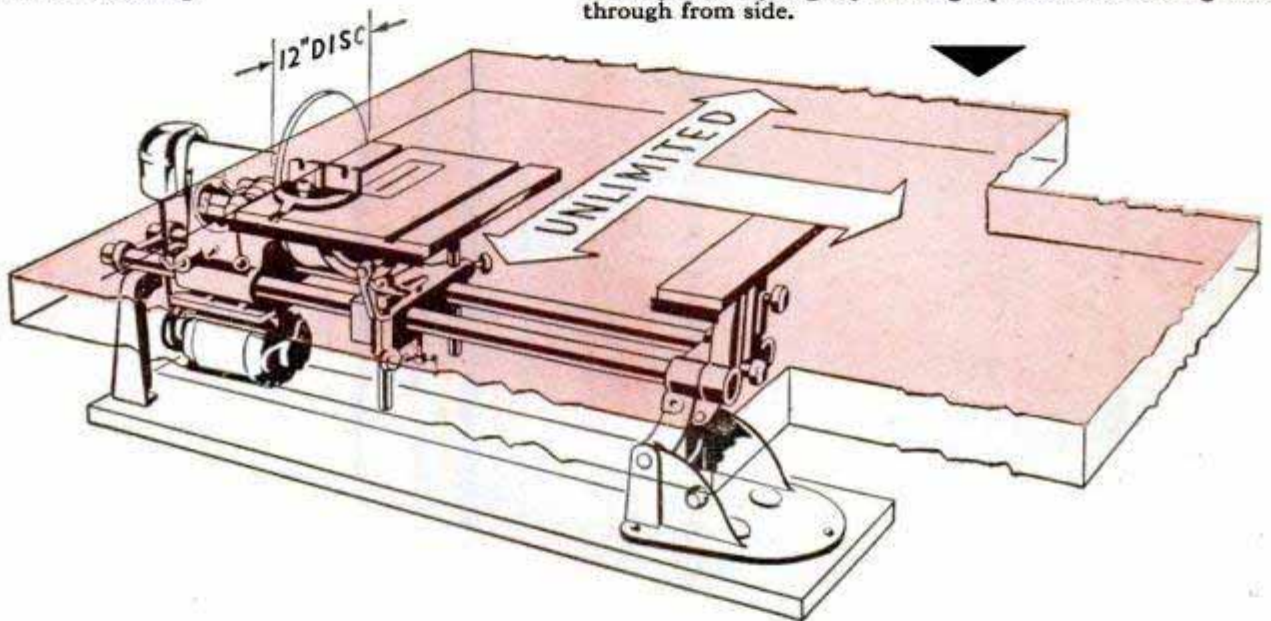


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12-INCH DISC SANDER. Only 12" sander with quickly changeable discs for different sanding grits. Disc can be fed into the work for maximum accuracy, speed and safety—can be set to stop on a hairline. Jointing to precise widths is easily done by slightly cocking rip fence and feeding work through from side.



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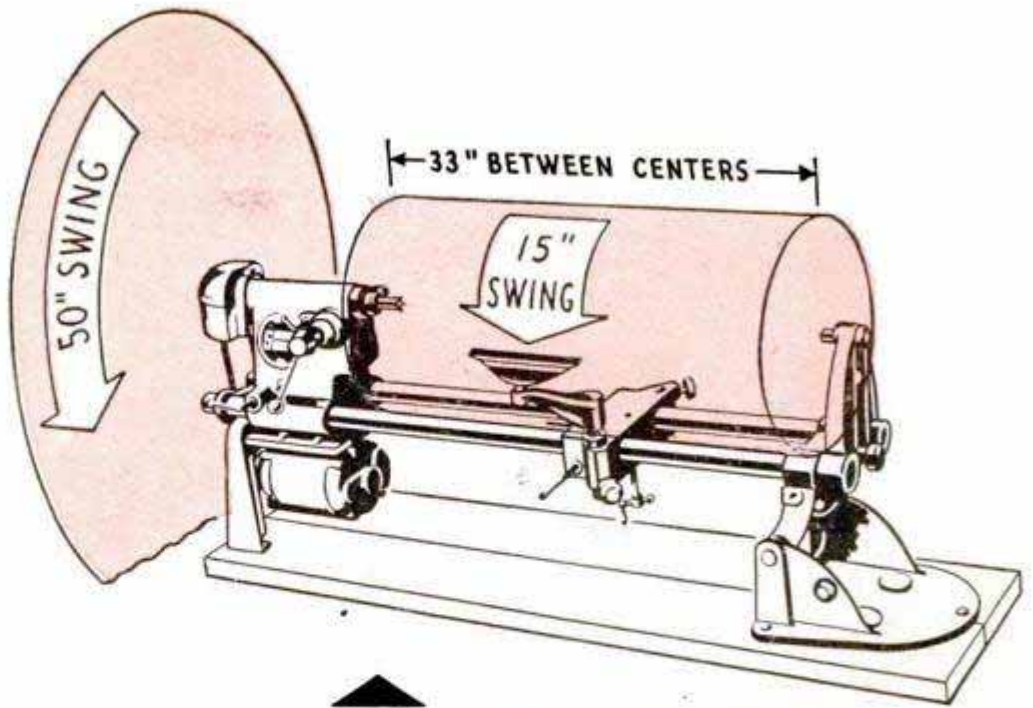
What does SHOPSMITH's great work-capacity mean to you? It means there is virtually no limit to the size work you can handle quickly and easily. You can saw to the center of full-size plywood panels . . . trim doors, screens, storm sash . . . accurately sand or joint room-length boards . . . drill or mortise oversize furniture or cabinet frames . . . turn table legs, bowls, lamp

bases, table tops up to 50" in diameter . . . spin metal bowls up to 15" in diameter . . . do your own remodeling jobs...*build your own home.*

Yet for all its capacity, SHOPSMITH is compact—occupies only 2' x 5' of shop space. It's extremely accurate—has precision features and micro-adjustments found only in production-type tools. It's precision engineered to watchmakers' tolerances. It's completely flexible, exceptionally sturdy and rugged, weighs 200 pounds. It's no wonder, then, that SHOPSMITH is America's largest-selling power tool!

See SHOPSMITH demonstrated—at leading hardware and department stores or any Montgomery Ward store. And send today for your free copy of the information-packed, 16-page SHOPSMITH booklet.

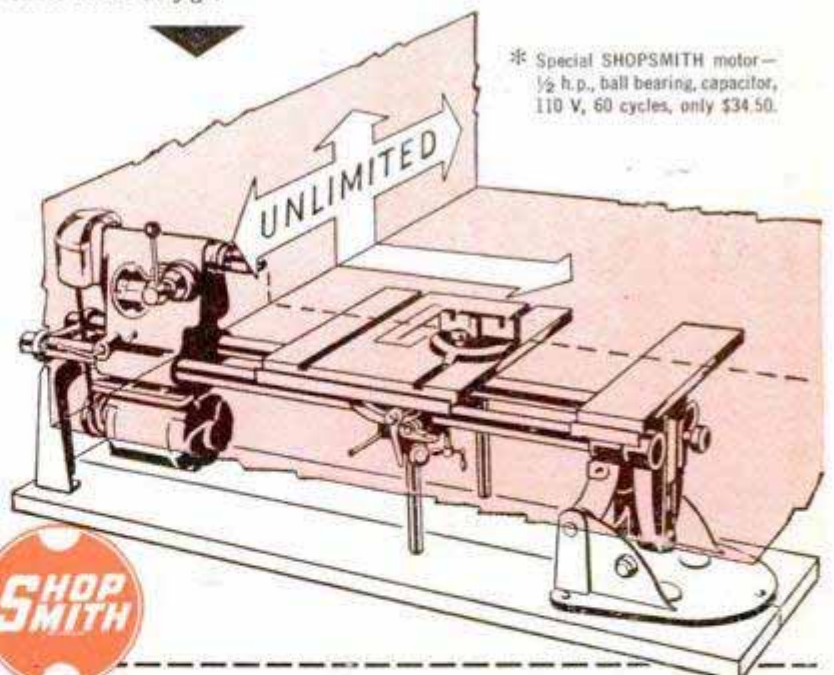
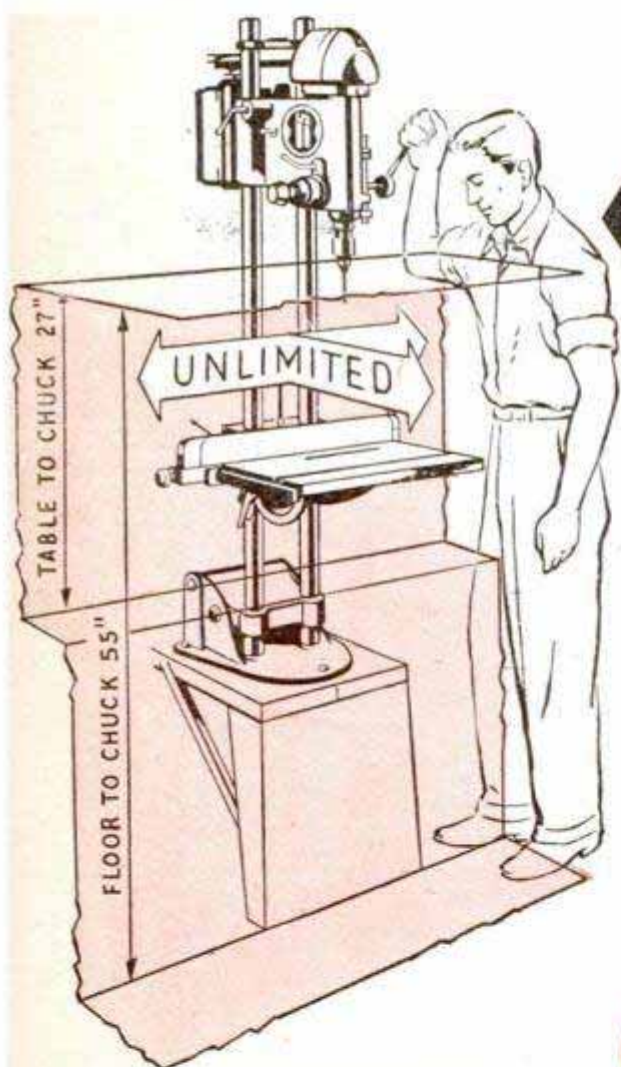
\$189.50
 COMPLETE
 5-TOOL UNIT
 WITHOUT MOTOR*



33-INCH WOOD LATHE. Capable of turning work up to 15" in diameter—4" more than most other heavy-duty lathes. 33" between centers. Headstock can be reversed for large-diameter outboard faceplate turning. Tool rest always slides parallel to work. Only lathe that lets you face your work while hollowing bowls or turning flat pieces.

VERTICAL DRILL PRESS. It's a bench model! It's a floor model! Drill to the center of a 15" circle. Jacobs key chuck takes drills up to 1/2" in diameter. Right or left-hand quill feed. Easy to read, adjustable depth scale. Spindle floats on four grease-sealed ball bearings. Rip fence and miter gauge provide convenient jigs.

HORIZONTAL DRILL PRESS. Makes easy work of drilling or mortising pieces too large or too awkward for vertical drill press. Just lay the work on the table, feed drill horizontally. Handy, too, for drilling flat pieces for doweled joints. Accuracy is automatic, since fence and table serve as jigs.

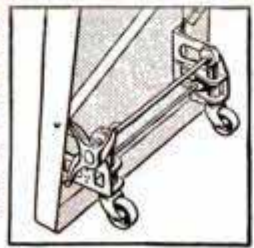


* Special SHOPSMITH motor—
 1/2 h.p., ball bearing, capacitor,
 110 V, 60 cycles, only \$34.50.



NEW RETRACTABLE CASTERS

increase SHOPSMITH's already great flexibility. They're easily mounted on any wood or metal bench. Easy to set, too, with three-stage foot levers that raise or lower unit. Your SHOPSMITH dealer has them. Complete set... **\$11.95**



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 417 Montgomery Street, San Francisco 4, Calif.
 Please send me the free SHOPSMITH booklet.

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Never a dull moment...

Sharp . . . and they stay sharp always. Every Pincor sharpens itself. No more expensive bills. No more annoying "time-out."

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Model illustrated is the famous P-22



Step out behind a Pincor and see, hear, feel the difference. Enjoy the featherweight ease of handling . . . admire the smart design that's made Pincor America's "best-dressed" power mower . . . thrill to the husky engine so simply controlled. Yes . . . see them all . . . then try Pincor and you'll know.

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The main purpose of the expedition is zoological research. Does life exist at the greatest depths? If so, what form of life? Is it possible the deep oceans cover secrets which are the answer to recurring reports of sea monsters, seen now here, now there?

About all this we can only guess. Science cannot give an answer yet, because no one has been able to penetrate to the greatest depths with instruments which could bring anything but the smallest living things to the surface.

Twice before things have been brought up from the sea—but from much shallower depths—which have caused an uproar in scientific circles. The first time was in 1930 when the Dana expedition caught an eel larva measuring 73 inches. Normally, an eel larva is two to three inches long. The grown eel is not often longer than three feet. But here a larva was found, double the size of a grown eel. It does not take much imagination, just a little calculation, to realize the size of the larva as a full-grown fish. Could not the thing be called a sea monster?

In 1938, an ordinary trawler, off the southeastern coast of South Africa, caught a sparkling blue fish, three feet long. Its like had never been seen before. And that was not so strange, for on closer inspection, scientists discovered that our only knowledge of this rare fish was from fossils, and that it had been regarded as extinct 80,000,000 years ago. But here came *Latimeria* swimming fresh and fit into the net of a modern fishing boat, an effective protest against its own obituary notice! There is no doubt that the deep seas have many more secrets such as these hidden in their waves. It will be the job of the *Galathea* expedition to unveil them.

At the same time all sides of life and possibilities for life will be examined. Samples will be taken from the bottom of the sea, radioactive isotopes will be used to locate the production of organic stuff by plants in the deep seas, the quantities and distribution of creatures in the water and on the floor of the sea will be examined down to microbe size, physical and chemical investigations of conditions for life, temperature, salt content, etc. The streams of the sea will be registered, profiles of the bottom drawn by means of an echo sounder.

But if you ask the scientists what they expect to find, they will not be able to answer. This is a pioneer job, an explorers' trip to quite virgin parts of the world. Darkness has loomed over them since the beginning of time, and it is the job of this expedition to send the first struggling ray of light into the darkness, and almost anything can be expected.



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THOUSANDS
ARE SUCCESSFUL!

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WANTED—men with ambition and desire to get ahead and *make money* in something for themselves. *Act now*—do as thousands of successful men have done—start on your own in floor surfacing with American Machines!

Take advantage of this opportunity if you want steady year 'round work—earnings of \$25 and more a day—pleasant indoor working conditions—and a lifetime of comfortable living for yourself and your family. No schooling—no experience needed. Sanders are easy to operate. Hundreds of prospects—new and old homes. Send coupon for "money-making" booklet entitled "Opportunities in Floor Surfacing"—enclose 25c in coin or stamps to cover handling.

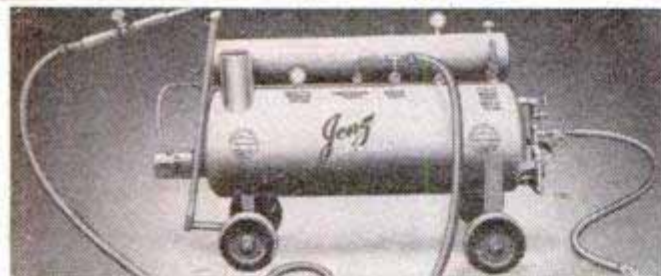
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The American Floor Surfacing Machine Co.
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Enclosed find 25c in stamps or coin for booklet "Opportunities in Floor Surfacing", telling me how I can start my own floor sanding business.

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At a cost of 20c with the NEW JENZ SUPER CHIEF STEAM CLEANER. Portable—No moving parts—Cleans anything—Any place—Motors—Chassis—Machinery—Floors—Buildings—Oil Rigs, etc.—Oil fired—Economic—Fully tested and warranted. 75 lbs. steam in ten min.—Model 80, Complete as illustrated..... **\$315.50**

F.O.B. shipping point

HI-PURE LABORATORIES, Evansville, Ind.



FAST—Old Town Lapstrake Boat

SMOOTH lines of this lapstrake outboard boat help you start in a hurry—and get there fast! She's roomy, too, with wide cross seats (folding backs) and long seats on both sides at the stern. Handles easily, with deep bow to fight stormy waves! Built of handsome woods for strength and service. Upkeep is easy.

FREE CATALOG shows just the model you need. Write for one today! Also rowboats, sailing dinghies, sailboats, canoes.

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SHARPENING LAWN MOWERS
IN YOUR GARAGE or BASEMENT!

READ WHAT THIS CUSTOMER SAYS:

"I am buying a home and my Universal is going to be a tremendous help paying for it." Another Universal owner says, "I have taken in last season **more than \$3500.00.**" Another "During this year I sharpened 602 mowers." Spare time or full time, **you, too,** can make big money in your own business and be your own boss. No other lawn mower sharpener has the advantages that Universal offers. That's why owners tell glowing success stories in this profitable business. Write today for full details of our proved success plan.



ONLY ON THE UNIVERSAL LAWN MOWER GRINDER

can the inside face and edge of the stationary blade, and all reel blades, be ground to proper clearance

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 Please send me full details about the profit possibilities of Lawn Mower Sharpening.

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I'm Building the Popular Mechanics Plywood Ranch House

(Continued from page 121)

but I chose the steeled finish because it is easier to sweep and more resistant to staining caused by oil and grease.

Plumbing is not difficult when planned properly, and you can save considerable here as I have done by renting a few tools and doing it yourself. The plumbing of the Ranch House has been designed throughout by architect John Whelan so that you can now or later on install all modern appliances such as a garbage-disposal unit, dishwasher or automatic clothes washer without any complications.

The plumbing plan allows you to add the luxury of an extra half-bath in the full version of the Ranch House. I have already installed it in my Ranch House because, by doing it myself, a second bathroom costs only \$100, including the toilet and wash-basin fixtures. Realtors say the extra half-bath will add \$500 to the value of the house.

Insulating your new home is inexpensive if done during construction and especially so if you do it yourself. The cost will be paid back in fuel savings in a few years. We rented two stapling guns for a dollar a day and installed the balsam-wool blanket insulation on walls and ceilings. It was so easy to do that my wife took this job over and completed it all by herself.

For heating the Ranch House I am using General Electric's new furnace, taking advantage of the fact that it requires only the simplest of duct work. Warm-air ducts to the various rooms are small galvanized or aluminum stovepipe and stovepipe fittings which anyone can assemble. And I find that modern wall registers, which give even temperatures by "washing" the windows with warm air, are the utmost simplicity to install. Sheet-metal work is required only for the furnace plenum, a standard item that you can buy. This meant that I could have a good oil or gas furnace and yet save so much by doing my own duct work that the total cost was kept very low.

We are also showing something in heating here that could not be done five years ago. We are placing the furnace right in the kitchen! Five years ago furnaces were too noisy and bulky to do this—today they sound and look like a second refrigerator. If you prefer, you can install the furnace in the basement or utility room of the Ranch House—there are three possible locations. I chose the kitchen installation because it centralizes the duct work of a basementless ranch house.

Scientists Create "TAILORED LIGHTNING" For Better Motoring

In the great engineering laboratories of The Electric Auto-Lite Company in Toledo, Ohio, a group of Auto-Lite Ignition Engineers have been probing inside engine cylinder walls, peering at "blow-by-blow" spark performances, charting the behavior characteristics of man-made "lightning" across the spark plug gap. From endless tests they've determined what your engine's ignition system needs most, and then set about producing spark plugs to fill the bill. Net result: Ignition Engineered Auto-Lite Spark Plugs . . . the spark plugs that are *world famous* for quality and performance.

ELECTRICITY LEAPS from storm clouds to top of Empire State Building as shown in this dramatic night photograph. Engineers harness electrical energy like this to "fire" gasoline in your engine.



FRANKLIN'S KITE experiment was first demonstration of electrical nature of spark discharges between clouds. Date: 1752.



"FIRING PIN" of the car engine. Your spark plugs fire as many as 15,000 fuel charges per minute with tailored precision.



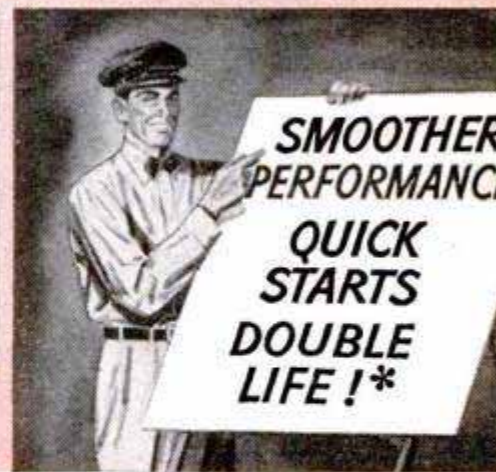
RELIABLE STARTING is one important benefit resulting from Auto-Lite research to assure correct materials, dimensions and design.



RIVER CUTTING CANYON resembles way surging of electricity wears away electrodes. For solution see next picture.



TINY UNIT called a "Resistor" permits wider initial gap setting, makes possible these advantages of Resistor Spark Plugs:



**SMOOTHER
PERFORMANCE
QUICK
STARTS
DOUBLE
LIFE!***

All car, truck and tractor owners benefit from the exhaustive research performed by Auto-Lite Ignition Engineers . . . the men who design the coil, distributor, spark plugs, wire and all the other parts of the complete ignition system used as original factory equipment on many leading makes of America's finest cars and trucks. *You're Always Right With Auto-Lite.*

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**DEPENDABLE
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*Here's
Why -*



★ **Every Bowes Plug is Individually Tested**—tested at higher voltage than is ever encountered in your car.

★ **Oversize Special Alloy. Electrode . . .** welded construction assures positive connection.

★ **Extra Large Ground Electrode** assures longer life for plug.

★ **Husky Aluminum Oxide Type Insulator** assures against porosity—sure proof against shorting.

★ **One-Piece, Leak-Proof Construction.**

★ **Patented Engine Gasket Retainer Ring** assures better contact and better heat transfer.

BOWES PLUGS

are tailored to YOUR car's motor

If your favorite SERVICE STATION does not handle Bowes Spark Plugs, write us direct for further information.

BOWES "SEAL FAST" CORPORATION
INDIANAPOLIS 7, INDIANA

Close-Ups From Miles Away

(Continued from page 116)

reason is that "I've become so fond of the old jalopy I couldn't bear to part with it now. Besides, I've got the rear end specially rigged to carry my equipment."

Cheney has his own darkroom in the machine shop. He even develops his own color films. Stacked around the shop among drills and presses are more than 8000 slides of scenes he has snapped. And the cameras . . . well, there are three 16-mm. motion-picture cameras, two 35-mm. cameras, a 3¼ by 4¼ press-type camera, and special 3¼ by 4¼ and 2 by 2 cameras Cheney built himself for astronomical work. All cameras attach to the telescopic equipment, and in addition there are 71 different lenses, many of which are used on several cameras.

"Actually, the camera itself is not so important in taking long-distance pictures," explained Cheney. "A box camera would do. The secret is in the optical system and the mounting. And unless the very best mounting can be obtained, the beginner would do well to try cardboard tubing and a 2 by 4."

Cheney has another theory on his hobby—or anybody's hobby.

"It should be shared," he said.

All photography fans turn out a lot of extra prints. Usually, these prints are dropped into the wastebasket, or tucked away in corners to gather dust. But not in Cheney's case. He sends all extra prints to the county tuberculosis sanitarium.

"The bedridden patients are able to travel through the pictures to different parts of the country—even to the moon," said Cheney. "Knowing the photographer, they take an interest in the pictures."

Cheney has made friends all over the nation with his picture taking, because he is one photographer who, when asked by a picture subject to "send me a print," never forgets to do so. Besides the case of the Indian fisherman, he recalls only one other instance when he has run into difficulty in taking pictures. That was the time he set up his telescopic camera and a drunk stood squarely in front of it, refusing to budge.

"This is a free country," declared the drunk, "and I've got a perfect right to stand here if I want to!"

Cheney feels that a man is missing nine tenths of photography—without a telescopic camera.

"It's the details that are most interesting," he said. "Of course, I see things upside down through my ground glass, but sometimes I think that's the best way to get a proper perspective on this topsy-turvy world."

Buy **CRAFTSMAN** Drill Presses for dependabable low-cost drilling!

REG. U. S. PAT. OFF.

NOW equipped with Improved Jacobs "Safe-Lock" Chuck!

Another SEARS "First"! CRAFTSMAN "100" Drill Presses are now *exclusively* equipped with the new Jacobs "Safe-Lock" chuck for **absolute SAFETY!** Threaded lock-collar positively prevents chuck flying off tapered spindle (regardless of speed or type of load); yet changes easily! Ends need for using special collet chucks. Here's PROOF of the "extras" you get with CRAFTSMAN!

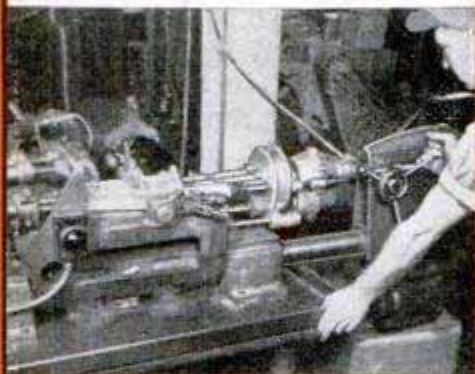


Drills to center of 15-in. circle

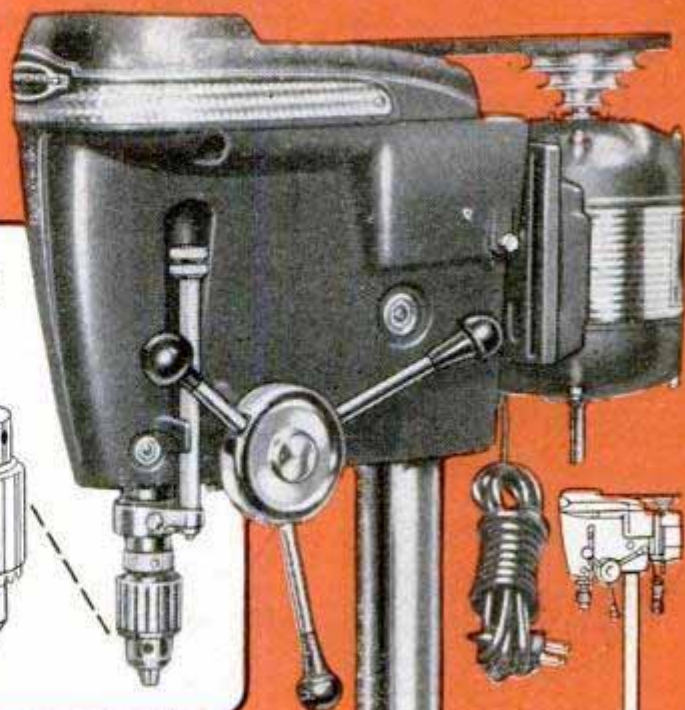
CRAFTSMAN flexibility makes possible dozens of operations like these!



Typical gang drill press set-up for tapping. CRAFTSMAN flexibility can save you money in hundreds of similar industrial applications like this!



Drill press head used horizontally in special multiple drill-and-tap set-up. CRAFTSMAN is "tops" for versatility in dozens of such industrial set-ups!



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\$82.50* Without motor
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Big .. Rugged! Exclusive Features! Outstanding for Industrial Accuracy!

Superb CRAFTSMAN dependability! Only industrial-type drill presses we know of with ALL these features . . . **at anywhere NEAR these prices!** Exclusive Jacobs SAFETY key-chuck (described above); 1/2-in. capacity; No. 33 taper. Precision ball bearings; *lubricated for life!* Longer lasting spiral "Perma-Coil" quill-return-spring. Pre-loaded bearings reduce spindle end-play. 11 speeds; 4-in. spindle travel. See them at (or call) your nearest Sears Retail Store TODAY! Or write Dept. 609, Sears, Roebuck and Co., Chicago 7, Illinois.

* Prices slightly higher south of Ohio and west of Mississippi rivers

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Homemade Safety-Belt Tester

From scrap materials, Staff Sgt. Guy J. Gear of the Military Air Transport Service has built a machine to test parachute harnesses and safety belts. It is powered by an electric hoist and pulls up to 1000 pounds, using 50-pound weights on a 10 to 1 ratio lever and fulcrum. A Plexiglas door protects the user if a belt or harness breaks under test.

Electric "Eyes" Watch Modern Ship Break Apart During Tests

Seven hundred electric "eyes" were on watch as the British Navy deliberately broke a modern warship in half. Purpose of the research was to test the stresses and strains as a sinking ship breaks up. The *Albuera*, an uncompleted destroyer was chosen for the test. Put in drydock, the craft was supported only amidships. The 700 instruments were installed at various places throughout the hull and then the craft was slowly filled with water until its back was broken. From a building on the dock the research men watched their instruments and calculated the strain on each part of the ship.

No-Rub Furniture Wax

All the housewife has to do to apply a new furniture wax is to spread it on, let it dry, then wipe it lightly. The wax, manufactured by S. C. Johnson and Son, Inc., of Racine, Wis., dries to a luster that needs no rubbing. The resulting surface is hard and dry, with no stickiness to catch dust.

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Also manufacturers of complete power mowers and garden cultivators.

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MODERN LAWN MOWER SHARPENER

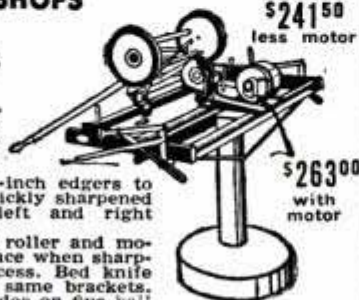
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FIX-IT SHOPS**

GOLF COURSES • PARKS
101 OTHER JOBS

Sharpens All Reel Type Mowers • Hand, Power or Gang
• 10 to 20 Minutes • No Dismantling • No Extra Attachments Needed.

All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist blades.

Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets. Grinding head rides on five ball bearing races. Easy to operate. Also sharpens chisels, jointer knives, planer blades. Big profit maker. Own your own business. Send Today for FREE Illustrated Bulletin No. 10-C. Prices Subject To Change Without Notice



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\$241.50
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CAMPBELL-HAUSFELD Spray Painting Outfits



SAVE time, materials
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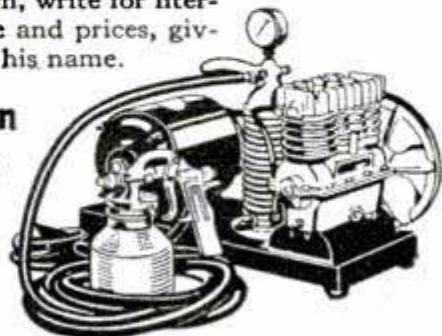
PAINT buildings, tractors, trucks. Refinish furniture and fenders. Inflate tires; lubricate motors and implements.

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The only 4 cylinder portable. Outperforms them all for spray painting without pulsation.



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South Bend STEPGLASS® ROD *Sensational - New*

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New! SMOOTHCAST® REELS
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New! FISH DECEIVER®
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New! Ex-
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Hand-Hit "Bird"

Only a sponge-rubber ball with feathers attached to its neck is required to play a new game resembling handball and badminton. The object is to keep the ball in the air, and opponents use bare hands to bat it back and forth or against a wall.

A Little Terramycin Makes a Lot of Pork

*Dr. J. H. Brown
Shenandoah, Pa.*

Terramycin, newest of the earth-mold "wonder" drugs, makes pigs grow bigger and faster. Used in very small amounts (less than a third of an ounce for each ton of feed), terramycin was given to pigs in a test on animal-feed supplements. Swine fed the terramycin gained 18 percent more weight than the control animals. Other wonder drugs were used and all proved beneficial, although terramycin was the most effective. Nobody knows why more nourishment is taken from food when these drugs are added, but they appear to be effective for humans as well as for animals and poultry.

During 1950 the scheduled airlines in the U. S. flew more than 17 million passengers nearly 8 billion passenger miles with only five fatal accidents.

Announcing "MOTO-MOWER"

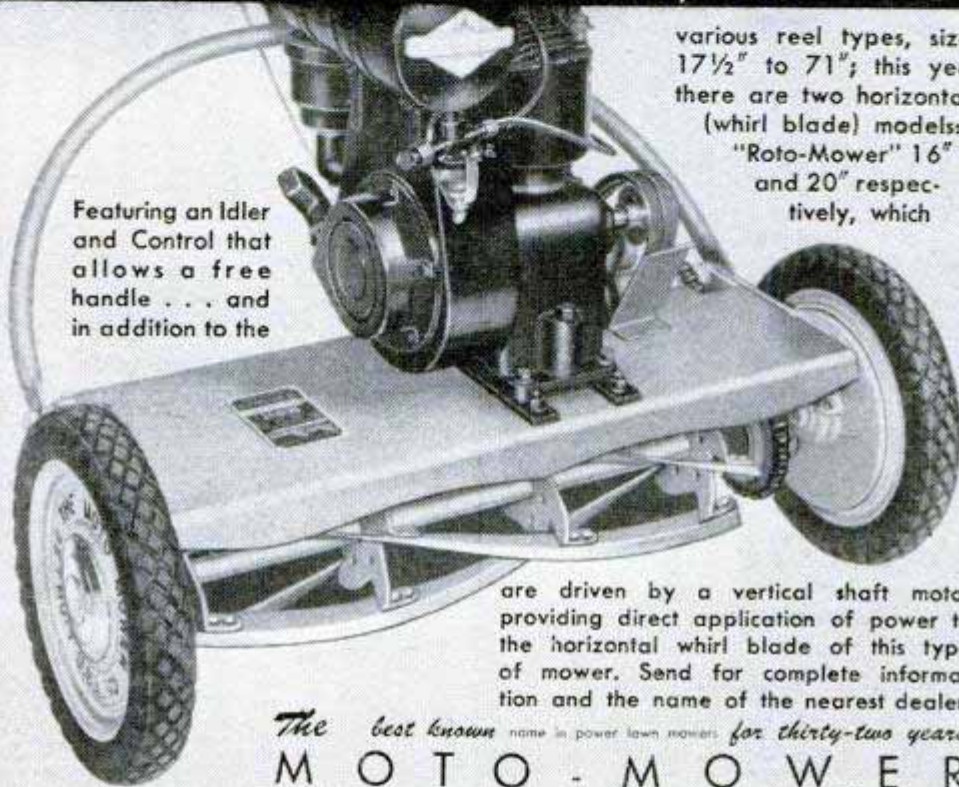
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providing direct application of power to
the horizontal whirl blade of this type
of mower. Send for complete informa-
tion and the name of the nearest dealer.

The best known name in power lawn mowers for thirty-two years

MOTO-MOWER
4615 Woodward Ave. Detroit 1, Michigan Company

New
MIRACLE WALL CLEANER

Saves Costly Redecorating!
AMAZING INVENTION. Banishes old-style housecleaning mess and mud. No tags—no sticky "dough"—no red, swollen hands. No more dangerous stepladders. Literally erases dirt like magic from walls, ceilings, window shades, upholstered furniture, etc. **Ends drudgery! SAVES REDECORATING!**

SAMPLES TO INTRODUCE Sample offer sent immediately to all who send name at once. A penny postal will do. **SEND NO MONEY—just your name.** KRISTEE CO., Dept. 687, AKRON 8, OHIO

COMPARE THIS !! **\$39.95**
300 AMP. - D.C. - WELDER KIT
ASSEMBLE YOUR OWN - SAVE HALF!

Never Before at Such an
Unbelievable Low Price!

Now you can make your own welder using any aircraft generator and save many dollars. Only a pair of pliers and a few minutes are needed to assemble this kit into a sturdy welder giving you many years of useful service. Satisfaction guaranteed.



HERE'S WHAT YOU GET: No. AW5-Kit includes Special Hook-up Leads, Amperage control with leads, Mounting Plate, Pillow Bearings, Bearing Supports, Shaft Extension, Flexible Coupling splined to fit your generator, Triple Groove "B" Type Pulley, Plan included.
No. AW5-Kit Complete — \$39.95.
No. AW6 includes AW5-Kit above plus Arc Stabilizer — \$49.95.
No. AW7 includes AW6-Kit plus R-1-300 Amp. Generator — \$67.90 (R-1 Generator Cost Gov't. approx. \$400.00).

EXTRA! A \$15.95 Accessory Kit Complete for only \$12.95! Includes Welding Helmet, Electrode Holder, 5 lbs. Ass't. Rods, Two 10 ft. Welding Leads with Terminals and ground clips, plus Audel's Welding Guide. Sold with any Welder Kit . . . Special Price **\$12.95**



PLANS 35c LeJay's proven plan for building your own Welder using aircraft generator. Catalog included.

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We SPECIALIZE in large sizes only—sizes 10 to 16; widths AAA to EEE. Loafers, Wing Tips, Moccasins, Dress Oxfords, High and Low Work Shoes, House Slippers, Rubbers, Overshoes, Sox. Extra quality at popular prices. Satisfaction guaranteed. Sold by mail only. Write for FREE Catalog.

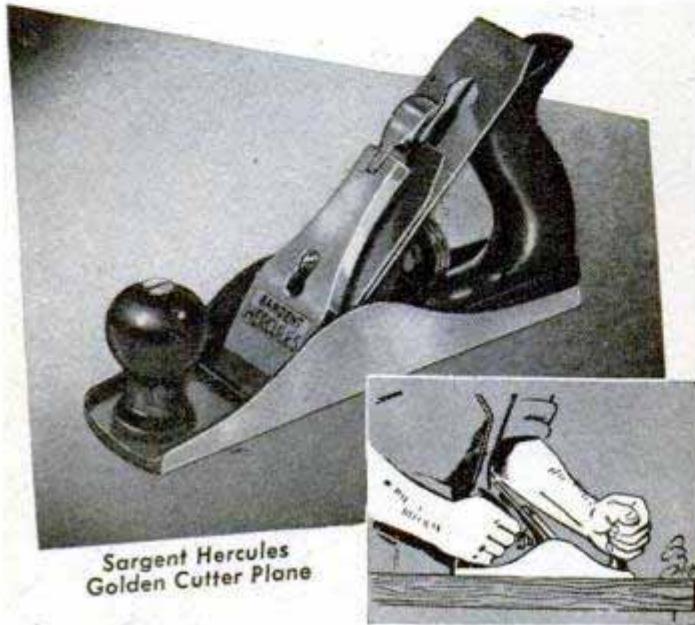


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KING-SIZE, Inc., 515, Brockton, Mass.



the plane with the Golden Cutter*



Sargent Hercules
Golden Cutter Plane

— never before such a blade

in a professional plane at a popular price.

*Precision honed from vanadium tool steel.

The Sargent Hercules Plane has a large brass nut for easy adjusting to cut paper-thin or coarse shavings. Steel spring under clamp toggle for firm seat. Knob and easy grip handle are second growth hardwood. Precision machined frog, bed and throat prevent chatter. Fully guaranteed.

Next time you pause at a tool display, check up on the 12 certified advantages of this fine tool.

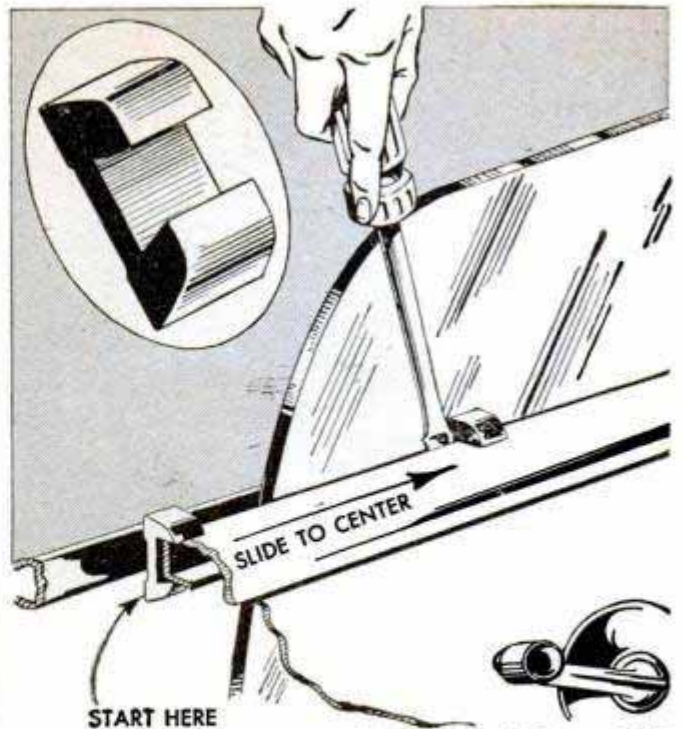
A better tool by —



Sargent and Company

New York, New Haven, Conn., Chicago

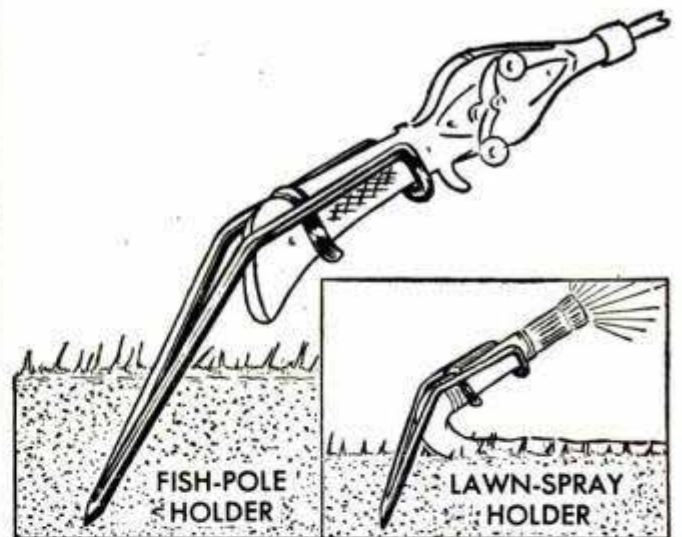
Builders Hardware and Fine Tools since 1864



Rolexco, Box 11, Orange, N. J.

Rattle-Stopper for Car Windows

Slipped on the inner sill of a car window, a one-piece rubber buffer stops annoying rattles. There are no springs, clips or screws to catch on the clothing. Even when the window is lowered until it is flush with the sill, the rattle-stopper still does its job. It fits virtually all cars except convertibles and some station wagons.



Bassett & Clark Industries, Vinton, Iowa

Pole Holder

Fishermen can now turn the chore of pole holding over to a dependable metal stake that can be pushed into the ground or wedged in an oarlock receptacle of a boat. The stake is bent to support the pole at the correct angle. When not used for fishing, the stake will hold the garden hose.

Among recently patented items is a "snore stopper" which fits under the chin and prevents open-mouth breathing.

GROBANS' WAR SURPLUS SPECIALS

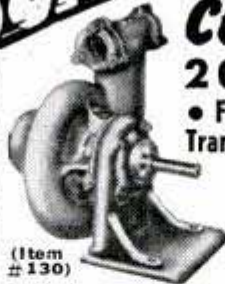
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GENERAL MOTORS-ALLISON

CENTRIFUGAL PUMP

200 GALLONS PER MINUTE

- For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering



(Item #130)

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/2" standard pipe thread, twin outlets with 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't. acq. cost \$145.00. F.O.B. Chicago Now Only...

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

39.50

SELF PRIMING ALL PURPOSE PUMP

IDEAL FOR:

- Draining Basements
- Insecticides
- Fuel Oil
- Vacuum Pump—25" for Milk- ing Machines, Lab use, etc.
- Air Compressor—for Paint Spraying, etc. Delivers 4.5 CFM at 40 PSI with 1725 RPM
- Home Water Systems
- 4-Ball Bearings—1/2" Shaft—3/8" Ports
- Rotate in either direction
- Rated up to 6 GPM, 50 PSI
- Use with 1/4 HP motor or larger, speeds from 200 to 1800 RPM
- Useful for hundreds of applications in the home, farm and factory
- Built by Pesco—Div. of Borg-Warner, Gov't. acq. cost \$45.00. Shpg. wt. 12 lbs. Free: Complete instructions and performance data with each pump. F.O.B. Chicago NOW ONLY.....

16.50

HYDRAULIC CONTROL VALVES

- ITEM #24. Four-way control valve with built-in relief valve, for use with one double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Ship. wt. 8 lbs. A \$38.00 value, postpaid..... 9.95
- ITEM #26. Four-way control valve for use with two hydraulic double-action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Ship. wt. 6 lbs. A \$60.00 value, postpaid..... 12.95



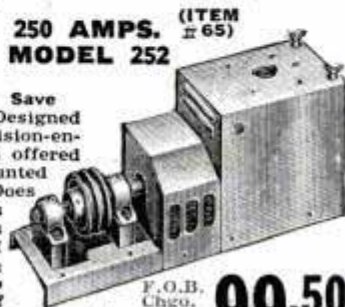
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NEW! STATIONARY OR PORTABLE

D. C. ARC WELDER

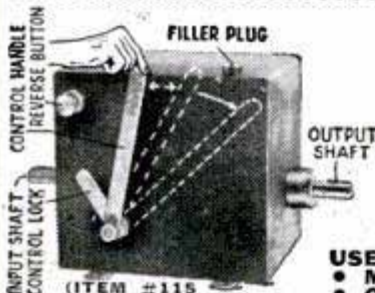
FOR ANY WELDING JOB, LIGHT OR HEAVY

Stop Costly Repair Bills, Weld It Yourself and Save One or two jobs will pay for entire welder. Designed for many years of trouble-free service. This precision-engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly where and when you need it. Has dial type rheostat for easy pinpoint control and a high-low range switch. Run welder at 2500 RPM from drive pulley or power take-off of tractor, a 7 1/2 HP electric motor or a 10 HP gas engine. Use two V belts or flat belt (on pulley). Now at a fraction of its value. Price includes double V or flat belt pulley and instruction book. Shpg. wt. 107 lbs.....



F.O.B. Chgo.

99.50



HYDRAULIC SPEED REDUCER

WITH FINGERTIP CONTROL

- USE FOR: • Reamer Drives
- Midget Cars • Feed Mills
- Canning Machines • Conveyors
- Lathes • Milling Machines • Motor Boats
- Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7 1/2"x7 1/2"x11 1/2". Gov't. acquisition cost, \$428.00. Shipping weight 26 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago

54.50

DIRECT CURRENT GENERATORS



For welders, plating, truck and marine use, D. C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

- Item #131 — Brand new Electric Auto-Lite 12 volt Direct Current electric generators, rated 18 amps. Complete with blower and pulley. Use for trucks, tractors, boats, battery chargers, etc. Part No. GEF-4805A. In original sealed U. S. Army cartons. \$40.00 value. Shpg. wt. 27 lbs. F.O.B. Chicago. Now Only..... 15.00
- Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Shpg. wt. 70 lbs. F.O.B. Chicago..... 22.50
- Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost \$380.00. Shpg. wt. 70 lbs. F.O.B. Chicago. Each individually packed in wooden box..... 35.00
- Item #73—Allis Chalmers MOTOR GENERATOR, 120 volt, 60 cycle AC, 7.82 amps. output. Input—24 volts DC, 63 amps. 3600 RPM. Ideal for marine and aircraft installations, farm and factory use where AC is desired and DC available. Run unit off DC Welder for handy 120 volt AC current for emergency power for oil burners, incubators, electric motors, etc. Shipping wt. 200 lbs. F.O.B. Chicago..... 79.50

Hydraulic Cylinders—Air or Oil

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

- ITEM #4—All steel double action hydraulic cylinder, 1 1/4" bore, 2 7/8" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. Postpaid..... 4.95
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- ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A \$45.00 value. Postpaid..... 10.95
- ITEM #41—Double action hydraulic cylinder, 2" bore, 6" stroke, clevis mounting at base and end of shaft. Over-all length closed 12 1/2". Has 3/4" stainless steel shaft, uses 1/4" tube fittings. Will lift up to 3100 lbs. with 1000 P.S.I. line pressure. Weight 7 lbs. Postpaid..... 12.50
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- ITEM #103—Double acting hydraulic cylinder, 2 1/2" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft. 3/8" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago..... 21.50
- ITEM #31C—Double action hydraulic cylinder, 3 1/2" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1 1/2" piston rod. Clevis mounting at base and shaft, 19 1/2" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses 3/8" tubing fittings. Value \$102.00. Ship- ping wt. 11 lbs. F.O.B. Chicago..... 22.50
- ITEM #6-A—Double action hydraulic cylinder, 3" bore, 25" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1 1/2" stainless steel shaft. Gov't. acq. cost \$176.00. Shpg. wt. 26 lbs. F.O.B. Chicago..... 28.00
- ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago..... 32.50



16.95

LOGAN HEAVY DUTY HYDRAULIC PUMP

For operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 10 GPM at 1200 RPM at 1000 P.S.I. using 6 HP. Has a 3/4" inlet, 1/2" outlet, 3/4" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value FOR ONLY..... 22.50 F.O.B. Chicago



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FREE, NEW CATALOG of those

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DURO-CHROME TOOLS



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Write your name and address in margin space below

ALL-PURPOSE, LOW-PRICED



HI-STANDARD
Sport-King

For only \$44 you can have this value-packed light-weight 22 long rifle automatic with either the 6 3/4" target barrel or the 4 1/2" all-sport barrel. Get both these precision-broached barrels for only \$8 more. Instantly interchangeable without tools. No other pistol has this feature.

Ideal for hunter, fisherman, trapper or camper. Just the gun for plinking or shooting varmints or small game, or as light-weight target pistol. Nothing else available of this quality for anywhere near this low price.

Equipped with diamond-checked molded grips with comfortable thumb rest. Or you can add the finest carved black walnut grips for only \$8.50 more.

Accurate glareproofed fixed sights. Easily installed rear adjustable sight with positive click adjustments for windage and elevation, and compensating front sight, available in a kit for \$6 additional.

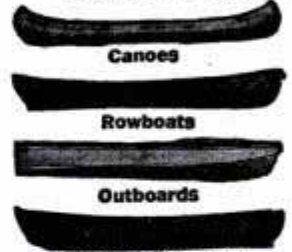
Ask your dealer about the Sport-King and the heavier target automatics—used by the world's leading target shooters—the Olympic for 22 shorts and the Supermatic for 22 long rifle cartridges. Write for free folder about all Hi-Standard pistols.

HIGH STANDARD MANUFACTURING CORPORATION
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Better Built
Lower Prices



Safe Boats With
Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows two new models of "Take-Along" Boats. Two big factories—save you freight.

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Light Boat for Auto
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B-M POWER MOWERS

CUT HOURS OF WORK into
MINUTES of PLEASURE!

- Prompt Shipment
- ★ Low Factory Prices
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- ★ Model D-3



For a quick, slick job and a smooth-as-velvet lawn, you can't beat a B-M Power Mower. Three Models of fine rotary mowers available for your special cutting needs. The D-3 (pictured here), the self-propelled P.D. models, or our light VD-1 Mower with vertical shaft engine and direct blade drive. Quick starting, dependable 1 1/2 to 3 h.p. Clinton engines. Safety features. Easy adjustments. Low factory-to-you Price. Write for FREE LITERATURE.

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Make your own castings of aluminum, copper, bronze, silver. Foundry sets are available in three sizes including 2400 Deg. F. blast Furnaces. \$22.50; \$29.50; and \$42.00. f.o.b. Kansas City. Free Circular.

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GLOW IN THE DARK!

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A Practical Power Plow and Cultivator for Suburbanites, Gardeners, Florists, Estates, Fruit, Nursery & Poultrymen.

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\$1⁰⁰/₃ SIZE

Entirely NEW design. Drills fast and perfectly in any wood. Six sizes, from 3/8" to 1" will fit any 1/4" electric drill or press. Knots and nails won't damage keen hardened cutting edges. Hexagon shank can't slip in chuck.

Sizes 3/8", \$1.00; 1/2", \$1.05; 5/8", \$1.10; 3/4", \$1.15; 7/8", \$1.20; 1", \$1.25. Set is \$6.50. Order set of six and save.

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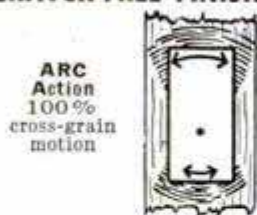
CHOOSE THE MODEL BEST FOR YOU!

Two DREMEL Electric SANDERS with STRAIGHT LINE Action for Guaranteed SCRATCH-FREE Surfaces

BEFORE YOU BUY ANY SANDER—BE SURE YOU WILL GET A SCRATCH-FREE FINISH



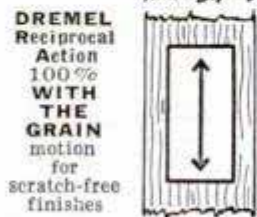
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Partial cross-grain motion



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DREMEL Reciprocal Action
100% WITH THE GRAIN motion for scratch-free finishes

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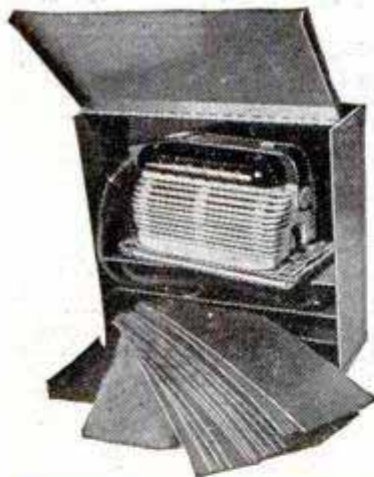
Model 2000
\$24.50

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SANDING STROKES
PER MINUTE

Model "A"
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The new Model 2000 is a fast-cutting production sander. It has the added stroke and power required for furniture and cabinet making, boat building or refinishing, resurfacing large area table-tops, sanding plastic, leather, etc. Great for building operations in sanding woodwork, stair treads, dry wall joints, siding and other exterior surfaces. Does a superb wax polishing job, too! Weighs only 5 lbs. yet has 21 sq. in. sanding surface. Over-all size 3½"x4½"x7". Model 2000 price includes steel carrying case shown, with 25 assorted sheets abrasive paper and 1 sheepskin polishing pad.



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FUN FOR BOYS FROM 8 TO 80

DREMEL Electric COPING SAW

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BLADE FACES 4 WAYS

FREE PROJECT PLANS

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Only \$5.85 with 3 saw blades

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For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—delivers 7,200 strokes per minute smoothly, effortlessly. Saws through ¾" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only 2 moving parts, never needs oiling. Uses 110-120 v. A.C.

make your own Gems 29.50 F.O.B.

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This exciting new book shows how to amaze your friends with chemical magic, describes many fascinating home experiments, tells of fun, thrills and big future opportunities for boys who know chemistry. Special atomic energy feature. Send today!

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with Spare-Time
Plowing &
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5-HP

GRAVELY Tractor

OFFERS 20 MONEY-MAKING TOOLS!

Make good money this spring plowing gardens with the powerful Gravely Tractor! Perfect seedbed in one operation. It's easy to earn \$30 to \$40 a week—*extra!* The tractor does the work—you collect the fee. After plowing season, use Sickle or Lawn Mower attachments for cutting brush, weeds, lawns. Remember, with 20 tools, Gravely does *every* lawn, garden and field job! All-gear drive, power reverse; moderate investment. . . . An easy way to get a Gravely of your own—and make a profit besides!

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500' 2-PLY NYLON	25 lb. T
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BRAIDED NYLON LINE

200 ft.	15 or 20 lb. Test
175 ft.	35 lb. Test
150 ft.	50 lb. Test
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Level Fly Line, size E & D, 75 ft. \$1.00
All lines available in longer lengths. Send Check, Money Order. We pay Postage.

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Save Point Repair Costs

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POINT SHIELD

Shields and protects ignition points. Serves as excess current regulator—prevents "Blue Points". Particularly efficient in cold weather starting as well as all ordinary driving. Saves cost of several sets of points. Easily and quickly installed—merely connect in series between coil and distributor.

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Any vacuum operated gas mileage indicator or tune-up tester can be made to fit your car to an accuracy within 1 mile per gallon at maximum level road economy with a Road-Miser Dial. We supply a set of Road-Miser sectional dials to cover all probable variations in cars of the same specifications. You easily attach the correct dial strip to your indicator after making a short mileage check by simple instructions. Road-Miser leaves all present dial numbers exposed on most indicators. The best index to your car's condition is a constant reading of its maximum mileage. Test it anytime with a Road-Miser equipped indicator. Money refunded if not satisfied. (Please give make, year, and model of car. Also, indicator name and dial size.)

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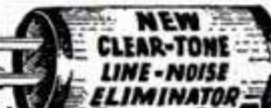


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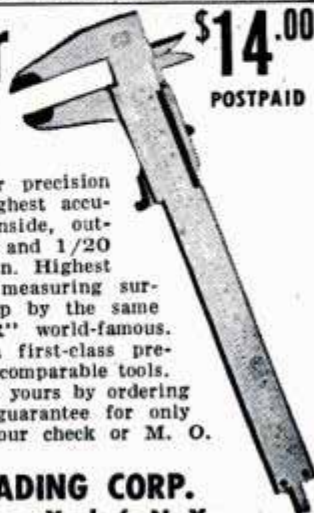
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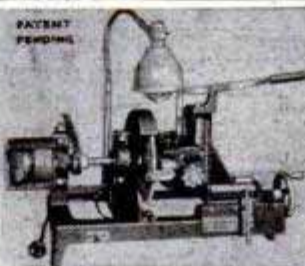
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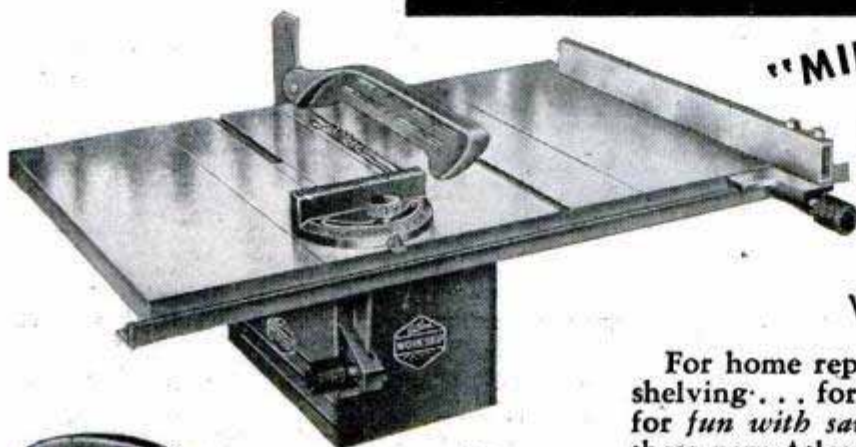
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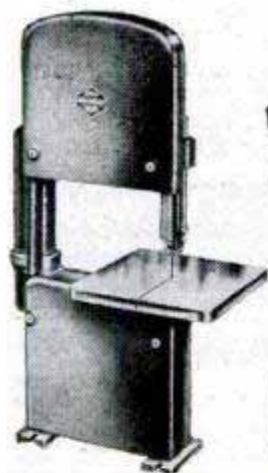


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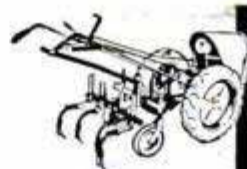


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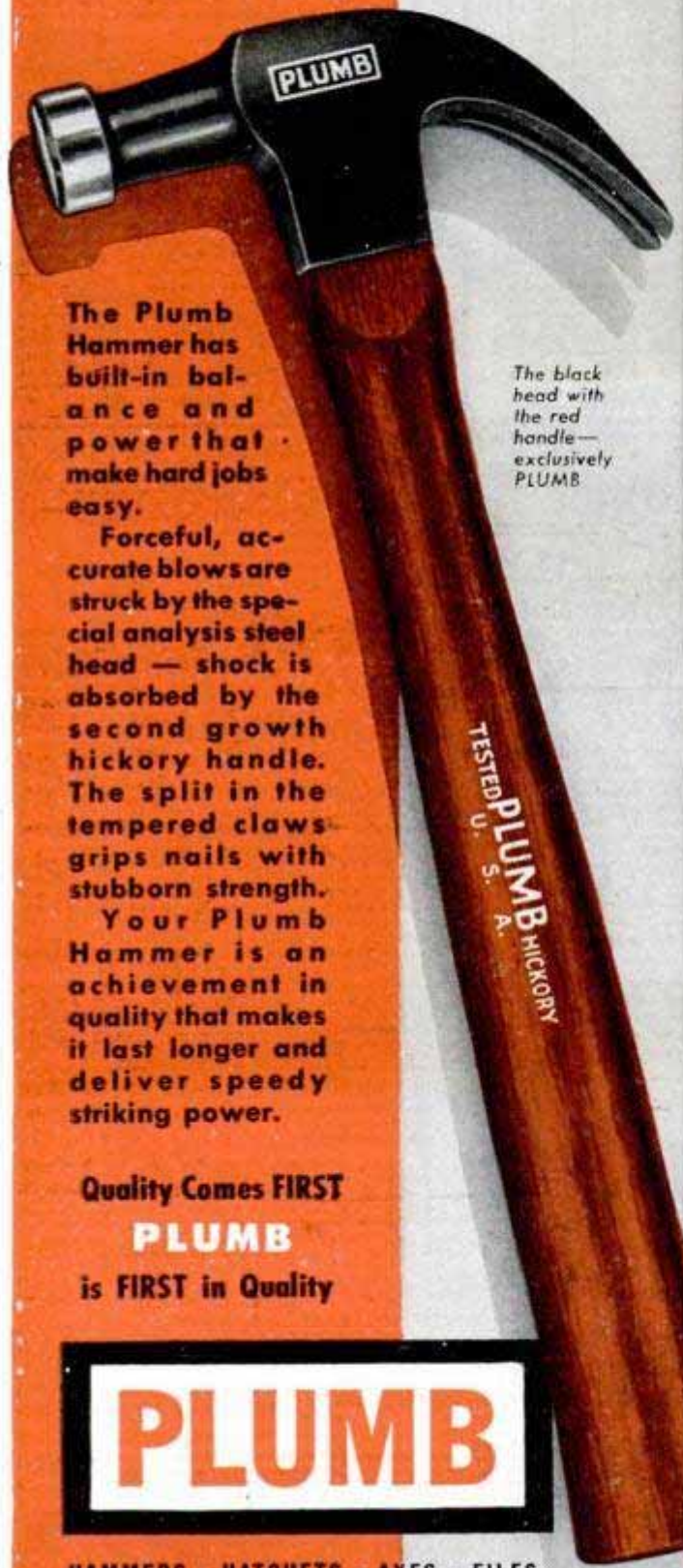
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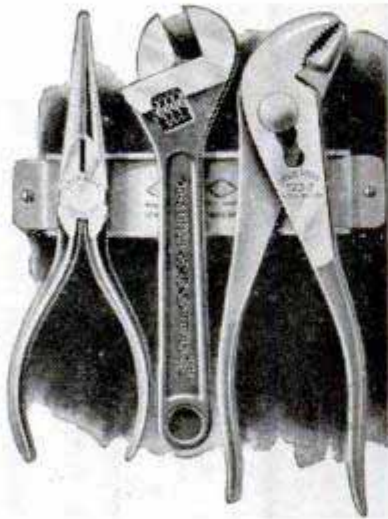
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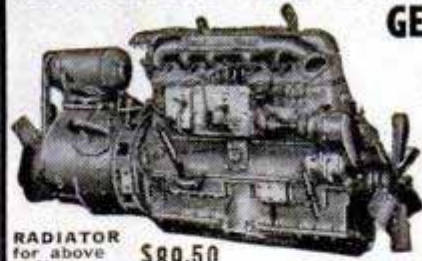
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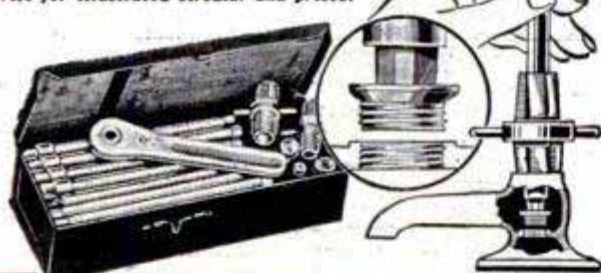
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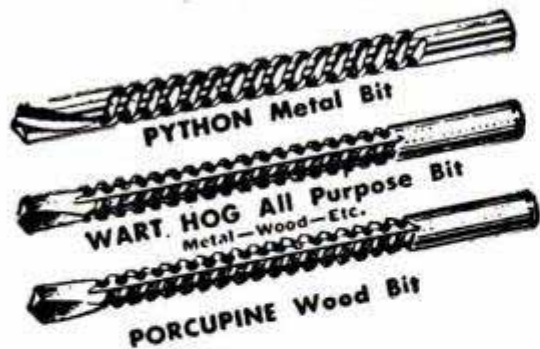
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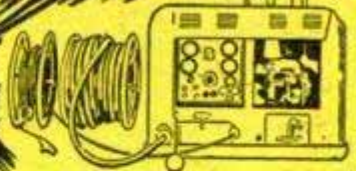
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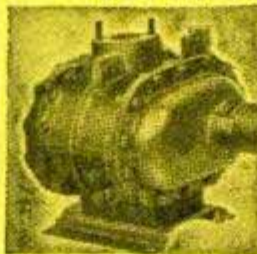
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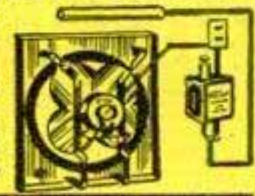


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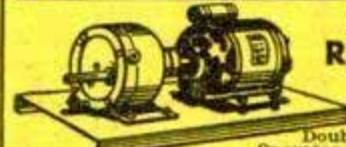
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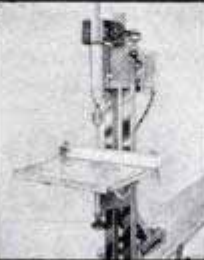
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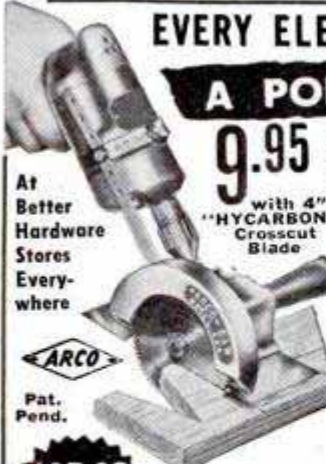
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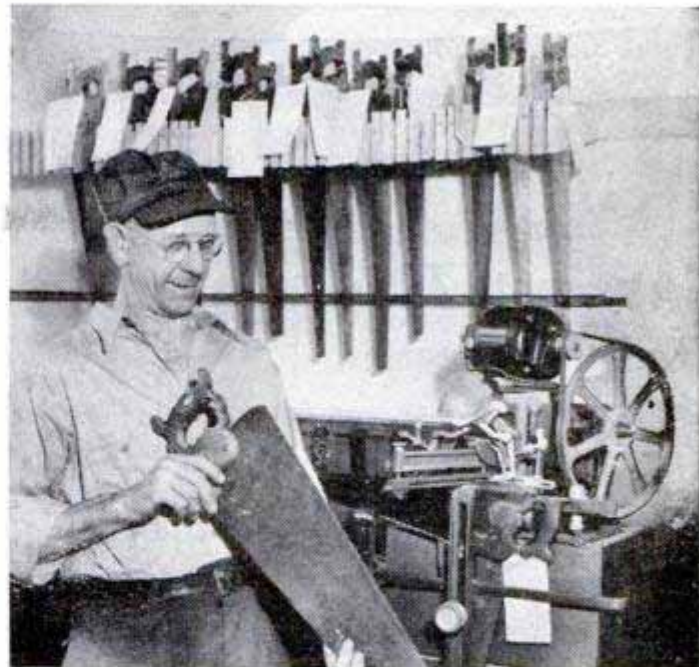
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• Gas Engine. 2-cycle, 1 h.p. Finest design. **\$26.90**

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• Same Winch, dual ratio 1-3, 1-9. **\$39.50**

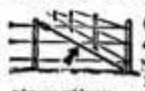
• Winch Snatch Block. 3,000 lb. cap. Roller Bearings. **\$ 5.50**

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• Hi-Efficiency Cent. Pump. Garden hose thread, over 15 GPM **\$11.95**

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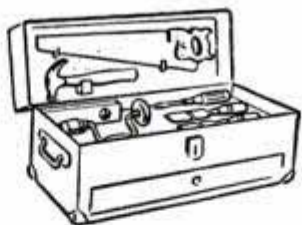
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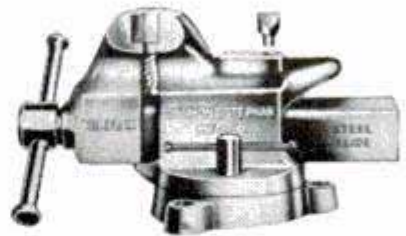
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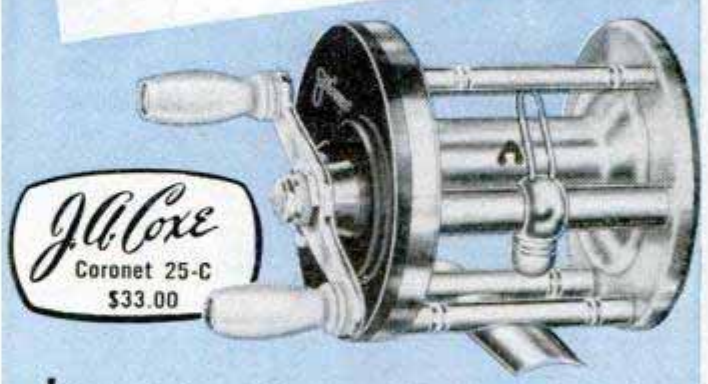
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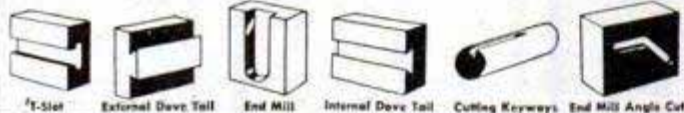
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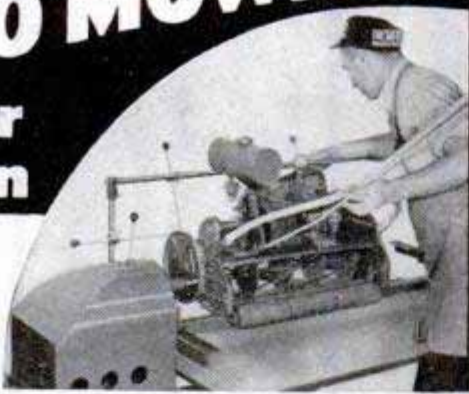
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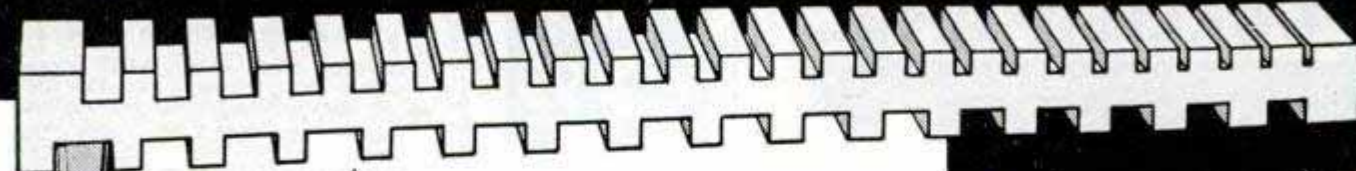
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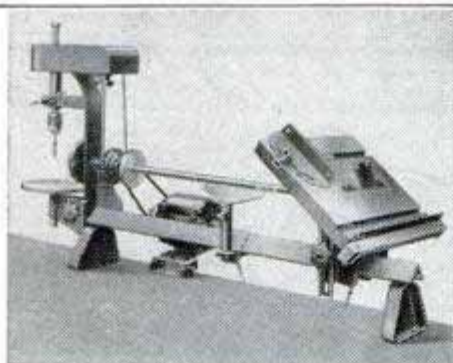
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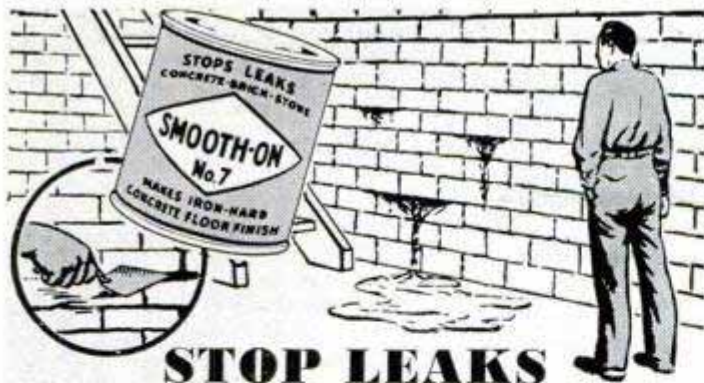
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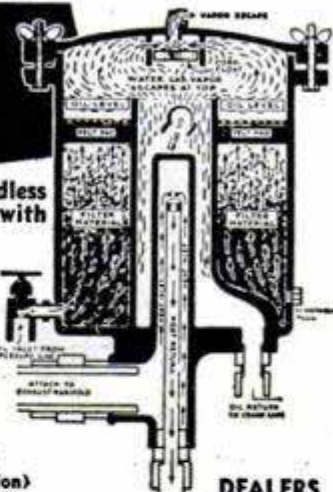
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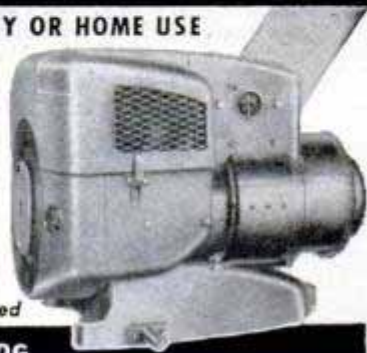


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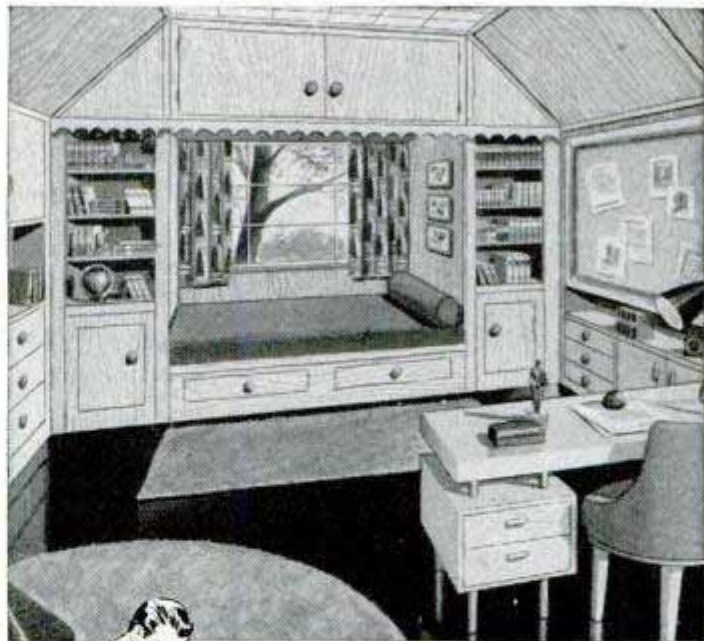
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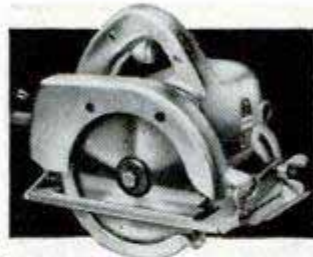
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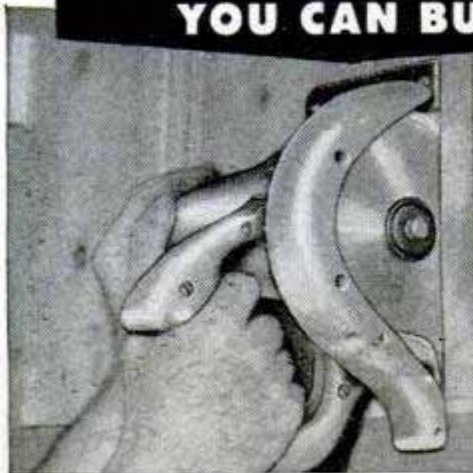
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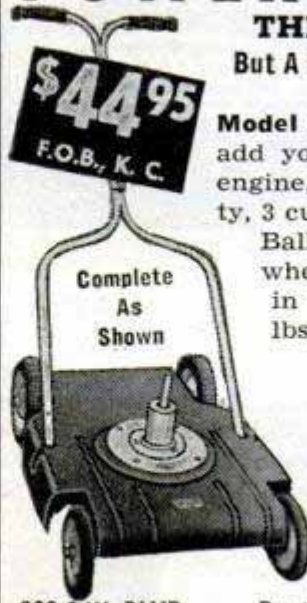
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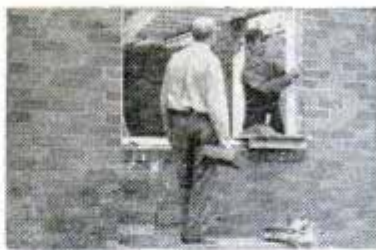


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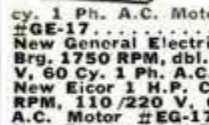
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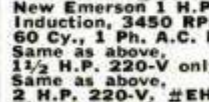
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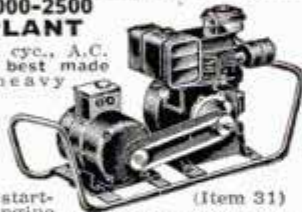


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500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1 1/4 hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for most oil burners, emergency lights, freezer, radio, incubator, etc. Ideal for trailers or camping. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. Be prepared if war or storm knocks out power lines. Reg. \$275.00 value. **\$143.50**

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GENERATOR ONLY and control box. Drive it with your engine or tractor. **\$169.50**



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(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2 1/2 lbs. Usually \$4.50—Special 40 ft. **\$1.99**
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PRESSURE SWITCH

(Item 30) Penn Electric Model 110 BPO2, best made. For pumps and air compressors. Heavy duty. Will handle up to 250 lbs. press. and up to 5 h. p. Autom. unloader valve, for easy starting. 110-220 v. A.C. or D.C. 2 pole. Wt. 5 lbs. Reg. list \$17.50. Our Spec. **\$8.95.**

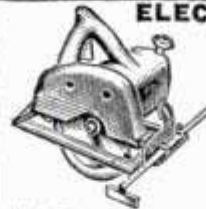


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(Item 26) Immersion type, heavy duty, 115v. A.C. 300w. Does not require watching. Thermostat shuts off at 185°. Keeps water hot for shaving, washing dishes, etc. Also good for keeping water from freezing in big troughs or tanks. Made by Cities Service. Wt. 4 lbs. Worth \$9.50. Our Spec. **\$4.50.**

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(Item 27) Precision made of solid bronze by Star Brass Co. Calibrated weights (incl.) acting against hydraulic piston, provides quick accurate testing of all pressure gauges up to 3000 lbs. per sq. in. Brand new in hardwood cases. Wt. 100 lbs. Reg. \$435.00. Our Spec. **\$135.00.**



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(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6 1/4" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in saw-dust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2 1/8". 1 year written guar. Wt. 12 lbs. Drastically reduced. **\$39.95.**



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(Item 25) Fits into chuck of any electric or pneumatic drill or flex. shaft. Operates at any angle in a full 360° arc. Makes possible drilling, grinding, carving, routing, etc. in close cramped quarters. Makes impossible jobs easy. Made by Kett Tool Co. Complete with built-in chuck (1/4" capacity) and adjusting key. Hardened alloy gears. Precision built for heavy duty. Lists at \$39.95 — while they last **\$9.95.**

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SPRAY OUTFIT

(Item 37) Twin cyl. piston type compressor direct-connected to powerful 110-120 v. AC-DC motor. Built-in air tank eliminates pulsation and provides steady flow of air at 25-30 lbs. Sprays lacquers, enamels, insecticides, etc. Does beautiful work on autos, furniture, farm equip. 1 qt. spray gun, relief valve and 10 ft. air hose incl. Full instructions and 1 year guar. Wt. 11 lbs. Easily worth \$50. Spec. **\$22.95.**

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(Item 20) Store gas or carbon tet. in 5 gal. safety can. Valve releases just the right amount into washing compartment. Parts are washed and drained on a "dunking" screen — no fishing for parts. Eliminates fire-danger, waste, spillage, evaporation. Wt. 14 lbs. Reg. \$19.50—Special **\$5.95.**



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(Item 33) DeLuxe model — powerful, smooth running, precision built. Handles toughest jobs. Cutler-Hammer switch, Jacobs key chuck. 110-120 v. AC-DC 300-450 rpm. Alum. alloy case for high strength and easy handling. Built-in blower assures cool operation. Cap. 1/2" in steel. 1 year written guar. Wt. 11 lbs. Compares with \$65 drills. Special **\$34.50**



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(Item 34) Hi-power, long-life, smooth running. Alloy steel gears; built-in blower, Cutler-Hammer switch, Jacobs hand-miter chuck. 110-120 v. AC-DC 1000-1600 rpm. Cap. 1/4" in steel. 1 year guar. Wt. 4 lbs. Terrific value at **\$12.95.**



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(Item 35) Includes above illus. guar. drill, buffers, polishing bonnet, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer burrs. Complete in heavy steel case. Wt. 13 lbs. 38 pc's., all highest quality. Complete kit worth \$38.50. Our Spec. only **\$19.85**



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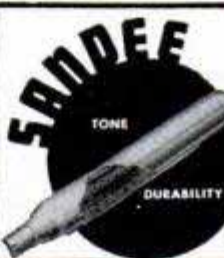
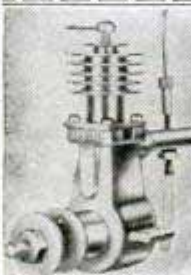
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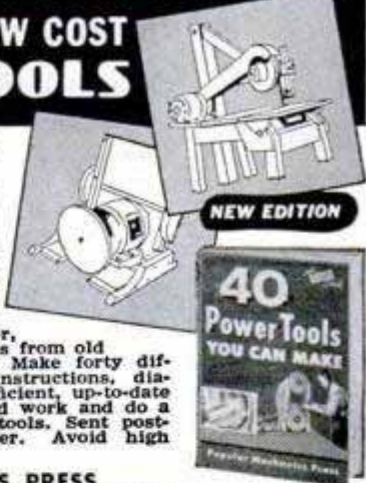
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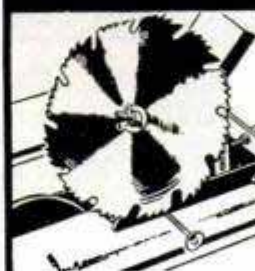
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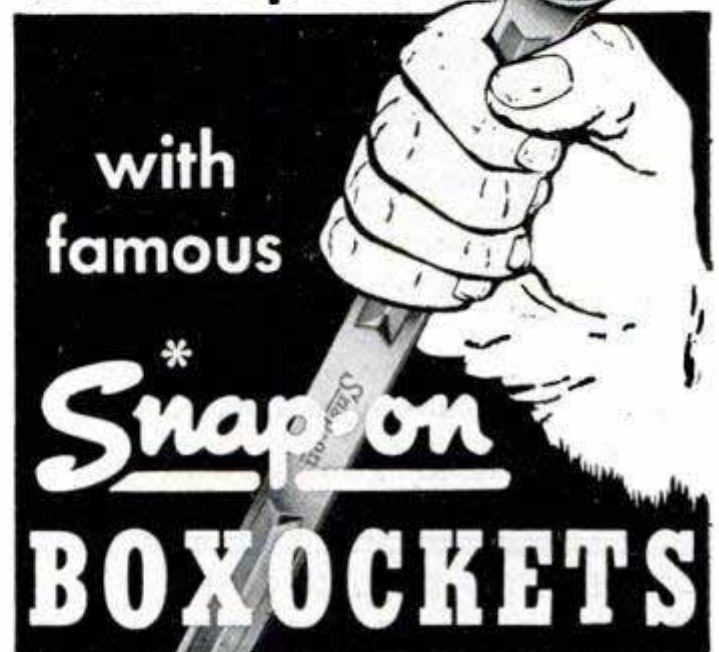
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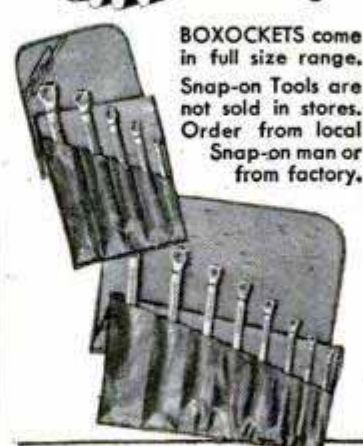
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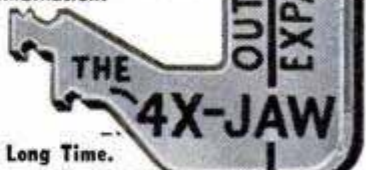


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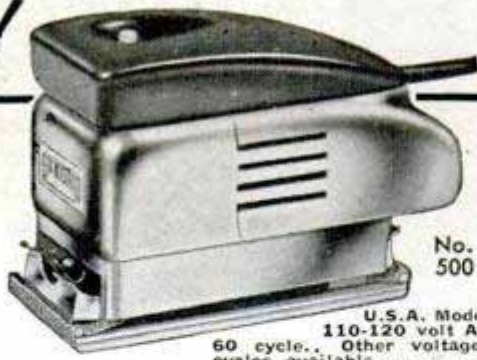
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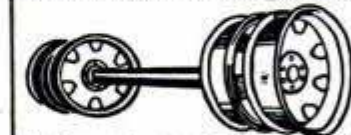


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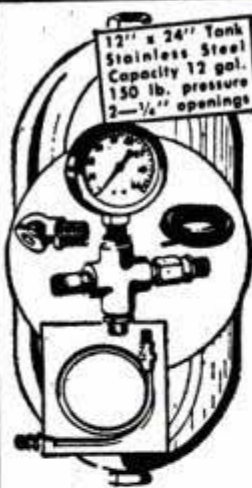
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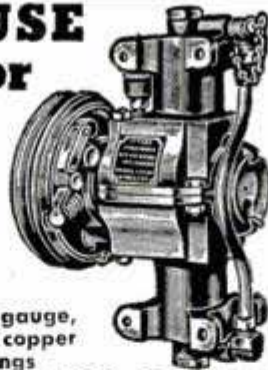


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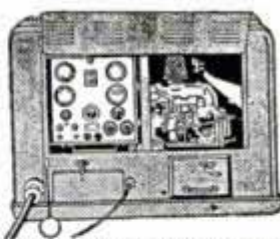
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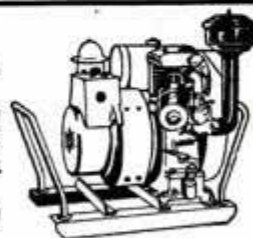
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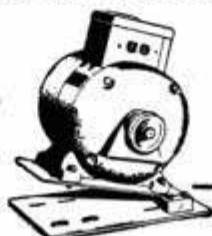
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500 to 750 watt, A.C., 110-120 volt, 60 cycle, 1 phase output. Also 100 watt D. C. battery charging output. May be used at the same time. Voltmeter, 2 outlet boxes. **\$99.50**
 Wt. 55 lbs. Price
 Furnished with 1 1/2 HP Engine with drive **\$149.50**
 2000 Watt, 110-120 volt, 60 cycle, A.C. 1 phase, 35 amperes. Starting, overload capacity up to 51 amps. Voltmeter, 2 plug-in receptacles. Wt. 75 lbs. Complete instructions furnished. Special Price **\$169.50**
 Furnished with 6 1/2 HP. **\$295.00**
 —B & S Z Engine.



WELLWORTH V-BELT CLUTCH



Takes starting load off engines or motors. When speed is reached, a flip of handle shifts clutch from idling to driving position. Handles "A" belts, 2.35" pitch diameter, 5/8" bore. Ideal for use with lawn mowers, garden tractors, home workshop motors, etc. 3 1/4" long. Safe, easy to mount, sealed bronze bearings, positive action. Shpg. wt. 3 lbs. **\$7.50**
BUSHING FOR 1/2" SHAFT, 15c
BRAND NEW SAME CLUTCH FURNISHED WITH 3/4" BORE \$8.50

Portable ELECTRIC HAND SAW



The Zip Sawyer With ALL the Features
 6 1/4" Diameter saw blade, 1/2" square arbor hole. Maximum depth of cut 2 1/8". (At 45°, 1 3/4".) Minimum depth of cut 0". Angular adjustment 90° to 45°. No-load speed, 5200 r.p.m. Full load speed, 3200 r.p.m. Amperes, full load 8.0. Universal AC-DC motor, 110/220 volt. Dimensions: 11 1/4" long; 9 1/2" wide (ripping guide removed); 7 1/8" high (without blade). Furnished complete with 6 1/4" diameter combination blade and 10 ft. cord and plug. Wt. 11 1/2 lbs. Price **\$39.95**

6 Ft. Stow FLEXIBLE SHAFT

BRAND NEW
 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. Wt. 8 lbs. **\$16.50**



AIR REGULATOR and EXTRACTOR
 1/4" Air Regulator, Gauge and filter. Wt. 5 lbs. **\$8.95**



New
 Regulator and Gauge only **\$5.95**
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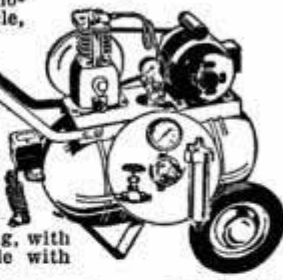
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BRAND NEW
 Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13 1/2" x 11 3/8"; inlet 8 3/4". Height 19". Width 18". Depth 16 1/2"; C.F.M., 1/4" S.P. 1600; outlet vel. 1575; wt. 45 lbs. **\$27.50**
BLOWER LESS MOTOR AND DRIVE \$2.50
 with belt and variable speed pulleys extra. (Motor required, 1/4 h.p.)

AUTOMATIC COMPRESSOR UNIT

1/2 H.P. heavy duty capacitor motor. AC 110/220 volt, 60 cycle, 2x1 3/4 inch piston type compressor, splash feed lubrication, 12x24 inch tank, automatic pressure switch. CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Mounted on 2 wheels, ball bearing, with 2"x10" pneumatic tires. Portable with handle. Shipping wt. 90 lbs. **\$98.50**



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LOW COST BATTERIES • LIGHT WEIGHT • 3-WAY SIGNAL • GTD. 1-YEAR

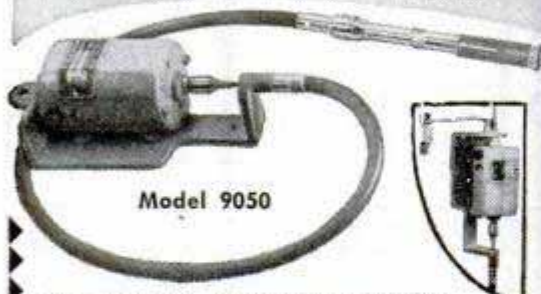
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POWER-PACKED 14000 RPM
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FLEXIBLE SHAFT MACHINE
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Offset Screw Driver
Drives . . . draws screws
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No. 400 1/2" capacity—more power than drills costing almost double. Jacobs Geared Chuck, removable top handle. **\$39.50**

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No. 200 1/4" capacity. Fast-drilling with added power. **\$16.50**
 With Jacobs Geared Chuck. **\$19.50**

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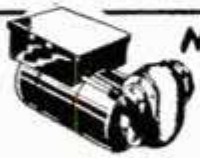
Here's a Real Buy! Finest precision built R-1 Generators, used on B-29's, cost the Government approximately \$400.00. Gives from 300 to 400 amps at 27 volts. Ideal for all welding, light and heavy up to 5/8" thickness, FREE complete instructions for conversion of this Generator to welding unit. R-1 NOW AVAILABLE AT



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Other AIRCRAFT GENERATORS

P-1	27 Volts	200 Amps	1595	E-5A	12 to 15 Volts	50 Amps	1295
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NEW! GEAR HEAD MOTOR

GHM-607 - Originally designed to drive large Aircraft Tow-Target reels. Powered by 24 VDC, 95 amp, compound wound motor. Rated at 2 HP. Turns 4,200 RPM and is geared down to 136 RPM at the power take-off shaft. 60 foot pound torque at take-off. Power drive is 3/4" female adaption. Unit has magnetic clutch for instant stop control. Comes complete with operating switches and control box.

3750



FIRE EXTINGUISHER

Kiddie Lux CO₂ Type. Built to Gov't spec. Shatter-proof, heavy case. Fully recharged. with horn.

No. 602A - 7 1/2 lb. \$35 Value. **19.25**

No. 603 - 10 lb. A \$65 Value. **25.75**

No. 601 - 4 lb. Wheel Control Type. **14.25**

No. 605-B - 15 lb. Wheel Control Type. **32.95**

No. 605-C - 15 lb. New Squeeze Grip Type. \$85 Value. **39.95**



LEAR ELECTRIC MOTOR

24 volt, 6 amps, series-wound reversible motor with over-load clutch. Motor turns 11,000 R.P.M. Has 11 to 1 gear reduction box turning 1000 R.P.M. at take-off. Adaptable to flex or rigid drive. Limit switch box. Size 10" x 4".

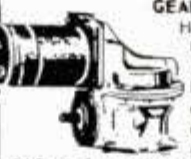
\$795



SAMSELL MOTOR

27 volts, 16 amps 1/5 H.P. reversible, series wound on motor. 3800 R.P.M., shaft 9/32" diameter. 12-spline. 4-1/8" x 2-3/8".

395



GEAR HEAD MOTOR

Heavy Duty G.E. Gear Head Motor. 1 1/2 H.P., 24 volt DC, 125 amp reversible motor will drive reduction gear box unit 44.5 to 1, resulting in 168 R.P.M. at 5/8" diameter take-off shaft. Motor contains electro magnetic break.

495

UNIT COMPLETE **1095**

GEAR BOX ALONE **795**

ELECTRIC ACTUATOR



Hundreds of uses for any mechanical device needing controlled 2-way action, opens, closes, raises or lowers doors, windows, gates, valves.

CTU-2 Foote linear actuator. 24 Volt A.C. or D.C., 8500 R.P.M., 1/6 H.P. Series wound motor, 4 1/2" stroke in 1 1/2 seconds. Compression and tension. Loads up to 750 lbs. Adjustable micro switch for limits of travel. Overall length retracted 11" **Only 695**

TACHOMETER - TYPE C-11

Operates on direct drive with flexible shaft. Range is 0 to 4500 RPM. Ideal for use on single engine planes or boats, autos, etc. Drives direct from camshaft or at 2 to 1 reduction from crankshaft. **\$475**

AUTO PULSE PUMP

Ideal for fuel pump for auto or boat. 24 Volt D.C. Can be adapted to 6 Volt D.C. 1/8" standard pipe ports. **550**

Sperry Aircraft Directional CYRO COMPASS

Dial is 360° swing, calibrated 1/10° (6 min). Panel mounted. Face is 4 1/2" square with 3" luminous dial. Can be used in autos, planes or boats by attaching one tube to intake manifold for required vacuum. Has external set knob. Government overhauled and ready **\$495**

D. C. METERS

AMMETERS		VOLTMETERS	
0-30-0	0-30	0-120	0-300
60-0	60	0-240	
120-0	120	0-300	

Your choice 3.95 ea.

COMBINATION VOLTMETER - AMMETER

30V - 30 AMP **\$4.95**

30V - 60 AMP

All meters 2" face except 0-300 which is 3" face.

SHUNTS - Required for use with D.C. Ammeters 30-60-120-240

SOLD ONLY WITH METERS. **\$1.00**

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No. 500 - New 1/2 HP - 27 Volt DC-AC. This motor can be readily adapted to deliver up to 1/2 HP on 110 Volts AC by the simple method of rearranging armature brush-leads. Free diagram with each order. A sensational Value **\$5.95**

No. 500-A - Converted to 110 Volts-AC Equipped with plug and 3/16" Heavy Duty Cord **\$8.49**

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bevel gear 1 1/2 to 1 reduction, size 7" x 6". A Life-time Value. **\$3.95**

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Both above gear boxes have lever control for engaging & disengaging positive clutch, dust proof housing. Pre-lubricated bearings. Both can be adapted in Vickers Transmission.

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Gives 20,000 lb. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lb. thrust with 3,000 lb. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS, 4" Bore, 1 1/2" dia. piston shaft, 18" stroke, length 30 1/2". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for roof, farm & shop machinery, presses, etc. Cost Gov't \$390.00 **295**

We carry the World's Largest Supply of New Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes & Types. Can also supply all accessories such as Pumps, Fittings, Valves, Tanks, Hose Fittings. Let us solve your Hydraulic problems. Write for information.

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P-3 STRATO POWER PUMP With built-in variable flow control valve in head. Positive displacement piston type. Displaces 450 cu in. per revolution. 2 gal. per min. cap. at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous. 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent maximum, 4500 RPM. Rotation either direction without adjustments. **1950**

GEROTER TYPE PUMP Logan Geroter type. For operating hydraulic systems on trucks, tractors, etc. Delivers 8 GPM at 1200 RPM at 1000 PSI with 5HP. Can also be used as hydraulic fluid motor. 3/8" stand pipe ports, 1/2" splined shaft for pulley or direct attachment. 5 1/2" dia., 7" long. Used but condition guaranteed. **2150**

VICKERS HYDRAULIC Transmission Self contained, 2 H.P. constant torque at all speeds with variable volume reversible piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output R.P.M. - 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Duplicator Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. **3250**

4" Spline Shafts for input & power take-off. **250 PR.**

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Rust resistant alloyed steel, extra flexible, preformed - 7 x 19 strand on reels.

1/16" ... 4 1/2 ft.	7/32" ... 9 ft.
5/64" ... 5 ft.	1/4" ... 10 1/2 ft.
3/32" ... 5 1/2 ft.	9/32" ... 11 1/2 ft.
1/8" ... 6 ft.	5/16" ... 13 1/2 ft.
5/32" ... 6 1/2 ft.	3/8" ... 15 1/2 ft.
3/16" ... 8 ft.	1/2" ... 18 ft.

Stainless Steel - Not pre-formed

1/8"9 ft.	1/4"31 ft.
-----------------	------------------

Bronze Cable - Not pre-formed

1/16"5 ft.	3/16"23 ft.
1/4"17 ft.	1/2"38 ft.

PIANO HINGE

Overall Width	Length	Price Ea.
1 1/2" (5/8" side)	72" alum.	\$1.00
2" (1" side)	9" alum.	\$1.75
2 1/2" (1-3/4")	54" st. steel	\$1.69

BRASS HINGE - 1 1/2" (5/8" side). 040 Any length at ... **29c per ft.**

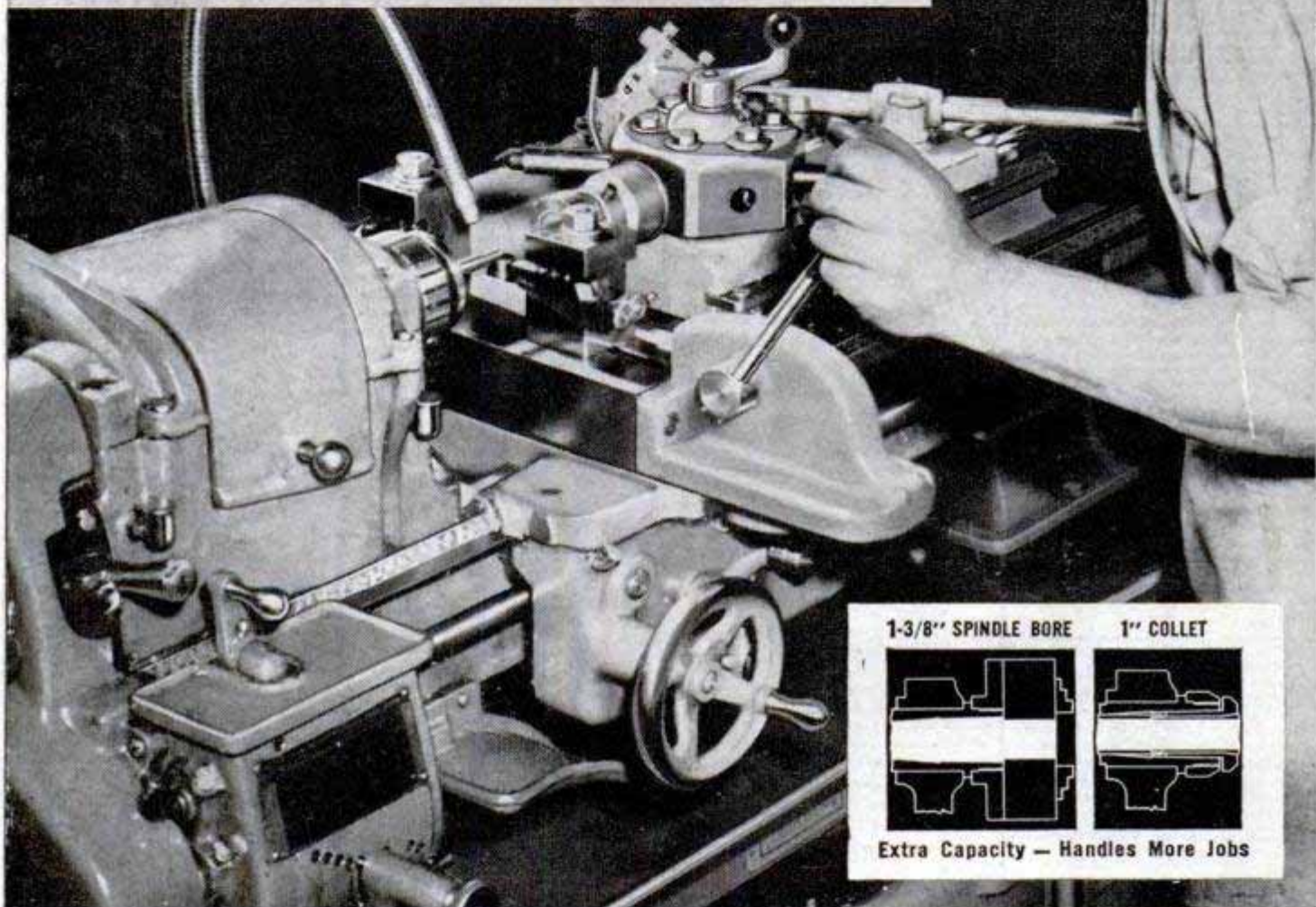
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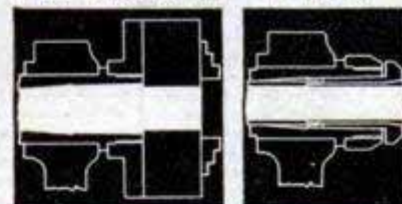
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SOUTH BEND SERIES 1000
PRECISION TURRET LATHE



1-3/8" SPINDLE BORE

1" COLLET



Extra Capacity — Handles More Jobs

This precision turret lathe is highly practical for machining small, precision parts. It meets the demand for fast, efficient production; yet is easily adaptable to many classes of work. It has the accuracy for exacting, close-tolerance operations; ample power for smooth performance; the rigidity for producing fine finish. It is especially suitable for second-operation work.

SPECIFICATIONS: Collet Capacity 1". Spindle Bore 1-3/8". Swing over bed 10-1/8", over double tool slide 3-9/16". Turret Tool Feed 4". Spindle to Turret 19-3/8", maximum. Thread Cutting Feeds (48) 4 to 224 per inch. Carriage Longitudinal Power Feeds (48) .0015" to .0836". Cross-Slide Power Feeds (48) .0006" to .0309". Spindle Speeds (12) 55 to 1340 r.p.m., approximate.



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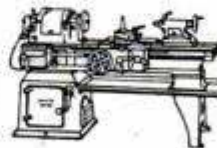
LATHE ATTACHMENTS

TURRET LATHE

TIME PAYMENT PLAN



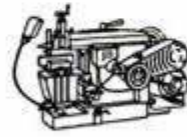
9" and 10" BENCH LATHES



10" to 16-24" FLOOR LATHES



14" DRILL PRESSES



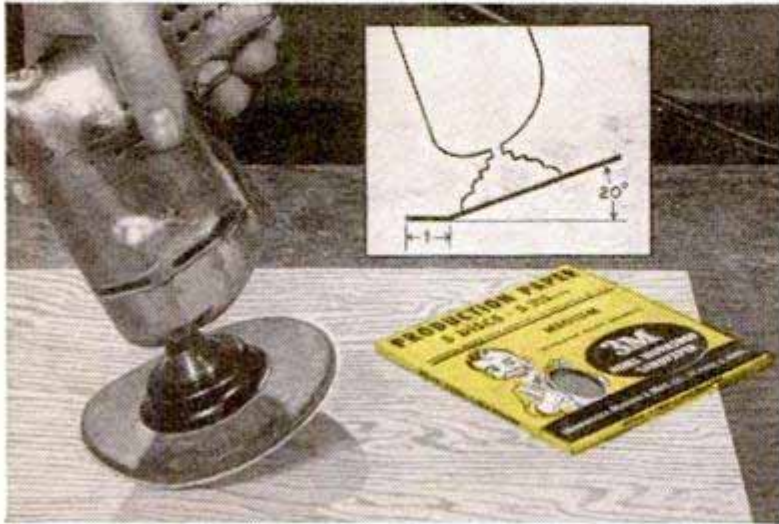
7" BENCH SHAPERS

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NOW! Professional-quality sandpaper pre-cut to fit your home power tools



SANDING TIP: for more efficient disc sanding hold the machine at a 20° angle to the work. Use only the outer 1" of disc surface for grinding. And to get even better results, use the new 3M Home Workshop Sanding Discs with aluminum-oxide mineral coating. For ¼" to 1" arbor, 5" and 6" diameters. 5 sheets to a pack.

Tough aluminum-oxide mineral coating lasts ten times as long as ordinary sandpaper—cuts faster, gives cleaner results on metal, wood or plastics.

Yes, 3M Home Workshop Sandpaper is the same "production" type sandpaper with the same tough aluminum-oxide mineral coating used in wood-working plants. It's tougher than flint or garnet—many times tougher than emery!

Never before has this fast-cutting, professional sandpaper been available to you in handy packs for home use. But now you can get discs, belts and sheets of aluminum-oxide pre-cut to fit everything from the popular 3M Sanding Block to most home power tools.

Your hardware dealer has 3M Home Workshop Sandpaper now. Ask him for it and you'll see the difference. Try it and you'll feel the difference.

Get "production" type 3M Sandpaper NOW from your hardware dealer!



3M Sanding Block



"Production" Paper Sheets



"Production" Paper Discs



"Production" Cloth Belts



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Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn. also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives. General Export: Durex Abrasives Corp., New Rochelle, N. Y. In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.



3M Rubber Sanding Block takes pre-cut sandpaper



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John Wayne
POPULAR, HANDSOME
HOLLYWOOD STAR

"I've been around movie sets enough to know how important mildness is to an actor. So when it came to deciding what cigarette was right for my throat—I was particular. I made a *sensible* test—my own 30-Day Camel Mildness Test!

"I gave Camels a real tryout for 30 days. The most pleasure I ever had from smoking. My own 'T-Zone' told me just how mild a cigarette can be!"



MAN'S IDEA OF A MOVIE HERO. And the women agree! 6 feet 4 inches, John Wayne has smashed his way to fame in dozens of motion pictures!

*Make your own
30-Day Camel
MILDNESS Test
in your "T-Zone"*

(T for Throat,
T for Taste)



Not one single case of throat irritation *due to smoking* **CAMELS!**

Yes, these were the findings of noted throat specialists after a total of 2,470 weekly examinations of the throats of hundreds of men and women who smoked Camels — and only Camels — for 30 days.

E. J. Reynolds Tob. Co.,
Winston-Salem, N. C.